

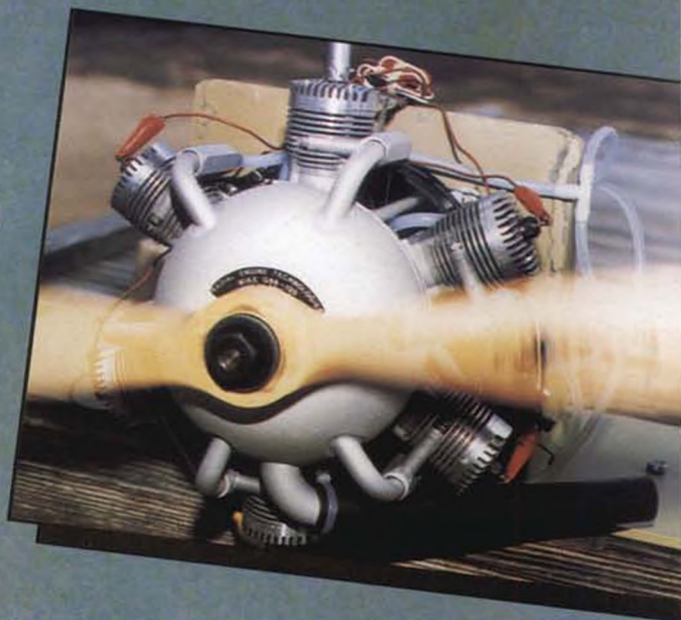
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SPECIAL**

**VISIT:
U.S. F3E
TEAM TRIALS**

**REVIEWS:
JR PCM-10
RADIO
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RADIAL ENGINE**



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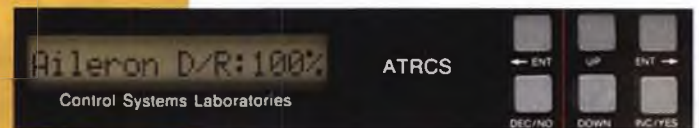
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ON THE COVER

Rick Brickert, flying the Lockheed T-33 "Red Knight," lays out white smoke trails from its tip tanks during an exhibition flight at the 1989 Reno National Championship Air Races. Rick and the T-33 were used to pace the air start of several Unlimited heats when Bob Hoover's P-51 sustained considerable damage to engine and prop while being taxied to the pit area.

The insert photo by Stu Richmond shows the Mike (Goldowsky) GR6-120 radial engine idling at about 1500 rpm. It develops over three horsepower, weighs 4-3/4 pounds. Complete review by Stu begins on page 29.



STAFF

EDITOR/PUBLISHER
Wm. C. Northrop, Jr.

GENERAL MANAGER
Anita Northrop

ASSISTANT GENERAL MANAGER
Dawn Johnson

MANAGING EDITOR
Richard Dowdy

ART DIRECTOR
Scott A. McPherson

TYPESETTING
Edna Clark

DRAWINGS BY
Al Novotnik

ACCOUNTING MANAGER
Robert Ruiz

OFFICE STAFF
Janice Fallon
Louis Garcia
Alexandre Nguyen
Betty Simpson
A. Valcarse

CONTRIBUTING EDITORS

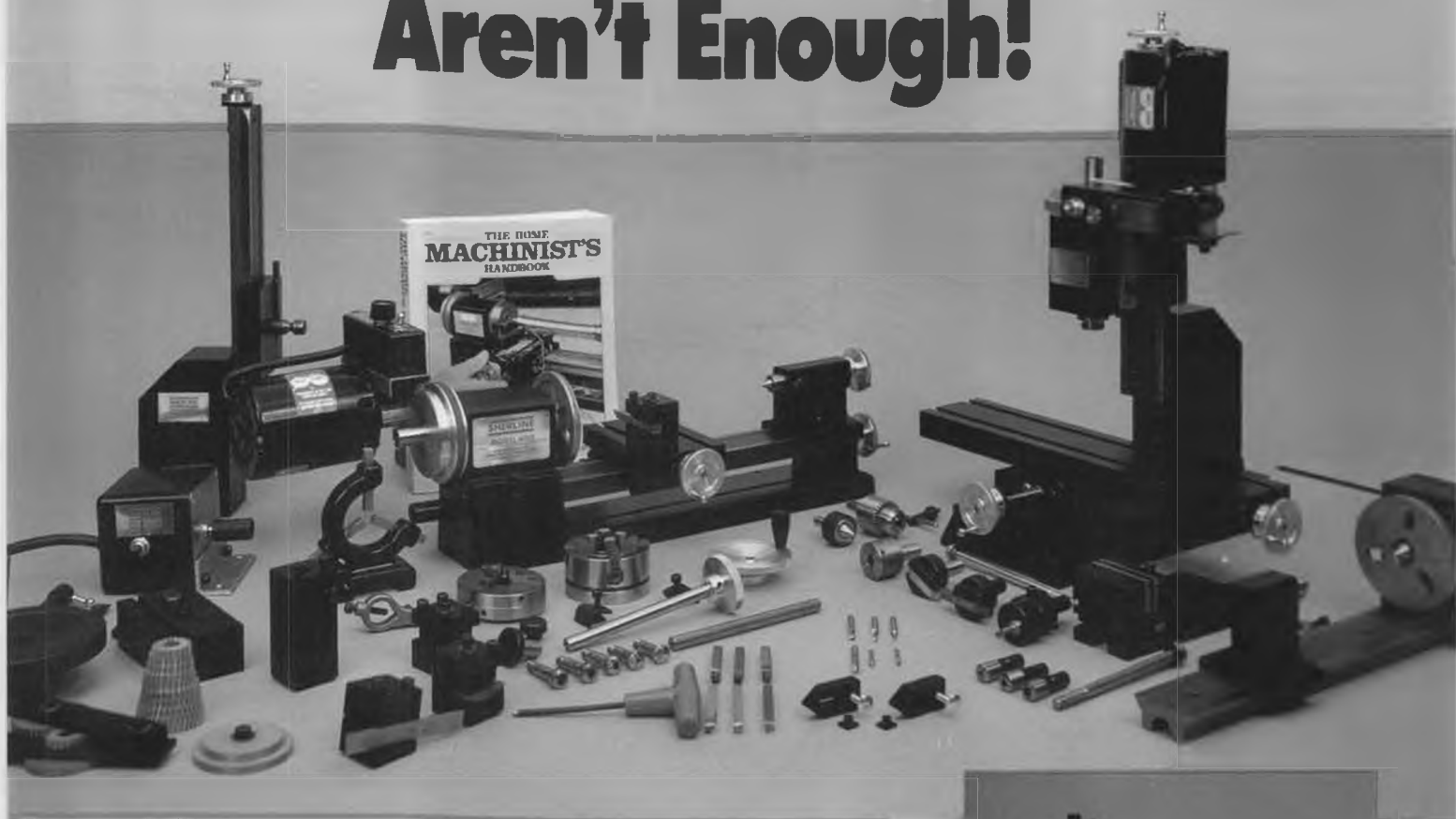
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ADVERTISING

Brenda Parris
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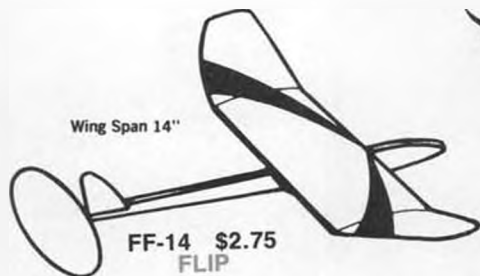
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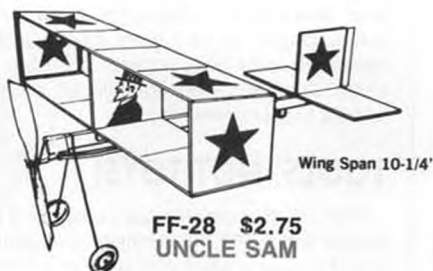
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I GET LETTERS...

As far as "Workbench" is concerned, this will have to be sort of a goof-off month. As you will see in my report on "A Weekend in Champaign," I recently spent five days away from the office, covering the *Kyosho/Model Builder* co-sponsored 30-size Helicopter Challenge, and am still trying to catch up. Consequently, in this month's column, to paraphrase the "Yellow Pages" advertisement, we'll mostly let our readers do the writing.

Dear Mr. Northrop:

"No man is an island entire of itself—every man is a piece of the continent, a part of the main, etc." The quote concludes with this line: "Do not send to see for whom the bell tolls, it tolls for thee." This was written by John Donne in 1623 in a piece entitled "Hymn to God my God in my Sickness." Does that answer your question?

My apologies for my long delay in writing you this letter—please forgive me. The main purpose is to offer you my belated but by no means less emphatic support to you for your position on producing a magazine for all modellers—even free flihters. I want to assure you that the only reason I buy *Model Builder* is because you recognize that there are still a few of us stick-and-tissue modellers out there. I will no longer buy any of the competing magazines because they either do not realize this or do not care. I am not opposed to other aspects of modelling and indeed like to see their activities reported in your magazine. Maybe I shouldn't tell you this but I have put my Peanuts aside for a while to build a plank-on-frame ship model.

I am enclosing a newspaper clipping from *Newsday*—one of NY's largest papers. I thought it might interest you and possibly other readers as well.

I will close by offering my sincere condolences to the family of Walt Mooney and to all of you who knew and worked with him. His loss is great but through his work he will remain with us for a long time to come.

Sincerely, James B. Scannell, New Hyde Park, NY.

My casual reference to a famous quote that I could not properly credit really pulled the cork on letters to the editor. Thanks to everyone who took the time, materials, and postage necessary to set us straight. It's nice to know we have so many literate readers... but it also puts us on guard in maintaining some sort of editorial decorum.

The clipping sent to us by Jim Scannell is from the Thursday, June 14, 1990 issue of *Newsday*, a Times Mirror newspaper, and is a guest editorial by Bill Dunwoody, who

retired from aerospace engineering to go sailing and write a book about Christopher Columbus. He lives in Northport, Long Island. The article is entitled "Why LI Has Stopped Growing Its Own Crop of Skilled Workers," and we suspect the same conclusions may be drawn in many parts of our country. It bears out some comments we've made in past issues.

"The Long Island Regional Planning Board has warned us that the Island is faced with a critical shortage of skilled workers, primarily in technical, engineering and scientific fields, and our schools and colleges are being challenged to do something but it. Long Island's economy for a half century has been based upon a large, highly skilled technological work force, which no longer exists. We would do well to examine how that work force came into being before we look to our educational system to provide Long Island's next group of technologists.

"Let's take a look at the aircraft industry, which was, between 1930 and 1980, the island's outstanding example of highly skilled manufacturing. Columbia, Edo, Fairchild, Grumman, Kollsman, Liberty, Republic, Seversky, Sperry, Stratos and countless other manufacturers found workers in abundance among the farms of Long Island long before there was a university east of Roosevelt Field.

"And while many of those workers had college degrees, their education in aviation and in manufacturing began at a much earlier age.

"In the 1930s, with the Depression in full swing, kids might save up a dime for a model airplane kit and another penny for a tube of glue. A few days—and many hours of effort—later, they had in their hands something they had produced themselves. They had learned the principles of manufacturing planning: Part A must go onto part B before B is put onto C. The need for quality control became apparent when the parts the kids cut out didn't fit. After building a few models from kits, youths could make model airplanes that would actually fly, and the mysteries of aerodynamics were revealed for them to solve. When they got around to designing their own models, all the different facets of the aircraft industry came into play: design, drafting, purchasing, parts fabrication, assembly, inspection and testing. Especially the testing, which often sent the test pilot back to the drawing board.

"Most of the workers in the 'Cradle of Aviation's' aircraft industry were headed in that career direction right out of their own cradles. In the air age, 'air-minded' meant a

view into the future. These days 'air head' has another meaning.

"For a teenager in those days, model airplanes were often just the beginning. At the end of a short bike ride to the outskirts of almost any town could be found a half-mile square patch of grass with a flock of brightly painted full-size airplanes perched in front of the trees bordering the field. If kids were lucky, and proved themselves good workers by mowing the airport's grass or washing planes after school, and pumping gas and cleaning up the sightseeing planes' cabins on weekends, they would be rewarded with a flying lesson on some weekday afternoon when the instructor had no paying customers. No pay, just quid pro quo.

"Others, not quite as lucky, could find a local machine shop in need of a 'gofer.' After running errands and sweeping up, they soon learned enough to operate a drill press or simple lathe for a few cents an hour after school. Because it was making something, it was fun, and it didn't really seem like 'work.'

"Our instrument and electronics industries found their core of skilled workers in radio hams and camera nuts, all of whom developed the interest, and, to a large degree, the skills, on their own while still in high school.

"It can never happen again.

"Developers have built houses on the fields where the models were flown, and NIMBY (not in my backyard) activists keep the model planes out of local parks. The little airports are now covered with housing developments, industrial parks, shopping centers or golf courses. And even if kids could find one (there are still a few small airports out east), there's no way they'd be allowed to trade working time for flying time. The U.S. Occupational Safety and Health Administration calls aviation a hazardous occupation, and there's a minimum wage law, Social Security taxes and workers' compensation to think about. And the airport's insurers would cancel their policy in a minute. Try to get near an airplane just to admire it at any of the larger airports and you're taken for a terrorist.

"I doubt that many kids like those model airplane builders can exist in this era of instant gratification. It took a long time to build a good model plane, and learning to fly took a lot of practice. TV, boom boxes and video games, which offer much the same entertainment value as the model airplane, provide virtually none of the useful knowledge. It's a rare kid who makes things on his own any more.

"A few years back, as an engineering group leader, I had occasion to look through

DEAR JAKE

ADVICE FOR THE PROPWORN—BY JAKE

some 300 or 400 applications for summer employment, to hire a student assistant for the summer. I was looking for a person who had any experience at all in making something, either as a hobby or in a job. Out of the whole pile I found only one. The most popular hobby listed was music, as listeners; few of them played an instrument. Work experience was almost always with a fast-food joint or a landscaper, or pumping gas.

"We shouldn't expect our educational system to provide us with the engineers and scientists we need until we provide the schools with students who are motivated to be scientists or engineers. Kids must want to do these things because they are interested in them, and even challenged by them, not simply because it's a job. The schools, after all, teach what their students want to be taught, and the students learn only what they want to learn.

"To a great degree our modern society must take the blame for having channeled young people into this rut by closing off most of the paths through which they formerly developed technical and scientific interests and skills. In our selfish pursuit of fast-buck development, security in the work place and comfort in our backyards, we have forced the service economy on our children.

"And that one student job applicant who built something? He turned down the job. He spent the summer clamming in the boat he had built. I would have done the same thing."

Dear Bill:

I have been subscribing to far too many magazines to read them all, so I recently decided to cut back. I elected to drop my subscriptions to R/C Modeler Magazine and even, with a certain wistfulness, Model Airplane News, even though I spend several hundred dollars per year on radio controlled models and equipment. Their coverage is too limited to R/C for my taste.

Near the top of my list of "keepers" is Model Builder. I read it cover to cover. I really appreciate the full coverage of the model airplane sport, including indoor, rubber, free flight, and control line as well as RC. Jake, Hannan, Poling, Pond, Stalick, Reynolds, to mention only a few, and the reruns of the Walt Mooney plans, are among my treasured reading. I wouldn't dream of dropping my subscription to MB.

In the future, I will bias my purchases of R/C equipment toward those advertisers who continue to support your fine magazine.

Sincerely, Frank Rowsome, Gaithersburg, MD.

Thanks for the pat on the back. It will help me crank out some more issues. We've had many letters encouraging the continuance of broad coverage of the model airplane hobby. Our top line of contributing editors really make it all possible.

Dear Mr. Northrop:

continued on page 60

Dear Jake:

After many years of barely tolerating model airplanes, my wife expressed an interest in learning how to fly an R/C plane.

Everything went fine until her first solo landing. Coming in on final, the plane was coming in too fast, so I clearly told my wife, "Off with the power."

She reached up and turned the transmitter off!! The airplane crashed of course, but is repairable.

We both respect your judgement and impartiality. Whose fault was it?

Please reply ASAP.

Peter in Centreville, Virginia

Dear Peter:

It would be easy to lay the blame on you for giving your wife an ambiguous instruction. After all, you didn't say which power to turn off. On the other hand, even the rankest novice should know enough not to turn the transmitter off while the plane is still flying.

So where does the fault lie? With the R/C system manufacturer, according to the courts.

In today's legal environment, where plaintiffs successfully sue for damages after being hurt while doing something the product manufacturer didn't specifically tell them not to do, your wife's crash has to be blamed on whoever made the radio.

For example, a man who picked up his gas powered rotary lawn mower and tried to trim his hedges with it was awarded a huge settlement after he cut most of his fingers off. His lawsuit against the mower manufacturer was based on the fact that their instructions had not said, "Do not use as a hedge trimmer."

So, unless the operator's manual that came with your radio specifically said, "Do not turn the transmitter off while making a landing approach," you have no one to blame for your wife's accident except the R/C manufacturer.

The one exception may be your hobby dealer. Like the bartender who fails to warn his customer while serving a Harvey Wallbanger that driving after drinking twelve of these may be dangerous, your hobby dealer may also be liable for your airplane loss if he didn't tell you at purchase not to turn the transmitter off during flight.

Jake

Dear Jake:

When the Good Lord handed out brains, you were back in the pimple line getting a second helping, weren't you?

Jake (No Relation) in Woodbine, Massachusetts

Dear Jake (Are You Sure We're Not Related?):

No, actually I was in the exchange line trying to swap one of the two left kneecaps I got for a right one.

Jake

Dear Jake:

Heat-seeking missiles detect their targets by the amount of heat being given off by the target, right? So if one airplane had hotter exhaust gases than another, it would be an easier target to hit, right?

So my question is this. What makes a better target for a heat-seeking missile, a prop job or a jet?

Sal Buda in Islip, New York

Dear Sal:

Neither. The outhouse at Pancho Rosenberg's Chili and Knish Cafe in Escondido would be the first thing hit.

Jake

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Dear Jake:

Why were the oceangoing, passenger carrying, multi-engine seaplanes of yesteryear known as "Clipper Ships"?

Rodney in Rosewood, Minnesota

Dear Rodney:

Because each one carried its own barber.

Jake

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Dear Jake:

Which came first—the chicken or the egg?

Philosopher in Fostoria

Dear Philosopher:

The egg most certainly came first. Reptiles were laying eggs long before any chicken ever existed. When chickens finally did come along and started laying eggs, they were simply mimicking their egg-laying, flying reptile ancestors.

The chicken did come before Dear Jake, however. While it is true that my column has been laying eggs for quite some time now, it is not true that I have been around longer than the pullet.

Jake

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Dear Jake:

I'm ten. I get \$40 a month for my job. I tried to buy a model plane, but it was too expensive. After reading about five Model Builders I found out that gliders are cheaper. Can you give me some advice on what kind of glider is very affordable and easy to fly?

John Hendrickson in Manitoba, Canada

Dear John:

Carl Goldberg's "Gentle Lady" sounds like a good choice for you.

Jake

Dear Bill Northrop:

How come a ten-year-old kid makes twice as much a month for whatever his job is than I get for writing this column?

Jake

• • •

Dear Jake:

'Cuz he's not working for us!

Bill
MB

OVER THE COUNTER

Hardly an issue goes by that we don't get word of at least one new item from Great Planes Model Distributors, and this month is no exception, what with three new kits to tell you about. First is the "Spirit," a two-meter sailplane that sports a modified Selig 3010 airfoil and a polyhedral wing with a state-of-the-art triple-tapered tip planform. The Spirit is designed to have both docile flight characteristics for entry-level pilots and excellent thermal performance for two-meter class competition. The kit lists for \$47.95.

Kyosho's "Soarus" is an ARF electric



The "Spirit" two-meter R/C sailplane from Great Planes.

motorglider said to be competition ready right out of the box. Construction consists of a blow-molded polypropylene fuselage mated to a 77-inch pre-covered built-up wooden wing, which has a Selig 3021 airfoil for superior power-off thermaling. Included with the \$209.95 package is a Kyosho LeMans AP36L motor and spinner-equipped folding prop—you need supply only the motor battery and a three-channel radio.

The Extra 300 seen in the accompanying photo is the latest in Hobbico's "ASAP" series, designed to get you in the air As Soon As Possible. It's an ARF, obviously, with what is described as a "balsa and ply structure with foam covering." The full-size Extra 300, made in Germany, is one of the current generation of ultra high performance machines that compete in world-class aerobic competition, and Hobbico has recreated it right down to the simulated rivets. The model spans 53-3/4 inches, is designed for .40-.46 two-stroke or .70-.91 four-stroke engines, and includes a chrome spinner, plastic canopy, and scale landing gear. Sounds like quite a package for the \$259.95 list price.

From Great Planes Model Distributors, 1608 Interstate Dr., Champaign, IL 61820.

A classic is reborn! Yes, the Cox Tee Dee .010, first introduced in 1961, is once again in production, thanks to ever-increasing demand from modelers. It's been 15 years since the last .010 production run, and in

those years the little jewel has become quite a sought-after collector's item, with collectors willing to fork over \$100 and up for a new-in-the-box original.

You won't have to pay anywhere near that for one of the new .010s, though. How about \$49.95 retail? Basically it's the same engine as before, still able to turn that tiny 3x1-1/4 prop at over 30,000 rpm, but the colors are different so as not to confuse the new engine with the old. Whereas the originals had a gold anodized crankcase and a red plastic carb body and tank/mount, the 1990 .010 has a natural aluminum anodized crankcase and black plastic parts. Included with the engine are a Cox wrench, prop, starter spring, and operating instructions.

From Cox Hobbies, Inc., 350 W. Rincon St., Corona, CA 91720-2004; phone (714) 278-1282.

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Ace R/C's new AT2000 NiCd charger is a dual output unit with automatic trickle charge on both circuits. It's a charger that you can hook up to your radio system's batteries, flip the "start charge" switch and walk away until you're ready to use them again, confident that they have been fully charged at the overnight rate and then kept topped off by the unit automatically switching to the trickle charge mode and remaining there until you disconnect them.

As we said, the AT2000 has two outputs:



The Kyosho "Soarus" electric motorglider distributed by Great Planes.



The Hobbico Extra 300 from Great Planes.



(Above) Ace R/C's AT2000 dual output NiCd charger. (Left) Back in production at last, the Cox Tee Dee .010.



The standard "Shuttle" R/C helicopter produced by Hirobo and distributed in the U.S. by Altech Marketing.



Hirobo's Shuttle XX helicopter.



Hirobo's Shuttle Z helicopter.



Hirobo's Shuttle ZX helicopter.

one is fixed at 50 ma, the overnight rate for 500 mAH NiCds. The other output has three rates available—25, 50, and 120 ma—at the flip of a switch. Both outputs operate at 10 ma in the trickle charge mode. Either output can handle from one to ten cells and will maintain a constant charge current. Thus, the AT2000 can be used to charge single-cell starter batteries, four or five-cell receiver packs, and eight or nine-cell transmitter packs. A really versatile unit!

Hookup to the charger is via readily available 0.10-inch pin power plugs. Adapter cables are available for a variety of radio systems, or you can easily make up your own for whatever your particular application requires. Two power plugs are furnished with the unit to use with your existing connectors. The Ace AT2000 comes fully assembled and tested, at a suggested retail price of \$49.95.

From Ace R/C, 116 W. 19th St., P.O. Box 511, Higginville, MO 64037.

Altech Marketing, the company that imports Enya engines into the U.S., is now also handling several of the excellent Hirobo R/C helicopters produced in Japan, as well as making parts and service available for these machines.

Probably the most popular of all the Hirobo helicopters is the Shuttle, which is currently offered in four distinct versions. The basic Shuttle is the original .30 size model that

many of today's chopper pilots cut their teeth on. It is well noted for its stable hovering characteristics, which is the first thing any novice helicopter pilot must learn. The Shuttle XX takes the basic machine a step farther by adding ball bearings to the control linkages for smoother, firmer control. Tail boom reinforcement struts are also employed for added strength. Both of these models are fine choices for the beginner and can be upgraded later with optional parts.

The next step up is the Shuttle Z, which is basically a stretched version of the basic Shuttle. The main rotor blades are weighted and are longer in length; the tail boom is likewise lengthened, and a new tail rotor system is used. The Shuttle ZX takes performance to the max with the addition of a metal clutch, ball bearings throughout, and tail boom reinforcement struts. Both the Z and ZX feature Hirobo's new FZ rotor head for increased performance.

All of the Shuttles described here are delivered assembled, either with or without an Enya SS35 Heli TN engine installed. The ZX is also offered as an unassembled kit without engine. So there are actually *nine* different versions of the Shuttle to choose from, which makes it that much easier to pick the one that's just right for you.

For more information on the Shuttle or any of the other Hirobo helicopters, contact Altech Marketing, P.O. Box 391, Edison, NJ 08818-0391.

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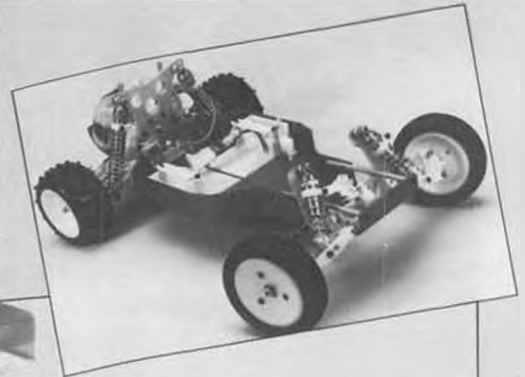
In addition to their regular 1990 product catalog, Robbe Model Sport now has available a 96-page, full-color Update Catalog that lists all kinds of interesting new modeling items produced in Europe. The two catalogs together provide over 300 pages of some really neat R/C models and accessories.



The Mike GR6-120 six-cylinder two-stroke radial from Radial Engine Technologies, Inc.



Bob Smith Industries' new "Super-Gold" odorless CAs.



The Aero L-39 Albatros slope glider by Vern Hunt Models.



The new Associated RC10 Championship Edition R/C car.

The 1990 Robbe update catalog is available by itself for \$4.50, or together with the regular catalog and a \$4.00 refund certificate for \$8.50. Order yours from Robbe Model Sport, 180 Township Line Road, Belle Mead, NJ 08502.

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The Mike GR6-120 is a six-cylinder, two-stroke radial powerplant offered by Radial Engine Technologies, Inc., of New York.

"Giant Snuf" mufflers from J'Tec.



The engine is also the subject of an in-depth "Inside Engines" column this month by our resident engine expert, Stu Richmond, so rather than just repeat what Stu has to say, we'll merely spark your interest here by saying that the Mike radial is made up of six complete K&B .20 Sportster engines arranged around a central prop shaft and geared to the shaft in a 1.36:1 ratio. Overall diameter is 8-5/16 inches, length to the back of the prop is 5-1/4 inches, weight with muffler and mount is a very light 4-3/4 pounds, horsepower has been measured on a dyno at 2-1/2 bhp, recommended prop is an 18x8, and the thrust has been measured at 16 pounds plus. The engine sells for \$849.00 and comes with a limited two-year guarantee.

Stu Richmond talks about the technical aspects of the Mike GR6-120 in his column, so we'll simply refer you to him. And if, after reading his report, you'd like to get some literature on the Mike, send a SASE and ask for the info sheet and list of applicable plans and kits—they've put together a list of around 80 models from various companies that would be well suited to this engine. A 45-minute demonstration tape is also available for \$15.00.

From Radial Engine Technologies, Inc., 7 Greenwood Lane, Valhalla, NY 10595.

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Bob Smith Industries has introduced two new additions to their extensive line of

hobby adhesives. "Super-Gold" thin CA and "Super-Gold +" gap filling CA, both packaged in 1/2, 1, and 2-ounce bottles, are the odorless equivalent of their "Insta-Cure" line of CA glues. These new adhesives don't give off the fumes of regular CA glues, which can irritate your lungs and eyes.

The Super-Golds are claimed to be the fastest bonding odorless CA glues available, taking only a few seconds longer than regular CAs to bond, and they will not attack white foam or fog clear plastic. They are also said to be more flexible in their cured state, for better shock absorption.

For more info, see your dealer or contact Bob Smith Industries, 8060 Morro Rd., Atascadero, CA 93422, or call (805) 466-1717.

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Associated Electrics sends word that the venerable RC10 car, which has been that company's standard-bearer for the last five years, has gained so many new features that it is now being produced in a "Championship Edition" that is claimed to be the fastest RC10 ever. These new features include wide track front suspension arms, zero-offset front kingpins and stub axles, longer travel front shocks and towers, turnbuckle tie rods and links, 3° rear toe-in blocks, and new three-piece low profile rims and tires—these, of course, are in addition to the long list of standard items supplied with all RC10 kits.



Aerospace Composite Products' "E-Z Lam" epoxy laminating resin.



Hitec radios are now being distributed in the U.S. by Hitec R/C USA.



The "Paydirt 60" sport R/C kit from Carden Corp.



Big 1/4-scale Waco HKS-7 from Norm Rosenstock plans.

Speaking of kits, the RC10 can be purchased as a basic kit with no electrical items or bearings, for \$188.00. Three full kits are also offered, consisting of the basic kit parts plus a Yokomo stock class 05 motor, resistor speed control, clear Lexan body shell and wing, and various combinations of battery pack and ball bearings, for up to \$290.00.

RC10s have won the 1989/1990 IFMAR World Championship and the ROAR Nats in 1986, '87, '88, and '89, and this new Championship Edition promises to be the hottest RC10 yet. You can learn more about the new RC10 either from your local dealer or from Associated Electrics, 3585 Cadillac Ave., Costa Mesa, CA 92626; or call (714) 850-9342.

The good folks at J'Tec have introduced a complete line of what they call "Giant Snuf" mufflers for engines from 1.3 to 5.7 cubic inches, such as the Quadra, Zenoah, Sachs-

Dolmar, O.S. Max, Supertigre, and several others. The mufflers consist of a specially designed aluminum manifold combined with one or two of J'Tec's patented "Snuf-ler" mufflers. This combination is said to greatly reduce engine noise with little or no power loss. They're easy to attach—just bolt 'em on. Mounting bolt patterns are matched for each engine. The mufflers are made in three different styles to suit various engines, with prices ranging from \$39.95 to \$59.95.

Giant Snuf mufflers are available now, either from your dealer or direct from J'Tec, 164 School St., Daly City, CA 94014.

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There are several small outfits producing kits for PSS (power scale slope) gliders, but one of the prettiest—at least to us—is the Czechoslovakian Aero L-39 Albatross recently released by Vern Hunt Models. The L-39 is the first of a series of PSS gliders that Vern hopes to develop over the next few years. As PSS gliders go, this one is larger than most, with a 52-inch span, 42-inch length (the fuselage is very close to scale, by the way), a modified E-205 airfoil, and a ready-to-fly weight of around three pounds.

The construction boasts a molded fuselage of polyester glass and carbon fiber, glass canopy frame, and balsa sheeted foam core wing and stabilizer. What you end up with is an extremely durable glider that can stand up to some pretty severe abuse. Vern says he has rolled his prototype L-39 into the hill on several occasions with no major damage to the airplane.

The L-39 Albatross kit is priced at \$175.00; fiberglass tip tanks are offered as an option for \$15.00 extra. Write to Vern Hunt Models, 4950 Butternut Trail, Juneau, WI 53039.

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Aerospace Composite Products is marketing, among other things, an especially low viscosity epoxy laminating resin called "E-Z Lam," which sounds like just the ticket for use with lightweight fiberglass, carbon fiber, or Kevlar cloth. Because it's so thin, composite materials can be wetted out easily and with less resin, which means less added weight. World-class R/C sail plane designer/flier, Joe Wurts, uses E-Z Lam and glass cloth to form the wing and stab skins on his state-



The RotorCraft Workstation from Lightning Products.



New catalogs from Robbe.

of-the-art hand launch gliders, where weight is extremely critical. Joe swears by the stuff; read his comments in this month's "R/C Soaring" column. E-Z Lam is packaged in 1-1/2 pint and 1-1/2 quart kits, priced at \$18.00 and \$26.00 respectively.

Also from Aerospace Composites is "No-Fray" carbon fiber tape, priced at \$9.00 for a one-inch wide, 12-foot length. Unlike other unidirectional carbon fiber strips that come pre-cured in an epoxy or CA matrix,

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SWITCHES FOR AIRBORNE SYSTEMS is our opening topic for this go-around, as some disturbing news on the subject has just come my way. As I write this, the July issues of the magazines have appeared, carrying advertisements for two different switch replacements about which I am compelled to strongly advise against.

First, problems with switches in this application are not new, we have suffered them since the early days of RC. In fact, there was a period in my RC career, back in the days of reeds, when I completely eliminated the On-Off switch from the airborne system, choosing instead to plug in the battery every time I was to go up, even though it meant removing the wing after every flight. Even ten dollar, gold-plated contact switches did not solve intermittent and vibration-caused problems. Finally, the Noble six-pole slide switch, manufactured by a company of that name, made its appearance. It was really four switches in one, and with all sections paralleled, worked so well that it soon became the standard for all RC equipment applications. Unfortunately, some years ago, the Noble company discontinued this particular switch, and substitutes had to be found. Nowadays, we see a variety of smaller switches in use, but notice that they all have one thing in common—they are all SLIDE switches.

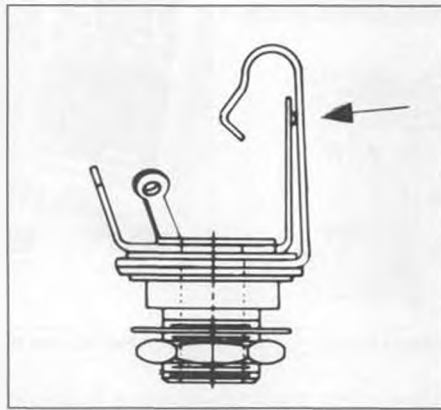
In the high-vibration environment that the airborne switch must operate it must have two features: positive lock in the On position, and no spring loaded contacts. A good quality slide switch automatically has both of these features. One whose mechanical performance has deteriorated over a period of time so that a definite lock is *not* felt as it is actuated should be discarded. Inside, the slide switch depends on two closely spaced fingers, into which a contact slides as the switch is operated. Thus, two contacts are made at each pole. Though four-section switches such as the old Noble are not now available, most good RC systems have a double section unit, wired in parallel for extra reliability.

If you are flying a cheapie radio (Why?), do yourself a big favor and inspect the airborne switch. If you don't have a double-section switch wired in parallel, replace it.

Slide switches have one more feature which is at least as important as those already mentioned. They are self-cleaning! That is, as those fingers I mentioned are pushed against their respective contacts, there is just enough movement and friction to keep the adjoining parts nice and shiny. Nice and shiny in electrical contacts means good, no-loss, reliable contacts!

Now, along come two new ways to turn your airborne equipment on and of. New and improved? Not hardly. Read on.

First of these two plane killers, is simply

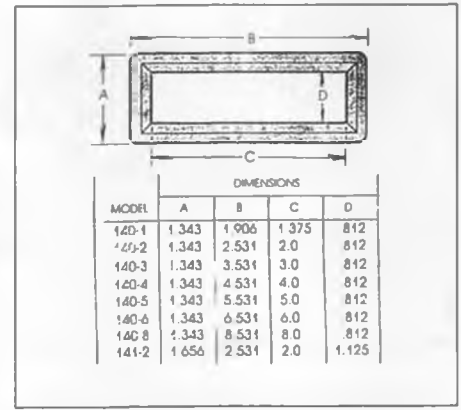


Closed circuit phone jacks such as this are not recommended for use as R/C airborne switches. When used as such, the life of the models is all gambled on proper electrical contact between a dimpled metal leaf and a flat leaf.

an open-frame, closed-circuit phone jack, of the type often found on small radios and cassette players, into which you insert a small plug to connect headphones; the closed-circuit feature is a pair of contacts which open as the plug is inserted, disconnecting one circuit, generally an internal speaker. When the plug is removed, these contacts come together again, remaking the original connection. Such jacks and companion plugs are available from Radio Shack; page 134 of its 1990 catalog.

If you will look at one, you will notice that the electrical contact is made between two small metal leaves, sometimes dimpled at the point of contact, and sometimes not. Only very light spring action is available to hold them together, and that important wiping action found in the slide switch is simply not there. Being completely open, the smallest speck of anything, including leftover balsa dust, is going to keep these two pieces apart and prevent electrical contact. Also, being flat and springy, under vibration these pieces are bound to set up their own rhythm and open intermittently.

In the recommended application as a switch, the jack is apparently wired so that when these contacts are closed, power is passed through and applied to the system. When the plug is inserted, the contacts open, i.e., the switch is Off! It is also claimed that the batteries can be charged and tested through the same jack, obviously with the plug now wired to the charger or tester. In this application, another problem with this jack/plug rears its ugly head. With every one of these combinations that I have ever seen, there is a momentary short circuit caused by the jack as it contacts both tip and body of the plug. In audio applications for which these items are intended, this is of no consequence, but switching a four-cell NiCd pack in this manner is not such a great idea. Should you prefer to do your own testing, apply a short circuit across your airborne battery, and see how long it takes for the



Dimensions of inexpensive plastic snap-in bezels available from RMF Products - see text.

wires to burn in two. Not long, huh? This system is definitely not recommended!

The other one to watch out for is probably not as serious, but is still something I would not use—based on a lot of experience with switches. This one is just another custom made switch harness—however, instead of a slide switch, it uses a toggle switch. The fact that the one in question is made by C & K, in my opinion makers of some of the best toggle switches to be had, is an indication of the good intentions of those offering this particular switch harness. But again, toggles depend on a spring for their contact pressure, and just how much spring can you jam into a quarter inch of space? And toggles aren't self-cleaning as already described. I won't ask you to burn up a switch harness to prove any of my theories, but just think about it. Not a single RC equipment manufacturer uses toggle switches on their airborne switch harnesses... or as On-Off switches on their transmitters, though a couple have appeared in the past, but those makers have now all resorted to the use of slides. There have to be a lot of good reasons for the use of slides—all boiling down to one thing... reliability!

RELATED SWITCH PROBLEMS have appeared with the use of the Du-Bro "Kwik-Switch Mount," its Stock Number 203. Both I and a flying buddy have experienced the situation to be described; I caught it and corrected it, he didn't and the earth corrected it for him.

You've all seen and probably used this switch mount, it is the one into which the slide switch is fastened with screws, and the whole assembly mounts to the side of the airplane through a single, neat 3/16 hole. Operation is via a push-pull wire with a small knob on its end. *There is nothing basically wrong with this switch mount or the idea*, it is just not 100% compatible with ALL of the many different slide switches currently available to us. In some cases, the opening in the Du-Bro mount will be smaller

continued on page 95

Helicopter WORLD

A WEEKEND IN CHAMPAIGN

BY BILL NORTROP

The long weekend of June 9-10, 1990, was quite an experience for this writer... you could say a "whirlwind" adventure. And it could almost be said that the main purpose of the weekend was nearly surpassed by what was supposed to be a sidelight.

The main purpose (not counting getting away from the publishing office for five days) was to attend the First Annual Kyosho/Model Builder-sponsored R/C Helicopter Challenge. That was "Whirl-

lunge, produced by Great Planes Model Distributors (hereinafter referred to as GPD), under the direction of GPD's Tim Lampe, and co-sponsored by Kyosho, manufacturers of just about anything you can think of as related to the R/C hobby, and in this particular reference, to its line of R/C helicopters. As the other co-sponsor, *Model Builder* was represented by this writer and also by its helicopter columnist, James Wang. James, by the way, was in the midst of preparing an important presentation at the University of Maryland,



wind" Number One! The "sidelight" was the conducted tours of already legendary R/C model industry establishments, all located within 10 minutes of the Challenge flying site, and of each other: Hobbico (Great Planes Model Distributors Inc. and Tower Hobbies), Great Planes Model Manufacturing Co., Hobby Dynamics Distributors, and Horizon Hobby Distributors. "Whirlwind" Number Two!

Champaign, Illinois, the home town of all this commotion, is located about midway north and south, and about a quarter of the way east and west from the eastern border of the state. The connected towns of Champaign and Urbana are the combined home of the University of Illinois, it being their main "industry," second only to farming. (After a thorough investigation of the situation, we'd have to declare that the radio control hobby industry is definitely a strong third!)

Compared to the hubbub, high population density, and continuous automobile traffic jams of our present Newport Beach, CA home base, Champaign (population 59,000) is very reminiscent of the laid back atmosphere that characterized Newark, Delaware, the university town in which we grew up. It was like returning home after being away for many years... very comfortable.

Again, the main purpose of this trip was to attend the inaugural R/C Helicopter Chal-

Aerospace Department, where he is working on his Ph.D., specializing in helicopter blade design. Consequently, his "whirlwind" tour of Champaign was only on Saturday and Sunday, as he arrived very late on Friday night and departed at 8:00 p.m. on Sunday. However,

he will report on the actual event, which he knows more about, while this writer will stick with the background coverage.

Thursday, June 7

Left John Wayne (Orange County) Airport at 0650 for a routine flight to O'Hare in Chicago, except for a southern detour and approach from the east in order to avoid thunderstorm activity (which was headed for central Illinois, naturally) over Iowa. Had our first, and bumpy ride in an American Eagle "Shorts 360," a prop-driven "boxcar," from Chicago to Champaign. Worst part of this short-line trip was the unnecessarily rough treatment of passenger luggage, as witnessed from the waiting area windows before boarding. Saw our folding suit bag thrown five feet onto the dirty concrete paved surface, along with others being transferred from jet flights. After more than ten years of travelling all over the US as well as overseas by air, that was the worst treatment it has had, thanks to American Eagle! It was also announced that the flight was overbooked and overweight, and they were looking for volunteers to wait for a later flight. We didn't volunteer, as we didn't

IRCHA (Intl. RC Helicopter Assoc.) President Don Chapman, placed 10th in FAI, flying a Concept 30. Also took 1st in Scale. Wayne Mann calling. Note single-stick transmitter.



Helicopter WORLD



Newest Hobbico office building.



(Top) Horizon Hobby Dist. office and warehouse. (Above) Hobby Dynamics Dist. office and warehouse.

want the bag to be off-loaded by the same ape. (Apologies to all simians, tame or wild!) When we left Chicago, there were three empty seats.

Just before landing at Willard Field in Champaign, we flew over a large, apparently inactive airfield and I noted some unusual aircraft parked in small areas surrounding the main field; a B-36, a B-58, a couple of camouflaged twins that could be Canberras, a B-29, and some others. I asked the young steward if he knew what field we passed over, and he had no idea! It turned out to be Chanute. They're having trouble trying to save it from developers!

Had dinner that evening with Tom Grogg and Mike Shaw of PGD at a unique restaurant, Alexander's, where you barbecue your own beef, selected by you from a large, glass-doored refrigerator. After visiting the salad bar, diners select their chunk of beef or steak and gather around a huge brick charcoal pit, helping themselves to various seasonings in large metal shakers, a pan of melted butter with a wide, long-handled brush, plenty of tongs for turning the meat and selecting the spot you want for well-done or charred-rare, along with limitless slices of "Texas" bread (about 3/4-inch thick) that you toast on the "barby" (I put melted butter and lots of garlic salt on mine), and a baked potato if you so desire. One thing sure, you can't complain to the chef about how your steak was cooked! If we were an official dining-out critic, Alexander's would earn a perfect 10!

Later that night we watched Portland eke out an overtime win in the NBA playoffs from Detroit on our motel TV. Outside, the storm we had skirted over Iowa on the way into Chicago dumped sheets of rain on Champaign, accompanied by heavy cracks of thunder and

lightning. Yessir... it was just like being back in good old Newark, Delaware. (That's pronounced "New Ark", not like the "Newrk" in New Jersey!)

Friday, June 8

Arrived at GPD about 0900, 0905, 0910, and 0915 (it took that long to case the whole exterior!) and was rescued by Al Green from a security guard who wanted to see my permit for taking pictures. Al took me inside, fixed me up with a visitor's badge, and we went upstairs to find Mike Shaw, who was taking me to GPM (Great Planes Model Manufacturing) for a tour. As he was somewhat new to GPD and Champaign, it would also be his first tour of GPM.

In keeping with our earlier comment, we arrived at GPM in just under 10 minutes (my motel, the Red Roof Inn, was also less than 10 minutes from GPD) and were given the full 25-cent tour by Dick Sumner. It is a large and well organized manufacturing company, from the raw wood warehouse to the final kit assembly and shipping areas. Cleverly designed machinery cuts raw wood to finished timber, and in turn, to finished and sanded sheet stock. We also watched shaped and notched leading and trailing edges for PT-40 trainers being spit out by the hundreds. Although cut by machine, parts are literally inspected individually, as alert operators handle each piece. Reminiscent of watching Jim Jensen matching Quik Fli and Ugly Stik fuselage sides many years ago in his garage workshop, an operator was doing the *exact same thing* with PT-40 fuse sides!

Die-cutting, as always, is done on modified printing presses, but technique is a long way from the old "die-smash" or "die-crunch" days. The main concern now is that enough wood is left uncut so that



Kazuyuki "Kaz" Takayanagi checks Concept XS 30 before one of several demo flights during weekend. Flying style and capabilities much like Curtis Youngblood.



James Wang tries to smile. Concept 30 knocked way out of trim when forced to shove under seat in short hop from Chicago. Judge Randy Gibson checks sky.



Judges for Novice (l to r): Jamie Clancy, Kevin Hyatt, John Reiter. Runner Bev Maddock "takes five."

Helicopter WORLD



Nina Officer, with caller/husband Kent, from Oklahoma, placed seventh in Novice, flying his Concept 30. He has moved up to 60-size.



Novice flier Rich Kruyer (Concept hell, Michigan) in hover check before starting official flight.



You could tell Cliff Hiatt used to fly pattern. He planted his feet about one yard apart while doing the "school" maneuvers!



Cliff Hiatt puts a finger on the subject of his discussion with *MB's* heli columnist, James Wang. Cliff took first in FAI, flying this X-Cell 30.



Giancarlo Saragosa stands by as Steve Gray strokes his Kalt Enforcer to make it fly better. Steve placed third in Intermediate.



Wayne Mann placed second in FAI flying an X-Cell, under the watchful eye of Tim Schoonard from Miniature Aircraft USA.



Yoshiaki Nagatsuki came on from Japan to place third in FAI with his Kalt Enforcer, being seconded here by Dan Milnick, who placed sixth



Mike Mas always managed to fly when the wind was gusting, still placed fifth in FAI with the Hirobo Shuttle, now distributed by Altech Marketing. Linda Mas calls maneuvers.



Intermediate judges do a little rubbernecking for camera. (l to r): Jerry Hicks, Kevin Burner, and Randy Gibson.

the sheets can be reasonably handled without having die-cut parts falling out all over the place!

After seeing the wire bending and plastic molding operations, we watched the final assembly of Super Decathlon kits. Each parts box is marked for quantity per kit, and each part goes into the kit in precise order. It's just mind-boggling to see finished Decathlon kits stacked floor-to-ceiling, row after row!

Our next-to-last stop at GPM was with Jim Schmidt, Product Development Manager, who does the final design and drawing of the kit plans, which as you might expect, is done on a CAD computer system. We picked up one little trick that Jim was using that makes a lot of sense. As you look over the full plan sheet, you note that the wing and stab lettering is upside down! Why? Simple. When you turn the plan around to build the wing and stab, the lettering will be right side up, so you'll know what you're doing! Logical. As we were studying the Ultra Sport 60 drawings in final stages of completion, it suddenly dawned on us that here is a company making and selling thousands of genuine, stick-em-together, build-em-yourself model airplane kits, for people who prefer to build their own, who actually enjoy the building as a hobby as well as the flying... Again, that

comfortable feeling.

By the time we had finished the tour, Don Anderson, GPM's C.E.O. had arrived, and we were able to confirm with him that the 60 version of the Ultra Sport will be out sometime this fall. Watch for it.

We crawled back into Mike's Fiero (you don't hop into these little "Ponyacs," and I now refuse to listen to any more complaints about entering or exiting my '72 Corvette!) and in less than ten minutes, were back at GPD and headed for lunch with Tom Grogg.

After lunch, we returned to GPD for my tour of this facility. Although the earlier drive-around preview was impressive, I still wasn't prepared for the unending vastness of the interior. In the office area, there were labyrinths of eye-level (at 6'-1", my eye-level is about 5'-9") partitions as far as you could see. And in every cubicle there was an operating computer with someone punching keys while talking or listening to a telephone tucked under their chin. I doubt they were communicating with each other just to impress me. The advertising art department alone was three to four times the size of our magazine production department, and there were enough bodies present to make up a baseball team with a few substitutes.

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FAI judges Bill Jeric (white cap), Craig Hath (leaning back), and John Adams. Jury member, tech adviser, and judge trainer Tom Dooley; also U.S. FAI hell team member, at left.



Scale entries on the judging pad (less Don Chapman's Hughes 300 which was flying). In foreground, Spencer Forman's Hughes 500 (Kyosho body on Shuttle). Mark Johnson's Jet Ranger (Kyosho body on Concept). Larry Jolly's Bell 222 on Concept.



Andy Pound, 11 years old, Terre Haute, Indiana, flew in Novice, with his dad, Ron calling. How long has he flown helicopters? Ten tankfills was the answer. Did very well flying a Concept 30.



There's Don Chapman's Hughes 300 with which he won the scale event. Concept 30 innards.



Low camera angle catches sunlight shining through lightening holes in Wayne Mann's X-Cell main rotor blades.



Only scale helicopter flown in regular competition (Novice) by John McDonald from Ontario, Canada. It's a Hughes 500 body on a Baron 30.

The real shock came as I was led into the massive storage area. Do you remember the how you felt the first time you came up to the rim of the Grand Canyon? The only differences here were that you looked up instead of down, and the vast space was full of merchandise, not empty! I thought I had seen the largest gathering of model hobby stuff in the world when visiting the Graupner facility in Kirchheim-Teck, Germany, about 15 years ago, and maybe at the time, it was. But this GPD stockpile was so awesome it was almost unbelievable. If *anyone* ever questions the fact that our model hobby is a multi-million dollar industry, I invite them to take one look at this organized mountain of colorful kit boxes full of airplanes, helicopters, gliders, racing boats, sailboats, scale boats and ships, electric and gas powered cars, plus radios, engines, and all the related items that go with them. And none of it stays there long enough to collect even a thin coat of dust!

The majority of stock is stored vertically in a computer-controlled area that rises roughly 30 to 40 feet high, with fully loaded skids at each level, ready to be reached by the computer controlled "picker." In other areas, forklift and manual loading and unloading are the rule. The last shred of doubt for unbelievers would be cleared by the continuous, almost ant-trail-like processions of handcarts loaded with merchandise being propelled by workers with "shopping lists." You could get run over in the traffic! It was becoming all too obvious that the huge parking lots outside the building which were overloaded with cars, pickups, campers, etc., were not being shared by anyone but GPD employees, which averages on any given day right around 600!

As we strolled along the painted walkway (to keep clear of that "picking" traffic!), Tom, at one point casually mentioned that, "We *continued on page 63*

Laura Melnick placed 4th in Novice, flying an Enforcer. Husband Dan seconding.

Wayne Mann puts up one of the flights that netted him a second place in FAI, being seconded by Tom Dooley.

Stan Olzaski, Glen Cove, New York, who goes to Andre Agassi's tailor, collects his prizes for first in Intermediate from Tim Lampe.

Wayne Mann with contest organizer and CD, Tim Lampe. Wayne will be a strong contender for a place on the US FAI Heli Team.

Don Chapman can now move up 200, from the Hughes 300 he flew to win Scale to the Hughes 500 he won for a prize!



Helicopter WORLD CHOPPER CHATTER

BY JAMES WANG

Hi folks, this month we will ease off on the heavy technical stuff. Instead we will talk about the Kyosho/Model Builder sponsored 30-size helicopter contest. We will also give you information on the four electric RC helicopters that are commercially available. We will then show you some new heli items, and pictures of Sikorsky's new RC flying saucer designed for military reconnaissance. Readers have requested articles on how to set up their choppers. Some wanted to know how to set up for aerobatics and some just wanted a simple beginner set up. Therefore, in this issue we have prepared an explanation of setting up helicopters for intermediates and beginners, it is included as part of the JR PCM 10 discussion.

On June 9th and 10th, our editor, Bill Northrop, and I flew to Champaign, Illinois to attend the Kyosho and *Model Builder* sponsored first Annual 30-size helicopter challenge. Four different events were held: novice, intermediate, FAI, and scale. FAI is the expert class; the required FAI maneuvers were illustrated in our May issue. Fifty five competitors and several hundred spectators showed up. The FAI class alone had 18 contestants, that's more than some of the Nats turnouts. Weather was horrible throughout May and early June in Champaign; rain, rain, rain. Even when I arrived at Champaign on midnight Friday, a big thunder storm was going on. But luckily on Saturday morning, sunshine popped out (Bill was given credit for bringing the good weather from California). Wind averaged 10 to 15 mph for the contest weekend. Sunny, 80-degree temperatures gave everyone a good sunburn.

I brought my Concept 30 and signed up for the FAI event. Because the Concept is very compact, I took it on board the plane as carry-on luggage. From Maryland to Chicago the airplane was a Boeing 767, so the Concept fitted in the overhead compartment without any problem. In fact, 3 Concepts would fit in each overhead compart-

ment. However, from Chicago to Champaign, Illinois I had to transfer to a small twin-propellor commuter plane. Then, the Concept did not fit in the tiny overhead compartment. The stewardess walked by and said, "Sir, you have to fit that model underneath your seat." Oookay. Well, it did fit! But Saturday morning, in Round One, I took off in the ready box and discovered the blades were out of track, and trims were way off. (In all the AMA sanctioned heli contests, the rule book says each contestant has a maximum of five minutes to start the engine, and do whatever adjustments and flight

testing he feels necessary, but the model must not fly outside of the two-meter ready circle that's clearly marked on the ground.) By now I knew I was in deep trouble; should have come one day earlier to do some test flights.

By the way, for readers who have never competed, nor seen a heli contest, you should try to visit one. You will learn a lot just by watching how the proficient pilots prepare their helicopters. And, by participating in contests yourself, it forces you to fine tune your models and your piloting skill. Other-

wise, the tendency for the average modelers is to just go out on weekends and do a few buzzing circuits and go home. Well, even though I have flown helis for over a dozen years, this was the first time I entered a real contest. I immediately discovered that I have been doing too much hot dogging and not enough contest practice!

In my one official flight, after completing the four hover maneuvers and moving into forward flight for the aerobatics, my engine was running so lean, that Cliff Hiatt sniffed the air and remarked, "Hey, where's is the steak?" The engine ran lean because I always run Redmax fuel at home. At the contest, I was using K&B 500H provided by Tim Lampe, and had not taken the opportunity to fine tune the engine. Then I discovered that my clutch was beginning to lock. Well, might as well sit back, relax and enjoy the show. One of the highlights for the trip was a tour of Great Planes and Tower Hobby by Tom Grogg, a manager at Hobbico. Their warehouse is

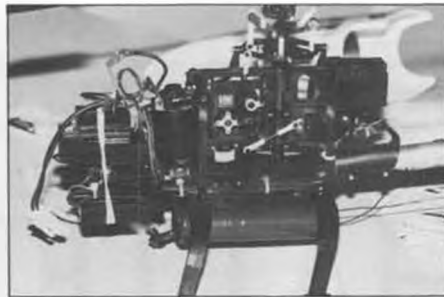


Reza Fetami's 60-size Sikorsky S-76. It's kitted by Vario in Germany, complete with retracts and closing doors. Reza distributes this in U.S. His number is (213) 556-8080.

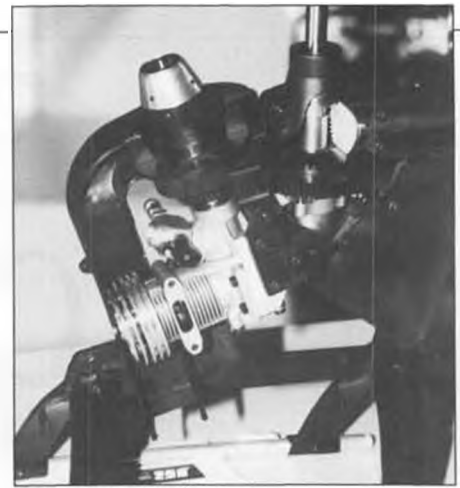
Helicopter WORLD



GMP's new 30-size Viper with metal Mini-Elite rotorhead. Available soon. It has forward facing engine, toothed belt-drive tail rotor, and interesting landing gear design.



The Kalt "Whisper," a practical electric RC helicopter. It was demoed at the Kyosho Model Builder 30-size contest. It did loops, rolls, and even motor-off autorotations. Read text for more details.



Kalt Enforcer 30 utilizes planetary gear drive transmission. It provides very smooth gear mesh between the engine and main rotor. The engine cylinder head faces forward, at an angle.



Sikorsky's proof-of-concept RC saucer. Uses two contra-rotating three-bladed main rotors to cancel the torque. The saucer is five-feet in diameter. Futaba radio used, and additional electronics shown in the clear window on the right.



Closeup of the Schluter three-bladed main rotorheads used on the Cypher. If you look carefully, you might see the wire mesh covering the entire rotor on the Cypher. Note two swashplates are used. Text has more details.



A standard four-cycle twin model airplane engine is used to power the Cypher. The spinner is used for starting the engine only. A shaft goes from the engine back to the main rotor to spin the

humongous! It's almost the size of a 747 hangar. About 600 people work there. After the two hour tour, we returned to the contest field.

The three-man X-Cell 30 team was impressive. Ex-national Champ Cliff Hiatt, Tim Schoonard of Miniature Aircraft, and Wayne Mann were all flying squeaky clean X-Cell 30s. These chaps were good! They showed the determination and professionalism that made them deserving of the win (first, fourth, and second, respectively, in FAI). Wayne built an identical pair of X-Cell 30s just for this contest. His were powered with Super Tigre 34s with mini tuned pipes. Lightening holes were drilled on the main rotor blades to produce forward chordwise CG to enhance model stability. To reduce model weight, lightening holes were also drilled on the plastic main gear. That is attention to detail. Tim even had lightening holes drilled on his X-Cell 30's landing gear struts. Well, every gram saved here and there adds up. But the model still weighed about seven pounds. These X-Cell 30s may be heavy for 30-size models, but the weight made them seem extremely stable, and suited for FAI hover maneuvers. Tim's and Cliff's modified OS 32s with tuned pipes helped move those ships along.

As the FAI routine requires smooth aerobatic maneuvers such as a big round loop, three-second roll, 540-degree stall turn, rolling stall turn, and 180 autorotation, these slightly heavy X-cell 30s are almost perfect. Cliff says the way to do good forward flight aerobatics is to fly the model out as far as you can see, then haul it in. Keep the corrections small and smooth, combined with high rpm to achieve the fastest entry. *Spoken like a true fixed wing precision aerobatics competitor, which he was before getting into whirlies. wcn* The key is to build up as much momentum as possible. If you have sufficient momentum, then you only need very little correction for the axial roll, at most minus one degree of collective pitch during the inverted section. Momentum also gives higher and prettier vertical climb in the 540-degree stall turn and rolling stall turn. In physics class you have learned there are two ways to increase momentum... by increasing the forward velocity, or increasing the mass of the moving

FIRST ANNUAL KYOSHO/MB R/C HELICOPTER CHALLENGE - FINAL RESULTS

FAI (15 Entered)

	1	2	3	4	Total	Hell	From
1. Cliff Hiatt	210.5	210.5	231.5	233.0	675.0	X-Cell	Florida
2. Wayne Mann	199.0	211.0	223.0	233.5	667.5	X-Cell	N.C.
3. Yoshiaki Nagatsuka	193.0	212.0	218.0	224.0	654.0	Enforcer	Japan
4. Tim Schoonard	211.5	220.0	222.0	205.5	653.5	X-Cell	Florida
5. Mike Mas	206.0	211.5	221.5	219.0	652.0	Shuttle	Florida
6. Dan Melnik	183.0	175.5	190.5	204.5	578.0	Enforcer	Florida
7. Dwight Shilling	157.0	175.0	187.5	207.0	569.5	Concept	Illinois
8. Dave Finkelstein	165.5	179.5	123.5	178.0	523.0	Concept	New York
9. Frank Dykes	160.5	172.5	181.5	152.5	514.5	Enforcer	Miss.
10. Don Chapman	129.0	163.0	159.0	174.5	496.5	Concept	Ohio

INTERMEDIATE (10 Entered)

	1	2	3	4	Total	Hell	From
1. Stan Olzaski	106.0	122.0	112.0	105.5	340.0	Concept	New York
2. Mike Bantz	110.5	110.5	106.0		327.0	Concept	Ohio
3. Steve Gray	85.0	121.5	88.0	88.5	298.0	Enforcer	Ontario
4. Mike Ellis	83.0	93.0	83.0	75.5	259.0	Enforcer	Tenn.
5. Orval Abney	75.0	88.5	74.5	63.5	238.0	Concept	Illinois
6. Jim Skelley	44.5	50.5	81.0	84.0	215.5	Concept	Illinois
7. George Ford	41.0	82.0	15.5	52.5	175.5	Concept	Illinois
8. Gary Tucker		86.0	56.6		142.5	Concept	Indiana
9. Ron Pound	53.0	59.0			112.0	Concept	Indiana
10. Dan Costa	21.0	62.5	24.0		107.5	Enforcer	Illinois

NOVICE (26 Entered)

	1	2	3	4	Total	Hell	From
1. Jeff Reed	168.5	169.0	182.5	185.0	536.5	Concept	Illinois
2. Mark Burks	142.5	172.5	169.5	181.0	523.0	Concept	Indiana
3. Jim Robertson	116.5	168.0	167.5	178.0	513.5	Concept	Oklahoma
4. Laura Melnik	168.0	157.0	180.5	170.5	508.0	Enforcer	Florida
5. Tony Chisum	146.5	168.5	170.0	164.5	503.0	Concept	Oklahoma
6. Patric Connell	150.5	161.5	164.0	172.0	497.5	Concept	Wisconsin
7. Nina Officer	154.0	158.5	165.5	170.9	494.5	Concept	Oklahoma
8. Gary Briethaupt	135.0	172.0	163.0	157.0	492.0	Shuttle	Ontario
8. Robert Dunkirk	153.5	161.0	167.0	164.0	492.0	Enforcer	New York
10. Lonnie Prince	119.0	156.0	161.0	169.5	486.5	Concept	Ohio

SCALE (4 Entered)

	1	2	3	4	Sta	Total	Hell	From
1. Don Chapman	537.0	558.0	615.0	507.0	825	1998	Concept	Ohio
2. Spencer Forman		264.0	255.0	408.0	680	1352	Shuttle	Illinois
3. Mark Johnson	198.0	288.0	321.0	381.0	545	1247	Concept	Minn.
4. Larry Jolly						1310	Concept	Calif.

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9. Stiffer tail blades increase tail authority.

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W O R L D

object. Thus, for general flying and hot dogging a light helicopter may be desirable, but for smooth contest work, you may want a helicopter with slightly more mass. Remember that back in the April 1989, issue we proved that a slightly heavy model will actually fly faster, if your engine can supply enough torque. Cliff's X-Cell 30 used 1500 rpm during hover maneuvers, and 1900 for aerobatics. Lower rpm for hover helps stabilize the vertical motion (the reason was explained in May 1990 issue). For the X-Cell 60, Cliff mentioned 1350 for hover and 1550 for aerobatics. Small helis employ higher rpm because smaller engines develop maximum power at higher rpm.

Even though the Kalt Enforcer was just introduced in the U.S., Hobby Dynamics still managed to get the kits to their factory pilots in time, and they were all at the contest with their new Enforcers. Thirteen Enforcers showed up. Kalt and Kyosho both brought their factory pilots from Japan to participate or fly demonstrations at the contest. Kalt's pilot, Yoshiaki Nagatsuka flew to a third place in FAI. The Kyosho pilot, Kazuyuki "Kaz" Takyangi demoed the new Concept SX. He was doing rolls at five feet off the deck, switchless inverted flight, and looping from five-foot altitude. Randy Gibson said that on Friday, they illustrated the kamikaze in-flight needle valve adjustment technique (One guy hovers, and the other fellow reaches out to adjust the needle valve while the model is still hovering. Not at all recommended by MB!). In the hands of these two demo pilots, the Enforcer and the new Concept SX looked mighty impressive.

Some of the Enforcer pilots were stretching the 180 autos, which resulted in decaying the main rotor rpm, causing tail boom strike. I have flown the Enforcer and also had a tail boom strike when I



A pre-painted black Airwolf fuselage for all the 30-size helicopters. The bottom needs to be painted white by the builder. The fuselage is molded from a flexible material similar to Kyosho's Concept canopy and fuselage.

stretched an autorotation. This is because of the hingeless rotorhead design used on the Enforcer, which employs a very thin spring steel plate. This permits the individual blade to flap up and down easily. A soft flapping hinge design was chosen because it makes the model easier to handle and reduces vibration. The drawback is that blade flapping amplitude increases to the extent that a blade can strike the tail boom in a hard landing. Furthermore, the Enforcer that I was flying came with very light main blades, not enough lead weight for stretching any auto. Maybe Hobby Dynamics should include more

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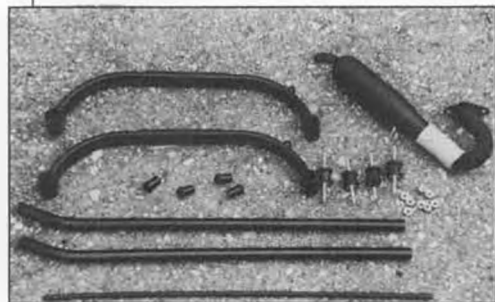
Miniature Aircraft's very new variable weighted paddle. The trailing edge portion is hollow, the leading edge has a hole where brass weights can be screwed into the paddles. Works quite well. Looks better than the original Japanese hollow paddles. The text has more details.



KDI's aft-muffler that we mentioned before. It is about 2.5 inches long. It is a rubber bladder that attaches to the end of your existing muffler. This is for 30 to 50 size engines. I installed one on my Competitor rear exhaust engine's box type muffler. There wasn't noticeable power lost, but noise was reduced only a little. My helicopter sure looked funny with a stinger out the bottom. Call KDI at (206) 854-8053 for info.



Century Import's gold anodized metal drive gear for the Concept 30. It comes with double ball bearings. Very well machined unit. \$37.95 a set.



Century's nylon landing strut and gear set. The set includes the shock absorbing rubber Lord mounts. The whole set is \$29.95. Also shown is the black anodized 30-size tuned pipe for the Concept 30. Power is great, but noise reduction is minimal.



Century's tool-steel metric Allen wrenches. The one on the left has interchangeable size tips. These tips are guaranteed not to round or break. The ones on the right have fixed tips. Slightly over \$10 a piece.



Radio Shack now sells a 400-channel scanner that allows you to hear fire and police departments, cellular phones, and it can also monitor RC frequencies to see who is on. About \$400.

Helicopter WORLD

REVIEW: JR PMC-10 RADIO

BY JAMES WANG

Rather than making this month's product review of the JR PCM10 helicopter radio just a product evaluation, we will make it more educational by using the PCM-10 as an example of how to set up model helicopters in general. The pitch curves, throttle curves and control settings in this article are what I am using on the Excalibur that was reviewed last month. Similar pitch curves and throttle curves are also used on my other helicopters, such as the Schluter Magic/Futaba 9 channel 1024 radio combination. The guidelines discussed in this article may be useful for beginners up to switchless inverted flying. At the end of this

low throttle/collective stick position. Hover pitch only affects the hover pitch trim, while high-end pitch trim only affects the full collective setting. Many flyers prefer this type of arrangement. But I like the Futaba 1024's arrangement. Futaba also has three fine tune



The Kalt Excalibur and Schluter Magic side-by-side. Magic was reviewed in *MB* March and April issues. Both helicopters now use similar pitch curve setups described in the article. The Futaba 1024 can also be programmed to give reverse rudder mixing and stunt trims by using the program mix. We will show how next time. (Insert) Excalibur in stable hover. The entire clutch and drive gear was recently replaced by a GMP unit because after a while the self-aligning clutch system began to give a slight problem. Read text for detail.

article, I will also tell you what I have learned after about 80 flights on the Kalt Excalibur.

The JR PCM-10 helicopter radio has been on the US market for almost one year. The PCM-10 and Futaba 9VH are the fanciest model helicopter radios available now in the U.S. Is one better than the other? That depends on users' habit. For example, PCM-10 allows you to fine tune the pitch curve quickly by three trim levers; a low-end pitch trim, a hover pitch trim, and a high-end pitch trim. The low-end pitch trim lever only affects the collective pitch at the

trim tabs; one for hover, one for high end, and one for moving the entire pitch setting up or down. I prefer this because it is extremely useful to be able to move the entire pitch curve up or down. For example, flying on a cold morning requires less pitch because the ambient air is denser, while flying on a hot afternoon requires more pitch because air is less dense. The beauty of Futaba's global pitch trim feature is that it allows you to raise the collective pitch globally for hover, high-end, and low-end, just by turning one knob. This feature does not exist on the JR PCM-10. Futaba 9VH also has the pitch curve copying feature that allows you to copy, for example, the idle-up 2 curve from the idle-up 1's pitch curve, or any pitch curve from another pitch curve. (Both radios have five pitch curves; normal, idle-up 1, idle-up 2, invert, and throttle hold.)

However, this does not mean the PCM-10 is not as well engineered as the Futaba 9VH. They each excel in different areas. For instance, the PCM-10 transmitter case has a better feel in the hand. It does not just feel like holding a square box, its ergonomical shape hugs the palms very comfortably. I need a transmitter strap when flying with the Futaba 9VH, but I don't need one when using the PCM-10. Furthermore, the PCM-10 control sticks are the smoothest that I have used. There is almost no deadband or slop at the center

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position. These control sticks are the best. I also prefer PCM-10's method of having the idle-up 1 and idle-up 2 both triggered by the same toggle switch. Futaba 9VH uses two separate toggle switches. The PCM-10 has a stunt trim feature that the 9VH does not have. But this capability can be implemented on the 9VH by using three program mix functions on the Futaba 9VH. The disadvantage is that even though the 9VH has four program mix circuits, using three for stunt trim setup on the 9VH would only leave one free programmable mix circuit. The PCM-10 has a build-in U-shaped throttle stick/rudder mix feature, while Futaba does not. Again, this can be implemented on the 9VH by using a fourth programmable mix circuit. (This is beginning to read like a "the good news is... but the bad news is" comedy routine! wcn)

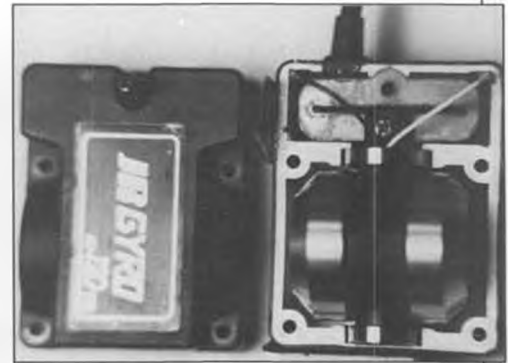
Aha, if we implement the above mixings on the Futaba, then there is no more programmable mix circuit left on the 9VH. I can think of at least two reasons for needing another three programmable mixes. It would be desirable to mix the fore/aft cyclic with roll cyclic. Thus, when you pull back the cyclic for a loop, a minute amount of roll cyclic will be fed in automatically to make the climb straight and level. This longitudinal and lateral motion cross-coupling exists on all helicopters when the main rotorhead is not free to teeter. The stiffer the main rotorhead setup, the more the cross-coupling. Instead of electronically removing the cross-coupling, it can be removed by rotating the swashplate anti-rotation mechanism until the cross-coupling disappears. For example, this can be mechanically implemented on the X-Cell by adjusting the length of the pushrod that holds on to the swashplate on the left side. On the GMP Cobra and Competitor, there is a similar pushrod that holds on to the swashplate. On the Concept 30, the cross-coupling can be removed mechanically by rotating the aluminum collar that sits on the main shaft (it's right above the sliding collective control collar). You need to rotate it counterclockwise (looking from the top) by about 10 degrees. You need to loosen the four set screws holding the collar first. This procedure is called "setting the phase delay" between the swashplate control input and blade flapping response. (Review August 1990 column on control theory.) The beauty of having electronic programmable mix is that things like phasing adjustment can be done easily by touching some keys on the transmitter. On helicopters like the Legend, Heim, and Magic, phasing cannot be changed mechanically, so electronic mixing becomes very valuable.

I sometimes mix in some fore/aft cyclic with the throttle stick in

Hobby Dynamics' JR PCM-10 helicopter radio. It rivals the Futaba 1024 9VH. It comes with five 4031 double ball-bearing servos, a 1000ma receiver battery, and 700ma transmitter battery. Until Airtronics' new Infinity comes out, this is the only radio that you can program by actually pressing on the LCD screen.



Inside the JR-120 gyro. Two hundred times better than the old JR 100 and 110 gyros. Unlike conventional gyros on the market that use springs for centering the gyro motor assembly, the 120 uses a thin spring steel plate to restrain the motor assembly. The picture shows this steel plate, and the gyro assembly is gimbaled on two ball bearings. See text.



such a manner that high collective gives some forward cyclic, and low collective gives back cyclic. The reason is that in forward flight, increasing the collective will cause the nose to rise. This mixing helps maintain a nice level flight at all throttle settings. And, in the inverted portion of a roll, very slight back cyclic stick is required as collective is lowered. Also, while doing switchless inverted flying, some back cyclic stick command is required to fly forward. With the above throttle/fore-aft cyclic mixing, back cyclic stick will be input automatically as collective stick is pulled back during switchless inverted flight. I usually set the mix so that as I pull the collective stick back for switchless inverted flight, just the right amount of back

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Figure 1. Pitch curves for any collective pitch RC model helicopter.

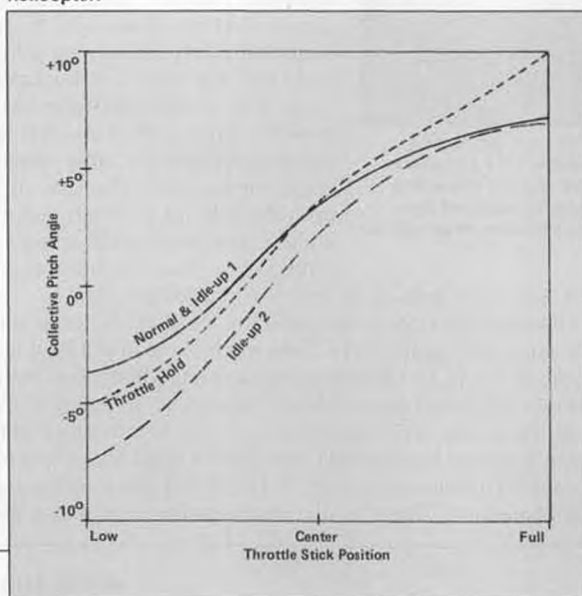
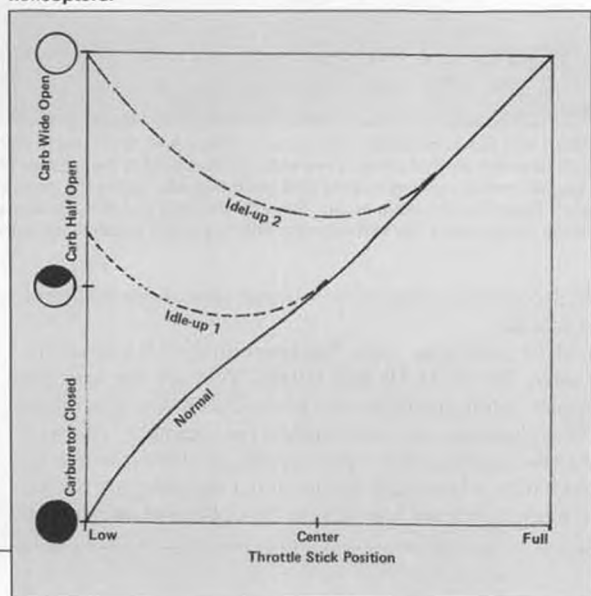


Figure 2. Throttle curves for any collective pitch RC model helicopters.



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FORTY
FIFTY
SIXTY

X-CELL

SCHOONARD Helicopters

LONG RANGER
QUICKSILVER
TRIUMPH/XL-PRO



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FIRST in Quality
FIRST in Standard Features
FIRST in Customer Satisfaction

FIRST in Parts & Technical Support
FIRST in Safety & Performance Innovations
FIRST in Sixty & Thirty Size Competitions

'90 DAYTON SPRING MASTERS CONTEST

1st FAI - Wayne Mann - X-Cell Long Ranger .60
1st Intermediate - Tom Erb - X-Cell .60

'90 MICHIGAN FAI CHAMPIONSHIPS

1st FAI - Wayne Mann - X-Cell Long Ranger .60
4th FAI - Doug Law - X-Cell .60
1st Intermediate - Mike Bantz - X-Cell
2nd Intermediate - Tom Erb - X-Cell
X-Cell dominates other makes by 2 to 1

'90 KINGS COMPETITION AND FUN FLY

1st Expert - Wayne Mann - X-Cell .60
2nd Expert - X-Cell .60
3rd Expert - X-Cell .60
1st Intermediate - X-Cell .60

'90 MICHIGAN FUN FLY

X-Cell dominates other makes by 2 to 1

'90 BURLINGTON, NC CONTEST

1st FAI - Wayne Mann - X-Cell Long Ranger .60
1st Intermediate - Jack Koontz - X-Cell .60
1st Novice - Steve Hodges - X-Cell
2nd Novice - Gary Whitford - X-Cell

'90 GREENWOOD, SC CHAMPIONSHIPS

1st FAI - Wayne Mann - X-Cell Long Ranger .60
4th FAI - Wes Suggs - X-Cell Long Ranger .60
1st Novice - Richard Mann - X-Cell .60
2nd Novice - X-Cell .60
3rd Novice - X-Cell .60

'90 1ST KYOSHO CHALLENGE - .30 SIZE HELIS

1st FAI - Cliff Hiatt - X-Cell .30
2nd FAI - Wayne Mann - X-Cell .30
4th FAI - Tim Schoonard - X-Cell .30
X-Cell dominates FAI class - even against Japanese factory teams!

R/C PRECISION AEROBATICS

BY RICK ALLISON



Some of the ships flown at the '89 Nats. Note the trend toward big, long tails—which, coincidentally, happens to be the topic of this month's discussion.

As you may recall, we've talked a little bit about trends in pattern plane design over the last couple of months. One of the items mentioned was the current popularity of what might be called The Big Long Tail (sounds like the title of a mystery novel about a murdered rat). I refer, of course, to the use of longer tail moment arms and bigger stabs on the newer designs. In the course of a pop-top fueled discussion on the subject with several of the disreputable pattern types that I am accustomed to pleasantly wasting time with, the eternal aeronautical question "Why?" was asked. As a designer whose current airplane (Cursor) has both long tail and big stab, I was forced to rake up the compost heap to explain "howcum." It took me long enough to do it that I convinced myself that the subject might rate a column. Let us proceed to leap into deep, dark water...

Right at the start, I should say that I am a Large Tail Person. Hmm. Maybe I should rephrase that. I am in favor of Big Tails. Nuts! OK, let's just say that I think that Big... ah, skip it! Next paragraph, please.

What exactly does a big stab on the end of a long lever arm do for us? By "big," I mean something in the neighborhood of 25-30% of the wing area. "Long" refers to a moment greater than about 2.7 times the Mean Aerodynamic Chord (MAC) of the wing. Since bigger and longer tails use up more fiberglass, foam, balsa, and finishing materials, it stands to reason that there had better be a serious aerodynamic/aerobatic advantage connected with them. Is there a good reason, or are the big tails just another

passing fad?

My answer, which was naturally compounded of equal measures of prejudice, opinions, and facts took us into the area of stability and control theory. Obviously, the main thing you would expect horizontal stabilizer size and tail moment arm length to affect is pitch stability. This is true, but airplane design is an interactive science, and it is seldom if ever that a design change has only a single effect. First, a little digression on the subject of stability.

I think most pilots would agree that the "ideal" pattern plane would be one with perfectly neutral stability. We would like to be able to place the aircraft precisely in a flight attitude and have it stay there without further input until we commanda different

flight attitude. In the real world, this isn't quite possible. Some minimum amount of positive stability must be designed in to give a control "feel," provide damping, and prevent divergence (dynamic instability). The trick is to get that certain minimum amount, and no more. Too much positive stability in an aerobatic aircraft leads to a very high pilot workload, as nearly constant control input is called for just to keep the model from trying to return to its primary trimmed condition, otherwise known as straight and level flight. If you don't believe this, I suggest you spend some time trying to fly an 8-point roll with a trainer. As model pilots, we get a little help here, because we don't depend on control surface flight loads to center our controls and provide a "feel."

Larry Dalzell's pretty but short-lived "Aurora" met its Waterloo when it tangled with power lines. It does, however, serve as a good example of the current use of long tail moments and big stabs.





From left: Don Weitz, Steve Rojecki and Chip Hyde talk airplanes at the 1989 Nationals while Ivan Kristensen flies in the background.



Paul Verger (left) and Jim Fife show the differences in the top and bottom color schemes of their twin Eclipses, both of which were built by Jim. Paul believes that such a marked difference is an asset to accurate judging.

Our controls are centered electronically, and the feel (feedback) is provided by the springs on the transmitter gimbals. Visually observing the aircraft in flight completes the feedback loop. All this means that we can successfully and pleasurably fly an aircraft with a smaller static margin of stability than the full-size aerobatic guys can tolerate.

Actually, what we have amounts to about half of the full-size jet jocks "fly by wire" system, which turns some fairly unstable fighters into pussycats. The other half of their system consists of gyros and electronic gimcracks of various types, all of which are illegal for our purposes. This is probably just as well. I can't imagine sunglasses with a heads-up display projected from the bill of a greasy ball cap anyway.

Back to theory. *Pitch stability in an aircraft is accomplished by locating the Center of Gravity (CG) forward of the Neutral Point (NP).* The NP, also referred to as the *Aerodynamic Center*, is that point through which the forces acting on the aircraft in flight (lift, drag, weight, etc.) are assumed to act. Finding this point on an aircraft is a complicated deal. Each streamlined component (wing, stab, fuselage, wheel pant, etc.) has its own NP, which lies at about 25% of its own MAC.

Providing that the airflow remains streamlined over the surface, this point *remains fixed*. It does not move as the aircraft's angle of attack changes, providing the component in question does not exceed its particular designed critical angle of attack and become stalled.

The NP for the whole aircraft is found by summing up the NP's of all the parts through a mathematical process which uses up enough weird symbols to cover a sorcerer's hat, taking into consideration each part's relative size, location, and contribution to the whole. For our purposes, it is safe to say that the NP of a conventional aircraft in the horizontal plane usually lies somewhere between 40% of the MAC of the main wing and the leading edge of the horizontal stab. Actually, the NP is almost always between 40 and 80% of the MAC. As in the case of a single component, the NP of the aircraft remains fixed as angle of attack changes.



I know that the last sentence above is going to generate some flak from those of you out there who were brought up with the old moving Center of Pressure theory. Center of Pressure is a convenient mathematical tool for explaining the pitching moments of airfoils. It is now largely unused, having been replaced by the Neutral Point or Aerodynamic Center explanation above. In any case, our symmetrical airfoils have zero pitching moments at all usable angles of attack, unless you consider a stall as being a usable angle of attack—which it is, during snaps and spins, but that's another story. End of justification.

As I stated above, pitch stability is dependent on the CG being located forward of
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(Left) Here we have one of the unsung heroes (otherwise known as contest directors), Paul Cole. Without these guys, nothing happens. (Below) President of the Florida Pattern Association, Sam Turner, with his very pink Eclipse at the '88 Nats. Some color scheme!



I.S.S. 7th ANNUAL R/C HAND LAUNCHED GLIDER CONTEST



Here's a look at most of the 33 models and pilots who participated in the seventh running of one of America's biggest R/C hand launch glider meets, the Inland Soaring Society's annual at Riverside, California.

Without a doubt, year after year, the Inland Soaring Society of Riverside, California, has the biggest RCHLG contest in the country. There may be others which come close, such as those in Texas and Oregon which I read about in various newsletters and announcements, but this one's the biggie. It always attracts a crowd of model builders and spectators! Over the years, the entries have been: 32 in 1984, 51 in 1985, 44 in 1987, 28 in 1988, 33 in 1989, and 33 again this year in spite of unseasonably high 100 degree weather!

TASKS OF THE ISS CONTEST

The rules of this annual ISS game are simple. Bring a safe and flyable AMA Class A R/C glider (1.5 meters or less in span), and a throwing arm (no winches or hi-starts needed). The throwing arm doesn't even have to be yours! The tasks are likewise simple: three rounds of ten-minute slot, man-on-man scoring. Round one: unlimited throws, the longest flight wins. Round two: unlimited throws, one five-minute max. Round three: six throws, best five count, two-minute maxes, or straight time if flights are under two minutes. Everything else is normal procedure for contests (i.e. no kibitzing between fliers, only one helper/thrower, etc.).

WHAT IS THE ATTRACTION OF RCHLGs?

RCHLGs are as big on satisfaction as they are small on size! They are a kind of concentrated soaring fun. The beauty and appeal of flying RCHLGs is all-embracing. They are simple, affordable, compact, easy to build,

Finishing one-two were Joe Wurts (left) and Daryl Perkins respectively. Both models were designed and built by Joe—Daryl's ship is actually Joe's 1989 entry—and features fiberglass wings and stabs. See text for details.



Two examples of the successful "Icky" Class A sailplane, as displayed by designer Marc Higginbotham (left) and Joe Rodriguez. Joe flew his ship to a very creditable 4th place finish in this, his first RCHLG contest!



Another top competitor is Larry Jolly, seen here flinging his venerable "Flinger," which he kits. The Flinger is one of the oldest—and still one of the best—RCHLG designs around and was by far the most popular kit model at the ISS meet.





Joe Wurts puts everything he's got into his hand launches. Picking your air *before* tossing is the key to longer flights.

and fun to fly. People who enjoy success from challenging tasks love working a thermal at low altitude from a hand launch, and seeing a model go up and out. Running after lift and throwing RCHLGs can be as physically demanding as one wishes. And all this low altitude action is fun to observe, so spectators at contests are entertained.

Not only are RCHLGs easy to build, but they normally build in less than a week, even for busy people. You can scratch build one in two weeks or less of your spare time! This makes Class A RCHLG the perfect format for experimenters and designers who like fast results from their ideas.

Lunch hour fliers with big vacant lots nearby and only a few minutes of break time will find RCHLGs are the perfect way to get air time on a busy schedule.

These models don't need to be taken apart to be stored or transported. They can rest on a small shelf, hang from a wall and be whipped out and flown on short notice. Pack a hand launcher in your car and you can try a new slope site almost anywhere, anytime, of any size.

WHAT DO PEOPLE FLY?

Of course, there will always be a good number of scratch built models and original designs, but kits are *always* going to be popular because of their building conve-

(Below) Here's a neat idea for anyone who could use a saw/sander combo and who has access to an old sewing machine. More in text. Drawing courtesy of *The Gull*, newsletter of the Central Ontario Glider Group.

nience. At this year's ISS contest there was a slightly higher percentage of O.D.s and prototypes than kits.

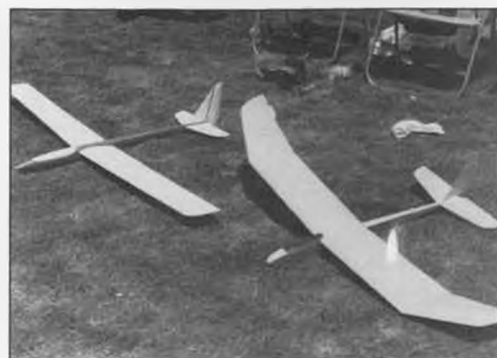
High on the kit popularity list was a perennial favorite, the Larry Jolly "Flinger" with at least six flown. Next in popularity was the Culpepper Models "Chuperosa" at two, the Whitney Models "Paraphrase" at two, the Mark Grand "Thermal Phase" at two, the Peck-Polymers "Genesis" at one, and the Midway Models "Tossette" prototype at one. This is an incomplete tab, but as it goes, fairly representative of what was flown. Other designs which in the past have flown at the ISS are: Midway Model Co. "Gnome," John Lupperger Plans Service "BODST" partial kit, Bridi Aircraft Designs "Kastaway" and "Tercel," Davey Systems "Ariel," Bob Owens "Zephyr" from *Model Aviation* plans, Buzz Waltz Designs "Poquito Primero," Top Flite Models "Wristocrat," and Mike Reagan's "Mini Mirage" partial kit. Many of these models are still available, but can be hard to locate and buy. Many are made by "cottage industry" manufacturers who come and go and almost never advertise. Some are rarely carried by hobby shops, and a few are no problem at all to find.

Another popular way to go is to obtain a popular two-meter kit such as a Carl Goldberg Models "Gentle Lady" or "Sophisticated Lady" or the discontinued Mark's Models "RO-8," then photocopy the plans at 75-77% reduction. You may have to buy the kit, or borrow the plans, but it is worth the effort. This reduced copy gives you a workable plan of a proven design. It may be a patchwork of 8.5x11 paper and Scotch tape, but it will do the job. Wood sizes will have to be refigured, e.g., 1/16 balsa sheeting at 75% reduction is an unobtainable size and probably should be converted to either 1/32 or 1/16. However, these are small problems.

If the plans fail to show rib shapes, no big deal. Plot your own (more on this later) or use a computer plotting program like Cygnet Software's "Foiled Again" (see ad in this issue—consult ad directory for page number). The Mirage and Rhode St. Genese 28 featured airfoils in this month's column, are only two of many excellent choices for RCHLG.



Patrick Conway (left) and an unidentified contestant both flew Culpepper "Chuperosas"—a potential winner in the hands of a practiced chucker.



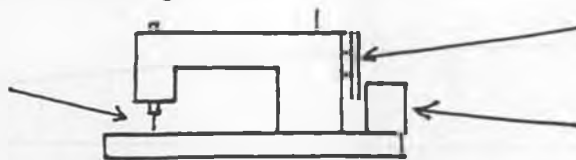
One of the few pivot-wing models used in RCHLG competition is Mark Grand "Thermal Phase," which looks like it would be more at home on a windy slope than at a flat-land thermal contest. The other model appears to be a "Zephyr" blown up to the Class A wingspan limit of 1.5 meters.



Rich Shelby took the Dick Odle "RO-8" plan and shot it at 75% to make a Class A model. Photo-reducing plans of two-meter ships has become a popular way to go in RCHLG.

At a recent club meeting (RHMAC) a member displayed some real ingenuity. He had modified an old sewing machine ...

1/8" Jig saw blade instead of needle... would cut up to 1/4" ply



Sanding disk attached to existing wheel
Small table with 90° & 45° guide.

Most of the Sewing machine drive is removed from underneath, leaving only the wheel & needle mechanism ... Worked beautifully.



Competitive pod-and-boomer is the work of George Spitzer. The semi-elliptical wing planform and overall low parasitic drag made it do very well in the light lift at Riverside.



When the lift is light, you gotta milk it for all it's worth! Fifth placer Todd Billman stayed in the light stuff one circle too long and stranded his 75% Sophisticated Lady.



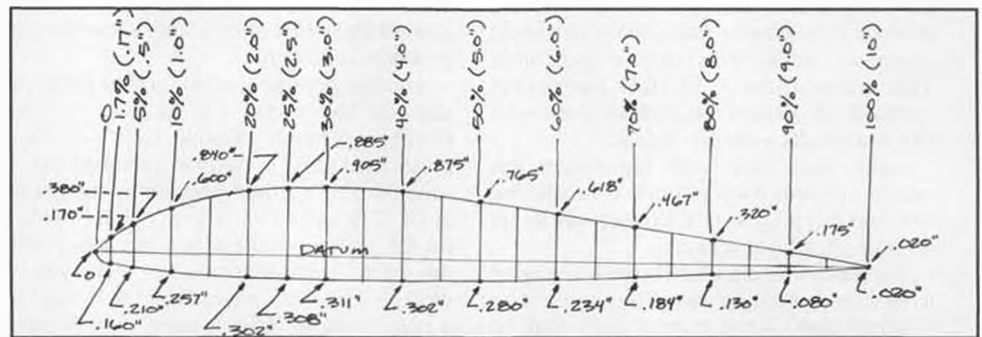
An unidentified modeler (a victim of our columnist's lost notes) with a really nice looking RCHLG. It sports a Jack Chambers airfoil similar to that on Dick Vader's "Skywalker," two polyhedral breaks per wing half, plus dihedral in the center section. Planes that look this right usually are right.

Starting with this year's contest winners, we'll touch on a few of the individual models flown.

First place went to Joe Wurts, who flew the latest of his unnamed RCHLG designs. Each year Joe refines his HLG model into a better and better ship. This year it appears he was trying to save as much as possible on parasitic drag—particularly the drag caused by air flowing past the fuselage and stab—and weight by going to a Mark Allen designed "Swift 400" fiberglass fuselage (Flite Lite Composites, P.O. Box 311, Windsor, CA 95492). To this fuselage, Joe added his own wings and stabs. The entire model is very aerodynamically clean, simple, and light at only 13.5 ounces.

The wings are blue foam cores, but were painted red using enamel spray paint before the F/G sheeting was applied and then vacuum bagged. This gives a very unique look and color to the finished wing. Joe cautions to only lightly "fog" the cores with

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Plotting airfoils by hand is time consuming and tedious, but it can be done with simple multiplication, accurate measurements, and the use of a couple of good draftsman's curves to connect the points. Shown here by way of example is the Mirage airfoil; the locations of the plot points, measured in inches from the datum line up (top curve) and from the datum line down (bottom curve), are for the airfoil drawn to a 10-inch chord. Compare these numbers with the Mirage airfoil coordinates included with this month's column. See text for explanation.

MIRAGE																
STA	0.00	1.70	5.00	10.0	20.0	25.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.		
UPR	0.00	1.70	3.80	6.00	8.40	8.85	9.05	8.75	7.65	6.18	4.67	3.20	1.75	0.20		
LWR	0.00	1.60	2.10	2.57	3.02	3.08	3.11	3.02	2.80	2.34	1.84	1.30	0.80	0.20	all negative	

RSG-28																		
STA	0.00	1.25	2.50	5.00	7.50	10.0	15.0	20.0	25.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	95.0	100.
UPR	1.87	3.35	3.97	4.90	5.59	6.12	6.91	7.40	7.61	7.63	7.33	6.75	5.77	4.55	3.15	1.58	0.82	0.00
LWR	1.87	0.78	0.47	0.22	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MIKE GR6-120 RADIAL ENGINE

This new engine was the engineering jewel of the 1990 WRAM and Toledo R/C shows. Our editor/publisher, Bill Northrop, was awed by it at the WRAM show, and spoke with Mike Goldowsky, who's developed the engine, about it being reviewed here in *MB*... and set the stage for this story. One of the display engines was run on a schedule at Toledo, and I was in one of the three-row-deep audiences when it fired up. There's no doubt about it, the Mike GR6-120 should be voted a major technical breakthrough in model airplane powerplants!

"Inside Engines" originates from Orlando, in central Florida. A few miles north of here (in Zellwood) is Bob White's grass strip airport. On a Saturday morning you can see Boeing and Stearman PT-17s, Waco Taperwings, a Butler Blackhawk, and one or more Beech Staggerwings on the ground and in the air. *These are real airplanes, with round engines and two wings!* A few miles south of here (at Kissimmee Air-

port, near Disneyworld) you can visit any day at Reilly Aviation's Warbird Air Museum, where restoration of WW-II aircraft takes place. The only restored B-24 Liberator bomber was done there, and it has four twin-row *round* engines, as do many of their projects. I've flown with *MB* reader Harvey Thomasian in his Clipped Wing Monocoupe... behind a round engine. Recently, *MB* reader Don Nix took me to California's Chino Airport where I sat close-by on the runway as a hopped-up F4U Corsair started its big round radial engine with fire-breathing, smoke-belching aura... its throbbing power even shook the concrete under me. Aviation has a love affair with big round radial engines, and we model builders do too!

But most of us simply can't afford a radial model engine. Most are four-stroke powerplants made by Saito (five-cylinder version near \$1400), by Technopower (five-

cylinder near \$1400 and seven-cylinder near \$1800), and by O.S. and Enya (both are near \$1350 for five-cylinder versions).

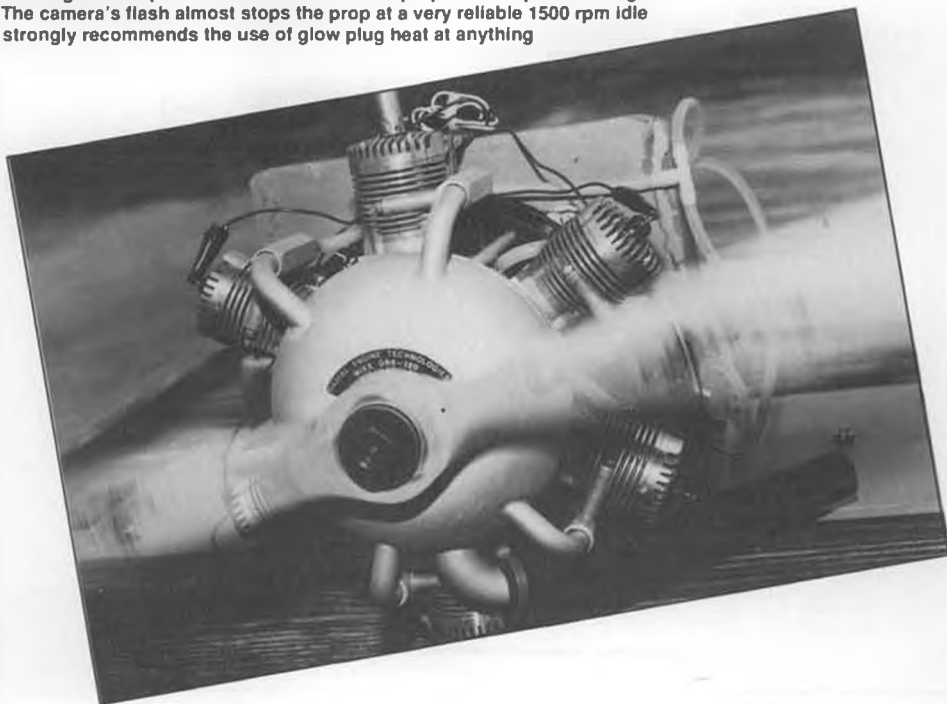
Mike Goldowsky, a fellow model builder, wanted a big *powerful* radial engine too... and about two years ago he started development on one. Mike is a graduate mechanical engineer (RPI) with a background in machine design. He's spent a number of years with a major American manufacturer and he

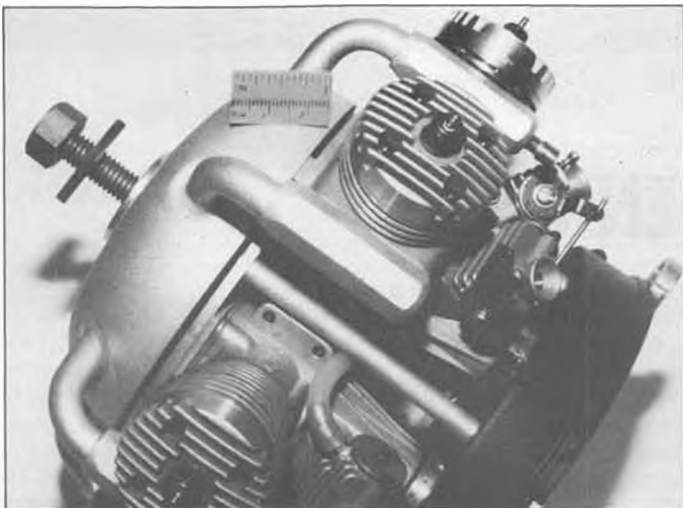
approached the model engine design development from a new and functional approach: The most reliable machinery often has the least number of parts; assemblies made from proven subassemblies are most reliable, two-cycle engines develop half again more power than four-cycle engines for a given weight; price had to be below one thousand dollars. Mike's development is successful and now you can buy a big, powerful, throbbing, two-cycle radial model airplane engine, for under a thousand dollars!

Let's look inside the Mike GR6-120. This is a 1.2 cubic inch two-cycle glow engine that puts out power equal to or exceeding that of a Quadra 40 or a Zenoah G-38. The engine weighs 4.75 pounds, requires no add-on muffler, no add-on engine mount, and requires no tricky direction-changing throttle linkages to fit your model. Mike smartly chose the K&B Sportster .20 engine as a well-proven sub-assembly to go into



Looking for all the world like the old Curtiss Challenger, the Mike GR6-120 is probably the most successful two-stroke model radial engine ever produced. Turns an 18-inch prop at 8000 rpm and weighs under five pounds. (Below) The camera's flash almost stops the prop at a very reliable 1500 rpm idle with glow plug heat on. Stu strongly recommends the use of glow plug heat at anything below half throttle.





From this angle we see that the Mike GR6-120 is made up of six K&B Sportster .20s geared to a single output shaft. The K&B engines face backwards, with all gearing located in the rear housing. The exhaust headers connect to the front bell housing, which is actually the engine's muffler.



Just like full-size aircraft engines, the Mike sports a manufacturer's identification plate.

the Mike GR6-120. Six of these engines are radially ganged in a rigid metal frame to make what is probably the most vibration-free engine next to a Wankel. At Toledo, Mike had a stemware glass of water on the engine stand; you had to be there to see and believe. The glass simply sat there as the engine accelerated in speed up to around 8,000 rpm on an 18-inch prop... finally the prop blast blew the glass back but the water was virtually ripple-free. The big-banger single-cylinder engines simply beat the hell out of our R/C equipment in big models. The Mike GR6-120 is engineered to exceed one hundred air-hours of flying (the subassembly engines have a lifetime warranty) and you can bet that your radio, servos and their delicate feedback pots will be none the worse for wear!

There's a patent pending (it's maybe been granted by now) on the cleverly engineered non-pumped fuel delivery system. You don't

have six needles to twiddle; the Mike GR6-120 has a single needle valve, just like any ordinary single-cylinder engine. Trust me... *Mike's system works... and durn well!*

Six spider-like fingers simultaneously open and close the throttles in unison from a single servo-controlled throttle arm. The engine's drive shaft runs through the hub of the spider assembly. The quarter-inch backplate serves as the bearing support and firewall engine mount. Stainless steel ball bearings absorb radial stress. Mike talked to me a long time about the technicalities of the gearing materials, the costs per pound of some of the component base stock, and a simple way for me to tell you about it is to say that you'd probably need to have the research facilities of GM or Lockheed's famous "Skunk Works" to parallel what Mike's Radial Engine Technologies company has done for us model builders.

In old movies of WW-II aircraft, you've

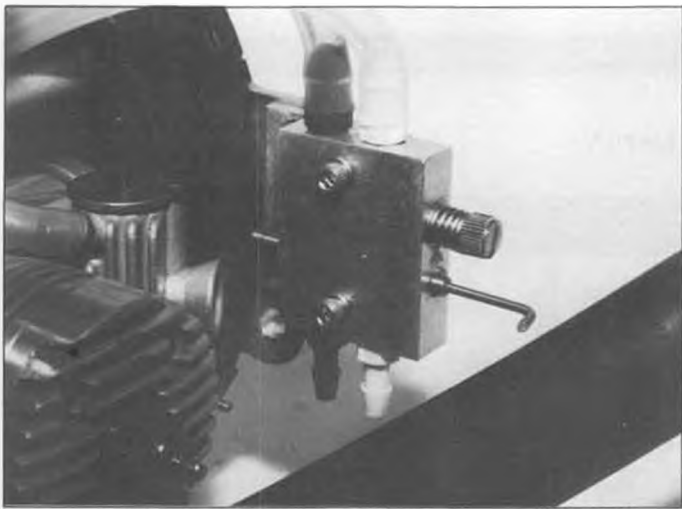
noticed the ground crew pulling the props through several times to avoid the problems of hydraulic lock as engine fluid drains into the lower cylinders. To guard against this possibility the Mike GR6-120 uses dual fuel tanks; one mounts above the other. The upper tank feeds the upper three cylinders, the lower tank feeds the lower three cylinders. From a cold start, the engine fires up on the upper three, then you change a position lever near the needle valve and the lower three fire up as fuel flows from the lower tank. The engine doesn't really need full-time glow plug heat—it'll run and fly on five or fewer cylinders—but this is a powerplant made with lots of power for fifteen-pound models on up. I think it'd simply be dumb to not carry on-board NiCds and at least have them supply plug energizing from half throttle on down for maximum reliability in the engine—and maximum safety for your model! Mike is currently developing a high-tech moderate cost onboard ignition system... it may even be ready as you read this.

Also, K&B has, as this is being typed in June 1990, just started shipping their new Sportster .28, which is built into the .20 size Sportster outer case. When I spoke with Mike recently he'd just received his first batch of .28s. His system was smartly over-engineered to readily accept this power increase from the subassemblies, so it may be available as both a 1.2 and also a 1.68 cubic inch powerplant.

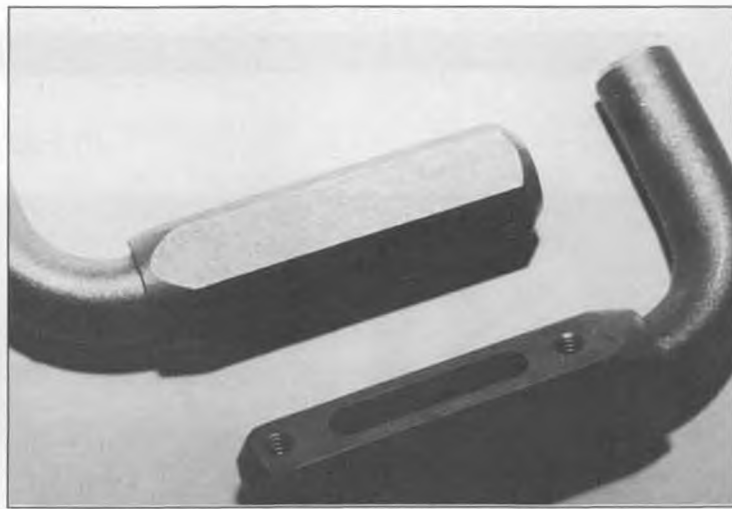
What makes the Mike GR6-120 so extremely smooth running is its cylinder firing order. As you look at the front of the engine, cylinders in the twelve o'clock and six o'clock positions reach top dead center simultaneously. About a hundred (not 120!) degrees of prop rotation later, cylinders at two o'clock and eight o'clock reach top dead center, and finally, after another identical number of degrees of prop rotation, cylinders in the four o'clock and ten o'clock positions reach top dead center—all firings are virtually one hundred percent opposed. When real radials misfire, they shake, rattle and rumble.

Parts breakdown of one of the K&B Sportster .20 engines used in the Mike radial. With the new .28 Sportsters, the total displacement jumps to 1.68 cu. in.





This clever bit of engineering eliminates the almost impossible task of twiddling six needle valves—mixture control for all six K&B engines is by a single knurled needle.



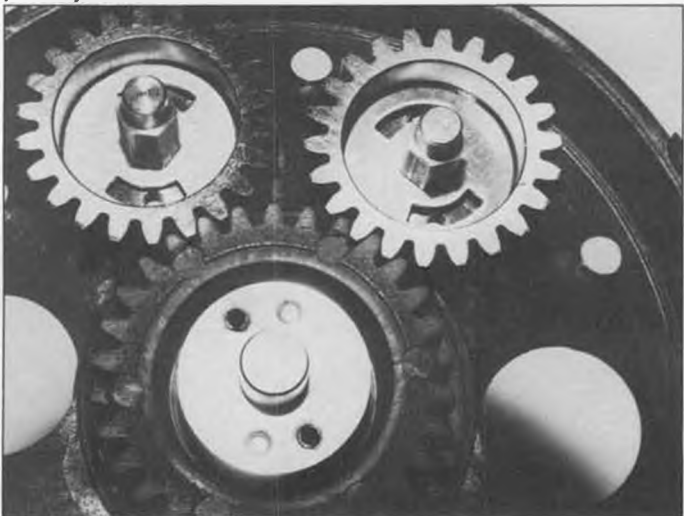
The exhaust headers, besides exhausting to the muffler, supply an oil splash to the gear system and a bit of fuel tank pressure.

Mike has overcome this by using an even number of cylinders and opposing them.

There are lots of other engineering and machine design features. Since you're only starting two opposed cylinders at a time, you don't need a special starter. The engine readily meets AMA's sound guideline of 90 db at nine feet. The front bell-housing is the muffler and it sure adds to a realistic appearance. Only two cylinders exhaust into the muffler at a time. Each of the six K&B engines has its power stroke factory adjusted for proper timing. The six exhaust headers are unique in cross section and assembly; one header also provides splash lubrication of the gears, another provides minor pressure to the fuel system. Appearance is certainly scale-like and no other commercial radial matches the performance. It comes with a limited lifetime warranty.

Prop sizes for best power conversion are 18x6 and 18x8 for the 120 engine. Ground rpms are redlined at 8,800. The engine's outside diameter from plug tip to plug tip is 8.3 inches. From the firewall mount forward to the face of the prop driver is 5.25 inches.

Inside the rear gear housing. Each K&B .20 turns a single pinion gear (two of which are shown here at the top of the photo), all six of which drive the central output shaft gear. Text describes engine timing—it's not what you probably think!



The engine will exceed three brake horsepower and burns two ounces of low nitro fuel a minute at full throttle. There is a VHS video tape available for \$15 showing a Corsair and a biplane in flight. This engine will easily fly a ten to twenty-pound model. Sixteen pounds of static thrust is nominal. It's no wonder this engine was a major attraction at the '90 WRAM and Toledo shows. The engine is the product of: Radial Engine Technologies Inc., 7 Greenwood Lane, Valhalla, New York 10595. Phone (914) 686-9373 on your nickel, please.

I'm real partial to the Ford Trimotor. With three of Mike's 120s it'd be 18-1/2 foot wingspan at quarter scale, and at one-third scale with three of his 1.68 cubic inch engines it'd be almost a twenty-five foot wingspan... WOWEEEE!

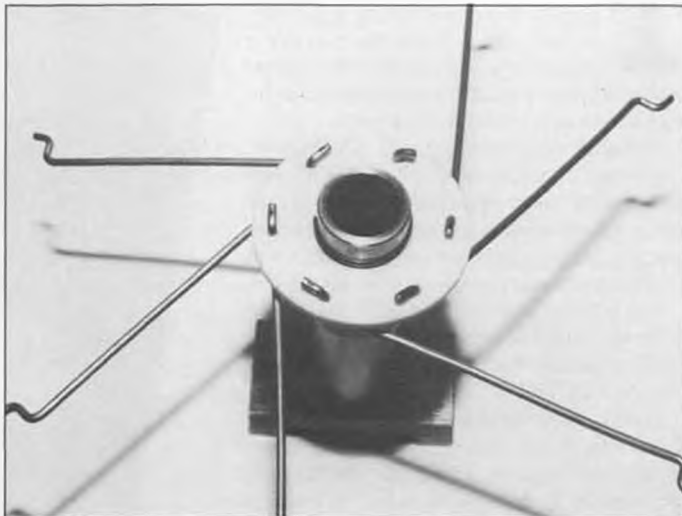
PERFORMANCE

This engine is in a class by itself. There's simply nothing to compare it to at this time. The instruction book says: "Engine red line is 10,000 rpm and is set by the dynamic gear loading and K&B recommendations. In order not to exceed this in flight, the maximum

ground rpm is 8,800. Engine speed this high does not produce optimum thrust even though horsepower is higher, so 7,500-8,200 rpm is recommended." We recorded an easy 7,900 on the review engine, turning a Zinger wood 18x6 with a slightly rich needle. We've been using a Sullivan DynaTron starter with one of those new KDI electric coil cords hooked to a Hobbico 12-volt 6-amp battery, and this combination readily turned the Mike GR6-120 over for easy starting. Glow plugs were K&B 1S regular shorts and we used the Powermaster Golden Break-In fuel. Without glow plug heat we idled reliably at 1500 rpm for a Richmond speed ratio of 5.27:1. With plug heat we got down to 1,000 rpm for an amazing 7.9:1 speed ratio, but occasionally the bottom cylinder would foul; 1500 rpm at idle is plenty slow enough, and I'd certainly recommend plug heat for safety. Also, if you don't shut off the fuel valve right after the engine stops, be very careful of the bottom cylinder getting a few drops too many (it only takes a few!) of fuel and wanting to hydraulic lock... it's normal with radials!

MB

This simple mechanism gives synchronous R/C throttle action. Prop drive shaft runs through the center line.



BY FLOYD MANLY

SUMPTHIN' SPECIAL



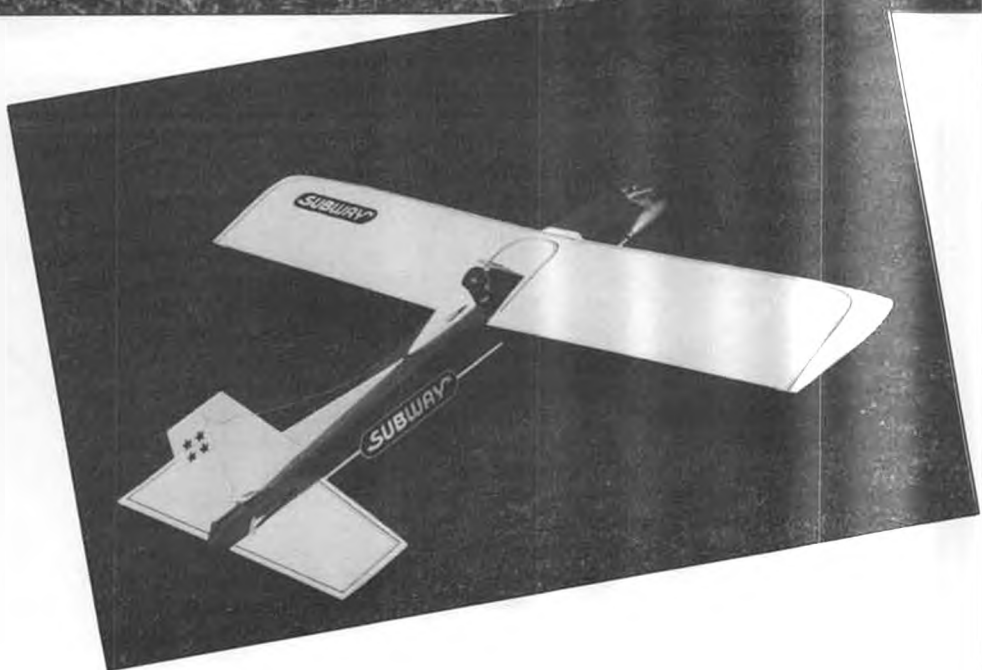
The Sumptin' Special is reminiscent of the early 1940s. It was designed purely from the mind of a person who is more than fascinated by aircraft, particularly those styled when he was a teenager in the mid forties.

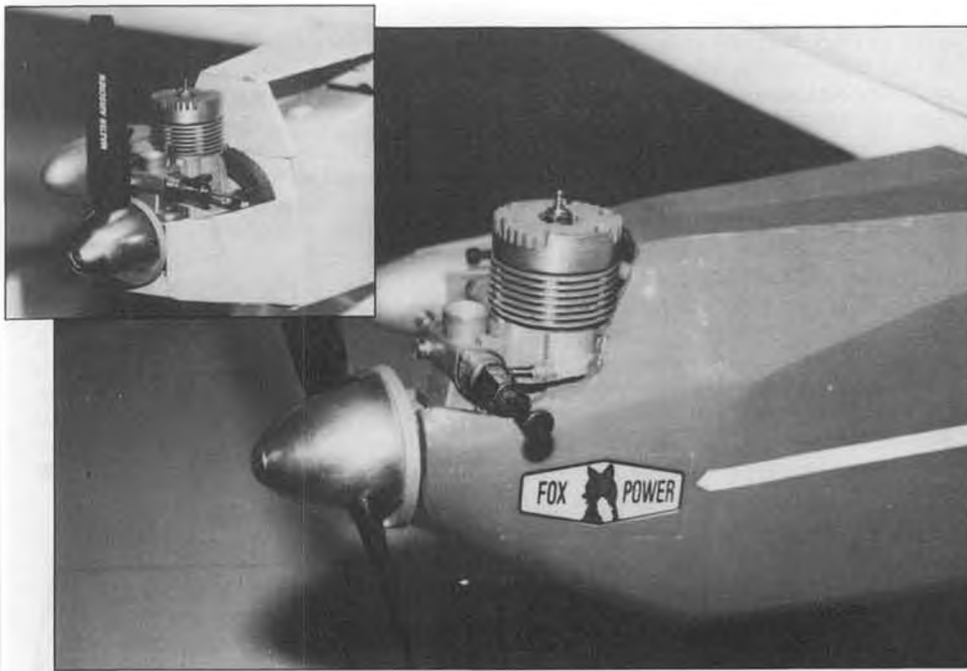
It has an open cockpit and a tailwheel. These two characteristics place this aircraft into a very short span of time, as earlier designs had radial engines and lots of wires bracing the wing and tail, while later aircraft all have enclosed cockpits and nosewheels.

The Special is "SOMETHING" Special in the mind of this designer, and hopefully a lot of other people his age.

CONSTRUCTION

The wing is standard spar and ribs, and should present no problem for the average or beginner builder. The prototype was assembled on an A-Justo-Jig, which is really a handy tool for the guys who build a lot. Most





other builders can work right over the plans by using shims under the trailing edge of the wings. The ribs are semi-symmetrical, and so will need a jig shim. Other than that, both wing panels can be finished over the plans without reading any instructions. Join the two halves so as to have 1-1/2 inch dihedral under each tip, then glass the center section.

The fuselage is basically planks and tri-angle stock. Cut the sides from 3/16 medium firm (close grain) balsa. No need to use 1/4... the extra weight is not needed. Use three-inch wide planks. Make a tracing of the wing saddle with thin paper or plastic, then lay this on the side planks and carefully cut both together. Also cut both of the stabilizer slots at the same time.

Cut the formers from the ply sizes shown on the plans. Carefully align the sides, and glue the formers into place. The landing gear block and it's ply diagonal brace can be glued now. Add the vertical grain doubler sheeting to the insides of the tank compartment, and install the wing saddle doubler before you put in the 1/2-inch tri-stock corner stringers. While you're working with the tri-stock, go ahead and add the reinforcement pieces to the firewall and LG block. Glue in the vertical grain doublers just forward of the horizontal stab. Make up the tail cone piece to approximate size.

The critical part comes now. Pull the fuselage sides together at the tail, and assure that you have them on the same center line as the firewall and other formers. Bevel and sand the inside of both sides for maximum mating of surfaces. An easy way to accomplish this is to glue some sandpaper to both sides of a piece of flat sheet stock (or use a double-sided sanding stick), then run this up and down between the fuselage planks until you have the taper needed. Glue the tail together.

Add the tail wheel ply mount, and some of the top and bottom fuselage planking. Keep in mind that until you have the control

nyrods (or push rods, if you prefer) installed you'll want access to the internal area of the aft fuselage. I used a forked arrow shaft push rod for the elevator, and a nyrod for the rudder. The shaft has a support about 12 inches ahead of the hinge, and the nyrod is anchored in three places.

The horizontal stabilizer can be installed now. Measure carefully to assure yourself that it is square to the fuselage. Glue it.

One worthy note on the vertical stabilizer is that part of it is extended down into the fuselage to be attached to the horizontal stab. This gives two-point attachment that is much stronger than just scabbing it to the top skin with a couple of gussets.

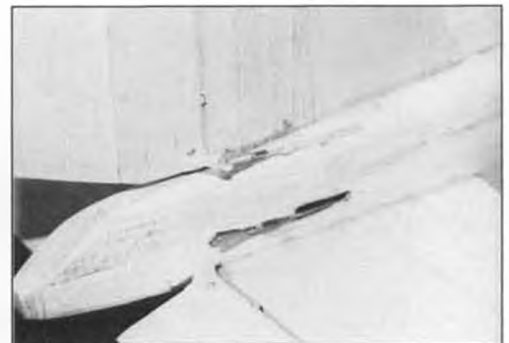
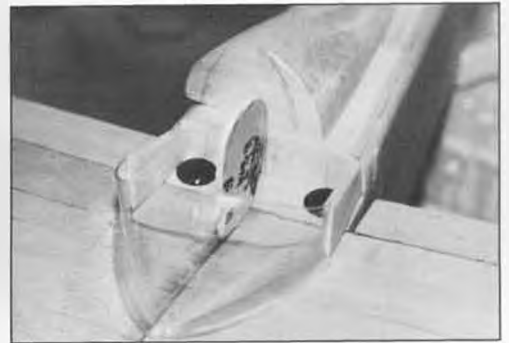
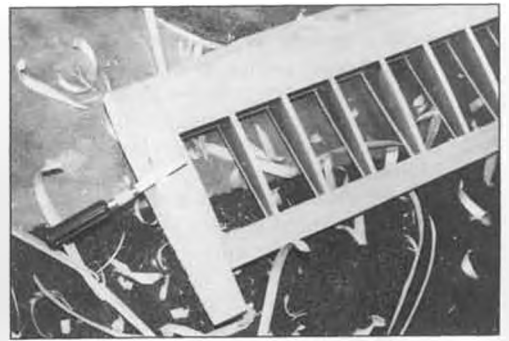
The tailwheel bracket and wire can be attached now. Just punch right up through the horizontal stab. The main gear and wheel pants don't need explanation.

Attaching the wing comes now. I usually check it two or three times with an incidence meter to assure that the saddle is a good fit, then I'll measure from the tips back to the tail a couple of times. I drill, tap, and install one bolt completely before doing the other one.

The tank and its shelf can be installed now. In this sequence you'll be able to fit formers F-1A and F-2A. After positioning the motor mount, drill bolt holes and install the blind mounting nuts; a little thick CA will hold them in place. Drill the holes through F-1A for the fuel, vent, and drain lines. Install the tank and lines, and plank over the fuel compartment.

Hang the engine (read the segment on Flying before choosing your engine.) Then add the engine cowl sheeting. Carve and sand all the bumps and lumps down to a pleasing shape to match the spinner, then remove the engine to fuel-proof the area.

Originally, the design called for a bubble canopy that would be detached when the wing came off, but after much head scratching and recalling the opening statement, the open cockpit was adopted... and it looks



good... as long as you don't seat Barney Google or an unzipped female in there.

With the servos in the location shown, the receiver and battery pack need to be as far forward as possible to meet balance limits.

FINISHING

Look in your library of aircraft photos, and pick a theme that appeals. The Special should be flashy, but not wild.

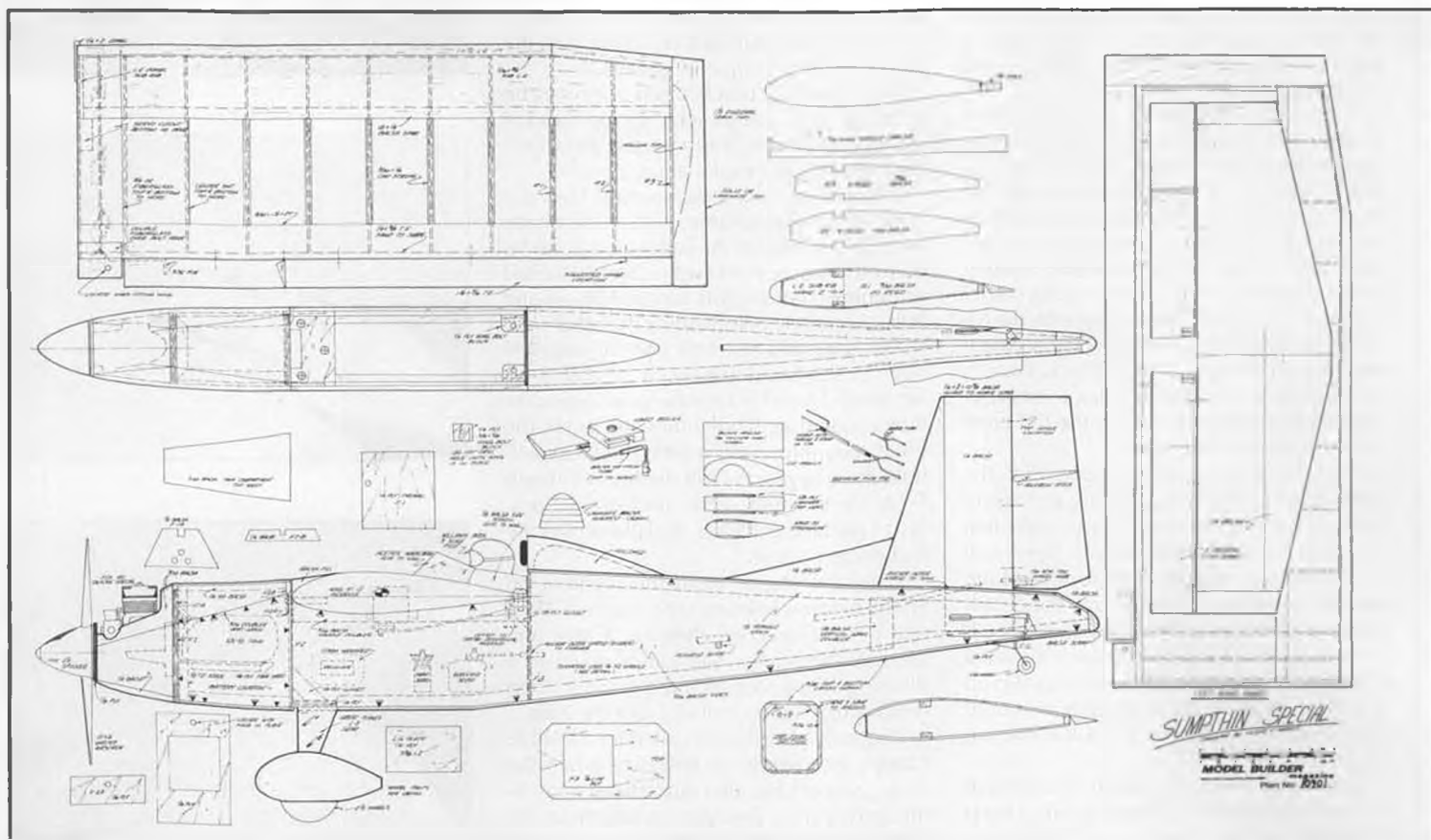
FLYING

I wish I could say that the Special flew hands-off on its test hop. It almost did. As soon as the throttle was advanced for some high speed taxi test runs, the Special jumped into the air. We climbed it out to about a hundred feet and the trims seemed to be pretty good, so we ran through the proce-

dures of pitch and roll checks, when we noticed that it had a tendency of a slight yaw. This was about two minutes into the flight. We headed it right into the wind and were steering with rudder to see what it needed, when at about 300 yards out it just quit listening to the transmitter and went into a slow, rolling dive into the wet bean field. The radio was dead when we got there, and wouldn't work on the bench afterward, either. Then it was remembered that that receiver had been in another aircraft that had crashed a couple weeks prior. It had checked out on the ground, but evidently it had something loose that didn't show up until we used it again. *There's a lesson here.*

A careful salvage job saved the wing,

vertical fin, elevators, landing gear, engine, and not much else. We managed to recover one former and the fire-wall, but the rest of the fuselage was totalled. The Special flew so beautifully for its short life that we had to build another. That's why you may see some differences in the photos. A mistake in the building of the Special was the selection of the FOX Sports Quickie. With its oversized carb, a .50 size muffler, and radical internal porting, it is just too much engine for this type of aircraft. I was told that it was a detuned Quickie 500 engine, but I thought it would work. It did... like a Porsche engine in a VW Bug! Unlimited vertical performance was not what we had in mind when the Special was designed. **MB**



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OLD TIME EAGLES

We are indebted for a report by Morton Ross, who described the action at the Old Time Eagles Contest in New Jersey on May 6. This contest featured 1/2A Texaco and 1/2A Texaco Scale, the latter being of especially great interest to this writer.

The 1/2A Texaco Scale event is a real winner inasmuch as the models fly realistically and well, something that cannot be said of some other Flying Scale events. Probably the most outstanding model entered was the Waco SRE by Walt Geary as seen in Photo No. 1. The model was built from Giant Scale rubber free flight plans and required only minor beefing up.

Ross reports the model flew excellently and was also capable of loops, rolls, etc. Needless to say, the Waco won by a wide margin. Other models of interest were the second place Taylorcraft of Elliot Berelson and Bill Fox's good flying Curtiss Robin, which placed third.

Also seen at this meet was Bob Peru's Allen A-4 scale model as seen in Photo No. 2. Examination of this pic will reveal that these scale models can be made to look good even with simple lines.

The rules for the 1/2A Texaco Scale event, as devised by Joe Beshar, contest director, are worth noting. All flights are scored like regular 1/2A Texaco; i.e., an official flight of 15 minutes (900 seconds) maximum. A score is also given based on fidelity to scale and craftsmanship. Two judges independently assign a percentage score varying from 10% to 100%. The two scores are then averaged



1. The East Coast boys are really having a ball with their 1/2A Texaco Scale R/C event. The Old Time Eagles club (New Jersey) ran it at their meet in May, and the winner was this gorgeous Waco SRE biplane as built and flown by Walt Geary. Provisional rules for the event are outlined in text. Photo by Martin Taft.

and multiplied by 900. This then counts as the second flight and is added to the first flight score.

Joe Beshar has pointed out that scale judging should not be that exact. Most percentage scores are based on offhand impressions. Beshar gives the following rules for judging:

- 1) Keep judging simple.
 - 2) Allow slight deviations from true scale in the interest of good flying characteristics.
- Worked out just great!

The 1/2A Texaco event was quite heavily contested with Larry Davidson emerging as the winner with his Anderson Pylon. One



2. Another of the 1/2A scale ships flown at the O.T. Eagles contest, Bob Peru's Allen A-4. This event looks like a lot of fun! M. Taft photo.



3. Who are all these people with the tiny gliders, and where are they flying them? Answer in text.

idea making the rounds among the modelers is to reduce the size of the allowable fuel tank from 8cc to 4cc. The complaint is that engine runs are too long, causing many fly-offs, long waiting lines, etc. With these small models, out-of-sight flights are quite common.

The argument here is that Cox does make a 4cc tank, so why not use it to reduce long motor runs? Worth thinking about, men.

ENGINE OF THE MONTH

This month's subject is as much a surprise to me as it will be to you. Imagine my surprise when my good friend, Vic Cunnyngham, Jr. called me to inquire about an engine he had acquired. Upon learning he had a Scrapper in his possession, attempts were made to borrow it but to no avail. However, Vic, being the good guy he is, made up a set of drawings and these are what we are presenting this month.

The Scrapper is one of those little-known, fairly rare engines that did not last on the



4. Photographer Mik Mikkelson attended a SCAMPS get-together at Taft and came away with this shot of Vic Westcar, of SAM 35 (England), with a very rare Push-Pull rubber job designed by Maurice Schoenbrun.



5. It doesn't float like a Lanzo Bomber, yet Steve Roselle's electric powered Berkeley Brigadier almost always places at or near the top. Took first place at the recent SCCMAS Annual in Central California. Fellow SAM 21 member George Jokimans the stopwatch.



6. Close-up of the Anderson Spitfire installation in Dennis King's Powerhouse, which won Texaco at the Australian SAM Champs. Dennis flies a 747 for Federal Express, but chose to ship his model to Australia via UPS (just kidding!). Photo by John Quigley.

market too long. First introduced in an advertisement appearing in the October 1944 *Air Trails* this engine sold in small lots as advertising ceased after two issues.

The Scrapper was advertised for \$18.50 ready to run with Aero Spark coil, condenser, and spark plug. All engines were guaranteed as they were claimed to have been bench tested. Produced by the Woodridge Mfg. Co. of Manchester, Connecticut, this Class B engine displaced .290 cu. in. No horsepower rating was given—as a matter of fact, additional technical data on the Scrapper is sadly lacking.

BAGGAGE CAR GLIDER CONTEST

Quite some time ago, this columnist was the recipient of numerous photos from Myrtle B. Coad, known affectionately by most of us old timers as "Mom" Robbers. Mom is one of those remarkable persons fully dedicated to model aviation. She has singlehandedly spearheaded and nurtured W.A.M. (Western Associated Modelers) from a starting membership of 200 to a peak of 2,000. She has performed some amazing tasks on behalf of the association.

In trying to identify the modelers in the various photos she sent, this columnist was lucky in sending Photo No. 3 to Gene Wallock (who appears in the photo). Imagine my surprise—as well as Wallock's—when he, in collaboration with Hal Cover, was able to identify all of the modelers. This writer was rather surprised at Gene's identification of Tom Davey, as this is either wrong or he is a half-twin to Bob Moncrief, one of my longtime friends.

The idea of having a model contest inside a railroad baggage car was the brainchild of John Brodbeck, of K&B Torpedo engine fame. In 1950, as in previous years, all the western contestants were gathered into one train leaving L.A. Grand Central. To relieve boredom and keep the modelers active, Brodbeck proposed this one-day competition for all members of the California Plymouth Dealers Model Plane Champions enroute to the Plymouth Motor Corporation

Fourth International Model Plane Meet at Detroit. (I know, I was dere Charlie, with my Freshman winner, Courtney "Al" Pond. Had a good time playing stud poker with Brodbeck, Englemen, and others.)

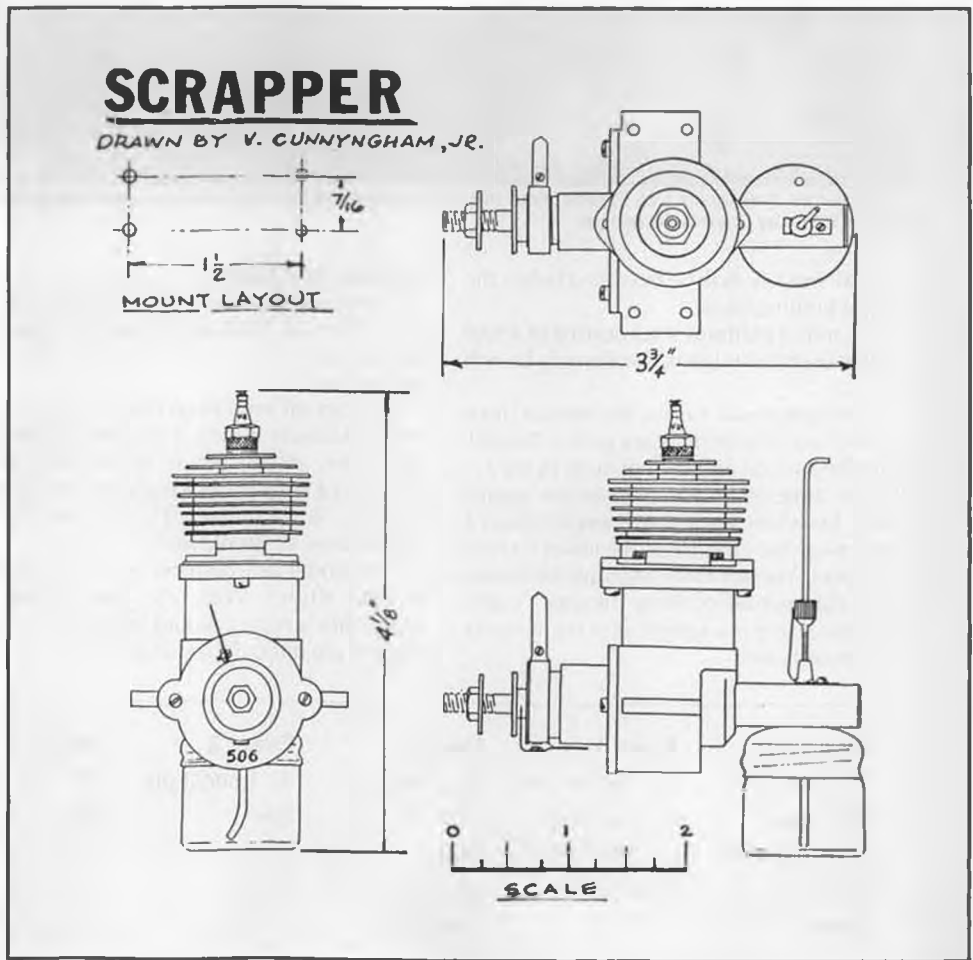
As Wallock points out, the idea was carried over by Mom and Pop Robbers in the 1951 trip. Jack Ritner, of San Francisco, was the big winner this time with a flight of 6.4 seconds and a total of 18.1 seconds.

We identify the following participants in

the photo taken by "Pop" Robbers: Front row: Sheldon Grenhut, Doug Spreng, Clint Merrill, Gene Wallock, and Gene Huston. Standing: Frank Gross, John Sawyer, Hal Cover, Janice Woods, Dennis Alford, Dick Peterson, "Mom" Robbers, Ron Barentson, Tom Davey (?) and Frank Townsend.

Rules were quite simple:

- 1) Standard tractor layout (no canards) with 4-inch wingspan and 1-inch chord. Stabilizer is limited to 2x3/4-inch chord.





7. Chris Pettigrew built and flies—and won the Aussie SAM Champs with—this "Bambino" O.T. C/L ship, powered by a 30-year-old Enya .09. Quigley photo.



8. "Fletcher's Surprise," a Warren Fletcher Wakefield design as replicated by Ken Cooper of Birmingham, England.



9. Joe Beshar fires up his 1/2A Texaco "Fox" (his own design from the early '40s) at a JAM meet in New Jersey. Photo by Charles Cortwright.

2) All models shall be launched below the height limiting lines.

3) Launch platform shall consist of a tool locker, or chair designated as the only launch site.

This contest was run on the basis of three ways of accumulating place points. Event 1 is the best single flight out of nine; Event 2 is the best three-flight total. Now for the laughs! Event 3 is where the top winners of Events 1 and 2 swap their models to the lower scoring members. You get three attempts here after a suitable period of three minutes "warm up" time. Here is a sampling of the winners (14 contestants):

ACTION—CAMERA!

It's about time in this column to get down to the pictures on hand. Everyone likes to see himself in a publication so we like to oblige them.

We start off with Photo No. 4, taken by Mik Mikkelson during a SCAMPS meet at Taft. Seen in the pic is British flier Vic Westcar of SAM 35, holding a very unusual design, a "Push-Pull" by Maurice Schoenbrun of Brooklyn.

The model did perform well... a three-minute flight! Was Vic ever elated! (Columnist's note: I would be too, as these designs are difficult to win with.)

SCCMAS "TOMCAT" ELECTRIC ANNUAL

This is the first annual electric contest put on by the Santa Clara County Model Airplane Society. The reason for running a report of this meet is because it did attract many Old Timer models. This was due to the "Last Down" event held at 1 p.m. Rules were extremely loose; as it turned out, you could use batteries of any size and capacity. Many contestants took advantage of this.

Steve Roselle, seen in Photo No. 5, used his Berkeley Brigadier to good advantage. Actually, in good weather the small model does not glide quite as well as the larger models. However, with the height gained at this meet, Steve was able to skate around on the heat inversion for 24 minutes!

TEXACO WINNER

The boys in SAM 21 are real proud of their member Dennis King, a 747 pilot employed by Federal Express. Being a pilot, Dennis did rate some special attention with his superiors and was able to transport his Anderson Spitfire powered Taibi Powerhouse to Australia. Seen in Photo No. 6 is his ship, winner of the Australian SAM Champs' Texaco event held at Canowindra over the Easter holidays. Weather was not the greatest as the rain finally made its appearance after quite a few years of dry weather.

John Quigley, a perennial winner at the SAM 1788 Australian National Champs, took the pictures and had Basil Healey relay them together with a full set of results. Truly a shame that space does not permit listing the winners.

However, we cannot close this piece on the Australian SAM Champs without noting the tremendous surge of interest in Old Time Control Line Stunt. This keeps attracting more contestants every year after an excellent initial start of 11 contestants first time out!

This year saw the younger set winning some places. Photo No. 7 shows SAM 1788 President Mike Pettigrew's son Chris's model, known as the "Bambino." To show that things haven't changed that greatly in control line, the model was powered by a 30-

Contestant	Event 1	Event 2	Event 3	Total
Tom Davey	8.5 sec/14 pts.	24.6/14 pts.	12.1 sec/3 pts.	31
Hal Cover	8.1 sec/12.5	23.9/13	5.9/1	26.5
John Sawyer	6.8/10	19.3/9	13.8/7	26
Doug Spreng	8.1/12.5	22.1/11	10.2/2	25.5
Gene Wallock	6.5/9	19.4/10	12.2/4	23



10. Bill Burt looks quite pleased with his Earl Stahl "Weight Rule Contest Model," which originally appeared in the June '38 *M.A.N.* It's becoming a popular choice for both Cabin Rubber and Commercial Rubber events. Photo taken by Mik Mikkelsen at the SCAMPS Annual at Taft.



11. The Spearhead, in both Jr. and Sr. sizes, has received SAM's blessing as an authentic Old Timer. Shown here is the original designer, Jerry Stoloff, holding his R/C copy of the Spearhead Jr. Model was kitted by Eagle Products back in the 1940s.



12. Pretty So-Long is the restoration work of Art Grosheider, SAM 1 newsletter editor. Alas, it exists no more—story in text.

year-old Enya .09.

WARREN FLETCHER O.M.T.

When this columnist called Warren Fletcher's Wakefield entry "ugly," he opened himself to a lot of flak from those who knew Warren and his designs.

Recently a picture came to this writer's attention showing the planform of the "Fletcher's Surprise." Photo No. 8 tells it all with Ken Cooper of Birmingham, England posing proudly with the American design at Old Warden Aerodrome. No reports on how the model flies but, of course, the Old Warden O.T. get-together is slanted strictly on fun with scant attention paid to competitive events. This is what has made the charm of Old Warden and its attraction to overseas modelers and visitors. We can take a few pointers!

WHICH FOX IS THE "OLD FOX"?

Every so often we find a slot for a photo we have been holding for the right time. Inasmuch as Joe Beshar has been actively promoting 1/2A Texaco Scale, we feel that Photo No. 9 is overdue.

Seen in the picture is the "Old Fox" with

his "Fox" design now converted to 1/2A Texaco. This photo was taken at the July 29 JAM contest by Charles Cortwright. Maybe we should call Beshar the "Silver Fox" after some white-haired sports coaches and managers. In any respect, Joe is one of a kind and has been nominated for an AMA Hall of Fame Award.

EARL STAHL

A very popular model that we have only run once is the Earl Stahl Weight Rule Cabin Rubber design. This Class C model as seen in Photo No. 10 was built and flown by Bill Burt of the San Diego (California) Chapter, SAM 41.

The model is just perfect for the 36-inch Commercial Rubber event. With a 17-inch propeller, this model is a real performer. Earl Stahl designs always flew well. Not many know it, but the best flying model on the field when Korda won the Wakefield Cup was Stahl's design. Ended up third or fourth, we're not sure, but like all Stahl models, it looked good and flew well!

SPEARHEAD DESIGN

For the benefit of those SAM members

who are unaware of the status of the Spearhead (both Senior and Junior), these have been approved as Old Timers.

Photo No. 11 shows the original designer, Jerry Stoloff, with a brand new R/C replica. Jerry reports the design flies as well as it ever did. He lost the model on September 2 but it was luckily found and returned on September 10 in good shape.

Jerry now resides in Florida, where most of the New York and New Jersey modelers have immigrated.

FREE PLUG DEPT.

Just received an interesting letter from Bob Peck (of Peck-Polymers) who announces the acquisition of a number of accessories for rubber and small 1/2A gas models. One example of the interesting items is the wheels, which range from 3/4 inch to 1-1/2 inch diameter. The wheels come in Vintage and Golden Age styles and have white or clear hubs and black rubber tires. Just the thing for small Old Timer gassies. Contact Bob Peck at P.O. Box 710399, Santee, CA 92072-0399.

AEROMODELLING DIGEST

Those who love those Zaic books, *Aeromodeller* Annuals, SAM 35 books, etc., will be pleased with the latest publication as so ably edited by Merv Buckmaster, Editor of Australia's *Airborne* magazine.

The *Aeromodelling Digest 1990* is a compact 5-3/4x8-1/4 inch softbound booklet. The publication features plans and articles on all phases of modeling; glider, rubber, gas power, electric, and quite a bit on unusual type models.

This excellent slick paper edition can be obtained from Merv Buckmaster, Barinor Productions, R.M.B. 1798, Samaria Road, Benalla, Victoria 3673, Australia. Costs are \$15.00 (Aus.) plus \$5.00 (Aus.) postage, giving a total of \$20.00 (Aus.). Good buy!

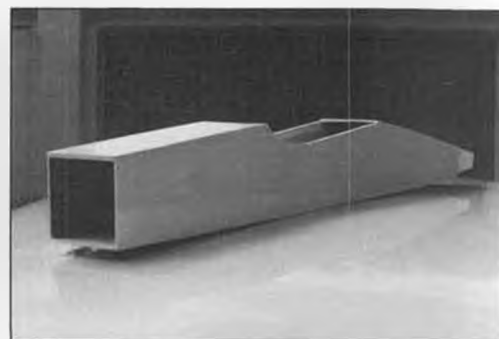
ELFIN 2.49 DIESEL ENGINES

Most of the readers are familiar with the fact that two replica Elfin 2.49cc diesel engines are in the process of being manufactured. The first one, received from Gordon.

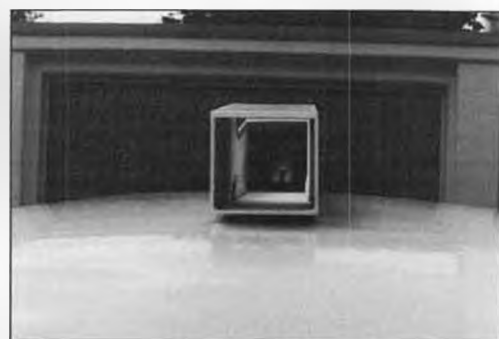
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This head-on view of one of our columnist's model shows the type of motor mount he likes best. Not the prettiest, but what it lacks in esthetics it more than makes up in simplicity, light weight, ease of thrust adjustment, ample motor cooling... you get the idea.



This month, Mitch gives the details of how he builds a rectangular sheet balsa tube fuselage, an example of which is shown here inverted on the roof of his car.



Looking down the throat of Mitch's tube fuselage. Note the complete absence of formers, and that the tail end is open for cooling air to exit.



Mitch likes to mount his landing gears externally so as to avoid taking up valuable space inside the fuselage. The fuselage bottom is Lite Ply in this area.

Two items inspired this month's column: Ken Willard and his design philosophy, and Harry Higley's new book, *Entering Electrics*. Ken Willard has always been my inspiration when I design an electric airplane. His motto, "KISS" (keep it simple, stupid) is the key to light, strong, and fast building electrics. My first successful R/C plane was a Schoolboy designed by Ken; it flew itself, which was what I needed in my beginner days. I had already crashed several planes, with great damage to my ego, and was about to give up until the Schoolboy saved me! Some of my early electrics (1974) were Willard designs; the Schoolboy (windshield washer motor), then the Schoolgirl (a biplane) and the Schoolmaster, both powered by the first Astro 05s. Again, they flew very well. I have always judged my own planes by how well they fly compared to those Willard designs. Ken set the standard for me. Last, but not least, Ken with his chief "dumdum" feature in his *RCM* column, has made it clear that no matter how much of an expert you are, you can and will make mistakes, and you might as well admit it and laugh about it. I understand that Ken has had serious problems with his health lately, and that is why we have not been seeing his column in *RCM*. May you get to feeling better, Ken, and thanks for all that you have done for so many of us.

Harry Higley's new book, *Entering Electrics*, emphasizes construction techniques, and contains a very up-to-date survey of what is available in electric kits and ready-to-fly planes. There are over 800 black-and-white photos! There are 32 color pho-

tos of planes in a center section, plus more in other parts of the book! There are 94 pages of text in the 8-1/2x11 format, which makes it a sizeable book. As a fellow author, I have to admit I envy the resources Harry has available to him. Any publisher I know of would faint if I suggested this much illustration, much less color! Being an independent publisher, as Harry is, means you can step beyond the limits set by most commercial publishers.

Harry has done a good job on this book. He has a conversational style which is very easy to read, yet gets the point across in fewer words than you might realize. The book does not use the double column format; it is written like a letter, with sentences going across the full width of the page. Personally, I find this a bit tiring to read; I prefer the double column. There is one technical error on page 11. The procedure for finding output power is not correct, it is too optimistic. It gives % efficiency in the high 80s; most motors are in the 60 to 70% range. However, this error will have no effect on anyone's flying. Check previous columns of mine on how to calculate output power. You can calculate power output from the data you get from the testing procedure given on page 11 in Harry's book, but do it via R (internal resistance) and k (voltage constant).

The photography in this book is superb. I know what you have to go through to get photos of this quality—I do it myself, and it isn't as easy as it looks. Nice work! There are many neat hints in the book on how to do things. I like the Watt Box and the Break-In

Box, among many others. Harry recommends 25 to 30 amp fuses; I agree. Lower values cause more power loss. Harry also emphasizes using a fuse, and tells how a modeler who did not use a fuse caught his plane in a tree, the propeller fouled, and the stall current caused a fire. Only pure luck prevented a forest fire!

There is much more in this book, and some of the construction ideas therein led to the rest of this column. We will cover those as we go along. *Entering Electrics* is \$13.95 retail at most hobby stores, or from Harry Higley and Sons, P.O. Box 532, Glenwood,

IL 60425. This is one of the better books on electrics, well worth the price.

• • •

I design my own planes. I like to scratch build, and I like to design the planes to suit my flying style, or flying situation. I prefer planes that are easy to build, light, and simple. Over the years I have developed a system that does all this very well. Let's take a look at how I like to build electrics.

The fuselage is the easiest place to save weight and reduce complexity. Any fuselage should be regarded as a tube, pure and simple. Formers (bulkheads) get in the way, they force you to place the battery pack and radio equipment where you don't want them, and they add weight and complication. Bulkheads are not necessary for structure. Fiberglass fuselages and the RTF plastic fuselages, such as those on the Graupner "Chip," are good examples of strong fuselages with no bulkheads. In fact, bulkheads (formers) are usually where the fuselage cracks in a hard landing because they concentrate stress along their edges. So, away with bulkheads! *Entering Electrics* also has a section on eliminating bulkheads.

The following is a step-by-step description of how I design and build a tube fuselage for electrics. If you want to try it, follow the steps in the same order as described here.

I usually build sheet balsa fuselages. I am not fond of lots of extra pieces, so I do not use stringers along the edges, or balsa doublers. I do use cloth doublers—Bob Kopski's method. He uses iron-on cloth used for patching clothes, available in fabric stores. I use Coverite or similar fabric type iron-on covering. I iron the cloth to the entire side of the fuselage piece, nose to tail. The cloth will be *inside* the fuselage. This makes a very tough fuselage. I do add some vertical stiffeners, usually 1/4x3/32-inch balsa, at the back of the cabin and at a point halfway back to the tail. These stiffeners prevent the sides from bowing in when the outside of the fuselage is covered with MonoKote, Solarfilm, or whatever.

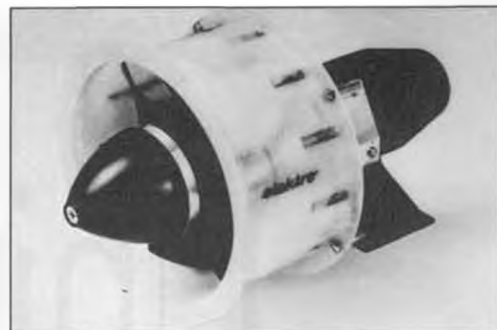
The fuselage is assembled with three

temporary formers, one at the front of the cabin, one at the back of the cabin, and one in the nose. They are made of 3/32 balsa and are spot glued in place. I check alignment of the tail in either of two ways. One way is to draw an outline of the fuselage taper on paper, then set the fuselage down on the paper so it matches. The other way is to sheet the bottom of the cabin area first—I use 1/8-inch Lite Ply, available from Sig or hobby shops. Now measure and draw a center line on the cabin bottom. Lay a yardstick down the center line, and check the tail to see that it lines up with the yardstick. Glue the tail together and plank the top and bottom crosswise. I usually use one size down on the top and bottom planking, i.e., if the sides are 3/32-inch, the top and bottom are 1/16-inch. Once the fuselage is planked, I cover it with MonoKote or Solarfilm. Note that the landing gear and tail assembly are not installed yet; that will come later. Now knock out the temporary balsa bulkheads at the nose and in the cabin.

The motor mount is very simple. Install 1/6x3/8-inch spruce or pine blocks in the nose as shown in the drawing. Make cross pieces for the motor from 1/8-inch ply or from plastic or metal. Note all the advantages of this system! Down and side thrust are easy to adjust with shims, there is lots of space for cooling air to flow past the motor, the motor can shift backwards in case of a crash, building time is almost zero, you can mount the motor higher or lower to adjust the thrust line, it easily accommodates all styles of motors, and it is easily repaired.

I prefer to mount all equipment in a tube fuselage on the bottom or sides of the fuselage. Velcro is an essential tool for this. Lay one or two strips of Velcro on the cabin floor, from the nose to the back of the cabin. I use self-adhesive backed Velcro available from clothing stores. The adhesive does not hold well to bare balsa, so use some medium viscosity CA glue to hold down the strips. Install the servos at the back of the cabin. Fasten them to the cabin sides with double-sided hard foam tape. I like the foam tape

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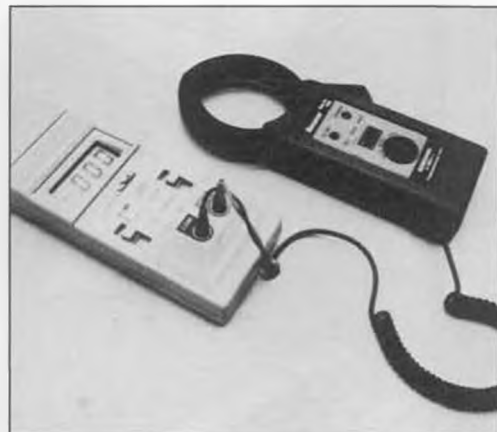
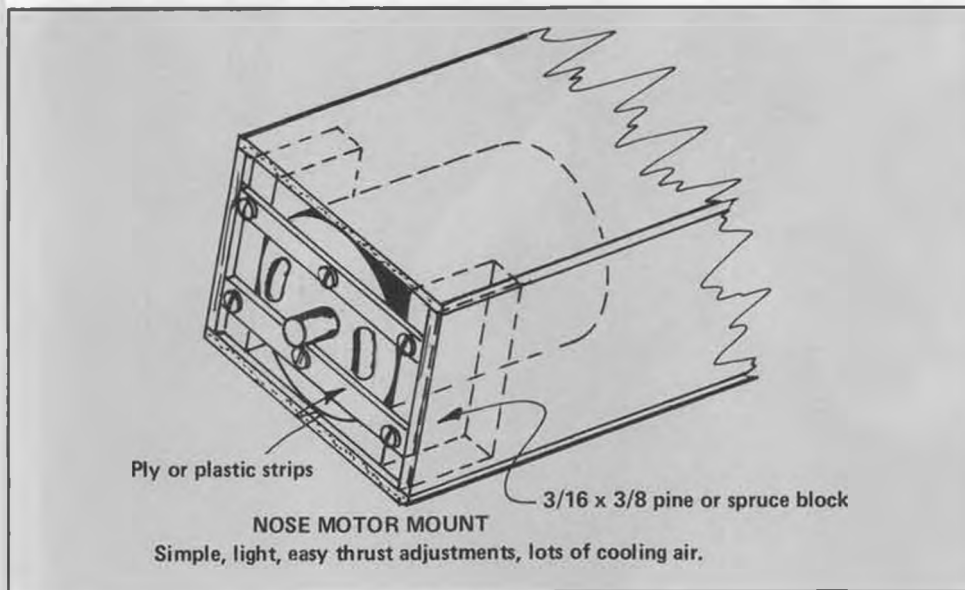
Anyone for electric ducted fans? The "Elektro-Impeller," made in Germany by Bauer and imported into the U.S. by Hobby Lobby, will go a long way toward getting you started. For 1000 watt motors and flying weights of around nine pounds.



Bauer's lightweight MIG-15 kit, also a Hobby Lobby import, was designed especially for the Elektro-Impeller unit.



Hobby Lobby offers the Simprop Power-Speed 2000-7 motor, an 05-size hummer said to be capable of 260 watts output. Mitch suspects it uses boron-neodymium-ferrite magnets.



Graupner's clever amp measuring device indicates current flow simply by clamping the jaws onto one of your power system's wires and reading the result on a digital voltmeter (not included). From Hobby Lobby.

BY ELOY MAREZ

United States F3E Team Selection

Virtually in *Model Builder* magazine's backyard, California's Harbor Slope Society, Club #128, hosted the F.A.I. F3E R/C Electric Powered Model team trials, to select the United States Team which will represent our country in the World Championships to take place in Austria later in the year. The F3E category is a highly specialized class of model requiring knowledge and application of a number of disciplines; heavily loaded high speed gliders, light strong structures, high power electric motors, propellers, high voltage batteries, and high voltage charging techniques. And oh yes, it also helps if you are a good R/C pilot! The cream of this particular crop met to pit their individual skills against each other, and the elements, which play a major part in glider performance. The fly-off took place the first weekend in June, in Costa Mesa, California, and brought together the following winners of regional competitions:

Jerry Bridgeman - Huntington Beach, California

Brian Chan - Hillsboro, California

Keith Finkenbiner - Carlsbad, California

Grant Messinger - Clearwater, Florida

Steve Neu - San Diego, California

Jason Perrin - Newport Beach, California

Bob Sliff - Midway City, California

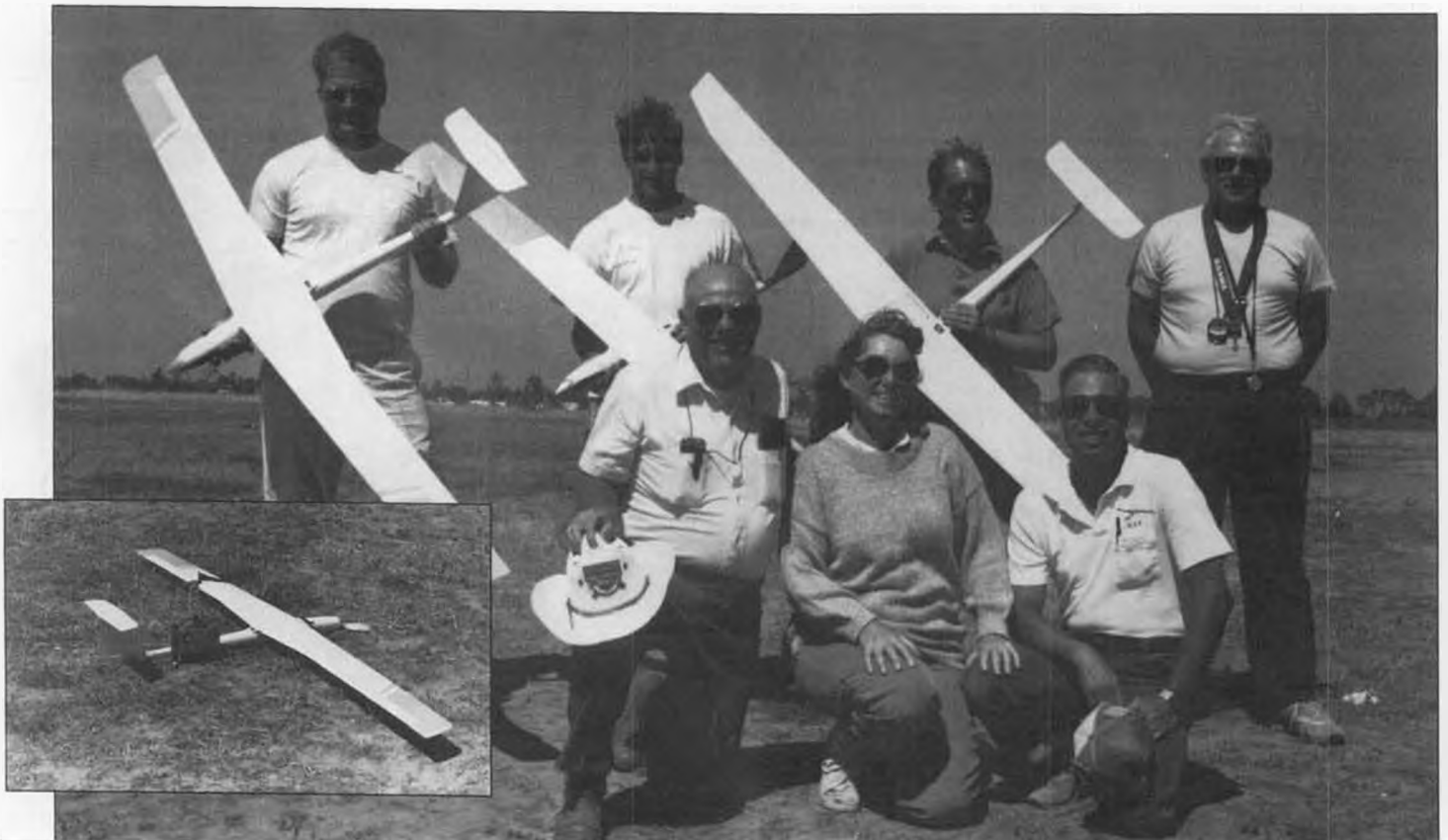
Felix Vivas - Newport Beach, California

This writer was not able to ferret out a clear reason why this is definitely a southern U.S. and mostly a Southern California domi-

The freshly crowned United States F3E team (l to r); Jerry Bridgeman, Jason Perrin, Steve Neu, and Team Manager Robert Sliff. In front (l to r); CD George Joy, desk lady Jo Joy, and assistant CD Frank Chasteler. (Insert) Jerry Bridgeman's SE-V is typical of the models built for and flown in this event. Construction is all from modern high-tech materials.



To the victors...AMA Executive VP Dave Brown aims the cork from a bottle of bubbly to toast the new U.S. team. Go for it, gang!





Perfect launch gets model on the way for the Distance Task. Square frame at left is for sighting turns; one at each end of course.

nated event, but I did get comments like "not smart enough" and "not good enough," which clearly sound to me like challenges to the rest of the country, especially to those individuals who are always saying "wait till next time"!

In truth, the F3E event would not be an easy one to compete in, contrary to some of the thinking that exists about both gliders and electrics. These airplanes can accurately be described as flying batteries. And we all know how heavy high capacity NiCd batteries can be. But first, let's take a look at the objectives, and then the airplanes themselves. Refer now to the F3E CONTEST SITE LAYOUT sketch.

The flying is clearly divided into two parts, first being the Distance Task. Notice that the field is laid out with two course lines 150 meters (164 yards) apart, not unlike a football field. The object for the flyer is to make as many laps as possible, in gliding flight, within 180 seconds after launch. The motor can only be used to climb, which must be done outside the course.

The requirements for a competitive airplane are thus a fast climb, high speed, and minimum altitude loss during each pass, as time spent with the motor running climbing back to altitude is time lost for flying the course.

After the 180 seconds allotted for the Distance Task have expired, the pilot has one minute to pass through the gate, located

(Below) It takes a bunch of concentrated manpower to monitor each flight; timers, turn sighting, lap counting, and judging. Steve Neu, with transmitter, is on the course. (Right) F3E Contest layout.



NAME	MODEL WEIGHT	SURFACE LOADING	AVERAGE MOTOR RUN	AVERAGE LAPS	SCORE
1. Bndgeman	2.5917kG 5.71 lb	74.01G/dM ² 24.270z/Sq.In.	6.25 sec	23.88	4756
2. Perrin	2.6668kG 5.88 lb	74.38G/dM ² 24.390z/Sq.In.	10.12 sec	23.13	4654
3. Neu	2.6412kG 5.82 lb	72.32G/dM ² 23.710z/Sq.In.	11.87 sec	21.38	4520
4. Sliff	2.8668kG 6.32 lb	68.56G/dM ² 22.480z/Sq.In.	10.50 sec	20.75	4372
5. Messinger	2.7718kG 6.11 lb	68.39G/dM ² 22.420z/Sq.In.	9.87 sec	20.50	4310
6. Finkenbner	2.711kG 5.98 lb	—	9.62 sec	20.38	4246
7. Chan	2.908kG 6.57 lb	—	12.83 sec	19.17	3459
8. Vivas	3.328kG 7.34 lb	—	15.5 sec	17.50	2131

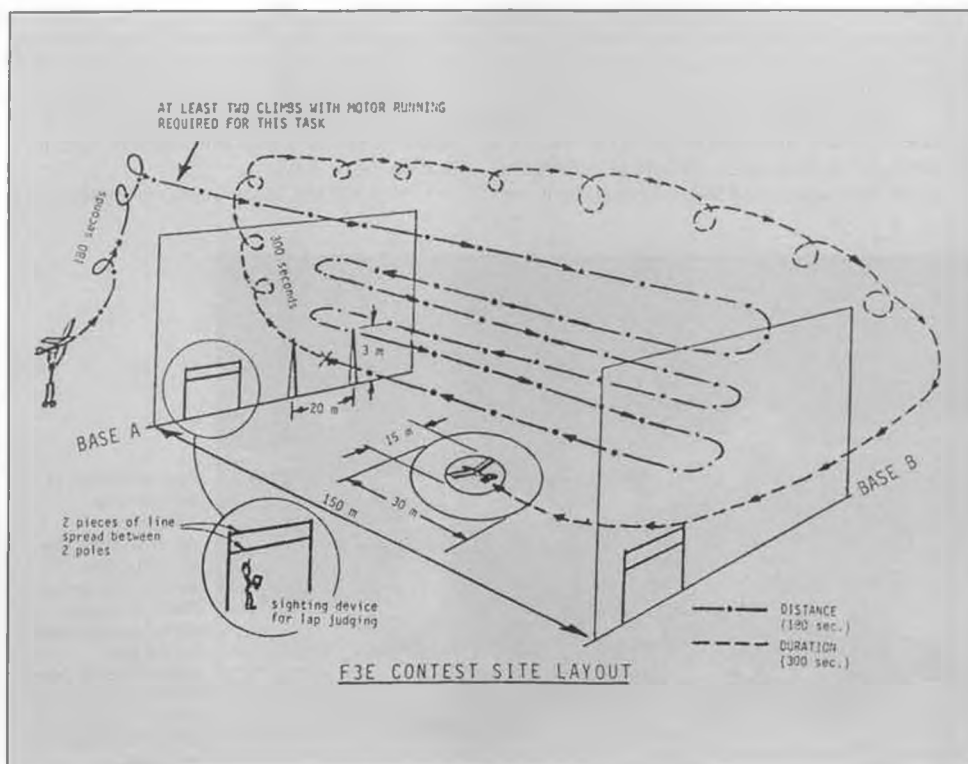
adjacent to Baseline A in our diagram. This signals the start of the second phase, the Duration and Landing Tasks. This part lasts 300 seconds, the object being to maintain soaring flight, without the motor running, for as much of that time as possible. The time the motor does run is deducted from the accumulated soaring time. Further points are earned or lost based on the actual time of landing, more or less than the 300 second allotment, and the actual point at which the model comes to rest in the landing circle.

For this second phase then, the heavy high speed model must now become a light thermal sailplane... not an easy combination to design, build, and fly. Let's review the F.A.I. rules for this type of airplane.

The maximum allowable surface area is 150 dM² (decimeters squared); 2335 sq. in. Maximum weight cannot exceed 5 kg (kilograms); 11 pounds. Surface loading must be between 12 g/dM² (grams per square

decimeter); 3.93 oz. per sq. ft., and 75 g/dM²; 24.59 oz. per sq. ft. The motor battery voltage cannot exceed 42 volts, or 30 cells. There are some other general rules, such as the prohibiting of ARFs, and a Builder of the Model rule. Included also, are rigid specifications for the courses, timers, and judges, and at events of this level, even an F.A.I. jury is required, which in this case was composed of AMA Executive VP Dave Brown, Cal Little, and Don Edberg.

As might be expected, because of the stringent rules and requirements, there was a certain look-alike pattern to all of the airplanes being flown. Well, when you are going to carry 2-1/2 pounds of batteries, you can expect them to have a great effect on how the airplane will look. We have some information on the winning airplanes, but first, take a look at the table, showing the final results, consisting of the best seven out
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BY ART STEINBERG

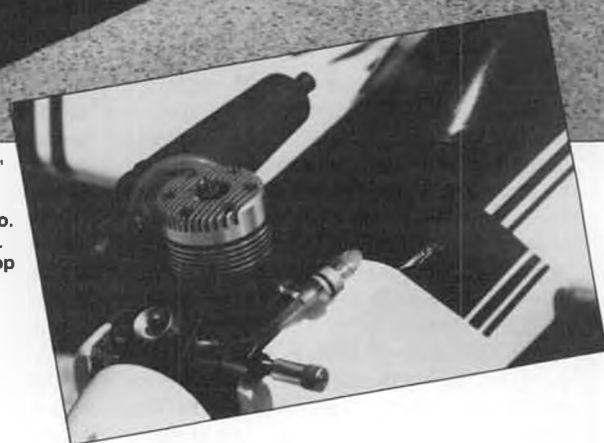
Sometimes just the name of an airplane conjures up visions of daring airmen in their flying machines, and the airplane we evaluate this month does exactly that. I am referring to the "Red Arrow" distributed by the Cermark Electronic & Model Supply Company. Actually, the full name of this model is the "ARF Red Arrow Low Wing 45." The manufacturer apparently decided it was necessary to use this name because a Hi-Wing Red Arrow 45 is also available. Personally, I would have chosen different names for the two models and by doing that, perhaps some potential confusion could be avoided. However, I like the name "Red Arrow," and that is what I decided to call it.

In describing this airplane, I would call it a conventional low wing intermediate sport plane with tricycle landing gear arrangement. But that description falls far short of completeness, as it doesn't tell you that the Red Arrow is really sleek-looking because of its rakish turtledeck and eye-catching color scheme. Normally, I describe the covering material on an ARF as consisting of some kind of vinyl shrink-type material. Regular readers of this column know that I often caution against the application of excessive heat to this material, as the results can be quite disastrous. As a matter of fact, you are sticking your neck out with the use of *any* amount of heat at all on a vinyl covering! The Red Arrow is the very first ARF to pass through my hands with, believe it or not, all surfaces covered with genuine Top-Flite Super MonoKote! Just this feature alone places this model way above the rest of the crowd, quality-wise. The repairability of MonoKote makes it one of the most desirable model covering materials in use today.

Without going too far overboard, I must mention that the color scheme consists of a basic white airplane with very tastefully and skilfully applied red MonoKote trim. When



(Above) Madeleine, the Wonder Whippet, likes the smooth lines of the "ARF Red Arrow Low Wing 45" distributed by Cermark Electronic and Model Supply Co. It's this month's featured review subject. The model comes covered in genuine Top Flite MonoKote, with all color trim and graphics already applied. (Right) Power for our columnist's Red Arrow comes from the new Skyward 40 ABC engine, which is distributed by the same folks who offer the Skyward line of ARF models—address in text.



I first unpacked the kit I noticed a couple of slight sags in the fuselage covering, but these were instantly remedied by a shot of hot air from my heat gun. That was about six weeks ago, and not a sag has turned up since. And then to gild the lily, the kit also has beautiful red computer graphic lettering which is applied to the wing, and believe me, this stuff is on to stay!

Checking the specifications of the Red

Arrow, I noticed that the wing section is fully symmetrical with a chord of about ten inches and a wingspan of 53 inches. Wing area is 533 sq. in. and the overall length of the fuselage is 40-3/4 inches. Predicted flying weight was indicated as 57-64 ounces, but this last figure is way off, as we shall see later.

The Red Arrow is entirely constructed of plywood and balsa, except for the wing, which is balsa-sheeted foam. Everything is straight and fits together perfectly. The quality of the hardware was such that I suspect it is of American manufacture, but I can't be positive about that. The front landing gear comes with ground flats so that the steering arm and the retaining collar are held securely in place. Another nice touch is that the nose gear is spring loaded to help soften those occasional hard landings. The wheels are not the usual foam rubber type that are supplied with so many ARFs nowadays; instead they are solid rubber, with strong hubs, deep treads, and are very light in weight. The wheels are so nicely detailed that they seem to be quite scale-like in appearance.

I especially liked the approach that was taken in designing the motor mount. A pair of breakaway motor mount plates is supplied. These are drilled to match the mounting



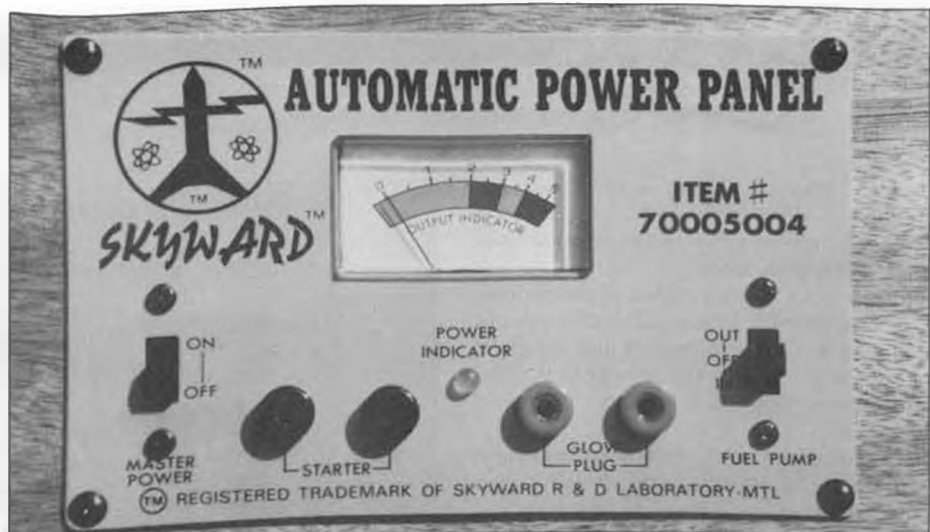
Pam Goldman, of San Marcos, California, demonstrates the new Skyward electric starter on the Red Arrow. Model is supported by the pre-assembled Skyward field box, which our columnist says is one of the best he's ever had.

holes in your engine, then the plates are bolted to the wooden beam mounts. One advantage of this system is that you can change from one engine to another very easily, as all that is required is to make another pair of motor mount plates for each engine. Another advantage is that these plates will theoretically break away from the main motor mounts in case of a nose-first crash, leaving the main mounting beams relatively unharmed. Another excellent feature is that the engine compartment is heavily fuel-proofed at the factory. Usually I add my own fuel-proofing, as I don't trust the customarily skimpy factory job, but this airplane had been fuel-proofed as well as I could do it, so that was one less job to be done in assembling the Red Arrow.

Some ARFS require a great deal less assembly than others; this model leans more toward the ready-to-fly category than the ARF classification. For instance, the control surfaces come fully hinged, and the servo mounting tray is completely installed at the factory. The biggest job is joining the two wing halves, but this follows the conventional procedure, using two strong plywood center wing joiners. The finished joint is covered with white tape to make it less visible, and a plywood aileron servo tray is glued in place. The tail feathers mount quickly, requiring only enough skill and care to make sure they are properly aligned, then the control horns are installed. Pushrods must be assembled from wood dowels and threaded rods, then secured with shrink tubing, all of which comes in the kit. I like this kind of pushrod, as I have never had one fail in dozens of installations. Besides, they are immune to expansion from the hot sun, causing changes in flying trim.

The main landing gear slips into grooved blocks on the wing undersurfaces, held firmly in place by sturdy straps and screws. As with all fuel tanks, a few minutes are required to put all the parts together, and this tank is really first rate. I even liked the quality of the silicone tubing supplied, and for once I didn't feel it had to be replaced. The spinner furnished was one of the better ones, according to my usual testing procedure. To me, a poor quality spinner becomes badly chewed up by an electric starter, but after several flights this one shows no marks or scuffs at all. I was pleasantly surprised to find that it was completely impervious to damage from the rubber starter cone, needing just a brief wipe with alcohol to return it to a brand new appearance.

The cockpit interior consists of unfinished balsa, but a black vinyl sticker is supplied which covers the entire cockpit floor. This sticker also covers the dashboard, and has a set of instruments printed on it. When completed, the cockpit looks quite authentic. The clear canopy is a perfect fit and doesn't require the customary trimming as found in most other ARF canopies. The instructions indicate that it is to be held in place with four tiny screws, but I preferred to use glue for this. When installed, the canopy blends naturally with the fuselage, avoiding



Close-up of the Skyward Automatic Power Panel on the author's field box. Panel has a master power switch and an indicator light that changes color when battery voltage gets low.



A smiling John Dekkar holds one of his ARD (Almost Ready to Display) solid models. These have excellent detail, and simply snap together. A catalog is available from Double Dekkar Enterprises, 9156 Buttercup Ave., Fountain Valley, CA 92708.

the appearance of having been stuck on as an afterthought.

For once I didn't have to decide which engine I was going to install, as a brand new .40 two-stroke engine was sitting on my workbench, waiting to be tested. This new entry in the sport engine category is an ABC ball bearing type manufactured in Italy, probably by Picco, and is called the Skyward .40 ABC. If appearances were important, this engine would place highly in any beauty contest, being mostly black with silver trim. When it was mounted in the Red Arrow it made the entire package look handsome. The engine boasts an inflight adjustable needle valve, but I chose to avoid the additional complexity and use of an extra servo, so I bypassed the system and used a conventional throttle control arrangement. One thing about this engine that I did *not* like was the muffler. It is a dead ringer for the muffler furnished by Rossi on its .40 engine, and my experience with it was all bad. First, it is terribly loud and gave my Rossi an unpleasantly harsh sound, and second, it disintegrates after only a few runs, being held together by weak rivets. Anyway, the muffler did manage to look ominously attractive, having the same dark finish as a .45 Colt automatic pistol, and probably almost

as much bark.

I mounted the engine on my test stand for a little familiarization and breaking-in, and installed a Fox R/C long shielded plug. The tank was filled with 5% nitro fuel, and the instructions were carefully consulted. Aside from some general directions, there were no specific procedures listed for adjusting the carburetor, so I just relied on my own expertise. At this point I would like to stress that for a detailed analysis of this engine, the reader will have to look elsewhere, as I do not consider myself an engine authority, and can only relate my general impressions. Accordingly, I found the engine to start very easily and run reliably. The noise, as expected, was deafening, so I will soon install a short tuned pipe, as I have done with my Rossi .40, and that should solve the problem. The specifications of the Skyward .40 ABC indicate that a pipe will increase its performance substantially.

The engine seemed to like the 5% nitro mixture, and seemed to be about as powerful as any .40 engine I have ever had. Needle valve sensitivity was low, often needing a half turn or more to richen or lean the run. Weighing in at around seventeen ounces with muffler, this engine is not a lightweight,

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Although I'm well aware of the harsh realities of life, and found out a long time ago that not everybody lives happily ever after and that life isn't always fair, I'm still a sucker when it comes to fairy stories. I like to think that nice things happen to nice people and that the good guys are gonna beat the hell out of the bad guys every day of the week and twice on Sundays.

Like everyone else, I find it hard to ignore what's on TV... the frequent attempts aimed at helping kids resist drugs. Unfortunately, it does seem that too many young people get very little parental attention or guidance and aren't encouraged to have a hobby. As a result, the combination of too much idle time and an overpowering amount of peer pressure all too often gets these youngsters into one helluva lot of trouble.

So, I feel mighty good when I hear about the fathers and sons who buddy together—particularly when it involves model aviation.

A real cockle-warmer was finding out about a guy named Zane Jones, who lives in Everett, Washington. Y'see, his whole family, wife Sue and sons Mike and Justin, are avid modelers who fly together and frequently attend fun-fly's hosted by other clubs.

And here's what got my cockles heated up even more. Zane's youngest son, Justin, is only six years old and has been flying since he was five! According to the club instructor who's been helping him, Justin's about ready to solo.

We often wonder who's gonna keep the hobby going after we've gone, who's gonna fill the void... because in many of our clubs all you can see is gray hair or bald heads. Well, the Joneses certainly have a handle on their end of it—but we just can't sit on our hands and hope that someone else is gonna pick up the slack.

After years of fun and pleasure it's time for us to give a little back to our hobby... time to pay our dues. If every older modeler would



(Above) The RC Flying Jones Family of Everett, Washington. Zane in the middle, wife Sue at his right, son Mike at his left, and son Justin in front. Read about 'em in text. (Right) Justin's hat may be a little oversize, but he can sure handle an airplane. Starting at five, he's a one-year veteran! (Opposite) Collage of photos taken at the Annual IMAA Fly-In Festival in Oshkosh, The last weekend in June, by "Crash" Evanson. No I.D.'s supplied. If you and your plane are here, let Al know and he'll acknowledge in this column.



encourage and "big brother" just one kid, we wouldn't ever have to worry about who's gonna take our place. The future of model aviation would be assured.

HANDY SANDERS

I don't know where this idea for making different sized round sanders came from, but it works great. As you can see from the drawings, it's self-explanatory and simple.

Use pieces of PVC plastic pipe and do your cutting with a large-toothed saw lubricated with candle wax. Since PVC pipe comes in various diameters, just choose the size(s) you need most often.

CHURCH KEY

I never seem to have the right tool handy when I want to remove a clevis or pop a ball joint... so what usually happens is that I end up fumbling for the nearest screwdriver.

And that's what I did yesterday. But this time, instead of a screwdriver, my fingers somehow found a "church key" (otherwise known as a can opener) that had been laying in my toolbox for years.

My first impulse was to throw the somewhat rusty opener into the trash. But I'm glad I didn't because it worked so well as a clevis remover that I also tried it on a ball joint, with equal success.

There may very well be tools better suited for separating clevises and ball joints, but don't discount the ancient church key. You'll want one in your toolbox.

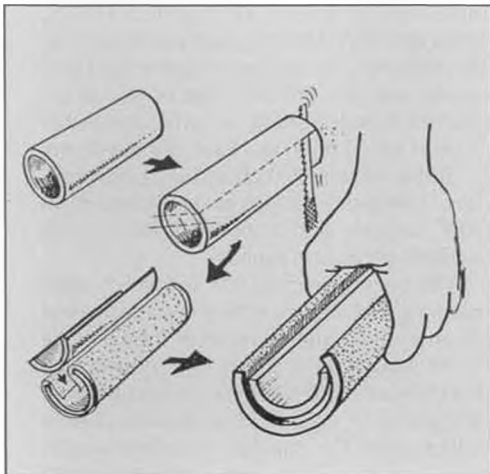
MALONEY 125

In case you're not familiar with the Maloney 125, it's a small (1.25 cu. in.) gas engine imported by World Engines. It's much improved over the original Maloney 100 and runs okay, but its power-to-weight ratio is on the low side. For its size, the 125 is pretty heavy.

So, how do you make a silk purse out of a sow's ear? Simply by converting the Maloney to a diesel with one of Bob Davis' new diesel heads, available from Davis Diesel Development, P.O. Box 141, Milford, CT 06460, (203) 677-1670. We're talking about paring off half the weight (getting rid of the mag wheel, etc.) while upping performance. As with any of the Davis conversion heads, making it into a diesel allows the engine to handle a larger prop with more pitch.

It's kind of odd that diesels have long been popular in most other parts of the world, but have never really become accepted here in the US of A. And there are many old-timers who still perpetuate horror stories about

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Avoid ARF Shock



ARF shock (*Almost Ready to Fly shäk*) n. 1. sinking feeling that occurs when dreams of quickly assembling and flying an "ARF" labeled R/C airplane are dashed 2. initial reaction to the sight of scores of pieces that need to be built, and parts that must be glued 3. dismay that costly additional component purchases are needed

COX Airplanes Live Up



E-Z BEE II 55" Wingspan
31" Length
Cox .049 Engine Powered

The most stable, best flying engine powered beginner R/C airplane. Now, two servos provide independent rudder and elevator control.

Take the lid off the package of any Cox brand R/C airplane and it's immediately apparent that Cox has set the standard for the term "ARF" by providing the world's most complete, "user friendly" R/C airplanes.

Right at the factory, Cox takes care of all the difficult, time-consuming, error-prone steps that are common to the R/C airplane building process.

All the construction prevalent with other ARF brands has already been done by Cox. In fact, every Cox R/C airplane is designed with such extreme attention to ARF considerations that even the most common step in typical ARF kits, that of gluing, has been completely eliminated! All that remains is for you to assemble the finished component parts.

Purchasing a Cox R/C airplane requires no additional, costly accessories. When you purchase a Cox R/C airplane with radio, your only required separate purchases are Alkaline batteries for the radio system and, if your model is engine powered, a Cox 400 or 990 kit with fuel and starting battery. Cox electric airplanes always include Nickel Cadmium motor batteries.

Each Cox ARF is outstanding in flight. They all have different flight and performance characteristics. Read about each individual airplane and ask your local hobby store for the one that fits your needs best.

Cox Hobbies, Inc.
350 West Rincon Street
Corona, CA 91720



FAIRCHILD 24 38" Wingspan
28" Length
Cox .049 Engine Powered

A classic favorite among scale airplane buffs, the Cox .049 Fairchild provides an attractive, stable scale R/C airplane at a very affordable price.



CESSNA SKYLANE 36" Wingspan
31" Length
Cox .049 Engine Powered

Cox's fastest model, this "turn-on-a-dime" R/C airplane also provides the stability novices need to learn intermediate level aerobatics.

To The ARF Claim . . .



ELECTRIC SUNDANCE 55" Wingspan
31" Length
Electric Motor Powered

Large, glider-style wings and two-servo rudder/elevator control enable beginners to learn to fly and advance to basic aerobatic maneuvers.



SILHOUETTE GLIDER 55" Wingspan
21" Length
High-Start Included

Takes an hour to assemble, flies like it's made of balsa and won't go to pieces if you crash . . . The Silhouette combines slope-soaring performance with affordability.



FLYBOY 27" Wingspan
20" Length
Electric Motor Powered

Everything possible . . . motor, radio system, rudder, push rods and even decals . . . is factory assembled. Incredibly easy to fly, the special FailSafe radio system enables anyone over 9 years old to fly.



VIDEO-COPILOT™ E-Z Bee II, Electric Sundance, Fairchild 24, Cessna Skylane

Cox is the only company to include an instructional video with your airplane. Cox Video-Copilots enhance written assembly and flight instructions, helping you to correctly assemble your Cox ARF and fly successfully.

AN UNUSUAL FLYING PARTNER

It was more than unusual; it was unique, for me anyway. I was flying an R/C floatplane over Lake Sammamish in my usual manner. Not quite usual actually, since I was flying very high. Once in a while I amuse myself by climbing overhead until the model disappears from sight in a clear blue sky. As soon as the plane disappears I put it into a spin and it promptly reappears. Needless to say I don't let my eyes leave the spot where I last saw it until I see it again. Do this stunt only almost directly overhead and you can always get it back.

Anyway, this time I was spinning down from extreme altitude, and a full-scale Piper Cub flew into my view. It could have been a Taylorcraft or an Aeronca; I was mostly watching my model, not the plane. Lake Sammamish is a popular place for full-scale planes, so its presence didn't surprise me.

But usually when planes are around while I'm flying, I'm close to shore at a hundred foot altitude more or less. This time I was invading his territory.

I couldn't judge whether I was higher or lower than the Cub. My model was probably higher than he/she at the beginning of my spin and he was flying toward it. As soon as I pulled out of the spin the Cub did a multi-turn spin! He then seemed to be circling me waiting to see what challenge I would give him next in an impromptu game of "follow the leader." Fun, yes, but I got the heck down to a low altitude fast! I would have loved to continue the game, but it wasn't safe.

The other pilot may have been quite unaware that I had no relative depth perception of the two planes at my distance. Also, even if he regularly played around with another full-scale plane at close range, he wasn't used to the small size, different speed, and the very rapid response of an R/C model.

He "won" the game because I quit. I have done quite a bit of dogfighting with other R/C models, going for body kills, but that game was not life threatening.

REYNOLDS NUMBER REVISITED

In the May issue we talked about Reynolds Number, that dimensionless combination of speed, size and air viscosity which defines the type of airflow around an airplane and degrades the performance of our scale models with respect to their prototypes. Smaller and/or slower airplanes have lower Reynolds Numbers and are generally less efficient than

R/C and C/L types, because they must have inherent stability and must make their models hold the desired climb angle and go to the desired glide angle only by means of pre-

set adjustments. I did just enough free flight modeling many years ago to know that real success in that game is a fine art. The following was extracted from an article published in the *National Free Flight Society Digest* for August 1969:

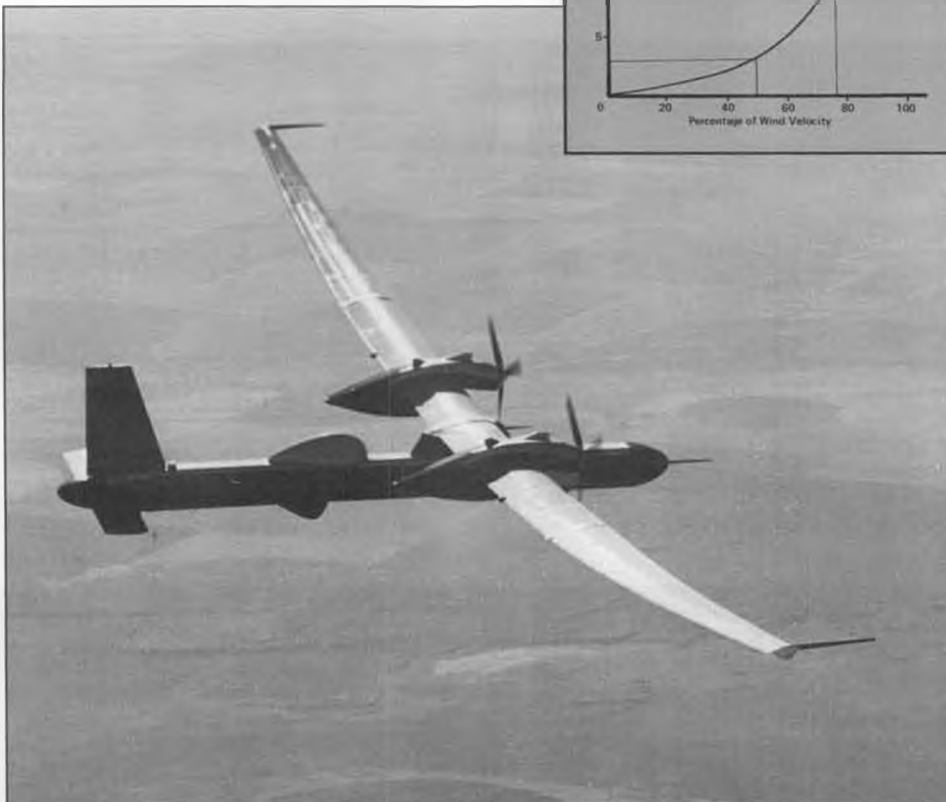
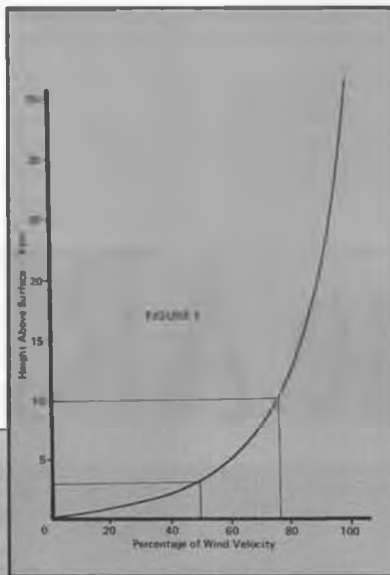
"The aerodynamic forces and moments on a model characteristically vary with the square of the velocity. There are two factors acting on models flying in our speed regime that change the model's trim, and thus its lift coefficient. These factors are down-thrust and Reynolds Number effects.

"The Reynolds Number is a non-dimensional scale parameter. Big airplanes have big R.N.s (in the millions) and models have small R.N.s (in the thousands). The characteristics of the aerodynamic forces on an airplane's flying surfaces change as the R.N. changes. For standard air conditions, the R.N. may be determined from: $R.N. = \text{chord (inches)} \times \text{mph} \times 780$. Thus, the R.N. changes directly with speed. If we double the speed

of the model, we double the Reynolds Number.

"Several of the model's aerodynamic characteristics change as the R.N. changes. The particular one that concerns us (free fliers) is the angle of zero lift of the model's airfoil. In the low R.N. range where our models fly (up to about 200,000) the

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So you thought the Boeing Co. only built airliners? Guess again. That company's latest research vehicle, called the Condor, has a span greater than a 747 but doesn't carry a single living soul. More in text.

larger and/or faster airplanes because the lift coefficient tends to be less and the drag coefficient tends to be greater due to less effective flow over the surfaces. I can't repeat all that was written in May (you kept the issue, didn't you?), but here is some additional information.

Free flight modelers have more Reynolds Number effects to be concerned with than

Some changes are sweeping the Nostalgia event. The San Valeers have already banned the use of Cox Tee Dee engines, although they still allow Medallions. The Willamette Modelers Club has adopted the NFFS rules and a new flyoff formula. The real NFFS rules remain intact, although new flyoff rules are being discussed.

These developments indicate a movement toward a set of Nostalgia rules that are the same from coast to coast and from north to south. Although regional differences will still be in place as long as the NFFS rules are not followed by all clubs, at least most fliers will find their models competitive regardless of where they fly. These moves are in the right direction from my point of view.

This month, I am featuring a newly approved Nostalgia design for Class C engines, and a Mystery Model that is itself a Nostalgia cabin design. Read on for a good look backwards.

OCTOBER THREE-VIEW— "BEJABBERS" by Ed Aikman.

If you have the December 1955 issue of *Model Airplane News*, you will see a set of three-views entitled, "Eleven National Winners." One of these is Ed Aikman's Class C winner. Bob Larsh has informed me that this model has been approved for Nostalgia competition by the eligibility committee. The 1955 three-view in *M.A.N.* is not adequate for building your own version, but this month's three-view will give you most of what you need to know.

The model, according to Ed, was originally designed for Atwood .49 power, but the power loading requirement was increased from 90 to 100 ounces per cubic inch displacement before he got the model in the air. Consequently, it was altered to accept a Fox .35 stunt engine, as this size was better suited to the new power loading. As now powered, the model flew very well. Trim was right climb under power and left glide,

No question about the name of the Nostalgia ship that Greg Davis is about to turn loose. Photo taken by Bob Stalick at a recent Willamette Modelers Club contest.



using the floating tab. A drag chute was used for D.T. Contrary to popular practice, Ed hand launched the model rather than using an ROG takeoff. He felt the extra three seconds engine run for ROG was not an advantage. The climb proved adequate and the soaring ability under light lift proved exceptional.

One of the headaches with this type of model is the stab location. With the stab inset into the fuselage, a pop-up stabilizer dethermalizer is difficult to rig up. My vicarious experience with chute dethermalizers shows that at best, they are

not very dependable. Two solutions suggest themselves:

1. You could fasten the bottom of the fuselage under the stabilizer to the bottom of the stabilizer and D.T. the thing just as you would a Fu-Bar, e.g., have a pop-down stab with the hinge at the trailing edge of the stab.
2. You could hinge the rear of the fuselage and allow the entire tail end to pop up just like a contemporary setup.

The Fox .35 stunt engine produced today is eligible for Nostalgia competition. So, you could use the same combination that Ed flew in 1955. The three-view is presented in



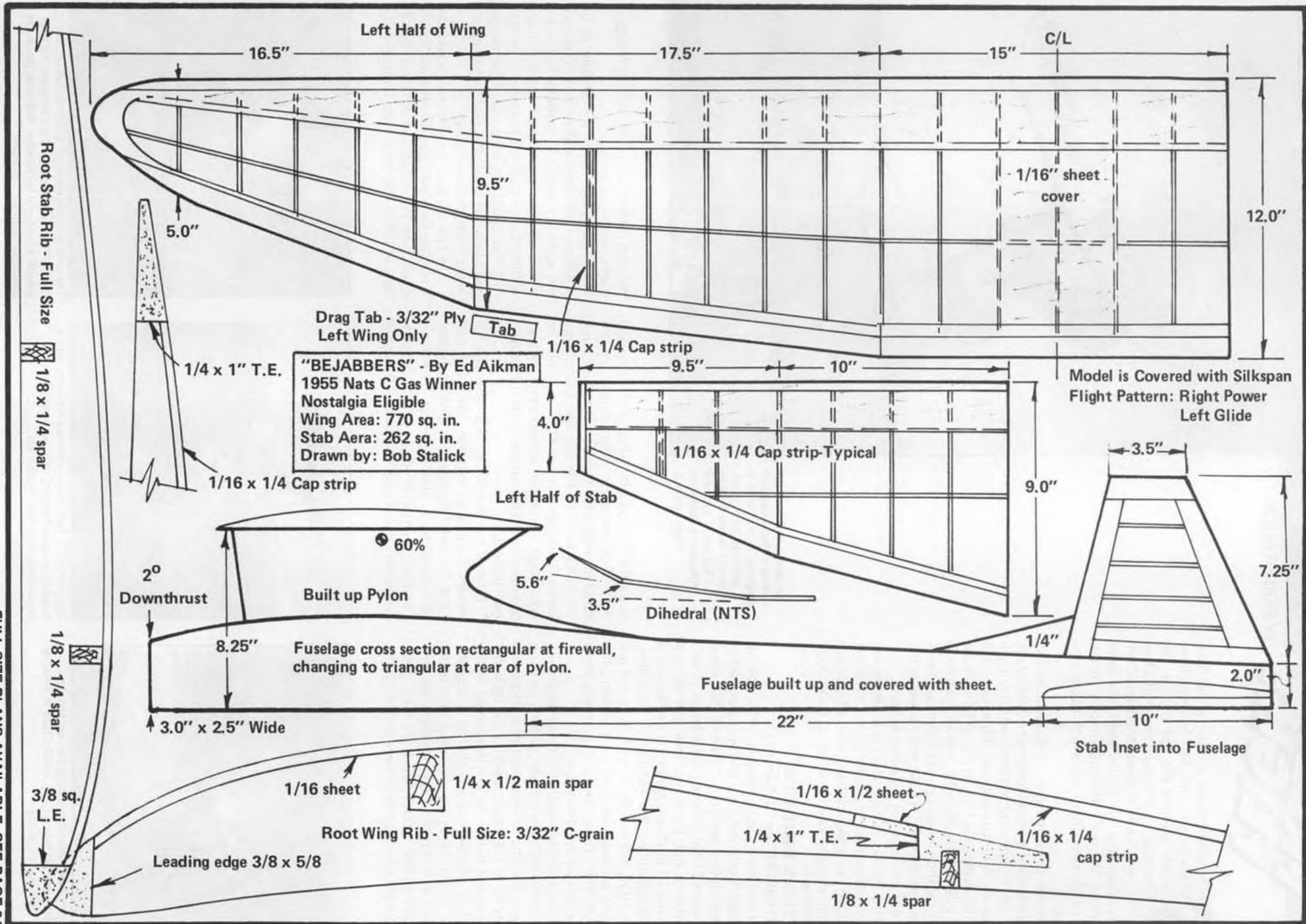
Chuck Gode fires up the only non-Nostalgia model pictured this month, a hot Class A Satellite 450. Bob Stalick photo.

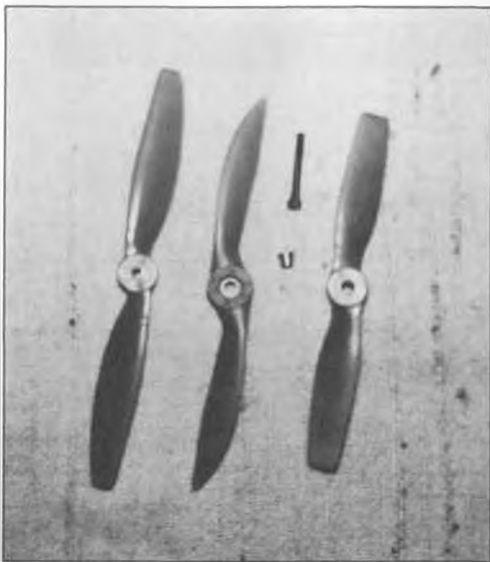


Washington's Ted Warren shows his form with a Nostalgia class Ramrod 250, powered with a reed-valve Cox .049. Stalick pic.

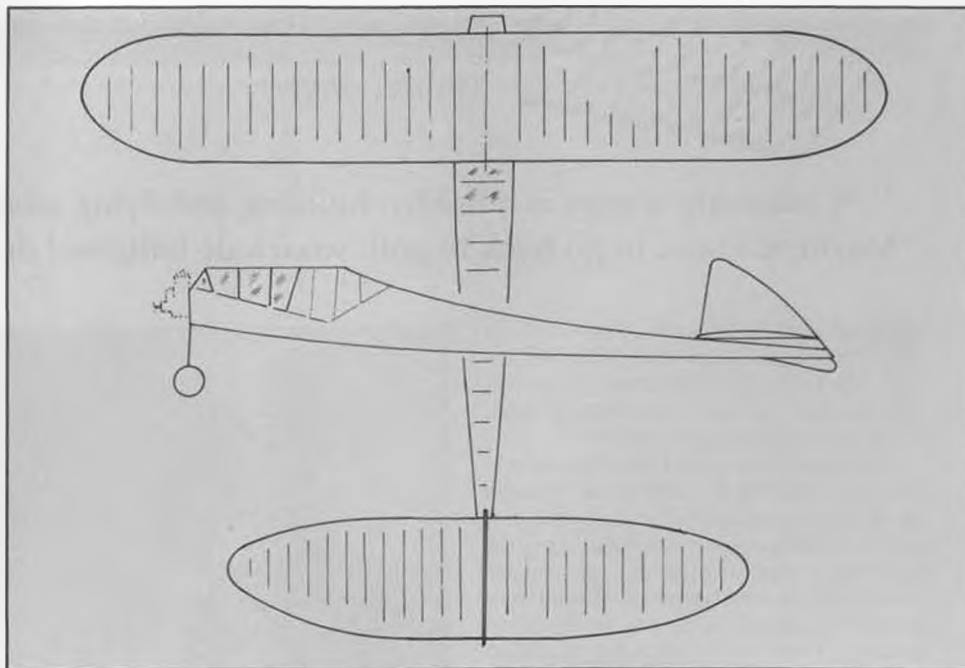


The original "Bejabbers," Class C Gas winner at the '55 Nats, with designer Ed Aikman. It's this month's featured three-view. Full-size plans are available from Ed—see text.





Shown here is the new APC 5.7x3 1/2A prop (middle), flanked by a standard Cox 6x3 (left) and 5x3 (right). The screw and bushing are necessary for proper alignment of the APC prop on a Cox engine. A quick measurement of these props shows that the APC is thicker at the root and thinner at the tips than either of the Cox props.



OCTOBER MYSTERY MODEL

1/5 scale and can be enlarged; however, the fuselage structure is a bit unusual and is not shown in the sketch, so it would be advantageous to order Ed's plans. If you would like a complete two-sheet set of full-sized plans, you can get them. Ed sells them for \$10.00 postpaid. Ed Aikman, P.O. Box 352, Marion, IL 62959.

OCTOBER MYSTERY MODEL

This is a design that I keep running across, and I really think it is a great mystery model topic. It is a Nostalgia era free flight and will work well in the cabin event. The original ship was intended as a .19 powered PAAload design. A close look at the surface shapes will give you a hint as to the designer, provided you were an active free flighter back in the '50s and remember such things. So, are these enough clues for you? If so, you can win a free subscription to *Model Builder* magazine if you send the right answer to Bill Northrop before anyone else does. Here's your big chance. Do it now.

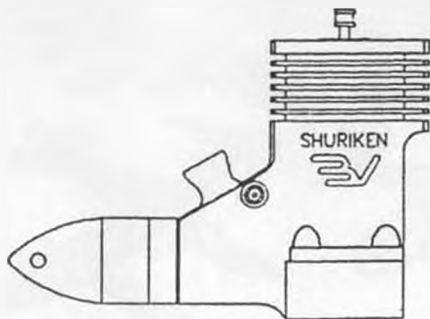
OCTOBER DARNED GOOD AIRFOIL—Gott. 276-Daimler VII

Here is another section from the oft-quoted *Comprehensive Guide to Airfoils*. This is from the Gottingen laboratories and was tested in 1918. The airfoil has a high point farther forward than we usually see in typical free

flight use. I think this section would be a good replacement for the Goldberg G-610b, as it is slightly thinner to boot. A radius leading edge will give more consistency to the flight pattern and easier trimming for the model. The slight undercamber should produce a fast climbing airfoil with a better than average glide. Try it on your next power model.

A NEW CHALLENGER IN 1/2A ENGINES—THE SHURIKEN

Most likely, many free flighters have heard of this engine. I first read about it in the *CIA Informer*, which described the following



Destined to become the hot ticket in 1/2A powerplants, the Shuriken from BV Competition Engines. Unbelievable power from only .05 cubic inches. More in text.

account:

"Gerald Caldwell obtained a prototype of the Shuriken for testing. He removed his hot Tee Dee from a Mini-Pearl and bolted on the Shuriken. The test was to check the altitude of the Pearl with the Tee Dee after a four-second engine run, and then to check it after the same engine run with the new engine in place. He never got the chance to compare the altitude gained with the Shuriken, as both wings ripped off outboard of the third bay at less than two seconds into the flight. Gerald noted that the model went vertically right out of his hands. He said he never heard an engine sound like this one—really distinctive!"

According to a companion report in the *Flyoff* newsletter of the Brooklyn Skyscrapers:

"You've probably never heard of BV Competition Engines, but it seems to be a pair of guys named Fred Baldwin and Jim Van Arsdall who have decided to go commercial in manufacturing a racing engine for model airplanes—in 1/2A and F1J sizes. First word here was received in mid-April in a letter from Harry Murphy. According to Murphy, big news is this little-known new engine which is to come out of Indy in about

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DARNED GOOD AIRFOIL



STA	0.00	1.25	2.50	5.00	7.50	10.0	15.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	95.0	100.	
UPR	0.94	2.67	3.58	4.88	5.86	6.52	7.51	8.07	8.44	8.07	7.59	6.95	5.83	4.38	2.78	1.95	0.80	
LWR	0.94	0.05	0.05	0.30	0.56	0.64	0.80	1.02	1.18	1.34	1.34	1.23	1.07	0.80	0.48	0.21	0.00	

**"Collecting stamps is a hobby; building and flying model airplanes is a passion."
"Maybe it's time to go back to golf: whack de ball, find de ball, whack de ball again...."**

Two lead-in lines this month, which seem to tie together nicely, perhaps clarifying the sometimes blurry distinction between a hobby, a sport, and an all-consuming obsession?

The first quotation is by Norm Rosenstock, from his new book *Tales of an Ancient Modeler*, an unusual publication in that it concentrates more upon model builders than upon the models themselves. *Tales* relates Norm's lifetime involvement with miniature aircraft beginning with his boyhood in Brooklyn (complete with graphic language) through his present retirement in Florida. Along the way his path crosses that of many other modelers, including such famous ones as Carl Goldberg, Bill Winter, Sal Taibi, Leon Shulman, and Jim Walker. Norm seems blessed with almost total recall, and his nostalgic reminiscences are amazingly detailed. His background encompasses free flight, control line and radio control, and his personal participation in each is thoroughly explored. Some of the tales might seem difficult for non-modelers to believe, how-



Two of our hobby's greats—gone now but fondly remembered. Carl Goldberg (left) confers with Walt Mooney during a Flightmasters R.O.W. meet at Lake Elsinore some years ago. Bill Hannan photo; print by Larry Kruse.



A fine assortment of Peanut floatplane entries at a Czechoslovakian indoor contest. How many can you identify? Photo by Pavel Jellnek.

ever most old-timers will easily identify with the events portrayed, having had similar experiences themselves.

Most of the happenings took place long ago in New York, and may surprise modelers from less-crowded locales. Can you imagine, for instance, carrying a six or seven-foot wing span gas model on a subway? How about half a dozen of them? Or buying gasoline for a borrowed car at nine gallons for a dollar? (To go model-flying, of course.) Ever wonder what may have happened to your youthful companions? Norm has managed to remain in touch with many of his, some of whom are still pursuing their

"plane passions" today.

We conclude this brief review with another quotation from *Tales of an Ancient Modeler*: "They say model builders are immature; always the little boy—the 'Peter Pan' syndrome. Perhaps that's why age never makes a difference among modelers—we are all kids."

CAMADAT

That's the acronym for *Computer Assisted Model Airplane Design And Testing*, the title of a recent book compiled by Curtis Givens. Actually, it may be obtained in either book form or as a combination of a book and a computer diskette (which is not



Klaus Jorg Hammerschmidt sent in this photo of the new limited production CO² powerplant being made in Switzerland.

sold separately).

Programs featured are concerned with a wide variety of subjects, such as airfoil plotting, biplane design, delta-wing configurations, float dimensions, propeller selection, helicopter performance, rubber-motor energy, calculating "G" loads on model structures, and many more. Curtis Givens has painstakingly gathered and tested programs developed by other computer specialists and converted, as needed, for inclusion in this compilation.

Curtis states that the material is presented in as generic a form as possible, making it compatible with the most popular types of personal computers in use by hobbyists.

Both *Tales of an Antique Modeler* and *CAMADAT* are products of VIP Aero Publishers, Inc., who offer them through *Model Builder* advertisers or direct from VIP, Box 16103, Colorado Springs, CO 80935.

OLD BUZZARD'S SOARING BOOK

Another new publication is by former *Model Builder* contributing editor Dave Thornburg, whose unique style imparts a maximum of wisdom with a minimum of effort, and is highly entertaining in the process. Witness these extracts: "Nobody with lungs ought to rush to Southern California." Or: "If you get a warm feeling inside from plugging numbers into formulas, do it." "... If on the other hand, you like to draw airplanes and build them and take them out next week and fly them—then let's get on with it."

All seriousness aside, as Steve Allen would say, this small volume is packed with useful advice for the R/C glider guider, with special emphasis on flying techniques as well as numerous building ideas. Chapters include The Perfect Thermal, Happy Landings, Choosing a Slope Site, Ten Ways to Lose a Sailplane Contest, Some Notes on Designing Your Own, a Glib Glossary of Glider Gibberish, and more—all calculated to enlighten and to amuse. Examples: "Water is nothing more than fat air..." and "The fish is second cousin to the flying machine." And "Radio control in the 1950s was almost exactly like free flight, only heavier." Well, you get the drift...

What is the big attraction of R/C soaring anyway? Dave sums it up nicely: "Gliderers are good, clean sport, quiet and non-polluting. And best of all from the landowner's point of view, they offer no fire danger." And if perchance you may not agree, you can always follow the advice in our second lead-in line, also from Dave's book, and go back to golf! And oh yes, that "Old Buzzard" in the book's title is not a reference to its author's age, but to a turkey vulture found hitchhiking, while Dave was driving across Arizona. Wanna know what a buzzard knows about thermals? Buy de book! Contact PONY X PRESS, 5 Monticello Drive, Albuquerque, NM 87123.

SPEAKING OF GLIDERS

We enjoyed the positive thinking expressed by Martin Simons, writing in the fine Australian magazine *Airborne*: "Model glider pilots who expect to find thermals usually do, because they are usually present."

FAMOUS MODEL BUILDERS

We refer to people who gained fame in other areas, but who consider model building an important part of their lives. Peter Young, of Centreville, Virginia, brought to our attention some lines from Astronaut Frank Borman's autobiography *Countdown*, including the following: "Building model airplanes became our principle joint hobby and one that I still pursue. At first we flew rubber-band powered models almost every Sunday, and when church competed with this activity, the model airplanes won."

"And, after he became a pilot in the Air Force: "I even found time to resume building model airplanes, including wire-controlled jobs. The kids in the neighborhood would come around to our backyard and watch me fly them. I should say, watch *us* fly them, for Susan got interested and began flying the models herself. Much to my chagrin, she also became more skilled at it than I was."

Don Campbell, of Detroit, Michigan shares a quotation he found in *God is my Co-Pilot*, by Robert Scott: "I confined my aircraft



Oink! The latest production to come out of the Peck-Polymers shops is this flying porker that flaps its ears and bounces a basketball by R/C!



Beautifully constructed rubber powered Fokker D-VII by master builder Bob Schlosberg won the WW-1 mass-launch event at a recent Arizona Cactus Squadron meet.

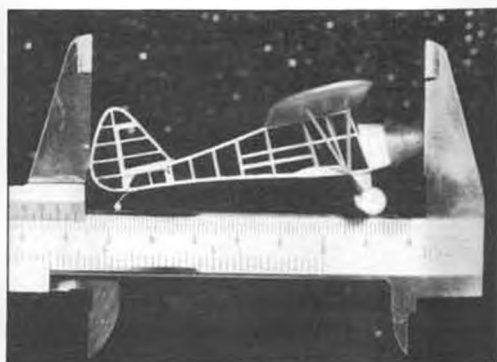
construction to scale models, and finally made one which won the first Boy Scout Aviation merit badge in that part of the country." Ah yes, we travel in distinguished company...

CO² NEWS

Klaus Jorg Hammerschmidt, of Germany, sent news about and a photo of a CO² engine being produced by two Swiss aeromodellers, Werner Heise and Peter Binkert. Most of the parts are from the Swiss PEWA CO² car powerplant, however the crankcase is especially designed and molded, while the tank and propeller are from MODELA of Czechoslovakia.

And in the Soviet Union, a nearly ready-to-fly CO² powered model is now being marketed. Named the "Junior," it is of foam and plastic construction and weighs 80

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And you thought Pistachios were small! This 1/72-scale Piper Vagabond by Frantisek Barta makes any Pistachio look like a Jumbo scale by comparison. Even more incredible is that it's CO² powered, using one of Stefan Gasparin's microscopic motors. Span is about 4-7/8 inches, with a flying weight of under two grams. Photo by Michal Gasparin via Fritz Mueller.

CONTROLLING INTERESTS

Control line airplanes come in a wide variety, but there's one thing that all of them have in common: There's a continuous linkage between the pilot's hand and the control surfaces of the airplane.

This "chain of control" includes the handle, the line connectors, the lines, the leadouts, the bellcrank, the pushrod(s), the elevator and flap horns, and the devices for connecting the pushrods to the bellcrank and horns. OK now everybody, one, two, three... "A chain is only as strong as... (you know what!)."

There are enough problems associated with this seemingly simple mechanical system—and enough different ways of dealing with each component—to fill several columns. We have already, in past columns, examined some of the general

Jeremy Simpson, age 14, and his father Neil, have been terrorizing the Geriatric Combat (Formula GX) contest circuit in the northeastern U.S. with their Coyote GX designs. Shown here is Jeremy with the #9 ship. Write up in text.

characteristics of control systems and how to suit them to the particular style of airplane and flier.

This month, a question from George Calvert, of Wagoner, Oklahoma, directs us to one small element of the control system: the linkage between the pushrod and the elevator or flap horn.

George was building a Squaw from Tom Dixon plans, and he had two control linkage questions. We'll deal with the second one first.

"What's the best way to fit a 'keeper' to keep wires from slipping out of the horns?" George asks. "I used to solder them, but does modern technology give me a better way?"

The short answer is that modern technology provides a variety of ways, all visible on the hardware pegboard at your local hobby shop. However, there are limits to the usefulness of each product, and care must be taken to make sure that the product you choose, or the method you construct at home, is suitable to the airplane you're

building.

To paraphrase another old saying: "Big problems sometimes come in small packages."

A personal tale drives home the point: Once upon a time there was a snazzy black and orange Magician, one of those classic kit profiles of the 1960s, veteran of many a casual stunt flight, covered in silkspan and Aero-Gloss dope. This was no competitor, just one for Sunday fun flying, pulled along by a reliable Testors McCoy .35 (the 1970s version with the peculiar square, finned crankcase). It was a sunny late autumn Sunday and I had just moved to a new town and decided to try out a local schoolyard. As is always the case, the plane brought out a crowd of youngsters and I was happily cruising through the stunt pattern with the old Magician, taking care to get those bottoms impressively low and elicit the wows from the kids.

Well, along came the outside square loop. Frankly, I've never liked outside squares; it seems to defy logic to dive straight at the ground, doesn't it? But turn I did, snapping off that top corner nicely. Then would come the bottom corner. Before I could say, "uh-oh," the Magician was a pile of sticks and tissue. It took a considerable effort to pull the McCoy out of the hole it dug in the soft ground, and to gather up the scattered airplane parts.

But it took very little effort to find the cause of my embarrassment. By the time the kids had stopped laughing and pointing at the wreckage, I had found the broken Du-Bro Kwik Link that connected the pushrod to the elevator horn. Let me add quickly that there's nothing wrong with Du-Bro Kwik Links, but everything has a proper use and an improper one. Underline the next sentence, photocopy the page, and pin it to your workshop wall: *Do not use a small Kwik Link to connect the pushrod of a stunt plane to the elevator horn!* There's simply too much stress on that control connection for that small (2-56) rod and keeper. I haven't tried it on a stunt plane, but I suspect that the 4-40 pushrod and Kwik Link assembly that later became available would work just fine. I have used them with absolute success on fast combat planes for years.

However, stunt fliers long ago got nervous about that type of keeper, partly because of the thousands of movements the control system makes over the hundreds of flights a typical stunter will make.

So how do we make the connection?

Well, as George Calvert points out, you can solder keeper washers on each side of the horn like you did in 1950. It's a method





A good wife, a good dog and a competitive airplane—who could ask for more? Ruth Simpson poses with "Gus" and the latest (#12) in husband Neil's series of Coyote GX combat models.

that still works as well now as it did then. If you take care not to melt the nylon elevator horn (use a paper spacer when you solder) and make a good strong solder joint, starting with clean metals and the proper solder and flux, the joint will outlive the plane and probably the pilot.

But the solder/washer method has a couple of drawbacks: It is permanent, and neither the length of the rod nor the position in the elevator horn can be adjusted.

If we were building a sport plane or a combat plane—basically any lightweight plane with low stresses on the control surfaces—the Kwik Link or one of its relatives such as the threaded bolt style of connector found in hobby shops probably would work quite reliably. Use the 4-40 Kwik Link on anything larger than a .15-powered plane.

(You might be surprised by the suggestion that a combat plane would have less control stress than a stunt plane, but it's true. A properly set up combat plane has very little elevator movement and a large elevator. In addition, the plane is quite light, and its moments are such that it takes little control input to create a quick turn. The result is a system that has a lot of stress on the bellcrank/leadout area but not much on the elevator. Relatively thin pushrods and 4-40 Kwik Links are common and reliable in this application.)

When we come to the stunt plane, we have to consider the relatively high stress involved in turning a large, heavy airplane (40-70 ounces, compared with 18-24 ounces for a fast combat plane), the dual control surfaces (flaps and elevator), and the relatively greater deflection of the control surfaces. All of these add up to a high-stress condition on the controls, not only on the leadouts and bellcrank but on the pushrod, horn, and connecting links. Pushrods are subject to bending and binding, and control linkages are subject to breakage (remember the Magician... R.I.P.).

For our stunt plane, we probably had better steer away from the Kwik Link and go for a much stronger solution. A pushrod end

that is simply an L-shaped bend in a stout piece of music wire.

If we are using the typical horseshoe-shaped flap or elevator joiner with an integral horn, this will require us to locate the bend perfectly for equal up and down travel. If we don't get it right, we'll have to discard the wire and try again. If we're using an elevator or flap horn that is separate from the joiner, or there is no joiner and we can just mount the horn on the control surface itself,

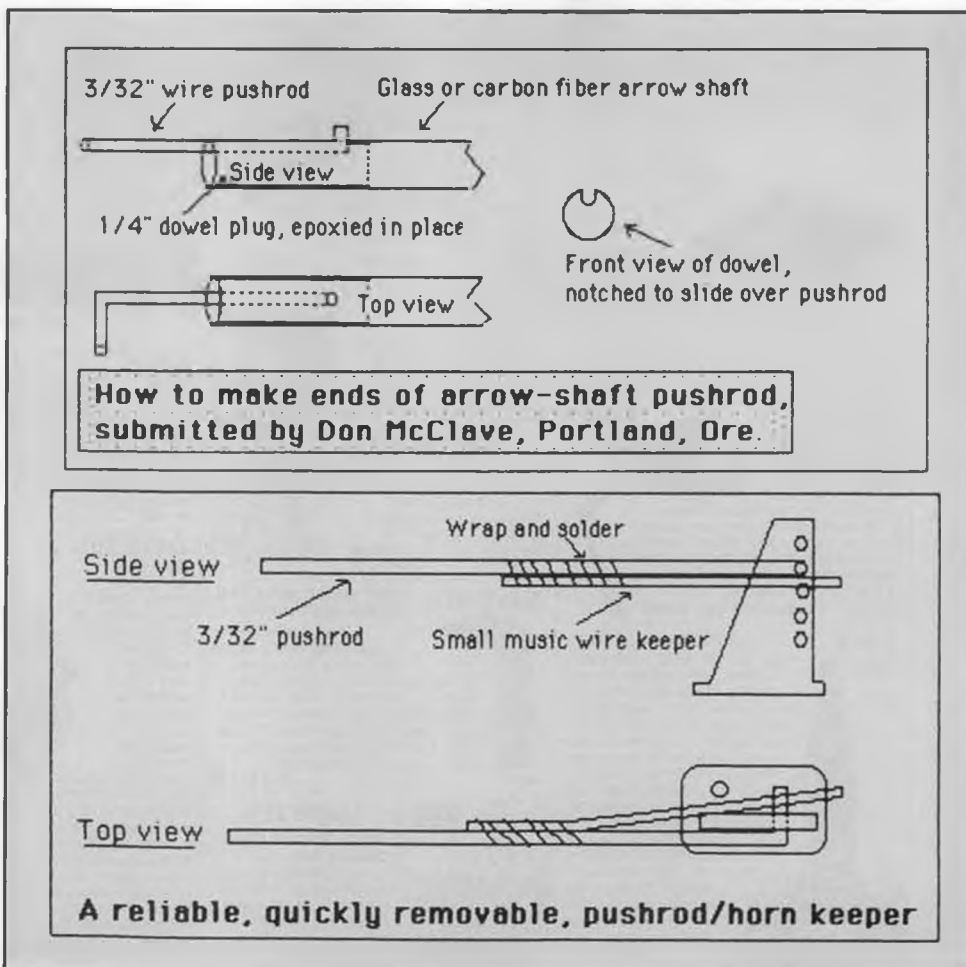
we can move the horn forward or back to compensate if the wire bend isn't perfectly located. Either way, once installed, the horn installation is permanent, so we have to get that variable correct during construction.

But we can construct a linkage, at the elevator at least, that can be moved up or down the elevator horn to vary the elevator travel. The following suggestion is an invention of Mike Hazel, the former *Model Builder* control line columnist. Mike and your current columnist have used this keeper on racing planes for years.

It is a simple and foolproof way of creating an elevator horn connection that allows adjustment of elevator travel. It is most applicable to sport, unflapped stunt planes (such as old-timers) or racing planes, because it could be difficult to apply to a flap horn. It may not be useful for full-competition flapped stunt planes because most serious stunt planes' elevator and flap travel will be permanently linked in construction. Any adjustments in travel will involve both surfaces, and will more likely be done at the handle (in adjusting line spacing) or at the bellcrank.

But here's our simple linkage for those applications where it is feasible:

Make the L-bend in the wire's end as you
continued on page 94



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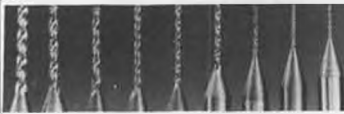
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Store and organize your most used small tools. Holds just about everything in less than 1 sq. ft. of space. Great for needle files, model knives, tweezers, scribers, pencils, rulers and more. 10" dia. X 6 1/2" h. Made of high impact plastic with Lazy Susan type base.
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Medium cut for wood, metal, plastic. 5 1/2" L. 10 different shapes.
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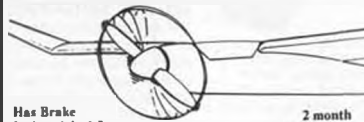
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and would be willing to loan them to you.

Several readers in the Milwaukee area have indicated their desire to come to the IMS show scheduled for Milwaukee on the weekend of October 5, 6, and 7, 1990, but are concerned about its closeness in time to the RCHTA show in Chicago.

Although both shows feature exhibits by model hobby manufacturers, they are very different in many respects, and as a consequence, IMS Milwaukee will have exhibitors not showing in Chicago, and vice versa. The reason for this is based on the main difference between the two shows. Chicago/RCHTA does not allow selling and hand delivery over the counter of products by exhibitors. Milwaukee/IMS, just as in Pasadena and Atlanta, and like the long running and popular Toledo and WRAMS shows, does permit selling and delivery to the public. Some RCHTA exhibitors will also be at Milwaukee, however, Milwaukee will not have the big static plastic companies, and the games companies... after all, it's billed as a Radio Control Model Sport & Hobby Show, and that's what it is!

Also, both shows are trade shows, but IMS is more consumer oriented. Not only is this better for the modeler, with live indoor RC demonstrations, static model competition, and a swap shop, but it's also the best opportunity for manufacturers to communicate with the ultimate consumer, for whom they are really marketing their products, the

WORKBENCH *Continued from page 7*

I am writing to see if you may be able to help me locate plans to the "Montana Duster," a late 1960s R/C pattern model which appeared in the *American Aircraft Modeler* 1969 Annual. Plans were offered for sale by Sudden Service Plans in that magazine.

Since AAM no longer exists, I thought your long association with the model publishing industry may have given you knowledge of where the Sudden Service Plans inventory is at this time so I can contact them.

If you can help me, it will be appreciated.

Sincerely, Allen Chapman, 309 Palomares Ave., Ventura, CA 93003.

Your concern about the disposition of the many fine model plans published in *American Aircraft Modeler* has been shared by many since its demise back in the early 1970s. Like others who have attempted to track them down, this writer also ended up in a blind alley. The bottom line always seems to come out the same; they were apparently trashed by the institution which handled the bankruptcy. In other words Sudden Service suddenly disappeared! It's still hard to believe, but then why should a bank see any value in a bunch of silly toy airplane drawings?

We have printed your complete address, on the chance that someone may have salted away a copy of the "Montana Duster" plans

modelers who make the final purchase.

Being the first annual show in Milwaukee, this will not be as large as future shows, however, as we've said in our "Listen Up" ad, modelers have not had a consumer-oriented RC model show in the area for five years, and IMS is bringing it back. Support of the opening show by good public attendance will assure its continuance and growth in the future. **MB**

COUNTER *Continued from page 11*

No-Fray consists of loose parallel carbon fiber filaments trapped between two layers of thin tissue paper. To reinforce a wing or fuselage, a length of No-Fray, tissue paper and all, is laid in place and brushed with epoxy or polyester resin, which easily penetrates the tissue and bonds the entire assembly in place.

For pull-pull cable control systems, Aerospace Composites has developed "Kev-Cord," an eight-strand braided Kevlar core surrounded by a high-density vinyl jacket. The result is a cable which absolutely will not stretch, and is protected from fraying by the vinyl coating. It can be used over pulleys, threaded through guide tubes, or used unsupported. Kev-Cord is packaged in 20-foot lengths and in two sizes: .038-inch diameter (85 pound tensile strength, \$7.00 per package), and .054-inch diameter (215 pound tensile strength, \$9.00 per package).

For additional information on these or other products, contact Aerospace Composite Products, P.O. Box 16621, Irvine, CA 92714, or call (714) 250-1107.

David C. Abbe, a pioneer participant in the growth of the R/C industry, has announced the formation of Hitec R/C USA, Inc., which has factory direct ties to the 17-year-old firm of Hitec Co. Ltd.

The aim of Hitec R/C USA is to market, through traditional distribution channels under the Hitec R/C USA brand name, a full line of advanced R/C systems surpassing the 1991 AMA/FCC guidelines, as well as servos, speed controls, chargers, and accessories.

"It's our goal to sell quality Hitec products to all distributors who supply the nationwide network of dedicated R/C shops at a cost that will allow individual store owners the opportunity to compete with interstate mail order R/C sales distributors," said Mr. Abbe. "The survival and growth of our industry requires the support of the individual R/C store owners by providing competitively priced quality products to all of our customers. That's what Hitec is all about."

There you have it. If you'd like to learn more about Hitec products, write to Hitec R/C USA, Inc., 9419 Abraham Way, Santee, CA 92017-2854, or call (619) 449-1112.

The Carden Corporation has come out with an eye-catching sport aerobatic model called the "Paydirt 60," designed to provide



Tony & Addie Naccarato switched to Micafilm

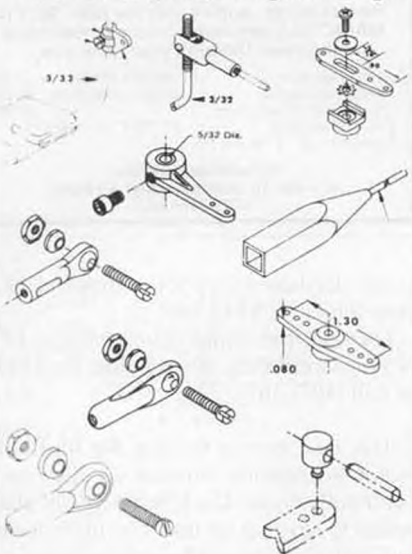
Tony & Addie told us they covered Carl Goldberg's Junior Clipper with Micafilm, flew it over 70 times, and never got a single sag. Think of that next time you have to tighten up your film covered ship. P.S. Yes, that's the master himself, Carl Goldberg.

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Compared to other 60 size motors on the market, the Fox Eagle 4 has the largest crankpin, the most massive connecting rod, and is generally of the most rugged construction. The Eagle is also available in a larger bore version, which gives a displacement of .74. This extra displacement makes it possible to pull a little more propeller.

The MK X design carburetor has been further refined to give a very smooth throttling action all the way from low idle up to full power. The bolt on cylinder design gives the unique advantage that the cylinder can be turned so that the exhaust faces left, right, or to the rear. This can be accomplished merely by pulling the 4 cylinder hold down screws, turning the cylinder assembly to the desired position and re-installing the 4 screws.

Fox Eagle 4's are supplied with a conventional tilt down muffler. If a tilt up muffler suits your airplane better, you can exchange your tilt down merely by sending it to us and asking for an exchange. There is no charge for this. While we do not manufacture pipes, the Eagle 4 responds well to a conventional pipe installation. The screw spacing on our exhaust flange is similar to the Rossi screw spacing, and the hardware designed for either the Eagle III, Eagle 4, or Rossi will fit readily. When the absolute maximum power is desired, we recommend the use of our F size carburetor, which has an intake diameter of .350, in conjunction with one of the after market pumps on the market. The rear cover is fitted with a tapped hole to accept a pressure fitting if you have occasion to use case pressure for either pump operation, smoke operation, or some other case pressure use. The hole for the pressure tap is not drilled all the way through. To make the pressure tap functional, you merely remove the rear cover, drill the hole all the way through with a 1/16" drill, and then install and fit your pressure tap. The thread is a 4-40.



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smooth performance throughout a wide speed range as well as slow, predictable landings. It's engineered to comfortably accept .70-.91 four-stroke or .50-.61 two-stroke engine/tank installations. Span is 60 inches, wing area is 800 square inches, and the flying weight can range from seven to eight pounds.

The Paydirt 60 kit actually has very few parts. It's not an ARF by any means, yet it's not at all uncommon to have the ship framed up and ready for covering in only eight hours. The kit features precision-cut wood parts, foam wing cores with balsa sheeting, custom milled ailerons, a molded canopy, generous hardware package, polished aluminum landing gear, rolled plans, and a

photo-illustrated instruction manual. Suggested retail is \$139.95.

For more info, contact Carden Corp., 1731 N.W. Madrid Way, Boca Raton, FL 33432, or call (407) 367-7744.

This next item is for you Big Bird buffs. Norm Rosenstock, famous for his line of beautifully drawn Giant Scale model plans, writes to say that he now has plans for the handsome Waco HKS-7 cabin biplane in both 3"=1' and 2.25"=1' scales. The one shown in the photo is the larger of the two, with an upper span of 99-3/4 inches and a maximum flying weight of 35 pounds. The smaller Waco spans a "mere" 74-1/2 inches and weighs in at 14 pounds max. Both sizes

have been built and thoroughly tested by Norm, so you can rest assured that the model you build from his plans is a completely proven, airworthy design.

In addition to plans, Norm offers cowls and wheel pants for the Waco, sold either separately or at a discount when purchased as a group with the plans. Also offered is a package of 20 photos of a full-size HKS-7 for scale documentation. The plan and accessory prices are too numerous to go into here, but you can get full particulars from Norm by sending him a SASE and requesting same. Write to Norm Rosenstock, 124 Granada St., Royal Palm Beach, FL 33411.

A firm by the name of Lightning Products is producing what it calls a "RotorCraft Workstation," a clever device designed specifically for building, repairing, and displaying R/C helicopters. Special clamps, which are adjustable in spacing, hold the model securely by the landing skids, and by means of a lockable ball joint, the model can be tilted fore and aft a total of 180°, as well as rotated a full 360°. A heavy duty pedestal mount and base tray are claimed to provide a steady platform regardless of the work angle. The press release states that the RotorCraft Workstation can also be mounted on a tripod for use as a portable field workstation, although the tripod is apparently neither included nor offered as an accessory.

No word on the price, but you can get this and other information by writing to Lightning

Products, P.O. Box 1607, Tomball, TX 77377-1607, or call (713) 351-0700.

Lone Star Models, a company headed up by C/L combat legend Riley Wooten (remember the VooDoo?), has a new catalog listing 528 stock sizes of balsa, plywood and hardwood, as well as glues, covering, carbon fiber, fiberglass, wheels, tanks, kits, engines, accessories, and various C/L specialty items. The catalog can be had by sending \$1.00 to Lone Star Models, 1623 57th St., Lubbock, TX 79412.

Procan—Professional Products of Canada, Inc., 1300-5 Shawson Dr., Mississauga, Ontario L4W 1C3, phone (416) 564-7226, is offering a solid-free, anti-wear, friction-fighting product which is blended with gasoline and most glow fuels. The product, Metalon C2, is claimed to bond chemically with ferrous and non-ferrous metals, forming a microscopic monomolecular shield that is unique to the base metal.

Metalon is said not to drain off, providing wear protection from the moment motion is initiated, while conventional lubricants would still be sitting in the crankcase. Procan states that when used continuously, Metalon C2 will; break in new engines with less metal removal, increase power and rpm, allow lower idle speed, stop rust and corrosion, enhance lubricity, provide easier starts, extend service life, lower operating temperatures, eliminate after-run oiling, and reduce maintenance.

It is available from Aerrow Inc., B&B Specialties, B&F Enterprise, Bob Parkinson Flying Models, Bob Violett Models, and Scott Airplane Co.

Eagle Products, 754 Dodsworth, P.O. Box 4609, Covina, CA 91723, phone (818) 339-1311, FAX (818) 915-3315 offers a variety of bright and colorful self-stick trim graphics. There are over 25 different color schemes, featuring brights, basics and neons in stripes, solids, and halftone blends. There are three 6 by 26-inch sheets per kit. One sample starts solid red at one end and through halftone blends, becomes solid yellow at the other end. Other sheets do the same thing across the width. Material is high quality, fuel-proof vinyl. **MB**

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WEEKEND *Continued from page 16*

are now in the Tower Hobbies area." I quickly looked around for a change of wall paint color, a dotted line on the floor, a different style of storage rack, a seeing eye detector... there was nothing. As you may know, Great Planes Model Distributors, Inc. is the leading importer/distributor in the US, supplying hobby dealers with a working inventory that would do justice to *Model Retailer's* "R/C Buyers' Guide." And you probably also know that Tower Hobbies is the largest mail-order supplier of radio con-



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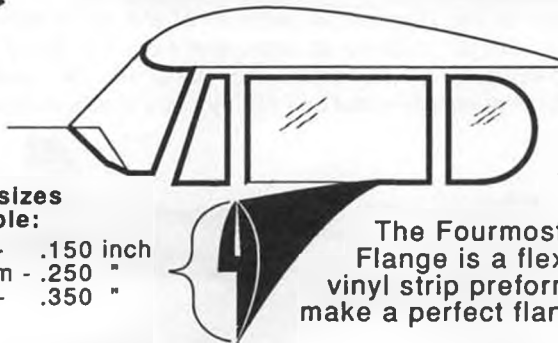
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trol hobby materials sold direct to the consumer, and that many items can be purchased by the consumer for almost the same price that GPD charges its dealers. The fact that GPD and Tower both operate under the common Hobbico roof and pull merchandise from the same storage racks is, to say the least, controversial, and beyond that, I wouldn't touch the subject with a ten-foot person of any nationality, Pole or otherwise!

By now it was mid-afternoon, and time to visit Hobby Dynamics. Armed with brief directions, we headed out in our rental car for another less-than-ten-minute drive. We can't emphasize enough the convenience of rural living. Every time we were about to

pull out on a main road, there might be one or two cars in sight, and that was it. If there was any difficulty for us at all, it was getting used to the short distances. We were continually overshooting turnoffs, which was actually no big deal. All the roads and streets are more or less north/south and east/west oriented. If you miss a right turn, you just take the next two rights and then one left, and you're back on track!

At Hobby Dynamics, we were met by Jerry Kaplan, who gave us the tour, as HDD's president, Mike Ciolli, had gone to the flying field, site for the Heli Challenge... you guessed it... less than ten minutes away!

Had we not just left the Grand Canyon of GPD, the newly-built Hobby Dynamics fa-

cility would have appeared larger to us than it did by comparison, though it was certainly not any less impressive. Again, row after row of storage racks reaching so high that you felt like a country bumpkin in downtown Manhattan, looking at skyscrapers. With its computerized order processing, product picking, storage input, and order shipping, the facility is obviously organized for rapid turnover of the products it handles.

With a promise to be back for an open house, including food and beverage, to start after five o'clock, we headed for the flying field, across open farm land... and passed Mike, who was on his way back to the office!

At the field, US FAI Heli Team member Tom Dooley, of Atlanta, GA, was busy with judge training for the four event categories; FAI, Intermediate, Novice, and Scale. Also watched our good friend from Japan, Kaz Mihara, a beginner in heli's, getting in some hover practice. Kaz was with O.S. Engines for many years, and now has his own model engine and accessory design business, K-Tech Design. We also met Larry Windingland, president of the Champaign County R/C Club, on whose flying site the Heli Challenge was to take place. It was an excellent site, by the way, with a unique contest headquarters/transmitter impound building, a large shade structure (the James F. Fielding Memorial Pavilion), two paved runways, and a large off site storage and clubhouse building. The nearest residential buildings are located on the edge of a small but active full-scale airstrip. No noise complaint problems here!

Back at Hobby Dynamics, we fueled up on the open house roast beef sandwiches, salad, and soda, and then Mike Ciolli drove us to his home within five minutes of the office and directly across the road from the fourth tee of a well-kept golf course. We backed into his driveway, parked, and then he pulled out photos showing how the small lake on the golf course, as the result of a recent heavy rainstorm, rose over five feet, with the "new shoreline" halfway up his driveway, cutting them off from the outside world for the better part of 24 hours!

Later that night, following what turned out to be the last heavy thunderstorm activity for the weekend, we drove out to the airport to pick up James Wang (arrived over a half hour late, about 11:45 p.m.), and watched the ground handlers throw his small travel bag, with transmitter stuffed inside, about three feet to the ground! He hand-carried his Concept 30.

Saturday, June 9

At this point in the story, we turn the details of the competition over to James Wang, but can't help mentioning the interest generated by demonstrations of the Kalt Whisper and Kyosho Concept EP electric helis. As mentioned last month, the Whisper should be available to dealers the 15th of August. It should also be emphasized that throughout the Heli Challenge weekend, although it was hosted by Kyosho/Great Planes, there was a very obvious air of



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Futaba's spectacular Seven Series radio control system provides accurate computer control of ATV, servo-reversing, dual rates, exponential, flaperons, snap roll and mixing with all settings clearly displayed on the Liquid Crystal Display and stored in memory. The dual conversion FM receiver meets 1991 standards and the transmitter utilizes a plug-in RF module. But scale models often need more than 7 channels to control the many functions to be duplicated from the original prototype. So we've added 12 more channels with our KEYKODER system to make an 18 channel radio. Besides the 6 regular servo channels for control surfaces & speed controllers there are 6 new momentary digital on-off channels for guns, torpedoes, sub-diving pumps, bells, & whistles PLUS 6 digital channels programmable for Key-on/Key-off operation for

lights and other latched functions. Each digital channel output is a solid state switch that controls up to 4 amps 3-28Vdc directly without extra servos. Or the outputs can be used to drive servo mechanics. External relays may be used for higher power or to switch the servo channel outputs to a second set of servos for even more versatility!

The KEYKODER uses the 5th regular channel to piggyback the twelve new channels; the joysticks and remaining FP-7UAF channels are unaffected. The KEYKODER transmitter Keypad is factory installed and unplugs for access to the transmitter programming buttons. The Receptor module, which separates the Keypad commands into 12 individual outputs, plugs into the receiver like a servo. Receptor: 6 1/4 X 3 1/2 X 2 1/8".

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complete and friendly cooperation among the various manufacturers present. Hobbico's Tim Lampe, who was the CD and prime mover of the event, kept everything open and on the table, even incorporating some good-natured kidding that was enjoyed by all parties and resented by no one. In fact, as the results show, Kyosho helicopters did not fare that well in the top-level FAI category, though they placed at least first in all the other categories, and outnumbered all the other brands put together in total number of entries.

The weather also cooperated much better than expected, with clear, cool, dry air, although said air was moving a little fast (can we say, "windy?"), causing some difficult turbulence from time to time.

The day's activities were capped off with an all-you-could-eat fried chicken dinner served at the pavilion for all fliers, mechanics, and workers. Suffice it to say, there was a little chicken remaining after everyone had had the opportunity to go back for seconds, or thirds, or whatever. The Red Roof Inn, which was the host hotel offering special rates for participants, was treated to some late-evening heli flying just before sundown, and bull sessions continued outside the rooms until about midnight.

Sunday, June 10

Two more rounds of competition were completed by 4:00 p.m. Awards were then given out and open flying was in order for the die-hards as competitors packed up for

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the trip home. James and I cleaned up at the motel, walked over to Alexander's where I introduced him to the cook-it-yourself experience, and then drove him to the airport to pick up his 8:00 o'clock "boxcar" to Chicago and the return flight to Maryland.

Monday, June 11

Would you believe one more tour? Remember, we said that Horizon Hobby Distributors was also in Champaign. Guess where? Five minutes from the motel and within sight of Hobby Dynamics!

Debra Love took us on this fourth and final tour of our trip. Although the smallest of the three distributor facilities we visited in Champaign, it must be remembered that Horizon Hobby also has a west coast and

east coast facility, obviously with the purpose of faster service to the dealers in the respective areas of the country. This office is also the main headquarters of the company.

If you've seen one, you've seen 'em all? In some respects, yes. The high storage racks full of hobby items, the fork lifts, the order pickers with their carts, etc. But one idea stood out and caught our eye. If you've been to the dry-cleaners, then you've probably seen them push a button and watch the clothes speed by on overhead tracks until they stop at your stuff. Well, here it was again, only now it was carrying stacked trays of hobby products! The picker stays in one spot and grabs the gold ring (or glow engine) as it goes by. Clever. Another noticeable

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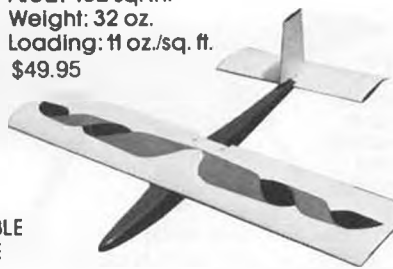
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difference, probably because of Debra's influence; a higher percentage of females on the work force and holding key jobs. Great!

By mid-afternoon, we were outta there and on our way home. Riding in the plane out of Chicago, I was thinking back on this weekend, and trying to remember where I had seen what. One thought, however, kept coming back to me... how enlightening it would be if every aircraft modeler in this country, whether the interest is free flight, control line, radio control, or any combination of the above, could see what I saw in Champaign, Illinois. Because if they did, they might then realize what a huge and vital industry there is behind all of their individual hobby interests. It's awesome! **MB**

CHATTER *Continued from page 20*

lead weight in the blades, and have an optional stiffer spring steel plate for the intermediate and advanced pilot who likes to do autos and aerobatics. A stiffer plate increases the control response for crisper aerobatics and hot dogging. The most distinct feature of the Enforcer is its transmission system (see the photo). Enforcer's planetary gear drive system is extremely smooth! Just try turning the main rotorhead by hand, and it will spin for a long time. We will discuss the Enforcer in detail in our upcoming review. By the way, I like the way the Enforcer does switchless inverted flight. It was very easy to do, almost felt like my X-

cell 60 flying inverted.

The Concept 30 was still the most popular 30-size model at the contest. Most novice and intermediate contestants flew the Concept SE. The SX was not available at that time. One of the differences between the SX and SE is that the SX has thrust bearings for the main rotor, thus weighted blades can be used more safely. The stock foam blades on the Concept weigh about 70 grams each. The Concept weighted wood blades are about 80-85 grams each. With thrust bearings you can probably use blades up to 100 grams. Alex Gauss, of Chesapeake, Virginia, makes 30-size fiberglass blades that weigh 95 to 100 grams each. They are well finished and cost \$69 a pair. Check with Alex at (804) 485-4210. The SX still uses a plastic swashplate, but the plastic balls on the swashplate have been replaced by steel balls. The main rotor blade grip pitch arm has also been moved in 5mm to give more collective pitch and cyclic pitch (Bell action). The SX also comes with a stiffer rubber damper, and larger and thinner Hiller paddles. These all result in a more aerobatic model. The centrifugal clutch drive gear on the SX comes with double ball bearings; these bearings are optional items for the SE and DX. The SX costs about \$60 more than the SE, but the amount of optional items included are worth much more than \$60.

Even though this was a 30-size only contest, top pilots from all over the country attended. Model companies took this con-

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test quite seriously to gain a share in the 30-size market. Altech Marketing, which is now the sole distributor of Hirobo helicopters in the U.S., sent Mike Mas to compete. He flew the new Shuttle ZX to a close fifth place in FAI. Even a fifth place was respectable, considering the fact that four of the top five place winners had all competed in the World Championships at least once. First place Cliff Hiatt was on the '85 U.S. team, third place Nagatsuka (flying the Enforcer) was on the '85 Japanese team, fourth place Tim Schoonard was on the '89 U.S. team, and fifth place Mike Mas was on the '87 U.S. team. Second place Wayne Mann says he wants to be on the 1991 U.S. team. Good luck, Wayne. After the contest Mas did another world-first stunt. He landed his Shuttle ZX inverted. Bill will (Did! September MB cover. wcn) show you the picture. Mas simply added a threaded rod at the top of the ZX rotorhead. The platform that he landed his helicopter on was drilled with one-inch dimples about two inches apart. Thus, once the model landed inverted on the platform, the protruding rod would walk by itself to a close-by dimple and stay there. The platform was mounted on a tripod about two feet high to move the model up and away from ground effect. Otherwise, the inverted rotor at very close distance to the ground surface causes air turbulence.

Presently there are four electric RC helicopters commercially available. Unfortunately they are all (Not quite, wcn) available

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in Japan only. The four models are Aisonics EH550 (and the newer EH650), Tobuzo Mini, Kalt Whisper, and Kyosho Concept EP. All these models, except the Aisonic 550, have collective pitch. Out of these four, I saw the Kalt Whisper and Kyosho Concept EP demonstrated at the contest. They averaged about four minutes on one charge. They were looping, rolling, and even performed motor-off autorotation. They looked very fragile, but they seemed to fly pretty well. They are probably too fragile to take the abuse that beginners will dish out. And it probably takes a good pilot to roll those electric helicopters, because without a large power margin, there is no room for mistake. They certainly have come a long way since

the first electric RC helicopter, Ishimasa EH-1, that was introduced in 1980. I had two of those Ishimasa EH-1s, I could only get a few seconds of battery powered flight out of them. These new electric helicopters are flyable because of more powerful motors, better NiCd batteries, lighter frame design and modern electronic speed control units.

In Japan, the Aisonic 650 and 550 are 59,000 Yen and 45,800 Yen each (130 Yen = 1 U.S.\$). Tobuzo costs 44,800 Yen. Tobuzo uses two RK-370 motors and a 7.2-volt 600 ma NiCd. The main rotor diameter is 24.3 inches and it weighs 1.4 pound. Tobuzo's main rotor blade grips are simply Hirobo tail blade grips. The washplate slides up and down for collective control. The Kalt

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Whisper and Concept EP look very similar. The Whisper is the largest of all the electric helis. It uses a single RX-540VS motor, a 9.6-volt 1100 ma NiCd, has a 37.4 inch rotor diameter, and weighs 2.6 pounds. They will be in the U.S. about Aug. 15 (See September MB "Workbench"). Copter Corner in California says that they have two dozen of these on order already. Call them at (213) 828-2028 for price. The Concept EP is 33 inches long, uses an 8.4-volt 1000 ma NiCd, and an AP-360 motor.

Every year I attend the American Helicopter Society's Technology Forum and Display. It is a conference where all the full-size helicopter engineers gather and exchange ideas. Full-size helicopter companies

also put on dazzling displays. At the 1990 AHS Conference I saw a neat RC flying saucer displayed at the Sikorsky booth. The pictures show you what it looks like. It is five feet in diameter, and has two main rotors rotating in opposite directions inside the doughnut-shaped body. The rotors are powered by a quarter-scale model airplane engine. Two Schluter three-bladed main rotorheads are used. Standard Futaba PCM radio system is used for control. Three Futaba 153 gyros are there to help stabilize the pitching, rolling, and yawing motions. The saucer is called the "Cypher." The displayed model was only a proof-of-concept model. Eventually, the final design will be about the same size, but powered by a 65 hp rotary

engine and will weigh about 150 pounds. Then, it can carry an additional 150 pounds of sensors and a data-gathering package. It will have a stability augmentation system to permit the Cypher to operate out of visual range and 30 km behind enemy lines to give division commanders real-time intelligence.

Sikorsky claims the shrouded coaxial rotor system requires only about 70% of the power that an unshrouded, single rotor system needs during hover. The shrouded unit will also be safer to operate in the field and less susceptible to rotor damages (no broken blades, guys!) The flight duration of the final Cypher will be in the 3-4 hour range, and with a cruising speed of 70 knots.

Finally, we conclude this month's column by showing some pictures of some new model helicopter items. The first is a picture of GMP's new 30-size "Viper." The Viper was not present at the 30-size challenge because GMP was still doing final flight testing. The Viper picture was sent to me by Greg Milosevich of GMP. John succinctly described the Viper flying performance as "terrific!" We will keep you posted on its development.

Another picture shows a set of new weighted Hiller paddles for 40 to 60 size helicopters. These are produced by Miniature Aircraft Supply. The beauty is that the trailing edge is hollow, and up to five half-inch long brass weights can be inserted in the leading edge to achieve desired paddle weight. I have flown these paddles on X-Cell and Legend, and they give very smooth control response. They are worth trying; and are less than \$20 a pair. When you use these paddles, you can remove your old flybar weights. MAS calls these CG-corrected paddles, but the improvement in stability is not due to adding weight in the leading edge. Adding weight near the leading edge on the blade can help stabilize a model, but the situation is different for paddles because blades can change pitch individually, but Hiller paddles don't because both paddles are tied together. Thus, there are different kinematic problems. Anyway, due to the paddles' rounded leading edge, and thick airfoil, and weight, they will make your X-Cell fly smoother.

The other pictures were sent to me from Century Imports (Helicopter World) in California. They show their 30-size pre-painted Airwolf fuselage, 30-size tuned pipe, 30 to 60 size nylon landing gear system, and tool-steel quality Allen wrenches. Check with them at (408) 436-1025 for more details.

While I was visiting California recently, I spent some time flying with the West Los Angeles College bunch of helinuts. These guys are interesting. When someone crashes, they cheer! One of fliers was Reza Fetami, who is the newest Vario representative in U.S. He imports the Vario helicopters and accessories from Germany. The picture shows his Vario Sikorsky 5-76 model. It's a 60 size model complete with retracts and closing retract doors; impressive! The other more fascinating thing he showed me was



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the Vario BERP model rotor blades. In April 1989 Model Builder, and May 1990 Model Aviation, I showed a picture of the BERP blades that I was testing in the wind tunnel. BERP stands for British Experimental Rotor Program. BERP blade was designed by British Westland Company in 1986 to improve the forward flight performance of their full-size helicopters. With the BERP blades, Westland set a new full-size helicopter speed record at 249.6 mph in 1986. Well, the German model company, Vario, has copied the BERP blade and shrunk them for R/C helicopter use. The blades have a symmetrical airfoil, and the length from tip to the mounting hole is 26 inches. Typical blade weight is about 190 grams, thus they will fit almost all the 60-size models. I tried a set on my Schluter Magic. The forward flight speed seemed a bit faster, but vertical climb rate slowed down very slightly. Hover was extremely stable; this could be due to the 193 gram weight. But forward flight was very smooth. Next time I will give you more principles on how the BERP blade works. These model BERP blades are not an exact copy of the full-size blades, because the full-size BERP design is still classified.

Whoops, this month's column is really getting too long. See you next month. For now, call Reza at (213) 556-8080 for ordering the model BERP blades and other info on Vario helicopters. These fiberglass blades are about \$130 a pair. We will show you the pictures next month. **MB**

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PCM-10 *Continued from page 22*

cyclic stick is fed in to make the model fly forward inverted and level. For most helicopters, like the X-Cell, Magic, Excalibur, and Legend, only about 2 to 4 percent back cyclic stick mixing is required, and about 1 to 3 percent forward stick mixing. The exact amount varies from model to model. Even on the same model, by using different sets of main rotor blades, each will require slight program change. For example, I am using Hybrid Hobbies' double reflex wood blades on my Excalibur now. One set causes slight nose dive in forward flight, while another set causes a slight climb in forward flight. These two pairs have identical airfoil and length,

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the only difference is the pair that causes diving is 155 grams and the trailing edge is made of balsa wood, while the set that causes climbing weighs 170 grams and has heavier Obuchi wood trailing edges. (Same amount of lead weight was added in both sets.) Next time we will show how to program the Futaba 9VH for stunt trim, U-shape rudder, and cyclic mixing.

Let's continue with the PCM-10. Besides the very useful stunt trim and U-shape rudder mix that uniquely exist on the PCM-10, it is also the only radio with a touch-sensitive LCD display screen. The user programs the radio by pressing lightly on the LCD display. Very neat! My friend explained the principle of how it works. Over the LCD display, there

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is a very fine wire mesh that is sensitive to the capacitance of our touching finger. When I show the PCM-10 to others, this is the feature that is most attractive. Under bright sunlight, the LCD display can be a little difficult to read. But this is not a complaint at all. The Futaba 9VH has a trim pot on the

side of the transmitter that allows the modeler to adjust the contrast on the LCD display. The PCM-10 does not have it. As you can see, the above paragraphs illustrate why it's difficult to say which radio is better. Each radio has its own merit. If the two companies combined, we would have a radio that will

be almost perfect!

The PCM-10 comes with sufficient features that will satisfy even the demanding expert fliers or electronics aficionados. I have even seen beginners flying with the PCM-10. Just holding this piece of work in the palm gives a tingling sensation. It's similar to stereo buffs who must buy the latest stereo system that gives flat frequency response from 10 Hertz to 40 kilo-Hertz, even though the human ear can only hear from 20 Hertz to 20 kHz.

The PCM-10 has a long list of features which includes reversing switches for all 10 channels, ATV end-point adjust, dual rate and also exponential for pitch cyclic, roll cyclic, and rudder, subtrims, throttle/rudder ATS mixing, and rudder/throttle mixing. Rudder/throttle mixing is different from ATS. Rudder/throttle mixing means that when right rudder command is fed in, throttle will increase automatically to compensate for the extra engine load that the tail rotor imposes due to increased tail rotor pitch. Like the Futaba 9VH, the PCM-10 also has five separate pitch curves and four throttle curves. The five pitch curves are for normal flight, idle-up 1, idle-up 2, throttle hold, and inverted flight. The figures illustrate the general pitch curve shape that are used on my models. Other features on the PCM-10 include CCPM for swashplate (see March and April 1990 for how CCPM was implemented on the Schluter Magic that we reviewed). JR PCM-10 allows only three servos 90-90-90 CCPM, or 120-120-120 CCPM. This means the three servos are each located 90 degrees apart or 120 degrees apart. The Futaba 9VH not only can do JR's three servos CCPM mixing, but Futaba 9VH can also do four servos CCPM mixing (which was used on our reviewed Magic). But, PCM-10 comes with five programmable mixing circuits, Futaba has four.

The beauty of these modern programmable radios is that the pitch curves, reversing switches, and mixings, etc. are input to the transmitter through depressing some keys or the LCD screen. There are no mechanical trim pots to adjust at all! Trim pots can deteriorate with age, but not software programming as on PCM-10 or 9VH. The added advantage of these is that up to seven different model configurations can be stored on them. In other words, you may use the same transmitter to operate up to seven different helicopters (of course not all at once). (Maybe next year, right James? wcn) Instead of buying seven complete radio systems, just buy one PCM-10 radio system and six more flight packs. This reduces cost and means you do not have to remember where all the switches are; which can be confusing when using different transmitter designs. Another useful purpose of having seven model configurations is that different control setups can be implemented for the same model. For example, you may have one set of configurations for smooth contest flying purposes, another set for hot-dogging, and another for hot and humid days. Even though it's called the PCM-10 (PCM stands for Pulse

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1 3/2 x 3	37			3 3/2 x 1 2	16	
1 2/0 x 3	37			1 8 x 1 8	08	
1 1/6 x 3	37	49	31	1 8 x 1 4	11	16
3 3/2 x 3	44	58	37	1 8 x 3 8	12	18
1 8 x 3	54	71	45	1 8 x 1 2	18	24
3 1/6 x 3	62	82	55	3 1/6 x 3 1/6	11	16
1 4 x 3	73	95	61	3 1/6 x 3 8	17	20
5 1/6 x 3	85	110		3 1/6 x 1 2	22	30
3 8 x 3	88	124	71	1 4 x 1 4	16	24
1 2 x 3	110	155		1 4 x 3 8	19	26
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1 1/6 x 4	58	76	48	1 4 x 3 4	34	44
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1 8 x 4	80	106	66	5 1/6 x 5 1/6	21	28
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Coded Modulation), it has the versatility of being switchable to Pulse Width Modulation by touching one key. By switching to the PWM mode, the transmitter becomes compatible with almost all the JR FM receivers. This allows you to buy the less expensive JR FM 327 receiver (the one that came with the Century 7 systems) for your second flight pack. (In the May 1990 review of Airtronics' Vanguard 6H, we explained the differences between PCM and PWM coding technique, and AM versus FM transmission method.)

The PCM-10 helicopter version retails for \$1299. It comes with five double ball bearinged JR-4031 servos and a 1000 ma receiver battery pack. While most R/C transmitters come with 500 ma NiCd packs, the PCM-10 utilizes 700 ma packs. I have safely logged six 15-minute flights on one charge. There is an optional base loaded whip antenna available by JR for the PCM-10 for about \$50. This whip antenna is only half the length of the fully telescoped antenna. JR claims there is no loss in radio range. I bought one of these and used it for about 30 flights. In one instance, I did have a brief loss of signal when my Excalibur, using the PCM-10, was flying at 100 foot altitude at about 700 feet away. Luckily I did not crash, because the moment I lost the signal, I realized that my transmitter antenna was pointing at the model. I immediately pointed the antenna about 30 degrees away from the model and regained control. There was a loss of signal for about two seconds.

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The Excalibur did 3/4 of a roll by itself. This may not indicate the problem was due to the base loaded antenna, it simply means DO NOT ever point the transmitter antenna at the model! Radio signals from a single antenna obey Bremstrulongs radiation principle and produce a rabbit ear-like radiation pattern; signal is the weakest in the direction that the antenna is pointing, and strongest at about 30 degrees to the antenna. Yes, I am still using the base loaded transmitter antenna.

Now, let me show you how I set up my helicopters in general. The PCM-10 and Kalt Excalibur will be used here as examples. For helicopter radios with two idle-ups, I usually set the pitch curve for idle-up 1 the same as

that of the normal pitch curve. For Excalibur, I use +7 degrees at full collective, +4 degrees at hover (throttle/collective at the center), and -4 degrees at low throttle/collective stick. For beginners, I recommend -1 degree or 0 degrees at low collective stick, because beginners tend to chop the throttle in emergencies, and we do not want to see the model suck itself to the ground, which can give unpleasant results! I use the normal curve for hover and general low speed cruising around. The ATS throttle rudder mixing is set up for the normal pitch curve, such that punching the throttle will give a vertical climb without the nose yawing to left or right. For setting up new helicopters, try 30% ATS as a start. Since most R/C model



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back of using idle-up is that usually after a crash, the idle-up switch remains engaged, thus the model will beat itself to death on the ground, and the engine roars wildly.

Idle-up 2 is used for switchless inverted flight. In idle-up 2, the engine carburetor is opened almost 100% at low collective stick. The pitch is still +7 degrees at the top, and about 3 degrees at the middle, but -7 degrees at low collective stick position. My helicopter hovers inverted at about 1/3 stick. At full low stick my model can climb inverted. Many fliers use a linear pitch curve for switchless inverted flight.

Since the maximum engine power will not change whether you are using normal mode, idle-up 1 or idle-up 2, these three modes should all have the same top-end collective setting. In general +8 degrees is a good place to start. Full power climbout is not the way to set the top-end pitch. For example, 10 degrees may not load up the engine in a full power climb out, but when you do a high speed tight turn, at 10 degrees, the engine will probably load up and quit. The reason is that in a banking turn, the centrifugal force is pulling the model outward. Think of it as someone holding on to the landing gear and pulling it. This phenomenon exerts extra aerodynamic load on the main rotor disk which causes the engine to bog down. In level flight the model is only doing one G. Which means the rotor only needs to produce enough thrust to equal the model weight. A 10-pound model in level flight means the rotor is producing 10 pounds of lift. But in a 40-degree banking turn, up to 1.5 g loading may be exerted on the rotor, and the rotor blades see a higher effective angle-of-attack than in normal level flight. Therefore, always set the top-end pitch by doing a series of full throttle, spiralling turns; the engine should bog slightly, but not die! For beginners who can't fly forward yet, set the top to what the instruction manual recommends.

Notice that the pitch curves are not a straight line. They flatten out at the top. This is because model engine power output is not linear relative to carburetor opening. For example, we hover at half stick with the carburetor half open. But at full stick, 100% carburetor opening does not give twice the power output as compared to hover. A typical engine horsepower output chart shows the hp flattens out as the carburetor opens up more, and as engine rpm increases.

On my Excalibur and my other 60-size models, the throttle hold pitch curve has +10 degrees at the top and -5 degrees at the bottom. The extra negative pitch allows me to bring the model down faster if I were going to overshoot a spot landing. The extra pitch at the top is for flaring the model just before touchdown.

I usually do all flying with the dual rate switch set at high. Typically that gives at least plus or minus 20 degrees of paddle deflection angle. Low rate switches are set to 85% of full rate deflection. On PCM-10 and 9VH, I use 15% exponential on fore/aft and roll cyclics, and 10% exponential for tail

helicopters have clockwise rotating main rotors, make sure you set the transmitter's rotor rotation switch to R, otherwise the ATS mixing will be backward. You want the ATS mixing such that increasing collective pitch will increase tail rotor pitch at the same time.

I do most of my aerobatics on idle-up 1. The throttle curve for idle-up 1 is shown in the drawing. Idle-up 1 has sufficient throttle opening so that as I am doing a roll, during the inverted portion, when I usually pull the collective stick back to about 1/3, the engine will maintain a fairly constant rotor rpm. I set most models to hover and do forward flight at 1500 to 1600 rpm. Miniature Aircraft's

Skytach is probably the only, and safest, way to measure model rotor rpm (about \$170). If you do not have a Skytach, then the rotor/engine should sound healthy, not lugging, but not screaming either. This is where experience comes in. After a while your ear will be a perfect tachometer. If you are a beginner, try seeking the help of a proficient heli flier. A general guideline to spotting proficient fliers is to see who has the better painted canopy. Usually only fellows who know how to fly and do not crash often are willing to spend extra time painting their canopy nicely. Of course, there are always exceptions to every rule. Beginners should not try to use the idle-up feature. The draw-

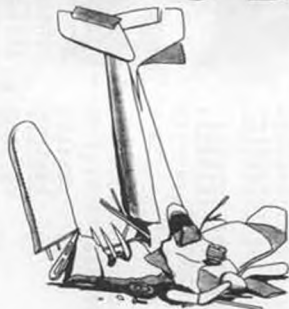
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rotor. Low rates are for precision hover only. If you have a PCM-10, try 5 percent left cyclic, 2 percent forward cyclic, and 5 percent left rudder as input for the stunt trim. These values should help make your model fly forward straight and level by itself, once idle-up is turned on.

Finally, we will wrap up this article by discussing the JR-120 gyro and Excalibur. The JR-120 gyro is probably the best gyro now. It far surpasses the old JR-100 and JR-110 gyros. It make those old JR gyros seem like garbage (not too many fliers liked the JR-100 and JR-110). The 120 is the only model gyro I know of that uses a spring steel plate for restoring the motor/gyro assembly to center. All the other gyros on the market use coiled springs. What makes the 120 so nice is that it must have a very nice control law algorithm. This is how the electronic circuitry processes the signal once a signal is picked up by the gyroscope. The signals are processed via a set of mathematics governing laws. In control theory, this set of math equations is called control laws. Different designers can derive different control laws. JR-120's designer has devised a very nice one that permits the gyro to be extremely sensitive, yet, not cause over-feedback which leads to tail wagging. Very impressive! The JR-120 retails for about \$130. But it does not have a motor switch. This can be annoying sometimes because often during adjustments to the model, you do not want to keep the gyro running. The JR-120 has an inflight

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switchable dual rate feature. I set the low rate to 30% and high rate to 40%. Low rate is set such that the helicopter can do the 540 degree stall turn maneuver without hesitation. High rate is used for precision hover, or when I feel lazy about working the tail control.

The Excalibur that we reviewed in the last two issues has logged over 80 flights. The self-aligning clutch has given some problems. One of the problems is that the clutch wobbles slightly. Since there is no clutch shaft to dial in, this problem can be alleviated by widening the slot in the plastic coupling unit. The clutch shoe on my Excalibur has broken once. The Excalibur and Omega use the same clutch shoe. Other

fliers have reported their clutch shoe failed, too. Many fliers are experiencing difficulty obtaining parts. I waited for my clutch parts for months. Finally, Copter Corner, which is located 3000 miles away from me, got a set for me. The other two sets that Copter Corner had were immediately snatched up by another modeler. Recently, I replaced the entire cooling fan, clutch, and clutch bell with a set from my GMP legend. They fitted perfectly on the Excalibur. Legend's clutch shaft fits the Excalibur bearing perfectly. One of the problems after many flights is that the stock Excalibur pinion that sits in the bearing block gets worn quite badly. When installing the GMP clutch bell, just remove the lower bearing sitting inside Excalibur's

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bearing block, then everything will fit beautifully. (Next month I will show you the picture.)

Aside from the clutch breaking, and the self-aligning starting system not lining up well, the Excalibur is an extremely desirable machine. It hovers superbly; once it's trimmed you can take your hands off the transmitter for two to three seconds, and the model will still be there. In forward flight it tracks like an arrow. The closing advice is to make sure you CA glue each of the five tail drive wire support disks in the tail boom. The instructions do not call for this. After about 50 flights, all five plastic disks migrated slowly by themselves all the way back to the tail end of the tail boom. This allowed the tail drive wire to whip inside the tail boom, and eventually caused the wire to snap. Luckily I autorotated the model safely. So, I do have lucky days! Skill alone doesn't cut it. See you next month for the X-Cell 60 Custom review. **MB**

PRECISION *Continued from page 25*

the NP. The distance between the Center of

Gravity and the Neutral Point is called the *Static Margin*. This distance is what we are playing with when we move the CG around during trimming operations to correct various flight problems. The CG goes forward, pitch stability increases; to the rear, stability decreases. Big deal, and tell you something you don't already know, right?

Generally speaking, it is to our advantage to have the CG pretty far to the rear in a pattern plane. If we don't stick it back there pretty far, sometimes snap rolls and spins aren't even possible, let alone controllable. More important, we don't want to have to counteract the overall nose-down pitching moment caused by a forward CG by carrying up trim or riggering the stab with more negative incidence (or the wing with more positive). We want the mainplane and the tailplane to be rigged to the same or nearly the same angle. For one thing, when the airplane rolls, all your up trim just became down trim, get it? Large angle of attack changes (elevator deflections) are required of the tailplane to hold the airplane on a line.

Knife-edge flight is another case. Here the wing and tail are (supposedly) unloaded. If there is angular difference between the rig-

ging angles of wing and tail, it will plainly show as a lateral pitch. The same thing is true with the vertical lines.

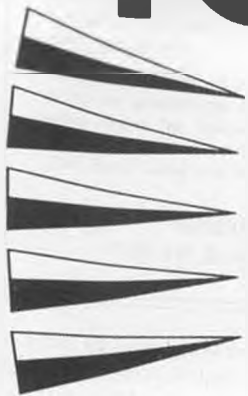
This is the reason that we move the CG around to achieve a level flight trim condition that involves no difference in incidence or trim between mainplane and tailplane.

So we would like an aft CG and the main and tailplanes rigged to the same angle, plus we don't want to carry any trim in level flight. And we want the airplane to be hands-off stable from horizon to horizon. Nice problem.

Unfortunately, moving the CG to the rear (closer to the NP) makes the airplane skittish. Pitch loads are too light and damping action is decreased. The plane is easily disturbed by gusts and tends to wander up and down rather than "groove." In other words, pitch stability has decreased. To regain our static margin of pitch stability, we have two ways to go. We can either move the CG forward again, or we can increase the tail volume. Tail volume is moment arm times area, so an increase in either makes for an increase in the whole. An increase in both is what we see a lot of these days. This accomplishes a couple of important things. First, it increases

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tailplane efficiency. The longer lever arm and increased area allow the stabilizer to be more effective both in control and damping. Second, any increase in tail volume moves the Neutral Point of the aircraft to the rear.

Moving the NP to the rear by increasing tail volume regains the static margin and the missing pitch stability. Our CG can stay where it needs to be, and everything is, ah, groovy again, you might say. Put another way, an aircraft with small tail volume and a forward CG and an aircraft with a large tail volume and an aft CG may have identical weights, identical static margins, and identical pitch stability, but they will definitely differ in their respective pitch force arrangements. The one with the small tail and forward CG will require a much greater difference in incidence (or trim) between the wing and tail to maintain a trimmed condition in level flight.

Now, wait a minute. Don't we need a little up trim in level flight if our main and tailplane incidence angles are the same and both have symmetrical airfoils? We have to keep that wing biting air, don't we? Aviation is not famous for providing free lunches. Well, maybe just this once we do get some help. Enough of us have owned, flown, or heard about aircraft that are zero-trim stable that we know that the condition is not impossible. My Cursor design shows no incidence difference on the plans, and when the CG is right, the airplane shows zero-trim stability in level upright flight at the de-



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signed maneuvering speed. Why?

My own crackpot opinion, herewith stated, says this problem gets mostly solved by the wing, providing the stab is not positioned too high on the fuselage relative to the wing position and thrust line. Vortex-induced downwash from the loaded wing as it generates lift will cause the stab to "see" an aerodynamic negative angle of attack, causing a download on the tail even if it is rigged at exactly the same geometric angle as the wing. This effect is always present, but becomes more prominent with the increase in tail size. Unload the wing, as in knife-edge or a vertical line, and the downwash disappears, taking the download with it. Inverted flight shows the same effect, but as

the stab is in a slightly different relationship to the wing (the thrust line may also be tilted), some slight trim pressure may be needed. Again, though, all of us have heard about airplanes that have near zero-trim stability both upright and inverted. A pipe dream? Maybe, or maybe just the right sized stab in exactly the right position.

There are other observations worth noting about the long tail. The drag (acting through the NP, remember?) migrates to the rear. Arrow-like flight characteristics and a cleaner, more uncocked drop on vertical downlines seem to result. Authority is increased in yaw. After all, the vertical fin and rudder are back there on that long lever arm also. The NP in the vertical plane moves to

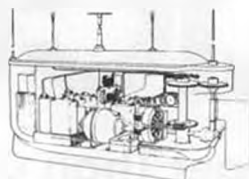
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Try to visualize yourself, if you will, living back in circa 1898 for just a moment. You're reading the newspaper when you come across an article about a man by the name of Nikola Tesla, whom sailed a boat without wind or steam, without a crew, without anybody on board! This actually happened. Tesla's boat, which resembled a submarine conning tower, was controlled without wires, but a new form of wireless control that would be called RADIO years in the future.

In 1897, Nikola Tesla, submitted a patent application for his invention (teleautomatics) to the United States Patent Office. Tesla's application stated a device capable of being controlled remotely and without wires! As the patent examiner began to scrutinize the patent application, he just couldn't believe what he was reading. He was awestruck! In fact, the application was so farfetched, the chief patent examiner decided to pay a personal visit to Nikola Tesla's laboratory to see the invention for himself.

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newest slope racer wing used 11 ounces of fiberglass cloth to only 6 ounces of EZ Lam, which is an excellent ratio. EZ Lam is available only from George Sparr of Aerospace Composites, P.O. Box 16621, Irvine, CA 92714, (714) 250-1107, call for price.

Joe has been slowly lightening his aircraft by using less and less materials in his wing and stab skins. The V-tail stabs are also fiberglass sheeted blue foam core. Here Joe used 3/4-ounce glass cloth. These stabs are so delicate that he has to caution anyone wishing to touch them that they dent easily, but they survive air loads just fine. For those who plan on an occasional violent meeting with planet Earth, conventional balsa wood stabs would be a better choice.

For his third RCHLG model in a row, Joe picked his favorite hand launch airfoil, the Eppler 387. This section is thin and somewhat undercambered from 50% of chord to the trailing edge. It was the Airfoil of the Month in the September 1985 issue of Model Builder (courtesy of MTB 1/2: Eppler-Profile & now available in the USA from John Lupperger Plans Service, see below).

For the third or fourth year in a row, Joe has turned in one of the most incredible flights of the day. How he does it is almost a mystery, but that is typical of how most "professional" sportsmen have a way of making their sport look easy! What Joe has repeatedly done is ace his first round flight on his first (or second) throw! Joe's near-ten-minute flight from a single toss this year was made even more impressive by the fact that lift was weak and spotty all day long, and the first round was especially so.

Daryl Perkins finished second, flying Joe Wurts' 1989 ISS RCHLG entry. This plane features a balsa fuselage along similar lines as the "Flinger," mated to a practically identical fiberglass and blue foam core set of E-387 wings, and similarly constructed conventional looking stabs. (If the truth were known, both of Joe's wings were built over

the rear, taking the drag with it. Knife-edge attitude seems flatter, given enough lateral area. Exits from snaps, spins, and stall turns damp better, and the airplane, being longer, presents a noticeably better line to the judges as it flies through the maneuvers. Pitch response is smoother and more graceful.

Everything is not an aeronautical rose garden, however. Increased authority in yaw means increased weathervaning tendencies in crosswinds. The same weathercock effect in pitch is noted in vertical or 45 degree lines with a strong head or tail wind. And the long tail can be a pain when it comes to shipping or transporting the airplane.

The best defense against excessive weathervaning is increased flight speed. The idea, as Hanno Prettnner once remarked, is "a light airplane and a very powerful engine." Right. Actually, some weathercock tendency is fine, as it amounts to setting a slight crab angle into the wind in order to hold ground track. The cocked fuselage attitude on a vertical line will mean absolutely nothing to a knowledgeable judge who is looking at track. As far as the rest goes, nothing works if you build heavy, and you can always make a plug-in stab, buy a bigger car, and

build a larger model box.

Thus ends the tale of the tail. In parting, I would like to renew my plea to make my mailbox sing with letters and especially photos. Color prints are just fine for magazine reproduction. See ya at the field. Rick Allison, 15618 N.E. 56th Way, Redmond, WA 98052; (206)883-3047. **MB**

SOARING *Continued from page 28*

paint, slowly building up opacity, to prevent the paint's solvents from eating the styrene plastic.

The vacuum bagged skins are a single layer of 2.2-ounce fiberglass cloth top and bottom applied with "EZ Lam" epoxy resin. On the top surface only, a second layer of this cloth extends out from center 8-10 inches.

Joe says EZ Lam epoxy is the best he has ever used (and he's used a lot of epoxies). He says it has a long working time and good pot life, plus it is extremely thin stuff so you tend to use less of it, thus saving weight. Joe says it wets out fiberglass cloth like water. His



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two years ago at the same time.)

The performance of this model was sufficient for Daryl to have little trouble placing very high at the ISS. In fact, at the end of the third round, Daryl and Joe were in a two-way tie for first place. A flyoff was required to determine Daryl's second-place standing.

Third place was taken by Kent McKenna. Unfortunately I have no info on pilot or plane.

Fourth place was taken by Joe Rodriguez, the ISS newsletter editor. This was Joe's first ever RCHLG contest. This fact makes his high placing very impressive, and even more so when you consider he was tied for first going into the final round with a perfect 2,000 point total.

Joe flew an original Marc Higginbotham design called the "Icky." This design is a very conventional V-tail, and resembles the old Larry Jolly "Icarus" two-meter class kit. Marc used an airfoil as close to the Icarus airfoil as possible, i.e., a 10% flat bottom. He knew that the Icarus flew very well, and he just felt that it "looked right" for his style of HLG flying.

The Icky wing has balsa sheeting from the leading edge back to the spar on the top surface only. All ribs were cap-stripped for additional rib and wing strength. The V-tail was shaped from solid 3/32 sheet balsa for strength and simplicity. An original design Icky fuselage was drawn up, and cardboard templates were made for future Icky models.

Specs for the Icky are: 34-inch overall

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length, 59.5-inch wingspan, 385 square inch wing area, 6.875-inch root chord, 5.375-inch tip chord, four equal length wing panels of five rib bays each, center panels are constant chord, tip panels are double tapered, 13.5-ounce flying weight, micro servos, 275 mA Ni-Cds, mini 4-channel receiver, and a sliding tray V-tail mixer.

There were two Icky models flown at the ISS. Marc Higginbotham and Joe Rodriguez were the two pilots. Each Icky had a sliding tray mixer for the V-tail. Both had the "rudder" servo mounted in tandem behind the "elevator" servo on the same sliding plywood tray. Both used a short wire pushrod between the elevator output arm and the forward fuselage bulkhead to slide the entire tray

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fore and aft for up or down elevator. Both used the small size Sullivan Gold-N-Rods for control surface actuation. The two pushrods which actually move the V-tail's independent "ruddervators" are attached only to the rudder servo's output arms, but on opposite sides.

These two pushrods alternate by pushing or pulling for right or left turns. As an example, viewed from the rear of the model, a right turn has the tail of the aircraft moving to the left as the nose goes right. This happens when the left half of the V-tail deflects up and the right half deflects down. (Yes, there is a slight counterclockwise rolling moment applied to the fuselage, but it is negligible, and will not affect the model's direction of



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The Mirage section excels at light wing loadings and low Reynolds numbers. It has a high stall angle with a gentle stall and fast recovery. Its performance is such that high launches and tight thermal turns are no problem. These qualities suit RCHLG perfectly for a wide range of piloting skills!

However, the Mirage section is for non-sheeted wings only. It requires the turbulation afforded by multi-spar open wing structures. Typically, you will need a main I-beam spar with 1/8x1/4-inch spruce caps just behind the 30% chord point, two upper surface 1/8 square balsa turbulator spars at 10% and 20%, and one turbulator spar at 15% on the lower surface. An optional upper surface turbulator spar can be placed at the 50 or 60% chord point for additional wing stiffness (it has no aerodynamic affect that I'm aware of).

The second airfoil comes courtesy of Fernando Gale's excellent book on aerodynamics, *Aerodynamic Design of Radioguided Sailplanes* (for availability, contact: Ing. Fernando Gale, Via Marconi 10, 28042 Baveno, Italy). This work features not only aerodynamic principles in English and Italian languages, but also 300 airfoil profiles with coordinates for hand plotting. These airfoils cover the widest range of designers I've ever seen in a single book.

The Rhode St.Genese 28 is one that I think will work very well for a wide variety of thermal and slope applications. This airfoil is *thin* (7.6% of chord length), and it is fairly well cambered (3.8%). These two features make the St.Genese 28 a great choice for slope or hand launch models that do not require the spar depth (strength) demanded by winches. It will have less drag than most other airfoils you have tried owing mostly to its thinness, yet with its moderate camber and gently curved upper surface, it should

flight.) When they move in unison, both up or down, you have up or down elevator (pitch control).

The difference between the two lcky planes was in how the plywood tray slides. On Joe's, the tray was epoxied between two 3/32-inch I.D. brass tubes running fore and aft. These tubes then slide over two 3/32-inch O.D. music wire rails, the latter being firmly epoxied between two bulkheads. On Marc's older lcky, the plywood tray slides between two 1/8x1/4 spruce rails. Both work well, but the tube-and-wire system will probably outlast the wood-on-wood system, and it doesn't seem to bother modern receivers with metal-on-metal RF noise.

Personally, I like the lcky design. It is simple, it handles well according to Marc and Joe, it has great still-air performance and moderate wind penetration, and should build in a hurry with no special composite materials skills required. (It also reminds me of Larry Jolly's "Request" which Larry flew in the 1986 ISS contest to three perfect 1,000-point rounds.)

Other models of interest were Rich Shelby's 75% reduction "RO-8" T-tail HLG, George Spitzer's pod-and-boom, nearly-

elliptical wing HLG, and an unidentified modeler's multi-hedralled, constant tapered, Jack Chambers airfoiled original design HLG. There is nothing like the creativity of these RCHLG modelers and many like them!

**AIRFOILS OF THE MONTH:
MIRAGE AND RHODE ST.GENESE 28**

The Mirage is a kit once manufactured by Dynafite of San Marcos, California. Originally, it was designed and partial-kitted by Blaine Rawdon of the San Fernando Valley Silent Flyers in about 1979. It gained overnight popularity in California thermal contests because of its excellent performance range for an ultra-lightweight model. It featured a flat center section with kicked-up wing tips which was an odd R/C configuration at that time, but widely accepted today.

The Mirage airfoil profile has been featured in my column before, however, the coordinates which I have given you before have only been suitable for hand plotting with a pencil and a French curve or ship's curve. Their accuracy has been lacking for computer plotting. This time I present the Mirage section with plot points which I have personally corrected and "eyeball" matched to the original Mirage plans. It took about two

hold a thermal turn with the best of them!

Longtime readers will think they are looking at the Gottingen 795 airfoil. The St.Genese 28 is similar, but I believe it probably is better! The Go-795 has roughly the same camber (4.00%) and a little more thickness (8.00%), but its upper surface has an aft-biased curve (recovery ramp) that says, to me anyway, that the boundary layer velocity gradient should be adverse past about 50% of chord. This would indicate early flow separation (stall) characteristics and/or increased drag at higher angles of attack due to laminar separation bubbles in this aft region. There is no denying that it is a proven performer in R/C, however. The only complaint I've heard about it is that the Go-795 is a low-launching airfoil that doesn't like to pull tight turns—which tends to support my feelings about it. The St.Genese 28 looks better than this.

The St.Genese appears to have a slightly flatter lower surface curve near the leading edge than the Go-795. It could be that it has more curve in the mean camber line close to the leading edge, giving a slightly steeper entry. To me, this would favor a higher angle of attack and slightly higher coefficient of lift at the sacrifice of slightly increased drag at low angles of attack (such as an RCHLG during launch or a fast pass across a windy slope).

Anyway, it looks well suited for RCHLG and deserves a try. Drop me a few paragraphs and photos if you try it, and let us know how it performs for you.

I have smoothed out Fernando's hand-plot coordinates using "Foiled Again" software so that they will work for your computer plotter as well as your pencil and ship's curve.

This airfoil will benefit from full or partial upper surface sheeting and partial lower surface sheeting (i.e. D-tube and cap strip structure). Vertical lines occur at 5% chord intervals for consistent placing of spar notches.

HOW TO PLOT AIRFOILS BY HAND

Many requests have come by my desk in the last few months regarding hand plotting or drawing the airfoils presented in this column. It has been a few years since I ran the explanation, so it bears repeating this month. (Please refer to the illustration at the start of this article.)

You start by selecting a chord length (let's say 10 inches) for a wing you'd like to build and the airfoil you like best for this aircraft.

Step one is to get your tools together. In addition to your chosen airfoil's coordinates, you will need a very sharp pencil, an accurate, preferably scribed steel engineer's rule marked off in tenths of an inch, a small 30-60-90 triangle, two or three drafting curves, and a simple calculator.

Next, draw a horizontal ten-inch line. This is your datum line. It could end up being the line connecting the LE and TE of the airfoil section, or it could end up being the flat side of a flat bottom airfoil, depending on how the airfoil was designed.

For an example, let's use the Mirage air-

foil. Using the "Foiled Again" data file, we see 14 lines of numbers. These numbers are arranged in four columns. (Eppler and Selig profile coordinates are typically in two columns, but the technique is the same.) The first two columns, "Stn.%" and "Upper coord," determine the upper surface curve. Similarly, the next two determine the lower surface curve.

These values are all multipliers of your 10-inch chord (the multiplicand). You will observe that the multipliers are also given, at least in this example, as a percentage figure. I believe this is done to aid visualization of the airfoil in one's mind before it's drawn, because it only complicates the multiplication process! Eppler and Selig coordinates are given as straight multipliers.

Okay. Let's get started. For NACA, Fernando Gale, and many other airfoil coordinates, you may notice that, as with this example, the upper and lower surfaces share the same "Stn.%" multipliers (e.g. 0.00, 1.70, 5.00, 10.00, etc.). These represent points along the datum line which you just drew, and because they are shared, this means less work for you!

Of course, zero times anything is still zero, so the first "Stn.%" is at the far left end of your ten-inch line. The next point is "1.70" and it is a percent (1.70%). Well, 1.70% is 1.70/100, or simply 0.0170 (used as a simple multiplicand). You simply shift the decimal point over to the left two times, adding a zero if you have to get there. So ... point number two on the datum line is 10 inches x 0.0170, or 0.17 inches to the right of the zero point. Make a dot here and draw a vertical line through the datum line at this point. This station point has an "Upper coord" point paired with it. It too is 1.700%. So your first off-datum point will be 0.17 inches to the right and 0.17 inches straight up. Make a dot here.

The next station point is 5.00%. This is 0.0500. So, 10 inches x 0.05 equals 0.5. Measure 0.5 inches to the right of your zero point and draw another vertical line through the datum line. The paired "Upper coord" point is 3.800%. So, 10 inches x 0.03800 equals 0.38 inches. From the datum measure straight up 0.38 inches and make a dot.

This simple multiply-and-measure process continues until all of the station points are determined on the datum line, and the plot points above and below it. Once done, play "connect-the-dots" using a French curve or a ship's curve.

At this point it is very easy to design a constant chord wing... you only need one rib! However, tapered wings require lots of different sized ribs. You can hand plot them all (it'll take days!), photocopy them all (you will not get the exact sizes you want and they may be distorted), you can make root and tip templates and stack sand them all (you'll get ribs with beveled edges)... Or, you can go out and buy the "Foiled Again" program for your home computer. You'll get exactly what you want even down to the exact rib shape for a sheeted elliptical wing... if that's what you're designing! *continued*



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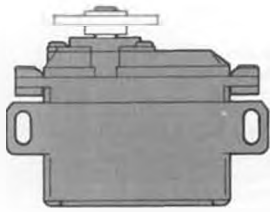
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derneath, leaving only the wheel and needle mechanism. It worked beautifully." It worked beautifully as a jig saw (in place of the needle) and a disc sander (in place of the flywheel). Thank you, Reg Bowyer and Bob Sherliker (editor) for that neat idea!

GOTTA GO FLY NOW...

That's all for this month, glider fans. Lots more neat stuff next month, so come back! Thermals to all! Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, CA 92530, (714) 245-1702 after 6:30 p.m.. **MB**

PLUG SPARKS *Continued from page 39*

WHERE TO GET AIRFOILS?

Well, you can buy a great many of them when you buy a computer program such as "Foiled Again," or Chuck Anderson's program, or you can buy books like Fernando Gale's, or any of the MTB books from Germany. These are distributed in the U.S. by John Lupperger, JM Lupperger Plans, 947 Joann Street, Costa Mesa, CA 92627. The most popular MTB book is the *MTB 1/2: Eppler-Profile* which runs \$19.95 plus shipping. There are other MTBs available too, but space is growing short. Send a self-addressed, stamped envelope and a request for MTB info to John and he will inform you completely.

John also has hundreds of fine sailplane

plans from England and Germany. He handles Argus-MAP plans (\$5.00 + \$0.31 California sales tax for catalog) and *Flug-und Modelltechnik* plans (\$7.50 + \$0.47 California sales tax).

NEAT IDEA—SEWING MACHINE SAW/SANDER

I recently picked up an issue of *The Gull*, the newsletter of the Central Ontario Glider Group (COGG), and spotted a neat idea on its front page. Reg Bowyer, the club president, wrote: "At a recent club meeting (RHMCA) a member displayed some real ingenuity. He had modified an old sewing machine...." Next, the drawing which you see elsewhere in this column was shown. "Most of the sewing machine drive is removed from un-

Burford, of Australia, gave the following results (using Red Max diesel fuel):

Yoshioka 9x4.5	9,100 rpm
Yoshioka 9x5.5	9,000 rpm
APC 9x7	8,100 rpm
Taipan 10x4	8,700 rpm
MK Glass 10x4	7,900 rpm
MK Glass 9.5x6	8,300 rpm
Yoshioka 10x5.5	7,600 rpm

These are my own measured figures extracted from test runs by SAM 21 and SAM 41 members. The figures are not "gospel" but do represent a wide range of propellers that can be used.

In that same line, as soon as we are able to lay hands on an Elfin from Argo-USA of Palos Verdes, California, we will present our findings on that engine. In all likelihood, the

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engines should run very similarly.

We have also received a Burford B.G. 250 diesel engine (one of the first prototypes) that should also be interesting. However, only about five have been produced on a custom basis so further production information is unknown at this date.

ORR DEPT. STORE "J-HAWK"

With interest in SAM escalating to an all-time high, it is no great surprise to see the sudden proliferation of events, both rubber and gas, increase at an even higher pace. Many one-design type events have surfaced such as Pacific Ace, Miss World's Fair, Nelder Moffett, and others. These have proven to be very successful club contest events. Ernie Linn reports in his SAM 56 newsletter the latest idea along these lines, using the "J-Hawk," a model designed by Bob Youngman for a one-design type contest sponsored by Orr's Dept. Store in 1938 at the old Yellow Air Cab site. According to records, Don Fisher won first place with a flight of approximately ten minutes, disappearing from sight over the field.

According to Ernie Linn, newsletter editor for the SAM 56 WHAM club, the J-Hawk (short for Jayhawk by which Kansans are commonly called) combined outstanding performance for its size along with simple construction and predictable stability that allowed the beginner as well as the expert a more reasonable chance for an exciting experience. Many neophytes were attracted to model airplanes by this model.



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In 1938, Dean Zongher was chosen to build the original test model for this design. Based on his excellent work, he has been chosen again in 1990 to build a test model of the J-Hawk to test the plans Ernie Linn hopes to market. This will be an accurate copy of the original kit plan. Ribs and patterns that were provided only on the print wood will be incorporated on the new plan.

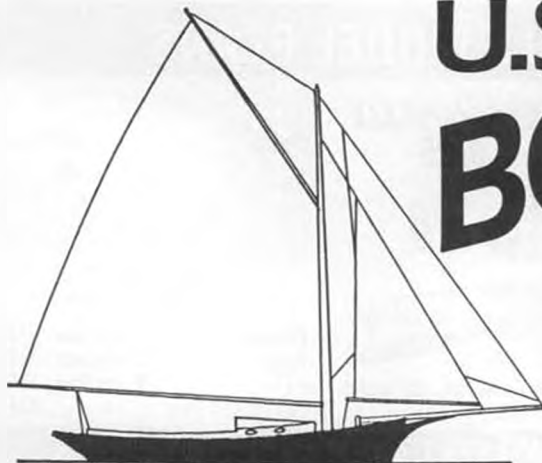
Dean's model has been finished and delivered, lacking only a few minor items such as the D-T setup, propeller hooks, etc. Dean's skill level is still there as he has provided metal rib templates for the club members to use when building their J-Hawks. We are looking forward to further reports on this model.

THE WRAP-UP

How about this! No obituary this time (there are many this writer has missed), as we are featuring Photo No. 12 as a lovely example of what can be done to a Bill Englehart "So-Long," the 1940 Nationals Winner in its class.

Art Grosheider writes to say he acquired the model from Al White in the early '60s. The model was actually flown in the No. 1 and No. 2 SAM Champs at Denver (Colfax Airport). When Al got out of the modeling game, he went into the restoration of full-size aircraft and as a sideline, works on vintage autos.

Art picked up the So-Long exhibiting considerable "hangar rash" and spent more



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Lay one or two strips of Velcro on the sides of cabin, from the front back to the servos. Again, use CA glue to make sure the strips will hold. Now you can mount the motor batteries, the receiver, speed control, and receiver batteries. The adhesive on the Velcro holds well to the equipment cases and battery jackets—no CA glue is needed. I install the motor packs as far forward as needed for balance, on the floor for a single pack, or on the floor and/or on the cabin sides if there are two or three packs. The receiver batteries go on the sides, and so does the receiver. The speed control can be on the floor, on the sides, or Velcroed to the top inside the nose.

Please note that there has been no mention of mounting plates, mounting blocks, servo trays, etc. Don't use them. They add weight, consume room, limit the ability to shift equipment, add complication, and provide no shock protection. William Stout, designer of the Ford Trimotor, was right when he said, "Simplicate and add lightness."

I use balsa pushrods (1/4-inch square) for the rudder and elevator; these are rigid and need no support. If you use Nyrod, you do need some support about halfway down the length. I have not done this in the past, and had no problems on my six and seven-cell planes. I did have problems on an 18-cell (Astro 40) plane, where the longer length of the Nyrods and higher power and speed led to flutter. In the future I will glue the Nyrod

time restoring it to the shape seen than would have been required to build a new one! The model flew pretty well in the SAM 1 competition meets.

Inasmuch as the 1989 SAM Champs at Jean, Nevada were held late in the year, Art decided to go. The initial flight was a big surprise to Art, as the engine performed much better at the lower altitude. With the added power, the wing folded and the model ended up in a large rubbish bag.

Art notes that in restoring models, care must be taken to replace or reinforce some of the old parts as balsa does get hard and brittle. Anyway, it is a good winter project!

Next issue, we will try to cover the SAM Championships at Westover Air Force Base

in Massachusetts held over the Fourth of July week. We do hope that photos and results will turn up in time for a good column! **MB**

ELECTRIC *Continued from page 41*

squares made by 3M, intended for hanging pictures. These are sold in hardware or stationery stores. You can also buy hard foam tape in rolls from the hobby store. The adhesive on the foam sticks very well to the servo cases as is. Use CA glue on the side that contacts the cabin walls, since the adhesive alone does not stick well enough to bare wood or cloth.

outer casing to the fuselage side about half-way to the tail.

The landing gear is mounted to the bottom. This eliminates parts sticking up into the cabin where they can get in the way. The landing gear mounts to the 1/8-inch Lite Ply mentioned earlier. I glue a small Lite Ply or balsa doubler about two inches long, 3/4 inches high, 1/8 inch thick right above where the landing gear is mounted. The landing gear can be either the aluminum blank type, like Hallco, or bent from music wire as shown in the photo. Another advantage of this type of landing gear mount is that the landing gear is easily removable, can be shifted, changed to float gear, etc. Space is running out, so next time I will cover the tail group and wings.

• • •

Jim Martin, of Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, Tennessee, 37027, sent a batch of photos and an offer you can hardly refuse! The Hobby Lobby Catalog #16 is free! Just write or call (615)373-1444 and ask for it. Jim did not include a price list, so I cannot tell you the prices. I am going to have to get catalog #16 myself!

The Bauer BM 40 Elektro-Impeller is a ducted fan unit for 1000 watt peak output motors such as the Astro 60 and Graupner 2000. This flies electric ducted fan jets in the nine-pound bracket. Bauer also sells a MiG-15 kit designed especially for this ducted fan unit. It has a span of 58 inches, area of 713 sq. in., and a nine-pound flying weight. You can definitely be one of the first to fly ducted fan electrics in the U.S. with this! I described the Heinkel 162 powered by the prototype of this unit in a column last year. I visited the Bauer booth at the Nuremberg Toy Fair last February and watched the videotapes of the Heinkel at takeoff, flight, and landing. It is a fully capable fan jet, nothing marginal at all about performance. In fact, other than the very turbine-like whine of the electric unit, you would think it was gas. The sound is unique, it sure pulled in the spectators at the Nuremberg Fair.

The new Simprop Power-Speed 2000-7 motor is said to have very high power. The motor is the standard 540 size, but is capable of 260 watts output. The advertising said this is a ferrite magnet motor; my bet is that it has the boron-neodymium-ferrite magnets I have mentioned before. These motors have a stronger magnetic field than even the cobalts.

The Graupner clamping amp measuring device will measure current up to 400 amps without disturbing wiring. Plug it into a digital voltmeter, then close the clamp around one of the wires. Each amp reads as .001 volts, therefore a current of 20 amps will read as .020. Handy, and it does not change the current in the system (as many ammeters will).

Have fun! Keep it simple, fly electric! Mitch Poling, 7100 CSW/MC, Box 734 PSC 2, APO 09220-5300 if you are using U.S. postage; Normannenweg 20, D-6200 Wiesbaden-Biebrich, Germany if you are using international postage. **MB**

F3E Continued from page 43

of eight rounds flown.

The information for the blank spots was not received. The Average Motor Run was the time during the Duration portion of the flight; the Average Laps being the average for all eight rounds. The highest number of actual laps were flown by Jerry Bridgeman, who hit 25 during his third round. Felix Vivas fell ill during the contest and did not fly at all after the fourth round.

Officially, the United States F3E Team is now composed of Jerry Bridgeman, Jason Perrin, and Steve Neu. They promptly elected Bob Sliff as Team Manager. We can only say to all: Break a leg!

The airplanes? The winners all flew a version of a Southern California evolved design they call the SE-V, for Snipe Electric, Mark 5, all with slight personal modifications. The similarity can obviously be seen in the accompanying photographs. Jerry Bridgeman's SE spans 82 inches, and weighs 91 ounces. He prefers the RG-12A airfoil, while Steve Neu uses the QB 1.5/9 on his. The wings are Kevlar skinned, carbon fiber reinforced, foam cores, while the fuselages are basically Kevlar.

Power in all cases is an Astro 60 motor, with twenty-seven 900 mAH Sanyo cells, and a Steve Neu designed speed control. The average estimated current drain is 60 amps. That is a lot of electrical energy. At 1.25 volts per cell, it calculates to an input of 2025 watts, or almost 2-3/4 horsepower! All of which is going into homemade carbon fiber 12 x 8 props, turning about 12,700 on the ground. The climb of these airplanes has to be seen to be believed, and while 900 mAH cells cannot be expected to last long under that kind of a load, I did not see a single airplane run completely out of battery power during a flight.

Equipment-wise, this event is totally dominated by Astro Flight motors, Sanyo batteries, and Airtronics radios, of which the Module Series is the favorite, and rightly so, as the SP transmitter is designed for no compromise competition sailplane flight.

Even with a relatively small number of finalists, an event of this sort requires a lot of planning and administration. In this case it was ably handled by George Joy as CD, with the assistance of Frank Chasteler, and a large number of Harbor Soaring Society members—all with one goal, that of possibly representing the United States in the World F3E Championships. To our Bridgeman/Perrin/Neu team, we at *Model Builder* add our "Bon Voyage" and "Good Luck." **MB**

ARFS Continued from page 45

but it looks sturdily constructed and should give years of service in average R/C use. The engine is distributed by Skyward Research and Development Laboratory, 4660 Decarie Blvd., Montreal, Quebec, Canada H3X 2H5. These are the same people who supply the



HAND BELT SANDER

WedgeLock

Hi! I'm ART GROSS, and I know that some of you have been wondering WHAT IN HELL IS A WEDGE LOCK? Well I will tell you. It is a hand sanding block made out of HIGH IMPACT STYREME—IF IT EVER BREAKS WE WILL REPLACE IT FREE. It uses belts the same size (3"x18") as Electric Hand Sanders. You might ask: WHY use "expensive" belts instead of using a "cheaper" sandpaper on a block to do your sanding? WHY: BECAUSE BELTS ARE MORE DEPENDABLE, ECONOMICAL, DURABLE AND EASIER TO USE than glueing, tacking or clamping pieces of sandpaper on any other block . . .

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Skyward line of ARFs, one of which was selected as our ARF of the year for 1989.

At this point I mounted the Skyward .40 ABC in the Red Arrow, and it was as if the plane and engine were made for each other. Actually, the engine mounting setup is such that you could stuff almost any size powerplant into the engine compartment and it would look fine.

The completed airplane was then weighed, and I realized that the flying weight of 57-64 ounces specified by the manufacturer was incorrect, as my Red Arrow came in at 80 ounces, or five pounds on the nose, a very reasonable weight for this kind of model. The wing loading calculated out to 21.6 oz. per sq. ft.—right in the ballpark for a .40 powered sport model. As the instructions made no reference to CG location, I determined that my particular engine installation resulted in a CG located at 2-1/2 inches behind the wing leading edge, and this worked out to be around 25%, just about right for a sport plane of this size and configuration.

I live in Southern California for one main reason, the excellent flying weather, so when the Red Arrow was ready for flight testing, I placed the batteries on charge and planned the test hop for the next day, confident that the weather would be perfect the next morning. Well, it poured all night and all the next day. For the next month I grew more and more frustrated, waiting for one of those windless and sunny mornings which are

common all year round, but one storm front after another kept delaying the flight.

After weeks of inclement weather, I finally made it out to the field on one sunny morning. However, as I lifted the plane from the car, the wind tried to blow it right out of my hands. Yes, there was about 30 knots of wind, but I told myself it was OK, as it was right down the runway. There were a couple of other foolhardy fliers around, and they were quite impressed with the Red Arrow, especially with its MonoKote finish. Anyway, reluctant to postpone the testing any longer, I fired up the engine, taxied out to center runway, and gunned her into the wind. The Red Arrow took off and flew as though there was no wind at all! The ailerons had been set for low rate response, and that's just how the airplane flew, responding gently to all transmitter inputs. As the plane passed nearly overhead on its first circuit, I realized the visibility of the model wasn't as good as it should be, because of the all-white undersurfaces. I made a mental note to be more careful about checking out the color scheme on the undersurfaces of future models before setting off for a test hop. The roll rate was very gentle, and rudder and elevator response were the same, with no surprises. A few circuits were made of the field, with a few simple maneuvers such as rolls and inside loops, and the landing was made with no difficulty, though it was necessary to keep almost 1/4 throttle going to counter the strong headwinds. The first test

hop was judged eminently successful in view of the wind conditions, so I packed up for the day.

A couple of days later, with much better flying conditions, I flew the Red Arrow again, confident in its performance. This time the wing bottoms sported a few red MonoKote stripes for increased visibility. Again, takeoff was straight and level, and responses were slow and reliable. I switched the transmitter to high rate, and found that the airplane flew even more to my liking, executing almost every maneuver in the book with ease. Because of the forward CG, snap rolls were docile, but as with almost any airplane, moving the CG farther back will significantly speed up the responses. The Skyward .40 ABC engine proved to be powerful and thoroughly reliable, never once missing a beat. I am certain that with additional breaking-in and a muffler change, this engine will become one of my trusty workhorses.

Please note that nowhere have I or the manufacturer referred to the Red Arrow as a "trainer." It definitely does not fall into such a category by any stretch of the imagination, unless you would like to consider it as a novice pattern flying trainer, for which it is nicely suited. Make no mistake, this airplane is not meant for hands-off flying, as close attention is required by the pilot at all times, as is the rule for most such sport planes. But for the pilot who has his basic training behind him, the Red Arrow is just the kind of airplane which tends to become a favorite

model, hauled to the field at every opportunity, and flown week in and week out. If you don't feel like building your own plane, or are hard up for a model to fly right away, the Red Arrow will please even the most demanding R/C flier. I don't know many builders who can scratch build a model any better than the Red Arrow. This classy airplane sells for a very reasonable \$159.95 (with no delivery charge) from Cermark Electronic & Model Supply Co., P.O. Box 2406, 107 Edward Avenue, Fullerton, CA 92633, telephone (714)680-5888.

Many thanks to all you readers who have entered the modern age of electronics and are using my FAX number, (619)726-6907, to send me all kinds of interesting information, and that goes for you manufacturers and distributors, too. For the rest of you diehards, you can continue to write me at 2267 Alta Vista Drive, Vista, CA 92084 (SASE for reply, please), or phone me at (619)726-6636, evenings preferred. **MB**

BIG BIRDS *Continued from page 46*

diesels. These guys will tell you how hard diesels are to start, how badly they idle, how much they shake, and how poorly they run.

And you know what? They're right about what they remember. Forty to fifty years ago, American-made diesels like the O.K., Drone, and McCoy left a lot to be desired.

But things are quite different now. You take a well made (usually) Schneurle-ported glow engine and just replace its glow head with a Davis diesel head, and that's really all there is to it.

Yeah, there is one more control to get used to—the contra-piston adjustment screw on the head—but that's no biggie and, in fact, I've found that once a diesel has been run on the test stand, you hardly have to mess with that head adjustment.

The advantages of a diesel are many: one or two flip starting; a lower (1500 rpm), virtually bulletproof idle; much cooler running; more power from a larger prop; a quieter, more acceptable mellow sound; and no batteries, starter, etc., to haul around.

The disadvantages are considered to be the smell of kerosene and a more gunky exhaust. However, both of these problems can be eliminated.

By using scented lantern fuel instead of regular kerosene (Davis fuel comes as a concentrate; you mix up a batch with an equal amount of kerosene or lantern fuel), the objectionable odor is taken care of.

And the exhaust can be routed through a muffler extension that's at least as long as the fuselage and dumped behind the plane without adversely affecting the diesel's performance. Try that on a glow engine and see what happens.

Anyhoooo... if you want real performance from your Maloney 125, convert it to diesel. **PERFORMANCE**

Evaluating an airplane's performance is very subjective because it depends largely



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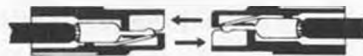
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on your expectation for that particular aircraft. And expectation, like beauty, is in the eye and mind of the beholder. Yet, regardless of what we see or think we see, an airplane's actual performance depends upon a number of things that we have absolute control over:

- 1) Building a light and true airframe.
- 2) Balancing the aircraft, fore and aft and laterally.
- 3) Choosing the right engine.
- 4) Matching the right prop to the engine/airframe.
- 5) Using clean, fresh fuel.
- 6) Alignment and angular settings of wing, horizontal stab, fin and engine.

Obviously this subjective evaluation can work for or against you. Either you're satisfied with the way a plane flies even though she's actually nowhere up to her full potential, or you painstakingly keep trimming a bird flight after flight until she's fine-tuned and "on the step." You can see graphic examples of both these extremes at any flying field.

The fact is that too many airplanes fly like

dogs, but they don't have to. It's amazing how just a little tweaking, like proper balancing and the right incidence, will turn a lousy and unsafe flier into a predictable and fun-to-fly aircraft.

Don't be satisfied with your new airplane just because she seems to fly okay. Expect more from your bird and be willing to put some time and effort into maximizing her full potential. You'll benefit by becoming a better disciplined and safer pilot... and by ending up with a superior flying machine.

YELLOW AIRCRAFT

These guys are busy. Pretty soon (hopefully by the time you read this) they'll be adding new kits to an already impressive lineup that includes a host of ducted fan and prop-driven aircraft.

What's coming up?

Well, how about a 118-inch B-25 designed for a pair of big Supertigres? This bird should weigh somewhere between 35 and 40 pounds. They're also going to market a P-39 Aircobra, a design that's rarely been modeled, especially as a Big Bird. According to Yellow's Ronnie Kemp, they plan to design a drive system so the engine can be mounted mid-fuselage and the nose can retain its clean, sleek look.

As for ducted fans, an F-5 is coming along, with an A-10 Warthog scheduled for a later date.

And, in case you didn't know it, Yellow Aircraft designs and manufactures their own retractable landing gear for all their airplanes. And these guys fly what they design.

Want to find out more? Contact Ronnie c/o Yellow Aircraft & Hobby Supplies, Ltd., 11919 Canyon Road East, Puyallup, WA 98373, (206) 845-8195.

THOUGHT OF THE MONTH

Winter's approaching for many of us, and that means we get to concentrate on building. Now's the time to start planning those winter projects. Al Alman, 1910 154th Street Court South, Spanaway, WA 98387, (206) 535-1549. **MB**

TECHNICAL Continued from page 50

angle of zero lift becomes a more negative number as the R.N. increases. As the R.N. is decreased, the boundary layer flow has less and less energy. It becomes less able to follow the lower surface and tends to separate near the bottom of the leading edge.

"The angle of zero lift of the wing and stab airfoils actually changes in flight as the R.N. varies in accordance with the model's speed changes! The nose-down effect with an increase in model speed and R.N. can be, and in fact is, used to decrease the model's lift coefficient from the value it has in the glide to a lower value under power to achieve climb stability." I quoted only briefly from a long article here, to introduce another type of R.N. effect.

In the October 1980 issue of RCM, Al Doig, in his "Soaring" column, quoted an article by Ian Turner in the *South Bay Soaring So-*

ciety News, which describes the whole range of flow at different Reynolds Numbers. Let me quote Al quoting Ian, again only partially:

"At very low Reynolds Numbers of less than one, all airflow around any object of any shape is laminar (including the boundary layer near the surface). As the Reynolds Number increases to a value of about four, regular circular flow patterns become established in the air behind the object. The flow is still laminar everywhere. At a Reynolds Number of about 100, the air behind the object is beginning to show a regular oscillation as air spills first around one side and then the other. The flow is still quite laminar in the stream. At a Reynolds Number of about 10,000 this regular vortex has broken up into a turbulent wake behind the object with laminar flow over much of the surface. At a Reynolds Number of 300,000, the wake is completely turbulent and the boundary layer will be turbulent over the complete surface of the object.

"Between 10,000 and 300,000 the exact behavior of an airflow is highly dependent on the shape of the object and its surface finish. Hence, general theories to predict the flow cannot be established, unlike the flow at Reynolds Number above 300,000 which are highly amenable to mathematical prediction.

"Model sailplanes operate right in the middle of the 10,000 to 300,000 Reynolds Number range, so that it is quite possible that within a flight the airflow can change from laminar to turbulent depending on its trim and flying speed."

Now you know more about R.N. than you ever wanted to, but this isn't the end of it. Probably in the December MD&TS column I will again address Reynolds Number, and give you some inputs from readers Grant Carson and Jim O'Reilly.

ON BEING WRONG

I hope you've noticed I am wrong now and then. I *hope* you have noticed, because that helps identify me as someone who takes risks and tries things. Abigail Van Buren, of "Dear Abby" fame, quoted the following: "...Risks must be taken, because the greatest hazard in life is to risk nothing. The people who risk nothing, do nothing, have nothing, are nothing..."

It is relatively easy to avoid most mistakes if we use the rulebooks of life and follow conventional practices in everything. If we are creative and try to do new things, like design model airplanes, we are bound to make mistakes. The more innovative we try to be, the more mistakes we will probably make. I have built a lot of models that didn't fly, or didn't fly well, because I always design my own, and I care little about following traditional design practices. In fact, I like to be different.

I have learned from my mistakes, and know I am now a better designer as a result. We learn a little bit from reading something, being told something, or better yet, seeing something. If we actually *do* something, and it works the way we expected or hoped, we also learn a little bit. We learn that we

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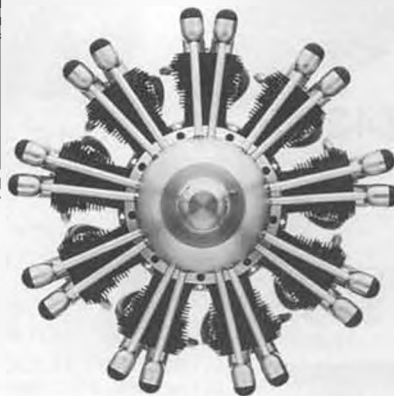
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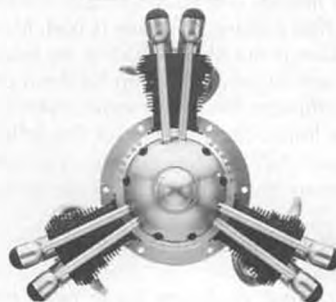
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already knew how. When we try something that *doesn't* work, we really learn the most and remember the lesson the best!

Therefore, take risks. Taking risks is risky, however! Society has a habit of looking down on people who make a lot of mistakes. Our parents, our teachers, our bosses, and even our friends and spouses have tried to teach us that making mistakes is bad. Making mistakes is not always bad in my book. I have much more admiration for the modeler who designs his own model, even if it turns out lousy, than I have for the fellow who buys an ARF and lets someone else take all the design risks (and have all the design fun).

CREATIVE PROBLEMS HAVE MANY ANSWERS

Most factual problems have only one solution. Two plus two is four. The teacher won't accept any other answer. Creative problems, such as design and development, usually have many possible correct solutions. We can design good-flying airplanes in an infinite number of variations of many different configurations. That is one of the strong

appeals of the modeling game for many of us. There is no limit to the number of new ideas we can get and try. Those of you who have been designing your own models know the joy of creating something new. There is satisfaction if it works well. If your bright idea doesn't work the first time, but takes revision and further development, the pleasure from eventual success is even sweeter. The greater the initial frustration, the greater the final satisfaction. Reward is proportional to effort. Design and experiment leads to this writer's greatest pleasures.

THE WIND DOESN'T BLOW AT THE SURFACE

We airplane types know about drag, so it is not surprising to observe that the earth imposes drag on the wind. What really happens is that, due to the drag of the ground or water, the wind velocity is less and less as we take measurements closer and closer to the surface. This wind shear or velocity profile with altitude is shown in Figure 1 (page 50), according to data from Manfred Curry. Note that at a height of ten feet the wind is blowing at 76% of its velocity higher

up, but at three feet "off the deck" it is only half as strong as it is at altitude, and at the surface the wind velocity is always zero!

This fact of nature affects sailboats, in that there is more wind in the top of the sail than there is near the bottom. Model sailboats see less wind than full-scale boats, because their short masts don't stick up high enough. However, it never occurred to me, until the other day, that the wind velocity profile affects our model airplanes significantly during takeoffs and landings.

We all know that we should take off and land into the wind, since this procedure minimizes ground speed and reduces the takeoff and landing runs required. But now let's look at what the drop in wind velocity near the surface is doing to our models.

Assume we are landing a model into the wind. As the model glides lower it is seeing less and less headwind. This would result in a gradual *increase* in its groundspeed, or acceleration of the model, if we were to maintain the same flying speed as it got closer to the ground. I doubt if the groundspeed actually increases during an approach, however. More likely we let the groundspeed stay about constant, which means the airspeed is *decreasing* as the plane drops down into the area of lower wind velocity.

The decrease in airspeed is not just the gradual reduction due to the momentum of the plane being slowly absorbed by drag. It is also a gradual robbing of more of the plane's momentum due to allowing it to enter the region of lower wind. The total rate of reduction in momentum of the plane is due to the sum of the drag losses and the wind shear effect. The momentum loss due to wind shear is explained by the fact that the reference point by which we are measuring the momentum is changing, namely the wind velocity.

Net result: I think our models land sooner than they would in the same headwind if there were no wind velocity profile. However, they land at a higher velocity, in terms of ground speed, than they would if the wind continued full velocity right down to the ground.

The same things apply to takeoffs, in reverse order. As the model which just took off into the wind climbs up where the wind velocity is higher, its airspeed, and consequently its momentum, increase faster than they would if the wind velocity it saw remained constant and all gains were due only to engine-induced acceleration.

I won't attempt to describe the effects this normal wind shear has on our models in taking off or landing down wind, but it must be about the opposite of the above. In crosswind landings the wind velocity profile is definitely helping us, because it makes most of the crosswind go away before the model touches down. Come to think of it, full-scale airplanes, which stick up in the air where the wind is blowing stronger, do have a lot more trouble with crosswind landings than we do with models.

Fascinating! I don't recall seeing wind velocity profile effects on models discussed

in print before. Have any of you? Since the wind velocity profile near the ground has been there all along, our airplanes are not going to fly differently now that we are aware of the phenomenon, but a better understanding of what is really going on may enable us to design better model airplanes or to pilot them more skillfully or safely. It is also time for me to repeat my apologies to those of you who are not interested in this much theoretical theorizing. (You have my permission to skip the preceding several paragraphs.)

WING CUBE LOADING REVISITED

I haven't expounded on the theory and practice of cube loading since the March issue. Now I would like to share some advanced work on the subject by Bruce Gilbert, a Boeing engineer. I met Bruce recently at a meeting of the Boeing Hawks Radio Control Flyers.

Bruce has expended a huge amount of effort in collecting extensive data on a total of seventy winged things, all the way from rubber-powered ROGs and hand-launched gliders to peregrine falcons and full-scale 747s. The data sheets include models, birds, planes, jets, and gliders; and list weights, areas, aspect ratios, wing loadings, wing cube loadings, and much more. I have copies of them, and they are impressive.

He next entered this data in a computer and had it plot a log-log curve of wing area vs. weight. Needless to say, the data points were quite scattered, but obviously the heavier fliers generally had the greater wing areas.

Next he looked at the wing cube loadings of all seventy "planes," to see how well WCL was actually divorced from size. He found a slight correlation with size yet, as I observed and discussed with you in my previous writings on cube loading.

(To review, the WCL for any airplane is theoretically constant as the plane is scaled up or down in size in full conformance with the scaling laws. We modelers usually build lighter than scale, however, because scale airplanes of exact scale weight would fly faster and land faster than we would like. Also, the lower Reynolds Number of models degrades the scale performance, so we need to build lighter than scale to try to recover some of that lost performance.)

Bruce Gilbert was then curious to see, in the real world, what empirical formula would give a loading factor with the least size dependence. He asked the computer to work the problem, by linear regression analysis, to get the best straight-line fit of the data on a log-log plot. The computer computed and announced that for the data it was given, the best formula is weight divided by area to the 3.4/2 power. The resulting curve shows it to be considerably more independent of size than WCL. This formula, with the slightly higher power, is showing us about how much we deviate from true-scale WCL loadings to get the speeds and performance we want.

I am not advocating that we all adopt Bruce's 3.4/2 power formula to the exclusion

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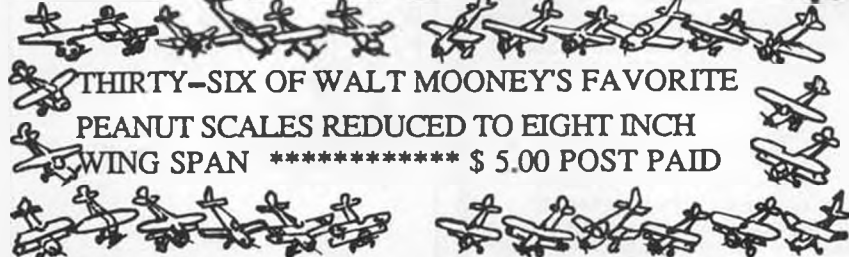
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of pure Wing Cube Loading (weight/area to the 3/2 power). WCL is useful in comparing scale models to their prototypes because it is theoretically independent of scale and lets us look at deviations from that true baseline. But Bruce and I say that in most cases, a scale model will fly as we are used to good scale models flying if it is built to a weight that agrees with the 3.4 power relationship instead of the cube relationship. If it is built lighter yet it will fly better than we are used to scale models flying. (If you don't think lighter is better, reread MD&TS for October 1988 and for September 1989.)

Bruce explains the use of his expression as follows: Say we wish to build a 1/6 scale model of a real aircraft and want a good

estimate of what the model should weigh to give desirable flying characteristics. Use a scientific-type pocket calculator to take 1/6 to the 3.4 power, or 0.0023. Then just multiply the full-size aircraft weight by the 0.0023 to get the desired (maximum) model weight. For any other scale, take the scale to the 3.4 power and multiply by the full-scale weight.

Bruce Gilbert's address is 4721 W. Berton, Seattle, WA 98199. He said he would be happy to hear from any of you who want to know the details of his empirical-formula work on loading, or who would like to contribute to his data base by providing data on interesting aircraft and their scale models, including wing span, wing area,

flying weight, propulsion (if any) and flying characteristics. He has offered to send a set of the data sheets and curves in return for a self-addressed stamped envelope (SASE).

THE BOEING CONDOR

We columnists get a little devious sometimes. No doubt the photo of the Boeing Condor at the beginning of this column caught your eye immediately, but I made you wade through this other "technical stuff" before I told you about the Condor. Looks like a model airplane, doesn't it? I guess it is. It is unmanned and it is a full-scale model of a Boeing Condor. The specifications are impressive. Information courtesy of the Boeing Company: Wing Span, 200 feet (more than the 747!). Aspect ratio, 36.6. Construction, all graphite/epoxy composites. Power, two six-cylinder 175-horsepower turbocharged liquid-cooled piston engines. Demonstrated ceiling, 67,028 feet (a new world altitude record for piston engines). Demonstrated duration, sixty hours. Control, by instruments and pre-programmed missions on onboard computers. Customer, U.S. Defense Advanced Projects Agency. Multiple military and civilian missions. (Not available in kit or ARF form.)

PARTING WORDS

"If I ran a school, I'd give the average grade to those who gave me all the right answers, for being good 'parrots.' I'd give the top grades to those who made a lot of mistakes and told me about them, and then told me what they had learned about them"—
Buckminster Fuller. **MB**

FREE FLIGHT *Continued from page 53*

6-8 weeks on a production basis. Engine is a real beauty! Double ball bearing, ABC piston/cylinder, completely anodized exterior, takes a supplied spanner wrench to disassemble, uses a special Glo-Bee plug and Kinn needle valve assembly. All other parts are made by the company.

"Production of the first 600 engines starts this week (week of April 16). Case is on a CNC machine for seven minutes. Starts as a solid block of aluminum and comes out completely machined, ready to anodize. These guys are Indy-car engine part suppliers who know their business. They built 22 prototypes for test purposes. I have one on loan. Neat machine!"

The spec sheet describes the engine as an air-cooled, single cylinder, side-exhaust, two-stroke cycle, crankshaft rotary valve, two ball-bearing, Schnuerle scavenged ABC engine with 2024-T3 aluminum alloy barstock crankcase, 4340 steel crankshaft, rod and piston pin, and a forged silicon-aluminum alloy piston.

Listed dimensions of the 1/2A version are: Displacement .0500 cu. in. Bore .399 in. and stroke .400 in. Bore of the F1J version is .440 in. for a displacement of .0608 cu. in. Weight is given as 63.78 grams (2.25 oz.). Fuel recommendation is 20% Klotz Super Techniplate plus anything up to 80% nitro.

If you are interested in getting one or more of these jewels, drop a letter and a 25 cent stamp to BV Competition Engines, 1163 Country Club Rd., Indianapolis, IN 46234. When your engine is ready, you'll get a letter of notification. Since all orders are direct from the factory, you'll get yours in the order it arrived—no favorites.

Regarding the \$200 price tag, Walt Rozelle noted, "Look at it this way. Say you're going to replace a 21,000 rpm Tee Dee with one of these engines. You are going to pay only \$3 for each 100 rpm gained."

SUPPORT YOUR LOCAL HOBBY SHOP— ONE MORE REASON, by Bill Moore

This article is excerpted and condensed from the original which appeared in the *Satellite* newsletter:

"If you ever doubted that your local hobby shop is really the best place to do your business, here's something that may convince you.

"In April, sometime between 9 p.m. of the third and 1 p.m. of the fourth, my garage-workshop was burglarized, and five fuselages with engines attached, one complete Pilfered Pearl 833, my hand saw, drill press, and tool box were stolen. Included among the engines were an 11cc K&B, an X-40, an O.S. Max VRP, a Rossi .21, a K&B 3.25, and a Tee Dee .049.

"As soon as I saw what had happened, I called the North Hollywood Division of the L.A.P.D. and reported the theft. Then, and most important, I called Tony at Tony and Addie's Hobbies, and described the engines and the airplanes. About an hour later, minutes after the investigating officer had finished her report, Tony called me. Two men had come into T & A to sell him an 11cc engine. Thinking fast, Tony told them that it was an older model engine, good only for spare parts. When the men agreed that the 11cc was an outdated model, they mentioned they had some other things to sell. He told them to come back, and if they had enough other items, he might make them a good price. They agreed to come back, and Tony kept up a conversation with them as he followed them out the door... and noted the car type and license number. He raced to the telephone, called the Burbank Police, and a plainclothes detective was in T & A when one of the men came back an hour later with a Rossi .21, the fiberglass prop still attached. At first, the guy wanted to buy a glowplug, then decided he wanted to sell the engine. Tony offered him seven dollars, the guy accepted, and as he took the money was arrested on the spot.

"Then, the fun began. After intensive questioning, others were implicated and arrested, and a wide-ranging investigation turned up warrants for two of the three men involved... and in the process, a sophisticated burglary ring was broken up. As this is being written, Tony and I are waiting for our second court appearance to testify against the men.

"Thanks to Tony's quick thinking, and superb cooperation between Burbank and North Hollywood police, I had a nice sur-

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prise when I got back from New Orleans ten days later. Police had recovered all the airplanes and my tool box. Lost were the 11cc, the X-40, and 3.25... and other goodies. But I at least got my planes, some engines and the tool box, all because Tony cooperated so splendidly.

"Next time you're in the neighborhood, stop in and give Tony a pat on the back for helping a fellow modeler in his time of need.

"As a result of the burglary (my third in three years), I have pulled up stakes and moved to Oxnard, where the air is cleaner, traffic much, much lighter, and my workshop is now inside the house, instead of in a garage."

Well, there is a big moral in this story: If

your model shop gets burgled, call the police and all of the local hobby shops as soon as you can. Not only do you stand to get most of your stolen goods returned, but you have a chance to be a good citizen by getting some thieves off the street.

And if any of you are in SoCal, pay Tony a visit—not just because he did a good deed for Bill Moore, but because he has one of the finest hobby shops for free flighters in the entire country.

SOME NIFTY TOOLS AND TIPS FROM TEXAS

Marvin Mace, from Seguin, Texas, passes along these two tips for free flighters:

"The Tri-City Free Flight team members (Jim Summersett, Russ Snyder, Frank

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Parmenter, Charlie Bruce, Jack Brown, Reid Simpson and I) travel to quite a few contests each year, and we lose our share of models in the process. Something that is helping us recover these lost models is a small stick-on label that we are getting from Walter Drake and Sons, 20 Drake Building, Colorado Springs, CO 80940. The label we are using is printed with the following:

Free Flight Model
Reward for Return
Call Collect
Modeler's Name
Modeler's Address
Modeler's City, State, Zip
Modeler's Phone Number

"Two hundred fifty are available from Walter Drake for \$3.98 plus \$1 for shipping. If you don't plan on building at least 250 free flight models, then the labels can be attached to lawn chairs, tents, model boxes, motor-cycles, and other items frequently lost.

"The second item is a tool I have been using for some time, and I'm impressed with it. It is a 10-inch Carbide Grit Sanding Blade made by Stanley which comes in coarse 46 grit and medium 80 grit (Model numbers 21-430 and 21-431). Cost is approximately \$3.50 each at your local builders supply store. There is a small lip on each end of these blades which I cut off with a hacksaw. This leaves you with a 10-inch piece of

'sandpaper' which is impossible to wear out on balsa or other things modelers want to sand. If paint or other soft materials clog the surface, I use a soft brass wire brush to remove it; and if that fails you can burn the surface with a propane torch with no damage to the sanding blade. I find the blades particularly useful insanding wing and stab leading edges to shape, shaping the front ends of fuselages, sanding solid balsa rudders to streamlined shape, removing CA glue from fingers, etc. You can also remove MonoKote or tissue from the framework of large models."

Thanks, Marvin, for the good advice. I imagine Walter Drake will be wondering about all of those orders coming in for stick-on labels for free flight models. I wonder if Walter even knows what a free flight is? Actually, I wonder if there is such a person as Walter Drake?

THE OLLIE 1/2A NOSTALGIA DESIGN

In a recent issue of *The Satellite*, newsletter of the San Valeers, Ralph Prey noted the beauty of a model that Gus Sundberg had on the field for the Annual Nostalgia Championships. This ship looked superficially like a Satellite, but upon closer investigation, it bore numerous differences. The model was said to be an "Ollie." For those of you who haven't heard about or seen this little ship, take a look at your back issues of *Air Trails*.

Page 58 of the September 1951 issue will show

you what I mean. However, if you don't have that issue, pay attention to *Model Builder* Free Flight next month. I will present the Ollie for your Nostalgia event consideration. The ship is a real beauty.

THAT'S IT DEPARTMENT

I am running just a bit low on pix from the flying sites outside of the Northwest. If you've got some good close-up photos, preferably action shots, I can use them. It's OK if they are sharp color pictures. Please provide pertinent information—flier's name, name of model if known, and other stuff.

Also, for those of you who send me notes requesting information pertaining to subjects covered in back issues of *Model Builder* Free Flight, I would appreciate a self-addressed, stamped envelope in which to return my response to you. Just a courtesy, I think.

So, with those little bits of advice, it's time to get out and do some flying. See you at the flying field. Thermals until next month. **MB**

HANNAN'S *Continued from page 55*

grams, complete. The kit includes the engine, charger, propeller, spare parts and two

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instruction brochures. According to one of Klaus Jorg's friends who test-flew one, "It is OK!"

MEANWHILE IN CZECHOSLOVAKIA

The fantastically small Piper Vagabond shown in one of our photos has likely been completed and tested by now. The anticipated total weight of it was a mere 1.8 grams. That's correct, less than 2 grams for the model and its power unit. The mind boggles! Ironically, the late Walt Mooney had sent photographs of his full-size Vagabond to provide detail reference for the model, very shortly before he died. Thus the tiny model will serve as a memorial to his memory.

MORE MOONEY MEMORIES

Condolence messages continue to arrive, and we want to share a few portions of them with you:

"His death came as such a shock to me that it seemed like model aviation itself had suddenly ceased to exist. That, of course, is the last thing that Walt would have wanted." Dick Howard, Lake Havasu, Arizona.

"... was truly saddened by the death of Walt Mooney—having started the beloved hobby in 1935, I have been privileged to have followed the careers of most of the contributors and he was certainly one of the stars!" Sherman Gillespie, San Jose, California.

"I feel he enriched my life, and no doubt, many others. Just as it is possible to get a copy of Shakespeare's complete works, it

would be great to have a copy of Walt Mooney's complete works." Bill Brown, Brown Junior Motors, Pine Grove Mills, Pennsylvania.

"While we will all miss the 'Main Man,' we will not forget him." Nick Ropar, Albuquerque, New Mexico.

"What he really left behind was a zest and enthusiasm to live life *now*,* this very minute." Tom Arnold, San Diego, California.

Edward Carson, of Denmark, recalled some advice about improving model performance received from Walt: "No thing causes so little weight as a nonexistent part!"

And finally, from *Flying Models* columnist Larry Kruse: "Walt was more than just a designer, teacher, and engineer. He was a valued friend who took everything in stride and enjoyed life, whatever it brought him. His enthusiasm and sense of humor were as infectious as the Peanuts he designed. We are all the lesser in his passing. We are all the greater for his having been with us."

PHILATELIST FLUGMODELLES

Some of our readers are stamp collectors as well as model builders, judging by our mail. Klaus Jorg Hammerschmidt alerted us to the new "Historische Flugmodell" series of postal stamps from East Germany. Subjects illustrated are the proposed flying machines of Leonardoda Vinci (1452-1519), Melchior Bauer (1733) and Albrecht-Ludwig Berblinger (1770-1829). We have not yet seen the fourth in the series, which is evidently issued in recognition of Otto Lilienthal.

AIR MAIL

Ed Whitten sent a clipping from the *New York Times* explaining the difficulties involved in implementing the United States census. It seems that one large apartment building received a stack of census forms which were deposited in the lobby, "... where children quickly converted them into paper airplanes."

ADVANCE NOTICE?

John Blagg, of England, favored us with an announcement by the S.M.A.E. (British counterpart of the AMA) of an international indoor flying scale model event to be conducted at the University of Nottingham on the 21st and 22nd of September, 1991. That certainly should allow plenty of time for even the slowest model builder to prepare! Categories include Open Rubber, CO²/Electric, Peanuts and Pistachios. Curiously, no other entry information was supplied. If we learn more, we'll pass it along.

LOW COST PEANUTS?

George Benson, of Mill Valley, California, returning to model building following some 45 years absence, says: "Last flew rubber-powered planes in wartime England as a boy. Now retired and have located a group of old timers who fly indoor and outdoor rubber. So far have built a Peanut Fokker D-8 from a kit and bought several hundred dollars worth of books and supplies!"

HOW'S THAT AGAIN?

Mark Allison, of Bishop, California, shares

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this comment from expert free flyer, Clarence Mather: "We spend half of our life making our models go up, and the other half trying to get them back down."

THAT SPIRIT SPINNER

In an earlier Hangar column, mention was made of the *original Spirit of St. Louis* spinner recently donated to the National Air and Space Museum by the Hawley Bowlus family. The late Hawley Bowlus had been foreman of the crew which constructed Lindbergh's famed transatlantic flyer. Joe Wagner, of New Wilmington, Pennsylvania, wrote in to report that two other notables were also part of that crew: Douglas "Wrong Way" Corrigan, and Mel Anderson of Super Cyclone model engine fame.

NEW MOVIE UNDERWAY

Now in preparation by the Walt Disney Studio is "The Rocketeer," conceived by super-talented comic book artist Dave Stevens. Apart from its exciting story, the film should have particular attraction for aviation enthusiasts since it is scheduled to feature Bill Turner's Gee Bee Z reproduction as well as a Pitcairn Autogiro. With special effects by ILM studios, who produced "Star Wars" and so many other box-office hits, "The Rocketeer" should be well worth watching.

WHY AVIATION?

When the late C.R. Smith was asked why he became involved in the business of flying, he responded: "The people in aviation made me want to get into it. Vigorous people with a sense of humor, their minds big enough to think of the whole world all at once! People whose vision does not stop at the horizon." Our thanks to Ed Whitten for this fine quotation to close our column. **MB**

CONTROL LINE *Continued from page 57*

would with the permanent solder/washer linkage. Most pushrods on full-size sport/

stunt/racing planes are of 3/32-inch music wire. Now, instead of soldering the washers on the L, we'll place a smaller piece of music wire alongside the pushrod on the inside of the L, extending slightly past the bend (see the diagram), wrap it with copper wire and solder it. This small wire serves as the keeper. It can be snapped in place and easily removed. It will keep the L-bend in the horn securely, but allow it to be moved from hole to hole as you seek the desired amount of elevator travel. Like the solder/washer method, it will outlive several airplanes.

We mentioned at the outset that the elevator linkage question was George's second question. The first was:

"I want to use an arrow shaft pushrod from flap horn to elevator horn. What's the best way to bind the wire ends that fit the horns to the arrow shaft?"

The arrow shaft pushrod is a boon to stunt fliers, particularly those using the large, heavy, full-competition planes with high stresses on the control system. The glass or carbon fiber arrow shaft pushrod will not bend or bind, and can be used without the usual guides inside the airplane that can give builders fits. And, in spite of the "space age" sound of the technique, it's quite simple.

For the answer to George's question, we turned to Don McClave of Portland, Oregon, a top-gun stunt flier and an expert in such matters. Don provided a diagram of how to bind the arrow shaft pushrod to our 3/32-inch wire end. The diagram is almost self-explanatory.

Don points out that both Dave Brown and Sig Manufacturing Co. produce arrow shaft pushrod kits, which include all the parts for making up the ends. However, if you are buying your own rod and making your own ends, here's the technique:

At each end of the arrow shaft pushrod, you'll have a short piece of 3/32-inch music wire, which will make the actual connection with the bellcrank, flap horn or elevator horn. At one end of the music wire (at each

end of the arrow shaft) will be the typical L-bend, which we've discussed above, terminated with whatever keeper you decide upon. At the other end of the music wire, and perpendicular to the L-bend, will be another L-bend, cut quite short (about 1/8 inch). Drill a hole in the arrow shaft for the 1/8-inch L-bend. Make a 1/4-inch dowel plug for the end of the arrow shaft. As shown on the diagram, notch the dowel so that it will fit into the arrow shaft along with the music wire. Epoxy the dowel into place with the music wire in the notch, with the small L-bend secured by the hole in the arrow shaft and the large L-bend sticking out. Voila! A secure pushrod end.

NEW KITS ON THE BLOCK

In the interest of keeping fliers informed about new products on the market, here's an update on the stunt and nostalgia kits being produced by Tom Dixon, of Atlanta, Georgia. Some earlier information appeared in the May edition of *Model Builder*, and Tom has made progress since that article was written around the first of the year.

Tom advises that he had available, as of May, kits for the 1952 Nobler (\$64.95), Black Tiger/Warhawk (\$59.95), Skylark (\$64.95), Thunderbird II (\$64.95), and 38 Special (\$49.95).

"The 38 Special is the biplane, 38-inch span(s), 520 square inches, looks like a Pitts," Tom writes. "(The kit includes) Dural gear and wheel pants. The dural gear designed for the '38 is also a perfect fit for Ringmasters, Goldberg Shoestrings, etc. The gear is available separately for \$8.50 (also good for profile carrier?). The larger profile gear fits Banshees, Twisters, etc."

"Due out (around June 1) is the Ruffy. This one will be re-engineered for easier and stronger construction, but will be 'aerodynamically authentic' and qualify for nostalgia rules.

"I'm also considering the inverted-engine Veco Smoothie. A version of the *Air Trails* Smoothie is available from Hobby Enterprises, as is the Chief and others.

"My Charisma design will be approximately midsummer coming on line. One other 'possible' will be a Dixon-ized Nobler for modern performance but able to fly with a Fox .35. General aerodynamic cleanup to lower drag and give sharper corners. It really won't look that much like a Nobler but I've got to see what the interest level is before proceeding on that one.

"Current offerings are selling well as the word spreads. Sold out all I had at the Tucson Vintage Champs.

"Also, Ed Southwick has 'blessed' the Skylark kit and Bob Palmer has OK'd the Thunderbird II kit.

"I'm also considering an R/C kit—Guillow Explorer (a scaled down Smog Hog, really)."

For more information about Tom Dixon products, send \$3 for a catalog to Suite 401, 1938 Peachtree Road, Atlanta, GA 30309.

GX-RATED

New England Combat News continues to regularly bring us news of lively combat action in the Northeast, where Geriatric

Combat (Formula GX) is all the rage. Several months ago, around the time we first reported on the newsletter and the Formula GX concept, Neil sent us some information on the airplanes he is using in Formula GX. Here's his commentary:

"The enclosed photos are pictures of the airplanes that my son, Jeremy, and I use for Geriatric Combat (Formula GX). There is one other guy on the circuit using a similar approach. These airplanes fly very well.

"However, there are several guys getting just as good results using the larger traditional AMA slow combat designs. Texas Slows, Pair-O-Dox Slows, and SC-2s as well as many hybrids that have evolved from some combination of these designs.

"In these larger ships the most popular powerplants are Fox Combat Specials (Mk III, IV and VI) with extra brass tubing inserts inside the normal venturi insert, Fox .36Xs and the O.S. Max .35 FP-S.

"The airplanes pictured are a design that evolved over the 1989 season. The concept was that since the Fox Combat Specials represented much more power than necessary to achieve the 73 mph maximum speed allowed in Formula GX, a lighter, more efficient airplane could be designed around a smaller (lighter) motor.

"Doc Passen (of Dox Generic kits—jt) suggested I might try the Brat .28 for power as it was light in weight and still put out very adequate power. The airplanes pictured are No. 9 and 12 in a series of airplanes built over the course of the 1989 season.

"I have built versions with several different cores (both Phil Cartier and Doc Passen cores) experimenting with different wingspans, wing areas and thus wing loadings.

"Depending on core size and fuselage design the airplanes have weighed between 19 and 22 ounces including everything but fuel. I have built versions with wing areas from 345 square inches to 460 square inches, with wingspans from 42 to 48 inches.

"The airplane that my wife, Ruth, is holding is the most recent and what I think represents the optimum performance, although all the variations I tried worked well. The specifications on that ship are:

"Front moment: 4 inches leading edge to thrust washer.

"Rear moment: 9 inches trailing edge to hinge line.

"Stabilator design: Exact copy of Doc Passen's latest Pair-O-Dox fast.

"Fuselage design: Stolen from Doc Passen's latest Pair-O-Dox fast, but with above moments. This design uses two pieces of 3/4-inch square balsa laminated together from which the basic fuselage is cut. Motor mounts are 3/8-inch high by 3/4-inch wide by 4-inch long maple reinforced with 1/8-inch vertical dowels. No plywood doublers.

"Tank: Smallest Bob Nicks Chicken Hopper.

"Weight: 19.5 ounces with everything but fuel.

"The airplane pictured uses a Doc Passen Pair-O-Dox fast core. The other core which also works well is a Phil Cartier Gotcha 400

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cut down to 42-inch span. Both of these cores have wing areas in the 385 square inch range, which seems to give the right wing loading. A stock Brat .28 with a 9/32 venturi opening pushes this ship at 73 mph. A stock Fox .35 stunt, although a 1/10 or two slower, also works well.

"By the way, the name of the airplane is the Coyote GX."

High-Low Landings, the newsletter of the Navy Carrier Society, reports that the new president of NCS is Joe Just of Sunnyside, Washington.

And the newsletter has a new editor: Mike Anderson, of Gilbert, Iowa. Fliers interested in the latest in Navy Carrier news may want

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As always, we invite letters, technical tips, club news, contest information, photos and anything else related to control line model aviation. Send your information to John Thompson, 1520 Anthony Ave., Cottage Grove, OR 97424. **MB**

CORNER Continued from page 12

than the opening within which the switch knob slides back and forth, which will prevent the knob from traveling all that it should.

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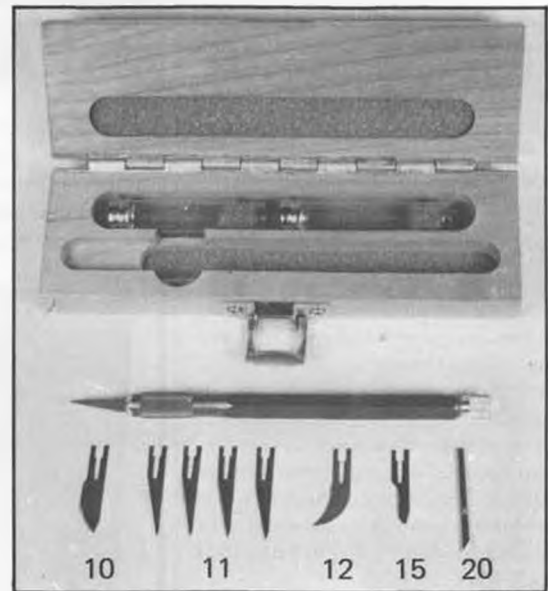
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As a result, the switch does not always come On; in my friend's case, it did, but apparently did not lock into position and vibrated Off soon after take-off.

As it originally appeared, the Du-Bro Kwik-Switch Mount was designed for the now defunct Noble switch, with which it mated and worked perfectly. Later on, it was modified to its present form, to "fit both small and large radio switches." There being so many different ones, it would be extremely difficult for such a device to fit them all perfectly, and it should be checked in all cases. Such checking is simple... install the switch and inspect it carefully for enough clearance for the knob to move its normal travel. If its travel is the slightest bit restricted, simply carve a slice or two off the switch mount until the knob does operate freely.

As with everything on the airplane, check and double check never hurts, it is only the things you don't discover on the ground that ultimately cause crashes.

DREMEL—now there is a name that needs no introduction, having long ago become synonymous with small, high quality electric tools. The "Dremel" as most of us somewhat erroneously call what is actually a Dremel "Mo to-Tool," has long been a standard in model workshops throughout the country. Personally, my shop is equipped with full-size table and band saws, electric drills, both portable and drill press, etc., but I find that I use my smaller Dremel electric tools just as much, if not more.

Though extremely reliable, Dremel tools now and then need some TLC or a part replaced. In that respect, there is good news for us in the western US; a fully equipped service center now exists in southern California. Dremel Authorized Service Center, 4631 E. Sunny Dunes, Palm Springs CA 92264, (619)327-3003, can handle both warranty and out-of-warranty repairs, as well as provide any and all necessary service parts and accessories for the complete line of Dremel tools.

Normal time for tool repairs is two to five days, while parts and accessory orders, written or verbal, are shipped within three to four days. Time of operation is 7:30 to 4:30 PST Monday through Friday, and VISA and MasterCard charges are accepted. And if that isn't enough, as of this writing, there is a 20% discount on all product, accessories and/or parts orders—but notice that service is not included in this offer. Certainly looks like a good opportunity to stock up on those cutters and grinding wheels that you only think about when you really need them.

On the subject of Dremel accessories, it still surprises me to learn now and then that some of my friends cut landing gear wire with files, hack saws, and maybe machetes in some cases. Guys, there is only one way, a No. 409 cutoff wheel in your Moto-Tool. Neat, clean, and fast! You'll also need a No. 402 mandrel on which to mount the wheels, and PLEASE!, don't forget to don your safety goggles.

As in all cases, when ordering parts for anything, it helps to mention the actual part number and certainly the model number of the tool. Descriptions of the "do-funny" that fits on the "thingamabob" doesn't always assure you of getting the correct part.

BEZELS—usually the hardest part to find for those homemade equipment projects. One can buy literally hundreds of neat enclosures, plastic and metal, large and small, for most anything one cares to build. But as soon as you start to mount a digital display of any kind, you wind up staring at a ragged hole that ruins the looks of an otherwise professional looking piece of equipment.

There is a source—at acceptable prices, I would like to share with you. The range of these plastic bezels covers most normal requirements of from two to multiple digits, and come complete with thin colored filters available in red, green and clear, as required for different LED's and LCD's.

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Schnuerle Porting
 Muffler included

Black Anodized*

The SKYWARD Line of Engines includes: Sizes 25*, 28, 40*, 46, and 61*

Skyward engines are hand cast and machined for superior performance.

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 Skyward Research + Development Laboratory
 4660 Decarie Blvd. Montreal,
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 Telephone: (514) 481-8107
 Facsimile: (514) 487-5383

SKYWARDTM
 RESEARCH + DEVELOPMENT

A New Dimension In .80 Size Power

Putting maximum size power in a minimum size package has become a specialty of Enya. And the 80XF 2-cycle takes this art form to yet another level.

With both its plane and chopper versions, the 80XF produces 1.6 to 2.0 hp at up to 16,000 RPM. But what's unique is that it packs this power into a size that fits the mounting dimensions of our 60XF-4.

For Chopper Pilots.

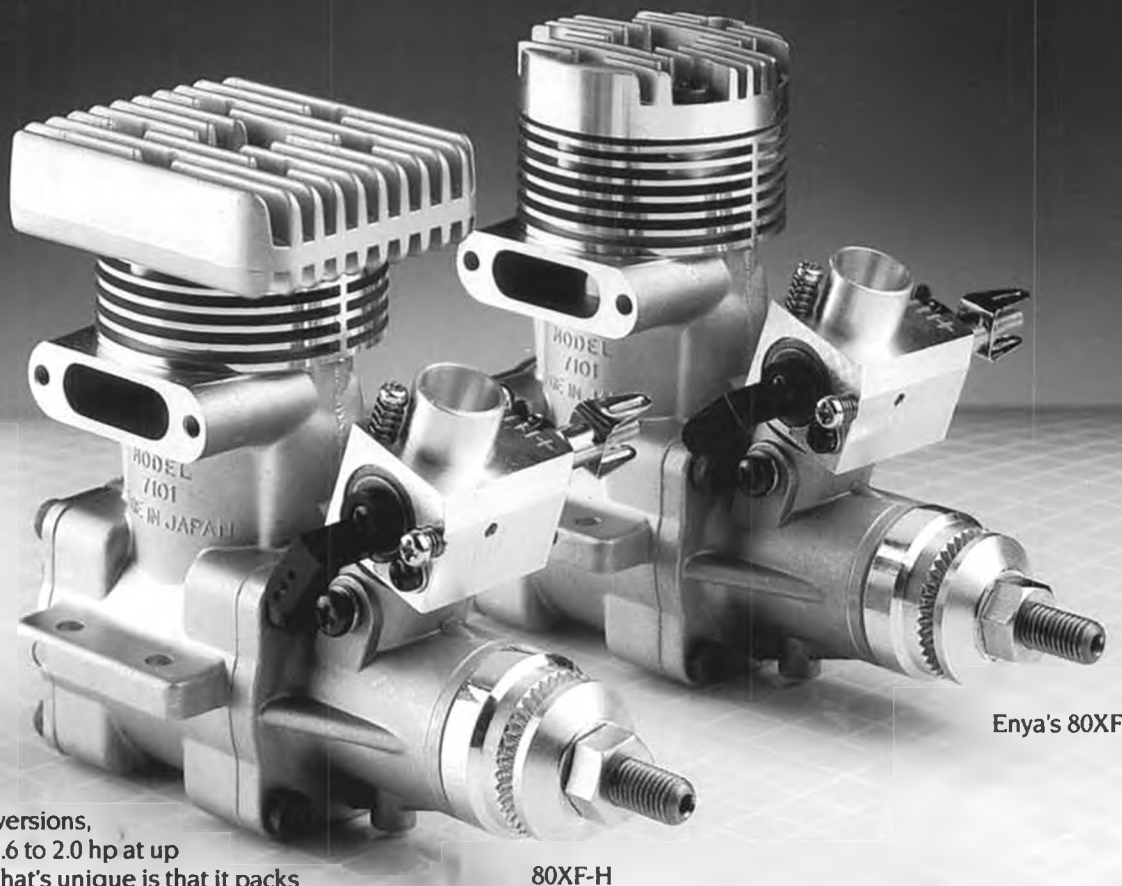
Think about it. If you're flying helicopters, you know that space is at a premium and power is often the key to performance. Yet 'til now, if you needed more power in a .60 chopper, you didn't have much choice. A 4-cycle wouldn't work, and a .90 wouldn't fit. Enter Enya's 80XF-H. For take-off power, solid lift and stable flight, you can put this 19.7 oz powerhouse, with its special engine-cooling heat sink head, into your .60 size chopper, and effortlessly lift up to 15.2 lbs. of helicopter with ease.

For Fixed-Wing Aircraft.

Swinging props from 12x8 to 14x12, the 80XF's extra torque lets you run bigger planes at lower RPM's and still get the power you need. It's not only nice to know you have this reservoir of extra power, but running at lower RPM's will also add life to your engine.

The engine is complete with a GM-10S carburetor that's adjustable in high-, mid- and low-end throttle speeds and is Schneurle-ported with side exhaust. Most important – it packs a major punch in a small package.

For maximum safety and enjoyment, read and follow manufacturer's instructions closely.



NEW FROM ENYA
A POWERHOUSE .80 2-CYCLE

ALTECH
MARKETING

ENYA MODEL ENGINES
P.O. Box 391, Edison, N.J. 08818-0391 (201) 248-8738