

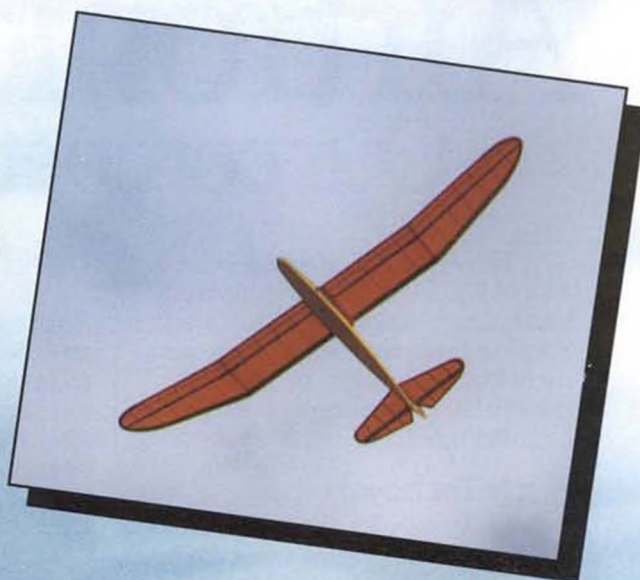
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MODEL BUILDER

WORLD'S MOST COMPLETE MODEL AIRCRAFT PUBLICATION

JULY/AUGUST 1990 \$2.95 CANADA \$3.95



**JET TRAILS
AT TOLEDO**



REVIEWS:
**MULTIPLEX mc3030
RADIO**
**KALT EXCALIBUR
HELICOPTER**
**HOBBY HORN
SENSOAR**

BUILD:
R/C FAIRCHILD 51

ICD08545



Airtronics is the best. Our competition has proved it.

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In fact, since 1988, all Airtronics' advanced FM and PCM aircraft transmitters and compatible Gold Label Super Narrow Band Dual Conversion receivers have been independently tested and certified as meeting and exceeding every AMA and RCMA guideline and specification for narrow band R/C operation in 1991 and beyond.

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We're helping advance the sport of R/C modeling through excellence in our equipment. Airtronics continues to develop new products and technology to keep us ahead of the competition.

We not only invest a great deal of time and money in product development, we also work to inform and educate modelers about the complexities of 1991 specifications and claims. We believe that knowledgeable, informed modelers will intelligently choose the best equipment available.

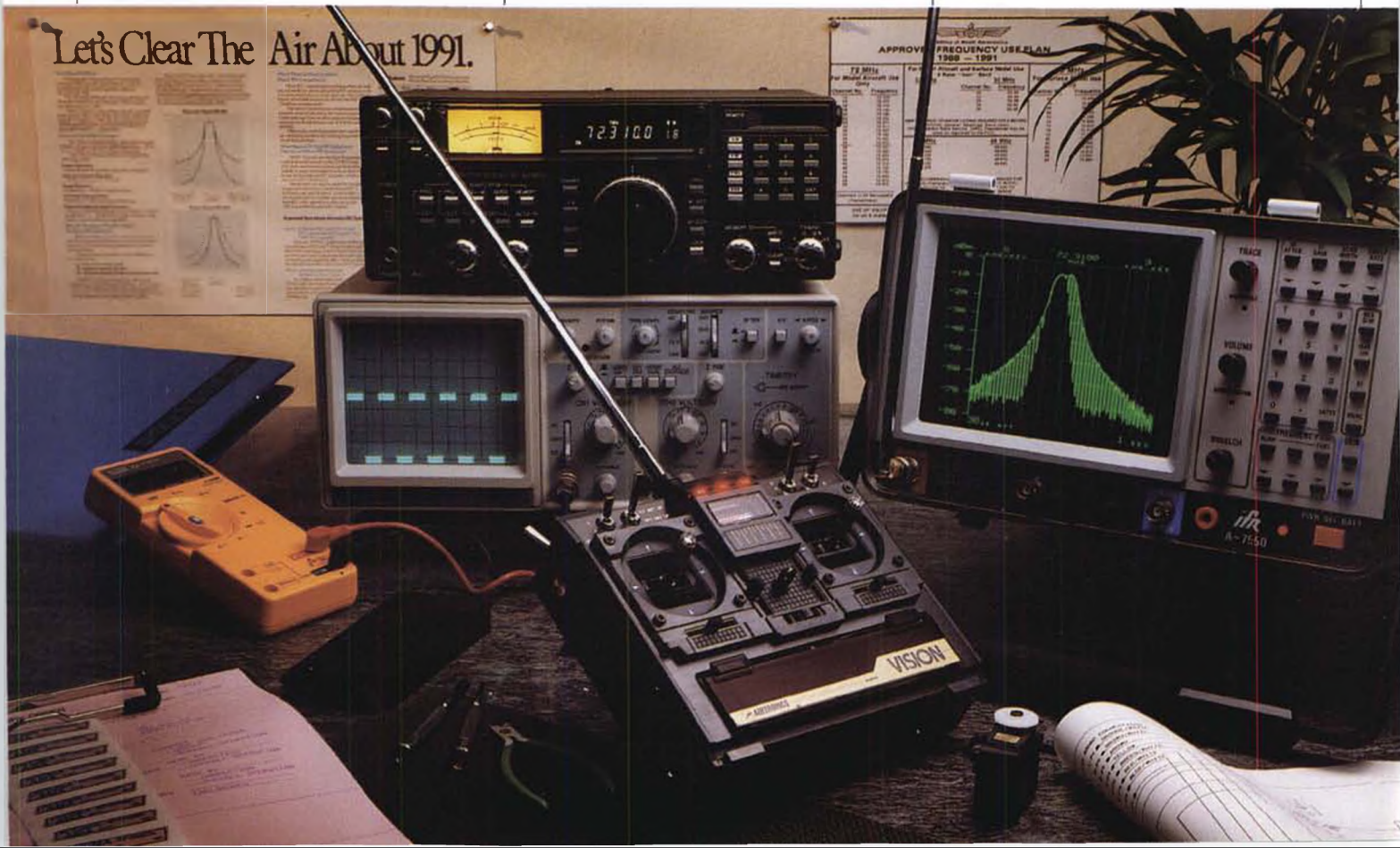
In the race to develop reliable narrow band 1991 R/C systems, everyone else is following our lead. Despite all the claims and confusion, Airtronics still sets the standard in R/C quality, technology, and 1991 performance.

We Set The Standard.

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Let's Clear The Air About 1991.



MODEL BUILDER

WORLD'S MOST COMPLETE MODEL AIRCRAFT PUBLICATION

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JULY/AUGUST 1990 • VOLUME 20 • NUMBER 221
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ON THE COVER

World Champion (1988) Formula 1 Grand Prix race car (McLaren) driver, Ayrton Senna, of Brazil, with Leo O'Reilly's quarter-scale Laser 200, in Australia. Ayrton is a devoted R/C flier, with a large and varied stable of aircraft, including pattern, scale and float planes. He learned to fly in just four flights! Photo by Leo O'Reilly.

Insert photo is of Midway Models' Sensoar, reviewed by Dave Garwood, on page 18.



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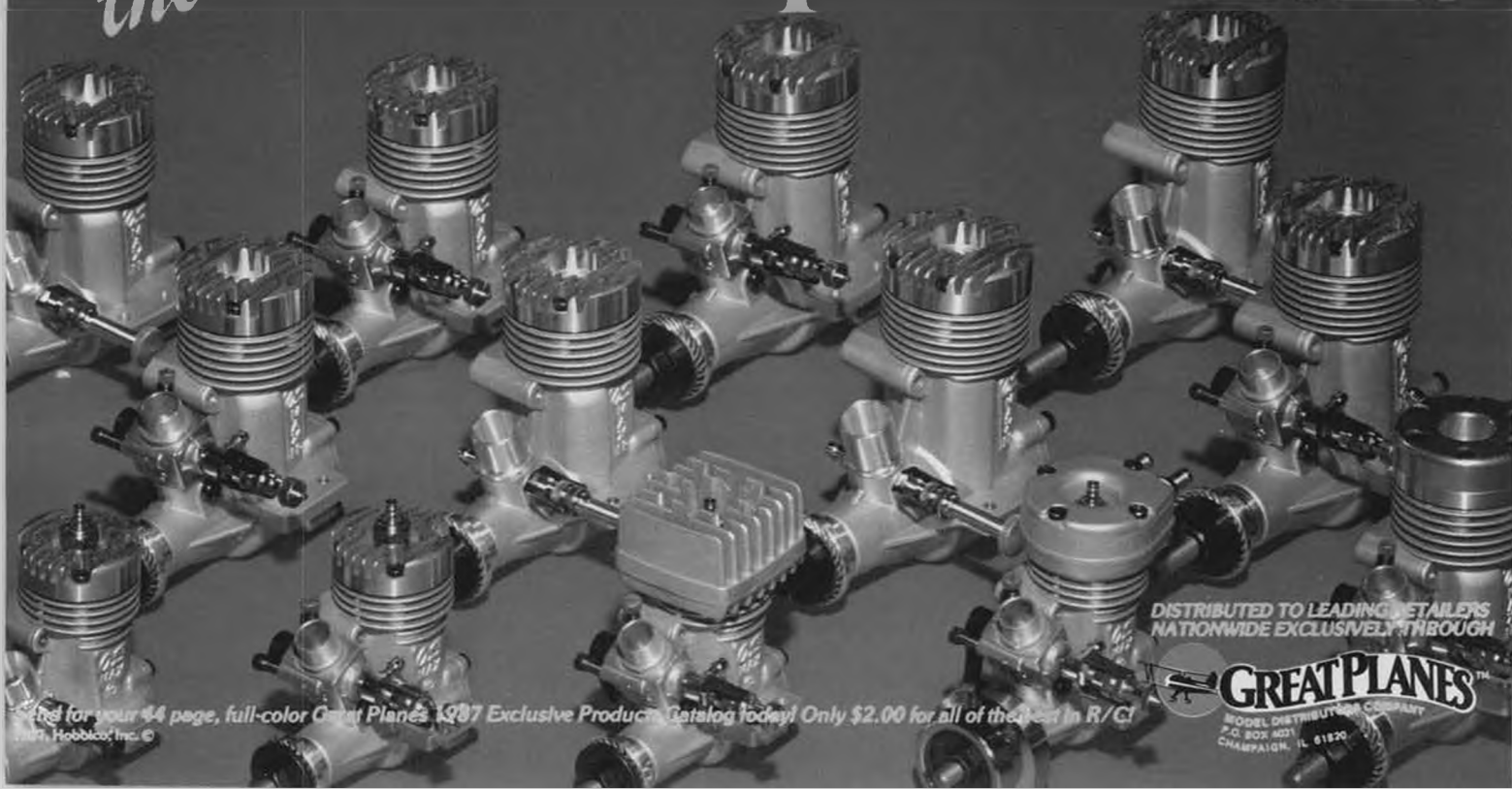
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control-line fliers will find engines ranging from the new .10 FP ABC up to the popular .40 FP. The brand new .10 FP comes in R/C control-line, marine, and buggy versions which all feature ABC construction. Another new addition to the FP series is the .15 FP, available in both R/C and control-line versions. Boating enthusiasts can find marine power in the unique .20 FP-M.

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Whenever we get together with a group of members of the model airplane hobby industry... and with the number of trade shows we attend, as exhibitors and/or producers, this is quite often throughout the year... the subject of the conversation most always gets around to the question of where the hobby is going.

Our own conclusion is that, in many respects, the hobby has just about gone the full circle, and we must now determine what is ahead for the second lap.

First of all, by saying it has gone the full circle, we're recalling the way things were when we "discovered" the hobby in the early 1930s. At that time, hobby shops were few and far between, and nearly all but a fortunate small percentage of modelers who lived near an existing source of materials, had to order their supplies by mail. Early magazines such as *Flying Aces* and the vintage *Model Airplane News* carried page after page of ads for nothing more than raw materials; balsa sticks and sheets, prop blocks, music wire, nitrate dope, glue, tissue, silk, bamboo paper, washers, thrust bearings, etc., and maybe a kit or two.

As the hobby rapidly grew in the mid and late 1930s, many more hobby shops opened up, new manufacturers appeared, and existing model companies grew in size to meet the increasing demand. Much of this new demand was created by several manufacturers of small, inexpensive stick and tissue



(Above) Fine example of a 1/4-scale Gipsy Moth built from the editor's plans (No.6771) by C.M. Reinisch, Thousand Oaks, California. Dry weight with O.S. 120 Surpass four-stroke is an ideal 16-1/2 pounds. Finish is Imron paint. Flies scale speed at one-third throttle, does honest loops and hammerhead stalls. Total flight trim amounted to three clicks of right rudder. (Right) Reinisch incorporated scale folding wings on his Moth. Note jury strut installed for folding, to keep wings in alignment. One-third scale plans now also available (No.2892).



"Name These Modelers." Another gem from the late Bev Smith photo collection. If you know who they are, we're also curious about the trophy and the approximate time frame. Earliest postmarked correct answer wins an Uber knife set.

rubber powered models, such as Megow, Comet, Guillow, Scientific, Joe Ott, etc., who did their part by cranking out millions of kits and marketing them in every possible outlet available; from major department stores and hobby shops in big cities, to the hardware stores, 5 & 10 cent stores, drug stores (whoops, pharmacy), newsstands, small hole-in-the-wall hobby shops, and even gasoline stations! This easy access to inexpensive model kits was undoubtedly the greatest single factor in bringing model airplanes to the attention of youngsters in every walk of life throughout the U.S. There was no need to push them into the hobby, it was literally stuck in their faces, no matter where they looked! (You want to solve the "Junior Problem?" Figure out a way to bring that era back!)

By the later 1930s the Academy of Model Aeronautics had been formed, the model ignition engine was in common use, and major industry, such as the Plymouth automobile company, the New York Mirror newspaper, Texaco Oil Company, and others, became involved as sponsors of huge annual competitions as well as specific events. By the time the U.S. entered World War II, model aviation was a thriving industry. With the shortage of raw materials because of wartime priorities, and most of its

customers in uniform and their "spare time" somewhat occupied, model manufacturers closed down or changed over to production of materials for the war effort. Many of the pilots in World War II had cut their teeth in aviation through their exposure to and their experiences in building and flying model airplanes during the "Golden Era" of the hobby.

Nearly all activity in the hobby, up to WW-II, was free flight, but as the modelers returned to civilian life, control line, and then radio control came into the act, and the hobby industry immediately picked up where it left off in 1941-42. As full scale aviation developed rapidly through the necessities of gaining military advantage during the war, the awareness of aviation in any form was all the more acute to the general public, and particularly to the returning veterans. More and more hobby shops blossomed in the post war years, and the hobby marketing

JUST AT PRESS TIME, IT WAS LEARNED THAT WALT SCHRODER, FOR MANY YEARS A MODEL MAGAZINE EDITOR AND PUBLISHER, DIED ON JUNE 4, 1990, AT THE AGE OF 83.

industry grew just as rapidly and became much more competitive.

Now inflation raised its ugly head, and naturally, the cost of model airplane items became swept up in the tide. In addition, radio control, with its mystical aura of being able to control a model airplane from the ground without any visible connection, began to draw more adults, who could better afford the higher cost of the equipment, thus accelerating the proliferation of costly products, and generally raising the entry level cost of the hobby. As far as industry was concerned, stick and tissue model kits were of no more interest because of the relatively small profit margin and difficulty of finding mass marketing outlets.

With so many new and expensive items to keep in stock in order to meet the broadening demands of the buying public, it became increasingly difficult for the inexperienced hobbyist-turned-merchant to keep the doors open to his small shop. The inevitable appearance of the mail order discount houses also added to the difficulties. Without the merchandising skills and/or the financial stability to compete with the mail order business, smaller and weaker hobby shops began to disappear.

So... as we commented in the second paragraph, the model airplane hobby seems to be completing the circle... we're coming back to where we started; a few good hobby shops scattered throughout the nation, particularly in the big cities, and the dependence on mail order to fill the needs of those who are not within reach of the good sources of supplies. But there are many obvious differences in the hobby between 1930 and 1990.

On the plus side, there's an uncountable
continued on page 62

DEAR JAKE

ADVICE FOR THE PROPWORN—BY JAKE

Dear Jake:

How come you never write about R/C model cars and, in particular, offroad racing? You one of those airplane snobs with no interest in cars?

"Wheels" Cottermann in New York

Dear Wheels:

On the contrary! I am a veteran offroad racer. Not intentionally, but off the road, nevertheless.

Jake

• • •

Dear Jake:

My dog chases model airplanes, especially when they're taxiing. Would I be legally responsible for damages if he ever got a hold of one?

Worried in Westport, Connecticut

Dear Worried:

Most definitely. The law places full responsibility for animals' actions upon their owners. A recent court case from Placerita Canyon, California provides an excellent example.

Dr. Frank and Mrs. Mary Poulan lived in a fourth floor apartment with a patio balcony. They owned a fourteen-month-old Weimaraner named Bubbette. On March 15, 1990, Frank was sitting out on the balcony tossing McDonald's french fries to the dog. In the bottom of the bag, he came across a burnt and shriveled french fry reject. Without thinking, he pitched it over the railing. Bubbette leaped after it.

The 80-pound dog landed on a Lamborghini four stories below. The lawsuit for damages to the car was decided in favor of the plaintiff, and the Poulans had to cough up \$20,000 for repairs.

They now live in a ground floor condo and keep tree moss as a pet.

Jake

• • •

Dear Jake:

Why is the steering wheel in an airplane called a yoke?

Garth in Gaithersville

Dear Garth:

I thought a yoke was the yellow part of an egg.

Jake

Dear Jake:

Yoke, not yolk! Yoke, as in oxen.

Garth Again

Dear Garth:

I didn't know oxen laid eggs.

Jake

• • •

Dear Jake:

I'm a big fan of aircraft racing, past and present. I love to read about the heyday of

national and international racing in the 1930s.

Recently, I came across an obscure 1935 racing journal translated from the original Italian. The issue had an article about clandestine observations of the secret flight tests of a new Polish racer under development. Apparently called the Seversky R-29 "Sea Slug," the mid-wing floatplane had an inline 16-cylinder engine and was destined for the Schneider Cup races. The reporter who covertly observed the flight testing estimated the sleek aircraft was capable of 300 knots DMS.

I have never seen this terminology before. What does the "DMS" mean in the aircraft's velocity estimate?

Racing Reader in Racine

Dear Racing Reader:

Down a Mine Shaft.

Jake

• • •

Dear Jake:

Why are air-to-air combat encounters called "dog fights"?

Curious in Colorado

Dear Curious:

In much the same way that miners take canaries down into the mines with them to check for poison gas, the earliest aviators used to carry dogs with them to monitor oxygen depletion as altitude increased. The theory was that if the dog passed out, the pilot would descend to a safer altitude.

In World War I, however, it was discovered that the dogs actually had more altitude and g-load tolerance than the human pilots. So it was frequently the case that the dogs had to take over the controls after the pilot passed out. When aerial combat became part of the war, therefore, more often than not it was the dog doing the flying. Hence the name, "dog fight."

It is a little known fact that the oft debated downing of the Red Baron was actually accomplished by a Canadian Airedale, while a Schnauzer was at the controls of the infamous Triplane.

Jake

• • •

Dear Jake:

Do the crews of the B-2 Stealth Bomber have to maintain silence like the old submarine movies on TV? You know how if somebody dropped something or sneezed, the sub's location would be given away and depth charges would start falling. Is the B-2 like that?

Nesmond in Nevada

Dear Nesmond:

As far as I know, depth charges are not a threat to the B-2, so I don't think silent
continued on page 64

CORRECTION

In our story on the Schneider Cup Reenactment at Lake Havasu, which appeared in the May issue, we inadvertently left out a paragraph dealing with sponsorship donations from *Scale R/C Modeler*, as arranged by its editor, Norm Goyer. Sponsorships are a major factor in the success of any large model event, particularly for its premier occasion, and should not go unrecognized.

COMBINED ISSUE

As many readers are aware, *Model Builder* deliveries have been running late for the past few months. This has been primarily due to a switching over process we are making to computerized production. The final step is a combining of the July and August issues to put us back on schedule.

It is important that our subscribers realize this does not affect the number of issues of *Model Builder* they are to receive. All subscriptions are automatically advanced one month to make up for the combined issue. In other words, if your subscription was due to expire with the December 1990 issue, it will now expire with the January 1991 issue, etc., etc.

OVER THE COUNTER

Ace R/C heads up our new products column this month with the announcement that they have purchased R/C Extra's, the company previously owned by Jim and Ruth Van Loo, and will be producing that company's excellent line of Giant Scale kits under the Ace R/C banner. As part of the deal, Jim Van Loo has joined the Ace staff and will be respon-



Another new kit from Ace, the Extra 230, available in three different sizes.



Ace R/C's new Clipped-Wing Taylorcraft in 1/4-scale, formerly kitted by R/C Extra's.



Big 1/3-scale Weeks Special, new from Ace R/C.



TOJ Can Am car body in 1/10-scale from Associated.

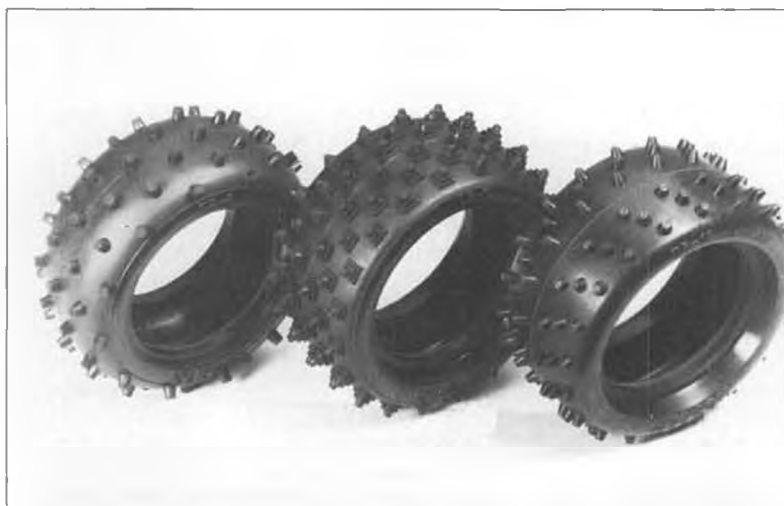
sible for getting kit production up to speed, quality control of Ace's entire plant line, new products, public relations, and so on. It's going to be a while before these new kits are up to full production speed, and therefore availability is going to be limited for the next several months. However, Ace is accepting back orders... so get your order in now!

Here is a quick rundown on the new Ace kits formerly manufactured by R/C Extra's:

- Clipped-Wing Taylorcraft in 1/4-scale. This is a sport scale replica of the ship flown by popular air show performer Duane Cole, with performance to match. Specs: 90-inch

span, 1300 square inch wing area, about 12 pounds ready to fly, and power can be a .90 to 1.5 two-stroke or 1.2 to 1.6 four-stroke. Suggested retail is \$219.95.

- Weeks Special in 1/3-scale. It looks a lot like a Pitts, but the full-size Weeks Special is an original design by Kermit Weeks, an outstanding U.S. pilot who has done very well with it in world-class aerobatic competition. The model features a semi-symmetrical airfoil, and an especially wide track landing gear for easy ground handling. This is the same design that Dave Brown used in the 1988 Tournament of Champions. Specs: 72-inch span, 1650 square inch wing area,



Three new types of spiked tires from Associated.



Associated's silicone shock oil, in five different weights.



Powermaster's specially blended Golden Break-In Fuel.

flying weight around 15 pounds, and suggested engines are the ST-3000, Quadra 35-40, etc. The kit lists at \$289.95

• Extra 230 in 25%, 30%, and 33% scales. The full-size aircraft is one of the most potent aerobatic machines ever built. U.S. pilot Clint McHenry has won a number of World Aerobatic Championship titles in his, which is the one modeled in the photograph. Specs for the three model sizes range as follows: 72-1/4 to 96-inch span, 858 to 1300 square inch wing area, 9 to 17-1/2 pounds, and power requirements for a .61 two-stroke on up to 2.6 cubic inches or more. Suggested retail prices are \$189.95,



Big Challenger Robin is the latest kit from Ikon N'wst.



The GB-5RX Speed Globutton (left), new from Twinn-K.



Novel shoulder-supported transmitter tray made by L.A.W. Racing Products.

\$229.95, and \$239.95 respectively. These last kits differ from the Taylorcraft and Weeks Special in that those two are of built-up construction, whereas all three of the Extra kits make use of balsa sheeted foam components in the wing and fuselage. Also, fiberglass wheel pants are supplied with the 25% Extra kit but are separate options for the other two sizes.

All of the new Ace kits come with rolled plans, step-by-step assembly manuals, formed aluminum landing gear, and fiberglass cowls. To help with scale documentation, special photo packages are also available as an option; write or call Ace for details.

From Ace R/C, 116 W. 19th St., P.O. Box 511, Higginsville, MO 64037; (816) 584-7121.

• • •

Those readers who are into R/C car racing will want to check out the new 1/10-scale TOJ Can Am car body just released by Associated Electrics, Inc. Priced at \$18.00, the TOJ recreates the detail of the original winner, including the smooth, aerodynamic lines designed to hug the ground and cross the finish line ahead of everyone else.

Associated's 100% pure silicone shock oil has proven that it will not thin out in hot weather or thicken up in cold. Because it maintains its viscosity, it works reliably in the cold morning qualifying, yet won't thin out in the heat of the day for the mains. Comes packaged in two-ounce bottles of your choice of 10 wt., 20 wt., 30 wt., 40 wt., and 80 wt., for \$3.50 each.

Lastly, Associated has three new offroad rear tires for Yokomo and RC10 cars, all retailing for \$11.00 per pair. On the left in the accompanying photo are the Pin Spike tires, and in the middle are the Pyramid Spikes. Both are made to fit two-inch diameter wheels; both are good all-surface spike tires, and both types are offered in soft, medium, and hard compounds. On the right are the Directional Cut Spike tires, which can be reversed to increase or decrease traction on hard, packed surfaces. These are



XL-R-8 CA accelerator, new from Powermaster.

made in soft and medium compounds only.

From Associated Electrics, Inc., 3585 Cadillac Ave., Costa Mesa, CA 92626.

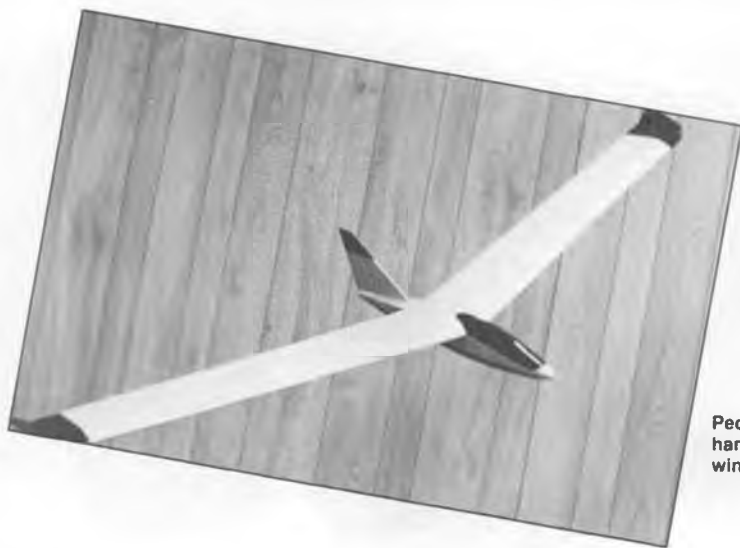
• • •

Powermaster Products has recognized the need for a fuel specially brewed for model engine break-in, and as a result has announced its new Golden Break-In Fuel, concocted by well-known engine expert and *Model Builder* columnist, Stu Richmond. The people at Powermaster feel this product has had more extensive field testing than any fuel currently available. Works equally well in two- and four-cycle engines. Golden Break-In Fuel comes in 1/2-gallon plastic bottles and includes a 32-page instruction booklet written by Stu himself, describing proven break-in methods for all types of engines.

Also new from Powermaster is "XL-R-8" accelerator for CA glues. It's available in two-ounce spray bottles and eight-ounce refills, works with all brands and types of CAs, and is said to be considerably less



Dave Brown's "Pour'n'Pump" fuel pumping station.



Peck-Polymers' "Genesis" hand-launch R/C flying wing glider.



The Shuriken .05, an ultra high performance 1/2A engine now in production by BV Competition Engines.

expensive than other similar products currently on the market.

For more info, contact Powermaster Products, Inc., 7807-H Telegraph Rd., Montebello, CA 90640; (213) 887-0801.

We've all seen those European style transmitter support trays that hang from your neck by a flexible strap. An outfit by the name of L.A.W. Racing Products has come out with a variation on that theme by offering a transmitter tray with *solid aluminum* straps that go up and over your shoulders, eliminating that annoying tug on your neck. The transmitter itself rests on a plate made of something called "Komatex," which is a very strong closed-cell PVC material that will not conduct static electricity, the nemesis of today's computer radios. The transmitter is positioned and securely retained to this plate by means of adjustable brackets and by a retention spring with a positive-lock safety clip.

The tray in the photo appears to be a beautifully made unit, with a black Komatex base plate and red anodized aluminum parts. It should hold lots of appeal for those who truly appreciate nice equipment. No price was quoted, but you can get this and availability information from L.A.W. Racing Prod-

ucts, 1229 Capitol Drive, Addison, IL 60101; (708) 543-2030.

Half-A fliers take note! Twinn-K has added the new Globee GB-5RX Speed Globutton to its line of button-type competition glow plugs. Whereas the other Globee plugs have a .050-inch bottom flange thickness, the new 5RX has a .080-inch flange (check the photo; the difference is obvious) that can be easily trimmed on a small lathe to adjust the volume of the combustion chamber as you see fit. Like other Globee plugs, the 5RX retains the unique flat-wound spiral coil element and exclusive glass-to-metal high temperature seal that has proven so successful in all-out competition.

The folks at Twinn-K advise that they're more than happy to answer your general or technical questions about glow plugs, either by mail or over the phone. Write Twinn-K, P.O. Box 31228, Indianapolis, IN 46231, or call (317) 839-6579.

For you Giant Scale buffs, Ikon N'wst has a 98-inch replica of the Challenger powered Curtiss Robin that looks like a real beauty. The main difference between this and the OX-5 Robin is the cowling; otherwise, they're pretty much the same airplane.

Ikon's prototype Challenger Robin was equipped with a .90 four-stroke, which they admit is really more power than the 14-pound model needs. Throttled back, though, the model is said to be a slow, realistic machine, and a real joy to fly. Outline-wise, the Robin is very close to scale and uses the scale airfoil. The kit includes pre-cut wood parts, pre-bent wire, an extensive hardware package, and inked plans.

Available at your favorite hobby shop or direct from Ikon N'wst, P.O. Box 306, Post Falls, ID 83854; (208) 773-9001.

Peck-Polymers is an outfit best known for Peanut Scale and other small F/F model kits, but they do have a couple of sport R/C kits as well... the latest addition to which is the "Genesis" flying wing glider designed by and developed over the last three years or so by Keith Schwemmer. At 59-inch span and 346 square inches it's just the right size for AMA Class A (hand launch) competition... or for leisurely tossing around the local park on a calm morning, or light-wind slope soaring, or even launching with a mild high-start.

The Genesis uses elevons for pitch and roll control, with rudder as a recommended option for smooth, coordinated turns. Detailed in the eight-page construction manual are three different ways to achieve elevon mixing; by using a sliding servo, electronic mixing (this is the best and lightest), and by mechanical mixing using a Du-Bro mixer (not included). Plans are full size, all balsa and plywood parts are die-cut, and a complete basic hardware package is supplied. There is plenty of room in the fuselage, but mini or micro servos should be used to keep the flying weight down to 10-12 ounces for best performance. We had a Genesis kit here at the MB office for a short time before sending it out for review (coming soon), and it did indeed look like a very nice package.

From Peck-Polymers, P.O. Box 710399, Santee, CA 92072; (619) 448-1818.

Half-A fliers who are really serious about competition, be it F/F, C/L or R/C, are gonna go absolutely nuts for this next item. BV Competition Engines, headed up by Fred



Big Cessna 206 Stationair is the latest plans offering from Wendell Hostetter.

Baldwin and Jim Van Arsdall, is introducing a new 1/2A powerplant called the Shuriken .05, the first production engine to come along in years... at least as far as we're aware... that could pose a serious threat to the Cox Tee Dee .049, which has been the dominant engine for 1/2A contest work since time out of mind.

As the photo shows, the Shuriken is a beautifully sculptured piece of work with modern, rakish lines. Of special note to you machinist types is that the crankcase/cylinder, the main body of the engine, is machined from a single piece of 2024 T-3 aluminum bar stock, then anodized red. Barstock engines as a rule generally come out quite heavy, but that doesn't seem to be the case here because the finished weight is listed at only 2.25 ounces. Other features include Schnuerle porting, ABC piston and cylinder liner, a steel wrist pin connecting the conrod to the piston, dual ball bearing crankshaft, and the new Globee GB-5RX button-type glow plug. A special wrench is provided that is used for removing the glow plug retainer, removing the backplate, and tightening the prop. No screwdrivers or conventional wrenches are needed... which is a good thing, because you know that sooner or later they'd slip and screw up that beautiful anodized finish!

Performance? On 50% nitro, 27,500 rpm with a 6x3 prop. This can go up to 32,000 rpm on 70% nitro with a single-blade 4x3 C/L speed prop. With the optional tuned pipe, the quoted rpm can go as high as 40,000. The engine is priced at \$200 plus shipping.

The first production run of 600 Shuriken .05s was to begin in April and orders were already starting to pile up. If you want to get on the list, your initial order should contain only a 25¢ stamp (no envelope) so you can be advised when your order is getting near the top. Fred and Jim emphasize that you are to send no money until your order is ready to be filled. BV Competition Engines, 1163 Country Club Road, Indianapolis, IN 46234; (317) 271-6650.

• • •

The latest plans offering from Wendell Hostetter is a 26% scale version of the powerful Cessna 206 Stationair, priced at \$29.50 postpaid for the two 42x96-inch sheets and a three-view drawing. The finished product is a real biggie with a span of 120 inches, length of 82 inches, 2080 square inches of wing area, and an all-up flying weight of 25 to 27 pounds.

As with other Hostetter plans, some accessories are available for your convenience; in the case of the Cessna these are the cowl, windshield and curved rear windows, nose gear, formed aluminum main gear, plans for 60-inch Edo type floats, and custom retracts for those floats if you want to build them in amphibious form.

The Cessna 206 drawings can be ordered from Wendell Hostetter's Plans, 1041 Heatherwood Lane, Orrville, OH 44667. If you'd like to find out about the other plans he offers, an SASE will bring full particulars.

• • •



The "PRO-kopter," a .60 size training helicopter from Robbe.



Robbe's wild R/c autogyro, called the "Whopper".

Dave Brown has a couple of new items you should know about. The first is "Lectra Lite" wheels, ultra-lightweights designed especially for electric powered models, where excess weight can't be tolerated. The tire itself is made of a durable low-bounce foam, mounted on a light plastic hub. Lectra Lite wheels are 1/2-inch thick and are offered in 1-3/4, 2, and 2-1/4 inch diameters, for list prices of \$3.50, \$3.75, and \$4.00 per pair respectively.

Also from Dave Brown is the "Pour'n'Pump" fuel pumping station consisting of an empty one-gallon metal can with one of the popular Six Shooter manual pumps already attached, for \$21.95. All you need do is pour in your favorite fuel and you're ready to go. The fuel can with fittings may also be purchased separately for those who already have a Six Shooter pump.

From Dave Brown Products, 4560 Layhigh Rd., Hamilton, OH 45013; phone (513) 738-1576.

• • •

Robbe Model Sport has announced two new models that will be of particular interest to rotary wing fanatics. First is the "PRO-kopter," a .60 size training helicopter made in Europe by Heim and based on that company's "Pro-Mechanik" mechanics introduced last fall. The helicopter's airframe appears to be quite simple and light. According to the press release, the structure

consists basically of the Pro-Mechanik assembly mounted on a molded plastic keel which serves as a mounting platform for the baseplate and the tail boom. Because of this design, all control linkages are short and direct for crisp control response.

One of the most unusual and interesting rotary wing flying models to come along in years is the Robbe/Schluter "Whopper" autogyro which, as the press release states, is an excellent introduction to rotary wing flight for the experienced airplane pilot. It appears to use a complete Schluter helicopter rotor head assembly, cyclic pitch controls and all, and is equipped with an engine-driven prerotorator to bring the rotor up to speed before takeoff. The Whopper uses a standard five-channel radio with no special mixing required. Best of all, most of the Whopper's parts are already in the Schluter helicopter line, which means that should you need them, replacement parts will not be hard to come by.

We wish we could give you a more detailed description of these neat machines, but the press releases we received were almost completely devoid of any technical information. We'd bet, however, that the folks at Robbe would be more than happy to answer any questions you might have. Contact Robbe Model Sport, Inc., 180 Township Line Road, Belle Mead, NJ 08502; phone (201) 359-2115.

MB

C APRONI-MORONI C2 "SCUD" EXPERIMENTAL FIGHTER

Most asked for ("demanded" might be a better word), has been a profile of yet another rare and almost unknown aircraft by the multitude of scale and stand-off scale buffs who've tired of building Cubs, P-51s and other ho-hum lookalikes.

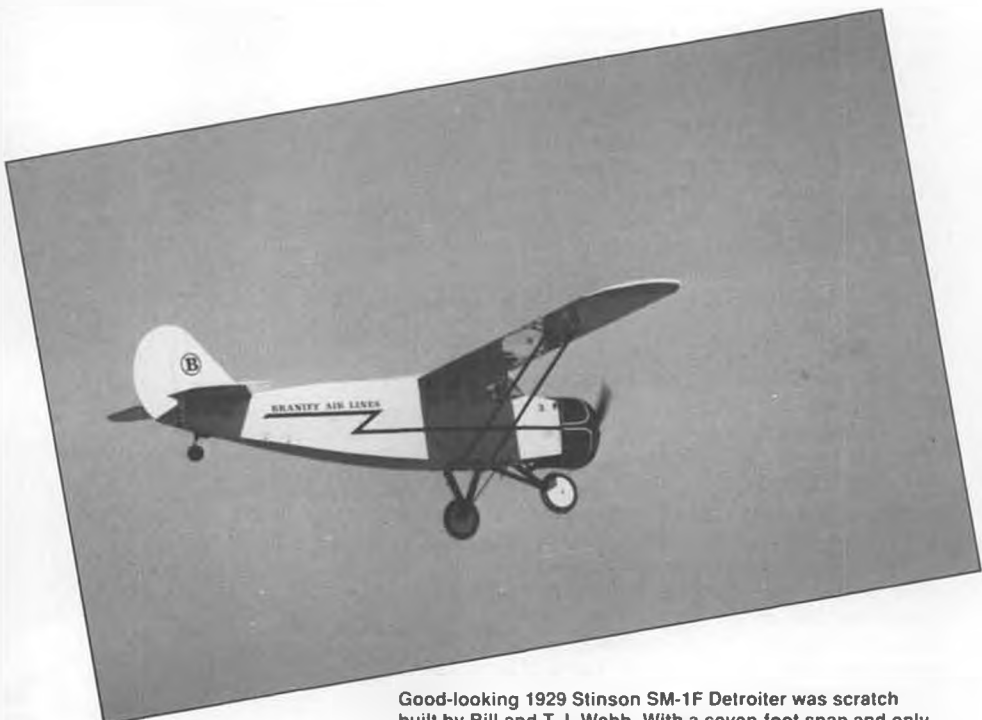
My mail reads pretty much the same. "Give us something different we can sink our teeth into," has been the cry from Big Bird lovers in all parts of the world. Proof that your pleas did not fall on deaf ears is in the pudding, and now, after untold sleepless days and weeks of diligent research I'm proud to present all known information, including an official sketch (sorry, no 3-views are known to exist), of the C2 "SCUD."

"When the tide of war turned against it, Fascist Italy turned with the tide. The C2, or SCUD, was the direct result.

"The engineers of Aeronotico Piccolino Albagano Blari Quattori in Turin were charged with designing an aircraft of modern fighter type that could, should word come in midair of yet another change in Italian allegiance, instantly reverse course and become part of the now friendly force.

"Thus the unique two-engine configuration, central cockpit with swivel-seat and dual controls facing fore and aft. Time for the SCUD (for 'Scuderia con curso il travaia,' or 'Turncoat') to switch directions and sides was something less than two minutes from a top speed of 265 knots. According to Air Force consultants this still is a world's record.

"This performance criterion was never tested, much less met, since pilots refused to attempt it—except on the ground with an ambulance close by. It was reported (although never verified) that one pilot did take the sole SCUD prototype aloft but, once airborne, decided to visit his mother in



Good-looking 1929 Stinson SM-1F Detroit was scratch built by Bill and T.J. Webb. With a seven-foot span and only a 6-1/2 pound flying weight, it's a slow, realistic flying machine with a Saito 65.

Salerno and wrecked this unique craft while crash-landing on a nearby beach.

"The SCUD was painted gold by artisans formerly employed in the upkeep of the Sistine Chapel. A remarkable feature of the plane, considering its fighter designation, was its total lack of armament. The designers successfully resisted all attempts to ruin its unbroken lines with ugly guns."

POWERMASTER FUELS

I first became familiar with Powermaster about a year ago when I needed fuel for my K&B .65 Sportster. A few of the local diehard fliers recommended it and, since the price was right, I bought a case. It appears to have been a good buy because the Sportster has

been deliriously happy running on this juice.

What I didn't know at the time was that Powermaster also makes other kinds of fuels, like their 1/4 Scale and ST (Super Tigre) Special brews—both of which I've since tried and found to be excellent mixes. My well-used Super Tigre 2500 loved the ST Special and the 1/4 Scale stuff worked equally well in a 2.6 Sachs.

For more info about their fuels, contact Powermaster Products, 7007-H Telegraph Road, Montebello, CA 90640, (213)887-0801.

RECHARGEABLE SCREWDRIVERS

After years of listening to other guys tell how happy they've been with their rechargeable screwdrivers, I finally gave in and took advantage of a Christmas sale. And now, after four months of use, I can't imagine how I ever got along without one of them that contraptions. However, as handy as it is, I've often wished that my screwdriver could also double as a drill... that is, without having to buy those special and expensive hex-shanked drill bits.

Well, it seems that fellow club member Jim Miller must have been reading my mind because at a recent club meeting he showed me the 1-1/4 inch chuck he'd adapted for use with his rechargeable screwdriver. Like most good ideas, it's simple, just silver-solder a hex-shaped bit to a chuck and you can use your screwdriver with any size drill bit.

I also had a 1-1/4 inch chuck laying around doing nothing so I pressed it into

Doc Mathews' prototype of the Big Bingo. Uses an ST-2500 with CH ignition, Davis Iso-Mounts and a Soundmaster muffler. A great flier and very quiet. Ace R/C will have a kit for it soon.



service. A smaller chuck, if available, should work fine. I think a larger chuck might prove to be a bit too heavy and unwieldy.

FINDING THE "RIGHT" AIRPLANE

Too many beginners make it unnecessarily hard on themselves by learning how to fly with the wrong type of airplane. Going hand-in-hand with being too small, the plane is also usually too fast, which does nothing to help build self-confidence.

Bill Webb ran into this when he switched from gliders to powered aircraft. I'm presenting his letter in the hope that others facing the same problem will be encouraged to consider scratch-building a bird that's tailored more to their needs. Here's Bill's story:

"Although I've been flying for 15 years I've just recently started flying powered planes. Gliders were my thing.

"In 1988 my son TJ and I built a Bridi 'Big B' and installed a Quadra 35 up front swinging an 18x6 prop. As you can see by the picture we altered the kit a bit in appearance. The plane flies very well and TJ loves it.

"However, with my eyesight and slowed-down reflexes it flies too fast to suit me. I wanted something that would fly and glide slower.

"I talked with many modelers and came to the conclusion that everyone flies 'rockets.' I had a good Saito .65 FS and wanted to use it, and since I love older planes something from the Golden Era seemed like it would suit me very well. Well, in the Encyclopedia of Civil Aircraft I found the plane for me: a 1929 Stinson SM-1F Detroit.

"TJ and I began to scale the plane to see how big we could build it using the Saito .65 for power. We had a computer program for aircraft design. Feed in engine rpm, weight, design type (trainer, sport, low-wing, etc.), and wing area. The computer will then spell out max speed, flight possibilities, and stall



Be the first on your block to build a quarter-scale model of the obscure and unique Caproni-Moroni C2 "SCUD" fighter. Text tells all.



Here's a modification that will let your rechargeable screwdriver do double-duty as a drill. Some brazing or silver soldering is required. See text.



Highly modified Bridi "Big B" is the work of Bill Webb and son T.J. Sure does look different! Plane flies very well with a Quadra 35.

speed. We estimated the weight of a seven-foot model to be seven pounds and entered the other information. The results were: good sport flying ability, a max speed of 55 mph and a stall speed of 13 mph.

"Next we drew up plans for a standoff scale model and began construction. I had opted for rudder, elevator and throttle, so

the wings built fast without having to fuss with ailerons. The wings were built to plug in and use working struts. The center section and rib caps were sheeted with 1/16 balsa and the 1/4x1/2 balsa spar was shear webbed. Covering was MonoKote.

"Next came the fuselage. I used 3/16 square longerons and cross-bracing and lots of 1/64 ply gussets. Assembly of the two sides included three frames, one at the firewall and one each at the leading and trailing edges. These were 1/8 lite ply edged with 3/32 spruce, the balance was 3/32 balsa also gusseted at all points. A second firewall of 1/8 ply was epoxied in place and the fuselage sheeted with 1/64 ply from firewall to wing trailing edge. The result was an extremely strong yet very light unit.

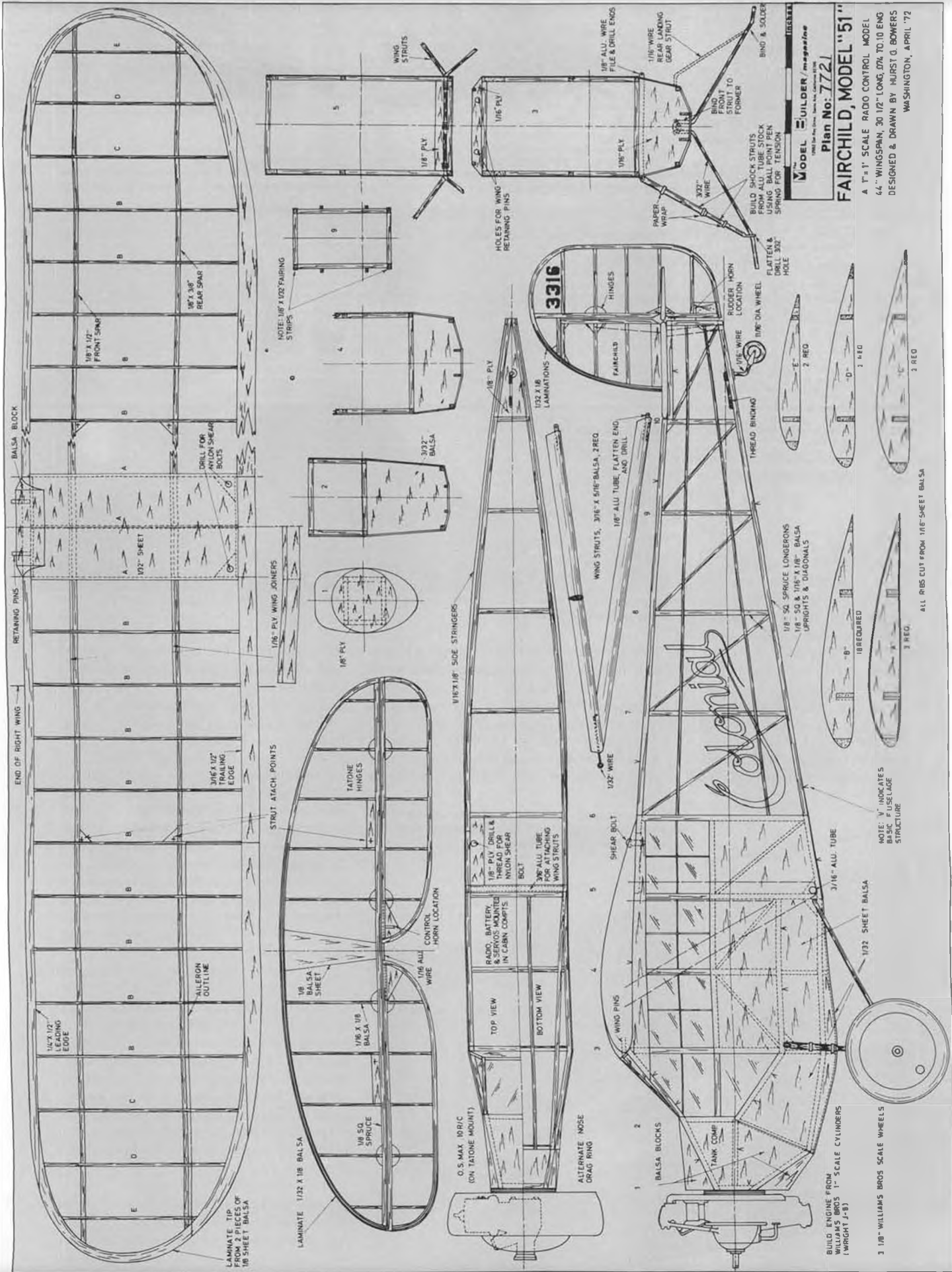
"Tail feathers were 1/4 square balsa and made to bolt onto the fuselage, which had 1/8 lite ply doublers where needed. Next we installed the radio, keeping everything as near to the CG as possible. Bare-bones it balanced at the CG but covered it needed two ounces of weight way back in the tail section. We used a pump so the engine could get fuel easily. Final all-up weight was 6.5 pounds. The cowl was hand made using a shaped foam plug and covered with fiberglass.

"TJ is the test pilot for Webb R/C. After a few taxi runs to check out ground control, he headed her into a light breeze at 1/3 throttle and after a short 50-foot run she lifted off

continued on page 64

Kerry Hurt provides a good size comparison for his big P-38, designed by Bill Baker. She moves right along with twin ST-3000s up front.





MODEL BUILDER magazine
 (Model for the Home, Back the Garden Gate)

Plan No: 7721

FAIRCHILD, MODEL "51"
 A 1" = 1" SCALE RADIO CONTROL MODEL
 44" WINGSPAN, 30 1/2" LONG, 07% TO 10 ENG
 DESIGNED & DRAWN BY HURST G. BOWERS
 WASHINGTON, APRIL '72

END OF RIGHT WING — RETAINING PINS — Balsa Block

1/8" x 1/2" FRONT STRAP

1/8" x 1/8" REAR STRAP

1/16" PLY WING JOINERS

WING STRUTS

1/32" SHEET

DRILL FOR ANTI-ION STRAP BOLTS

3/16" x 1/2" LEADING EDGE

AILERON OUTLINE

LAMINATE TIP FROM 2 PIECES OF 1/8" SHEET Balsa

NOTE: 1/8" x 1/32" FAIRING STRIPS

1/8" PLY

1/8" PLY

1/8" PLY

1/32" Balsa

1/8" PLY

Holes for wing retaining pins

1/16" PLY

1/16" PLY

1/16" PLY

1/16" PLY

1/16" PLY

1/16" ALL WIRE FILE & DRILL ENDS

1/16" WIRE REAR LANDING GEAR STRUT

1/16" WIRE BIND STRUT TO FORMER

1/16" WIRE BIND & SOLDER

1/16" WIRE

1/16" WIRE

BUILD BACK STRUTS FROM ALU. TUBE STOCK USING BALL POINT PEN SPRING FOR TENSION

1/16" DIA WHEEL

FLATTEN & DRILL 3/32" HOLE

1/16" DIA WHEEL

1/16" DIA WHEEL

1/16" DIA WHEEL

1/8" x 1/8" Balsa

1/8" SQ SPRUCE

1/16" x 1/8" Balsa

1/16" PLY

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1/8" x 1/8" Balsa

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1/8" SQ SPRUCE

1/16" x 1/8" Balsa

1/16" PLY

1/16" PLY

1/16" PLY

BUILD ENGINE FROM 1/8" & 1/16" SCALE CYLINDERS (RIGHT 48)

3 1/8" WILLIAMS BROS SCALE WHEELS

NOTE: V. INDICATES USE LAGE STRUCTURE

1/8" SQ SPRUCE LONGERONS 1/8" SQ & 1/16" x 1/8" Balsa UPRIGHTS & DIAGONALS

1/16" DIA WHEEL

2 REQ

1 REQ

3 REQ

ALL RIBS CUT FROM 1/16" SHEET Balsa

BY COL. HURST BOWERS

FAIRCHILD 51

Just an old cabin monoplane, but when American aviation was making its mark in the "Classic Era", this ship always happened to be around. It's a triple-threat model, too. With little modification, it can be built for radio control, free flight rubber or free flight gas.



That famous statement of Winston Churchill that never have so many owed so much to so few, could be paraphrased to apply to the boxy old Fairchild Model 51. Its pioneer work with air mail operations, early domestic scheduled airline service, route surveys of Latin America's future airways, photographic work, bush flying, and a host of other tasks, made possible what we consider routine in civil aviation today.

For years I have seen this aircraft pictured in its various roles in pioneer aviation, and its only noteworthy characteristic was simply a lack of any prominent feature. It was just one of those old cabin monoplanes which were so prevalent during the late 1920s and 1930s, but there was something different. Its lack of flamboyance made accurate identification difficult and locating drawings was almost an impossible task, but I acquired such a fascination with this ancient machine that I resolved to model it. After all, here incorpo-

rated into one basic airplane was one of the most perfect examples of "Aeronautica Americana" to be found.

I started with a J. Triggs painting done for the Phillips 66 Historical Aviation series, which features a Fairchild 51 in the livery of Colonial Air Service plodding along over the Mohawk Valley. From there I found a gold mine of data in *The Antiquer*, a magazine published by the Antique Airplane Association, and in *U.S. Civil Aircraft* (Vol. 4) by Joseph Juptner. Shortly afterward I located a "real live machine" in storage which I was permitted to study and photograph. Armed with this material I was able to develop the drawings accompanying this article, which are to a scale of one inch equals one foot, giving the model a 44-inch wingspan. Although 100% accuracy is not claimed, the drawings are reasonably accurate and certainly adequate for stand-off scale. Although my model is powered with a Cox .09 and stressed for radio, it is sufficiently light to be flown in free flight scale, and with a few minor weight saving changes here and there, it could even be flown on rubber power. How's that for versatility? Just like the prototype.

Now let's get underway and start putting pins into the workboard. The construction is quite conventional, so I will not burden you with how to connect stringer x to upright y. Instead, I will only touch on the areas where a brief explanation is necessary. First, study the drawings and note that the basic fuselage frame to be constructed on the plan is outlined with small "v" marks. The bottom third of the fuselage under the cabin is formed by the formers, as shown on the cross section views of stations 2, 3, and 4. Covered with hard 1/32-inch sheet balsa, this makes a clean and very strong structure as well as being quite light. You will note that the longerons are 1/8 square spruce. This is the secret of the weight and strength of this model. Although you may substitute balsa here, my recommendation is to find some good Sig spruce and use it... you'll like it.

The landing gear is simple and functional, as well as being scale. I made the shock struts from telescoping aluminum tubing with small ballpoint pen springs inside, and strips of paper to represent collars on the outside. This, along with the Williams Brothers 3-1/8 inch Old Time Scale wheels, goes to make the landing gear highly accurate. And while speaking of Williams Brothers, use their one-inch scale Wright J-5 cylinders to make up an engine to camouflage the powerplant you use. Here is where the ingenuity of the builder comes to play, but with a little time and effort you can produce a real masterpiece. If you can't spare the time, just hide your engine behind a thrust plate under a drag ring, and you will still have a scale version, for some owners did add these innovations.

The wing and tail are conventional and should present no problems. I built my tail outlines from 1/8-inch reed purchased in the basket weaving department at the local



(Top) A perfect example of the statement, "Glamour is not in beauty alone," the Fairchild 51 was just another boxy monoplane, and a perfect example of the simple, rugged, and functional aircraft that dominated the "Classic Era" of the 1920s and 1930s in America and in the Canadian bush country. It just begs to be doubled in size, with a live radial up front. (Above) The author and designer, and now curator of the AMA Model Museum, Col. Hurst Bowers with his '51'. The metal scale prop returns to its job as letter opener when it's time to fly. Original was powered with a Cox .09 "J-5." If you're interested in 2" or 1/4-scale plan blowups, let us know.

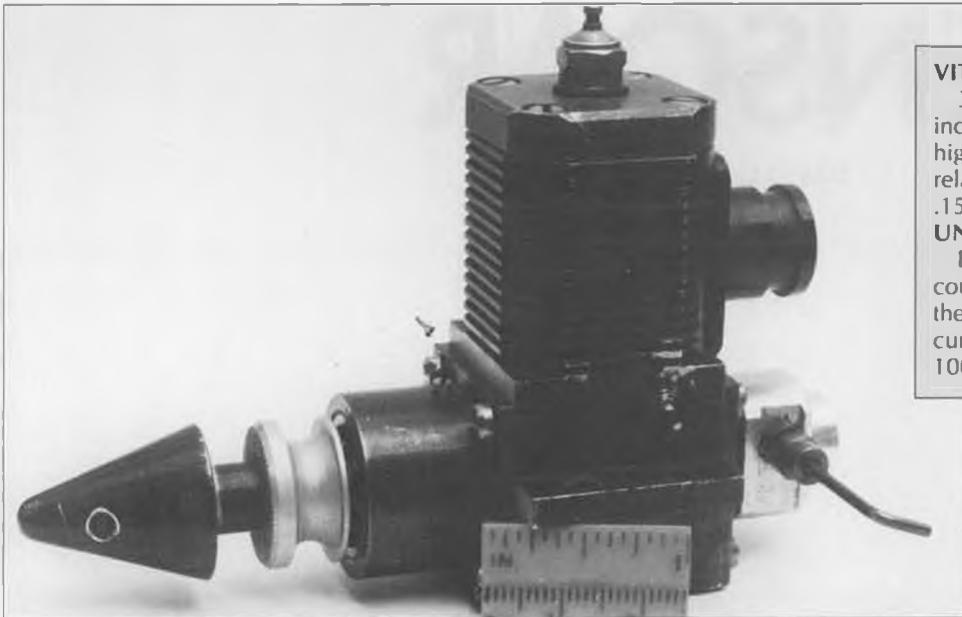
craft shop. You younger builders won't be familiar with this material, but at one time, reed or bamboo was the standard stock for curved wingtips, tail outlines, etc. I would recommend the laminated balsa method which I have shown on the plans, however, as reed will not retain its form nearly as well, and has a greater tendency to warp.

You may use anything from Japanese tissue to the new press-on, heat-shrink materials for covering, but I used silk, for it just seemed the thing to use on a model of this vintage and construction. Pick any color combination and chances are it was used on a prototype. I used the old Army Air Corps

olive drab and yellow for I understand several of these Fairchild's were used as military transports. I have been unable to verify this but I like the old Army colors so much I used them anyway. The Colonial version was all silver with black lettering, numbers and details. This was also true of the version used by PANAGRA, except the lettering and numbers were green.

For R/C flying, any of the new light radios are excellent. This model would also fly well on pulse rudder if kept light and powered with a good .049 engine. Whatever you use, it will be a slow, stable replica of this obscure, but outstanding aircraft. **MB**

THE MATAS 2.5 CUBIC CENTIMETER RACING GLOW



The Lithuanian MATAS 2.5cc racing engine is truly one of the modeling world's rarities. Machined entirely from bar stock, which accounts for its rather heavy 9-1/4 ounce weight.

Magazine publishing is a complicated cycle, so it's very hard to determine when this particular Engine Of The World will appear in print. But as this is being typed the small country of Lithuania has made its 1990 declaration of independence from the Union of Soviet Socialist Republics. It has declared that it is again a free democratic republic... and the newspapers and national television are full of news about how this declaration sits poorly with the Soviets and their President Gorbachev.

Yesterday the Soviets shut off the flow of crude oil to this Baltic Sea country that's roughly the size of our West Virginia. The oil is processed in Lithuania's largest commercial industry, a refinery built by the Soviets, and then pumped back around USSR as well as providing the only gasoline supply for cars in Lithuania. Today the Soviets cut the natural gas back to less than a 20% flow, and

the factory that makes this month's engine has got to be darn cold in the April winter frigid climate—there's only enough gas for cooking.

Not so in the U.S.A., but elsewhere around the world the 2.5cc (.15 cu. in.) size engine is the most sought-after and most useable size for model aircraft competition due to FAI team racing and free flight categories. Our AMA's Executive Council meets in Reston this coming weekend, and on the agenda is the subject of the U.S.A. curtailing major expenditures (about \$150,000 each year) to form FAI teams and send about 200 or less aeromodelers to international competitions. With the near-collapse of the Communist system I'd like to see the world's modelers join into AMA membership.

But off the soapbox and on to the MATAS. This is an extremely rare model engine that was sold in the Soviet Union for 52 rubles and ultimately found its way to my collec-



Engraving on the bottom of the crankcase gives the name, the displacement and the price: 52 Rubles, a very expensive engine by world standards!



The drum intake valve (center) features an angled insert pressed into the bore that, in theory at least, deflects the incoming fuel mixture toward the cylinder bypass ports.

VITAL STATISTICS

3-1/16 inches long to the prop driver, 1-5/8 inches across the mounting lugs, 2-1/2 inches high to the top of the cylinder head. Weight is a relatively heavy 9-1/4 ounces for 2.5cc, which is .15 cubic inch displacement.

UNIQUE FEATURE(S)

Engine is made in Lithuania, a small Baltic country that's just declared independence from the Soviet Union. The Soviet/Lithuania discord is currently in world headline news. Engine is 100% machined from barstock.

tion. The U.S. dollar value for this unrun engine is something over \$250. Every piece is machined from barstock to give the strongest model engine possible. Either for heat dissipation or for prettiness, the engine is almost entirely black. The prop driver has a peculiar yellow plating characteristic of Soviet nuts and bolts, and the carburetor is unpainted aluminum with a black oxide needle valve and brass fittings. The engine appears in none of the collectors' journals and books. It is known of and spoken of, but few modelers outside the Soviet system have even seen a MATAS—that's how rare it is! It

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The glow plug gasket is the only gasket in the entire engine. Each MATAS engine is first run at the factory, which is why the combustion chamber area of the head is slightly darkened. Stu's engine has not been run since it left the factory.



The Schnuerle transfer ports are plainly visible in this view with the head off and the piston at bottom dead center. Excellent internal fits make up for the rather rough outside finish.

HOBBY HORN SENSOAR

BY DAVID GARWOOD

The Hobby Horn "Sensoar," designed by Bob Sliff, is a two-channel, two-meter polyhedral glider suitable for beginning builders and fliers. The model is well designed, easy to build, pretty to look at, and impressive to fly.

I first saw the Sensoar fly on a slope soaring trip to Cape Cod. I liked the airplane's attractive appearance and graceful flight, and I decided to build one. This article is really the story of two Sensoars, the first constructed by my friend Rudy Coletti and the second by me.

KIT CONTENTS

I was pleasantly surprised to find the kit is available from Hobby Horn for a mere \$18. For this modest price the kit contains all the balsa, plywood and spruce parts needed to build the model. Hardware, covering material, and adhesives are supplied by the builder. Wing ribs are machine cut as are the fuselage sides, formers, doublers, curved wingtip parts, and other small parts.

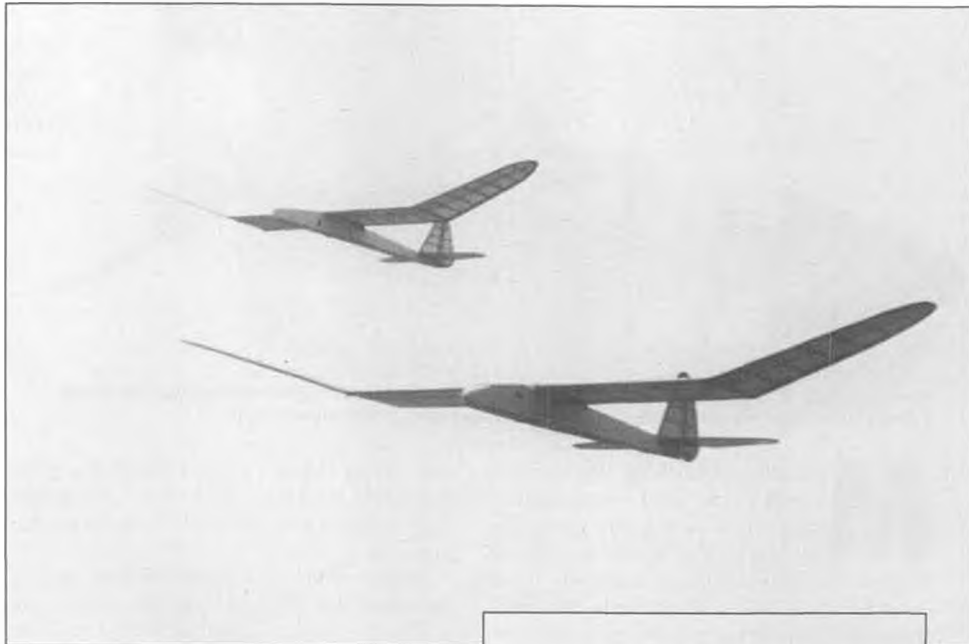
The kit includes two sheets of full-size rolled plans, and an eight page instruction manual which contains building, trimming and flying tips useful to those who are new to R/C gliders. According to the plans and instructions, the Sensoar can also be built as a motorglider, launched by electric or .049 gas power.

CONSTRUCTION

Detailed building instructions are given in a logical sequence. Construction uses traditional materials and common adhesives, and I believe most builders will be comfortable with the process.

The builder begins by pinning the wing center panel parts to the building board and assembling the pre-cut ribs to the leading edge, trailing edge and bottom spar. I used CA glue for the ribs and spar shear webs and aliphatic resin (tan carpenter's) glue for the top spar because a little longer working time is needed.

The wing outer panels are assembled in the same manner, and the pre-cut parts provided for the rounded wingtips save substantial time over making them yourself. The tip panels are joined to the center panel with pre-cut plywood parts, installed with epoxy. The result is a light, strong open structure, and the wing is completed by sanding and covering.



(Above) Two Sensoars, built by our author and his flying buddy, Rudy Coletti, make a pretty picture as they fly gracefully in formation. Photo by Jim Harrigan. (Right) Dave's Sensoar was finished with transparent MonoKote flying surfaces and painted fuselage. Those tapered, curved wing tips may take a little longer to build, but they sure look great in the air! Photo by Paula Garwood.



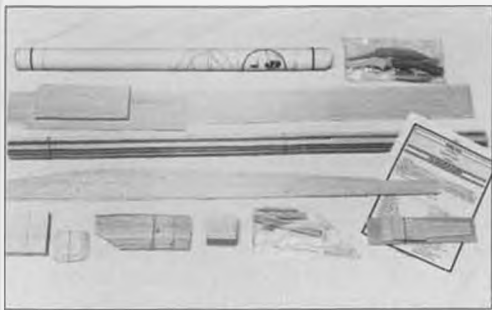
The stabilizer/elevator and fin/rudder are built like the wing, by pinning parts over the plans. Again, pre-cut rounded parts for the curved tips are provided. I used CA glue for wood assembly, epoxy to install nylon hinges, then covered the wing and tailfeathers with transparent MonoKote.

Fuselage construction is straightforward, and consists of installing longerons along the edges of the pre-cut fuselage sides, installing formers and doublers, and gluing the rear sides together using the plans as an alignment guide. The bottom sheeting and nose block are glued in place and the control rods and servo mounts are cut and installed. Again, CA glue was used for small parts and tan carpenter's glue was used for larger parts where longer working time is needed. I used a hot-melt glue gun to secure the control rod outer tubes, but I believe epoxy and specialty adhesives will work too.

When the top sheeting is installed and the hatch is fitted the fuselage is completed. The final finish on my fuselage is two coats of spray primer and one coat of spray enamel, sanding between coats.

Final assembly of the airframe consists of installing and aligning the tail parts and connecting the control rods.

The only portion of the construction sequence I found confusing is that the plans appear to show the trailing edge of the fin and the trailing edge of the horizontal stabi-



The Sensoar kit includes two sheets of rolled plans, machine cut wing ribs, formers, fuselage sides, doublers, curved wing tip parts, and other small pieces. Hardware is not included. The eight-page instruction manual includes building and flying tips.

lizer intersecting. It's as if two sticks are shown occupying the same space, and the instructions do not clarify the situation. Rudy's approach was to cut the fin stick; mine was to notch it. Both solutions worked out fine in practice.

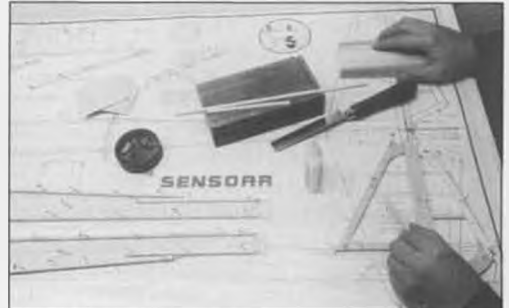
I built my Sensoar in 26-1/2 hours over 11 evenings. Rudy finished his in less than a week. My cost to construct the model was \$41.40, not counting adhesives, paint or the radio. The components of this total are the kit (\$18), two small control horns (55 cents), hinges (\$1.30), Sullivan 506 control rods, which included Sullivan metal clevises (\$3.50), a towhook (95 cents), two small screws (10 cents), and two rolls of Top Flite transparent MonoKote (\$17.00).

CONSTRUCTION MODIFICATIONS

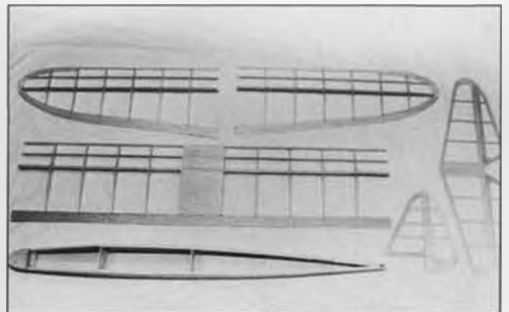
I made four changes to the construction procedures given in the instruction manual, based on watching Rudy's Sensoar fly. His model needed five ounces of nose weight to balance, and his fuselage cracked more than once in front of the wing during hard landings. Note that Rudy's model flies fine, I just thought that if I could lighten the tail to reduce the nose weight required, and



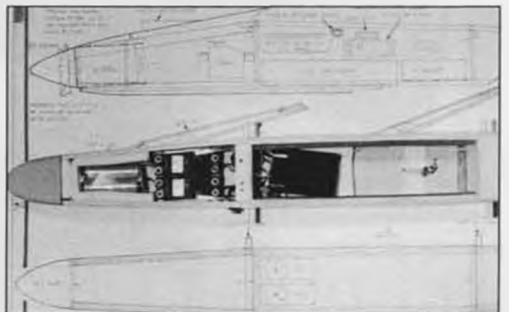
The three wing panels are constructed separately, flat on the building board over the plan sheet, and assembled later.



The horizontal and vertical stabilizers are built up from 3/16 balsa stock. At left, the longerons are pinned to the balsa fuselage sides while the glue hardens.



Construction is pretty much complete at this point. Remaining tasks are wing assembly, fitting the fin and horizontal stab, and installing the servo mounts and control linkages.



Radio is mounted as far forward as possible, but one ounce of nose weight was still required to get the ship to balance. See text for the author's thoughts on how to lighten the tail.

strengthen the forward part of the fuselage, then I would have an improved airplane.

Two changes were aimed at reducing the weight of the tail. The first was to substitute smaller balsa stock for the trailing edge of the rudder and elevator. The second was to

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Rudy Coletti launches his Sensoar for a trim flight over Fisher Beach in Wellfleet, Massachusetts. It's a great light wind slope soarer, suitable for beginners.



R/C PRECISION AEROBATICS

BY RICK ALLISON

Pattern returns to the pages of *Model Builder!* Mr. Bill Northrop has asked me to carry the semi-sacred (and no doubt dangerously fuel soaked) Torch of Aerobatics forward into the '90s. Fortunately, I have an excellent medical plan which includes burn coverage, so I was overjoyed at the opportunity to oblige. Barring unforeseen tragedies of cosmic scope, this column will be here each and every issue, just as regular as the price on the cover. The only exception will be if Mr. Bill decides to preempt me for room to cover the Third Inter Galactic Space Free Flight Champs (R/C assist allowed for retrieval on!) or something similar at some time in the future.

First columns by brand new columnists are traditionally time for introductions. This is boring stuff, but mostly obligatory, so feel free to skip this paragraph if you like. I wish I could! A good many of you hard core

pattern types out there already know me, since I've been writing a column in the *K-Factor* for over a year now. The *K-Factor* is the monthly newsletter of the National Society of Radio Controlled Aerobatics, which is the AMA recognized special interest group for Pattern. If you are interested in pattern and aren't yet a member of the NSRCA, you are definitely missing out on a bunch of good things. Send 20 bucks to Suzi Stream at 3723 Snowden Ave., Long Beach, CA 90808, and join up. Suzi is the Treasurer, and can be trusted with your money. Tell her I sent ya.

For those of you that don't know me, well, you will soon enough. Off and on, I've been modeling since about 1955, and I've played with free flight (rubber, gas, and scale), control line (mostly stunt), and for the last decade or so, radio control. At present, I am a regular competitor in FAI F3A, and I am

married to a wonderful lady who competes in the new Expert Turnaround class. I get to build, fix, and trim a lot of airplanes because of this, and I've gotten pretty good at all of the above out of necessity. I like cats, dogs, soft late summer evenings, and the color yellow. I paint almost all of my airplanes yellow. I dislike cold and rainy weather at contests, mid-air, flat beer, CA glue spilled in my flight box, and people who mess up my transmitter trims. All this is probably more about me than you really need to know, but I feel it's important for you to know that I share some of your concerns, like about the transmitter trims. And you probably don't care much for mid-air either, or spilled CA, or flat beer, especially in that particular order on a cold and rainy day at a contest. This officially ends the introduction. On to the more important stuff.

Before we dive headlong into things, however, I would like to make a plea for let-



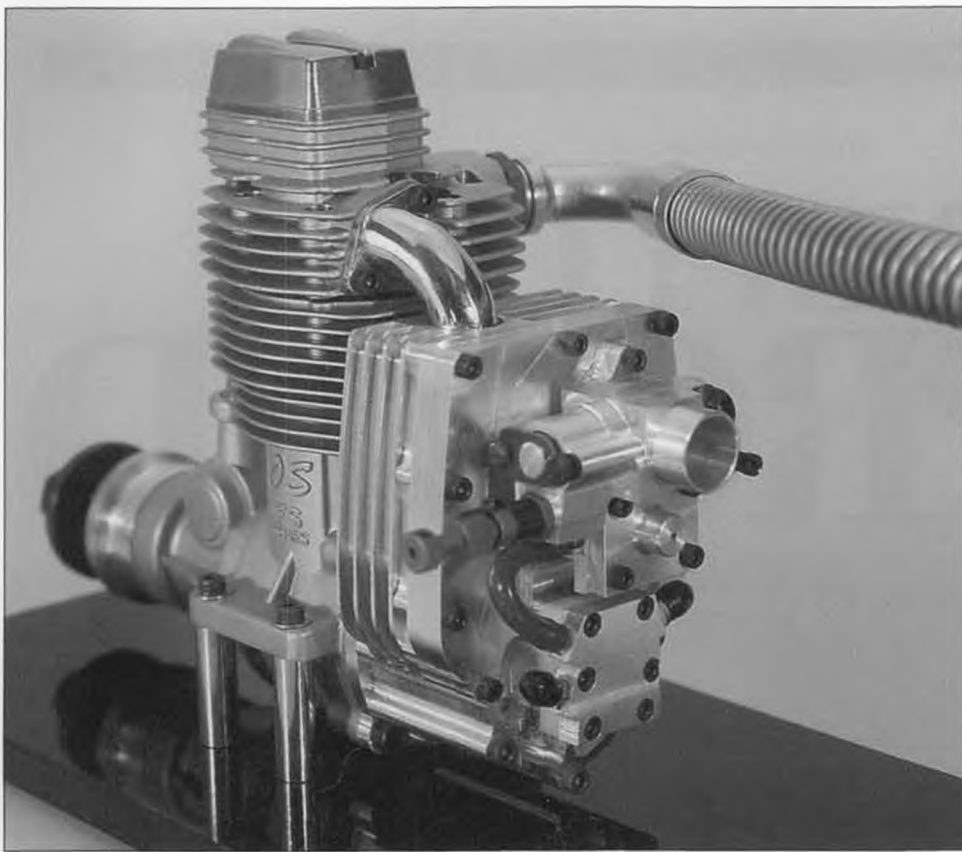
(Left) Rick Allison's prototype of the "Cursor," now being kitted by RC City. It's state-of-the-art throughout, a low mid-wing design with a thin airfoil and fairly sharp leading edge, and a large stab set on the thrust line. A very efficient and mean looking ship, especially with that four-blade prop! (Right) "Bogie" is the brainchild of Roy Speights. Note the placement of the wing and stab in relation to the thrust line. Photo by Buck Boynton.



Top Canadian flier, Ivan Kristenson, flew his "Summit III" at the '89 Nats. This view clearly shows the long tail moment and very large tail surfaces that typify modern turnaround designs. Don Passey photo.



Don Passey's flight line shot taken at the '89 Nats reveals quite a few taildraggers, as well as an almost total absence of exposed tuned pipes.



Another kind of "ULTIMATE," The mechanically supercharged O.S. FS-120 Surpass SP, first four-cycle model aircraft engine so equipped. Supercharger provides 40 percent power increase over standard FS-120 with pump, and only adds 5.11 oz. Now in production, but hand machined and assembled. Take a number!

ters and photos from all of you around the country. I believe that a column like this works best as an interactive thing. I'm not talking about sending in blow-by-blow contest reports, but rather about keeping me informed as to all the trends, tricks, tips, new designs, modifications, new products, new sources for old products, and general innovations that active pattern people keep inventing and/or digging up. Plus, all of us enjoy pretty pictures of brand new airplanes. Send it in and let me do my best to let everybody else know about it, and while you're at it, let me know about what you would like to see in the column. Your good quality 35mm color prints are just fine for magazine reproduction. Because of the lead time necessary in the publishing business, I'll



Largest model port in the world, the Utah Salt Flats. Brett Forsberg, Steve Rojecki, and Larry Lutton (l to r) try out the flats after an eight-year absence because of high lake level. Dick Hanson photo.

have written two or three of these columns before you read the first one, and the sooner you ship me something, the sooner I'll be able to stop working so hard! Seriously, writing in a vacuum is no fun, so drop me a note. The address is at the end of the column. Thanks.

As part of my preparation to write this column, I did a little review work. Actually, I just started out to read a few old *Model Builders*, but you know how these things go, and before I knew it, I was hip deep in reorganizing my entire magazine collection, which is fairly extensive. Looking through the old mags was quite a nostalgia trip, and I couldn't help but be impressed by how far pattern has come and how much has changed since the early '80s; specifically since about 1983 or so. When you are living through such a significant period of rapid change, it's sometimes difficult to get a feel for what's really happening, no matter how hip and aware you think you are at the time. Either you are generating change or racing to keep up with those who are, and there just isn't a lot of time to ponder and reflect. Only when you're able to look back at where you've been do you clearly see what the dynamics of the situation were. I'd like to share a short look back at the recent past with you. I think you might find it as interesting as I did. The facts are a matter of record; the opinions and conclusions are all mine.

For much of the 1970s and right along into the '80s, pattern flying and pattern plane design remained pretty much status quo. True enough, engines were gradually



Our new columnist's wife, Joan (love those dimples!), with her Dirty Birdy in years gone by. Note the high aspect ratio wing with blunt leading edge, exposed exhaust system and the obligatory nose wheel. Pattern ship design sure has come a long way since then! Photo by Johnnie Johnson.

getting better, as were radios. Good hardware, like tuned pipes and retracts, was becoming more available. There were a few exotic experiments going on then, as there always are, but by and large, airframe design was fairly static. The Prettner Anhedral Stab was the innovation of the decade. Joe Bridi's Dirty Birdy design remained a competitive, up-to-date airplane in almost all the classes for well over 10 years. It wasn't at all unusual for a guy to use not only the same design, but the very same airplane for five or six seasons of competition, while advancing through several skill levels!

If anything at all was evolving, it was the level of complexity of the average pattern bird. Starting with retracts and tuned pipes, we worked our way into fuel pumps, in-flight mixture controls, nose wheel brakes, flaps, pull-pull hardware and adjustable pitch props. Fiberglass fuselages and foam wings became standard equipment, and all real pattern airplanes were covered with glass cloth and painted. The planes of the era

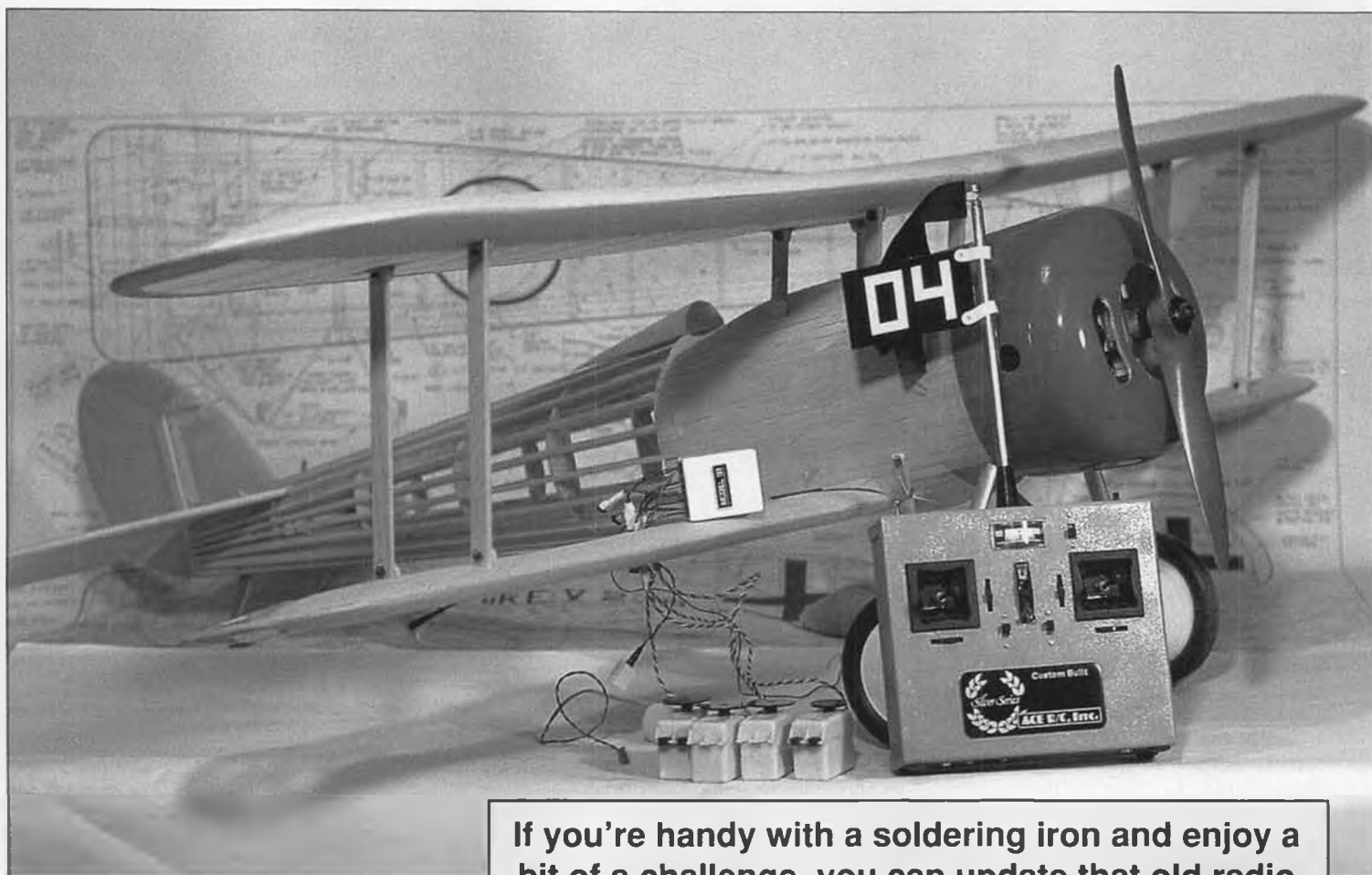
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The new Ultimate 10-300 from Carl Goldberg Models, designed by Dave Patrick. Span 54 inches, area 980 sq.in., weight 7.5 - 8.5 lbs., power; .60 two-cycle. .90 - 1.20 four-cycle.

BY GARY DANFORD

'NINETY ONE APPROVED



Completed system in front of scratch-built Newport 28C built from Nick Zirolli plans.

If you're handy with a soldering iron and enjoy a bit of a challenge, you can update that old radio system with Ace R/C kits to 1991 status for less than the cost of a whole new radio.

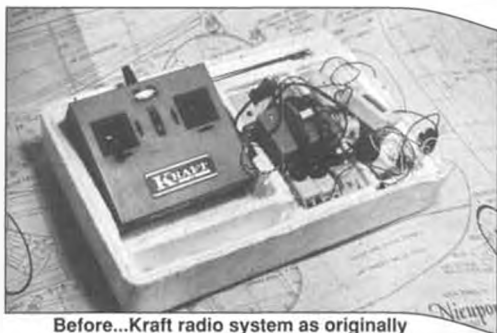
The radio frequency changes that take effect in 1991 are causing me and are going to cause most modelers some heartburn. I don't pretend to understand all the technical requirements but understand enough to know that I need a new radio if I intend to do any flying next year.

I have been looking at new radios since the inception of the new rules. Every radio I decided on fell into one of three categories: I either couldn't afford it, it wasn't "1991" approved, or wasn't available configured the way I wanted it.

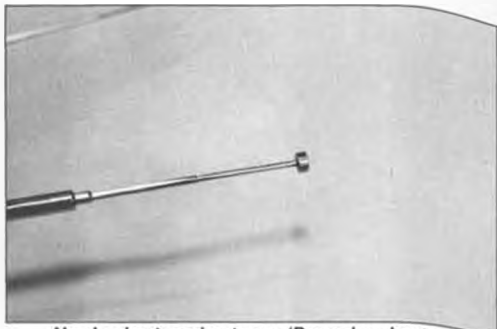
While at the Davenport Iowa Club swap meet, my flying partner, Mike Smith, purchased two old radios. The owner made it clear that both were not working properly and were not usable. Both contained outdated technology, were not working, or were on the old "forbidden" frequencies. One, a six-channel Kraft, and the other, a Tower Hobbies, hadn't been used for a long spell and the previous owner was correct, neither was economically feasible to repair

or to have upgraded. But for the swap meet price we could find a good use for them.

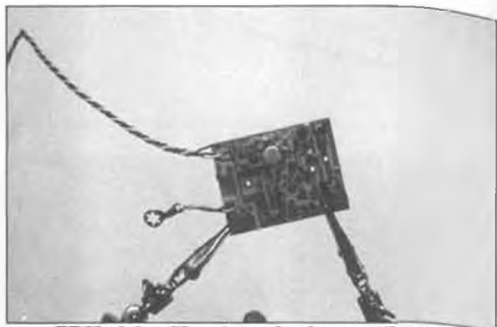
While reading the Ace R/C catalog I picked up at the Chicago Hobby and Trade Show, I noticed that in the experimenters section, Ace was advertising their "Tx Electronics" Part No. 11G307 in kit form for \$69.95 and their "Model 91 Rx Kit" for \$79.95. It required only a short conversation with my local dealer, a little negotiation over price for the components, and a plan was coming



Before...Kraft radio system as originally purchased at a swap meet.



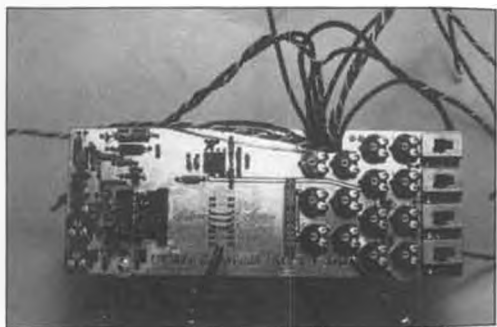
Newly shortened antenna (Dremel and cut-off wheel) with tip reinstalled.



RF Module with antenna lead connection from old radio installed.



RF Module installed in case. Also note dual rate switches installed.



Completed encoder board with wiring installed.

together.

The old Kraft was chosen for the project. It appeared to me that the main compo-

nents—gimbals, antenna, case, switches, and most of the servos—were in usable condition. The only problem was the outdated electronics in the transmitter and the outdated receiver—relatively small but important parts. My only problem was building the kit which, to quote Ace R/C, "If you have the ability and patience to build a decent model airplane, you can put together an Ace kit (given the right tools and assuming you read the instructions)." Since building things is what I like to do, and considering that a couple of planes I've built cost as much or more than the Ace components, I was convinced. A call to Ace R/C and after a short conversation with Mr. Tom Runge, I was convinced my plan would work. The only bit of encouragement needed was received when Mr. Runge assured me that if I got into deep trouble, they would bail me out. Well, needless to say, that small bit of encouragement was all I needed. I ordered the kits.

I ordered the Transmitter Electronics kit and the Model 91 Receiver kit plus a half-dozen Deans connectors. While waiting for the kits, I started cleaning up the old radio. The old switches, gimbals, antenna, batteries, etc., were removed from the old case. It was scrubbed with a good detergent, cleaned with alcohol and painted with grey Hobby Pox. If the radio you wish to convert has a plastic case, you can purchase a new case for less than \$10.00.

When scratch-building a radio you can add, change, or modify the radio configuration or function locations of any of the components of the radio. This is also the best time to add any "Gee Whiz" components. The flexibility afforded by this type of conversion is the ability to change or add any option or modify any feature of the radio. However, keep in mind that it requires careful advance planning. For instance, the placement of the retract switch or whether or not to add programmable push buttons, exponential rates, coupled aileron/rudder mixing or an electronic mixer for the "V" tail Bonanza all have to be decided beforehand. The cost is less than \$12.00 for each sub-kit.

The instructions mention several items necessary to operate a Silver Seven Encoder/Transmitter that should be mentioned at this time. The antenna length has to be 39.5 inches long. The new transmitter electronics operate on 9.6 volts and the potentiometers have to be 5K or 10K for the sticks and 1.5 to 5K for the trims. These items could present some obstacles for the conversion but none are insurmountable.

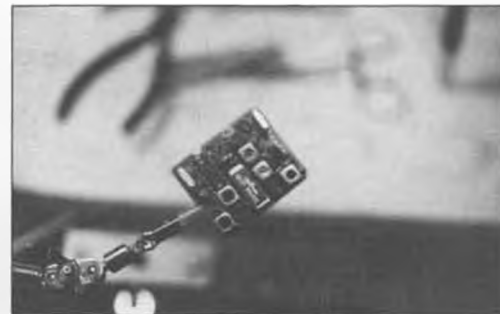
While waiting for the paint to dry, I first removed from the old Kraft circuit board some components not supplied with the new kit. They included the on-off switch, antenna lug, and charger plug. I then remounted all usable components and did a tight fit of the new decoder circuit board, RF module and dual rate switches to determine placement. The only new parts not supplied by the kit were the dual rate switches.

As soon as a general placement of these

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Completed transmitter with back cover removed.



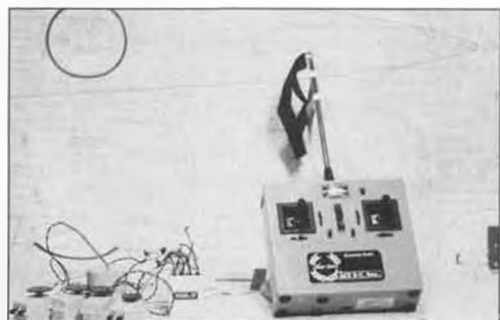
Completed receiver board with large filter very visible.



Completed decoder, with servo wiring installed.



Completed aircraft receiver before final assembly.



After...completed system after '91 approved conversion.

the encoder board as per the instructions furnished by Ace. They enclosed a guide full of helpful hints on electric circuit board

FRESNO SOARING SOCIETY'S ANNUAL SPRING SOARING MEET



As many of you have told me to avoid "contest reports," I will not bore you with blow-by-blow accounts of this contest, which used to be called the Dr. Pepper Classic. Rather, I took some notes on field observations and modeling tips which I hope will be more profitable for you.

Although I was present at the FSS contest, I was unable to attend both days, April 7 and 8. As it turns out, several guys told me, "You didn't miss much Saturday. It was very windy, heavily overcast, and it even rained a bit." Bad as the weather was on Saturday, it was beautiful when I arrived on Sunday. Cloud streets from horizon to horizon reflected the heavy thermal activity which was present below.

The Dr. Pepper Classic has become the Fresno Classic Soaring Contest (now in its ninth year). Lots to offer the serious competitor; excellent flying site, central California location, catered meals, on-field camping, and a hard working host club.

The "Brickyard," as the Fresno field is called, is an old, no-longer-used adobe brick factory. At one time 3.5 million bricks could be seen drying in the sun here. The field changed hands recently, so the brick makers no longer make mud and straw bricks there. However, years of brick production have resulted in a hard, very flat surface, like a clay tennis court which is unyielding to balsa or even fiberglass models.

One unlucky Oly 650 flier unwillingly demonstrated the hardness of the Brickyard. He experienced radio interference near the launch area and watched helplessly as his plane did a near-vertical 100-foot dive into the dirt. The wings were shattered, but somehow the fuselage escaped serious damage. The divot was only about 1-1/2 inches in diameter and 3/4 inches deep!

Don't discard your popsicle sticks! Use 'em as canopy hold-downs, per Arana's Chameleon.

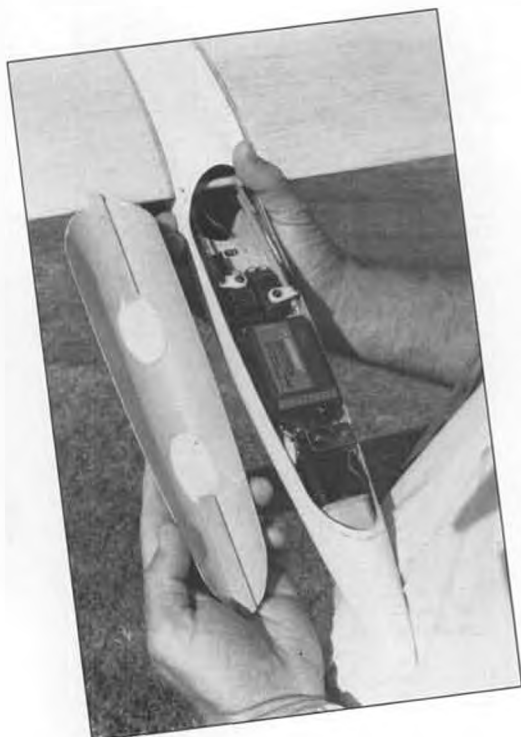


Jerry Arana flew this sleek-looking two-meter (foreground) to fourth place in the class. His Unlimited Chameleon SE came in 11th. See text about the latter.

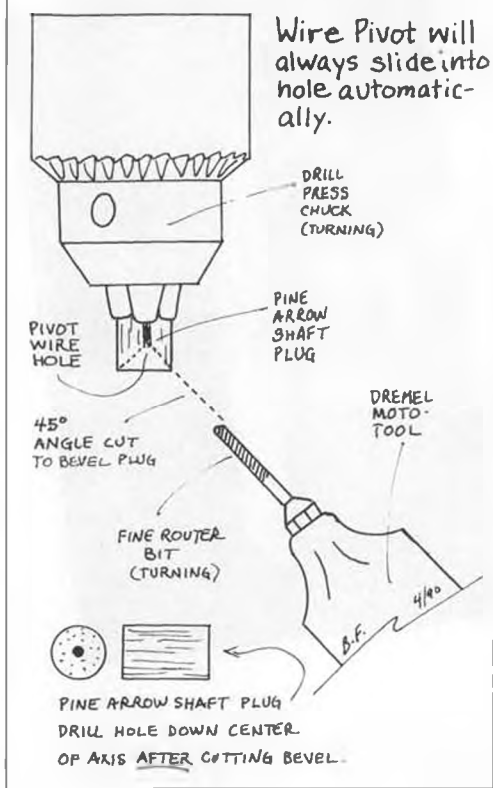


Jerry's Chameleon SE features easy-connect servo connectors built into fuselage and wing root. Note big diameter wing joiner tube, first seen in pattern ships.

If you've been scared off from attending this meet in the past because you've heard about the tough field, pay attention. Over the past year, the new owner of the Brickyard has allowed the FSS to install a sprinkler system and grow a soft, grassy landing area. The FSS did have to bring in the top soil and fertilizer, but the payoff was worth the



Self-Centering Arrow Shaft Plug



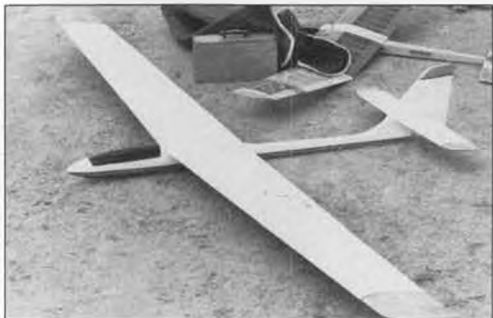
investment. The FSS fliers now have a nice place to land as well as a superb place to fly. The field is flat, has no trees or telephone poles nearby, on-field camping is allowed for the big contest, and the lift is usually very good.

WHAT THE GUYS WERE FLYING

At this meet there was a greater ratio of polyhedral sailplanes to aileron sailplanes, a kind of trend-reversal. Plentiful were the



Mack the Knife has nothing on Art McNamee's soarer, sporting rubber "shark's teeth" and fish-flap skid behind two hook. No roll-out, no flip-overs (see text).



Genesis flying wing designer Keith Schwemmer gave his Airtronics Cumic a straight wing with spoilerons. Looks and flies great!

Airtronics Cumics and Cumic Pluses, Cumic variants, Sagittas, and Olys. There were lots of Pierce Aero Paragon variants and Geminis. There were Larry Jolly Pantera variants and Cheetahs. Flite Lite Composites' Falcons were also present in good numbers as well as the Dodgson Windsongs and/or Lovesongs. Many of the standard wood kit sailplanes were modified, some of them greatly, and many new building techniques were being used.

BETTER MOUSETRAP DEPARTMENT:

1. ARANA CHAMELEON SE

Jerry Arana of Santa Cruz, California, flew his Chameleon SE design as he did at the Visalia meet covered here in my January 1990 column. As promised then, I am going to share a few "better building" tips with you as they were explained to me by Jerry.

Jerry's Chameleon SE is based on the Falcon 880 fuselage, but with a modified fin. Jerry cut his own foam cores using the ubiquitous Selig 3021 airfoil. The flat, constant chord center section wing panels (with flaps) were mated to tapered tip panels featuring ailerons and elliptical wing tips. Arrow shaft hinges were built into the trailing edge control surfaces to cut drag (see illustration), and the flaps and ailerons were driven by four internally mounted Airtronics 401 Microlite servos for direct, slop-free linkages. An Airtronics Vision radio was employed to do the mixing chores.

The nice thing about Jerry's arrow shaft hinges is that they are easily removed and installed. The wooden plugs which guide the central pivot wire through the metal hinge posts are beveled (like tiny funnels) so that the wire is easily centered in the hole.

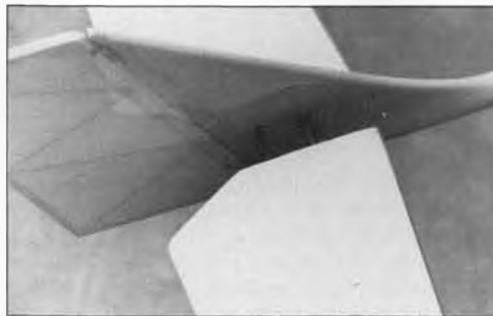
To get a concentric bevel in the small wood dowel plugs, Jerry says to first chuck them up in a drill press. Set up a Dremel Moto-Tool with a small, high speed router bit. Turn on the drill press and the Dremel and hold the Dremel bit at a 45 degree angle to the axis of the dowel. Gently carve out a cone shaped depression. With the dowel still turning in the chuck, use a small, hand-held pin vise with a drill bit the same size as the music wire pivot to drill a hole through the center axis of the dowel. Check for the wire's fit in the hole and increase the hole size if too much friction is felt. Keep it as small as possible, however, or excessive slop in the ailerons or flaps may result.

Another hot tip will make spars and joiners easier to build into a foam core wing. Jerry used an aluminum tube joiner in the Chameleon SE (.049-inch wall, 3/4-inch O.D.) which was about 18 inches long (I didn't measure its length). You can plainly see this joiner in the photo. Inside the relatively thin-wall tube joiner is inserted a light pine or hard balsa dowel which keeps the tube from crushing under the heavy loads of typical soaring flight. This can be removed and replaced with combinations of lead ballast and wood dowel to increase wing loading to suit wind conditions.

The wing spar of Jerry's Chameleon SE is your average garden variety PVC sprinkler pipe (3/4-inch I.D.). The aluminum joiner



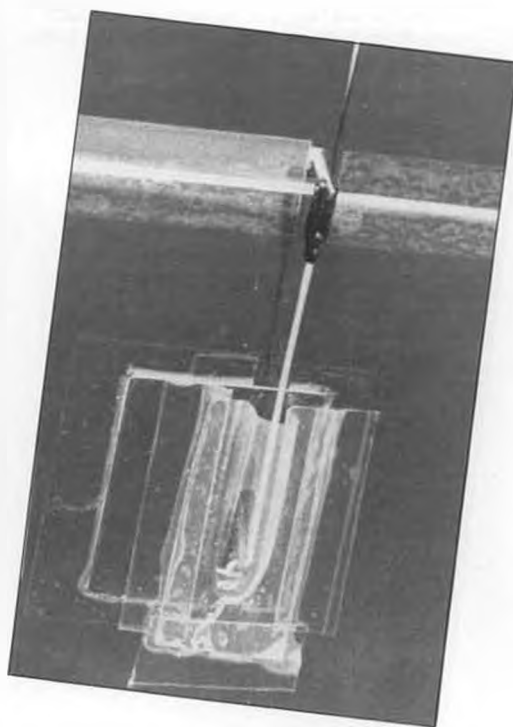
Myles Moran really modified his Pantera. Looks like a Larry Jolly Cheetah now, with S3021 airfoil, flaps, ailerons, and more (see text).



Myles uses a 1/4-inch carbon fiber rod for stab pivot pin. Will be last thing to break, if ever! Gemini MTS-style stab is plenty beefy too, and it doesn't flutter.

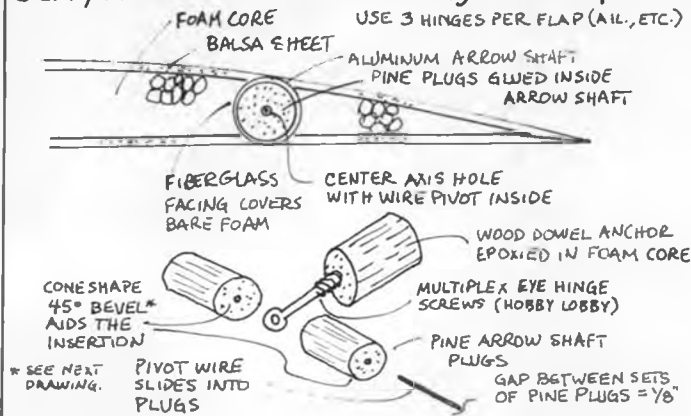
(3/4-inch O.D.) fits perfectly inside, making wing joining a breeze.

To make the overly flexible PVC spar stiff and strong, Jerry first used 50 grit sandpaper to rough up the top and bottom of the pipe. Then, he bonded carbon fiber strips to the top and bottom as you would over a balsa shear web. Although I didn't ask, I would imagine Jerry used pre-cured, slow-impregnated carbon tow strips and a slow curing cyanoacrylate adhesive or maybe even Pic's Plastic-Stic or Pacer's Plasti-Zap. I ran some test samples of this kind of PVC/CA bond,



Myles cuts drag (possibly) and saves wear (probably) on aileron or flap pushrods. Molded plastic fairings taped in place under wing.

Jerry Arana's Arrow Shaft Hinge Technique



Bobby McGowan (seen at Visalia meet) took first in Unlimited at Fresno. Says Falcon 800 (100" span) is easier to land at a slight sacrifice in thermal performance over the 880 (112" span).



and provided the CF is sanded lightly and only tapped free of dust (not wiped down or handled with fingers), it worked quite well.

Also of note was Jerry's Falcon 880-like servo lead connectors which stick out of the wing (see the photo again). This connector has unusually long, wide pins and female jacks. I don't know where you would find such a four-pin connector, but they should be a replacement part for Falcon 880s. I



Keith's Cumic wings slide onto joiners built into removable root fairing or center section, which bolts down. Tape cleans up the airflow and holds wing snug to the fuselage.



would think Mark Allan could supply you with a set. Write to Flite Lite Composites, P.O. Box 311, Windsor, CA 95492.

What this connector allows is instant servo hookup when the wings are mounted completely onto the joiner tube. Either tape or some kind of strong spring should be used to hold the wing panels together firmly, or a servo disconnect could possibly occur. The four pins are adequate for two separate servos, even though at first glance two servos would normally require six pins. This is because you wire up the servo extension harness so that both servos share the red (+) and black (-) pins. Keep the two signal wires for the two servos independent and on their own separate pins.

Finally, Jerry uses good ol' popsicle sticks as canopy hold-downs. The simple setup is self-explanatory (see the photo). All you do is mix up some epoxy and micro balloons, blob it on both ends of the canopy, and stick on the wood sticks so they hang off about 1/4 inch. The sticks lay flat against the canopy (without being shimmed up for the fuselage thickness). To attach, simply slide the canopy's rear stick under the rear of the fuselage's canopy opening far enough to clear the overhang of the front stick. Slide the canopy down and forward so that the front stick slides under the fuselage's front lip, and it's done! It takes two seconds, max. Cheap, simple, fast, and effective.

2. ART McNAMEE FALCON 880

One of the many Flite Lite Composites Falcon 880s present belonged to Art McNamee. Art used the popular "shark's tooth" type landing skid at the nose of his plane, but he also had a small fishy-looking fin just behind the towhook. This beefy plywood and fiberglass skid serves two functions. First, it protects the delicate buried-in-the-wing micro flap servo from gear damage on hard, flaps-down landings by raising the rear of the wing far off the ground. Second, it pushes the nose down in a landing. This reduces the wing's angle of attack relative to the free stream of air to a negative figure. The wing then creates a down-force which pushes the landing skid into the ground even harder,

Ed Holder likes his new Airtronics "Image." Performance and value are typical Airtronics. This new kit is finally available.

and it prevents flip-overs (and zero-point landing bonuses) in heavy winds.

3. MYLES MORAN CHEETAH VARIANT

Myles Moran is the ultimate expert at repairing broken aircraft. Not because he crashes a lot, but because he collects "totalled" models. (I also think he collects jigsaw puzzles!) I doubt he has bought a new model sailplane in years!

One of his latest acquisitions was a Larry Jolly Pantera fuselage and rudder. To these fragments he added a set of Pierce Aero Gemini MTS stabs (which his club has been adopting as a standard design), and his own set of cut foam core wings (Selig 3021, of course). An Airtronics Vision radio does all the fancy mixing.

continued on page 83

Paragon lost tip panel when joiner snapped on hard winch launch. Model was under control all the way to a rough (but safe) landing, with generous amounts of right rudder and a light touch on elevator.



BY SCOTT STAUFFER

JET TRAILS AT TOLEDO!

The 36th Annual Toledo Expo was held on April 6, 7, 8 at the Toledo Sports Arena. There were over 200 manufacturers, dealers and distributors on hand, displaying their wares. Approximately 10 ducted fan manufacturers were present at the show (More on them later). There were seven jet aircraft on static display in the main hall.

Bob Violett models seemed to be the big winners of the show as far as jets are concerned, taking home three awards. The first winner was Jerry Caudle, of Metropolis, Illinois. He took First Place in Sport Monoplane with his black and copper Aggressor X. He also won the Best Painted Finish award. I was told by a friend of Jerry's that the black and copper paint scheme was done by Jerry (who paints real aircraft for a living) and that the graphics and lettering were done by Jerry's son, a graphic artist. The finished product was immaculate, and was all decked out with Violett accessories, such as gear doors, etc., and was equipped with a Futaba 1024 radio.

First Place in Military Stand-Off Scale went to Terry Nitsch, of Columbus, Ohio, with his Violett F-86 Sabre. The plane was equipped with fully operating gear, doors, drop tanks, and featured some aluminum access panels. Terry used K&B Epoxy paint and what seemed like thousands of rub-on rivets to produce a truly scale looking aircraft. Other aircraft entered in Military Stand-Off Scale included an F-104 Starfighter



We don't have the space here to list all the superlatives that apply to Jerry Caudle's Aggressor X; suffice to say he took home very well deserved first place awards for Best Sport Monoplane and Best Painted Finish.

entered by Pat Defilippi's and Aldo Guerter, from Arlington Heights, Illinois. This Master Flykit model featured an Italian paint scheme, flaps, leading edge slats, and very nice cockpit detail. Power was provided by a Byrojet/Rossi 81 fan system. Pat Webb entered a very nice Byron F-16A Mod III. I spoke with Pat about the aircraft and he informed me that it was patterned after the Group Commander's plane of the 906 TFG at Wright Patterson AFB. The paint was provided by the USAF and is of the correct Mil Spec. numbers. It's all flat except around the gun area, which was sprayed with clear to ease cleaning (the Commander is very picky on how his aircraft looks). Other features included O.S. 91 engine, retracts and MGA pilot upgraded to the rank of Colonel.

First place in Military Stand-Off Scale went to Terry Nitsch's immaculate F-86 Sabre. See the May '90 issue of *MB* for a review of this Bob Violett kit.

There was a large 1/5.5 scale Cessna/Citation II 550 RB entered in scale by Jerry Keller and Dave Escobar. The power was provided by two O.S. 91/Dynamax systems mounted on pods. It weighed 32 lbs. and had a 114 inch wing span. It was 102 inches long and used an Airtronics radio and 10 servos. Construction was fiberglass and end-grain balsa.

One of the most original planes entered was a plane called the Thunder Jet. It kinda resembled a sporty F-4. The plane was designed and built by Ed Dobias of North Blomsted, Ohio. Construction was mostly balsa with fiberglass duct work and used an O.S. 91/Dynamax fan. Ed claims it will fly off grass even though it weighs 14.1 pounds. Top speed is 150 mph and Ed says it flies great.

WHAT'S NEW

Bob Parkinson Flying Models, has recently released two new ARF kits; the Fun-



Pat DeFillippis and Aldo Guerrier teamed up on this impressive F-104 Starfighter, built from a Master Fly kit. Features a Rossi .81/Byrojet fan combo and operating slats and flaps.

in construction of the Barracuda kit. It sells for \$25.00 and is approximately two hours long.

By now, you all must have heard about Bob's new Eagle Supreme. It's basically the same size as his now famous Reagle Eagle, but with more molded parts for a more scale appearance. Some of the new molded parts include; a completely molded nose, drop-tanks, and molded cockpit detail. The plane is also stressed for Bob's new 90 tractor fan, which is specifically designed for the new 90 size engines. Speaking of engines, Bob has just made a deal with Rossi USA to handle their complete line of engines, pipes, headers, and accessories. This includes all

Supply, about their new Fengine 100. He told me that the engine is producing about 14-3/4 lbs. of thrust at 24,000 rpm. At that rpm it consumes 3.9 ounces per minute of fuel and weighs 3.5 lbs. The fan is five inches in diameter and is of one-piece construction. It contains 40% carbon fiber and utilizes a 1-3/8 inch spinner. It will retail for \$470.00. Coming soon is an 85-inch long true scale T-38 Talon with single fan and bifocated exhaust. You should be able to see this plane fly at the upcoming Sacramento Fan Fly. Now available from Yellow is an ARF F-16 completely built and patterned for \$850.00. There is an accessory package *continued on page 85*



No question about the authenticity of the colors on Gary Webb's Byron F-16; the Air Force supplied the paint, the same stuff they use on the big ones!



Big Cessna Citation II is the combined effort of Jerry Keller and Dave Escobar. Uses two O.S. .91/Dynamax fans, spans 114 inches and weighs in at 32 pounds. We'd guess it to be a very fast and smooth flying model.



Charlie Lines used Mark Frankel plans to produce this attractive 1/6-scale Learjet 35A complete with flaps, retracts and spoilers. Power is two Rossi .65/Dynamax fan setups.



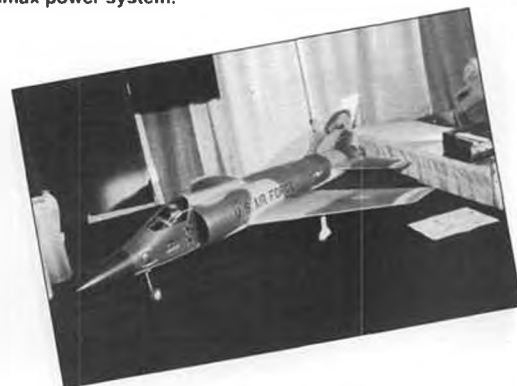
Not many individuals are into designing and scratch building their own ducted fan models, but Ed Dobias is an exception. He's quite pleased with the performance of his "Thunder Jet," which is built mostly of balsa and sports an O.S. .91/Dynamax power system.

fan Trainer and the Funfan Saber. They are constructed of vinyl plastic and have foam core wings. Bob claims you can put them together in about eight hours. They feature a removable engine/fan package. This allows the power unit to be moved from plane to plane with very little trouble. It uses a 45-61 size engine and 5-1/2 inch fan. The fan is mounted up close to the intake, so no starter extension is necessary. Suggested retail price is around \$229.00 with fan. Bob has also released a new construction video. This one features a step-by-step comprehensive guide

Rossi engines for cars, boats, helicopters, as well as all aircraft engines. I will be warehousing and distributing these engines for Bob here in the U.S., so if you need an engine, give us a call! We will be offering special engine package deals.

I spoke with Ron Kemp, of Yellow Aircraft

Jet Model Products, headed up by ducted fan pioneer Tom Cook, produces a kit for this Starfire II, one of the current crop of ultra high performance non-scale jet models. See text for a description of some of Tom's new hardware items.





Ready for an ARF ducted fan? Ron Kemp shows us Yellow Aircraft's new F-16 that is supplied completely built and painted as you see it here. An engine/fan/retracts package is also available. More in text.



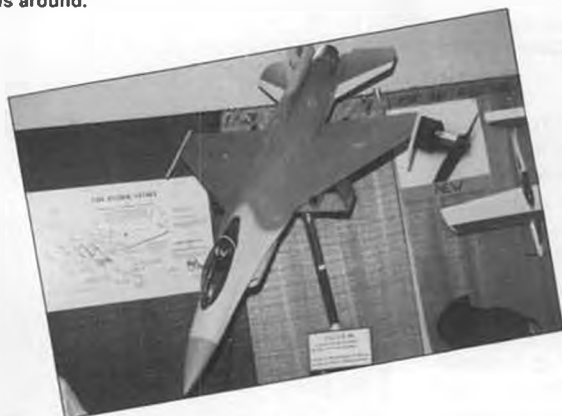
Yellow Aircraft's big F-14 Tomcat takes up darn near the whole table. Glass and foam construction, 83 inches long, 88 inches in span, 26 pounds, two O.S. .91/Dynamax fans. Do the wings swing in flight? We're afraid to ask!



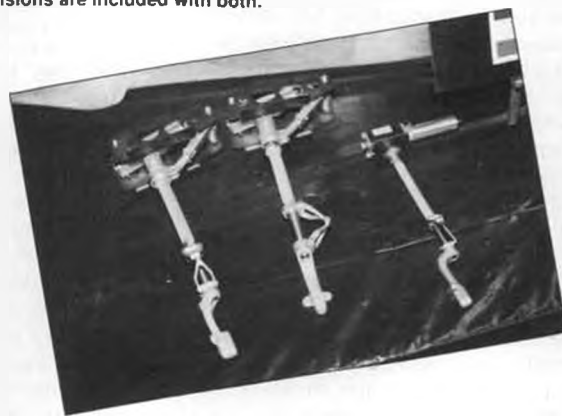
Bob Violett's Aggressor II, done up in a very pretty white and yellow USAF scheme. It's one of the most popular non-scale high performance fan models around.



K&B's new .82 size ducted fan engine is offered with your choice of a regular head for tractor fans or a heat-sink head for pushers. Shaft extensions are included with both.



The newest kit from Bob Violett Models is this F-16, which features an unusually high amount of prefabrication—details in text.



Century Jet Models has expanded its product line by adding these very nicely made scale retracts, which boast chrome steel oleo struts and stainless steel scissors.



The Bob Parkinson Flying Models booth was jampacked with airplanes. From left are the Regal Eagle Supreme, Barracuda, Blue Hornet, Fun Fil F-15 Eagle 40, Vector Eagle and the new ARF Sabre.



The ARF Sabre from Bob Parkinson is made of molded vinyl plastic. Bob claims it can be built in about eight hours.

ALL ABOUT ARFS

BY ART STEINBERG

A great many model airplanes are introduced to the public these days, most of which only arouse a passing interest among those who build and fly R/C models. After a short time they fade from the scene, only to be replaced with something newer and perhaps more different. And so it goes, a constant procession of products, most of which are destined only for a limited acceptability and a quick demise. In today's rapidly changing, fast-paced world, this seems to be the rule with almost everything manufactured on mass production assembly lines, be they articles of clothing or sports cars costing up to six figures. However, once in a while a manufacturer strikes it lucky, and one of his products captures the fancy of the public. Such merchandise achieves long lasting success by becoming a classic, something to be revered and treasured, and in this category we find Rolex watches, Bugatti automobiles, and Piper Cub aircraft.

Among those few model airplanes which have attained some semblance of immortality can be counted the Astrohog, the Kaos, Das Ugly Stick, and the Senior Falcon, to name just a few. Unfortunately, ARFs haven't been around long enough to establish which will and which will not become perennial favorites. As of this writing, however, one ARF model seems destined to go on indefinitely, and that is the Royal-Air 40T, by Royal Products. When I reviewed this high-winged intermediate trainer in an early 1989 issue of *MB*, I was impressed enough to select it as the "ARF of the year for 1988," and I am gratified to see that its popularity continues and is still growing to this day. It is my prediction that this is one model which is expected to become a standard in its field, ranking as a milestone in the annals of the Almost Ready to Fly trainer class.

Since that time, Royal has been industriously working to introduce even more ARFs into their product line, and recently they



(Above) Lee Zimmerman displays the futuristic F/F ARF from Cox Hobbies, aptly dubbed the "Space Probe." Description in text.

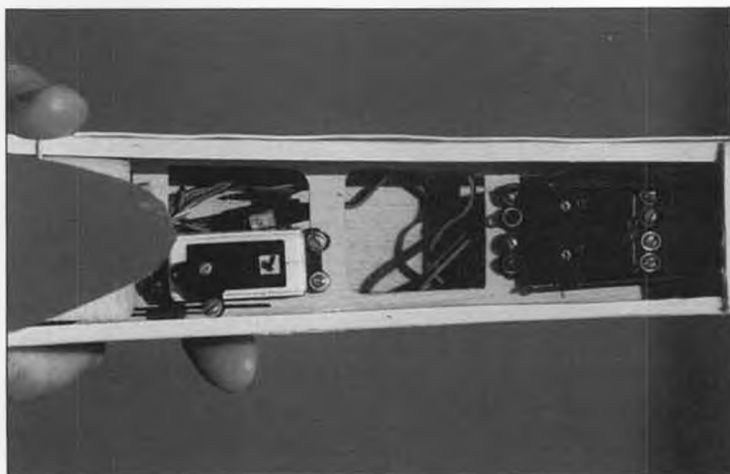
have brought forth a trio of glider-type models which are intriguing, to say the least. Royal refers to them as the "Sailplane Series," and the first of the three versions available is called the "Electrosoar." This airplane is furnished with a high power Mabuchi electric motor, folding prop, spinner, and wiring harness. The second version is called the "Powersoar," and is intended for gas power. Lastly, the "Easysoar" is offered as a conventional unpowered sailplane to be used with a high-start, a winch, or as a slope soaring glider.

As an avid ARF enthusiast, I pride myself on being somewhat lazy when it comes to

(Below) Chuck Thompson shows us the parts that make up the latest offering from Royal Products. It can be called the "Easysoar," "Powersoar," or "Electrosoar," depending on whether you fly it as a glider or with gas or electric power. It's this month's featured ARF.



Here's Chuck about to... chuck... the Powersoar for its first test glide. Note the belly mounted single wheel.



Even with three servos installed, there's room to spare in the Powersoar fuselage.



Chuck chose to build the Powersoar version and installed an Enya .09 R/C. Anything from an .049 to a .10 can be used.

flying, so I chose to review the Powersoar version. It was my original intention to install a Cox Queen Bee .074 throttled engine, but after delegating Chuck Thompson to do the assembly, he determined that the C.G. demanded a bit more weight in the nose, so we ended up installing an ancient Enya .09 engine. Let's let Chuck tell us about it in his own words:

"The Royal-Air Powersoar is, as the name implies, a gas powered sailplane, distributed by Royal Products, 790 W. Tennessee Ave., Denver, Colorado 80223. Actually, three different kits are produced: the Electrosoar, which is electric powered; the Easysoar, which is a slope or thermal machine with a soft nose cone in place of power; and the Powersoar.

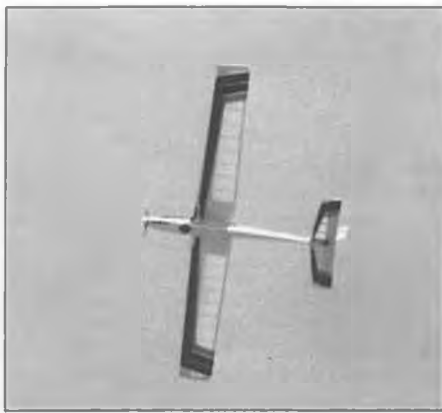
"Other than weight, all three have the same specifications. The following apply to the Powersoar: Wingspan is 66-1/2 inches, area is 495 square inches, and fuselage length is 40-1/2 inches. The model is intended for engines in the .049 to .10 range, and a two or three-channel radio may be used. The weight range is listed as 35 to 40 ounces, and it is built completely of balsa and plywood. Our completed Powersoar weighed in at 32 ounces, for a wing loading of a light 9.3 ounces/square foot. We powered our model with an Enya .09 R/C engine with throttle control. The radio was Royal's mini receiver and Ace micro servos, all this making up a very neat package.

"The Powersoar is, of course, an ARF. The wing is built up as are the tail feathers and fuselage. All are covered with an attractive shrink film, as are most ARFs these days. The rudder and elevator come out of the box hinged and ready to install.

"Following detailed instructions found in a bound, comprehensive, 56-page instruction book, we proceeded to join the wing halves, then completed the fuselage, and finally installed the vertical and horizontal tail surfaces. No problems were encountered, and everything was easily put together. Included in the kit were pushrods for the rudder and elevator, and wire for the throttle. A single, center-mounted nosewheel was also included, as well as a fuel tank. The hardware package was unusually complete, and nothing was omitted.

"The model was completed in a very short time at the workbench. We checked the balance, verified the radio range, and hand glided the Powersoar a couple of times prior to its first power flight. We were gratified to see that it had a flat and stable glide, so we fueled her up, started the engine, and hand launched the model at full throttle. The climb-out was steady and uneventful, and we circled while continuing to climb until the 80cc tank ran out. At this point sufficient altitude had been gained to be in thermal territory. After riding a few weak thermals, a routine landing was made. One must be careful to adjust the prop to stop in a horizontal position, as the first two landings did break a prop each time.

"All in all, I found this to be a fun model, easy to assemble, and a pleasure to fly."



With an all-up wing loading of 9.3 ounces per square foot, the Powersoar is easily capable of soaring flight in mild thermal lift—something most power R/Cers never get to experience.

Once again, we are indebted to Chuck for his efforts in helping us evaluate this model. As I was in on the flying end of it, I do have a few of my own comments to add. After breaking a couple of props on landing, we located an old nylon prop, and that ended our problems, as no further breakage was encountered. As for the belly-mounted wheel, it was a great help in accomplishing smooth landings, and prevented any scrapes or damage on the fuselage bottom. Unfortunately, the wheel is only used for landings, as the prop is far too close to the ground for power takeoffs, so hand launching is mandatory.

A word here on power pod thrust lines seems to be in order. A great many powered gliders carry their motor pods above the wing saddle and are made to be removable. The advantage here is that the glider can easily be converted for use on a winch, a high-start, or for slope soaring. The disadvantage is that the high thrust line usually requires a good deal of trim for the climb, and another radical trim change for the

glide. While this system prevents prop breakage on landings, the pod sticking up into the wind does provide a great deal of drag, thus detracting from the airplane's performance. Placing the engine in the conventional nose location, as in the Powersoar, does preserve the aerodynamic qualities of the model, but as previously discussed, tends to be hard on props (except in electric powered gliders which use folding props). However, such a glider is committed to use of power, as quick removal of the engine is not practical. So a lot of thought has to go into where the engine is to be placed on a glider.

I feel that this glider is not suitable for a rank beginner, as it flies quite fast due to its sleek and streamlined lines. However, for the more experienced R/C pilot, it is a really high performance machine, able to scoot from one thermal to another in a minimal amount of time. I also felt that the addition of a third servo to control the throttle was really not of any significant use. All that is necessary is to achieve enough altitude to go thermal hunting, and at that point the engine is no longer needed. Furthermore, there is little reason for controlling engine speed if the plane cannot be landed with the engine running. About the only use we had for the extra motor control channel was to cut the engine run at the height of the climb. This could have been done just as easily by limiting the amount of fuel in the tank, or by rigging an engine cutoff to full down elevator control. One other way to limit the engine run would be to install a non-clunk tank and going into inverted flight to starve the fuel flow to the engine. I liked the Powersoar because it drew upon my flying skill and because it rewarded me with outstanding performance.

NEW RELEASES FROM COX

About a year has passed since Cox Hobbies, Inc. announced their new Fairchild 2Aircraft Company during the 1930s and
continued on page 88



From the European firm of Roga Technik comes this big quarter-scale J-3 Cub in RTC (ready to cover) form. Top quality construction, says our author.

“Everything always looks impossible for the people who never try anything.” Those are the words of one Jean-Louie Etienne, co-leader of a group of six men you may have heard about, the ones who walked and dog-sledded their way across Antarctica, upon their arrival at their destination March 3, 1990, 3,741.1 miles and 221 days after their departure. Unfortunately, the U.S. media did not see fit to cover this historic event in the manner that it deserved; in contrast, TV viewers in Europe and Asia were even lucky enough to see the group as they crossed their self-designated finish line at a Soviet research station.

There will probably be a book, a must on my reading list, though I will suffer through every footstep and every “Mush”—nobody hates cold and cold weather like I do! Still, I love adventure even more and have fond memories of my own Antarctic travels, even though they were done in the relative comforts of a Douglas C-124 which, though prop driven, far exceeded the speeds of even the fleetest team of huskies. We shared the cold though, as once down past 60 degrees south, we would don full survival gear and turn off the cabin heat, the idea being that in case of a serious in-flight emergency we might be too busy otherwise and find ourselves down on the ice in our short sleeves—not recommended at 50 below! Antarctica is an experience, best described by another earlier explorer there, Robert Scott, who in his diary wrote about it as “Great God! This is an awful place.”

Pardon the digression from the subjects you normally encounter here in EC—but I like that opening statement, feeling as I do that the model building hobby provides one of the few modern pastimes in which most of us can try new things, even impossible things. It is definitely one of the few interests one

can have in which he is more of a doer and less of a watcher. Our country is populated mostly by watchers—check the numbers of sports fans that crowd stadiums and TV screens watching so-called “spectator sports.” Now, what is so sporting about being a spectator? Wouldn’t it make more sense to spend more of our allotted time doing something ourselves, rather than watching someone else do something?

So, if you haven’t started that scale job that you’d like to build, or only sit in the pits watching the others racing, because it looks impossible, keep in mind that it is so only because you have never tried it!

The **Tournament of Champions** is just around the corner. Again! How time flies. In connection with that popular event, I have also seen some ads by a company in Florida who advertises that twelve of the twenty contestants will be flying airplanes that it has built. I am familiar with the design and construction of these airplanes, and there is no doubt that they are tops in their class—but being of the old school, a true modeler who builds what he flies, I am more impressed by the same type of “modeler.” Oh, I know that our ranks are now swollen with model *fliers*, as opposed to model *builders*, but still, model airplane competition used to include the building and adjusting of the model, and I for one would like to have seen it remain that way. I really don’t think I am alone in feeling this way, and feel that more of us would have a greater respect for the contestants were they competing with their own creations.

Then too, isn’t it more of a victory when you do win with your own airplane?

Off the soapbox for this month, let’s get on to things electronic! First subject is not a new one, dealing with one of the space-age miracles that has made its way into our

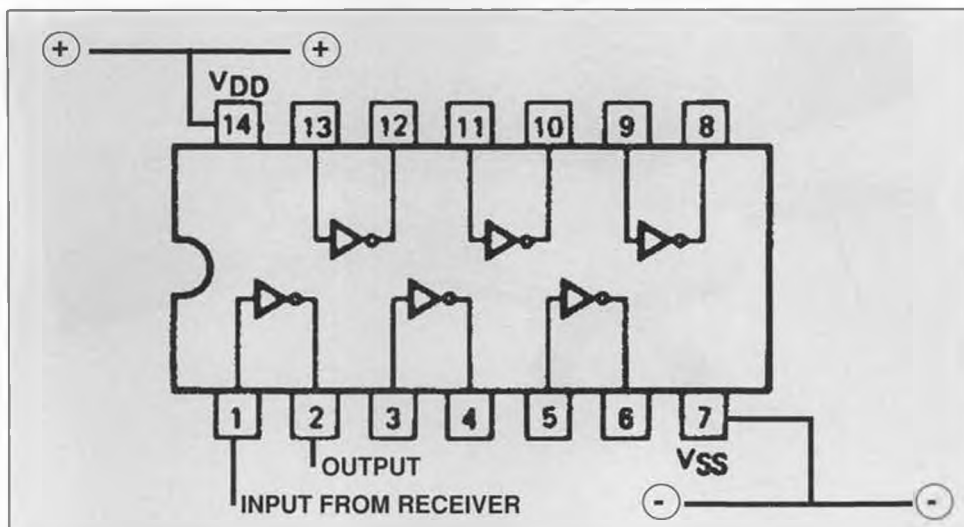


This pretty lady is sharing with us her new sweatshirt. It (the shirt, not Sylvia) is one of the R/C oriented items, including T-shirts and some great full-color posters, all available from Your Business, 1334D Benson, Upland, CA 91786; (714)985-2552. Write or call for a brochure and pricing. Great stuff!

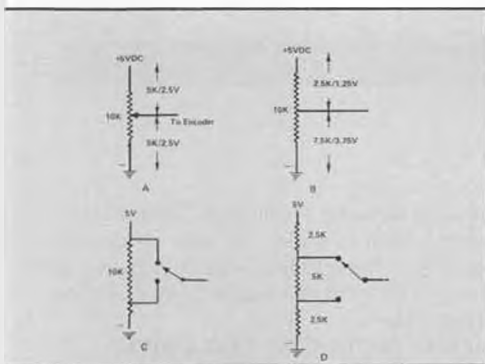
model construction: carbon fiber. The use of carbon fiber materials, either in molded sheet or in its basic threadlike form, can add a tremendous amount of strength to a model structure, with a very low weight penalty. However, carbon fiber is electrically conductive, and in some cases has been known to cause erratic R/C system operation. The same sort of thing can happen as occurs in models with a lot of metal parts. In certain transmitter-to-airplane relationships, the metal either shields or reflects the radio signal, momentarily blanking out the receiver and giving you a couple of those breath-stopping glitches.

There is now an alternate material available, which will give the same strength-to-weight results, but without the possible problems, as it is a non-conductive material. It is not really new, just newly and readily available for model building projects. It is Kevlar, the material which in woven form is used in the manufacture of bulletproof vests. It is now available in its raw filament form from K&S Engineering, a substantial quantity costing only \$1.49.

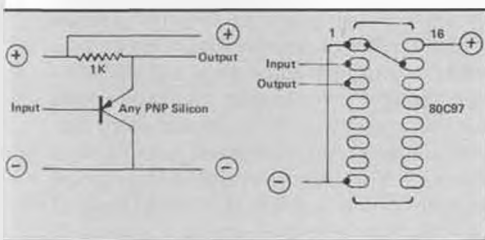
The Kevlar filament is recommended for strengthening wing spars, where it is claimed to add as much as 200% strength. Obviously, its application in such instances is practically unlimited, in everything from Quarter Scale to Peanuts. There are a couple of cautions to be observed however. The



This diagram shows how to wire up a 4069 Hex Inverter I.C. for use as a pulse inverter, which will let you run a negative pulse servo (such as a Pro-Line) with a positive pulse receiver. One section is used for each channel, with separate inputs and outputs, and common voltages from receiver to servos.



Voltage divider type of stick-to-electronic encoder circuits used in many of today's transmitters, also described in June's text and omitted by mistake.



Single and six-channel servo buffer circuits described in June "Electronics Corner" and omitted by mistake. Useful to maintain control signal amplitude with long extension leads. Only one section labeled on IC, other connections in text.

material is composed of extremely fine fibers, and the instructions advise you to be extremely careful in handling it, as it can break off and "float around like cathair." That last word threw me, until I deciphered it to be "cat hair"! Nonetheless, I know that carbon fiber is stiff enough to embed itself in flesh and is almost impossible to remove. I don't know if Kevlar fibers are individually strong enough to do this, but I don't plan to research the problem. My recommendations are not to handle it with bare fingers, and to use nose and eye protection while so doing. Overkill? Well, maybe so, but as the old saying goes, better safe than sorry.

Older servos is the subject of a letter from Richard Boutillette, of Buchanan Dam, Texas, who tells us: "I find myself (and I'm certain others do likewise) with the need to update my old equipment. So I've got a bunch of servos from old equipment and need to try to find out which (if any) can be salvaged and used with the new gear!"

"Specifically, I have a new Aristo 5 Ch. PCM. The older servos consist of Kraft KPS 15 II's, Royal Super Sports (based on the old D&R mechanics) and several Pro-Line 70 Series servos. I get the impression that the Kraft items can be made useable by replacing the wiring and plug to match the Aristo items. I believe the same situation prevails for the Royal SS servos.

"Now as to the Pro-Lines, I know they were originally set up to receive a negative going input pulse (I have a scheme of these items). Are they amenable to and readily converted for use with the Aristo rig? I'd appreciate it if you might find time to offer your advice and opinion on this conversion activity. If perchance there has been a run-down on this subject in your column I'd

appreciate info on the month and year!"

Well, a quick reference to my handy-dandy subject index (see EC May '90) reveals that yes, I have discussed the subject before—in October 1984. Since almost five years have passed, I guess I can discuss it again without being accused of being repetitious. Besides, there have been some new developments since then.

First off, irrespective of pulse polarity, there are some known cases of incompatibility of older servos with some of the newer receivers, in some cases, much newer servos that those that our friend in Texas mentions. For example, the Futaba R129DP receiver will not accept all of the previously delivered Futaba servos, resulting in quite noticeable instability around center. If you experience this, the servos can be updated by Futaba—be sure to explain the situation in your letter. I do not know of any similar problems with the Aristocraft PCM receivers, but due to different impedances between the units, the same thing can be expected to occur at least in some instances.

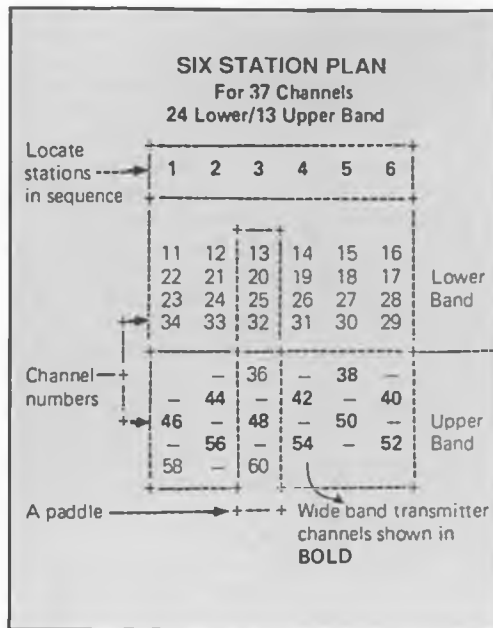
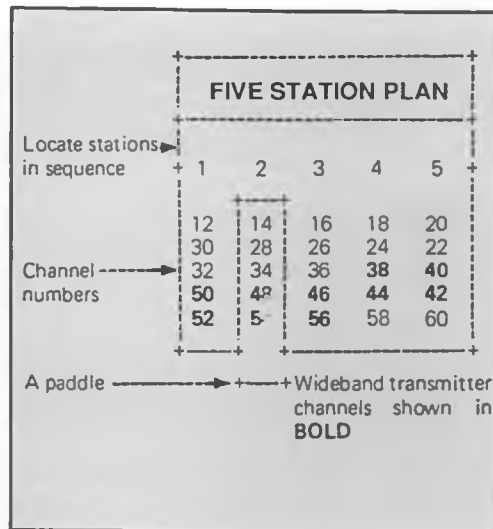
* Now, the Kraft and Royal servos being positive pulse input devices will probably work with Richard's new receiver. If instability is noted, I don't know of a quick fix to the servos themselves, but the cure would be the addition of a servo buffer device such as described in our June issue. The negative input pulse Pro-Lines, assuming that they are three-wire units, are another story, but still usable. Actually, there are three possible solutions.

Two of them require the installation of a pulse inverting circuit between the receiver and the servos. Method #1 is Ace R/C's solution—the Pulse Inverter, available either assembled (14G18C @ \$3.30) or in kit form (14G18 @ \$2.30) just for this purpose. The inverter makes use of an NE 544 IC, mounted on a small PC board with all other required components and wiring. You have to provide the proper connectors, and a separate unit is required for each channel.

If you like to do it all yourself, you can go with #2: assemble your own pulse inverter around a 4069 Hex Inverter Integrated Circuit, which requires only the application of the proper voltages, available from the receiver servo outputs, and "in" and an "out" connections. The diagram included shows all of the necessary connections; use one or as many of the six individual sections as required. A small Radio Shack printed circuit board, No. 276-159, can be used to mount the IC and all its associated wiring.

My choice is #3, simply the complete replacement of the electronics with a modern amplifier, such as Ace R/C's 14G25 (Bantam Servo) or 14G25R (Midget Servo), available as a kit for only \$10.75. You gain not only the elimination of all those extra connections and wiring, but in the case of the Proline servos, a *twenty* year gain on technology. Now my best advice: Don't take any of the advice just offered!

Why? Let's think about this now! While ordinarily, my general advice is against purchasing cheap R/C equipment, the poor-



est quality off-brand imported servo you can buy is going to be far superior to these older ones in design and will not have corroded feedback pots contacts or gummed-up motors with worn-out brushes. Even brand name servos can often be bought for less than \$20, and off-brand cheapies for less than \$10. There is a large investment of time and money in any airplane now flying, and before I would trust its life to a twenty-year-old servo I would want to put in a new motor, new pot, new harness, and new electronics—everything but the plastics, a modernization which will actually cost more than a complete new servo.

I have a need to save money on my hobby also. For example, I use the lower nitro fuels—I don't race any more! I use slow setting epoxies, which actually are better because they have time to penetrate into the wood. But to me, saving money on R/C equipment can often be false economy. The most ragged Ugly Stik in the country is worth more to its owner than a servo. Or an old battery pack.

1991 is almost upon us. No, this is not a hint to make your New Year's reservations

continued on page 90

THE MD&TS CONTEST

I heard a cute little technical problem the other day which will be a good one for you clever technical readers to think through. The question, in simple terms: Could a wind-propelled land vehicle, with a propeller-type windmill mechanically connected to the wheels, travel directly into the wind, and could it travel downwind faster than the wind?

Figure 1 shows how our unique vehicle is configured. This "car" can be shifted into any gear ratio desired between the windmill and the wheels. It is known that iceboats can travel faster than the wind crosswind (that is called "reaching," in case any of you landlubbers didn't know). But even excellent iceboats and sailboats can't go directly into the wind or go faster than the wind velocity downwind. That would violate a few laws of physics, but our windmill-carrying land vehicle may be a different beast.

The first reader to give me the correct answers and explain why these answers are true will receive a ten dollar check through Uncle Samuel's postal service. No phone calls please. If I receive two or more correct answers in the same mail the prize will be split. I trust that any of you who may have heard this problem and the answers will disqualify yourselves. I will announce the winner(s) in a future column and explain the answers.

SCALE CONVERSIONS

There has been considerable confusion on how little airplanes relate to big airplanes. I have addressed a bit of it, in the past, in my promotion of size-independent "Wing Cube Loading" in place of the usual wing (area) loading, which has the disadvantage of varying with scale.

Those of us who like to study the technical aspects of our hobby are sometimes curious about, or need to know, other scaling conversions. Here is a slightly-abbreviated list of the various theoretical relationships, which I am borrowing from Darrol Stinton's excellent text, *The Design of the Airplane*, published by Van Nostrand Reinhold.

Unit	Conversion
Length	scale
Area	scale squared
Volume, mass & force	scale cubed
Moment	scale to the fourth power
Moment of inertia	scale to the fifth power
Velocity	the square root of scale
Acceleration	constant
Angular velocity	1/ the square root of scale
Angular acceleration	1/ scale
RPM	1/ the square root of scale
Power	scale to the 7/2 power
Power loading	1/ the square root of scale
Wing loading	scale
"Wing Cube Loading"	constant
"Displacement loading"	constant

Note that I added Wing Cube Loading and Displacement Loading to the bottom of Stinton's list. The dimensions of Wing Cube Loading are ounces over feet cubed, but these "cubic feet" don't represent any actual volume, since the third dimension used is the square root of wing area. WCL equals weight in ounces divided by wing area in square feet to the 1.5 power.

In my previous articles I pointed out that both weight and displacement are cubic functions of size, therefore displacement loading is a constant with changing scale. But as you can see by Stinton table, power varies as the seven-halves power of scale. Therefore power loading is not constant with scale. Confused? I hope I'm not.

PAINT IS AN INSULATOR

You know it and I know it, but I still had problems because of it. I usually install the servos and then paint the model, to minimize the chances of damaging the finish. If I was going to spray paint next to servo leads, I would mask the servo connectors before painting. I underestimated the distance that overspray can travel and stick, however, and how it can penetrate small openings. On one airplane I had radio trouble twice, and in each case traced it to a very light and essentially invisible dusting of spray paint on connector pins. In one case it was the switch connector pins, and in the other, the pins on the aileron servo in the wing. Beware! Acht nehmen! Akht! Attention! Attenzione! Akta Dig!

MECHANICAL "EXPONENTIAL" DEVICES

In the April column of MD&TS I talked at length about unfavorable and favorable nonlinearity in R/C control systems, and proposed a do-it-yourself device which replaces a conventional servo arm to give favorable nonlinear control similar to the electronic "exponential" control available on some transmitters. I built several of the device shown in that column and played with them on the workbench, but I had not flown one when I mailed the column to *Model Builder*. Subsequent testing of the device convinced me that there was too

much danger of the linkage becoming disconnected under flight loads, so I quickly rushed a warning to MB, which was stuck into the column.

The fix turned out to be easy. The original version required a spring to keep the pushrod engaged and that spring had to be excessively strong before I would trust it. The revised "safe" version is shown in Figure 2. The slots are closed so the pushrod cannot disengage, and no

spring is required. I have built and tested this version, and it works OK, but we can do better yet. The problem with this one is that it is a bit tricky to make with neither binding nor backlash.

MODEL PRODUCTS' "LINE DRIVE"

You may recall that in April I discussed "Line Drive," a device marketed by Model Products Corp. It is an attachment, consisting of a drum and light steel cables connected to a pushrod fitting, to put on a servo in place of the customary arm. This gives a linear output instead of the usual unfavorable trigonometric output. By this I mean that the angle that a conventional servo arm assumes at the ends of its travel gives a lower rate of control surface travel than is provided near the neutral position. We would like just the opposite. We need to have relatively insensitive controls near neutral so we can fly very smoothly without any tendency to over-control. On the other hand, for aerobatics, we need rapid full control-surface throws. Line Drive corrects the unfavorable nonlinearity of a conventional linkage, but it doesn't go the desired further step of providing favorable *nonlinearity*, as transmitter exponential does.

I prefer to fly with exponential, whether electronic or mechanical, instead of dual rates, because dual rates complicate our flying, requiring us to adjust our reflexes to two different rates, and to take a thumb off a stick and blindly find the dual-rate switches. I'm pleased to see that I have support. Oley Howe and Eloy Marez, in his "Electronics Corner" column in the March issue of this magazine, expounded the virtues of exponential. The mechanical devices I'm describing can give you equivalent favorable nonlinearity without an expensive transmitter which provides exponential (and other bells and whistles which you perhaps don't need).

Dick Remington's (Model Products Corp.) Line Drive unit is a nice little device. As it is now manufactured, Line Drive is linear, but it can easily be made favorably-nonlinear, like exponential! I have converted a Line Drive unit to exponential and have built several similar units of my own which are also nonlinear. The trick is shown in Figure 3. Dick's Line Drive has the servo shaft at the center of a circular drum which carries cables to the pushrod. By simply moving the shaft off center, as shown, the device becomes nonlinear, yet retains all the advantages of this neat concept.

I chatted with Dick Remington by phone today. He points out that the linear Line Drive imparts no lateral motion to the pushrod at the servo, which allows a narrower slot for the pushrod to pass through on some aileron installations. That is not a problem in most of my installations. The exponential-type action is more important

to me. Dick said he will change the Line Drive literature to point out that these units can be mounted off center to gain exponential. The amount of nonlinearity could even be made adjustable, as it is with electronic exponential.

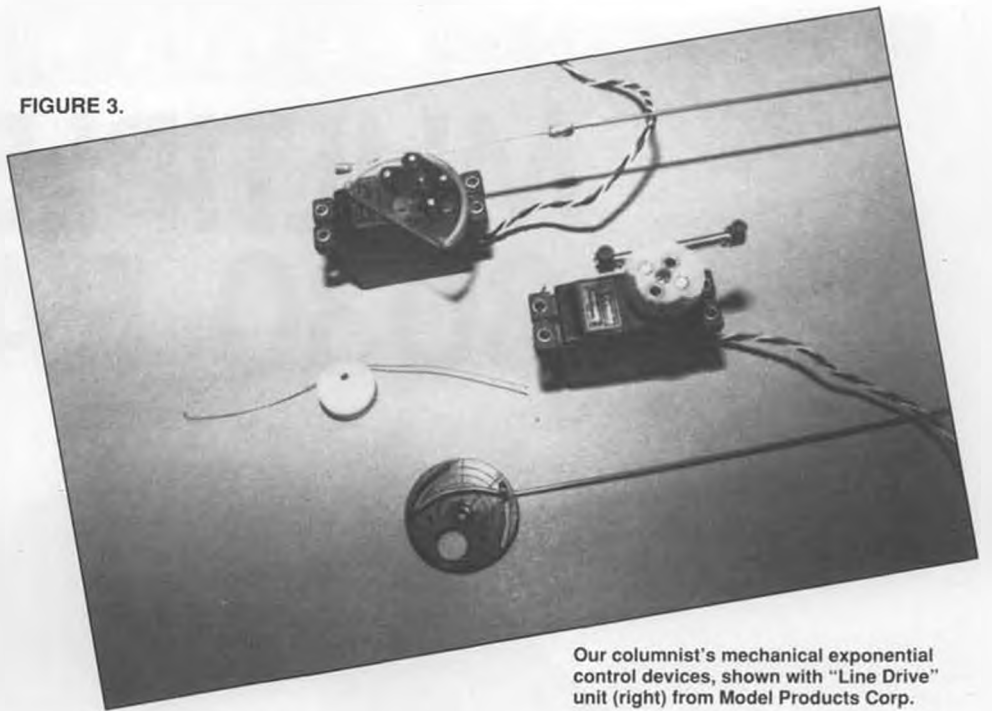
In the meantime, to make your own nonlinear drum-and-cable-type device, turn or find a narrow plastic pulley about 1-1/2 to 1-3/4 inch diameter. (Line Drive isn't now manufactured large enough for optimum pushrod travel in my opinion.) Drill a hole through the pulley (drum) which is large enough in diameter to accept the hub of a standard arm for the servo you intend to use. The location of this off-center hole will determine the amount of nonlinearity you will get. With the hole located as shown in Figure 3, the nonlinearity is about 1.4 to 1.

Saw off the side of the drum opposite the off-center hole. Shorten or cut off any excess legs of the standard arm, put it through the hole, and attach it to the drum with screws. Procure about ten inches of strong flexible non-stretch cable or cord. Both Dick and I have used stranded steel cable about .015-inch dia. Some fishing leaders are OK.

Drill a small hole into the groove near each end of the pulley flat spot, so you can thread the cable through the holes with enough bends in it to keep it from slipping after completion. The two ends of this length of cable wrap around the drum in opposite directions and are attached under tension to a special long pushrod end-fitting. The tricky part is to get the parts properly arranged and hold them while one secures the cable tightly for zero backlash.

I used short brass tubing sleeves over the cable and rod ends and soldered them on. Line Drive uses staking and set screws. The pulley-groove radius should be close to the radius of the pushrod end, to keep the unit aligned so the cable doesn't unwrap from the drum.

FIGURE 3.



Our columnist's mechanical exponential control devices, shown with "Line Drive" unit (right) from Model Products Corp.

If you understand all of this description and it doesn't scare you, you are qualified to build one. This device will improve the quality of your aerobatic flying significantly. I like the flight response of mine very much. It is 100% reliable and trouble free, and weighs only a fraction of an ounce.

THE INVERTED RUDDER-TURN ANOMALY

Most of us who fly inverted are using aileron-equipped airplanes. Ailerons work the same way inverted as they do upright, but did you ever think about what a rudder does when the plane is inverted? "Right rudder" will become left rudder if the plane is upside down, and the plane should turn to the left instead of to the right. Right (meaning "correct") and wrong!

The rudder will deflect to the left as viewed from the ground, but an inverted model without ailerons will turn to the right when given "right" rudder. I have flown such models inverted and that is what happens. The rudder inputs are normal; only the elevator inputs must be reversed for inverted flight. The anomaly yielded to analysis, and I think I have seen it in print elsewhere, but I can't give you a reference.

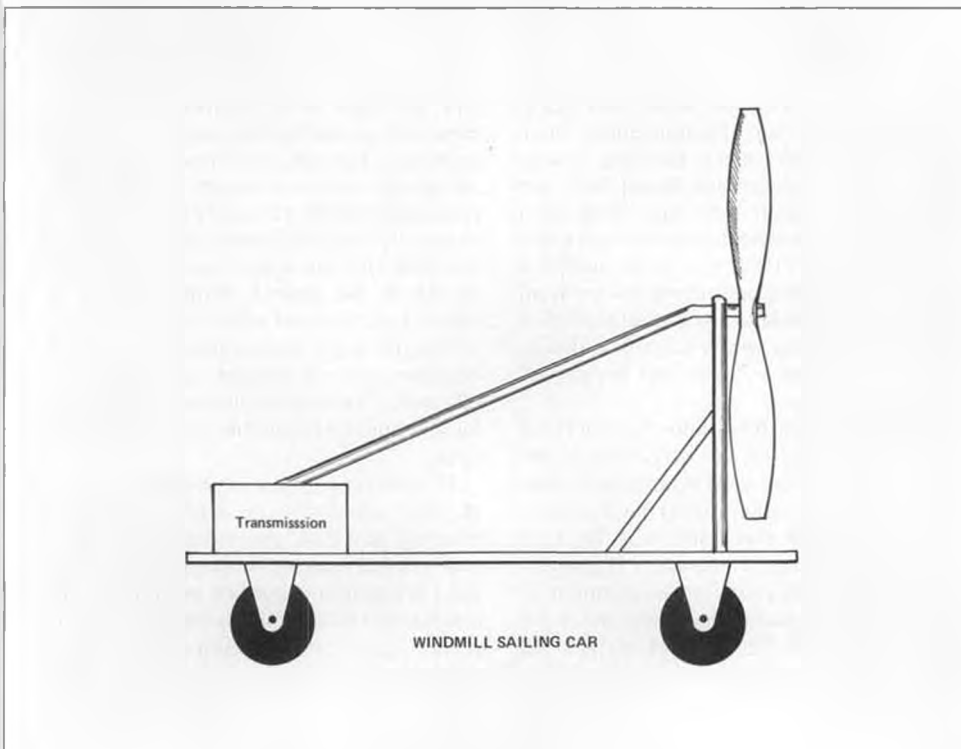
We need to go into the "as-viewed-froms" a bit before we go further. In a manned airplane flying inverted, if the pilot applies right rudder the plane will yaw to the right as he sees it, since he is inverted along with the plane, but it will yaw left as seen from the ground. An R/C pilot is seeing from the ground, so an inverted R/C plane will yaw left when given right rudder.

You may have noticed that R/C models without ailerons usually have considerable dihedral. The dihedral isn't there just to make them more stable, it is there to make them turn. Rudders produce yaw, but a yawed airplane with the wings level turns only very slowly. To get normal turns we must roll the airplane and then use up elevator to increase the lift, so the lateral component of lift pulls the airplane around the turn.

But, how can we roll an airplane with no ailerons, in order to make it turn? We can do it with the rudder. The rudder of a plane with no dihedral will produce chiefly yaw, but if the plane has significant dihedral we get a lot of yaw/roll coupling.

Why this is true isn't difficult to understand. You may recall that dihedral has two purposes. One is to produce roll stability. If one wing gets above the other the dihedral will make it effectively shorter than the other wing in the horizontal plane, so the high "short" wing will have less lift and will drop back down to level where it has the same effective length and lift as the other wing.

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MULTIPLEX mc3030 RADIO

BY ELOY MAREZ



The many-featured Multiplex mc3030 transmitter, shown here with the long sticks recommended for the European tray-supported style of flying. It is fully programmable to your individual model and flying style.

If you are the kind of modeler who buys his radio equipment by the pound, i.e., the cheapest that you can find, you probably don't want to read any farther. My advice to you is to total up your losses in airplanes due to "bargain" radios, and reconsider whether you might be better off in the long run with R/C equipment of higher quality. If you can then concede that *reliability* and *inexpensive* are not synonymous, allow me to introduce you to the Multiplex Company and its Profi mc3030 R/C system.

Multiplex is a West German concern, and has been producing R/C equipment for the modeler for close to thirty years. In the interim, it has come from the admittedly crude devices of those early days to some of the most sophisticated and expertly designed and built equipment now available. It is just as obvious that Multiplex has not evolved into a mass market company. Its philosophy, even in its home country, seems to be that there are Mercedes 600s, and there are Volkswagen "Beetles." You see both of them on the German autobahn, but there the resemblance ends! Though Multiplex equipment is high in price as well as quality, it has a large following in Europe where it has performed consistently for many years with frequency spacing as little as 10 KHz while we in the U.S. were still flying with 80 KHz channels and long before the words "narrow band" were of any consequence to the

American R/Cer. Though a lot of us knew of Multiplex and its excellent reputation for years, the equipment did not become available in this country until 1985, when Beemer R/C, still the sole importer, distributor, and service facility, was established in Phoenix, Arizona. This company carries not only Multiplex R/C systems, but also the varied line of model kits, primarily sailplanes, for which the parent company is also famous.

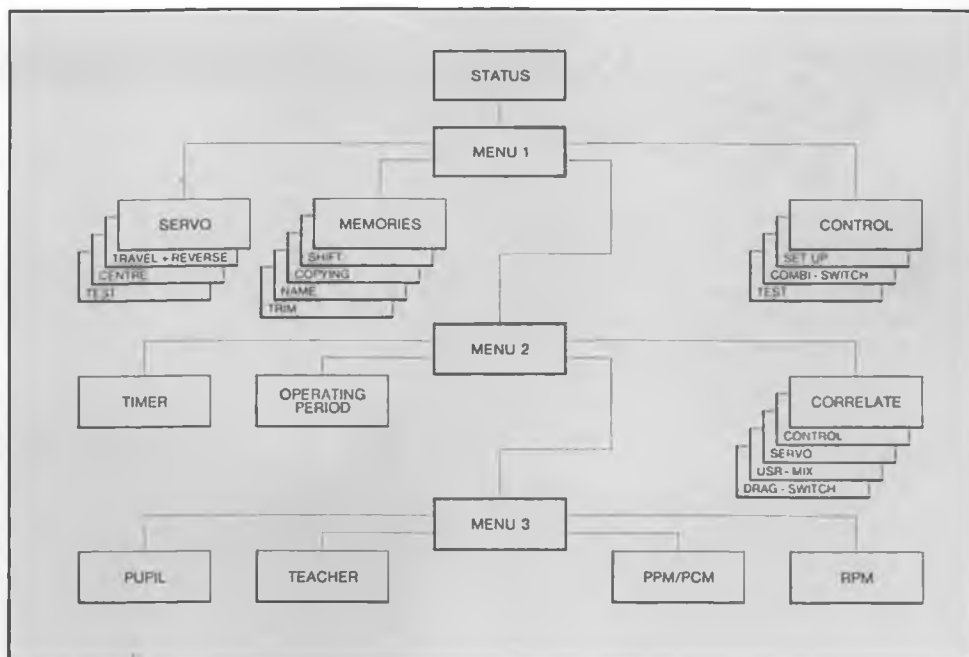
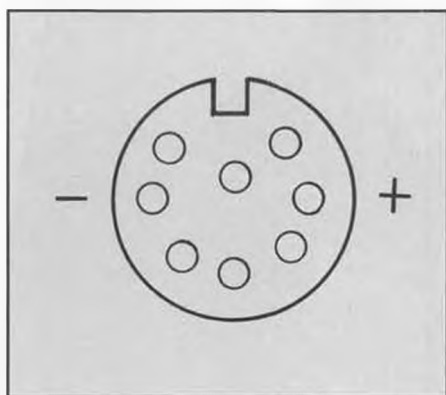
Now, for the Profi mc3030! This report will focus primarily on the transmitter, since the airborne equipment is the same as supplied with the Multiplex Royal MC, the subject of our report in the May 1986 *MB*. I can attest from personal experience as to the reliability of the PCM-DS receiver and Profi servos—mine have performed flawlessly all that time. I appreciate the fact that Multiplex has seen fit to stay with a successful design rather than offer a "new and improved" version annually.

The Profi mc3030 is a nine-channel PCM/PPM transmitter, of the so-called "computer" type; its operation is accurately controlled by a user-programmed microprocessor. More about that later. It is, by U.S. standards, a large transmitter, being designed for the European tray-supported style of flying. Its actual dimensions are 9-3/8 inches wide by 8-7/16 inches high by 1-5/8 inches thick. In comparison to another transmitter style, this makes it 1-11/16 inches

wider, 2-1/16 inches higher, but 1-3/16 inches *thinner* than the nine-channel Futaba 1024 transmitter. Weight-wise it is almost identical, actually weighing only one-half ounce more, at two pounds fifteen ounces. It is furnished with two twist-off control stick ends, one of 2-5/8 inches height for thumb-and-forefinger tray supported flying, and one of 1-1/4 inches height for thumb hand-held operation. As an option, the long sticks can be fitted with pushbutton switches mounted on the tips for auxiliary channel operation. The antenna is mounted in a ball-and-socket assembly which can be set for best angle and then locked in place with an externally located screw. Remember that the most efficient antenna angle is perpendicular to the ground. While this can be somewhat awkward while flying, at least a 45 degree angle is recommended and will be better than the straight-out angle generally seen. The antenna is removable and a lock-in holder is available on the rear of the case.

The transmitter case is completely plastic, of what appears to be a fiber reinforced material, in a dark grey matte finish. Quite professional looking without being in the least bit gaudy! A further example of the mechanical quality of this unit is the use of what I consider the epitome of toggle switches: U.S.-made C&K flat-handled switches which I know are quantity priced at

(Right) The Menu Tree as programmed into the 3030 and accessed through the eight-button keyboard. Extremely easy to understand and to follow. (Below) Charger connections to multi-contact socket on mc3030 transmitter, to be used with chargers such as Ace R/C variable chargers.



about five bucks each. The feel of the handle in your fingers and the solid "click" as the switch is operated tells you that you've got mechanical quality in your hand. No skinny handled, wishy-washy working cheap switches here!

In the middle of the transmitter, between the gimbal assemblies, are four slider type controls. You are partially correct in assuming that they are auxiliary channel controls. This type of control should be appreciated, as I know that few fliers like the switch or rotary knob operated controls found on the majority of transmitters. However, two of

these levers, the inner two, have another unique and very useful function. They are not really channel controllers, but are actually a reference point for the outer two, which are in fact the channel levers. The inner levers can be positioned as desired by pushing them outwards towards their companion channel lever and moving them to any desired position. When flying, to arrive at a predetermined control position, it is only necessary to move the channel lever parallel to the reference lever—no need to take your eyes off your airplane or to search for a desired control amount!

The battery in the mc3030 consists of only six cells, yet it is capable of producing more than enough RF energy for its intended purpose. This is basically the same battery and RF circuitry used in the Royal MC, and as I stated earlier, I have found that system to be completely reliable. There is a difference, though, between this transmitter and both the Royal MC and all other transmitters that I know of. This one is powered by the new Sanyo SCE 1700 mAh capacity cell, for which an operating time of over *eight hours* per charge is claimed. When initially turned on, the digital display includes in its basic information the battery voltage in both a digital (for hundredth volt accuracy) and analog (for instant readability) form. The latter is a series of bars, which for a full charge extend to the extreme right side of the screen, lessening in number as the voltage diminishes. An accumulative operating period timer also appears on this initial display, which can be reset at any time and can be used as a measure of either the elapsed time since charging or the day's activities. Either will give one an excellent indication of the safe remaining flight time. If that isn't enough, included is a built-in battery monitor which emits an audio signal when you are down to 15 minutes operating time. And if you are extremely insensitive to warnings, you can install an emergency back-up battery, which is automatically

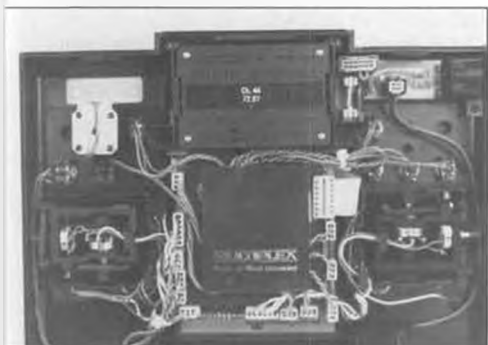
switched in when the primary one dies completely, giving you an additional 15-20 minutes. Even this latter safety device is provided with a safety device: a red LED which normally illuminates to indicate a power on condition goes into a blinking mode to indicate you are operating on back-up power!

Seems one can't use the transmitter battery as an excuse anymore, doesn't it? Seriously, don't overlook the fact that all these features are far from being gimmicks; they provide useful information. Additionally,

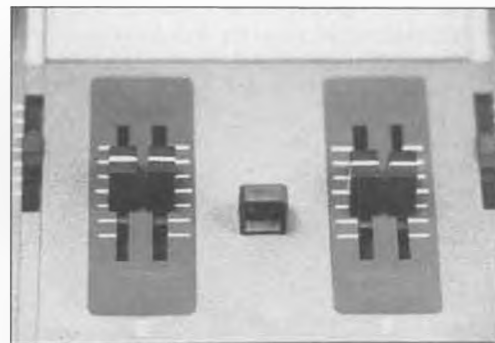
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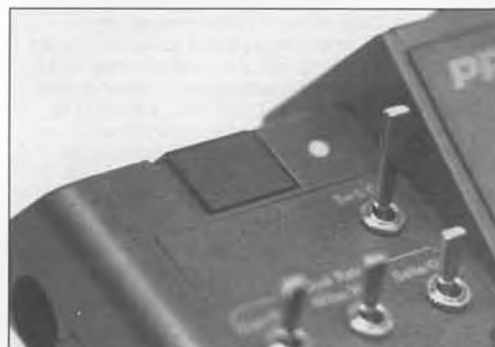
All transmitter programming is done with these eight clearly marked keys; inputs are displayed on the large LCD at the top of the Tx case.



The easily removable rear cover reveals a modern, uncluttered interior. In addition to the electronic programming, the transmitter can be tailored mechanically to suit individual preferences.



Only the outboard two of the four linear slides in the center of the Tx are used for auxiliary controls; the inboards are positionable to provide a reference point while flying.



The on-off switch, the serrated plastic tab at the top, is completely immune to inadvertent or accidental operation. Note also the high-quality flat toggles for auxiliary operations.

I did not have space in the last column to discuss five of the ten connectors presented in the table. Now is the time! The five remaining connectors and measured resistances were the Adams (0.45 milliohms), the Sermos (0.28 milliohms), the R/C Prep (1.18 milliohms), the Deans two-pin connector (1.03 milliohms), and my own design homemade connector (0.30 milliohms).

The Adams style connector is quite popular in Europe. It was marketed in the U.S. for awhile by Les Adams. It is gold plated, and very well made. It is also sold in some electronic stores. The shanks are hollow, and the wire is flow soldered into the shank. The overall size is a little large, about one inch long when plugged together. It does not have a housing; heat-shrink tubing is used for insulation. Since it does require more room, it would be best in larger planes.

The Sermos connector came out the best in the tests, and it is a very unique design. The contacts are silver plated. A leaf spring in the connector housing forces the contact faces together very strongly. This is the connector that is preferred by many fliers and car racers for high power installations. It has made an excellent reputation for itself. If you wish to disassemble the contact and housing, however, it is quite a job. There is a special tool that makes it easier; I think C.S. Systems, 31 Perry St., Middleboro, MA 02346, (508)947-2805 might have it. The wire is flow soldered into the shank, and you must be careful that no solder gets past the shank area into the contact area. If that happens, the contacts will not mate fully, and the resistance will go up. The contacts are not male/female, so polarity is created



Practical electric powered R/C helicopters are here at last, folks. Horst Wiederhold (left) and Kai Reuter demonstrated their Graupner Star chopper during a recent meet in Bad Nauheim, in West Germany. Power is a 355-5 Plettenberg cobalt motor on 24 cells. More in text.

by locking the housings together to make a single plug unit. You can rotate one housing 90 degrees on its axis to make an even more definite polarity. The ridges molded in the housing will accommodate this rotation for one side of the connection, but not the other, which must be glued with CA glue. The total size of a single connection is 3/8x1-5/8x3/8 inches, which is bulky, especially in smaller models. CS Systems and others sell the Sermos plugs.

R/C Prep markets a connector that is popular for offroad cars. It is a clever design, with wide flat contacts, is gold plated, and quite small. This plug was a big surprise, in that it did not do nearly as well as I had expected it to. It has lots of surface area, but that didn't seem to help. I worked on this one to try to make it better. I increased the contact pressure, and even solder coated the faces to see if that would make a difference. Nothing made any major change, so I am really mystified about what is going on. It is about as good as the Deans two-pin plug.

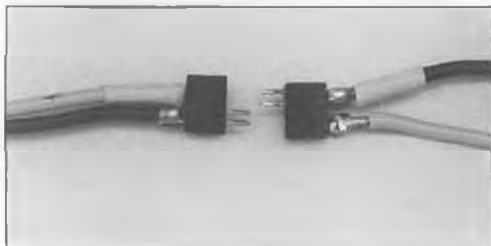
The Deans two-pin plug is the "old faithful" I have been using for years. It is very small, easy to solder, and is gold plated. I use two pins per line, so the usual plus and minus plug will use four pins. The Deans plug relies on a gap between the first and second pin to establish polarity. On earlier plugs this gap was not much different from the regular pin spacing, so it was possible to get connections reversed. Deans widened this gap considerably a couple of years ago, so now it is not possible to accidentally

reverse connect the four-pin plug. The Deans are used for offroad cars—obviously someone registered some complaints! I prefer to polarize by using two female pins and two male pins as shown in the photo. It is easy to pull two pins from a four-pin connector with needle nose pliers. Since Deans come in all-male or all-female blocks, conversion means pulling two pins from each block and inserting them into the other block to give a plug block with two female pins together and two male pins together. I use the male pins for the plus lead from the battery and polarize all other connections accordingly. This type of polarization also evens out the use of male and female pins. Before I went to this system I always had a surplus of female pins and a shortage of male pins. This was because I have a lot of motors, which in my old system used male pins. The Deans plugs are available from Ace R/C.

Last, but not least, the homemade connectors came out very well, better than any connector other than the Sermos. These connectors are simple, easy to make, and inexpensive. I made them out of a generic brand of brass tubing, 3/16 and 1/8-inch outer diameters. K&S brass tubing would do as well. The smaller diameter tube fits inside the larger one with just enough clearance for an easy fit. I cut 7/16-inch long pieces; the smaller tube is the male fitting. See the photo. The wiring is soldered to the outside of the female connector and to the inside of the male connector. Alternatively, the male could be made longer, about 5/8-inch, and the extra length used as a shank. The wire



(Above) Mitch Poling's homemade power connectors are ultra simple, being made from hobby shop brass tubing, but they outperformed all of the commercial connectors Mitch tested except the Sermos. Small and light, too. (Below) This month's column tells how to polarize Deans connectors to prevent accidental backwards hookup.



could then be soldered on the outside of the male connector as well. The inside diameter of the male tube is large enough to accommodate up to 12 gauge wire. I used a K&S tubing cutter to make the connectors; this makes a very smooth cut. It does leave a ridge inside the tubes, which has to be filed down with a small round file. I sand or file the inside of the female connector and the outside of the male connector to clean off the oxidation layer, which will cause extra resistance. (Since these connectors are not plated, this will have to be done periodically.) Squeeze the female connector slightly with pliers so that the connectors fit firmly. This is a matter of feel; too hard and the connectors will be difficult to take apart, too light and the resistance will go up. Finally, I use heat-shrink tubing to make a neat covering and protect against shorts: 1/4-inch diameter heat shrink is ideal for the female, 3/16-inch for the male. I let the heat-shrink



The new Fokker E-III Eindecker from Graupner appears to be very close to scale, although no such claims are made. Span is 53 inches, for up to eight cells.



Graupner unveiled several new products at the recent Nuremberg Toy Fair, one of which is the "Chili" (who comes up with these names, anyway?), a high-performance motorglider for up to 16 cells.

lap over the end of the female connector about 1/16 inch before shrinking, this will then shrink down to cover the cut end. The heat-shrink on the male is there to cover the wire and does not overlap onto the male connector surface. This means you have to pull on the wire on the male to take the connection apart. If this is a problem, make the male longer with a shank, as mentioned before. The connection when finished is about the same size as the two-pin Deans (about 1/2 inch long), but with a contact resistance that is less than a third as much. The cost per connection is about 20 cents! So there you have it, an inexpensive and efficient connector!

I think from this experience with connec-

tors that the factors that matter are: surface area (the more the better); pressure of the contacts (the more the better); and plating. John Sermos told me that silver plating beats gold plating in high current applications. The Sermos connectors are silver plated. This data makes me think John is right. The gold plated connectors in my data did not do as well as the Sermos connectors, or even as well as some of the unplated connectors. The advantage of gold is that it is maintenance free, it does not oxidize. Silver and unplated contacts should be cleaned occasionally.

I did an unplanned experiment on contact pressure. I accidentally squeezed the homemade female connector a little more than usual. The resulting connection was very tight, and difficult to pull apart. But the contact resistance dropped to 0.23 milliohms! That is the lowest value I have seen for any connector in these sizes. Well, there you have it, and now you too can evaluate connectors.

I decided to check out fuse losses while I was at it. I used the automotive plastic spade lug type fuses, with spade lug type holders. I measured the voltage drop by sliding the wire insulation back from the connection to the spade lug, then clipping on the voltmeter probes. The table shows the resistance values for the fuses in milliohms:

Fuse	Milliohms
10A	13.3
15A	6.7
20A	4.6
25A	3.3
30A	2.6

The spade lugs on the fuses were sanded before measuring to make sure the resistance was minimum. Nevertheless, these values are high compared to connectors. In fact, if the Sermos or homemade connectors

are used, the fuse will represent over half of the connection losses. My recommendation is to avoid the use of 10 or 15 amp fuses; use a 20 amp fuse or larger. The 20 amp fuse should protect even the 020 size motors. Using current squared times resistance, the loss in a 10A fuse at 20 amperes is 5 watts, which is considerable. It is 2 watts for a 20A fuse, and 1 watt for a 30A fuse, which is a lot more acceptable. You *can* omit the fuse altogether, but that is a risk that is unacceptable to most fliers. With no fuse, you stand a strong chance of having a fire if the plane crashes. What happens is that the insulation

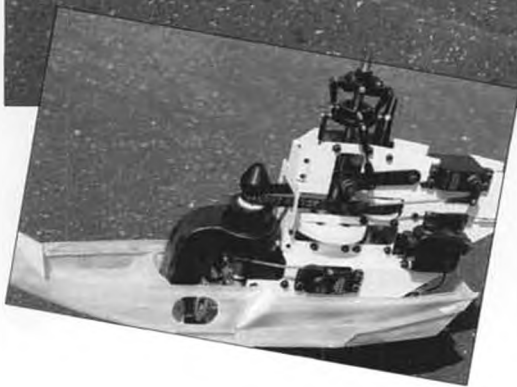
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Graupner's new "Elektro Junior" is well suited to beginners because of its relatively slow flying speeds. Takes up to seven cells.

CHOPPER CHATTER

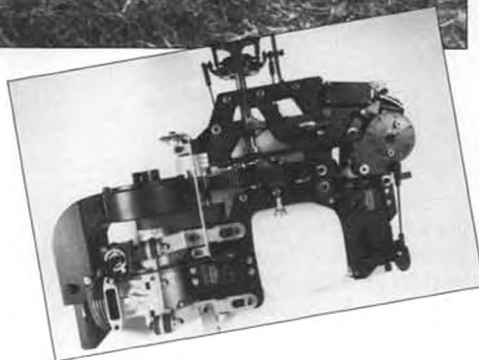
BY JAMES WANG



(Above) GMP's new 30-size "Viper" should be available by the end of summer. It uses a unique fiberglass pan for the lower fuselage, clear canopy on top. Will retail for about \$400. (Left) A close-up of the Viper's innards reveals a forward-facing engine, belt drive transmission, belt drive tail rotor, and straight linkages from the servos to the controls. Rotor head will be an all-metal piece similar to the GMP Elite, but smaller.



(Above) The latest offering from Miniature Aircraft USA is called the "Triumph," designed expressly for all-out FAI competition. Features the very best of everything, and sports a white gelcoated fiberglass fuselage. More details in text. (Right) Details of the power train used in the Triumph. Features push-pull controls throughout and a forward-facing engine mounted on rubber dampers. Mechanics are assembled in a special jig at the factory.



For the next few months, we will delve into various aspects of helicopter principle and theory. In the August 1989 issue, we explained in detail the technical reasons why helicopters are more difficult to fly than airplanes: One, because of predicting translational motion from rotational motion requires four orders of time integrations in the pilot's head; two, to control a helicopter successfully, the pilot must simultaneously manage six unstable degrees of freedom. Model helicopters are even harder to pilot than full-size helicopters because small flying objects have a shorter reaction time constant. In the January 1990 issue, we discussed helicopter stability theory, during which we explained the stability benefit of having a Bell-Hiller stabilizer bar, also known as a flybar. This month we will discuss helicopter control theory, and explain why a flybar is useful from a control theory standpoint. For following months, we will continue with model helicopter acoustic theory, explain the physical mechanism of how rotor blade noise is generated, and discuss optimal airfoils for model blades, horizontal stabilizer sizing and angle, etc.

As usual, before we delve into the heavy-duty stuff, let's look at some of the new model helicopters and accessories on the market. Just coming off the press are GMP's 30-size Viper and Miniature Aircraft Supplies' Triumph. Triumph will be the flagship of MAS. It will cost \$1499 apiece! Whew! But, Triumph will come already assembled and built by Ted Schoonard himself. All the Triumphs will be built in a jig, therefore, they will all come out identical. A special gelcoated fuselage that looks like a mix between a Jet Ranger and an Aerospatiale Squirrel is included in the kit. The model features belt drive transmission, 9.45 gear ratio (but three other gear ratios are available), carbon graphite composite frames, double push-pull for all controls, gyro and tank located at the c.g., torque tube tail drive, rubber mount engine, and many other features. The list of features that Ted sent me covered a whole page. Maybe he ought to just list the features as an ad. It looks mighty impressive. The most interesting line was that all Triumph buyers will have a private serial number, and you must provide this number when ordering Triumph parts, and a private toll-free number will be provided to Triumph customers. The pictures shown were sent to me by Ted Schoonard. From the descriptions and pictures, the mechanics seems impeccable. We will let you know more details in the future. By the time you read this, Triumph will be available.

Even though GMP and MAS work independently, the 30-size Viper looks almost like a scaled down version of the Triumph. Viper also has a front facing engine, servos located all over the side frames, fuel tank



Century Import's 3-Dimension R/C Helicopter training stand can do away with a great deal of the grief (and expense) of learning to fly R/C helicopters. It allows the model to rise, yaw, and translate, and simulates free flight quite well.



Here you can see that the supporting plate is mounted on four rubber dampers to allow the model to tilt. This is very important, otherwise, in order to move sideways, the rotor head will tilt too much and cause excessive stress on the hub.



New products from Century Imports include a precision blade pitch gauge and Black Shark tuned pipes and headers. Nice looking parts, eh?

located near the c.g., and belt drive transmission. But the Viper only costs a third as much (retails for around \$400). Triumph is aimed at becoming the ultimate 60-size FAI machine, while Viper is aimed at becoming the king of the road of 30-size helicopters. Viper is designed as a high quality, high performance mini helicopter that offers more aerobatic capabilities than existing 30-size models. Everything is made in the U.S., and mostly of metal construction. A metal mini-Legend Elite rotor head will be supplied. It is identical to the 60 Elite rotor head, except it

is about half the size. GMP says Viper's precision mini Elite head will also fit Concept 30, Shuttle, and other 30-size helicopters. The frames will come in a beige color. In the future, other colors, such as yellow, pink, white, etc. will be offered. Legend's belt drive tail rotor system is used. The landing gear is very unconventional. It uses an aluminum plate in place of the normal struts. The web looks like Mr. Sensui's helicopter used at the World Championships. I saw the Viper when I was on a trip to California last month. I did not get to fly it because it was still in the prototype stage. But, GMP says they will send their first kit to us for a review. How nice. Now I just have to find time to build it and test it. (Last time I counted, I have built 33 helicopters, and 19 planes. And I estimate that since 1973 I have dumped at least \$15,000 in R/C modeling. That's more money spent on hobby than on dates! Does your wife or girlfriend complain?) Stay tuned, we will give you our usual 10-page review with lots of handling quality evaluations, and with hair shaving close-up photos.

A few months ago, Century Import, in San Jose, California, sent Ray Hostetler and me a Century 3-Dimensional Helicopter Training stand. Ray reported his results in the December 1989 RCM. Basically, he seemed to be very pleased with it. As I already know how to fly R/C helicopters, I gave mine to a local beginner to use. It took about three hours to assemble. Then we mounted his GMP King Cobra on it. We concluded that it provided very good simulation of a free flying helicopter. The beginner and I both liked it very much. The unit retails for \$199. If two or three people get together and purchase one unit and learn on it, then it is definitely worth it. It could save you one or two crashes. Later, it can be used again for learning nose-in hover. This 3-dimensional training stand allows the model to rise vertically, yaw freely, and tilt fore/aft or left/right. The swinging arm is spring loaded, so the helicopter only has to lift its own weight.

Century Import also sent us a new, anodized black tuned pipe system (called Black Shark Tuned Pipes). The picture shows their tuned pipe, new pitch gauge, and transmitter cases. The black anodized exhaust system looks very nice. They match the black anodized frames on Hirobo, Kalt, GMP, Schluter, and X-Cell helicopters. In the letter, Century says these black anodized tune pipes and headers are custom made for them, and are similar to the Hatori pipe design. Three header configurations are available: left side side-exhaust for Schluter helicopters and Kalt Excalibur, right side side-exhaust for GMP, X-Cell, and Kalt Cyclone, and rear exhaust header for GMP, X-Cell, Kalt, and Hirobo. The U-shaped pipes are \$64.95. The headers are \$36.95 each. For more information call Century at (408) 436-1325.

While we are talking about exhaust system, Kevin DeShazer, at KDI in Seattle, mailed me a very interesting gadget that he is now starting to sell. Kevin is the one who



For a real touch of professionalism, get yourself one of the single or double transmitter carrying cases from Century Imports. Priced at around \$70 and \$100 each respectively.



The modified GMP Prohead on the author's Cobra is a good example of the Bell control system. Note that no flybar is used; cyclic controls go from the washplate directly to the rotor blades. See Figure 2 also.

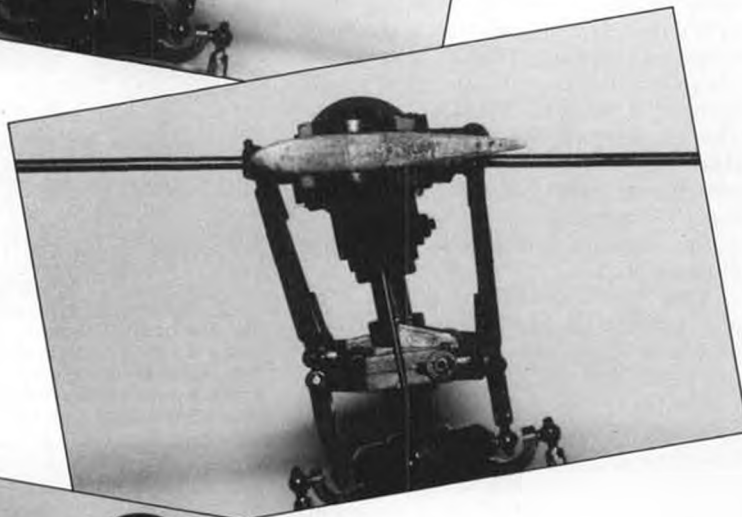


The Hiller control system as used on the GMP Rebel. This design uses a flybar, and only one control rod is needed from the washplate to the flybar. Cyclic control inputs will rotate the flybar to change the angle of the Hiller paddles. Refer also to Figure 3.

designed and manufactures the transmitter tray and power grip starter unit that we showed in "Over the Counter." His new product is a rubber bladder unit that at-



Our columnist has been the fastest kid on his block ever since he installed a Rossi 60H ABC and tuned pipe in his Schluter "Magic!" Definitely not for the faint of heart!



This sequence of photos demonstrates the Concept 30's 90% Bell-Hiller mixing ratio. Tilting the flybar 10 degrees relative to the rotor shaft will change the main rotor blade pitch by 9 degrees. The flybar may tilt relative to the shaft because of an outside gust or the pilot's cyclic input. Note that the swashplate is level in all three photos.

taches to any regular airplane or heli muffler to quiet it down further. The rubber bladder has many small holes. The principle is somewhat similar to a gun's silencer. The one he sent me was for 40-45 size engines. He also has one for 60 size engines. Kevin says these rubber silencers will cause very little power loss, sometimes have even showed minute power increase. I plan on putting mine on a Concept 30 or on my GMP Rebel. I will do some flight tests and let you know the results next time.

The weather is finally getting nice on the East Coast. With Daylight Saving Time I can put in some flying after work, then go back to work again after dinner. I am very fortunate to have a nice, big grass flying field right where I work, at the University of Maryland.

The field is remote from all the buildings and parking lots, so it makes a quiet and safe flying paradise for me. Besides building a new 60-size X-Cell custom, I have been putting many flight hours on my Magic, Excalibur, and Rebel. I need to start practicing FAI on my Concept because *Model Builder* and Kyosho are sponsoring the first 30-size only helicopter contest. As *Model Builder's* heli columnist, I should be there, so I might as well compete in the FAI class. This will be my first FAI contest, and I probably will get blown out of the sky by veterans. People ask me how I have time to do research, work on a PhD degree, build models, fly them, write articles, and still watch some TV? Well, I just don't sleep!

I have recently installed a Rossi 60H ABC

on my Magic. Boy, that thing is like a rocket! The Rossi is expensive and takes a long time to break in. It has so much compression, I have to loosen the glow plug to start the engine. Once the engine gets started, I tighten the plug. It is not the engine for the average flier. But if you want gusto at any expense, then this Rossi is it. It retails for \$399 and comes with a matching tuned pipe that has a swinging header which allows the pipe to fit almost any helicopter. The specifications says it has 1.95 hp. After flying it, I certainly believe so. My Magic with the Rossi 60 flies even faster than when I used the Enya 80H. However, the Rossi 60 costs almost \$100 more than the Enya 80H. Note, my Rossi is the three-port design 60H. By the end of this year, Rossi will be out with a new five-port 60H which has even more power! Probably an even higher price tag, too.

We tached my Magic, and noticed the head speed was 1700. This means the Rossi was turning at 17,000 (Magic has 10:1 gear ratio). Rossi is truly a powerhouse. But it requires diligence in breaking in and setting up. The Rossi is perfect for people who like to fly flat out fast! With increased forward speed, my Magic does beautiful axial rolls. The Enya 80H may be great for the heavier Magic with Jet Ranger fuselage. The 80H puts out more torque, which allows running at lower rotor rpm and higher collective pitch. Lower rpm reduces cyclic control sensitivity and thus more scale like handling. Scale model helicopters also sound more scale with lower head speed, because human ears perceive tonal qualities by the frequency of the sound. The frequency content of rotor noise is exactly proportional to rotor rpm. As real helicopter main rotor rpm is around 450, and model rotors turn at 1500, their sound characteristics are quite different. By reducing model rotor rpm, it would sound more like real helicopters. We will talk more about my Magic with these two engines in my Magic update.

My Rebel is flying very well, in spite of the engine. It is an extremely stable helicopter. This is because the soft flapping head gives soft cyclic response. The fixed-pitch design gives it 100% Bell-Hiller stability mixing ratio. And, the hingeless nylon rotor head design helps eliminate teetering slop and dead-band that exist on traditional pivoting teetering head designs. However, the vertical control response of a fixed pitch design, like the Rebel, will always be slower than any collective model. My suggestion is to make sure that you buy a decent 45 size engine, or a top quality 40 size engine. A good 45 is ideal. You should definitely avoid a 50 size engine; it will be too much. The cheap 40-size engine that I have in mine just doesn't quite do the job. With a 45, the Rebel makes an inexpensive and stable first helicopter. My friend, Jim O'Brien, has an airplane 45 engine in his Rebel, and his flies great. I will have to put a 45 in mine, then do some pylon races with him. Make sure you buy a rate gyro, any inexpensive one will work fine. Any low-cost airplane radio will work great, too, but just don't buy an el

cheapo engine. One thought that I have is, since the one-piece nylon head on the Rebel works so well, maybe it would be a great idea to replace the MFA 500's head with Rebel's, because MFA 500's teetering wire tends to break due to fatigue. If you have a Rebel, and know how to fly it, try to loop it. It is very easy, just fly straight and forward fast, then pull back gradually. But do not roll it! Rebel does not like to roll. I have never rolled my Rebel.

Now we begin the technical topic. From January "Chopper Chatter," we learned that the flybar acts as a mechanical stability augmentation system to automatically improve the handling qualities of model helicopters. I have talked about Bell-Hiller mixing ratio many times in the past in various articles. However, every time the context pertained to how the ratio affects stability. Higher mixing ratio is like turning up the feedback gain on a rate gyro to increase the stabilizing effect of the flybar, which makes the model more stable.

Let us review the flybar in two paragraphs. The simple principle of how it works is that the flybar will remain stationary in space to act like an inertial reference. It remains stationary because it has rotational inertia and it is gimballed to tilt freely. When a gust tilts the helicopter fuselage 10 degrees, the flybar will seem to be 10 degrees off from the fuselage, and through Bell-Hiller mixing levers, cyclic commands are mechanically fed to main rotor blades to automatically bring the fuselage back to level.

We can visualize this mechanical feedback action by looking at our model blade from the blade tip. First, adjust the collective pitch so the rotor blade pitch is at zero degrees. Next, by tilting the flybar by hand, you would see the main rotor blade pitch has changed. A 100% Bell-Hiller mixing ratio means the blade pitch would change by the SAME angle as the flybar tilting angle. The three pictures illustrate the 90% Bell-Hiller mixing ratio on the Kyosho Concept 30. The pictures show that for 10 degrees of flybar tilt, the main rotor blade pitch angle only changes by 9 degrees. Since most collective pitch model helicopters on the market have only 50 to 70% mixing ratio, Concept is considered to have one of the highest mixing ratios of any model. The high mixing ratio and soft flapping head make Concept one of the most stable helicopters. Other designers choose to have lower mixing ratio because the design goal may be to have a more aerobatic helicopter, rather than a mellow and stable model. In general, 50 to 80% represent a common ballpark.

Now we will discuss something new... helicopter control feel. The Bell-Hiller mixing ratio also has a strong impact on a helicopter's control feel. High mixing ratio means the majority of main rotor's cyclic control comes from the Hiller paddles, and very little from the feathering action of main rotor blades. Now let's see how the paddles and blade feathering action control the main rotor.

A helicopter can fly forward, or sideward

Figure 1. The main rotor is divided into 360 degrees. These are called azimuth angles.

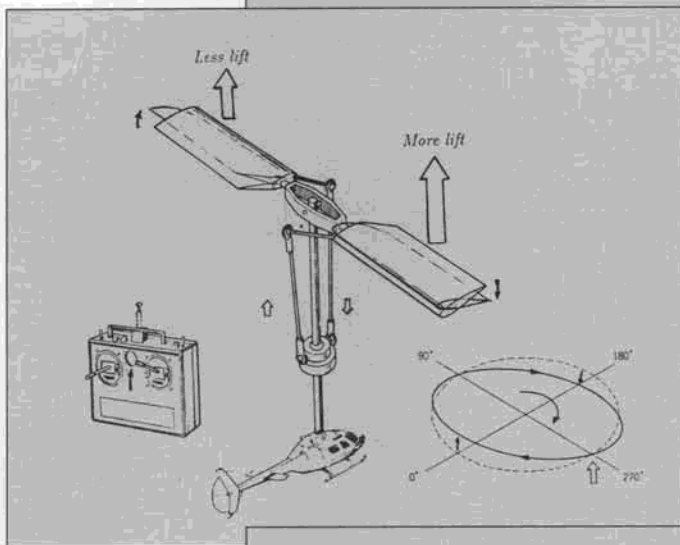
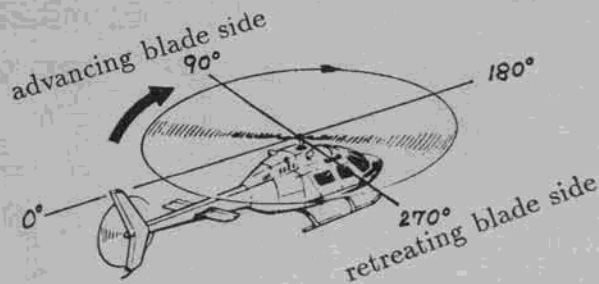
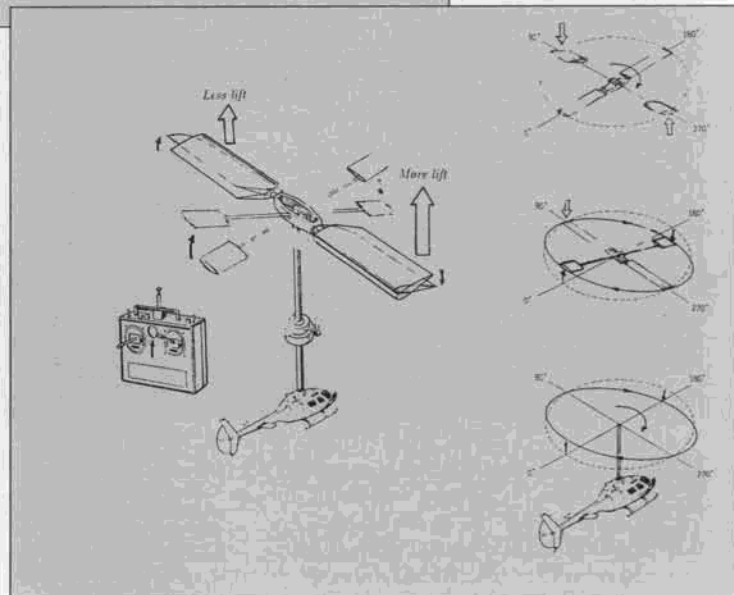


Figure 2. The Bell control system. Tilting the swashplate forward produces unequal lift to tilt the main rotor disc forward, which consequently moves the helicopter forward.

Figure 3. The Hiller control system. A forward cyclic command forces the flybar plane to tilt forward, which then forces the blades to change pitch angle cyclically. The main rotor disc will then tilt forward due to unequal lift.



by tilting its main rotor disk to direct the rotor thrust in the direction that it is to fly. The pilot controls the tilt of the rotor disk by fore/aft cyclic and left/right cyclic stick inputs. For example, as the pilot pushes the joystick forward, the swashplate will tilt forward, which in turn implements a cyclically varying command to the flybar and main blades to cause the entire rotor disk to tilt forward in about 20 milliseconds. Once the rotor thrust is tilted forward, it pulls the model forward. Simple, right?

For those who are interested, the rotor disk will usually tilt forward after the blades have made about a 1/4 to 1/2 revolution. The delay depends on a parameter called

Lock number, which is governed by blade radius, chord size, air density, airfoil shape, and blade inertia. As the delay is always around a 1/4 to 1/2 revolution, this is why higher main rotor rpm gives quicker cyclic response.

Now, let's examine the tilting action one step closer. When the swashplate tilts, there are two things that lead to tilting of the entire rotor disk. One is because the main rotor blade pitch angle will change. This action is called *Bell Control*. The second thing that also helps to tilt the rotor is that the Hiller paddle angle changes. This part is called *Hiller Control*.

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KALT EXCALIBUR HELICOPTER

BY JAMES WANG



Because of the tremendous amount of information that we will cover, this review will be in two parts. This month I shall discuss the flying qualities, crash-worthiness, and features of the new Kalt "Excilibur" helicopter. I will also get into air and ground resonance. Next month I will complete the review by discussing setting up of the Excilibur, programming the JR PCM-10 for the Excilibur, the JR-120 gyro, and performing aerobatics with the Excilibur.

Let's make this review terse and succinct. (That was the objective.) I give the Excilibur two thumbs up! Yes, I really like it. Last month we reviewed the Kalt "Cyclone II," which has the same K-5 main rotor head as the Excilibur, however, I would not give the Cyclone two thumbs up. The Cyclone has an air resonance problem and the collective pitch mechanism has slop. There are three ways of getting around Cyclone's resonating

(Above) The Excilibur shows off its clean lines while in a rock-stable hover. It's an expensive machine, to be sure, but it's also one of the best performing .60 size helicopters available. James just loves it.

(Right) The Excilibur uses the same molded K-5 rotor head as the Kalt "Cyclone" reviewed last month. The machine's aerobatic capabilities are further enhanced by the JR PCM-10H's stunt trim feature and reverse tail rotor mixing.

problem; we will go over them later when we discuss the air resonance phenomenon. Even though Excilibur uses the same K-5 rotor head, it does not exhibit the same air resonance because it has different natural-body frequencies.

The three reasons that I like Excilibur are:

1) very nice handling qualities in calm weather, 2) very high quality parts, 3) it is the easiest 60-size contest helicopter that I have ever assembled. However, it is not an inexpensive kit. It retails for \$999.99. Replacement parts are not the cheapest either. For example, the plastic canopy costs \$51.99.



But, if you are an intermediate or expert flier, then you will appreciate this helicopter. I usually do not recommend that beginners start out with expensive, 60-size contest models because they require more diligent setting up, and the instructions are usually not geared toward beginners. However, for the above mentioned three reasons, I would not hesitate recommending that a beginner start out on the Excalibur. The only drawback is that it costs more than other 60-size models on the market.

I have read other reviews on the Kalt Cyclone which said the Cyclone can be made into a great hot-dogging machine by purchasing an extra 60-size engine mount, add a tuned pipe, get a new 60-size cooling shroud, buy a new Excalibur bearing mixer and washplate, etc. But why bother? You will end up spending a few hundred dollars, and the Cyclone would still not match up to the Excalibur! Leave the Cyclone to the beginners for whom it was designed. The Cyclone may cost half as much as the Excalibur, but there is twice as much slop everywhere. The bottom line is, you get what you pay for, and a helicopter does best at what it's designed for. The Cyclone is a robust and easily assembled machine. It may be fine for beginners, but I felt it inhibited me from flying to my full potential. (I like to fly fast and smooth and do some hot-dogging, too.) The Cyclone in stock form with a 50 is definitely not a hot-dogging machine, while the Excalibur is capable of doing more than I am presently capable of doing. The Excalibur is unique in the sense that it is docile enough for the beginner, yet it can perform any aerobatic maneuver that experts may demand.

Furthermore, as the pilot gets better, he becomes more fastidious and demanding. A beginner probably doesn't care if there is vibration in the tail boom as long as the model can be airborne, while a non-beginner may spend hours to eliminate any minuscule vibration or microscopic bubbles forming in the fuel tank. Therefore, non-beginners will really appreciate the smoothness with which Excalibur operates. But, if you are a beginner and willing to spend twice as much as for a Cyclone, then I also recommend the docile flying Excalibur for you. It's your decision.

In addition to my own Excalibur, I have flown two other Excaliburs. They all had extremely smooth running mechanics and were very docile to handle. The handling is almost like an overgrown Concept 30; very predictable, and instilling confidence. In calm weather, it is probably one of the best flying 60-size helicopters; stable and fast. We have clocked the Excalibur with a radar and it did 70 mph at full blast. However, on windy days, the handling qualities fall off dramatically. It also loses penetration on windy days. I rate Excalibur as one of my favorite 60-size machines if the weather is calm. (This is compared to Magic, X-Cell, Champion, Legend, Competitor, Stork, and Heim.) I would pick the Excalibur as my contest machine. However, if the wind gets

over 10 mph, then I would pack it up and fly one of the other 60 machines.

As a full-size helicopter engineer myself, I strive to design real helicopters that will be stable on calm and windy days. But sometimes it just doesn't come out that way. A great design involves 80% engineering, but still needs 20% luck and 'feeling' by the designers. There are just too many coupling variables involved, such as shaft height, fuselage inertia, radius of gyration, boom length, rotor flap stiffness, lag hinge location, Delta-3, Delta-4, Bell-Hiller stability mixing ratio, control mixing ratio, fuselage shape, fin area, airfoil shape, control setup kinematics, etc. It usually takes 10 years from the first sketch made to the first commercial batch delivery of a new full-size helicopter design. A third of the research and development process is devoted to flight tests and refinements. Note, typical model helicopter designs only take one year from sketch to production because models have many less design variables and less stringent handling requirements.

The systematic layout of Excalibur indicates that Kalt designers must have done their best to achieve a great flying machine. Everything is neat and clean. They just happened to end up with an extremely nice machine on calm days, and slightly less stable in windy days. That's just how the design ended up. On a scale of 100, I still give Excalibur a 90. (I have yet to fly any helicopter worth 100 points.) By the way, helicopter gust response is an area on which many helicopter industry experts are still working. Two of my colleagues have done their PhD work on analyzing gust response problems, but no one has yet to offer a panacea to drastically improve helicopter handling in gusts. The reason is that just analyzing the problem theoretically to account for every variable is already a formidable task. Only after the gust response mechanism is completely understood, can a sure cure be offered. Delta-3 feedback seems to be the most viable solution so far. Excalibur's K-5 rotor head does have about 15 degrees of positive Delta-3 angle. In the future, I will have to buy new K-5 blade holders and modify them to increase the Delta-3 to at least 30 degree and see if the gust response improves. These experiments cost time and money, and I just don't have the time or money to do everything at once.

I will now tell you about some experiments that I did conduct. The kit does not come with any flybar weight. I added a set of GMP flybar weights on mine and noticed the handling became even more docile, yet, without degrading the aerobatic capability. I highly recommend adding a set of flybar weights. If you live in a windy neighborhood, or you are a beginner, two sets of flybar weights can be added to make the Excalibur extremely docile.

There are two holes on the K-5 rotor head's Bell-Hiller mixing arm. The head comes with the pitch link connected to the hole on the right, which gives about 90%



Kit contents all laid out for inspection. Main and tail rotors come factory assembled. James says the Excalibur is the easiest .60-size hell he has ever put together.



Close-up photo showing the standard Kalt side exhaust muffler, which fits the recess molded into the canopy. Very quiet, but delivers less power than the tuned pipe.



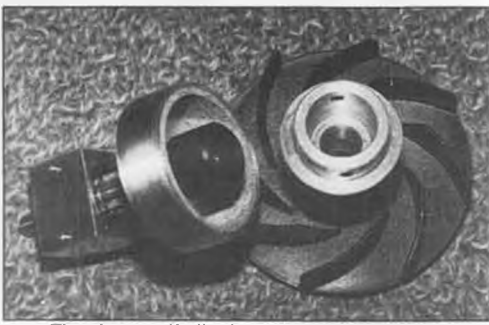
Side frames are black anodized 2mm thick aluminum and have ridges stamped into them for added strength. The Excalibur rates an "A" for crashworthiness; see text.



Servo tray is molded plastic, which really speeds up assembly. Note that our author has tied the servo wires together very neatly—he was not expecting to crash!

Bell-Hiller stability mixing ratio. (In this month's "Chopper Chatter" column we explain Bell-Hiller ratio.) I have tried moving the ball and link to the other hole which reduced the ratio to about 80%. The result is slightly more sensitive control response, but a very slight, but noticeable, decrease in inherent stability. Therefore, I suggest that you leave the rotor head untouched.

There are also two holes on the scissor



The clever self-aligning clutch mechanism used on the Excalibur. On the right is the cooling fan and flywheel. A special tapered nut is supplied which automatically centers the flywheel. The starting shaft (left) is connected to the clutch itself (not shown) through a universal joint, which eliminates the painstaking task of "dialing in" the parts to get them in perfect alignment.



Just one example of the Excalibur kit's high quality is the roll control bellcrank, a metal casting that pivots on ball bearings. Position of the steel ball for the link can be adjusted to five different positions.



Beautiful workmanship is evident in this close-up of the tail rotor gearbox. Most model helicopters have the pitch control bellcrank fixed to the gearbox. The Excalibur's pitch control bellcrank sits on an arm that can pivot, which gives better kinematics for smooth pitch change action.

mixing arm. The kit comes with the ball and link connected to the inner hole. I have experimented moving the ball and link to the outer hole. This resulted in increased collective throw and pitch and roll cyclic throw (more Bell action). Total collective travel increased by two degrees. I tried this because I wanted to fly inverted. But, again, I have changed the ball and link back to the original factory position, because moving the ball to the outer hole accentuated the slop in the system. Therefore, leave the kit alone, and do not modify anything. After all the experiments, I found that the model flies best in the original form! Well, this is the reason for reading my reviews, I spend time to check things out, so you don't have to mess around and waste time!

Excalibur does beautiful, large round loops. It is my favorite looping machine.

Magic does very nice tight loops, but Excalibur does better 100 foot diameter loops. Excalibur maintains nearly constant speed through its loop, too. It also rolls very nicely. This may be because the JR PCM-10 radio that I am using is set up to mix in right tail rotor when collective pitch goes below zero degree (PCM-10 is the only helicopter radio on the market with this feature). Normal helicopter radio ATS mixing would continue to mix in more and more left tail rotor as collective stick is reduced. When collective pitch goes below zero degree, normal radios continue to mix in more left, which is wrong. The tail rotor's purpose is to counteract the torque due to the main rotor's drag. The main rotor's drag decreases as pitch is reduced. At lower main rotor pitch, less tail rotor thrust is needed. But, when main rotor blades go into negative pitch, drag increases again, thus tail rotor thrust should increase accordingly. So far, only the JR PCM-10 does this increasing tail rotor thrust correction when main blades go into negative pitch. The JR PCM-10 allows the pilot to fine tune the helicopter, thus the tail rotor cancels out the main rotor torque at any collective setting. This helps the Excalibur perform beautifully straight loops without any nose yawing tendency. Combined with its good longitudinal cyclic response, 100-foot diameter loops are very easily done with the Excalibur. With PCM-10's proper tail rotor mixing, it also eliminates yaw during rolls.

Another thing that helps my Excalibur perform beautiful loops and rolls is using the stunt trim setup on the JR PCM-10. Again, PCM-10 is the only heli radio with stunt trim feature. Stunt trim feature allows the pilot to program the radio to automatically kick in any amount of cyclic pitch trim and tail rotor trim when hi-idle 1 or 2 is switched on. For example, the preferred procedure is to hover with hi-idles off, then switch on hi-idle 1 for forward flight, and hi-idle 2 for aerobatics. For people who know how to do forward flight, you should have noticed that if the model was trimmed perfectly for hover, then left tail rotor, left cyclic, and forward cyclic have to be fed in simultaneously to achieve straight and level forward flight. With PCM-10, I programmed in 5% left tail rotor, 5% left cyclic, and 3% forward cyclic for stunt trim. Thus, as I flip the hi-idles, the radio will automatically activate the stunt trims to make the model fly forward straight and level by itself. The advantage is that now the entry into any aerobatic maneuver will more than likely be level and straight. You only need to concentrate on performing the aerobatic maneuver, rather than also trying to maintain a straight entry.

The PCM-10/Excalibur combination allows beautiful axial rolls to be performed. Mine is set up with +10 degree collective and -10 degree collective. There is sufficient negative pitch to allow the model to climb inverted during the middle of a roll. The model is very predictable, thus I got carried away last Sunday. I started doing rolls at 100 foot altitude. Then, on every pass I went down 10 feet. When it was at 50 foot alti-

tude, I made a bad entry into a roll, it was in a slight dive. I thought; no problem, the model has plenty of negative pitch, I could always feed in extra negative to bump it up during the inverted portion. Well, that day the wind was howling at 20 mph, and I was doing the roll down wind, and I was using idle-up 1 instead of 2. My idle-up 1 did not have enough throttle for inverted climb. Therefore, if the ground was one foot lower, I would have made it. I have not crashed a helicopter for two months, and this was a surprise. Well, here is where the crash-worthiness evaluation of the review comes in.

Yes, it deserves an 'A' for crash survivability! There were only five damaged parts. My fellow flier commented that I just don't know how to crash. When he crashes, he always totals the model. We were extremely surprised to discover the major damage was a broken window screen, which is the clear part of the canopy. The actual body of the canopy was undamaged. Fortunately, Kalt sells the window screen by itself (\$16.00). Both vertical and horizontal fins were snapped off (another \$15.00). The plastic seesaw on the K-5 rotor was broken (\$11.00). A seesaw ball bearing was also sheared off. There was a dent in the tail boom, but it is useable. The main rotor shaft was bent about 30 degrees (\$11.99). Aside from these items and my pride, the helicopter survived the crash very well. The side frames did not bend. The molded landing gear struts are the best available. If you need replacement landing struts for your Legend or X-Cell, get the ones for the Excalibur. You won't regret it. Cyclone II also has the toughest nylon struts in the world. For beginners flying other brands of helicopters, I recommend buying a set of Cyclone II landing gear and struts. It is just as tough as that of Excalibur, but with wider stance to prevent tip-over.

Another thing that I like about Excalibur's landing gear design is that the front and rear struts are very far apart. This helps strengthen the landing gear system.

Now that the Excalibur has passed the crash-worthiness test, let's examine the kit features. The instructions are very easy to read because there aren't that many words. Rather than having wordy instructions, there are large drawings on every page. Furthermore, the main rotor head and tail rotor unit were both factory assembled. The servo tray is molded, and there isn't much to build. For these reasons, I think the Excalibur can be built by beginners without difficulties. It took me 15 hours to build the model, and another five hours to inspect and set up the model. My friend, Andrew Sutton, in California, built his in six hours.

At first, I thought the canopy and fins were too flimsy, because the canopy is made of ABS plastic instead of the common clear plastic as used by all other manufacturers. Well, after the crash, I think the canopy is very sturdy. There was a lot of mud on the canopy, which indicates the canopy did hit the ground. The clear windshield was shattered, but the canopy did not crack at all.

continued on page 97

BY JOHN POND



5. Sal Fruciano submitted this photo taken in 1948 of Frank Zaic holding his "Hurry Up" Wakefield design. See text for a report on Frank's current activities.



4. A real rare one! It's a Henry Struck "Two-In-One" combination gas/rubber model. Original power was a Baby Cyclone; this one flies with an Ohlsson 60.

7. Here are Frank Zaic and his wife, Carman, taking in all the action at the 1979 World F/F Champs at Taft. Fruciano photo.



Well, the contest season on the West Coast is now in full swing, with five meets having been held starting in February. Some of the SAM Chapters have sent little or no contest information, so this editor has had to draw on reports from various SAM Chapter newsletter editors.

The biggest meet, of course, is the opener, the Southwest Regionals, held February 10-11 at Eloy, Arizona. This year marks the fortieth annual held in the Phoenix area with O.T. F/F, O.T. R/C and R/C Soaring events being held at three different sites. Those who think about staging an annual every year will get a shock at how flying sites seem to evaporate over the years, the S.W.R. have been held in Cactus Airport, Lukes Aux. 3, Buckeye Airport, and now Eloy, Arizona.

As reported by Bob Angel, SAM 26 newsletter editor, great weather was the order of the day. The only fly in the ointment was the Civil Air Patrol closing the airport to model flying! Dick Bringgold was equal to the problem and promptly moved all flying to another site four miles away.

Some photos are in order. The first is of Eut Tileston's flying wings as seen in Photo No. 1. Two sizes are seen, 1/2A Texaco and Class A. Flying these models is something of a black art when the model is viewed head-on. You only see a line and very little fuselage. However, Tileston has been practicing long enough to the point that his 1/2A Texaco model is very competitive. Photo No. 2 is a shot of Tom Empey, the SAM 49 newsletter editor, seen with a Brooklyn Dodger. Although shot at Jean, Nevada, the background of Eloy, Arizona is quite similar. The weather was quite comparable with about 75 degrees and no drift. A feather could have dropped straight down! Tom didn't win but he had his share of fun.

Credit for a well-run meet should go to Gordon Davies and to Dick Bringgold, who was the prime mover in restoring this meet to its former place of prestige.

Big winners were Joe Percy (overall high point champion), along with Tom and Frank Jozwiak, Gerald Martin, Murvil Lipsey, Don Blackburn, and Jack Elrod. The Texas boys really cleaned up this time!

The other outstanding meet of this early contest season was the SAM 26 Spring Annual held at Taft, California. This meet, ably run by Bob Angel, Don Bishop, and Robby Robinson enjoyed tremendous weather, with moderate temperatures, gentle breezes, and great booming thermals.

With the Sweepstakes Trophy up for grabs, Don Bekins was equal to the task and nabbed it for the third time. Photo No. 3 shows Don with a Hermes "Hayseed." This clean design is a real winner in the hands of Don, exhibiting a tremendous climb and superlative glide. The good guys make it tougher for



1. Two sizes of the Gross Flying Wing, as built by Eut Tileston for 1/2A Texaco and Class A L.E.R. Don't dismiss them as mere novelties—these things really perform.



2. Tom Empey's Torp 29 powered Brooklyn Dodger features unique pull-pull cable controls made of dental floss (unwaxed) for the ultimate in light weight. Seems to work OK so far, although one line came off a servo at the SAM Champs and he could only make right-hand turns.



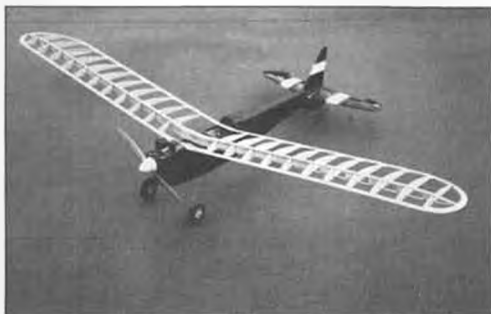
3. Sweepstakes winner at the SAM 26 Annual for the third year in a row was Don Bekins, shown here getting his Ohlsson 60 powered Hayseed off for yet another max in Class C.



6. Frank Zaic seems to be thoroughly enjoying himself at the 1955 World F/F Champs at Wiener-Neustadt, Austria. Photo by Sal Fruciano.



8. Steve Bennett of Duncanville, Texas, is one heck of a prolific builder, turning out ten complete models in twelve months! And not a Lanzo Bomber in the lot, much to our columnist's delight.



9. Only a couple of copies of the Schumacher "Josephine" have shown up so far. Joe Percy, of Ft. Worth, Texas, feels the model has lots of contest potential and is building this one for O&R 60 power.



10. Texas flier Gerald Martin (left) got a chance to meet and talk with original Playboy designer Joe Elgin at the Jean, Nevada SAM Champs.



11. Not all Old Timers are built just for competition. Ted Andrews did a beautiful job on his Bellanca Skyrocket, which appeared in a 1938 issue of *Mechanix Illustrated*.

the rest of us all the time!

Also seen in the photo is Dave Steinel of SAM00 with his Ohlsson 60 powered Comet Clipper that always places. Holding the model is SAM 21 prexy, Dave Lewis. Lewis has turned out to be a tremendous shot in the arm for SAM 21 as he not only runs the club, but does an excellent newsletter!

Bob Angel, who also doubles as the newsletter editor of SAM 26, put out an

interesting report on the contest. Rather than a general description of the meet with accompanying results, he did a "blow-by-blow" report; that is to say, each event was individually described for action, flying, and interesting commentary.

While wandering around the field, this writer had the luck to run into a rare one, a Henry Struck "Two-in-One" combo gas and rubber design as seen in Photo No. 4. Unfortunately, we didn't get the name of the builder, but it is truly a pleasure to see something other than a Lanzo Bomber!

The Struck model appeared in the June 1936 issue of a little-known publication known as *Model Aircraft Builder*. This magazine, which was a successor to *Model Aircraft Engines* (lasted slightly over a year) was picked up by the Polk brothers and was published for about eight issues during 1936. Betcha didn't know that Irwin Polk was a publisher!

FRANK ZAIC O.M.T.

Last issue, when we featured Frank Zaic as a famous old-timer personality, we were extremely short of photos. Wouldn't you know it, no sooner had we committed the column to print than we received a flock of interesting pictures from Sal Fruciano. In retrospect, it is absolutely amazing how Zaic has kept his interest for over 16 generations. This ranges from the late twenties to 1990. To completely cover Frank's interests would require another yearbook.

Some of the photos sent us are not suitable for reproduction, however, we are fortunate to have a shot taken in 1948 showing Frank with his latest effort called the "Hurry Up." Photo No. 5 shows that Zaic has been and still is interested in Wakefield designs, both old and new.

Even when he didn't make the Wakefield Team, Frank's interest was such that he either got the appointment as Team Manager, or failing that, as a very interested supporter. Photo No. 6 is an excellent example of what we are talking about as this pic shows Frank Zaic at the World Champs at Wiener-Neustadt, Austria, in 1955. A look at the background gives a good indication of the interest the Wakefield event generated by that time.

As reported last issue, Zaic has been living in Northridge, California for the past twenty or so years. It was only natural that the World Champs held at Taft in 1979 would draw the attention of Zaic.

As can be seen in Photo No. 7, Frank Zaic is seen with his wife, Carmen, enjoying the weather, models, and competition. Of course, Frank was always involved, being a judge on the International Competition Committee set up to process and review all models for conformance to specifications.

Frank was also involved with the New Zealand Wakefield team. As Frank says, "It was like a family reunion when we greeted our New Zealand friends when they arrived in the United States early in October. They came to help and cheer the New Zealand team competing in the International Model Meet at Taft. Their schedule was very tight,



12. Art Peterse and the late Carl Goldberg, pictured here at Toledo with Art's R/C version of the Comet Sailplane, one of Carl's many designs.



13. A good choice for the Commercial Rubber event is the Dietrich "Convertible" as copied here by Mark Sexton of Seattle, Washington.



14. Eric Clutton, who imports P.A.W. diesel engines into the U.S., is a staunch supporter of the Old Timer movement. He uses a Merco conversion in his big R/C Flying Quaker.

something we could understand, so that we could not have them with us for more than a day and a dinner. However, we were able to gossip at a greater leisure after meeting them again at the contest. In correspondence with Martins and Malkins, they mentioned they had a grand time and promised to come again real soon and see more of the States."

Frank has been retired for quite some time and the best way to describe his activities is to let Frank himself tell it:

"Retirement is gradually being accepted as a norm. It takes a while to realize it requires a new perspective, adjustments, outlook, and acceptance of certain facts. Perhaps the major effort one should make is to establish a routine to fill the day in a satisfying way. The first activity after breakfast should be one you can enjoy without feeling guilty. It will give you something to anticipate as you fall asleep the previous night. It may be nothing else but sitting down to catch up with magazine reading, and/or watching the morning TV. And, if the night was restless, you may doze off peacefully. I also find I tend to be more cautious while active. I let dollars do my tree-topping

or shingle relaying now. No more of those days when physical exhaustion simply meant a bit more push to get there. One can still be devilish, but no need to be dare-devilish! Since state of health is a major preoccupation to those of us in the 'club,' I am taking advantage of the blood-pressure check offered by the local Sr. Citizen Center. It is surprising how much better one feels knowing that all is well. Did complete two books. One is a print of the *American Boy* issues with Model Plane series way back in 1928. The other book deals with mechanics and physics of model aircraft. Also, had one class in oil painting which I enjoyed, but found that it needs total absorption to do it properly. The books and oil just did not mix."

Luckily for modelers, Zaic devoted enough time to publish the books for our edification and enjoyment. (How about *those* fancy words?)

ENGINE OF THE MONTH

Again, we are pleased to present another engine so kindly lent to this writer by Bob McClelland. This month's article concerns the Pee Wee as designed, developed, and marketed by the Dallaire Brothers of Detroit, Michigan.

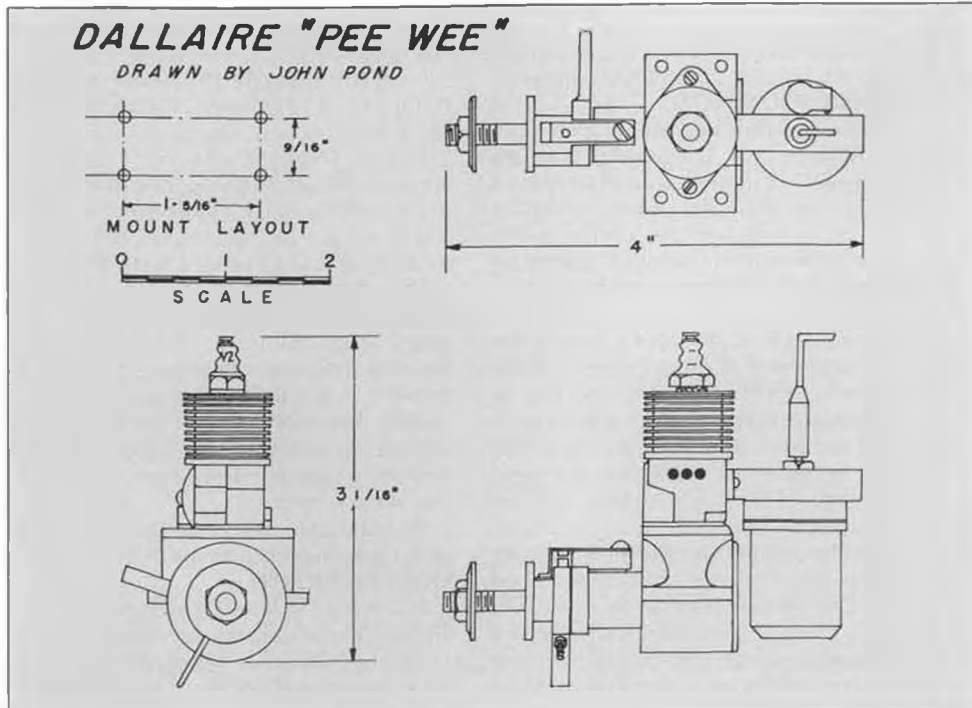
The Dallaire Model Aircraft Co. (started by Frank and Joe) started as a garage operation as did most of the early model manufacturing firms. As Karl Spielmaker pointed out in his excellent article on the Dallaire engine, Frank developed the Pee Wee by "fooling around"; loosely translated, this means a lot of hit and miss in the method of development.

In spite of discouraging results, Frank was able to produce a suitable running engine by concentrating on the inside finish rather than the exterior cosmetics. The early experimental engines were machined from solid bar stock. It was not until one Dallaire employee, a kit packer attending Henry Ford Trade School, made up a set of detailed drawings that casting patterns for the crankcase, cylinder, intake tube, and bypass cover were made up for the engine named the Pee Wee.

Now Frank could do some experimenting as the castings were solid with no coring. Influenced by the crop of small engines then starting to emerge on the market, Frank came up with the "Pee-Wee" with a 1/2-inch bore and 9/16-inch stroke. All this work was done in the garage behind Frank's home in 1937.

The first national notice the Pee Wee received was from the advertisement appearing in the April 1938 issue of *Model Airplane News*. The mailing address given was Frank's home at 10140 Crocuslawn Ave., Detroit, Michigan. Later on in 1939, the manufacturing facility was moved to 9830 Wyoming Street.

The first engines were produced in small amounts to match the incoming orders. It must be noted at this time that Frank Dallaire was the exclusive manufacturer of the Pee Wee. It was not until sales began to climb that Frank had to farm his work out to Ward



Marvin and other interested neighbors.

In the March 1939 *M.A.N.* issue advertisement, the bore of the engine was changed from 1/2 to 9/16 inch to get more power. Business was really booming for the Dallaires as they produced kits, sawed wood to size, produced most all of the balsa wheels seen in the kits of that era, and made the Pee Wee.

Towards the end of 1939, another Marvin, Marvin Miller, who was now producing Pee Wee engines for Dallaire, started making changes so that eventually the Pee Wee bore little resemblance to the original design. The higher rate of production prevented Marvin from test running all engines as was Frank Dallaire's custom. Engines were now only spot checked. In addition, the high amount of zinc in the castings caused crankcase leaks, further contributing to poor compression and poor running characteristics. For this reason, it was during late 1939 that Frank Dallaire turned over all manufacturing rights to Ward Marvin.

When advertising again resumed, the Pee Wee now sported the name of Marvin. These 1940 models can be easily spotted with their spoked fin cylinder head much resembling the GHQ engine. With the advent of World War II, advertising ceased after January 1941. Marvin engines were produced after the war, but that is another story.

When the Pee Wee engine was first advertised, the price was set at \$14.50 complete with coil and condenser postpaid. The original advertisement announced the following specifications: Bore 1/2 inch, stroke 9/16 inch (giving about .11 cu. in. displacement, the later 9/16-inch bore increasing size to about .14). General dimensions were 3-1/4 inches height, length 4-3/8 inches, with a weight of 7-3/4 ounces. The engine was rated at 3,500 rpm with a 10-inch propeller.

As noted before, the cylinder and piston were cast iron with a bar stock crankshaft running on a bronze bearing. The crankcase



15. O.T. control line is gradually catching on in some parts of the country. This little rocketship is called the "Dreamer," built for O&R 60 power by Glen Allison, Mesa, Arizona.



16. Very clean lines and excellent flying characteristics are noteworthy features of the "Hayseed," designed by the late Carl Hermes. Shown here is Don Hughes' 7-Cell Electric R/C version.

and carburetor were aluminum alloy sand castings while the gas tank was machined from solid bar stock with a cone-shaped bottom.

It was natural that Dallaire would put out a complimentary model airplane kit for this engine known as the Pee Wee Speedster. This complete kit sold for \$3.75 and featured a wing span of 54 inches. Complete model was 24 ounces ready to fly.

In closing off this article, it is of particular note that replica Pee Wee engines are currently being made by Karl Spielmaker, 4690

Burlingame SW., Wyoming, Michigan 49509. Price will be considerably different!

ONE MAN SQUADRON

Received a most interesting letter from Steve Bennett, 431 Longworth, Duncanville, Texas 75116 enclosing Photo No. 8 showing that Steve did indeed build ten models in one season. According to Joe Percy, this "one man squadron" should be building Lanzo Bombers (ugh) if he wants to win.

A quick look at the photo reveals the following models: Comet Clipper, Super Buccaneer, Scientific Streamliner, Buccaneer Standard, and two which appear to be a Mike and Miss America. This somewhat approaches this writer's collection, who says, "The winner is the guy who dies with the most airplanes."

Steve also sent photocopies of newspaper clippings and a souvenir program of a Fort Worth Gas Model Association meet held June 25, 1939. The meet enjoyed excellent newspaper coverage with no less than four photos covering the page (and showing Steve at 13 years of age).

The most interesting item was the Flying Program which is something to consider nowadays in this era of "gotta win" type of competition. According to the program, the first event was the Appearance Contest run between 9:30 and 10:00 a.m. A mass line-up would be staged and the best-looking model selected. The only requirement is that the model must make a successful offi-

cial flight.

Event No. 2 was the Duration Event from 12:00 a.m. to 12:00 noon. Then lunch from 12:00 to 1:00 p.m. followed by flying to 2:30 p.m. Finally, Event No. 3 was held (similar to the LAGMAA type precision meets) wherein the model was judged for described maneuvering characteristics before the flight. A half hour was allowed, 2:30 to 3:00 p.m.

Then the resumption of endurance flights as Event No. 4 was held until 5:00 p.m., and awarding of cash prizes at 5:30. Probably the most spectacular event was No. 5, held between 5:00 and 5:30 p.m., where all models are lined up. On launch signal, engines are started and the first one passing over an imaginary downwind line is declared the winner.

Now don't tell me that isn't fun! We could take a few pointers from these old meets!

MORE FT. WORTH

Following the letter from Steve Bennett, this writer received a missive from Joe Percy, 2100 Gumm Road, Ft. Worth, Texas 76134, enclosing several photos of his latest project, a Schumacher "Josephine."

As can be seen in Photo No. 9, this project is still in the bare bones state. Joe sez he sent the photo to prove the Texans do build other models besides the Lanzo Bomber. Joe feels he is the first in the USA to build a Josephine while acknowledging that Merv Buckmaster, Australian *Airborne* editor, built the first.

Joe is quite enthusiastic about the potential of this model. Well he should be as it is

patterned somewhat after the successful "Ethy" design by Schumacher. The model was created for Charlie Pottol, fellow member of the Cloud Dusters, to handle the power of a Thermite .60.

Just recently this writer presented a set of plans to Charlie, a recent member of SAM 21. Really knocked his hat off! This writer will be very interested in hearing how these models perform.

MORE AND MORE TEXAS

While on the Texas kick, another letter came in from Gerald Martin of 127 Avenue F, Hereford, Texas 79045 enclosing a photo taken at the Jean, Nevada SAM Champs.

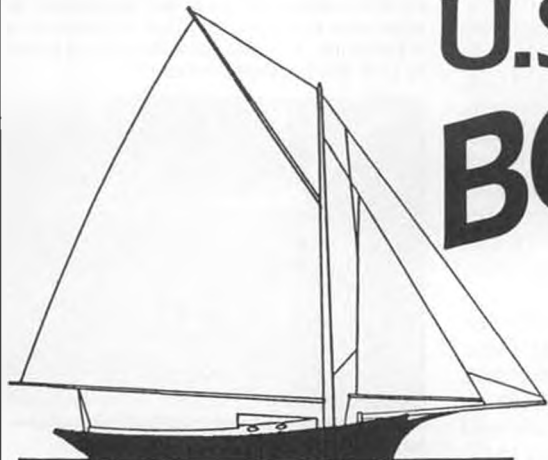
Photo No. 10 shows Gerry on the left in the company of his idol, Joe Elgin, Playboy designer. Believe it or not, Joe is still active, giving full credit to the Old Timer movement for reviving his flagging modeling interest.

I believe we mentioned it before, but Gerald takes this writer to task for castigating modelers who build nothing but Lanzo Bombers. Gerry feels the Bomber is well qualified under the present rules. He also says there are designs that will outperform the Bomber but they are more complex to build.

SAM 4 HI-JINKS

Karl Spielmaker, aka "The Great Bearing Von Spielmaker," "Krazy Karl," and others, writes an extremely humorous newsletter from which we have extracted the following entitled "Three times and out."

"I have just built my third Mercury Bullet



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model for the slag engine event. To justify the building of a third model takes a little telling.

"Looking for some ideas for a model, I rummaged through old *Model Airplane News* magazines and ran across the Mercury Model Airplane Co. ad. They advertised a Mercury Bullet kit and an early Pioneer Brown 'slag' engine for the unheard-of price of \$8.95. The package deal was offered with coil, condenser, timer (extra), propeller, and has balsa wheels. Wotta deal!

"I purchased a set of plans from John Pond and built Mercury #1 powered by a Rogers .29 Slag. I couldn't wait to fly it so I did my test flying on the farm. The model glided over the barn. I ran (yes, I ran!) but quickly stopped when looking at the herd. Were these bulls? Enlisting the aid of the kids on the farm, we proceeded to rescue the model. Too late! The curious cows had walked all over my pretty yellow Mercury Bullet. The model somewhat resembled a No-Cal model.

"Undeterred, I built #2 Mercury and covered it yellow. This time, I flew it at the R/C field. Model flew real nice, but not great as the slag engines were not known for high power output.

"At the 1988 SAM Champs at Lawrenceville, Illinois, I again encountered a site surrounded by corn and potato patches. On the third flight the model dropped into the corn. With five of my friends, we hunted for several hours, no luck! I saw where it dropped

but how do you spot a yellow plane in the corn?

"Later on that year, the NFFS and SAM 57 held their Champs at Lawrenceville. I asked Bob Edelstein to check up on the missing model. Bob did find the model! But, in the harvest, the model went through a corn picker with only the solid material showing up: engine, motor mount, ignition parts, and timer.

"Some guys learn the hard way. I have now built #3 Mercury with a Genie Slag engine that hopefully will last the 1990 season. I have learned to stay away from cows and corn fields. Oh yes, this model is yellow colored too." (Ed. Note: Some guys never learn, let alone the hard way.)

OLD TIMER INDOOR CHALLENGE

Ed Lamb, who has been promoting the Old Timer Indoor movement, reports the 1989 season is now over and Mark Sexton is again the champion. Ed stresses this trophy is open to all O.T. enthusiasts. Ed Lamb of 15911 S.E. 42nd Place, Bellevue, Washington 98006, has this to say:

"I want to make it clear that any club in the region can run the O.T. Challenge and participants in any of these contests can earn points toward the Old Timer Championship award. All I have to have is a copy of the contest results signed by the Contest Director. A couple of other clubs around the country are picking up on the Old Timer Indoor idea. The Topeka Model Aircrafters Club is running an event for Baby ROG

using rules similar to ours, and they may extend to other Old Timer indoor types in the future according to Jack Koehlar, president and newsletter editor for the "TOP-MAC" club. The other club giving thought to the idea is SAM 56 in Wichita. Their latest newsletter talks about it and asks if I will send a copy of our rules. The answer is yes—and I'll be happy to send copies to anyone else who sends me a S.A.S.E."

READERS WRITE

Been looking for a spot to use Photo No. 11 of a Bellanca Skyrocket built by Ted Andrews, 5345 S. Langley Road, Langley, WA 98260.

This beauty was built from the plans (from Pond, natch!) appearing in the *Mechanix Illustrated 1938 Annual* by Fred Tuxworth. This 80-inch wingspan model featured a complete knockdown system as the photo in the article clearly proves. Fred was able to carry it in about the same space as a large suitcase.

Ted has done a beautiful job of finishing the Coverite covering using Rustoleum paint. Not many modelers have tried this but an excellent article on its use appeared several years ago in *R/C Flying Scale* magazine. No question about the finish! Note how well cowled the O.S. 61 4/C engine is. Hard to spot where the engine is!

EAST COAST ECHO

Don't get too many photos of East Coast action, but Photo No. 12 sent in by Art *continued on page 102*

A CUT ABOVE

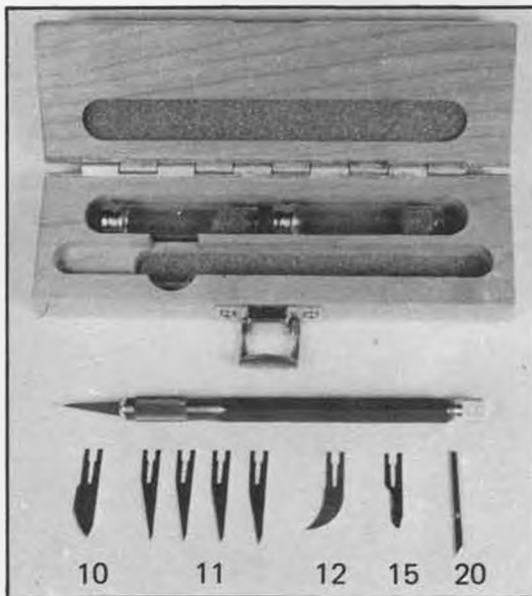
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"He turns not back who is bound to a star."

The above quotation, by Leonardo da Vinci, sent to us by Ed Whitten, seems a most appropriate epitaph for our dear departed friend, Walter E. Mooney.

A memorial tribute, organized by Bill Chana, was conducted in the San Diego Aerospace Museum on March 10, 1990. Over three hundred people attended, and as Dick Baxter explained, it was not only the size of the crowd that was so impressive, but the variety. Walt's circle of friends was so all-encompassing that practically every facet of the aviation and aerospace communities was represented in the gathering.

Curtiss Mooney, Ken Hannan, and Shirley

Baxter all reported that the mood was not gloomy, it was simply a large group of friends, relatives and admirers freely exchanging fond memories of experiences shared with Walt. Frank Allen, another very close acquaintance, expressed the opinion that Walt would have much enjoyed it himself.

Condolence messages continue to arrive, confirming the far-reaching scope of Mooney's influence, and we would like to share a few extracts:

"Walt gone! Oh dear!" Merv Buckmaster, *Airborne* magazine editor, Australia.

"The Peanut movement has lost one of the greats. I can think of no other individual, however, who left a larger collection of testimonials. Imagine the welcoming com-

mittee there to greet his last flight." Dick Johnson, Texas.

"Walt's positive attitude toward life instantly made him a favorite friend to Brenda and me. How could anyone resist loving a man like Walt, so broad of smile and optimism that it was just plain catching!" Henry Frautschy, Wisconsin.

"Looking back on the times I shared with Walt at meetings and contests, I must say that it's the little flashes of his gestures and expressions that stick so vividly." Bill Noonan, California.

"A great loss to all of us. How weird things are at times. I was in the process of cutting and pasting a Mooney plan that he did just for our (Flying Aces Club) newsletter, when I got the telephone call. Lin Reichel, Pennsylvania.

"What a remarkable person. I still remember his television appearance." (Walt did a marvelous aerobatic sequence in his



(Left) The late Walt Mooney, wearing his ever-present "regulation necktie," poses for the camera with his North American Apache at the Olay Mesa flying site near San Diego, California. Photo by Frank Allen. (Above) Walt Mooney's full-size Piper Vagabond poetically photographed by Jiro Sugimoto, of Japan, in front of the San Diego Aerospace Museum hangar at Gillespie Field.

sailplane for the TV program "Thrill Seekers," hosted by Chuck Connors, some years ago. w.c.h.). "Poor Chuck Connors was trying so hard to make it sound dangerous as well as thrilling. Walt would not cooperate: 'You just go up and do it!'" Janet Lueken, California.

Soon after learning of Walt's passing, Ichiro Yamada, of Japan, wandered into a downtown Osaka bookstore and found an old issue of the now-defunct magazine *The Model Journal*, which featured Ichiro's article introducing the Peanut Professor to Japanese modelers. The concept gradually blossomed, especially in Nagoya, where the Shonai club is today one of the largest and most active promoters of small flying scale models extant.

Ichiro said that discovering that particular old magazine was not a coincidence, and in terms of oriental beliefs, "We would make much of it, saying 'Innen,' providence, karma, destiny or reason." Most appropriately, he forwarded the publication to Carole Mooney.

MORE MOONEY TRIBUTES

"...we'll all remember him for sure. Always enjoyed watching him having fun with his models (of course, wearing a tie—even over here in a muddy alfalfa field!)." Al Lidberg, Arizona.

"My wife, Toshiko, bestowed upon him the sobriquet 'Red Sox' (which is what he usually wore at contests). Our modeling world will certainly be a lesser one for his passing. Smarter are the ones who recognize and savor the 'good times' we experience." A.P. "Speed" Wilson, Oregon.

"He was a major force in my modeling life through his designs. Enough to say that Walt's articles and designs will fuel modelers for some time to come." Dan Walton, Kansas.

"Sad news indeed—most especially for those who knew him personally all these past years, as you and hundreds of modelers and buddies involved in the 'toy' aeroplane game." Joe Bickinella, California.

"I had seen Walt at a number of contests, the one on the San Marcos college lawn being prominent in my memory (I can still see his Waco Cabin Peanut soaring away, flying beautifully...)." Ken Hamilton, California.

"I met him in San Diego and we went sightseeing from early morning to evening. He sent me Peanut models for Shonai Peanut contests every time. He was the greatest Peanut Scale man in the world. I weep over Walt's death." Shoichi Uchida, Japan.

"Walt had called Monday of the week of the tragedy, discussing in his incomparable style the fun he and two friends had flying to Mojave to see Burt Rutan's new little jet. We then discussed the Flying Aces Club Nats (I bought his and Tom Arnold's tickets). We'll truly miss him!" Fernando Ramos, California.

"His death was a great shock to all the model builders in the world. It is so hard to give up our good friends. Mr. Walt was one of these, and his memories will always be a

part of our precious heritage." Jiro Sugimoto, Japan.

"Life, like our models, is a fragile thing. We must 'FLY' both with care." Ray Crowell, California.

"I had the privilege to meet with Walt when we went to the indoor event with Warren Shipp, and even with this brief meeting, I could appreciate how sympathetic and smiling was this fellow. At least it is a relief to know that he went away without pain. But it is so stupid that life is so short, when you have plenty of things to do." Georges Chaulet, France.

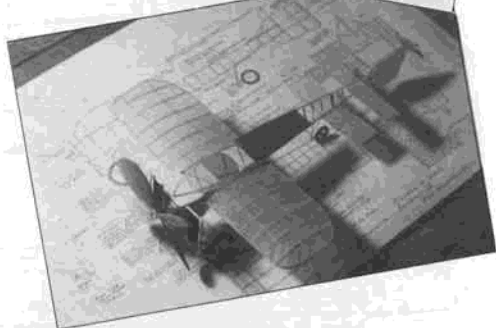
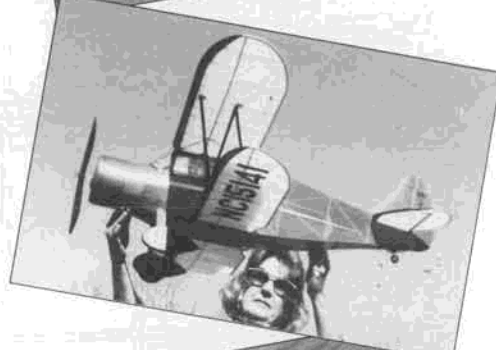
"Guys like Walt are kind of rare, and leave a big hole in one's circle of friends." Fudo Takagi, California. (Fudo did much of the photography that accompanied Walt's articles. w.c.h.).

"I never had the privilege of meeting him personally, but through the inspiring articles and mouthwatering plans, I counted him as one of my friends. Indeed, many thousands of aeromodelers, worldwide, have done the same down through the passage of years. Truly he was a giant, standing benevolently in the midst of us who build and fly. In the quiet of evening and in the bright dawn, Walt Mooney will be well remembered." Ray Malmstrom, England.

"I had the privilege to meet Walt at the 1988 Flying Aces Club Nats, in Geneseo. I really can't describe the feeling I had when I first saw him. I must admit to having been in awe. To me, and many others, Walt Mooney definitely had celebrity status. This was the gentleman I idolized through his many published designs. They were the first I had any luck with. At first I was quite nervous (an understatement) to approach him, but when I did make his acquaintance, Walt not only acknowledged it, he started a conversation! (Boy did I feel like a big shot). I quickly started to feel comfortable talking with him. It really is nice to meet someone who loved aviation as much as Walt did. He surely did not have to try to impress me; after talking with him I knew he was on a level not many of us ever attain. Yet it was obvious he did not feel that way. He treated me as an equal, and I will always respect him for that. I know I will never forget him." Paul Boyanowski, Cloudbusters President, Michigan.

Johnny Luxon described Walt's last model-flying session at the Otay Mesa border flying field near San Diego. It was a perfect 60 to 70 degree temperature day with blue sky, scattered white clouds and very little breeze. About eight modelers were taking advantage of the fine weather, and, as Johnny recalls: "Walt was so happy and enthusiastic as he always was, and having such a good time."

"After we were through flying, three of us were standing around visiting with Walt, and he was telling stories about his full-size sailplane flying. One of the fellows said he wished he had his video camera to record Walt's stories. How great it would have been to get him on tape at that moment, considering it was the last time we would see him."



(Top) Walt's designs are popular worldwide. This Peanut Honey Bee was built from MB plans by George Kandilakis, of Greece. Mooney helped design and build the full-size Honey Bee also. (Middle) Marion Backstrom displays her husband Al's Waco Cabin, based on an old Megow kit. At 50-inch span, it would dwarf Mooney's Peanut version mentioned in the text. (Bottom) Paul Boyanowski outdid Louis on this one! Paul's Pistachio Bleriot 9 flies fine, even though the full-size one didn't. Paul's club is donating a Walt Mooney Memorial Trophy to the Flying Aces Club Nationals.

"The next Sunday, March 4th, I was again at Otay Mesa and learned of Walt's passing. It was very hard to believe that we wouldn't see him flying his models again."

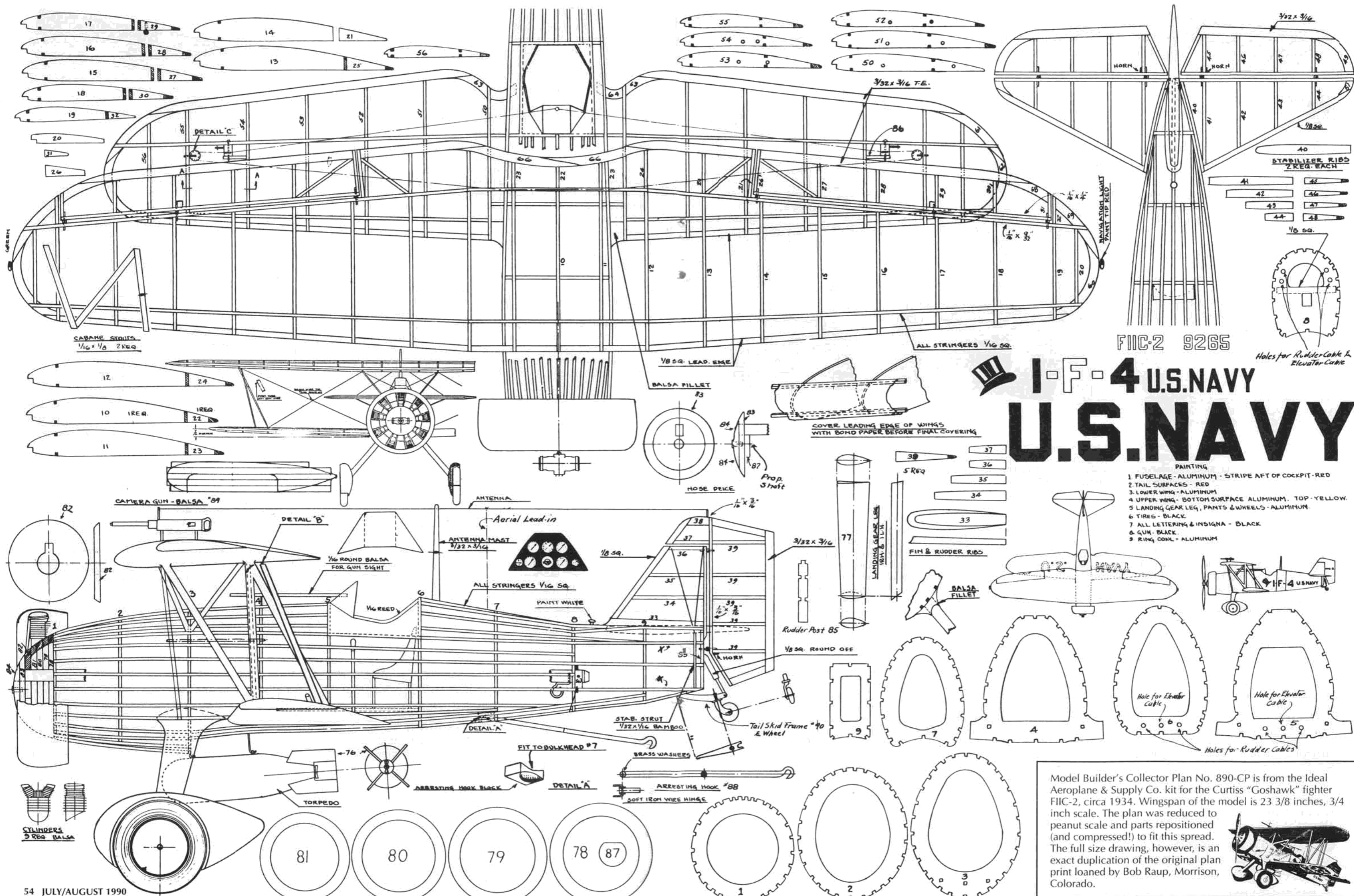
And finally, the closing comments from a postcard received from Walt Mooney himself, only a few short months ago: "A million models to go—Thermals forever."

IN MEMORY OF WALT MOONEY

The San Diego Scale Staffel club will continue to conduct the annual Fourth-of-July outdoor Bostonian contests, according to Jim Alaback. Walt himself sponsored and directed these entertaining and relaxed events during past years, and it is expected that even the traditional watermelon feast will be perpetuated.

The Los Angeles area Flightmasters anticipate establishing a Mooney Memorial Trophy, according to Bill Warner. Newsletter editor Mac McJunkin's stirring tribute to Walt was doubtless inspiring to the entire

continued on page 103



FIIC-2 9265

I-F-4 U.S. NAVY

U.S. NAVY

- PAINTING**
- 1 FUSELAGE - ALUMINUM - STRIPE AFT OF COCKPIT - RED
 - 2 TAIL SURFACES - RED
 - 3 LOWER WING - ALUMINUM
 - 4 UPPER WING - BOTTOM SURFACE ALUMINUM. TOP - YELLOW.
 - 5 LANDING GEAR LEG, PANTS & WHEELS - ALUMINUM.
 - 6 TIRES - BLACK
 - 7 ALL LETTERING & INSIGNA - BLACK
 - 8 GUN - BLACK
 - 9 RING COIL - ALUMINUM

Model Builder's Collector Plan No. 890-CP is from the Ideal Aeroplane & Supply Co. kit for the Curtiss "Goshawk" fighter FIIC-2, circa 1934. Wingspan of the model is 23 3/8 inches, 3/4 inch scale. The plan was reduced to peanut scale and parts repositioned (and compressed!) to fit this spread. The full size drawing, however, is an exact duplication of the original plan print loaned by Bob Raup, Morrison, Colorado.



FULL SIZE PLANS AVAILABLE SEE PAGE 106

BY JOHN THOMPSON

POWER PACKED

Every model airplane flier over the years piles up a few extra engines. Besides the ones on the planes there are others that have been purchased and put aside for some future project never completed. There are engines taken off long-crashed airplanes and retired. Or maybe there are engines that the flier just couldn't resist even if he had no particular use for it. So, in every workshop there's a drawer or cupboard full of new, old, obsolete or obscure engines.

Then there's R.F. Stevenson, of Seattle, Washington, who as of December 1989 had 1,051 engines—and he's "trying to quit." Yes, he's been trying to quit for a long time. That's what he said when we met him at the 1977 Northwest Regional Control Line Championships and the number then was 800 or so.

For many years, Steve brought much of his collection to major contests such as the Regionals. His professionally packaged display of engines—all of them in new condition, but many of them which have been test-run—always attracted a crowd. He has reduced his display appearances in recent years.

Steve is a recently retired Boeing employee who also is a flier. A true representative of the "old timer" era, Steve remembers model airplane promoters and showmen such as Jim Walker, and Steve can still do some of their old tricks. He's been known to fly three airplanes simultaneously, for example (one in each hand and one from a handle attached to a helmet).

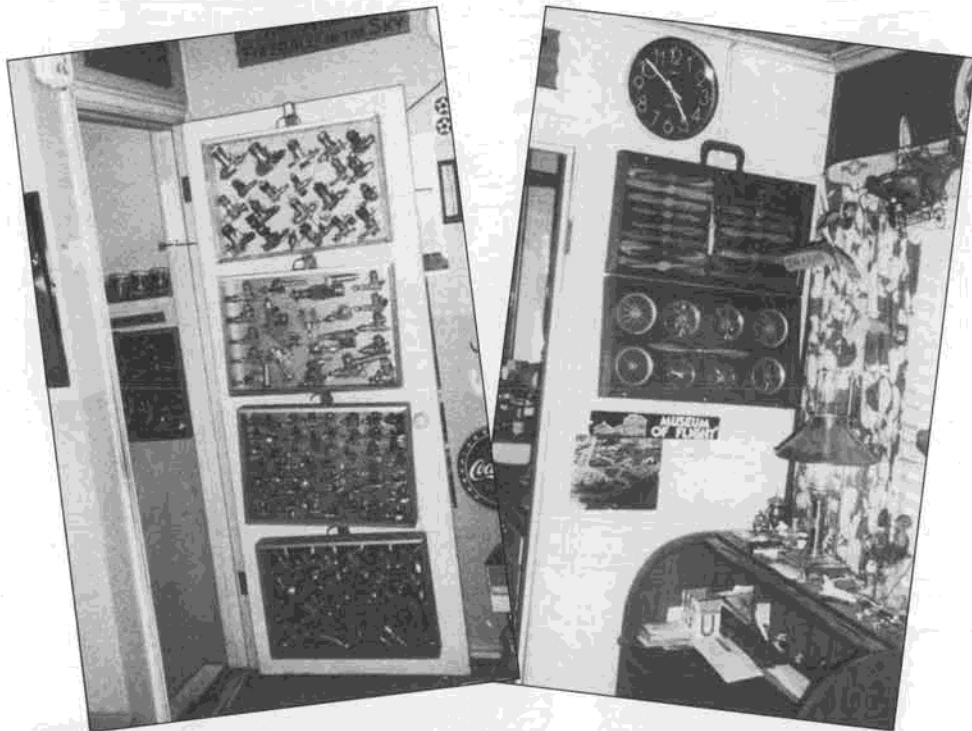
But he's best known as a collector. There are props and other memorabilia in addition to the engines—enough so that Steve has declared his house a private model aviation museum.

He's posted a sign on the front porch calling it the "Blue Barn Museum of Flight Annex," a reference to the "Red Barn Museum of Flight" at Boeing Field airport in Seattle. Steve is a life member of the Boeing museum.

A couple of representative photos from Steve's house give you an idea of how model aviation pervades it.

Some statistics about Steve's engine collection: It includes 896 glow engines, 58 ignition engines, 47 diesels, 38 four-cycle ohv engines, 18 electric motors, seven chain saw conversions, six CO*BI*2*AI* engines, two jets and one steam engine.

There are 158 Fox engines, 107 O.S. Max engines, 105 McCoy's, 86 Coxes, 78 Superstigs, 67 K&Bs, 21 Enyas, 20 Atwoods, 17 Mercos, 11 Johnsons, 10 Wasps, 10 Web-ras, nine Holland Hornets, eight Rossis, seven each of Doolings, OPS and HP engines, six each of Veco, Taipan, Wankel, Ross and Saito engines, five OK Herkimers,



Two views of the interior of R.F. "Steve" Stevenson's house/museum. More in text.

four MVVS, four Forsters, three each of Profli, Gilbert, Ohlsson and Rice and Technopower engines, two each of HB, Aero, Evra and Allyn Fury engines, and one each of Como, Moki, Morton, Burgess, Arden, Kalt, Hope, Kraft, Damo and Conley engines.

There are twins, radials, rotaries, opposed and parallel multicylinder engines (up to nine cylinders).

If you run across Steve at a contest, make it a point to ask him about his collection. If you're in Seattle, look him up at 8326 17th Ave. NW. 98117. You'll be glad you did.

Steve is a member of the Seattle Skyraiders club, a very active control line club in the Puget Sound area.

Another stalwart of the Skyraiders and the Northwest for many years has been Jim Parsons. Jim never flew model airplanes competitively but was one of the top precision aerobatics judges—and one of the hardest working. He was there with clipboard at most Northwest stunt contests.

Jim died of a heart attack on January 21, leaving his friends and fellow modelers with a sense of irreplaceable loss.

As noted in *The Skywriter*, the Skyraiders' newsletter:

"His passing will leave a substantial hole in our stunt world. His passing was sudden and totally unexpected. We shared company with Jim and his wife, Joanne, at the annual banquet of the Skyraiders on the previous Friday evening. Jim was a real friend to many of the modelers in our area who regard his untimely passing as a real personal loss.

"Although Jim never flew competitively, he has more than 'paid his dues' to the hobby he enjoyed. Jim has been a regular in the judging corps for over 20 years and has served at several Nats in various locations across the country. He was usually around to help with the setup, and among the last to leave a contest site after cleanup.

"He earned the respect of those of us who have worked with him over the years, as well as those who have come under his critical eye. Jim's standards have raised the level of competitive flying in our area, which is reflected in the performance of some who have competed at both the national and international levels. Jim's shoes will be hard to fill."

LINE TENSION (Continued)

Our April discussion of line tension boiled down to an assertion that line rake—the position of the leadouts as they exit from the wing—is the most important factor in optimum line tension. We concluded that line rake is more important than engine or rudder offset. That column generated some useful comments from readers, enough to warrant a postscript. After all, if there's a more important topic for control line fliers than optimum line tension, we haven't discovered it yet.

First, we received a note from Gregg Smith, of Salt Lake City, Utah, who thanked us for clearing up a lot of old wives tales about line tension. Gregg, a 30-year modeler with experience in indoor and outdoor free flight, C/L and radio control, had a question that some of our readers may be

able to answer.

Gregg has just finished a Tomahawk for some C/L sport flying and he's looking for some other old plane plans. He writes:

"For some time now, I have been trying to locate plans from many different sources for the Veco Thunderbird, Chief and Smoothie. John Pond, of Old Time Plan Service, has Chief plans available but he hasn't got the others. Perhaps you or someone else might know of sources where I could obtain plans for these old birds?"

I'll bet that there are readers out there who either have plans that they could copy, or know where they can be ordered. If you want to volunteer some information, write to Gregg Smith at 8755 Alpen Way, Salt Lake City, Utah 84121 and send a copy to the address at the end of this column so we can pass along any useful information to the readers.

Now, on to some comments from two other writers who had some very useful information about line rake and tension.

First, from Lou Crane: "Finally, an excuse to write to say I enjoy your column in *MB*. You and Tom Stephens (*who had asked questions that led to the line rake discussion—it*) went over some things I've studied for many years. Are there really C/L fliers who don't juggle leadout locations?"

"OK, so who am I? No one special, just a guy who's flown C/L, mostly stunt, since the 1950s in a quiet, for-me-mainly way. I've been in Old Time Stunt a while, too. I'm retired Army; they didn't always station me where there was a lot of C/L. This often left more time to analyze control line than to fly it—a dangerous situation.

"The term 'line rake' is useless unless you know how to measure it. Rake *angle* is important. All angles need a point where straight lines cross, and straight lines that cross at that point. The angle is how much of a circle drawn from the point is between the straight lines. Simple and obvious, right? This leads somewhere. Bear with me.

"In an overhead view of you flying your C/L model level, an imaginary line from you to

Close-up of the team racer flown by Tom Knoppi and John McCollum of the U.S. Another state-of-the-art tallless design. Jim Cameron photo.



the model is straight. The lines sag behind the straight line, due to wind drag. Still with me?

"The wind drag causes sag (rake) until the lines reach the leadout guides, whether the bellcrank is internal or external (if external, sag shows up between the guides and the bellcrank. It is insignificant, though).

"Rake angle, due to sag caused by drag, is the angle from the lines when they reach the leadout guides, to the imaginary line from you to the model. C/L models can be up to four feet long. Even from 60 or 70 feet away, four feet is pretty big. So where are we talking about when we say 'from you to the model?' Let's use the CG as the end of our imaginary line.

"Strictly, the Center of Gravity applies to all three axes—across the span, top to bottom, and front to back. In C/L, we deal mostly with the front-to-back (or longitudinal) balance point, and call it our CG. Vertical and spanwise CG don't make much difference. We can say two important things about any real object:

"First—All forces that pass through the object's CG try to move the whole object in

the direction the force points.

"Second—All forces affecting the object that *don't* pass through the CG try to rotate the whole object *around* the CG. (This is what a moment really is.)

"Each C/L model is a unique 'object with a CG.' Four forces apply to all flying machines—thrust/drag and lift/load. In control line, we also have centrifugal force (CF). (This is centripetal acceleration and tether force.)

"CF comes from flying on a 'tether' we call the control line(s). It is unique to C/L flight. No other form of flight has it. And it is pretty strong. Even a 45 mph stunter will make over two 'g' of CF (if it weighs three pounds, CF pulls over six pounds).

"Let's say the body's center line flies perpendicular to the imaginary lines from the handle to the CG (not 'yawed' into or out of the circle).

"Cable or wire lines are flexible. They can't push towards the model, or across their length. They can only pull along their length. When they get to the tip guides, air drag has caused a certain amount of sag

continued on page 103

Soviet FAI team racer, photographed by Jim Cameron at the 1989 Tri-Cities Nat's. These models look simple but are actually quite complex in design and construction.



Believe it or not, Roland Baltes is still campaigning the same Junkers JU-88D-1 that earned him a place on the 1978 U.S. Scale Team! Still looks great after 12 years of active flying. MB has plans: No. 2802, \$12.50. Cameron photo.





Perry Peterson sent in this shot of Australian modeler David Anderson (left) and Wakefield flier Bill Lovins, of Colorado. David was just taking a leisurely trip through the U.S. when he happened to stop by Colorado on his way back from the World Champs in Argentina.

Rubber Power! I know it's not as catchy as "power to the people" or "Grey Panther Power," but neither of these have anything to do with free flight. However, rubber power is where it started. With new and improved rubber motor stock available, it appears that rubber powered free flight of all sorts is continuing its growth, while other forms are remaining stagnant or actually decreasing in popularity. Additionally, rubber power gives practically anyone of any age or experience an event in which he or she can fly. The number of designs available is mind boggling, from indoor to outdoor, from scale to outright performance ships, from old timer to the most modern Wakefields, from ultra simple to the most complex.

Well, you ask, so what? I have begun to tally the club surveys sent out earlier this year, and a number of changes have occurred in our free flight ranks over the last decades. It appears that the number of sites is decreasing around our country, almost all are shrinking in size, and some are constrained by anti-noise requirements. In case you are inexperienced with rubber models, be aware that some of the rubber events can be flown in more restricted spaces, and of course, the loudest noise they make is when a motor breaks and does punitive damage to the fuselage. Compared to the noise from a gas model, there is no noise at all from a rubber ship. So let me encourage you to discover or rediscover rubber power. Since my experience with gumbanding is quite limited, and most of my correspondents are considerably more expert than I can ever imagine myself being, I have collected a

wide range of ideas and research and am including many of these ideas in this issue of *Model Builder Free Flight*, so read on, future rubber powered free flier.

FANTASY WAKEFIELD by Jim Quinn

This state-of-the-art competition rubber ship was selected as the 1989 Wakefield of the Year by the National Free Flight Society Top Ten Committee, and it has an excellent win record in competition. A complete description of the model can be found by buying the 1989 Symposium from Fred Terzian, 4858 Moorpark Ave., San Jose, CA 95129. To quote briefly, "Fantasy is a straight-

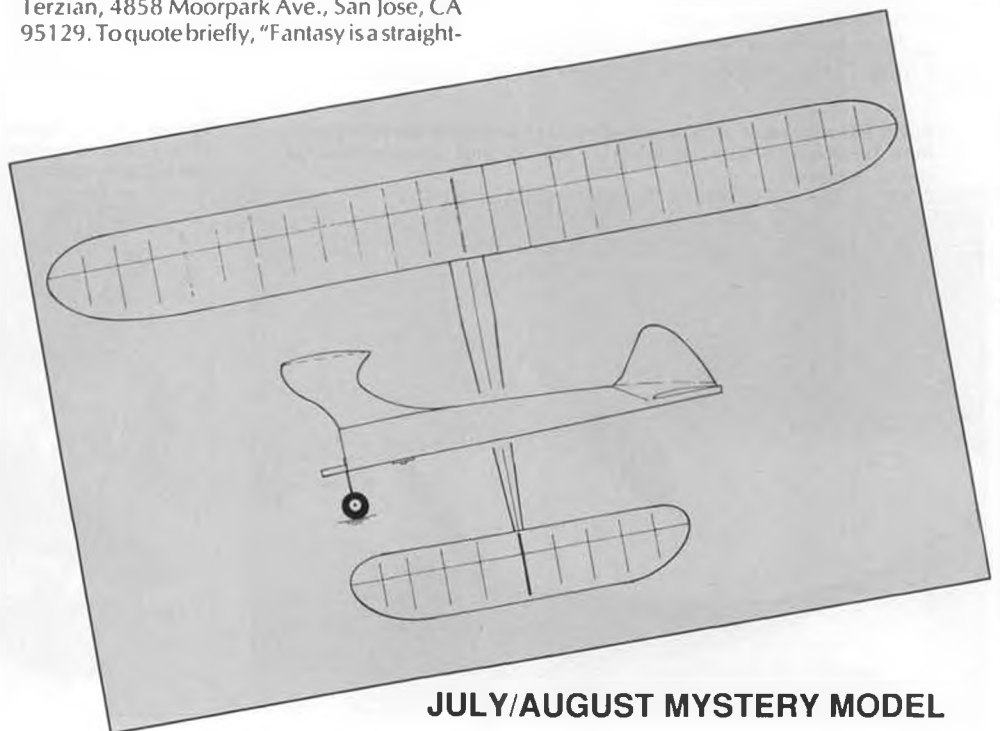
forward model with no gadgets. Fantasy uses fuse detormalizer and fixed rudder and stab (no gadgets for auto rudder or auto stab). The wing is shoulder mounted and the platform is held in place with tape, so that it may be easily moved to change the center of gravity. The wing is covered with silk. Jim says he has developed a system which completely fills the pores of the silk with only one coat of dope, and the result is only slightly heavier than Japanese tissue and dope.

"Jim Quinn has developed the design of the Fantasy by many hours of flying. Jim flies almost every week and has over the years refined his design into the model known as the Fantasy. The contest record of the model is impressive... Jim was the number one qualifier in 1986 for the 1987 FAI team. In 1988 he repeated as top qualifier for the 1989 team."

So, if you are properly impressed, please take a close look at these three-views. They are slightly larger than the ones that appeared in the 1989 Symposium, and the airfoils are presented full size for your convenience. Craig Cusick drew them up and they are presented here courtesy of SCATTER, the newsletter Craig edits for the SCAT club.

DARNED GOOD AIRFOIL— MAKAROV F1A

Once again, I turn to the pages of SCATTER for this month's airfoil. Cusick obtained the coordinates from Alberto Dona, who obtained them from a friend in Europe. This section has been used by a number of F1A Nordic fliers, including Peter Alnutt, from



JULY/AUGUST MYSTERY MODEL

Canada, who had his Silver Hammer equipped with them. Peter flew the Silver Hammer in the last World Champs in Argentina. The word is that the Californians have seen quite a bit of this glider recently at Lost Hills, and apparently the performance is impressive enough that Juan Livotto has built a Silver Hammer of his own.

Just a cursory look at the section indicates that it has a minimal Phillips entry and quite a pronounced undercamber. Also, the high point is at 40%, which is quite far back for standard airfoil designs. The slightly flapped trailing edge would seem to work against controllable zoom launches, but would work in favor of improving glide time. Could this be the replacement for the very successful and popular CH-407? Try it and see.

Now, usually I don't go back into the mid-1940s to find Mystery Models, because a good many of the readers of this column were not born yet, or have no access to some of the magazines that were printed during this time, but now and then I think it is a good idea to give the more mature members of the readership an opportunity to have first crack at these things. So, here are a few tips to whet your interest: It is not a Goldberg Interceptor, it was designed by a well-known free flyer who published a great many ships well into the 1960s, it is a Class A ignition powered design, and it got its rather colorful name due to the unusual color scheme used. That's it. If you think you know the name, just drop a postcard or letter with the information on it to Bill Northrop, c/o Model



Bob Isaacson and his Tilka/Wakeup winner from the 1989 U.S. F/F Champs. See text for more details on this entry-level FAI event.



Bill Passarelli uses the winding-stooge-in-the-car-window approach to preparing his Gollywock. Photo taken by Jim Bocckinfuso at last year's Eastern States Champs, held in Pennsylvania.

JULY MYSTERY MODEL

I know, the first thing you'll say is that this is not a rubber model. You are pretty alert, I'd say. However, I get about one letter a year from Dan Ciesla, and he usually includes some weird design for me to consider as a Mystery Model. This one comes from him, but he noted that he had help from his buddy, Les Alonzo, who actually spotted it in an old *Model Airplane News*. Anyhow, for Dan, who guides an 18-wheeler across the country, it seemed time to try it again.

Builder magazine. The winner is the one who gets there first with the correct answer. Whaddaya win? Why, a year's free subscription to *Model Builder*, what else?

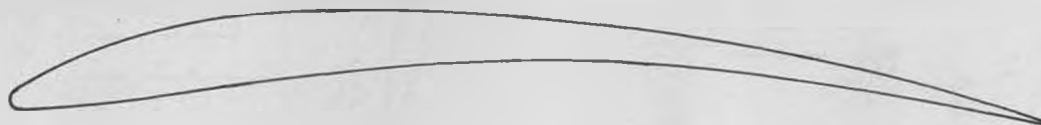
SELECTING THE RIGHT RUBBER AND PROP by Bill Gibbons

This information was presented recently at a meeting of the Magnificent Mountain Men Free Flight Club in Denver. In it, Bill presents (along with the accompanying chart found elsewhere in this issue) the information you need to know about outdoor rubber

and prop combinations. Let's get on with it: "At the annual planning meeting, Bill Gibbons presented the chart and some useful discussion. When someone like Bill is available you are always asking him how many turns and strands and how long of a motor you should use and all of those other questions. Well, he must have got sick and tired of all those questions and wrote them down. One of the big things that Bill ascribes to is the length of the motor and the weight. That way you always get the proper cross section of rubber and don't have to count the number of strands. This makes up for the inconsistency in the various rubber strand sizes. Bill is also very emphatic about winding with a torque meter.

"For his presentation, Bill suggested two articles, one of which is 'Competitive Model Airplane Rubber Motor Testing,' by Earl Boteler (9-15-80). The other is 'Rubber, All You Need to Know,' by Fred Pearce in *Model Aviation*, March and April 1979. Pearce's article explains rubber in detail and shows how to evaluate rubber by energy storage capacity in foot-pounds per pound of rubber (3400 to 3600 is today's standard). Boteler's article explains the different testing

DARNED GOOD AIRFOIL—MAKAROV



STA	0.00	1.25	2.50	5.00	10.0	15.0	20.0	25.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.	
UPR	0.75	2.42	3.25	4.66	6.64	7.93	8.85	9.41	9.81	9.88	9.46	8.47	7.11	5.41	3.13	0.21	
LWR	0.75	0.05	0.00	0.21	0.82	0.60	2.31	3.04	3.79	4.89	5.36	5.22	4.49	3.34	1.84	0.00	

methods of full motors and the temperature relationship to storage and release of energy. The accompanying chart is an empirical compilation of model data summarized by Bill of successful models over the years."

I hope you find the chart useful. My suggestion is that you photocopy it and put it on your workshop wall or in the book of important information that you keep close by. That's what I plan to do.

CHOOSING AN INDOOR RUBBER MOTOR by Emanuel Radoff

This information comes from the *Brainbuster's F/F Newsletter*, often used by this columnist for original material. This article, by indoor expert Radoff, will serve as a complementary piece to the outdoor chart noted above.

"A well-known indoor modeler and physicist computed that an indoor rubber motor should weigh 1.3 times the model weight, sans rubber, for optimum flight time. In practice, I have seen the weights vary from 1.0 to 1.27 on winning models. If these numbers are strange to you, you must be a beginner. In that case you should use the rubber size and length as recommended by the designer of the model you are flying. If you are flying your own design, then previous experience will enable you to know where to start.

"Propellers can be changed to accommodate each motor, but we will assume that you are using your best prop and simplify the choice process by limiting it only to the motor. Also, this discussion will be limited to high ceiling flying where it is believed that at the end of a flight, the model should land with a half row of knots or less after being wound to capacity for the flight.

"There are two problems that occur with rubber motors if you are not lucky enough to guesstimate just right: either the rubber is too strong or too weak. If you are deadsticking and your motor is underweight, increase the length about one-half inch at a time. If

BILL GIBBONS JAN. 1990	F1B Wakefield	Mulvihill & Unlimited	O.T. cl-D cabin or stick	O.T. cl-C C or 3	Coupe	P-30
Motor weight * = fixed	*40 gm	80 gm	80 gm	40 gm	*10 gm	*10 gm
Loop - length (inches)	19" old 17" new	40" old 34" new	40" old 34" new	30" old 26" new	11" old 10" new	17" old 16" new
No. Strands (average)	26 old 28 new	28 old	28 old	16 old 16 new	12 old 12 new	8 old
Torque (inch-ounces)	120 old 120 new	80	80	60 old 60 new	35 old 35 new	20
Turns	400-425 old 375-400 new	800 ±	800 ±	700 ± old 650 ± new	350 old 325 new	600
Propellor Dia/pitch	24.5 D / 29.0 P	24.5 D / 29.0 P	Varies ave: 18D / 23P	Varies 16 D / 20 P	18 D / 25 P	Plastic 9 D / 7 P
Blade Area (inches squared)	± 30	± 30	± 30	± 24	± 18	± 9
Prop run time (seconds)	40	120	60	40	30	?
(P/DR) x 2D P + A	.98	.98	.86	.90	.91	.87

Bill Gibbons' Rubber Model and Propellor Chart. Discussed briefly in text, this chart should be used as a starting point for anyone interested in rubber powered free flight endurance events.

you are up to weight, then go down in width about .002 inch at a time while keeping the same motor weight. If you are coming down with too many winds and you are up to motor weight, ask yourself if you put in all of the turns possible without hitting the top. If you didn't, then it is possible for the extra winds to take you all the way up, and you will use up the winds on the long cruise down. If you have tried that and your model is capable of withstanding the extra torque, then add about .002 inch in width to each successive motor, keeping the same length, till you come down with the half row of knots. If your model is fragile in spots and the extra torque would cause problems, then decrease your motor length about one-half inch at a time. The decrease in weight will let your model reach a greater height and have a better and longer cruise down, to use up all of your winds.

"There are the basic rubber techniques with sizes cut from the one skein of rubber you bought. If your different rubber sizes are commercially cut, then these techniques are not exact, as the sizes may well be from different batches with different torques.

"Low ceiling rubber choice is a whole other thing, even winding techniques are different."

TILKA/WAKEUP TROPHY

George Schroedter wrote recently to announce the second annual Tilka/Wakeup Trophy competition that will be/was held this year at the U.S. Free Flight Champs at Lost Hills. Although this announcement will be read too late for the 1990 competition, it will give ample time to pursue the competition for 1991. Here's the deal: "The Tilka/Wakeup competition is intended to encourage modelers to give FAI competition a try. Building one of these two kits is the easiest and cheapest way to get started. Once they get a taste of what this type of competition is like, Bror Eimar and I think that most will want to get seriously involved. Some may elect to start with Wakefield, others may try one or more of the other FAI events.

"To enter the Tilka/Wakeup competition, the modeler needs to build a reasonably stock Tilka or Wakeup design. (Kits are available from FAI Model Supply or from Schroedter.) Substitution of tube fuselages is not permitted, but timers and VIT are okay. There is no entry fee. All that is necessary is one additional sheet be signed when registering to fly Wakefield at the Free Flight Champs. The highest time with one of those models wins a nice trophy. If we can work the entries up to six or more contestants, then a nice perpetual trophy will be awarded to the Tilka/Wakeup winner.

"There are a lot of Tilkas and Wakeups that have been built. We certainly encourage their builders to bring them to Lost Hills and fly them in this competition. They could easily wind up winning two trophies!"

continued on page 106



These three distinguished looking fellows are the 1989 America's Cup winners, photographed here by Al Hotard at the Max Men Annual in Lost Hills, California. From left: Bob Sifflet (F1C), Paul Crowley (F1B), and Matt Gewain (F1A).

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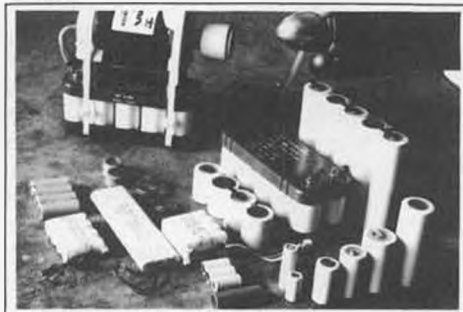
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WORKBENCH *Continued from page 7*

number of new products and materials for the many new areas of interest in the model airplane hobby. In the 1930's there were free flight rubber-powered and gas-powered airplanes, and there were gliders... period. Today? There isn't space enough here to list them all... umpteen types of free flight, control line, and radio controlled aircraft. And most of them are in kit form. But the ARF (Almost Ready to Fly) and ERF (Entirely Ready to Fly) are really coming of age (Not really sure if we're proud of having been the inventor of those terms back in 1965 while R/C Editor of another publication, but they sure stuck!).

At first, the ARF was billed as a quick replacement for the modeler whose pet aircraft was out of commission (crashed) and who thus needed something to fly for the coming weekend. Then it began to fill the need for the impatient modeler, the slow builder, or simply the unskilled builder who needed an airplane to fly.

Today's market for the ARF or ERF is all of the above, plus a whole new and very large element of total newcomers who also lack the skill or patience to build a model. In these days of the accelerated life-style, the ARFs and ERFs are finding most appreciative customers... those who want to fly a radio controlled plane, but have no intentions of building a model... period! R/C has become

a sport, if you will, the same as tennis or golf. You don't have to build your own tennis racquet or golf clubs, so why build an R/C model? Rest assured it will never happen in free flight. Can you imagine an ARF Class C Texan or Satellite in the hands of a newcomer? In control line, except for the little plastic .049 models by Cox and Testors, there has been no real attempt to reach a possible ARF market.

On the negative side of completing the circle, youngsters, except for the fortunate ones who have parents willing to spend the money required, and take the time to chauffeur them to the distant hobby shop and flying field, are not in the scheme of things. The majority of today's model airplane products are radio controlled models aimed at the young adult, the yuppies, and the older adult who has usually stayed with the hobby through the years. This is a sad conclusion that we don't like making, but as we said before, the Golden Era of inexpensive model kits in every easily accessible nook and cranny, is not apt to occur ever again. We who have lived in that era can only chalk it up as a small niche in history that we were fortunate enough to experience.

The next era in model airplanes, which is now getting under way, would seem to be based on two types of enthusiast. The hard core modeler will continue to function, and will hopefully increase in number. Here you will find nearly all of the control line and free flight modelers. By necessity, they will continue to be the designers, the innovators, and the scratch builders. As there will be an almost total lack of F/F and C/L ARFs and kits. But these modelers don't really care, as they prefer to design, innovate, and scratch build... that is the hobby to them.

There will also be an even greater number of hard core modelers in R/C, some of whom are additionally in the free flight and control line ranks. Again, as innovators, designers, and scratch builders, as well as kit builders, they branch out into the special interest areas, such as pattern, pylon racing, soaring, helicopters, ducted fans, scale, and Old Timers, as well as being competition fliers in all areas. On the other hand, the majority of R/C will be made up of the second type of enthusiast, the one who sees R/C as a sport only, not a hobby. This type is mostly "passing through," giving the "sport" a casual try. Some will stick and become hard core modelers. Some may even graduate to free flight!. But the largest number will "buy and try to fly," and that's a whale of a big market that will take all the skills of a well-founded industry organization to penetrate (There's another article in itself!).

One thing sure, the hobby needs both types; the hobbyist and the sport. The hobbyist is the person who keeps the pleasure of building and flying model airplanes alive. However, he cannot go on forever. And hopefully, enough non-modelers, young or old, who try the sport, discover the fascination of the hobby and then decide to stay with it.

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Only a limited number of the full-scale, German-made Extra 300s exist. Most flying enthusiasts have to settle for seeing the international world-class aerobatic plane at airshows or in flying magazines. Hobbico's ASAP semi-scale model lets you get a little closer. Like right behind the sticks.



Knife-edge maneuvers like this only hint at the ASAP Extra 300's snappy aerobatic performance in the hands of an intermediate or experienced flier. And it's got the style to match: the details, including trim, colors, and full-view bubble canopy, have been carefully documented from the full-size plane.

a foam core, a synthetic layer with bonded-in color, and a fuel-resistant film surface. The instruction manuals are brief and clear. After all, there's not a lot of building to be done.

Easy assembly, carefully hand-crafted quality, superior flight performance. Nothing else cuts it like a Hobbico ASAP.

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We are still receiving inquiries about the "Hey Kid!" series so well done by Bill Warner and illustrated by Jim Kaman, that ran through our 1988 issues. As you may or may not know, Bill put the series together in book form for Tab Books. It is now in the hands of Tab, and we are awaiting word on when it is due to be released. The only prediction we can make is that it should be available sometime later this year.

THINGS TO DO

A clinic on electric R/C systems will be featured at the Northern Connecticut Radio Control Club's Third Annual Electric Fun-Fly. The NCRCC's clinic will be conducted by Larry Sribnick, proprietor of SR Batteries, Inc. of Bellport, New York. The Fly-In is to take place on July 22, starting at 9 a.m. at the NCRCC field in Ellington, CT. For more information, call Ron Torrito, at (203) 528-2227. The flying will be a seven-minute precision flight with spot landing, and a lap pylon event. On August 8, the club will hold its Fifth Annual Soaring Rally, for Two-Meter, Standard, and Unlimited. For more information on this one, also check with Ron Torrito.

• • •

The First Milwaukee Annual Radio Control Sport & Hobby Show will take place on October 5, 6, & 7, 1990 at the MECCA center. It's a selling show. Mark your calendar and tell a friend. Get your models ready for the static display competition and be prepared for the swap shop.

MB

DEAR JAKE *Continued from page 7*

running is required. But I am sure that radio silence is a must, however, so if you're thinking of making a radio controlled model of the B-2, you're out of luck.

Jake

• • •

Dear Jake:

The legend of gremlins has always fascinated me. These little guys are said to cause all sorts of mechanical trouble in an attempt to make crashes happen.

How do you suppose gremlins got to be associated with mechanical problems and accidents?

Ned in New Hampshire

Dear Ned:

I dunno. Probably because American Motors built them.

Jake **MB**

BIG BIRDS *Continued from page 13*

beautifully.

"After a few circles we estimated her speed at about 55, just like the computer said it would be. She tended to climb a lot. Full down trim was added but she still climbed at any power setting over half throttle. She cruised nicely at 1/4 throttle and flew hands-off.

"At about 100 feet altitude and 100 yards out TJ throttled back and made his first

approach. She flew past us, never getting lower than 25 feet. A second approach with the engine at a lower idle resulted in a perfect landing.

"We shimmed the elevator, refueled and took off again. The shims corrected the climbing and she now flies level at any speed. Landings are pure joy! Throttle back to idle on base and glide her in. I love it.

"I recommend the book mentioned for anyone wanting to find a plane to scratch-build. The going rate building that way is now about \$1.25 per inch of span, not counting the price of the radio and engine.

"TJ and I always fly together so we installed two figures in the cockpit. Then on a whim I added pictures of our family—our wives, my daughter and the four grandkids as passengers. One other thing, the Saito four-stroker sounds quite realistic swinging a 14x6-10 prop.

"Thanks for your time and keep up the good work... and let's build big and light so we can use small engines. Also, while building this bird several guys said, 'It would never fly, not enough power.' The world is full of rocket experts."

BIG BIRD SOCIAL CALENDAR

June 22-24: The Billings Flying Mustangs (IMAA Chapter #203) will be hosting their AMA and IMAA Sanctioned 2nd Annual Regional Fly-In. Come on out, relax and enjoy the Big Sky Country. These guys know how to have a good time. They've got plenty of RV parking, motels within 10 miles, a

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4-cycle engine	20-26	48-61	60-91	120
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Length	37"	44.25"	56"	76"
R/C channels	3-4	3-4	4	4
Wing area*	449	730	909	2127

* (sq.in.)

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- ✓ Specifications worth noting on the SP7P by Airtronics include snap roll adjustable inputs; dual rate on elevator and aileron; automatic dual rate on rudder; adjustable travel volume on elevator, aileron, rudder and throttle; adjustable low throttle trim; flap/elevator mixing; elevator/flap mixing; aileron/rudder coupling; exponential on aileron, elevator and rudder; pulse mixer for flaperon, elevon, or V-tail models.
- ✓ The SP7P is a 7-channel digital proportional narrow band radio system. It weighs 37 ounces, and has a power output of 600 MW. The frequencies available are 50, 53, and 72 Mhz. Modulation is FM/PCM. Power supply is from a 9.6-volt NiCd, with a current drain of 230 MA. Temperature range is 0-160 degrees, and the pulse width is 1.5ms (nominal). The receiver type is a dual conversion FM/PCM super narrow band.

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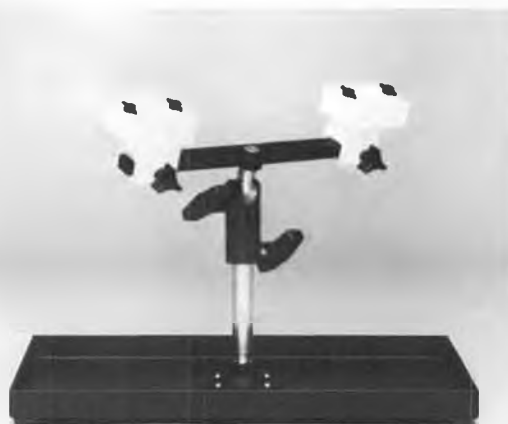
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food concession, raffles, and drawings. For flyers, contact Event Director Donald Herington, P.O. Box 22406, Billings, MT 59104, (406)656-3558.

June 28-July 1: The International Miniature Aircraft Association (IMAA) 10th Annual Rally Of Giants at Wittman Field, Oshkosh, Wisconsin. What a get-together this is going to be! Four great days of easy-to-take noncompetitive flying and fellowship. Got a biggie on floats or a flying boat? Then bring it along because there's also going to be a separate water-fly. And in addition to the traditional banquet and picnic, you'll have the EAA Museum to visit.

Pre-registration deadline is June 15, so get your flyers/forms now from me or Les Hard, 2909 West Michigan Ave, Lansing, MI 48917.

July 14-15: The Puget Sound Rocs' (IMAA Chapter #108) 8th Annual Big Bird Bash & Tea Social at their new Rocs' Roost, which is even bigger and better than their old flying field. As usual, this is AMA and IMAA sanctioned with lotsa RV parking, a radio raffle, food, and drinks—and two full days of Northwest hospitality and fun. C'mon out and enjoy.

Need a map? I've got flyers or you can get them from Event Director Bruce Gale, 811 9th Avenue SW, Puyallup, WA 98371, (206)845-0705.

THOUGHT OF THE MONTH

You're getting old when time flies whether you're having fun or not!

Al Alman, 1910 154th Street Court South, Spanaway, WA 98387, (206)535-1549. **MB**

ENGINES *Continued from page 17*

enjoys a superb reputation as a high performing engine made of low-tech materials in the most modern configuration. You can bet it's made on World War II type machinery run by only a few very skilled modelers who want the best. My engine is serial number 443, and it's my best judgement that the availability of all Eastern Bloc model engines will diminish and that each one will become more rare as economic restructuring in Central Europe causes industry to concentrate on things more needed for everyday living than model engines.

Four 7mm long bolts hold on the rear cover; four 8mm bolts hold on the front cover and four more hold on the head. Metal-to-metal fits are so excellent that the engine's only gasket is under the glow plug. The shaft's front and rear ball bearings are pressed in place and then four circumferential punch pricks are made to further lock the bearings in place. A locking set screw also screws down onto the top surface of the rear bearing—I've not seen this before. The bottom side of the cylinder head (which forms the top of the combustion chamber) is nearly the same shape as a Cox #1702 high compression glow head for .049/.051 sizes. The head is finless. The cylinder's bore is .590

inch and the piston's stroke is .549 inch. The engine is well oversquare and has 160 degree exhaust timing. It's designed to run on either a tuned pipe or an extractor pipe like the Nelson Quarter Midget engines use. Although the cylinder is steel, it has a slight taper to a smaller inside diameter at top dead center like other modern high performance engines. I'll bet it took hours of careful and meticulous hand honing inside the cylinder to get the piston to just barely pinch tight at top dead center... and it's this careful fit along with a drum intake valve that makes the MATAS' reputation.

I've shown you drum intake valves before—most recently in the October '89 issue of *MB*, page 34—but this one is totally unique in that an aluminum deflector plate is pressed into the drum at a 45 degree angle to "bounce" the engine's incoming fuel/air mix up into the Schnuerle ports... a touch of brilliance!

The MATAS' glow plug is also unique in that its seal is ceramic porcelain like our Champion spark plugs and glow plugs of the 1940s and 1950s.

RATINGS

The MATAS 2.5cc glow engine gets a full 10 points for design excellence.

It gets 7 points for manufacturing excellence. Machining is relatively poor but that's offset by the piston/cylinder fit and the machining in the drum valve intake.

Since this engine is so rare and new, it was not run for a performance rating.

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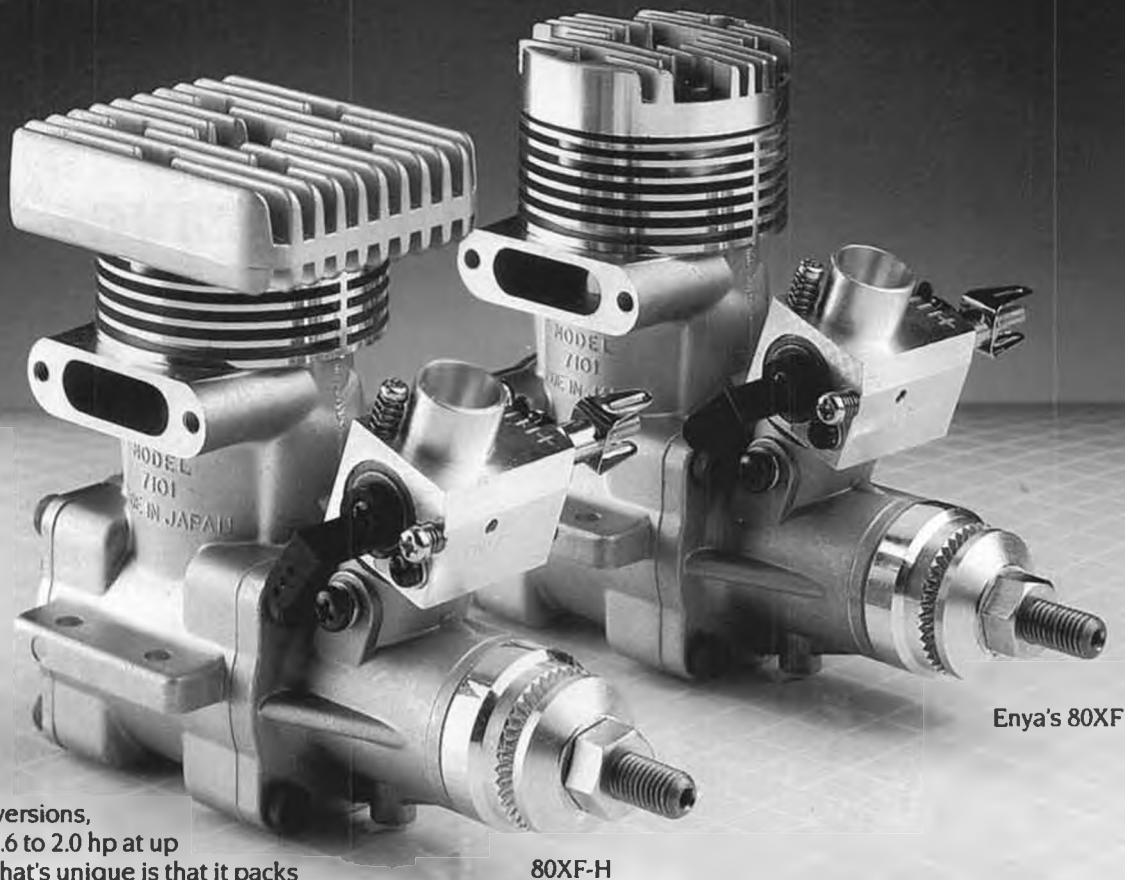
Think about it. If you're flying helicopters, you know that space is at a premium and power is often the key to performance. Yet 'til now, if you needed more power in a .60 chopper, you didn't have much choice. A 4-cycle wouldn't work, and a .90 wouldn't fit. Enter Enya's 80XF-H. For take-off power, 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.

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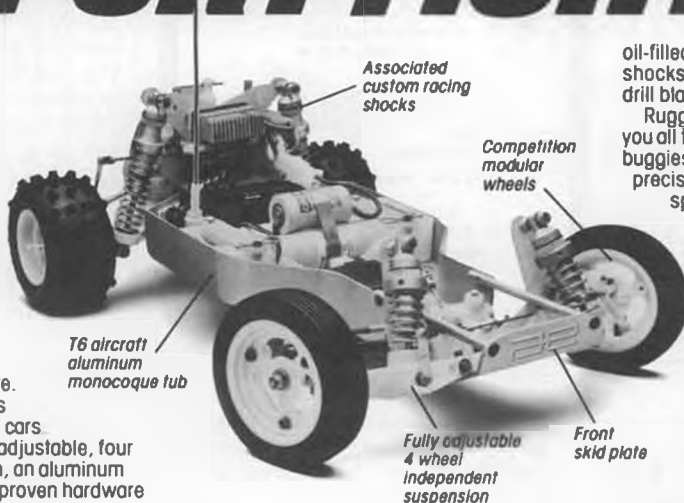
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In 1989 I heard of a MATAS selling to a collector for \$300. Mine was a gift—it's not for sale! **MB**

SENSOAR *Continued from page 19*

use thinner balsa sheeting for covering the bottom of the rear fuselage rather than the 3/16 sheet stock provided. I also sanded the tailfeather structures and rear portion of the fuselage vigorously. I figure one ounce saved in the tail results in three ounces saved in counterbalancing nose weight.

To further reduce flying weight, the servos were installed in front of the F2 former as shown on the plans for the electric powered

version of the Sensoar. Any fixed weight that can be moved farther forward reduces the nose weight required, and thus reduces the airplane's overall weight.

And finally, to strengthen the fuselage I substituted 1/16 birch plywood for the balsa flooring from the nose block back to the F3 former at the wing trailing edge.

These changes seemed to pay off. The second Sensoar required only one ounce of nose weight and weighs four ounces less than the first. Also, my fuselage has not cracked in more than 60 landings, and some of those landings were rough.

RADIO INSTALLATION AND FINAL CHECKOUT

Selection of radio gear is not critical, as

there is plenty of space for standard size equipment. In my case, a Futaba FP-R4F four-channel receiver was installed, along with a 500 mA/H battery pack—standard size and weight equipment. The receiver and battery pack, along with the pair of Futaba S-48 servos and the switch harness brought the weight of on-board radio equipment to 8.5 ounces.

With the lightened tail section and servos moved forward the model balanced at the center of the wing spar with no additional nose weight. With two 1/2-ounce steel washers at the nose block the balance point moved up to the front of the spar, the location specified in the plans. The ready-to-fly weight is 25-1/4 ounces, a bit higher than midway in the recommended range of 20 to 28 ounces.

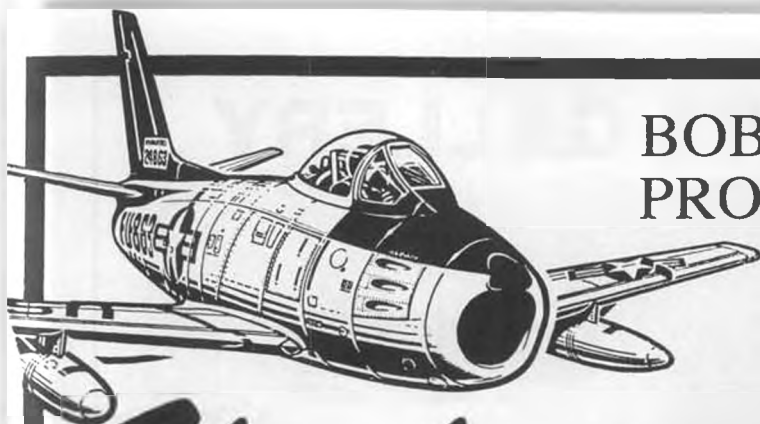
The elevator throw was set to 5/8 inch up and 5/8 inch down, and rudder throw was set to 7/8 inch each way. I took care to make sure the wing center section was perfectly flat and that the tip panels have a bit of washout—the trailing edge is up 1/8 inch at rib W-9. After double checking control throw direction, and installing the towhook, I was ready for flight testing.

FLYING

Flying from the first hand tosses could not have been better. The model is quite stable and has a flat glide. Only two or three clicks of up trim were needed to achieve hand launch flights over 12 seconds and more than 300 feet.

Launching from a high-start is a joy. With the towhook in the location shown on the plans the model has a brisk and steady climb and smooth release off the line. Rudy and I decided to test the Sensoar's hands-off launch stability. We found that when the model was carefully trimmed for level flight, it would climb to full height, release itself, and fly straight out into level flight—all without touching the transmitter. Of course, to perform this demonstration successfully the wingtips must be level at release.

The Sensoar exhibits slow, stable, graceful flight and a low sink rate. More than once during the first day of flight testing I set up for a landing only to find the model kept flying and flying. Several times I had enough time to make another 180 degree



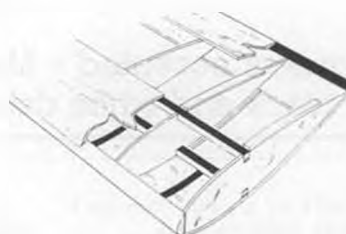
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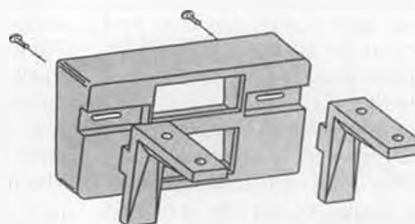
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turn and fly it back to myself. (This trick works only in calm wind conditions.)

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The Sensoar makes a good slope soaring trainer and will fly willingly in light lift. It can also handle stiffer wind with a few ounces of ballast at the center of gravity, which is another reason to move the servos forward and leave room in the fuselage compartment under the wing.

CONCLUSION

Rudy and I believe the Sensoar makes a good trainer, based on its ease of construction and forgiving flight characteristics. It looks great in the air and in addition to thermal soaring tasks it can fly in light air on the slope. When you consider its inexpensive kit price, The Sensoar presents a combination that's hard to beat.

Here are the addresses of suppliers mentioned in this article:

Hobby Horn, P.O. Box 2212, Westminster, CA 92683.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

Sullivan Products, P.O. Box 5166, Baltimore, MD 21224.

Top Flite Models, 2635 S. Wabash Ave., Chicago, IL 60616. **MB**

PRECISION *Continued from page 21*

routinely weighed 9-11 lbs. without fuel, on an average wing area of about 700 sq. in. They were crammed with so much equipment that crash sites resembled miniature airline disasters. The quest was for straight-line speed. Props were small, pipe lengths were short, and engine timing was radical. The flight characteristics of these high performance, heavily loaded missiles were jet fighterish, and the noise level was high, well over 102 db on the average. By the end of the '70s, pattern planes had a mostly deserved reputation for being fast, hot, hard to land, and tricky to handle in flight. The engines, retracts and other doodads of the day required more or less constant tinkering. In essence, what we had were airborne fuel dragsters, tuned to nine decimal places. In the modeling media of the time, R/C scale pilots were being advised to fly pattern planes as preparation for flying models of WWII fighters. Pattern pilots were increasingly looked on as a breed apart; noisy masters of speed and exotic technology. At far too many fields, a pattern ship turning up in the pits became an unfortunate signal to sport pilots to land or risk being intimidated out of the sky. New recruits were getting a little hard to come by.

Around 1981 or so, a few concerned comments over this state of affairs were starting to appear in the modeling press. By this time, almost all of the new pattern designs that were appearing were styling refinements of old designs. Still, folks were saying that all pattern planes looked the same, and they were mostly right. The technology needed to stay competitive had become mysterious and expensive. Noise was starting to be a recognized factor in the increasing loss of flying sites, and with the sites that remained, overfly space was shrinking as the suburbs expanded. All of these problems were even larger and more immediate in Europe and other places around the world than they were in America. Contests, already diminishing in size since the late '70s, began to disappear from the calendar in some areas. Some of the key people from the heyday of the '70s began to drop out. Individual reasons varied, but for many of them, pattern had simply become boring as well as expensive and complicated. People are funny critters. They can tolerate expensive to an incredible degree when it comes to their hobbies, and a good many even like complicated, but few of them will sit still for boring. Fun-Flys and Giant Scale became the new rage. Pattern was at a low ebb, and as late as 1982, the future didn't look all that wonderful.

So what happened? The last two Nationals have seen huge turnouts for pattern. The NSRCA has more than tripled in size since

1983. New contests are popping up all over the calendar. New designs are multiplying like fleas in an old dog rug, and more important, they differ far more than they used to, both from their predecessors and from each other. Major engine and radio manufacturers are again using large amounts of pattern related advertising to promote their top line products. Pattern is, by any measurement, in the middle of a resurgence of interest. Why? What caused all this, and what do we feed it to keep it growing?

Well, as I see it, the primary changes in the early '80s were the FAI switch to turnaround style pattern and the FAI noise limit. The logic was that turnaround would require less space to fly (it does), and that a noise limit would encourage the development of quieter airplanes (it did), and that both of these measures might stop the bleeding a little as far as the loss of fields went. If there were any visionary souls who believed that the new approach would totally revitalize the sport from the top down, they weren't saying much, at least at first. Early on, what people were saying was that it wasn't as much of a change as you might think, and that the old designs would do just fine with a little tweak here and a little tweak there. Well, yes, as long as the old designs were flying the new pattern against each other! But ya see, the nature of competitors is to look for an edge or a way to improve... and it was becoming increasingly apparent that the room for improvement in airframe design was huge.

In drafting rooms and workshops around the planet, the electricity bill began to climb. Like it or not, the competition designs we fly are always created in response to the tasks that comprise our events. If an event has multiple skill levels, like pattern, the overall design parameters will be set by the tasks at the highest skill level. Nobody ever aspires to create a mediocre competition design that does about half the stuff pretty well. These designs exist, but they are usually called "sport" airplanes. This is a shining truth that applies to all facets of competitive model aviation. It predates Winter, DeBolt, Lanzo, Ehling, Taibi, Grant, Maxwell Bassett, the Good brothers and all the rest of the names from the Golden Age. It may even be older than John Pond!

When the old style Masters/FAI pattern was the top skill level, aircraft design was keyed accordingly. After all, what worked in Masters would certainly work in Sportsman or Advanced. As long as the event requirements stayed static, the designs didn't change. Over the years, almost everyone had come to feel that the designs that had evolved were pretty well suited to the tasks and the style, so nobody felt the need for much change. It was much safer to copy the "formula," change the shape of the canopy, tail, and wing tips slightly, and call it a new design. But as soon as it became apparent that Masters was no longer the premier event, and that the road to the World Champs led through FAI Turnaround, the top pilots switched over with the speed and precision



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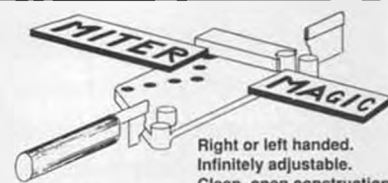


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of a Marine drill team. We had a whole new ball game.

The demands of the new turnaround style of flying and the noise limit were tough and very different. All anybody knew for sure was that the old heavy iron flying at warp nine on a 10-inch prop didn't work for squat, and everybody had a fresh sheet of paper. Like John Madden says, "... all of a sudden, Boom!" The excitement was back at the top level of the sport because everybody had a fist full of new cards and a new stack of chips, and that excitement was duly documented in the modeling media and, over time, translated into renewed interest at the local level. Tons of stuff was tried, discarded, modified, and tried again. Conversation at contests was animated about what was hot for turnaround and what was not. The radio and engine people got into the act with new products. Innovations by the top fliers like high-pitched props and soft mounts were picked up by the cottage industries (thanks, you guys!) and became available to the average competitor. The most successful of the new designs were kitted, became obsolete practically before they were built, and were replaced by still newer designs, some of which were even furnished as ARFs! To a certain extent, this is still going on; at the last World Champs, two biplanes showed up, along with a dizzying variety of airframe sizes and powerplant/prop schemes. This revolution in pattern design is by no means over; in fact, there is good reason to believe that all we have seen is the beginning of Act One.

Certain trends have emerged, though, and some of them are likely to stay with us. If you take a look at what the "average" bird of today looks like, compared with the usual flightline squatter of 1980, the first thing you notice is that although fiberglass and foam are still the standard, about two pounds of excess weight are missing while the whole airframe is around 5-10% larger. Wing area is up to around 800 sq. in. for two-strokes and over 900 sq. in. for four-strokes. Where tricycle gear was nearly the absolute rule, conventional gear now is more common. The nosewheel brake left with the nosewheel. The pipe no longer hangs out in the breeze like the plumbing in an unfinished basement. The engine is factory equipped with a pump or pressure regulator, and the fuel tank is at or near the CG. Noise and vibration (and maintenance requirements) are low because the engine sits on a soft mount. The high-pitched prop is much more efficient while turning thousands of rpm less, and the average noise level is down to around 94-95 db. The flying surfaces are likely to be finished with plastic film to save weight. Control surfaces are much larger. On the whole, aspect ratios are lower and wing leading edge sweep greater. Airfoils are thinner, leading edges have smaller radii, and tail moments are much, much longer. Horizontal and vertical stabilizers are larger. The horizontal stab is set at or near the thrust line, and the common wing position is slightly below same. In-flight mixture controls have

all but disappeared, as have flaps and anhedral stabs. Flight speeds are down, but acceleration out of slow flight conditions is up. Spectacular vertical performance by yesterday's standards is common, and as the wing (or cube) loading would indicate, behavior in the landing pattern is very gentle, with low landing speeds. As an aside, I was amused to note some months back that my new Cursor design, at 812 sq. in. and 7.5 lbs., is a closer fit to the "trainer" profile than the "pattern" profile on fellow MB columnist Francis Reynold's cube loading chart!

Back to considering our "average" bird of the '90s, we see that some of the complexity has been removed from the radio compartment (extra servos, mixture controls, brake hookups, etc.) and added to the airframe (plug-in wings, light weight honeycombed panels, belly pans, removable canopies, carbon fiber reinforcements, soft mounts, etc.). Most of today's airplanes are a positive pleasure instead of a heart attack to fly, do a pretty darned good job of flying the FAI pattern, and don't take nearly as much tinkering to stay up and running. They also do a great job of flying the AMA style tasks, handily beating the older designs at their own game with nothing but slight changes in prop/pipe setups. We will talk about this last point later.

As kind of a bonus, the new quiet powerplant setups have greatly enhanced the image of pattern at the local club level. On any given Sunday, the loudest ship at the average field is far more likely to be somebody's .40 sized trainer or a Quickee 500 racer with a flow-through muffler than a pattern plane. On noise control, pattern pilots now occupy the high moral ground, which is not only an astonishing turnabout, but kind of fun for a change! And since it is hard to be intimidated by something you can barely hear, the sport pilots don't land and make nasty remarks anymore, and new recruits are no longer in such short supply.

You can draw your own conclusions from all of the above. A couple occur to me. Since the new designs even fly the old tasks (AMA style pattern) better than the old designs ever did, it is pretty obvious that, while years of no change in the primary nature of the event had led us to believe we had arrived at some sort of pinnacle of pattern plane design, then at that point, all we had really arrived at was kind of a plateau of complacency and stagnation.

While the idea of maintaining stability in the rules of an event has a lot of good things going for it, overly stable conditions maintained for too long can become boring, and I believe this is what the ebb tide of the late '70s and early '80s. Conclusion number two is that, knowingly or not, and mostly against our will, the FAI fed us all just about exactly the right medicine at about the right time. And yes, this includes those of us still flying the older style. I don't say this because turn-around is more fun to fly (although I believe it is), or because there was a positive need to

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save fields, but just because it was different! Not just a little different, but enough different to cause some real excitement at the top, and force our most creative designers and best competitors to make fundamental changes in their entire approach to the event. Change and new challenges are a sure cure for boredom. Think about it. Next month we just might take a short peek at the future, and talk a little about computer radios. See ya at the field.

Rick Allison, 15618 N.E. 56th Way, Redmond, WA 98052, (206)883-3047. **MB**

'NINETY ONE *Continued from page 23*

full of helpful hints on electric circuit board assembly, including detailed instructions on soldering and component identification. Their instructions were complete and relatively easy to follow. Electronic kits and their instructions tend to overpower you when you open the box, but by taking them one step at a time, you soon discover the kit is relatively easy to assemble. The encoder board took a couple of evenings to complete. Assembly of the transmitter took only a week and that includes a couple of evenings of non-radio work for my wife.

The only components from the old Kraft transmitter requiring conversion/modification was changing the voltage of the battery pack and shortening the antenna. A Dremel with a cutoff wheel quickly made the antenna the required 39.5 inches and the old antenna tip was easily soldered back in place. If you have problems soldering, just remember one simple rule: *clean and tin* both parts whether you think they need it or not. You will be amazed how easy soldering is, following this simple rule. The other modification was converting the transmitter battery pack from 6 to 9.6 volts. Three additional sub-C Ni-Cd batteries converted the pack. The old 6-volt Kraft system used the larger Sub-C 650mAH batteries as opposed to the standard 550mAH batteries found in most radios. You can add batteries to old packs but you must use the same amp rated batteries in a pack. The space problem with this larger size battery was solved by mounting the pack on the inside of the case lid.

The Model 91 receiver kit is a relatively new kit, therefore the building instructions were more detailed and the parts were more easily identified than in the transmitter kit. I used the standard "pigtail" connector rather than the optional Deans or Futaba plug-in strip that is built on the receiver circuit board. I felt that during extra-hard landings (normal for some of us), the Deans pigtail connectors would unplug easier, causing less damage to the receiver circuit board than the built-in connector strip.

I must warn builders that there are a lot of small parts in a very small area, so take your time. Assembly of the receiver was easier than the transmitter and the purchase of a headband magnifier, one that magnifies 2-1/2 times, is a good investment. By using the

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I am sure that you know of, and maybe have had, an old, well browned motor that seemed to run just a little bit better than any of the others of the same make around it. I have come to feel that the magic ingredient these occasional extra eager motors have is related to the effectiveness of the crankcase seal. When a piston comes down, the gas in the crankcase is compressed in preparation for the bypassing. If the case is not tight, some of this gas escapes and there goes part of your power. "But where does it go?" you ask. "My rear cover gasket is absolutely tight, and I am sure it is not leaking." Well, there are several other places case pressure can go. One is out alongside the crankshaft and into the intake. One is up between the skirt of the piston and the inside of the liner and out the exhaust port. "So," you say, "Let's make these fits tight so the gas can't escape." That is fine, except that when you get the surfaces too close together, friction goes up and the power output goes down. Make it too loose, and you lose case compression. A large number of experiments over many years has brought me to the conclusion that the residual castor oil in the motor will effectively seal a clearance up to .0015 (.003 on the diameter). With some of today's very thin fuels, using low viscosity synthetic lubricants, this critical clearance would be smaller. As a matter of experience, we have arrived that .0015 to .002 being a good crankshaft clearance, .002 being a good piston skirt to cylinder bore clearance below the ports, and .001 being a good case to cylinder clearance. In the case of racing motors or high performance motors, we tend to make these looser.

Now, a lot of our customers like to take their motor apart and clean and inspect all the parts, and sand off any rough surfaces or carbon build up. What happens? The clearances get a little bit greater. Sometimes there may be a burr or piece of grit or sand. This will abrade a little bit more out of the sleeve, and a little bit more off of the piston, resulting in a little bit more clearance. Also, putting the motor back without coating the surfaces with castor oil causes a little more leakage. The synthetic lubricants often used today with their high detergent characteristics, prevent any carbonized oil build up which would normally help fill and seal these leakage areas. My advice is do not remove a crankshaft or a cylinder or piston unless it is really necessary. If your motor gets a snoot full of dirt, I suggest cleaning it by removing the rear cover and the plug, and immersing it in Stoddard solvent, and sloshing it around and turning the motor over.

Now, on another problem. We get quite a few complaints about glow plugs burning out. In 9 out of 10 cases, it turns out that the user has built himself a power panel in which he uses resistors or a rheostat to bring the starter battery voltage down to glow plug voltage. This is fine if you are able to tap one cell of your battery, and use resistors and/or rheostat that have a 10 amp rating. But if you use a rheostat and resistors having only a 4 or 5 amp rating, or less, what happens is that you find your adjustment after the resistors and rheostat have warmed up considerably. Then when you are ready to fly, and they have cooled off, the resistance drops considerably, and when you connect the plug, you get a rush of power, which overheats the plug element. I recommend that you never build a power panel pulling the full battery voltage down to the 1.1 volt the plugs want. Tap into just one cell and then use rheostat and/or resistors that have at least 10 amps rating.

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MODEL BUILDER

SEE PAGE 90

magnifier, I found a couple of solder bridges that would have been nearly impossible to find without it. You must check for solder bridges after every connection. Ace warns that most problems are caused by solder bridges and in my case that was good advice.

Finally, I hooked up the batteries, turned on the transmitter and plugged in the receiver and, you guessed it, it didn't work. However, since there was no smoke, I started through the troubleshooting guide, looking for the cause. The first test was to check if I was getting interference on my television. I showed some interference on Channel 2 but not nearly as much as one of my other factory built transmitters. The interference pattern and sound didn't change when I moved the sticks, thus indicating trouble in the encoder board. After checking part numbers against the instructions and testing everything I could test (you need a digital voltmeter), I called a friend with an oscilloscope. We checked patterns, we checked voltages, we wiggled wires and poked parts, and finally after two evenings, I reluctantly called Ace and asked to talk to a technician. After a few moments Steve came on the line and asked if he could help. I briefly described my problem and Steve quickly said I had reversed two capacitors. He even gave me the part number of the reversed capacitors. I couldn't believe he could be correct in just 10 seconds and I emphatically stated I had rechecked all the parts and placement before calling, but got out my magnifiers and checked as instructed, and sure enough, I was wrong, Steve was correct. The parts were incorrectly installed.

My embarrassment quickly passed, the parts were switched and the transmitter worked. It sure is amazing how reading the directions correctly makes things work better. After the transmitter was transmitting, I started checking the receiver and found my solder bridges, repaired them, and tuned the receiver. I used my voltmeter initially but asked my friend, John Mayfield, over with his oscilloscope again and fine tuned it. The voltmeter worked but a scope sure made the job easier and more fun. You can, of course, send the completed unit to Ace or an Ace repair station to be tuned and checked, as I am doing for this article, but it's a great experience to do it yourself and not nearly as difficult as you would think.

If you do damage a part during construction, or later during a hard landing (we never have crashes), all parts used in the radio are listed in the Ace catalog and can be ordered very inexpensively. During assembly of the encoder board, my three thumbs damaged a 10uh choke. I looked up the part number on the directions, and for fifty cents they sent me a new one.

I did encounter some difficulties building the transmitter and receiver. They were disheartening at the time but no more so than the frustration of building anything. It required far less time to build the radio than to scratch-build the Newport 28C I put the radio in, and when I had trouble, the folks at

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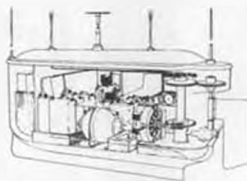
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Try to visualize yourself, if you will, living back in circa 1898 for just a moment. You're reading the newspaper when you come across an article about a man by the name of Nikola Tesla, whom sailed a boat without wind or steam, without a crew, without 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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Was it worth it? On the plus side, I have seven-channel radio with dual rates, servo reversing, endpoint adjustment, and it is 1991 Gold Label approved (whatever exactly that means) with several add-on features—not bad for the price. On the minus side, I have to remove four small screws to flip the servo reversing switches. My new radio doesn't look as fancy as the one the kid down the block has for his model race car, the radio doesn't have the fancy graphics on the case and it doesn't have an "ergonomically designed, comfort contoured case and adjustable length control sticks." I do believe I have a radio with quality U/S.-made electronics and with better than local service—I have Home Service. The radio will perform with the best built; after all, I built it and I can truly say when asked about my latest flying machine that it is "scratch-Built" right down to the radio. **MB**

SOARING *Continued from page 25*

After sheeting the assembled foam core wings, Myles takes the wing panel over to a band saw to cut off the ailerons and flaps. He sets up a fence on the saw table to keep the hinge line straight, then buzzes off the aileron or flap surface.

Once free of the main cores, the ailerons are placed upside down on top of some trailing edge stock (or anything that elevates the trailing edge off the saw table). This gives the ailerons the leading edge bevel needed when using Scotch tape hinges. The same fence is used again to buzz off a triangular strip of aileron leading edge (the bevel).

Finally, either epoxy or foam-friendly cyanoacrylate adhesive is used to bond 1/64 plywood strips to the exposed foam areas of the wing and control surfaces. Once sanded flush with the balsa wing sheeting, you're

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done! The result is a very stiff, accurate, light flap or aileron that is quick and easy to produce. The hinge area edges are very sharp, hard, straight, and they look very neat.

Another trick Myles uses to keep from stripping his flap servo gears on flaps-down landings is to employ R/C car (specifically RC-10 car) "servo savers." These are designed to protect car steering servos when the car driver hits a wall or rock with his front wheel. The impact is similar in effect to our flap-hits-rock or clump of grass scenario. The servo saver is spring-loaded to give on sudden forceable impact.

If there is a disadvantage to using servo savers, it is that they can sometimes be a little on the sloppy side. This, combined with their elastic nature, prevents their use on F3B or other such high speed sailplanes where aerodynamic flutter is a concern. On cruise-around-and-spot-land thermal ships, they are just what you need... unless you don't mind changing servos or servo gears at the flying field in the middle of a contest!

Myles also likes to vacuum form small

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Lexan fairings to cover up the exposed servo arms and Z-bend pushrods which invariably hang down in the breeze below the wing. This is believed to cut aerodynamic drag and give a small margin of protection to these parts.

These fairings could just as easily be formed out of epoxy resin and fiberglass cloth for those without access to a vacuum forming device. All that is needed is a balsa mockup of the shape you want glued to a piece of scrap wood, then covered in MonoKote. A little carnuba car wax will help prevent the epoxy from sticking to the MonoKote. Lay up a couple of layers of two-ounce cloth with epoxy resin over the form, let it harden, then pop off your fairings! Apply paint if you like, then cut to size and tape in place over your pushrods.

Myles likes beefy stabs, so that's why you'll see a set of Gemini MTS stabs on practically all of his contest gliders. They are all interchangeable with each other because they all have the same pivot to drive pin separation and pin size. A few guys in his club also practice this standardization so

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that should any lose, break, or forget a stab during a contest, a set may be borrowed.

Myles uses extruded, 1/4-inch diameter carbon fiber rods from Aerospace Composites as pivots for his stabs. They are stronger than typical brass tube rods and they weigh less than equivalent diameter steel rods.

4. KEITH SCHWEMMER CUMIC VARIANT

Keith found himself wanting to fly an aileron and flap model, and having a standard Cumic already flying, realized how easy it would be to build a new set of wings for a conversion. After all, what's the point of having an Airtronics MD7SP modified with a Vision-type, ATRCS computer if you are flying rudder/elevator?

What he did was acquire a custom cut foam core wing of 113.5 inches total span with ten-inch root and six-inch tip chords. The resultant aspect ratio from this double taper wing is a visually pleasing 14:1. Keith says the sailplane weighs 78 ounces, has a wing area of 908 square inches for a 12.4 ounce wing loading. The Selig 3021 was the airfoil of choice. Control functions include rudder, elevator, ailerons, and spoilers for landing (45 degrees upward deflection of both ailerons), but no flaps.

The wing was set up like an Adante wing so that it could be bolted to the fuselage like a Cumic, but be taken apart at the center like a Sagitta (see photo). The small center section, barely the width of the fuselage, was made from 1/16 and 1/8 plywood ribs and formers with balsa sheeting for a smooth shape.

Keith says the plane flies best with a rather aft balance point of 40% of root chord. He tried 35% at first but says it flew as if it were nose heavy. The Cumic variant, says Keith, "Flies good. I really like it. It penetrates very well and yet it can 'mush' in a breeze." He added, "The wing tips have a 30 degree upsweep at the tip. I can't say if they benefit the plane's performance, though, as I never flew it without them." Obviously Keith is satisfied with his new Cumic variant or he would remove them.

WINNERS OF THE NINTH ANNUAL FRESNO SOARING CLASSIC

Quickly now, here are the trophy winners of the Soaring Classic (computer scoring by "Stretch" Collins):

EXPERT CLASS (top 10):

1. Bob McGowan, DVSS, 1902 points
2. Chris George, CVRC, 1886 points
3. Randy Spencer, SULA, 1884 points
4. Myles Moran, TOSS, 1874 points
5. Pete Russell, SBSS, 1871 points
6. Steve George, CVRC, 1867 points
7. Paul Rose, CVRC, 1844 points
8. Dick Pantzar, HSS, 1837 points
9. Paul Lowrie, MRCC, 1825 points
10. Phil Hill, CVRC, 1820 points

SPORTSMAN CLASS (top 5):

1. Mark Puchalski, SULA, 1794 points
2. Claude Turner, CVRC, 1775 points
3. Gene Diaz, MRCC, 1767 points
4. Mike Ratner, PSS, 1725 points
5. Mary Holley, SWSA, 1721 points

2-METER CLASS (top 4):

1. Chris George, CVRC, 1894 points
2. Bob McGowan, DVSS, 1894 points
3. Tony Martin, HSS, 1892 points
4. Jerry Arana, SBSS, 1840 points

CONTEST ANNOUNCEMENTS:

Changing the subject from California to Texas, the Fourth Annual Southwest R/C HLG Contest is an opportunity for R/C hand launch glider fans to compete with the newly formed bi-club organization, the North Texas Soaring League. Contest will feature hand-toss or 3-pound pull Dynafite Up-Starts with 20-foot monofilament line, normalized scoring, one ten-minute time slot max duration round, 1-3-5 minute precision flight rounds. Date: Sunday, July 8. Contact "Bud" Black, 1322 Magnolia Dr., Richardson, TX 75080.

Ronald Torrito of 1625 Main St., East Hartford, CT 06108 asked me to mention that his club, the Northern Connecticut R/C Club, will be hosting a soaring rally for 2-Meter Class, Standard Class, and Unlimited Class gliders on August 5. Task will be 6-minute precision with spot landing bonus (CD is Gerry Knoblauch, 203-658-1538). Also, the NCRCC will be hosting an electric fun-fly for soaring and pylon racing with clinic on July 22 (CD is Larry Neal, 203-537-4001). In both events the location will be Ellington Field, Ellington, CT. Contact the CDs or Ronald Torrito for additional info.

TIME TO GO

Lots more stuff from the mailbag, as usual, that will have to wait till next time. Letters, photos, and comments always welcome. Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, CA 92330. **MB**

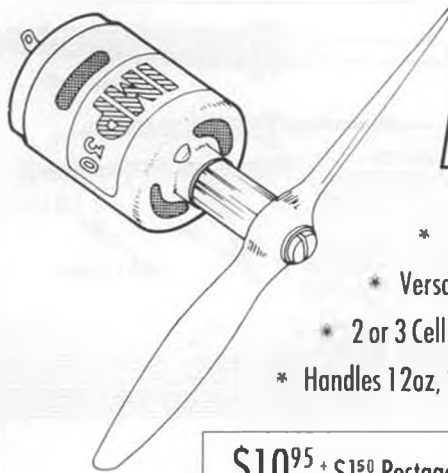
JET TRAILS *Continued from page 28*

consisting of the engine, pipe, fan, and some very scale looking and operating retracts available for an additional \$475.00.

Tom Cook, of Jet Model Products, is coming out with a line of performance hardware for jets. Two items currently available are a carbon fiber tuned pipe holder for \$9.95, and two sizes of steel threaded couplers .062 inch and .072 inch I.D. They come four to a pack for \$4.95.

Bob Violett showed me his much awaited F-16C kit. He says it's the most prefabricated jet kit ever! Some of the features include an epoxy glass Kevlar fuselage with molded-in panel lines, and scale details. It also has a gray skin color to minimize paint work. Wings, stabs, and fins are pre-built of foam and balsa with carbon fiber spars installed. Scale looking, scale operating retracts and gear doors are also included in the kit. These are just a few of the too-nu features of this kit. For a complete list, contact Bob. The introductory price is \$1000.00, with scale retracts. Bob also has some new fully functional steel oleo struts for his Aggressor/Viper kits, called Robo struts. They sell for about \$100.00. Also new is a scale documentation book for the F-86 Saber Jet. It features lots of color pictures of F-86s as well as 3-views and lots more. The book sells for

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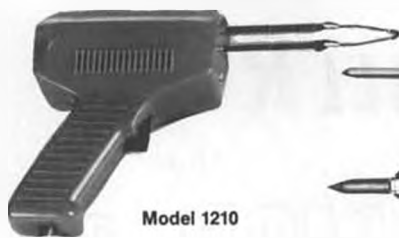
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\$25.00. Bob tells me that his new quiet pipe (selling for \$85.00) works with either the KBV 82 or the new K&B 82 engines. K&B says their engine lists for \$310.00 for the small-head version for use in Dnyamax and Viojets, and \$320.00 for the large-head version for use in pusher designs, such as Byron's and Bob Parkison's Pusher. Both engines come with a crank extension.

Bruce Sanders of Century Jet Models, Rantoull, Illinois, announced the company is moving to Sumter, South Carolina and John Kasprak will remain behind as their Rantoul sales rep. The latest kit from Century is their F-105 Thunderchief. It has a span of 44 inches, weighs 11 to 12 pounds, and uses either the Dynamax or Viojet fan units. All kits are now available in basic or deluxe versions. Century also has some neat accessories such as 1/10-scale and giant-scale retracts which feature functioning oleo struts made from Chrome-moly, plus stainless steel scissors. Also available are single and dual adjustable speed retract selector valves. They combine a selector valve, air tank filler, and speed adjuster all in one. Coming soon will be a Model 3 valve which will allow you to independently adjust the up and down speed of the nose gear and the mains. I would like to say "good luck" in your new location, guys!

Finally, at the show I ordered video from Barry Cohen of R/C Video Review. It's called the "Guide to Ducted Fans," building and flying sequences as well as interviews with some manufacturers, plus a look at the latest in ducted fan ARFs. The video sells for \$24.95. I'll try to review it in a future article. I'd again like to congratulate Jerry Caudle and Terry Nitsch on their wins. Thanks to all the manufacturers for their generous support with information for this article. I hope to see you next year at the 37th Annual Toledo Trade Show, April 5-7, 1991.

Till next time, keep your gear up, your burners lit, and watch you six. **MB**

CHOPPER *Continued from page 43*

First, let's examine Bell control action. Figure 1 shows how helicopter designers label the rotor disk from 0° to 360° for ease of reference. Figure 2 shows a two-bladed teetering rotor with Bell control. It is a two-bladed flybarless rotor. Examples of helicopters with only Bell control are; the GMP flybarless Legend, the full-size Bell Jet Ranger, Bell AH-1 Cobra, Bell 222, and Airwolf on the television show. The drawing shows that swashplate tilt leads to cyclic change in the main rotor blade pitch (blade pitch change is called feathering). Cyclically varying blade pitch angle produces asymmetrical lift distribution on the rotor disk to tilt the main rotor. Simple, right? (That's easy for you to say! wcn) Since all multi-bladed rotor systems also have the blade pitch control linked directly to the swashplate, they can also be called Bell control method.

The advantage of Bell control method is that it is very direct and simple. Swashplate

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As a product reviewer, Ray Hostetler can be tough. After all, this popular columnist has a reputation to protect as a model helicopter expert and design consultant to many R/C helicopter manufacturers. But the Kyosho Concept 30 is ready for scrutiny. It's engineered to let you learn quickly, and have fun doing it.

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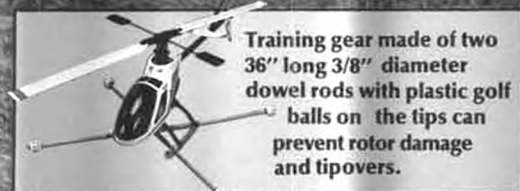
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commands are fed directly to the blades, thus the control response is almost instantaneous, with only about a 1/4 to 1/2 revolution delay. (We can easily calculate the delay time. Assume the main rotor is spinning at 1500 rpm, that means each revolution takes only 0.04 second. If the delay is a 1/2 revolution, then the delay is .02 second, which is also called 20 milliseconds.)

Next, let's look at Hiller control method. Figure 3 shows a helicopter with Hiller control system only. Examples of this control system are the old 1980 version of the Kalt Baron 28 collective pitch helicopter, GMP Cricket, and GMP's new beginner Rebel helicopter. Figure 3 illustrates the sequence of action after the pilot feeds in forward cyclic stick on a Rebel. First, the swashplate tilts forward which leads to angle-of-attack change on the two small Hiller paddles. One paddle produces positive lift, and the other negative lift. The middle drawing in Figure 3 then shows that the asymmetrical lift of the paddles causes the flybar to tilt forward. On Rebel, or any other fixed pitch helicopter, the main rotor hub is underslung from the flybar, thus, as the flybar tilts, the main rotor blade pitch angle will change. Figure 3 shows that the retreating blade will have an increase in pitch angle. The advancing blade will have a decrease in pitch angle. This produces asymmetrical lift distribution that causes the rotor disk to tilt forward as shown in the bottom of Figure 3.

The disadvantage of the Hiller control

method is that it is an indirect method; it must make the flybar tilt first, which then leads to main rotor blade pitch change, then the rotor disk will tilt. The delay time for the flybar is around a 1/4 to 1/2 revolution. Then, add an extra 1/4 to 1/2 revolution delay for the blade aerodynamic effects to set in to tilt the rotor disk. As we can see, the delay in pure Hiller control system is almost double that of the Bell control method.

The advantage of the Hiller control method is that it reduces the wear and tear on control actuators (the servos). The reason is that the servos are not linked directly to the main rotor blades, thus the unsteady aerodynamic loads acting on the blades will not go directly to the little servos. On Bell control helicopters, blade loads go through the pitch arm, then directly through the pitch links, and swashplate to shake the poor servos. This is why the GMP flybarless Legend has extra lever arms at the rotor hub to provide mechanical advantage to cut the feedback load in half. The picture shows the extra levers on my modified GMP flybarless Prohead.

On Hiller control helicopters, such as the Rebel, the two cyclic servos only control the tiny Hiller paddles. As the paddles are very small aerodynamic surfaces as compared to the surface area of the main blades, it is significantly easier for servos to move the paddles, than moving the blades. Once the paddles deflect, aerodynamic lift acts as a natural power boost to tilt the flybar and

change the blade pitch. Hence, in a Hiller command system, it is through Hiller paddle action, that we get Bell-like action.

Above was a very brief explanation of the differences between Bell and Hiller control methods. Next month we will continue with discussions of modern R/C helicopters that have combinations of Hiller and Bell control. With Bell-Hiller control, we will also have to explore the meaning of how Bell-Hiller mixing ratio influences cyclic control feel. We will also talk about whether it is better to have more Hiller, or Bell in a Bell-Hiller control model helicopter. By the way, all modern kits, like X-Cell, Legend-Elite, Cobra, Magic, Champion, Concept, Excalibur, etc., employ the Bell-Hiller control method. See you next month. **MB**

ARFS *Continued from page 31*

1940s. To quote Cox Hobbies, "The Cox .049 Fairchild 24 is an easy-to-assemble ARF model airplane. This model will take about two or three hours to assemble. Each assembly step is illustrated in detail, making the model very easy to complete. The Cox Fairchild's blow molded fuselage and OPS thermal bonded laminate foam wings and tail surfaces provide maximum strength and durability. A high wing provides the stability beginners need to learn to fly. Large rudder and elevator control surfaces enable experienced pilots to perform aerobatic maneu-

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vers that require quick response and agile execution."

Except for seeing this model fly in a promotional video, I have only examined it at a static display, but finally, after a long delay, I hope to actually flight test this model and report to our readers about it in a forthcoming column.

Another release just announced by Cox is the Piper Cub, an ARF with a 40-inch wingspan, powered with the same Ranger .049 engine as the Fairchild 24. Again, it is hoped that we soon will have an opportunity to evaluate this very interesting model.

Not to neglect their electric R/C fans, Cox has also introduced the Electric Sundance for 1990, a 55-inch wingspan ARF which comes equipped with a Mabuchi RK-370 electric motor already installed. Also included is a two-channel Cobra radio and a 15-minute charger. The manufacturer states that this airplane is suitable for beginners in R/C, and further claims that "This is the best flying electric ARF ever sold."

Those who may have purchased Cox two-channel aircraft radios in the past will be interested to learn that it is no longer necessary to settle for a transmitter with elevator control on one stick and rudder control on the other. The new Cobra transmitter now places both controls on one stick, and will be easier to use by those who fly Mode 2, the prevailing system in use today.

Though not radio controlled, I was greatly amused by another ARF just brought out by

Cox, the "Space Probe." To quote the manufacturer once again, "The Space Probe is a Cox .049 powered disk that really flies. Start the engine, hold the Space Probe high in front of you, and spin it up into the air. The Space Probe accelerates away from the ground and climbs hundreds of feet. It flies great, sometimes stopping to hover before it again increases its altitude. When the engine runs out of fuel, the Space Probe slows its spin and slowly returns to earth for a soft landing." Sounds like a lot of fun to me, so I'm going to get my hands on a Space Probe as soon as possible.

The last bit of news from Cox for 1990 is that the Tee Dee .010 is back! Yes, those of you who have been hoarding your .010 engines as collector items can now buy them again, and that includes spare parts, particularly glow heads! It's nice to know that a manufacturer sometimes listens to the requests of its customers, and in this case Cox has made a lot of modelers very happy by bringing back this truly remarkable engine.

A CHALLENGE TO THE MANUFACTURERS

Though I rarely build an airplane from scratch these days, I often do assemble Almost-Ready-to-Cover models. In keeping with my "get away with as little work as you can" principle, I usually use a heat-shrink covering such as Super MonoKote. What I want to see made available is a covering material which has a built-in design or pat-

tern, such as stars, stripes, or even polka dots and plaid designs. As a matter of fact, a good camouflage pattern would also be nice to have. Actually, the possibilities are virtually limitless, so why hasn't one of these manufacturers started the ball rolling in this direction? The technology is certainly available, and modelers will welcome such a product with open arms.

ARFS BY HANNO PRETTNER

A most interesting ARF has just made its appearance in this country. Actually an Almost-Ready-to-Cover model, this airplane is an authentic reproduction of the famous clipped-wing Piper Cub. It is produced by the Roga Technik firm in Austria, under the direction of world champion R/C pattern flyer Hanno Prettnner.

The quality of this model has to be seen to be believed. The hardware, such as wing struts and tail wheel assembly, are painstakingly pre-finished and detailed. Wingspan is 111 inches, but the manufacturer claims a ready-to-fly weight of 15 to 19 pounds, using an engine with a displacement of 30 to 50 cc. At this writing a U.S. distributor does not seem to have been named, but watch these pages for further information coming soon.

Always happy to answer your questions, just don't forget a SASE. Write to 2267 Alta Vista Drive, Vista, CA 92084, or phone me at (619)726-6636. As I usually fly all day, evenings are the best time to phone. My FAX number is (619)726-6907. **MB**

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CORNER *Continued from page 33*

early, but a reminder that we will soon be using all of the frequencies which became available to us back in January 1982. This process will require some rethinking on our parts, and the acceptance of new equipment and field procedures. The material to follow has appeared in other publications, including AMA's *Model Aviation* magazine, but I think that it is important enough that everyone everywhere should study it and that it bears repeating. While you are doing so, please keep in mind that all of this is not a scheme on the part of the radio equipment makers to force you to buy new radios, though some have dragged their feet in providing the better equipment possible with today's technology or providing the recommended documentation. It is not AMA's plan to make life difficult for you—all of this is intended to allow *more* of us to fly under as *safe* conditions as possible!

Quoted from AMA's release:

72 MHZ BAND CHANGES RECOMMENDED PLAN

The AMA recommended frequencies for R/C operation in the 72 MHz band are fifty "Aircraft Use Only" channels, CH 11 through 60, inclusive. Narrowband receivers and transmitters must be used to operate on all 50 channels. Use of the 50 channels can be controlled with the commonly used frequency pins, using as many channels as other considerations permit. The only re-

striction is that *all receivers and transmitters must be narrowband.*

INTERIM ALTERNATE PLANS

The AMA recommends the use of narrowband equipment for R/C, but recognizes that some R/C flying sites may continue to use some wideband receivers and transmitters during the changeover. In recognition of this, the AMA recommends the interim use of two alternate frequency management plans.

Both interim plans restrict wideband transmitters (silver sticker) to even-numbered channels 38 to 56. These are the wideband transmitter channels currently in use. This emphasizes the recommendation that old wideband transmitters not be converted to the new channels. Better yet, convert them to narrowband.

ALTERNATE PLAN NO. 1:

The interim alternate plan no. 1 recommends use of 25 "Aircraft Use Only" even-numbered channels 12 through 60. Use of narrow- or wideband receivers on any even-numbered channel is acceptable. Narrowband transmitters (gold sticker) are required on all channels except even-numbered channels 38 to 56. Either wide- or narrowband transmitters can be used on those 10 channels. Use of the 25 channels can be controlled with individual frequency pins as is common now. Four flight line restrictions are recommended:

1. Keep aircraft's flight path away from other operating transmitters.

2. Maintain pilot's flight station spacing, 10 to 20 feet apart.

3. For fixed-wing powered aircraft, flight path and line of pilot's flight stations should be along parallel lines separated by a minimum of 25 feet.

4. Keep transmitters operating on adjacent numbered channels near each other. Avoid using channels numerically near each other at extremes in distance from each other.

At sites where random use of frequency pins for frequency control does not provide adequate interference protection, Five Station Plan is suggested (see page 33). Note that it employs a paddle containing the frequencies assigned to a specific station.

Details of how to implement a flight station plan will be provided in the 1991 Manual.

ALTERNATE PLAN NO. 2:

The interim alternate plan no. 2 recommends use of Flight Station Plans. This plan is recommended for sites where a mix of wide- and narrowband equipment will be used along with a mix of odd- and even-numbered channels. One of the Flight Station Plans to be listed in the Membership Manual is described here, the Six Station Plan.

This station plan uses 37 channels—24 lower- and 13 higher-numbered channels. Six frequency paddles are used to maintain frequency control at six flight stations. Each paddle controls availability of six or seven R/

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C channels.

The Flight Station Plan requires narrow-band transmitters and receivers on the lower band. Upper band can use either wide- or narrowband receivers. Wideband transmitters are only permitted on CH 38-56. All other channels must use narrowband transmitters. Three flight line restrictions are recommended: (see page 33).

1. Keep aircraft's flight path away from other operating transmitters.
2. Maintain pilot's flight station spacing, 10 to 20 feet apart.
3. Flight path and line of pilot's flight stations should be along parallel lines separated by a minimum of 25 feet.

This briefly summarizes the AMA recommendations for 72 MHz frequency band management at R/C model aircraft sites in 1991. The same frequency management plans may be used at AMA sanctioned events with one additional requirement: All transmitters used at sanctioned events must be narrowband and display an RCMA/AMA gold sticker.

OTHER CHANGES:
CHANNELS 00-09

The AMA recommendations for managing R/C channels 00 to 09 (6-meter band, Amateur frequencies) are similar to those for channels 11 to 60. All channels can be used only if all equipment is narrowband. Use of wideband receivers requires use of even-numbered channels only. Wideband transmitters cannot be used on any channel. CHANNELS 62-90, SINGLE, AND TWO-COLOR FREQUENCIES

No changes will be made in the recommended frequency management of these R/C bands. The R/C frequencies on 75, 27, and 53 MHz will continue to be used without a requirement for narrowband transmitters or receivers. However, the AMA notes that use of narrowband equipment on these bands decreases the chance of interference from non-R/C transmissions.

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MODEL DESIGN *Continued from page 35*

The other function of dihedral is the one we are interested in here. If an airplane with dihedral yaws for any reason, the forward wing will operate at a higher angle of attack than the trailing wing. If this is news to you, conduct the following little test. Take a piece of writing paper, put some dihedral bend in the middle of this "wing," and look at the leading edge with your eyes in the plane of the wing. When you yaw the wing you will see the bottom of the nearest side, but only the top of the other side.

Therefore, this increased angle of attack on one side of a yawed wing with dihedral produces roll. With rudder and elevator only we can therefore bank and turn an airplane with dihedral. But let's look at the inverted situation.

Upside down, a wing with dihedral acts as though it had anhedral or negative dihedral. Now let's apply right rudder as the R/C

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pilot and his transmitter knows it. The rudder swings left as seen from the ground and produces left yaw. Pick up your writing-paper wing again and invert it so its dihedral is negative. Sight at the leading edge with it yawed. The side on which you see the greater inverted angle of attack is now the side farthest from you, not the near side as with an upright wing. So the inverted yawed plane with dihedral will roll *opposite* to the direction of the yaw, producing a turn opposite to the deflection of the rudder. Talk about adverse yaw!

In grammar we learned that two negatives make a positive. Same thing here. The inverted plane yaws left as seen from the ground when given right rudder, but it rolls right due to the effective anhedral. This double reversal resulting in "normal" rudder control when inverted makes life simpler for rudder fliers who want to fly aerobatics, and it gave us an interesting little mystery to solve.

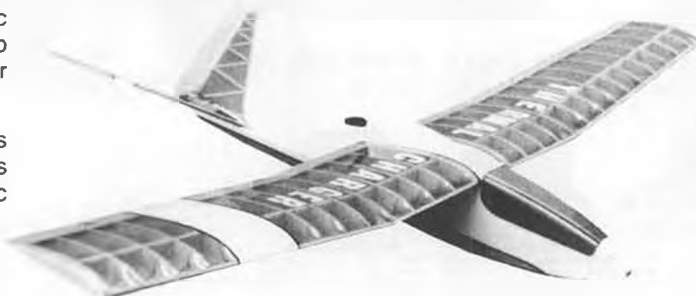
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mentioning, but the fact is that it is a sore subject with a lot of other brands of equipment. The center mounted toggle switches on some transmitters have been blamed for a lot of crashes, as apparently they are often turned off by the neck strap. Those transmitters having slide switches mounted in the center have also caused their share of airplane fatalities, as the pilots turn them off as they reach for a nearby trim lever. Frankly, I am of the opinion that if you can't tell a trim lever from a slide switch, you haven't fully graduated from ground school. But that is just an opinion—the mc3030 on-off switch type and location positively prevents any inadvertent or accidental operation. It is located on the upper left corner, away from everything else, and recessed flush with the surface of the case and is the only one of its type on the entire transmitter. One has to be thinking "on-off switch" in order to operate it.

Well, maybe I really shouldn't use words like "positively prevents," etc.; what with all of the otherwise impossible things we have all seen at the flying field. But if you continuously turn this one off accidentally, maybe you really ought to forget the whole thing and go back to baseball cards or macrame!

Frequencies on which the mc3030 is currently available include all of the 72 MHz channels now assigned, and will include the odd numbered channels when their time comes. For non-fliers, 75 MHz will soon be on hand, but unfortunately, there are no plans for 50 or 53 MHz equipment. Frequency control is via an internally located RF plug-in module, for which the channel number and frequency appear through a clear portion in the transmitter rear cover. The entire unit is fully FCC certified and is delivered with the R/CMA "gold" narrow band sticker affixed to the module.

Even the rear cover is an interesting feature of this transmitter. As you know, most transmitters have the covers held on with a multitude of screws, often with some components attached to the covers, and others which fall out as the cover is removed. Not so the mc3030. It is almost as if Multiplex wants you to see and appreciate the insides—the cover removes simply and cleanly by depressing two catches on top of the

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MULTIPLEX *Continued from page 37*

don't overlook the fact that the operating time quoted is three to four times what most other computer-type transmitters are capable of.

The battery is charged through a seven-pin DIN connector on the upper left side, which also makes necessary connections for what most of us refer to as a direct servo control cable, while Multiplex refers to it as closed loop operation. Same thing—a harness that plugs into the switch harness for transmitter-to-servo control without putting a signal on the air. The same plug also makes the necessary connections for a trainer system with another mc3030; the optional

tachometer sensor; and to the Multiplex service instrumentation for checkout and adjustment.

Should you have occasion to use a charger other than the one available from Multiplex, the SCE batteries can be revived at a fast rate of two amperes for one hour, or for normal overnight charging, 200 milliamps for 10 hours. Refer to the diagram furnished for charger connections—the pins shown are as you see the female socket on the outside of the transmitter. It should be of interest to some of you that the Sanyo SCE cells are true high rate charge cells, contrary to those found in many other transmitters of this class.

The on-off switch might not appear worth

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case. Everything is secured, nothing falls out. If you have ever looked into any similar transmitter, you know how completely full they are, with parts and wires and things running seemingly without order. In contrast, the mc3030 will appear almost as if some of the parts were left out. All the electronics are on a center mounted printed circuit board, the gimbals are fully exposed, and all wiring is neatly routed to plug-in connectors around the perimeter of the board. This provides a versatility unheard of with any other transmitter that I know of—if you don't like a control or switch position or function, you can change things exactly as you like. The mc3030 comes with the normal switches, dual rates and landing gear, for example, mounted on sub-panels in a standard configuration. However, just in case you prefer a different arrangement, blank sub-panels and self adhesive labels are provided so that you can arrange things exactly as you like them. If you own most any other type of computer radio, you may have already found out that even the parent company can't or won't relocate a switch or control for you.

If you are the type who takes pride in owning and using nice things, and taking care of them, you will appreciate the following. The toggle switches in question are mounted not with regular hex nuts, but with round serrated edge dress nuts. A fine touch in itself; however, without the proper tool to remove or tighten this type of nut, you wind up with either a plier damaged nut or a loose switch. Not so for mc3030 owners—a dress nut wrench is included, with which you can jump switches around all you want without damaging the looks of your equipment. A small point, true, but to me it is an indication that the kind of pride I talked about is shared by the people who bring us the mc3030.

The same thing applies to mode changes. We usually hear: "Can't be done," which in some cases really means, "We don't like

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them or have the time to do them." Again, not so the mc3030. It comes mode-less! Say what? It comes with no ratchet action at all; both sticks are spring loaded at center. To make it into the mode you prefer, you simply remove a spring assembly and adjust a screw to the exact ratcheting action you like—that's all. To keep any channel sequence you might prefer, in a sequence referred to as "Correlating Servos," you then assign the throttle and elevator functions to the proper sticks through the computer programming. Mode changes are so easy you can even do it at the field if you fly one method and want your friend who flies another way to take a turn.

Helicopter, pattern and sport versions of the mc3030 are *not* available! One version does it all—in sharp contrast to other brands that offer "different strokes for different folks" type of transmitters. Due to the programming, mixing, and function assignment capabilities of the mc3030, it can be tailored specifically for any one of the above applications, limited only by the user's understanding of the model's requirements. The transmitter has the capability of storing the

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settings for 18, yes, *eighteen* different programs. That is, you can store the control settings for 18 different models, so that you can program it not only for different types of models, but for more than one of each kind. Including trims, yet! To save time for you, once you have recorded a specific type of program and wish to adjust for another model of the same type, say from your old helicopter to a new one, it is not necessary to start all over. You can simply transfer the complete information from the original machine to a different memory for the second one, keeping the first one intact, and tailoring the second one as required by the new model. To make initial understanding of your new mc3030 even easier, it is delivered with programs for ten different models, some of each type. They are basic, and you can modify them to your own needs quite easily.

Programming of a transmitter with the capabilities of the mc3030 can be quite intimidating to the uninitiated. It needn't be, as Multiplex obviously put a lot of effort into the development of a system which is described in the original German literature as

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"User Oriented Transmitter Language." This does not require prior knowledge or experience with computer programming, though it does not relieve or replace the necessity for the user to understand radio controlled models, their requirements and their reactions to different control inputs. Properly used, the capabilities of the mc3030 permits the transmitter/model/pilot combination to "be all you can be."

There is one very important point to remember in the use of a transmitter such as the mc3030 as compared to a basic four-channel no-frills unit. With the latter type, to do it properly, you have to start planning your R/C installation quite early, so that ultimately you wind up with the control

horns and servo arm pushrod connections on the proper side so that up is up, etc. Once your model is assembled, you adjust the clevises on the servo arms and control horns to get *approximately* the correct amount of control surface deflection. As you know from such experience, worse of all to adjust is the engine throttle, with the nose wheel being a close second. All of these frustrating problems are a thing of the past with the mc3030. You can install the R/C equipment however and wherever you want, for best utilization of space and most efficient linkage orientation. Then you make all the necessary adjustments at the transmitter, in the same order that you used to do so mechanically. First you get all the servos

running in the proper direction for up, down, left, right, etc. Then you adjust the throws, not "approximately" but to within *one degree*, with whatever differential you may want. In the case of the throttle, you simply run the throttle stick all the way up, and push one of the buttons until the throttle is fully open. Throttle idle is set in a similar manner. What could be easier?

Control information within the mc3030 is displayed on a 16-character-per-line, four-line LCD (liquid crystal display). Selection of the displayed information and inputs are made with a simple eight-key control pad located under a flip-up door on the lower front of the case. These keys are clearly marked with their function. Refer to the information flow chart; it clearly illustrates the various sections and functions of the information contained or which you can program into the computer. I won't attempt to detail the various steps involved in any or all of the possible operations; it is all clearly detailed in the 78-page manual.

For most users, the manual is only necessary for programming the first model of each type. After that, one finds that the display "walks" you right through the necessary steps. Refer again to the flow chart; the "Status" is the first display to appear as the transmitter is turned on. The "M" button brings up "Menu 1," which tells you which one of the four center buttons to push to bring up either of the "Servo," "Memories," "Control," or "Menu 2." Same process will bring up the information under the "Servo" or any other subheading. It is all much easier to do than to explain, and I find that it helps tremendously to have a working airborne system in front of you so that whatever inputs are made can be seen translated to mechanical servo movements. This is especially helpful in the case of mixing, which can be somewhat confusing anyway.

The four buttons in the center are used to select from the information seen on the display, each subheading also telling you which one of these buttons to operate.

The buttons marked with plus (+) and minus (-) signs are used to adjust such things as throws, which are displayed as percentages. Another nice feature: for large excursions during initial setup, a knob is located on the right upper panel which has the same

control as the + and - buttons, except that its action is much faster. For those of you who have true computer experience, the knob works in the same manner as a "mouse."

The only other button is the one marked "R." It is used to reverse any function that needs reversing, such as servo travel direction, the operating direction of a switch, to switch a function from "off" to "on," etc.

An individual code is programmed into each individual transmitter to prevent unwanted or accidental inputs by your tinkering friends. Quite simply, it prevents the transmitter from proceeding past the initial display without the code being entered into the keyboard.

Failsafe? Why yes, there is a failsafe, but with a difference. The one in the mc3030 is of the type that drives all flight control servos to neutral and throttle to idle under conditions of signal loss due to interference. I have found that not all owners of failsafe equipped systems understand this feature, and often blame it for in-flight problems for which it is not responsible. In short, not everybody likes failsafe. Those of you who don't will like the difference in this one—it can be turned off at the companion "PCM-DS" receiver.

On the subject of receivers, in addition to the PCM receiver mentioned, there is the Multiplex "PPM-DS," a double conversion nine-channel FM unit. Both are advertised as true narrow band receivers and are recommended for maximum efficiency with the mc3030 transmitter. Size-wise they will fit most .40 and above models, measuring only 1-13/16x2-3/4x1 inch and weighing 2-1/4 ounces. However, in the PPM mode, the mc3030 transmitter will work with almost all other brands of FM receivers. For sailplane fans with their fewer channel requirements, Beemer R/C recommends the Airtronics Micro FM Receiver No. 92245. It is a four-channel unit, merely 1.8x1.125x0.75 inch and weighing only one ounce. Please note that this is *not* a narrow band receiver, and no such claims are made by the Airtronics Company. As a matter of fact, it is offered only on wide-band channels 38 to 56. However, I was informed by a member of the Airtronics group that this receiver will soon be replaced by one of similar size and weight that will be narrow band and available on all assigned 72 MHz channels.

All of the mc3030 features have not been listed here. There are dual and exponential rates, timers that count up or down, a tachometer for props with up to four blades, and you can program aux functions to occur at any selected position of one of the main sticks. You can fly V-tails, deltas, coupled flaps, etcetera, etcetera!

Wanna talk money? As I stated initially, there are different classes of products of any kind, and no one is going to try to tell you that Multiplex mc3030 equipment is cheap. And I have to repeat something I said about the Multiplex Royal MC: it is not for everyone! If you are a plastic airplane or Ugly Stik flier, you really can't make use of all of the capabilities of this type of equipment. Addi-

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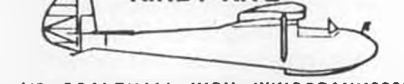
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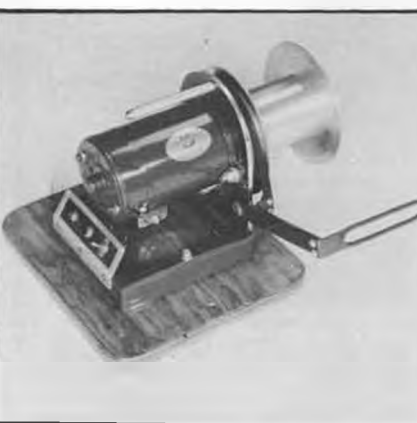
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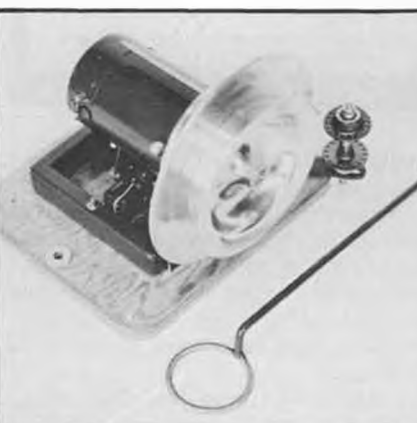
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tionally, and this is very important, *you have to understand airplanes, you have to understand their reactions and requirements*, before you can really understand R/C equipment like the mc3030. On the other hand, those who are serious about the R/C hobby can appreciate that before you can grow personally, your equipment has to allow you to do so.

As is done in Europe, Multiplex equipment here in the U.S. is sold individually, so that you can obtain only what you need. The basic mc3030 transmitter is priced at \$819.00. The transmitter with PCM-DS receiver, airborne battery, and switch harness is \$995.00. With a PPM-DS receiver and those items, the price is \$965.00. A system consisting of the transmitter, PCM-DS receiver, battery, switch harness and two Profi ball-bearing coreless motor servos is \$1100.00. Additional servos are available at \$65.00. The transmitters are furnished without chargers; a dual plug-in wall charger is available for \$22.00; a 12V "Delta Peak" charger for field use is \$94.00. Those of you with either of the Ace R/C adjustable chargers can use them to good advantage here.

One of the major complaints with owners of other brands of advanced radios is the

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unavailability of additional airborne equipment. And it is a logical complaint—what good is being able to program half a dozen different models if airborne systems are not cataloged or available? Multiplex airborne components, as well as all spares and accessories and any other information that you may need, are as near as Arizona: Beemer R/C West, Inc., 17252 East Falcon Dr., Fountain Hills, AZ 85268; Phone (602)837-0311, Fax (602)837-0155. **MB**

POWER *Continued from page 39*

on the wires melts from the heat of the stall currents and then a short circuit develops, which sets the plane on fire. Don't omit fuses.

Speaking of fire hazard, fire is the main reason I do not set up my planes with a charge plug. Yes, it is slightly inconvenient to remove the battery pack and charge it outside the plane. However, I learned the hard way about fire very early. Way back about 1975, I was flying with a plane that had its own charge plug. I had a hard landing, not a crash, and the battery shifted and pulled on the charge plug. This yanked on the charge plug contacts and shorted them across each other. The plane burned. I was flying in a grass field, it was dry, and there were some bad moments when I thought the field might take fire. I did get it stamped out. Since then I have not used charge outlets in a plane, and I do all my battery charging outside the plane. I have had no plane fires since. Enough said!

You might fuse right at the battery pack, so that the charge current must go through the fuse. If, however, you are using the Futaba receiver with built-in speed control and BEC, you cannot do that, since you then run the risk of a blown fuse killing the radio in flight. It is better to keep it simple and don't bother with the extra wiring for "inside charging." Leave it out. Velcro is the ideal answer for holding battery packs in place.

Novak and Tekin have speed controls that can eliminate the fuse. They use TEMPFETs to control current. The TEMPFETs will cut power if the current gets too high. It really works well; I have the Novak T4 and I have overdriven it hard enough to have it cut out. Once it cools, it will operate again normally. The Novak can handle up to ten cells and retails for about \$120. It is heavily discounted in mail order advertisements. It also includes a brake. The only drawback is that it and the Tekin are "frame rate" controls, that is, 50 cps pulse rate. This can lead to motor and battery heating. The Novak advertises a "filtered output," which I believe means the pulses have been rounded off. This would mean less heating problems. The Tekin and the Novak throttles are very small, light and well made. I hope they come out with 2000 to 4000 cps units someday.

In February I went to the Bad Nauheim meet, which is quite large. There were over 70 pilots registered for the pylon racing on Saturday, and over a hundred pilots for the F3E events on Sunday. During the Saturday noon break I saw a very impressive electric helicopter demonstration by Kai Reuter and Horst Wiederhold. Horst flew a .60 size Graupner Star helicopter with hovering, freestyle flying, and lots of high-banked turns. No inverted flying or rolls, but it looked capable of it! Performance was such that you would have thought it was gas. The flight was between five and six minutes, Kai says five minutes are routine. They have been flying this helicopter for a year. It is a very attractive ship. They use a 355-5 Plettenberg cobalt motor. I had not heard of Plettenberg before this meet, but I saw several there, and they look very well made. They are apparently sold only by direct order from Plettenberg. I do not have that address, I am sorry to say. The battery pack was 24 sub-C cells. The speed control was designed and built by Kai. All-up flying weight was 4.8 kg, or 10.5 lbs.

There were two other electric helicopters on display, another Star by Graupner, and a Kyosho Concept 30. Neither was flown that day, although both looked like they have been flown. The Concept looked like it had a Keller 50 in it, and 14 cells. There will be a big electro meet at Weilmunster on June 23 and 24, which will feature pattern flying, F3E, sport gliders, and electric helicopters. The helicopters will do tasks consisting of: 1. Hover, two 360 degree circles, and spot landing; 2. Hover at 5 meters, constant heading; 3. Simple hat flight going 4 meters horizontal, then 4 meters up, then 4 meters

down and horizontal; 4. Simple turn; 5. Flyby at 5 meters height, 30 meters along the runway; 6. Landing with a 180 degree volte (swap tail for nose) on the spot. Three flights are allowed to complete the tasks. It sounds like fun—Kai and Horst's helicopter should find this easy! Contact Rolf Eckold, Sudetenstrasse 30, 6292 Weilmunster, W. Germany, phone 06472/7295 for more information about the Weilmunster meet.

I went to the Nuremberg Toy Fair in February, and saw a lot of new electric planes and items. Graupner supplied me with photos of some of their many electric products. The Elektro-Junior is for beginners, flies fairly slow, and is 2.1 meter (83 inches) span. It flies with six to seven cells. The Chili is a hot one, it flies with ten to sixteen cells (that should take it nearly straight up!) and is 2.15 meter (85 inches) span. The Fokker E-III is a fun sport model for seven to eight cells, 1.335 meter (53 inch) span. Hobby Lobby carries the Graupner line, contact them for availability and pricing: 5614 Franklin Pike Circle, Brentwood, TN 37027, (615)373-1444. For now, fly straight up, fly electric! **MB**

KALT *Continued from page 46*

Therefore, the canopy is a lot stronger than it appears. The reason is there are many molded ridges inside the canopy for support. The molded instrument panel also added support. The windshield is a separate tinted piece glued onto the canopy, which can be purchased by itself.

The canopy deserves an 'A' for ease of assembly. Unlike all other canopies on the market, Excalibur's canopy requires no trimming with scissors. It comes out of the kit in perfectly trimmed condition. A bottle of MEK is included. It took me only five minutes to complete the entire canopy. It is molded in white. The windshield fit perfectly to the canopy, again, no scissor trimming required. It came with a nice, blue tint. Now I began to like Kalt canopies!

The vertical and horizontal fins are constructed similar to the Concept main rotor blades, they have foam outer skin, and 2mm plywood on the inside. Again, they are stronger than they appear. However, not strong enough to survive the crash.

The main frames are beautifully black anodized. There were no rough edges or 90 degree bends in the frame. Unlike other manufacturers' frames, Excalibur uses 90-degree angle brackets at the bottom of the frames for mounting the landing gear. Then, as the pictures show, there is an extra bracket outside each frame to prevent lateral bending; similar to how the flying buttresses of Gothic cathedrals prevent the walls from buckling. Very nice frames, and they did not bend in the crash.

However, the aluminum tail boom and tail boom support tubes were not finished at all. They were like pieces of bare aluminum pipe that just came out of the Alcoa factory. Therefore, I had my tail boom and support

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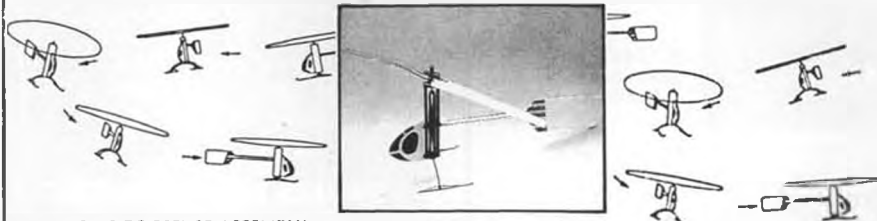
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tubes painted by Mr. Ray St. Onge, of Hybrid Hobby in Connecticut, to match the neon paint job that he did for my canopy. Ray St. Onge does an awesome misty neon paint job. I call the color on my canopy "hot pink." He calls it magenta. You can reach him at (203) 276-8465. For \$68, he will supply any Schluter, GMP, or X-Cell canopy, build it and paint it for you. A fancy color scheme like mine costs slightly more. I mailed my Excalibur canopy to him for painting. Ray also sells wood rotor blades for many helicopters on the market. I have flown his wood blades; they were nicely cut. I will talk about his new double inflex airfoil design rotor blades in a future issue.

The collective pitch mechanism on the

Excalibur is far superior to that of the Cyclone. The Excalibur collective arm is supported by a metal bushing, while the Cyclone does not even have a bushing. Excalibur's sliding collective ring is also pivoted on ball bearings, which reduced the slop to a minimum. However, the sliding collar sitting above the swashplate is plastic and gives some play. Kalt could have inserted a steel sleeve inside the plastic sliding collar. I hope that Hobby Dynamics will forward the message to Kalt and make the kit flawless.

The 90 degree roll bellcrank on the Excalibur is excellent! The close-up picture shows the superb workmanship. The centrifugal clutch and flywheel system is quite

unique. As the picture shows, the engine starting shaft is not bolted solidly to the clutch. Kalt calls the system a self-aligning flywheel and clutch. The kit supplies three different taper nuts to fit OS, Enya, or YS engines. Upon tightening the tapered nut, the cooling fan and flywheel will automatically seat properly. The clutch bell-housing and starting shaft sit loosely on the clutch. The starting shaft has a universal joint type of coupling, so turning the starting shaft will turn the engine, but the starting shaft does not have to line up with the engine crankshaft perfectly. This design eliminates conventional dialing alignment requirements. I really like this system because it saves time, and also ensures minimal vibration. However, I noticed that my clutch bell or the coupling unit must be drilled slightly off because the system wobbles slightly. I have checked two other Excaliburs. One of them was perfect, while the other had some misalignment. Mine had the worst wobble. The result is some vibration and zinging noise in flight. I have requested a new unit from Kalt. At the time of this review I had yet to receive the unit. I hope to receive it soon so I can tell you if the wobbling will disappear.

The tail rotor hub unit is probably one of the best metal units available. It is very similar to the TSK unit. It uses a modern, sliding, ballraced collar pitch control mechanism like that on X-Cell, Magic, and Legend. The unit is almost flawless, except the pitch arm has a very slight amount of play at the pivot. Each of the tail rotor blade grips is supported by two radial bearings. The feathering action has very little slop. However, upon closer examination, the tail rotor hub on mine was drilled off-center by two to three degrees. In other words, the hub is not exactly 90-degrees to the main rotor shaft. As the tail boom does not vibrate excessively, the tail rotor blades must have elastically flapped to compensate for this problem. Old Hirobo tail rotor hubs were also sometimes drilled off-center. I had an old Hirobo tail rotor hub that was at least 10 degrees off. Schluter Magic and X-Cell use teetering tail rotor hubs, so there is no worry about a miss-drilled hub. Now I think that a teetering tail rotor hub may be a good idea!

The instruction manual said to take pliers and squeeze the special ball links on the mixing scissor unit to loosen the ball links. Do not squeeze them! They are very brittle. I squeezed them, and one of them snapped immediately. As the instruction said the unit is sold as one unit, I bought a new scissor mixing unit. It retails for \$68. So don't make the same mistake! To loosen any ball link, just take a Philips screwdriver that fits the ball link and move the screwdriver in and out and pry the ball link hole slightly. Don't over do it, or the ball link hole will become too big.

The gear ratio for Excalibur is 8.7:1:4.5 (engine : main rotor : tail rotor). The Japanese market version of Excalibur, called Baron Alpha has 9.78:1:5.52. I tached my Excalibur with the MAS Skytach and my main rotor speed was 1700. This means my

engine was running at 14,790 rpm which is exactly where a tuned pipe engine develops its maximum horsepower. Japanese like to fly with lower head speed, thus they use higher gear ratio. If their engine also turns at 14,790 rpm, then their head speed will only be 1512. Actually, I would have preferred the 9.78 ratio because 1700 rpm is turning pretty quick. High rpm makes the collective pitch jumpy. High rpm also puts tremendous centrifugal stress on rotor blades. Kalt rotor heads require blades with 18mm thickness at the root, so Kalt blades should be able to handle higher centrifugal loadings. Note that Schluter, GMP, Heim, Hirobo, and X-Cell all use blades with only 14mm root thickness. One drawback of using 18mm blade root is that we can no longer use off-the-shelf fiberglass and wood blades designed for all other 60-size helicopters.

On mine and my friends Excalibur, we noticed air resonance phenomenon if the main rotor rpm fell to 1500. This is the only reason why I fly at 1700 rpm. I would have preferred to fly around 1500 to 1600. The symptom of air resonance is that the fuselage will rock fore/aft or side-to-side by itself. Air resonance is a self-induced oscillation due to blade lead-lag frequency coinciding with fuselage fore/aft pitching or lateral rolling natural frequencies. In Excalibur's case it is a fore/aft oscillation, because the lead-lag frequency coincides with body fore/aft natural frequency. Note, every helicopter has different body frequencies. In the Cyclone's case, it has fore/aft oscillation at 1400 rpm and lateral oscillation at 1550 rpm. Therefore, I fly my Cyclone at 1750 rpm to avoid air resonance. At that rpm it flies beautifully, but sounds kind of scary. By the way, I could have flown my Cyclone at below 1400 rpm, or at between 1400 and 1550 without any resonating effect. But the rotor rpm can fluctuate during different flight conditions, thus you may inadvertently get too close to 1400 or 1550 rpm. For example, Excalibur has a fore/aft resonating problem at 1500 rpm. As I fly my Excalibur at 1700 rpm, there is no oscillation. But in an autorotation maneuver, rotor speed will bleed off at the end of the auto. As main rotor speed decays, we noticed the Cyclone or the Excalibur nodded and oscillated at the end of an auto. People have suggested lubricating the rubber O-ring. We tried that and it did not eliminate the problem. Weighted blades help a lot. Modelers in England suggest removing the brass bushing that holds the teetering pin. But I don't like that idea because then the floating axle may pull closer to one blade than the other. I did notice that after 50 flights or so, the oscillation problem almost disappeared, but it would still nod a little at low rotor speed. However, during normal flight condition, the Excalibur is as steady as a rock. Just keep the rpm at 1650 to 1700. (The instructions say 1600-1650.)

I have tried two exhaust systems on the Excalibur; a standard Kalt side exhaust muffler and a Hatori U-shape tune pipe. The Kalt muffler is extremely quiet, and it is designed to fit in the groove molded in the

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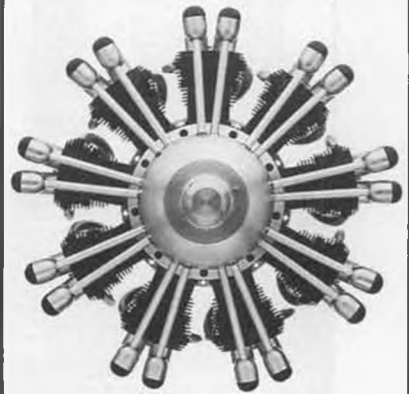
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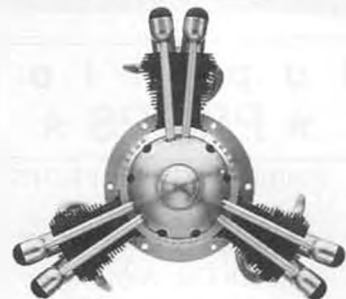
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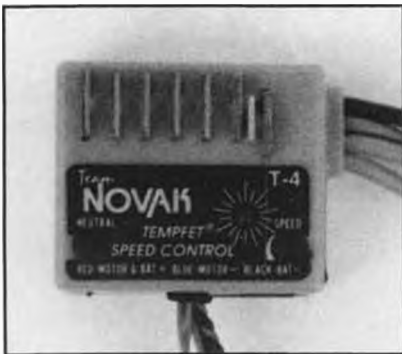
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canopy. I like this muffler very much. You do need to install a pressure nipple on it for pressurizing the fuel tank. I like to fly fast and push my helicopters to Mach 1, therefore, I sent my OS 60 SFNH engine to Miniature Aircraft Supply for Blue Printing. MAS claims their special engine Blue Printing technique will increase horsepower. We believe engine timing was raised because MAS says now a tuned pipe must be used. A Hatori tuned pipe distributed by Futaba was then installed. The Hatori #765 header was used. This header was intended for Schluter helicopters. Put the header in a vise, and heat it up with a hot air gun, then bend it clockwise 15 degrees, it will allow the pipe to fit the Excalibur perfectly. Look at the picture for the shape. Do not use a torch, it will melt the header (this idea was offered by Frank Dykes).

The new MAS/OS 60 engine with Hatori pipe is a powerhouse. There is a noticeable 20% increase in power. What more can I say; the combination works... a nice power increase without hurting the idle. I asked Ted Schoonard what he did to the engine, he said that's a secret. Of the noticeable power increase, some may be due to simply adding the tuned pipe, and some can be attributed to engine rework. The Hatori pipe is about \$90, the header is another \$35, and the MAS Blue Printing modification costs another \$70. So, just ask yourself, do you really want that extra 20% in horsepower to blow your fellow club fliers away? The pipe does reduce exhaust noise even further, so in this respect, it is a nice investment. And it looks serious! Frank Dykes says a Whisper Tech muffler will also give power increase. I have not tried one, so I can not give you a comparison to the Hatori pipe. For now, I am very happy with the Hatori pipe.

The kit came with narrow-chord main rotor blades. I found that they do not load up the engine sufficiently. I am now using a pair of wide chord rotor blades such as used on the X-Cell or Schluter Champion. The Excalibur does better aerobatics with wide chord blades (Kevin, are you taking notes?). I have also tried a pair of Miniature Aircraft Rotorsport Pro Kevlar fiberglass blades. The ones I used were designed for X-Cell. They had a symmetrical airfoil and weigh about 185 grams. Because they had a 14mm root section, two 2mm washers were added to increase the blade root to 18mm. The machine was extremely stable with these fiberglass blades. The blades were made in Austria for MAS, and they came pre-balanced and ready to use. Yes, they really didn't need any balancing. I just bolted them on and there were no vibrations from the blades. The best thing about them is that the Excalibur does beautiful slow, floating autorotation with these blades. Yale sells weighted wood blades with 18mm blade root for Excalibur, but they only weigh about 170 grams each so you cannot stretch the auto for a long time. Both of these blades have wide chord. Yale's pre-built wood blades are \$55. MAS glass blades are \$139, but they are a work of art. They come in shiny white gelcoat finish, and have sawed-off tips similar to Sitar blades.

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A set of Len Mount's fiberglass blades with reflexed airfoil was also tried. But the result was horrible. The model was not as stable in hover, and it was jumpy. But that same set of reflex blades was great on my Legend. Len also used that same reflex blade to win seventh place at the World Champs. Well, this simply means a set of blades will work more optimally with one particular helicopter than another. I found Excalibur seems to like heavy, wide chord, symmetrical airfoil blades. GMP helicopters seem to like reflex blades. The GMP Cobra flies great with MAS Rotorsport wood reflex blades.


Well, what else can I add to describe the kit? The plastic main gear is very nice, it looks like it was machine cut, rather than molded. I had a discussion with a colleague, a fluid dynamic professor, regarding the correct direction for angling the cooling fan blades. Kalt and Hirobo have their cooling fan blades angled in opposite directions. While GMP and X-Cell simply have their blades straight out. The conclusion is that we are not sure which direction is best. Then my friend recalled that he knew an M.I.T. professor once conducted an experiment to find the best blade angle for a water pump. After umpteen designs, he discovered that they all worked about the same!

Well, the engine in my Excalibur seems to cool down just fine. One reason is the Excalibur has the best cooling shroud on the market. Most cooling shrouds, like X-Cell and Schluter, leave the bottom of the shroud below the fan open. There is a back plate underneath the cooling fan, but the centrifugal fan works on the principle of throwing the air out against the shroud wall, and whirls the compressed high pressured air to the cylinder head. The opened bottom shroud allows the high pressured air to escape, which reduces efficiency. Excalibur's cooling shroud is closed on the bottom, thus the efficiency is increased by at least 20%. This deserves an 'A' in shroud design.

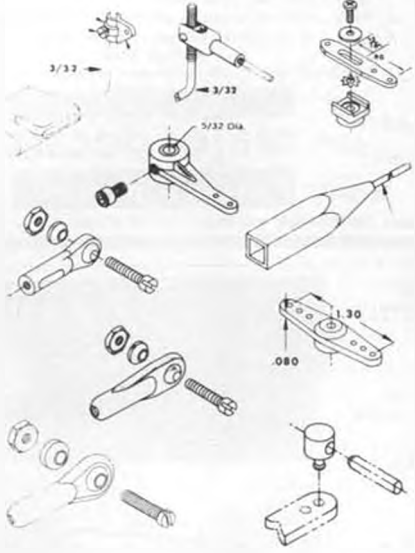
Please do not forget to cut a hole in the shroud for the engine carburetor, the instructions forgot to say so! Also, when installing the seesaw collar on the flybar, make sure that the collar with the shoulder side faces the seesaw bearing.

The tail rotor on Excalibur is on the right side, while most models have it on the left side. For helicopters with a clockwise rotation main rotor, the tail rotor should be on the right side to achieve higher tail rotor thrust efficiency, because it's better to have the tail rotor thrust blow cleanly away. You do not want the tail rotor thrust to impinge on the vertical fin and tail boom. Seems like Kalt has done its homework. Modern designs like Concept 30 and Legend all have the tail rotor correctly facing right.

Finally, there were no parts missing. All ball bearings were pressed into the parts by the factory. It is a highly prefabricated kit, and attention to detail was done at most places. For example, the tail rotor drive wire was ground flat by the factory to ensure the tail rotor drive shaft would not slip at high rotational speed. The starting shaft was also

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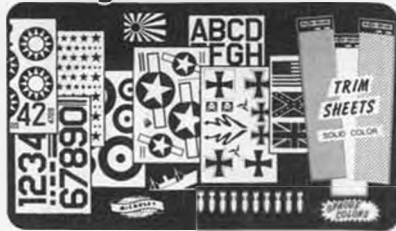
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ground flat, to ensure the starting cone set screw will seat properly. But the instructions forgot to mention adding grease at all moving joints! Use your common sense and add oil and grease. I am very happy with this model. I hope the replacement parts will come soon so I can continue the flight test and report the second half to you next month. Stay tuned. Next month we will cover programming the JR PCM-10, setting up the Excalibur for aerobatics, and discuss the high performance JR-120 gyro. **MB**

SPARKS Continued from page 51

Peterse with Carl Goldberg at the Toledo

Trade Show tells it all.

The photo is particularly interesting as this was the last time Carl attended the Toledo Show. Art Peterse was just tickled pink to have Carl pose with him and his red and yellow transparent MonoKote covered Sailplane, one of Goldberg's outstanding designs kitted by Comet Model Supply Co. **READERS WRITE O.M.T.**

One of the best-looking Dietrich "Convertible" Class C rubber models is seen in Photo No. 13. Built by Mark Sexton, 8717 17th N.W., Seattle, WA 98117, the Convertible is an excellent model for the Commercial Rubber event.

Mark comments it should fly great if and when he gets it sorted out. This writer has yet

to sort out the glide properly. Looks good under power!

IS YOUR DIESEL DIESELING?

Just received a most informative booklet from Eric Clutton of 913 Cedar Lane, Tullahoma, Tennessee 37388, that is probably the most informative publication on the art of starting and running a diesel (compression ignition engine to you).

Eric has been the distributor in the USA for P.A.W. (Progress Aero Works) diesel engines for as long as this writer can remember. As Eric says, he has been in modeling for fifty years and has never owned a flight box or electric starter. The only essential item is a wiping rag (that fuel with ether does have a smell all its own) which can be easily carried in the back pocket.

To show the reader Eric flies what he sells, Photo No. 14 shows a Flying Quaker (taken at last year's SAM Champs at Lawrenceville, Illinois) with a diesel conversion of a Merco 35.

This writer is quite enthused over this book; he highly recommends you invest \$10.00 immediately (add \$1.00 postage). Anyone who cannot start a diesel engine after looking the book over better take lessons in reading comprehension.

SAM EXPANDS

According to Jim Adams, SAM Prexy, in a telephone call, the latest Chapter to form is SAM 78 based in Svitavy, Czechoslovakia, headed up by Jarslov Rybak. As proof that things are loosening up in the Soviet sphere of influence, this is the first SAM Chapter to be formed behind the Iron Curtain.

Rybak indicates they have better than ten members to start. If the old timers grow as this writer has witnessed, this club should be a major modeling club in a year or so.

Adams also indicates that with interest growing in a SAM European Champs, Austria will be the next nation to found a SAM Chapter. Great stuff!

OLD TIME CONTROL LINE

We recently received a photo from Glen Allison, 7417 E. Edgewood Ave., Mesa, AZ 85208, via Howard Osegueda, of an unusual control line model, the "Dreamer" manufactured by Eagle in 1945/46.

As seen in Photo No. 15, the Dreamer is powered with an Ohlsson 60. Glen sez it started on the second flip after 35 years in storage!

Allison hopes to fly this 1946 Ohlsson 60 powered model in the Nostalgia Control Line Contest at Tucson, Arizona. In talking to the Contest Director, Glen was informed that the competition flying will be over by 1:00 or 2:00 p.m. Then the circles will be cleared and the fun flying starts. This should be a fun meet. After all, that's what it is all about, right?

THE WRAP-UP

At the last SAM 21 meeting, this writer was struck by the thinness of Carl Hermes, who was attending in the company of his son, Bill. Carl thoroughly enjoyed the meeting hi-jinks, show and tell, and just the all around camaraderie. Bill was so pleased he wrote me a letter commending the actions of

SAM 21.

Despite all our hopes, I received a telephone call from Bill stating his dad had died from cancer one week later, on March 17th, at the age of 68. Carl is survived by his daughter Barbara, granddaughter Carrie, son Bill, and first wife (mother) Louise.

Carl can be remembered for his good flying O.T. design known as the Hayseed. As can be seen in Photo No. 16, the model not only looked good but flew just as well. Quite a few have been built with good results and this electric powered version by Don Hughes is no exception.

Although Hermes was characterized by his quiet demeanor and soft talk, we are going to miss his easygoing manner. Here's hoping you have joined the gang up there where they have no crackups, only "max" flights. **MB**

HANNAN'S *Continued from page 53*

membership.

The Detroit Cloudbusters model airplane club is donating a Walt Mooney Trophy to the Flying Aces Club Nationals, according to Don Campbell. The design concept is the work of artist/modeler Pres Bruning, who is well-known for his outstanding productions.

Model Builder readers who may feel moved to make memorial contributions in Walt Mooney's name may send them to your choice of: The National Free Flight Society, 2810 Chiles Road, Suite B, Davis, California 95616; The San Diego Aerospace Museum, 2001 Pan American Plaza, Balboa Park, San Diego, California 92101; The American Heart Association, P.O. Box 3625, San Diego, California 92103. Thank you.

Walt Mooney's Peanut plans will remain available, with the service being operated by his son, Douglas Mooney. The first five "Bags of Peanuts" construction drawings are \$5 each, postpaid from Doug, at P.O. Box 231192, San Diego, CA 92123. **MB**

CONTROL LINE *Continued from page 57*

behind the imaginary straight line to the CG. The pull through the lines aims at the model's CG—the CG 'tows' that end of the lines. The sag—or rake—angle depends on the model weight, line diameter and line length. I didn't 'forget' to mention speed: speed affects both line drag and CF, in exactly the same way. Speed does *not* affect rake angle for the same model weight, flying radius and line diameter, under most conditions. The exceptions don't count unless you are at the top end in speed.

"The angle, caused by 'sag' behind the straight imaginary line, can be calculated. We've mentioned the CG as our imaginary target: The rake angle is the direction in which the lines apply CF or pull, when they get to the leadouts. The leadout guides should be where they point the pull straight at the CG. If they aren't, they cause a force that does not pass through the CG. It forms a

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moment' which wants to yaw the body away from right angles with our imaginary line. The model will crab one way or the other, and not fly as streamlined as it should.

"If the model is pulling six pounds, and the guides aim the pull two inches ahead of the CG, the moment is (force times distance) 12 inch-pounds, or one foot-pound. It is exactly the same as if something were pushing the tail out with a force of 12 pounds, one inch behind the CG. *Not a safe condition!*

"So, leadouts must be where model weight, flight radius and line diameter point CF carried by the lines at the CG location along the rake angle. There is no single answer to what the rake angle should be. No two

models weigh exactly the same. The flier's arm extension is part of the flight radius. Going from .015-inch to .018-inch lines, or from 51-foot to 65-foot lines changes it.

"John, you're correct that rudder and thrust offset are minor factors. If the engine pulls four pounds and offset is five degrees, the 'outward' part of the thrust force is just over 5-1/2 ounces. Not much compared with from six to 15 pounds of CF, eh? But when things go slack, live with the 5-1/2 ounces—it may be all you get. The fin and rudder can help keep the model tangent, or at right angles to the imaginary flight radius. And besides, I fly a lot of stunt; stunt planes without rudders don't look right.

"Something else: the 'curve of C/L flight.'

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The distance around one level lap lets us say the model thinks it is flying very close to *straight!* A little math to see this?

"From the CG of a large (four-foot-long) model to its prop may be 1.5 feet, so from CG to tail is the other 2.5 feet. These numbers let us figure out the angle caused by the circular path. Playing with geometry, you can prove for yourself that the 'automatic offset' of engine and tail are the same as the angle between our imaginary line to the CG and an imaginary line to the prop (or to the tail).

"On 60 feet, with two-foot arm extension, and a two-foot inboard wing from the CG to the line clips, our flying radius is just about 64 feet. Sag doesn't change much at all.

"Now let's do some basic trig. Imagine a right angle formed by the imaginary line to

the CG, the line from CG to prop and—if you want a complete triangle—an imaginary line from the prop back to the handle.

"The tangent of an angle is the ratio of a right triangle's opposite side to its near side (not the hypotenuse). Still with me? If the prop is 1.5 feet ahead of CG, and the flight radius is 64 feet, the tangent works out to 0.023, so the 'automatic offset' is about 1.3 degrees.

"When we go through the same process for the tail, 2.5 feet back from the CG, the tangent comes out to 0.039, and even a straight fin/rudder has 2.3 degrees of offset. One of the first guys to notice this was Hal deBolt, in the late 1940s-early 1950s. His Speedwagons had curved fuselages, and in-thrust. As John points out in his April column, in-thrust is still a good trimming trick,

mostly for speed and racing where CF can get humongous.

"Think about the numbers I just ran by you. We didn't make clear where on the tail we were talking about when we said it was 2.5 feet back of the CG. A few inches back there doesn't make much difference for this calculation. We used the back of the prop because it is easy to measure, and the engine thrust is applied to the model there. Also, a four-foot-long model is big, even for .60 stunters. The 'automatic offsets' are smaller when the models are shorter.

"Over the years, I've found a few articles and reports which help put numbers on things so I could figure out which ones are important. I also enjoy bashing BASIC. So, I've developed a GW-BASIC program to design C/L models, mainly stunters.

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"It works. My last four or five computerized designs have no adjustable tip weight or leadout gimmicks—they don't need any. I only use such gizmos when a design is so offbeat that the program might not get it right.

"There's a lot more that I've studied—and confirmed by flying—that doesn't get any more technical than this. If you use an IBM compatible, I might be talked into furnishing a disk with my design program. The program is posted on CompuServe's ModelNet, in DL5, as Stunt.IIC, if you want a look at it without much documentation or instructions—it does need some."

Our thanks to Lou Crane for this excellent treatise on line rake. IBM computer users may want to sneak a peek at Lou's data.

Nagio Forbes, of Glenview, Illinois, takes a look at the same topic from a slightly different angle (rake?). Here are his comments:

"Couldn't resist commenting on the T. Stephens line rake letter in your last column. He mentions several designs and observed that none used line rake, just engine and rudder offset to achieve line pull—not a correct observation, at least as far as the 'All American' was concerned.

"One of the main points of this design was that it did not use engine or rudder offsets (or outboard tip weight) to achieve line tension, this (presumably) being accomplished by the extended inner wing panel. In fact I suggest that deBolt *did* use wingtip weight in

the sense that the fuselage was offset to the outside of the circle and that his models were kept out on the lines during the critical takeoff phase by engine torque (he flew clockwise, remember?).

"In any case, line rake is a difficult concept to discuss because, in a real sense, there ain't no such thing. The angle measured between the leadouts and the fuselage center line isn't relative to nuttin' nohow any more than it signifies squat just where the bellcrank is located! What is important is the location of the leadout guide in relation to the center of gravity! (Note that, in different terms, Nagio is saying basically the same thing Lou said above—jt).

"And I repeat—you can bolt the bellcrank to the engine or fasten it to the tail skid and the model will fly just fine as long as the leadouts exit the wingtip in the proper place. The only reason for putting the bellcrank in the 'traditional' location is to avoid the mechanical problems attendant upon bending the leadouts around corners; again, the important thing is the relative positions of the CG and the leadout guide.

"Do not take my word for this. Do what we did—take a Guillow trainer, leave the line guide alone, move the bellcrank anywhere on the airplane and it'll fly fine, but move that line guide any great amount and you'll either get some interesting flights or (more likely) some wild crashes.

"But (the man wants to know) how can you tell where that point is? Well, find the

CG, draw a line through it angling back 10 or 12 degrees from the fuselage center line and where the line leaves the wingtip will be pretty close to right, but the *exact* best location will vary on the length, weight and drag of the control lines. Thick, heavy lines made of twine need a more rearward location than .010 music wire. That, after all, is why they make adjustable line guides. (Again, here Nagio is presenting a trial/error version of the same concept Lou discussed above—with the force of the lines pointing at the CG at the fuselage centerline—jt).

"The line guide location also has a lot to do with the 'Ringmaster wobble.' It is seen when attempting tight (or square) corners. At this point the flier is usually using full up or down elevator and the model is, literally, being restrained by only one control line, which probably exits the wingtip an inch or more ahead of or behind the 'proper' location. Best bet here is to separate the leadouts vertically so they both exit at the same fore-and-aft location. (With racing planes that have internal line connectors, a common practice is to have both lines exit the same hole. This could be done with leadouts if the connectors are staggered to avoid entangling of the clips—jt).

"Engine offset has relatively little effect (as compared to line guide position) and the only reason a control line model needs a vertical fin is for reasons of appearance. Consider the vertical fin area of any combat model—or just contemplate the effect on

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the sponsor of some major contests such as the annual Internats and the 1986 Canadian Nats. However, in 1989 there was some ugly political division within the VGMC and a new club has been formed by some of the former VGMC control line members. Some apparently still belong to both clubs and some have stayed with the VGMC.

President of the new club is combat star Lyn Murray, vice-president is Larry Bell, and secretary-treasurer is Barbara Bell. Frank Boden is editor of the newsletter, *Airwaves*.

Let's hope peace can settle over the Vancouver area and the fun of flying can be restored.

As always, your contributions of club news, photographs, technical tips, contest information, and questions help make this a democratic and informative feature. Send them to John Thompson, 1520 Anthony Ave., Cottage Grove, OR 97424. **MB**

FREE FLIGHT *Continued from page 61*

For further information about these kits or the other materials that George sells, contact him at Champion Model Products, 880 Carmen Court, LaVerne, CA 91750 or call (714)599-3348.

PANDA RUBBER STRIPPING NOTICE

How's that for a headline? Well, it has nothing to do with cute and cuddly bears or some kinky new wave device. What it means is that if you bought some of the Panda rubber that Champion Model Products was importing from China for a brief time, you should be careful with it. It seems that some of the Panda rubber was not very clean and contained contaminants such as grit, dirt, and other foreign objects. In fact, some was so gritty that it ruined the cutting edges of more than one rubber stripper. It seems to me that the best thing you might do with this rubber, unless you have an unusual batch, is to tie it into loops that can be used to hold the wing on your model.

ORIGINAL ZEEK MANUFACTURER IS BACK IN BUSINESS

In the 1950s Premium Manufacturing Co. in California was a major free flight kit outfit. That organization was operated by Bill Cranford, and he tells of thousands of kits that were die-cut, packaged, and shipped around the world in those days. Well, Bill has since moved to Oregon, and he is once again in business as Premium Manufacturing Co. Needless to say, if he were to produce thousands of kits today, he would need to buy storage space for the unsold. However, he is producing a Zeek short kit that contains excellent plans, complete instructions, building and flying tips, a lot of testing time, and a complete hand-cut set of wing and stabilizer ribs. Two versions are available: the Pee Wee 30 Zeek, which has 146 square inches in the 30-inch span wings, and the 286 square inch Zeek, which can be flown with any .049 or .051 engine. This model is Nostalgia eligible and would be a great combination with a Hornet or Space

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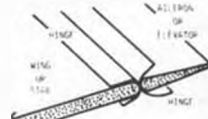
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the stability of your Ringmaster the last time you knocked the rudder off (and haven't we all?).

"Two things that don't have much (if anything) to do with the 'Ringmaster Wobble' are the airfoil and control moments. Leadout position has a small effect but the main one, I suspect, has to do with tip weight, or more accurately, the relation between the amount of tip weight and the weight and drag of the lines.

"Again, it is a matter of observation that this wobble can be made better or worse by changing the diameter and length of the lines and altering the tip weight. One thing that people tend to do is consider only the airplane, forgetting that a control line model

in flight is a dynamic system in which the lines play a considerable part."

Our thanks to Nagio for adding more insight to the line rake discussion. We have made some of the same observations regarding bellcrank locations, having moved them around inside and outside our combat planes for construction convenience—as long as the leadouts are in the right place, bellcrank location has not shown any effect whatsoever.

A FINAL NEWS TIDBIT

Another new club has appeared on the C/L scene, this one in Vancouver, B.C. It's called the Pacific Aeromodellers Club.

Vancouver has for 50-plus years been home to the Vancouver Gas Model Club,

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NEW OLD TIMER MODEL SUPPLY CATALOG

I just received the newest catalog from Ken Sykora's Old Timer Model Supply. This is a small but jampacked illustrated listing of what you can buy from this cottage industry source. However, if you are really turned on by the rubber powered movement, then this is one of the prime sources for supplies, such as balsa, bamboo, plywood, rubber lube,

nitrate dope, tissue of various types and colors, and other goodies. Additionally, Ken handles both black and tan FAI rubber in smaller amounts than the standard skein, free flight books and publications, rubber winders and stoges, and probably at least 500 plans from current to ancient. So, if you want to know exactly what he has, contact him at Old Timer Model Supply, P.O. Box 7334, Van Nuys, CA 91409. Send two bucks and you'll get your own catalog to peruse.

One of the neat things Ken does is to include clever or poignant quotes in some corners of the catalog. It's fun to search them out and savor their reading. One example to pique your curiosity: "While you're putting off starting that next model, just remember life is what happens... while you are looking at more plans."

AND FINALLY, HOW ABOUT A MIDYEAR HOROSCOPE?

I've never been a reader of those horoscopes that appear in the newspapers, but I always read my Chinese fortune cookies. So, in the same spirit, here are some specially tainted horoscopes for free flieters, compliments of the Minneapolis Modeler, who swiped them from the San Diego Aeroneers newsletter, Aero News, edited by Jim Alaback.

ARIES (March 21-April 19): Romance will pass you by if you insist on staying in the basement. Seek legal advice before coming upstairs.

TAURUS (April 20-May 20): Your stubborn attempts to fly in high winds will only bring you grief. Cancel all plans and drift aimlessly.

GEMINI (May 21-June 20): Try a twin pusher, chew Doublemint, double your fun. You have every reason to be suspicious, but for reasons you will never know.

CANCER (June 21-July 22): The good news is that you will find that engine you have been looking for for years; the bad news is your wife will be with you.

LEO (July 23-Aug. 22): Your parents will continue to badger you about why you still spend good money on this junk. Don't forget to wash the dishes regularly.

VIRGO (Aug. 23-Sept. 22): You're not as smart as you think you are. A fat lady will sit on something special in your workshop.

LIBRA (Sept. 23-Oct. 22): Stick with hand launched gliders—something your limited intelligence can cope with. Be careful of saying "I love you" to the wrong stranger.

SCORPIO (Oct. 23-Nov. 21): Your trail bike may run out of gas at a critical moment. Your past catches up when your spouse goes revenge shopping.

SAGITTARIUS (Nov. 22-Dec. 21): Whenever you go flying, keep a sharp lookout behind you, someone is out to get you. Eat a lot of chili this month; you will be free at least.

CAPRICORN (Dec. 22-Jan. 19): Clean up your workshop this month—you will find something precious you lost 25 years ago. You aren't getting older, you just look like it.

AQUARIUS (Jan. 20-Feb. 18): If you thought last year was bad, you ain't seen

NEW!

BY POPULAR REQUEST LARGE SCALE ENGINE CYLINDERS

PRATT & WHITNEY WASP



WRIGHT J-5 WHIRLWIND

Molded of high-impact styrene, these dummy cylinders feature deep cooling fins for utmost realism. Both the Wasp and Whirlwind types of cylinders are available in two different large scales: 1/5th (2 1/2" = 1') and 1/4th (3" = 1')

Kits include assembly instructions. Smaller sizes are also offered.

Note: These units may be modified to resemble other cylinder types.

Send \$3 for full-color catalog, featuring aircraft paintings suitable for framing.

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nothing. Cowling in your Rossi and slapping on Ohlsson decals will fool no one.

PISCES (Feb. 19-March 20): Yield to carnal passion if you must, but avoid picking your nose while using CA glue. You will feel out of control and inferior. This is normal!

SO, THAT'S IT DEPARTMENT

Thanks for sticking with me for another month. I hope you enjoyed the information about rubber modeling. Please follow up with orders to some of the manufacturers, if you want to get yourself into this really enjoyable part of the free flight hobby.

That should do it for July. I hope you are having a good contest summer. I hope I do. Thermals to all.

MB

HOW TO GET H



M-TC-FM Trainer Cord

You're ready for takeoff with Futaba's new Conquest Series. These are the systems that can take you from fledgling flyer to confident RC pilot, and make it easier than ever.

CABLE READY. FM. AND MORE.

The Conquest 4NBF is a perfect first system with everything a beginner could ask for, and then some. For starters, the FM signal of

the 4NBF has superior noise rejection to ward off increasing interference, and, of course, it's 1991 ready. The 4NBF also has servo reverse for easy installation, adjustable control sticks for a custom fit and it's equipped with transmitter and receiver NiCd packs.

And with its built-in trainer system all you need is our optional trainer cord to make teaching or learning a breeze.

THE SYSTEMS FOR 1991 AND BEYOND.

Conquest 4NBF, 4NBP, 6NFK and 6NPK systems all use state-of-the-art, dual conversion 1991 receivers. The 4 and

6 channel FM systems use the R127DF, which utilizes SMT assembly, ceramic and crystal filtering

and voltage regulation. Conquest PCM system receivers are equipped with Futaba's exclusive PCM microprocessor to further reduce the possibility of glitching and interference.



The heart of the new R124DP/R127DP PCM receivers is Futaba's custom microprocessor circuitry.

Release the trainer switch and control of the airplane is instantly and safely transferred to the instructor.

The Conquest 4NBF



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HOOKED ON RC.



PCM

The Conquest 4NBP and 6NPK



CONQUEST SYSTEM SPECS

System	Signal	Receiver	Servos(#)
4NBF	FM	R127DF	S148(3)
4NBP	PCM	R124DP	S148(3)
6NFK	FM	R127DF	S148(4)
6NPK	PCM	R127DP	S148(4)

PICK THE PERFECT CONQUEST FOR YOU

There are four new Conquest systems to choose from.

The Conquest 4NBP is identical to the 4NBF, except it's Futaba's first 4 channel PCM system and includes our R124DP receiver. If it's more channels and features you need, consider the Conquest 6NFK or 6NPK.

These 6 channel FM and PCM versions incorporate dual rates for aileron and elevator plus a retract switch and a 3-position sixth channel.

Take off with confidence. Futaba Conquest systems offer the number one combination of features, value and performance, whether you're a novice or just looking for a high quality second system. And like all Futaba radios, Conquest systems are covered by our full year warranty.

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The Conquest 6NFK



HEART OF A NICE FLIGHT. DIGITAL PROPORTIONAL RADIO CONTROL SYSTEM.

FP-T6NFK

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