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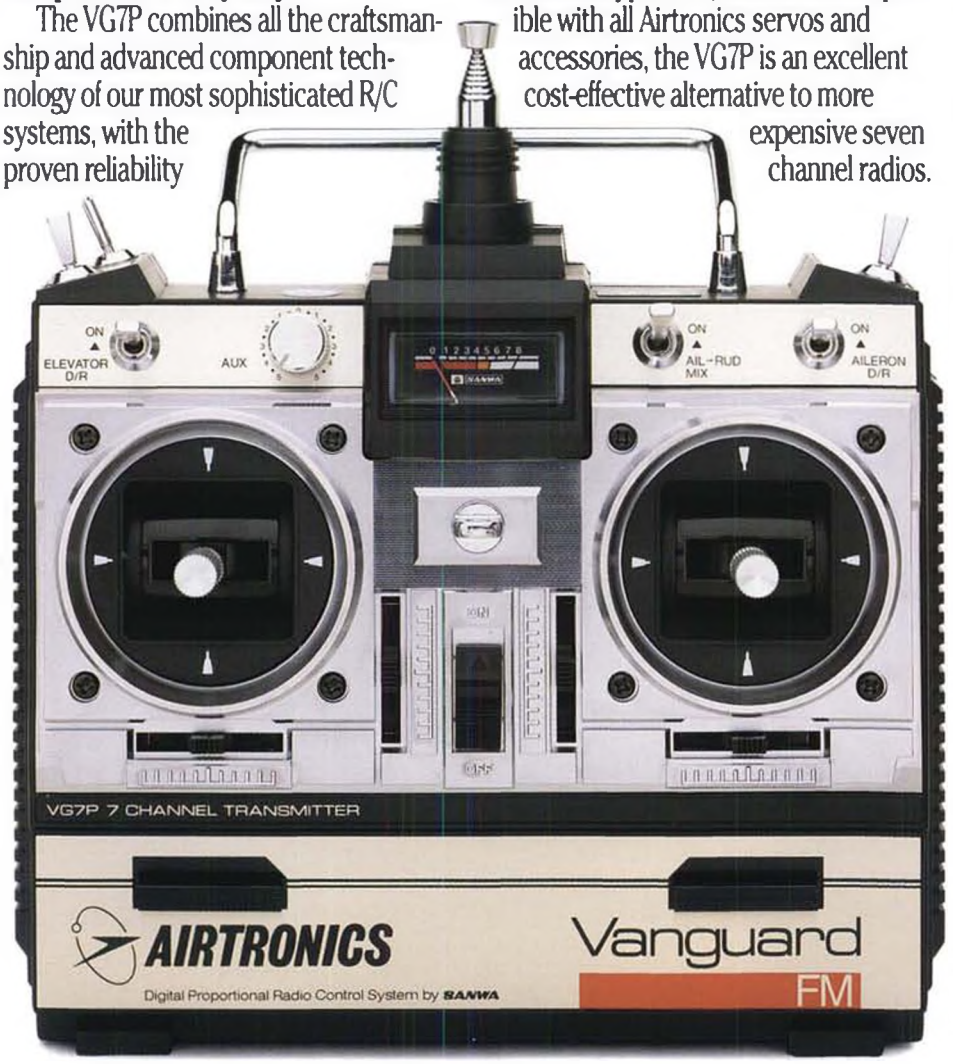

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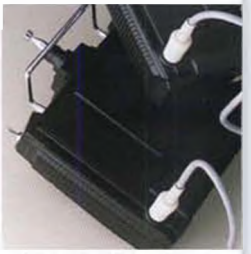

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FIGHTING COLORS Glory Days of U. S. Aircraft Markings 1930-1990, Dorr. A look at the markings, insignia and nose art of the combat fighter. Once bright, vivid, splashy colors decorated these planes, gave courage to their pilots and evoked fear in the enemy. Today these markings have given way to drab, low visibility paint schemes so the combat pilot can hide in the invisibility of the vast sky. But occasionally a pilot dabs on a few splashes of brightly colored paint even on today's high-tech jets. Sfbd., 9" x 10 1/2", 128 pgs., 80 color ill. Books shipped 4/15/90.....3187B **$19.95**

WARBIRDS WORLDWIDE DIRECTORY, Chapman and Goodall. A truley monumental compilation of the whereabouts and previous ownership of warbirds known to exist throughtout the world. Notations indicate model aircraft, serial number, N-number, location and dates of ownership of each. Thousands of listings. Wonderful reference volume, a must for warbird buffs. 100 photos, half in color, 321 pgs., 6" x 8", sfbd. 1533D **$24.95**

COVERING MODEL AIRCRAFT: R/C Handbook, Peacock. Covers model skins and their effect on performance, from traditional oiled silk to high-teck films. Includes how to finish and detail the model. 64 pgs., 80 ill., sfbd., 7" x 9 1/2".....3195C **$9.95**

MOULDING & GLASS FIBRE TECHNIQUES: R/C Handbook, Holland. Covers easy and affordable techniques to make your own canopies, cowlings, fuselages, and wing skins. How to build a home vacuum-form machine, heat formed plastics, make composite spars, strenghten structures, rubber moulding, casting and superior finishes. 64 pgs., 80 ill., sfbd., 7" x 9 1/2".....3193B **$9.95**

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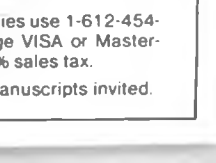

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ON THE COVER

"The Snowbirds" Canadian jet aerobatic team, celebrated its 20th Anniversary season by participating in the 1990 National Championship Air Races in Reno. The "Snowbirds" fly CT-114 Tudors, Canadian-built military jet trainers powered by a General Electric J-85 engine producing about 2,700 pounds of thrust. Top speed, with smoke tanks attached, is 470 mph. Photo by Felix Vivas, whose photo coverage of the 1990 Air Races in Reno will appear in a future issue. Insert: Twice As EEE-Z RC Twin, By Al Wheeler.

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BY BILL NORTHROP

BILL NORTHROP'S WORKBENCH

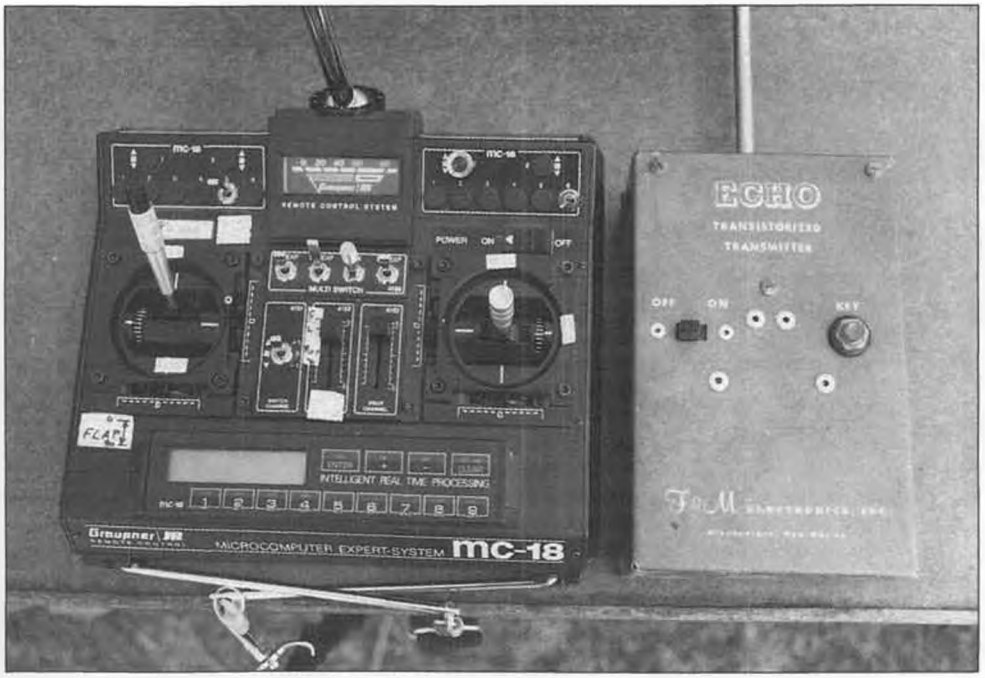
Past records show that during times of economic stress, such as we are now experiencing, that quite obviously, sales, especially of non-essential goods, but even of those that are essential, take a serious plunge. Past records also indicate that there is an increase, during these times, of inexpensive, close-to-home, leisure activities. It is pretty logically claimed that the reason for this is to relieve financial worries, and to get troubled minds off these and other related problems. To do so, the general public turns to simple recreational pursuits; hiking, camping, sandlot sports, and of course, hobbies.

Does the idea that hobby activities can increase during times of economic stress bode well for our industry? Well . . . maybe. There's a catch-word in the line of thought, however, "inexpensive."

Let's jump right into the subject of the model airplane hobby. In the three categories of our model hobbies . . . airplanes, boats, and cars . . . boats are probably the oldest, simply because they were around before airplanes and cars. And though motorized wagons were running around

Seen at Selinsgrove reunion, Labor Day Weekend. Midwest's Frank Garcher demonstrates classic form launching double-size Midwest (what else?) Esquire. Note both feet off the ground. Somehow the plane doesn't look that big with Frank launching it!

Hal Parenti adjusts brand new engine as Jimmy Grier gets ready to fly his Royal Rudderbug. It flew well once the engine had a few break-in runs.



We've come a long way, Baby! Walt Good's Graupner/JR Microcomputer Expert transmitter dating back to the early 1960's.

ADVICE FOR THE PROPWORN—
BY JAKE

CLUTCHES, PRAYER & DEBONDER

before Gustave Whitehead and the Wright brothers got their act together, model airplanes seemed to have jumped the gun on cars . . . probably because small enough engines weren't available for car modeling until they had been developed for model airplanes.

The model airplane hobby in the early 1930's, immediately following the Depression, consisted of two categories; solid models and rubber powered flying models or gliders . . . that was it.

The solid model kits included a balsa block for the fuselage, and sheet wood for the flying surfaces, a set of three-views that were your full-size plans, a few hardwood sticks for landing gear and wing struts, possibly turned hardwood wheels, and possibly cast lead radial engines and props. The fancy kits had the wing and tail outlines printed on the sheet wood! Some even had small vials of paint for finishing the models. Prices ranged from 10 cents up to as much as a dollar.

With 10 cents worth of model kit, you could spend many pleasant hours, cutting shaping and sanding your fingers, along with the model parts!

Stick-n-tissue models, those intended for flying of some sort, were also available in kit form for as low as 10 cents. For a kit model about the same size as today's Peanut Scale beauties, you received a set of full-size plans, the proverbial sticks and colored tissue, a sheet of 1/16 balsa with the wing ribs, tip outlines, tail surface outlines, and a few bulkheads and/or formers printed thereon, a saw-cut balsa prop, ready-formed music wire rubber hooks, thrust button (maybe), washers, a length of rubber strand, turned balsa or hardwood wheels, maybe a little tube of glue, and a teeny piece of windshield material. Bigger models, with wingspans up to 24 and 30 inches, cost as much as a dollar or more. Cleveland TOMASCO, and Miniature Aircraft kits were the super-deluxe scale model kits then. They were usually 3/4-inch scale, and included all dopes and glues, thread for rigging, celluloid radial engines, flying and static prop materials, tapered aluminum cowls, the works . . and they cost as much as three to five dollars. Though built up and tissue covered, few modelers attempted to fly them, as the hours and hours taken to build, cover, finish and detail these classics made them too valuable to the builder to risk flight. Besides, building and flying techniques had not developed to the level of today, and they were usually way too heavy to fly.

Sure, we're talking about the times when a piece of pie and a cup of coffee cost a total of 25 cents, and you could buy a brand new automobile for $595 and fill the gas tank for the cost of one gallon of today's 92 octane unleaded (and we're talking "Full Serve," because that's all there was)! However, even at today's costs for materials, one of those super-deluxe scale kits would probably go for less than $40.00. For instance, the fine - performing, Nationals - winning, 24-

continued on page 108

Dear Jake:

I know absolutely nothing about helicopters, but I enjoy watching them fly, especially the scale ones that don't fly upside down or do hot-dog aerobatics. I've always been curious about how they can hook up an electric starter and get the engine going without the rotors turning. I mean, the engine's connected to he main shaft, isn't it? So how can the engine start without turning the rotors?

Well, my curiosity finally got the better of me, so I asked one of them. He said it was possible because of a "centrifugal clutch." I didn't want to advertise my ignorance, so I didn't ask him, but what in the world is a centrifugal clutch?

Baffled in Beaumont, Texas

Dear Baffled:

Yosef Centrifugal was the 7-foot 3-inch center of the 1972 Romanian Olympic basketball team. In the semifinal round against Puerto Rico, he found himself on the foul line with no time remaining and his team trailing by one point. He had only to make one free throw to tie and two to win. Shooting underhand a la Wilt Chamberlain, Yosef's first shot went clear over the backboard and struck a soft pretzel vendor. Changing his style and jump shooting his second attempt, the ball struck an exposed bolt on the backboard superstructure and deflated explosively. So Puerto Rico won this now famous game which ended with the Centrifugal Clutch.

Jake

• • •

Dear Jake:

I am a Christian Scientist. When my Enya .60 became hard to start and idled irregularly, I prayed for it to return to its original working order. It now runs and starts as well as ever. When my retractable landing gear system began to not lock reliably in the down position, I prayed for the elimination of this troubling malady. The landing gear now functions flawlessly. When seven-channel digital RC system started experiencing intermittent signal dropouts, I prayed for a cure of its electronic ills. But on the very next flight, a longer duration dropout occurred and my cherished aircraft plummeted into a stand of trees.

My faith has been sorely tested by this experience. Do you have any insight for me?

Marion in Mayfair, Massachusetts

Dear Marion:

Two out of three ain't bad?

Jake

• • •

Dear Jake:

What's the difference between a two BIT digital array processor and a four BIT microprocessor memory mapper?

Paul Shrenk from Pennsylvania

Dear Paul:

Twenty-five cents.

Jake

• • •

Dear Jake:

Hi, it's me, Tommy Smith. How are you and your family? My little brother's skin graft is healing nicely, but we had to throw his catcher's mask away.

I have a question about those things called debonders. Do they really work? Like if our cat's front paws accidentally got glued to his scratching post, would that debonder stuff get him loose? Or how about if Nancy Papanak's lunch box won't open, would debonder help get the lid off? One more thing, is it safe to use on hair?

These are all hypopotical questions, I hope you understand. It's not that I would ever have to use this debonder stuff. I was just curious.

Your friend, Tommy Smith

P S. Did you know that ear wax and superglue make smoke?

Dear Tommy:

Debonders really do work. In fact, if you had some, you could have removed that piece of pizza that was stuck to the envelope before you mailed your letter to me.

Jake

• • •

Dear Jake:

If you're through with the nonsense in this month's column, could we get on to something serious?

We are losing far too many flying fields and something has to be done about it. So far, you've done nothing to help. Isn't it about time you got off your duff?

Outraged in Oneonta, New York

Dear Outraged:

Hey, if you cant remember where you put

continued on page 74

OVER THE COUNTER

Airtronics Inc., 11 Autry, Irvine, CA 92718, phone (714) 830-8769, announces two new radios, the Caliber 3P with pistol-grip transmitter which is specially engineered for serious boat and car model racers, and the Vanguard VG7P seven-channel two-stick model aircraft radio which offers advanced design features and super narrow band operation at a very affordable cost.

The three-channel FM Caliber 3P is said to be the world's first fully computer programmable pistol grip radio, available on 27 and 75 MHz, and capable of programming into memory three individual model settings. Our world of "lefties" has not been forgotten either, as the handle, for which an optional rubber grip pad is available for the sweaty palm set, is easily reversible.

For the top line competitor who is looking for the fine points in equipment adjustments, the Caliber 3P has Adjustable Steering and Throttle Rate Control, Adjustable Rate Control Point, a Thumb-Activated Steering Dual Rate, Trim Memory, and Steering as well as Throttle End Point Adjustment.

Ya say ya want more? How about a built-in Programmable Stopwatch with Alarm, Plug-In R.F. Modules, optional NiCd Battery Packs, Power Voltage Display, Key Lock protection, Model Select, Display Switch, Data Reset, Data Copy, and Transmitter Battery Alarm?

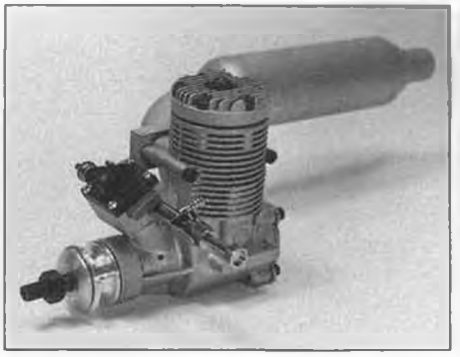
The Caliper 3P transmitter and super selective receiver head up a full line of compatible Airtronic servos and accessories.

The seven-channel FM Vanguard VG7P, designed for the serious sport or competitive model aircraft flier. It offers many fine-point features of more expensive seven-channel radios, such as Aileron/Rudder Coupling, Dual Rate on Elevator and Aileron controls, Throttle End Point Adjustment, Adjustable Low Throttle Trim, Flap-Elevator Mixing, and Total Travel Adjustment on Aileron, Elevator, and Rudder. Other features include rechargeable NiCd batteries, a trainer system, and servo reversing on all channels.

Available with a variety of compatible servo options, the VG7P offers a proportional auxiliary channel, Expanded Scale Voltmeter, high quality precision gimbals,

Airtronics VG7P transmitter.

Airtronics Caliber 3P pistol grip transmitter.


Webra "Quickee 500" .40-size racing engine.

Tower Hobbies 1991 catalog.

Badger Model 350-4 air-brush set.

"Tips on Covering" booklet from Coverite.

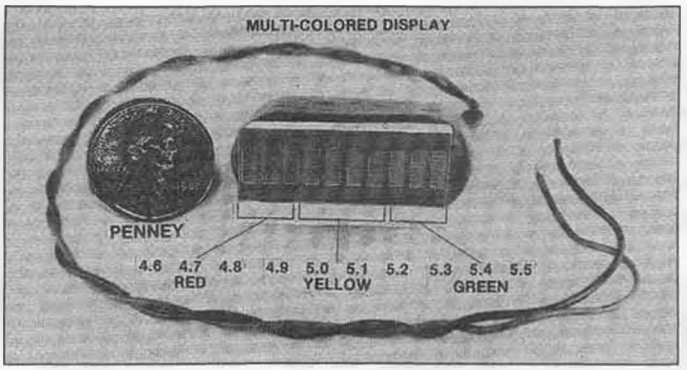
All material published in *OVER THE COUNTER* is quoted or paraphrased from press releases, furnished by the manufacturers and/or their advertising agencies, unless otherwise specified. The review and/or description of any product by *MODEL BUILDER* does not constitute an endorsement of that product,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

electronic trims, three-position flap switch, and adjustable length and tension for the control sticks.

The VG7P also features a compact, Gold Label super narrow band FM receiver with surface mount technology for reliable and efficient operation in high interference areas.

For more information on details and prices of these new Airtronics radios, contact the company, and be sure to mention that you read about them in *Model Builder*.

• • •



Batgraph by James L. Wardrope Astrodata.

Available now at your local hobby shop is the new Webra Quickee 500 engine distributed by Hobby Dynamics Distributors, P.O. Box 3726, Champaign, IL 61826-3726, phone (217) 355-0022, FAX (217) 355-0058. This new .40-size engine is designed with the model aircraft racer in mind, particularly for the Quickee 500 class, but also for anyone who has a 40-size aircraft which has been designed for high-speed flight.

Compared to the standard Webra .40, the Quickee 500 has an all-new cylinder head and combustion chamber which offers much higher compression. The higher rpm developed is the result of the Quickee's heavier crankshaft and new piston/sleeve combination. Equipped with the Dynamix carburetor, it obtains fuel-injection performance because of its flow-through venturi system.

If your local hobby doesn't stock the engine, contact Hobby Dynamics to find out how you can obtain it.

• • •

If you are a model *builder* as well as a flier, and have never used an airbrush, perhaps the time has come to give it a try. Evidence of the kind of results you can obtain show up whenever you examine well finished and decorated models built by prize-winning modelers.

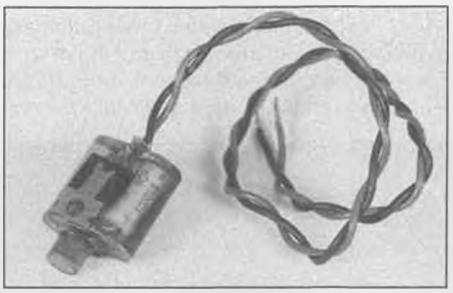
Badger Air-Brush Co., 9128 West Belmont Ave., Franklin Park, IL 60131, phone (708) 678-3104, is introducing its Model 350 airbrush in a set designed for beginning students, hobbyists, ceramists, van and motorcycle painters, and those interested in various crafts.

The set, called the Model 350-4, includes one Model 350 airbrush with medium tip and attachable 3/4 oz. (22cc) jar, fine and heavy fluid assemblies, 2 oz. (60cc) jar with cover, 1/4 oz. (7cc) color cup, 8 ft. (2.45m) braided air hose, 1/4" pipe thread fitting (adapts airbrush to compressor or CO2 tank), wrench for head, and instruction booklet. The whole package has a suggested retail price of $65. Check with your local hobby shop, and if they by chance don't have it, check with Badger for the nearest source and tell 'em we sent ya.

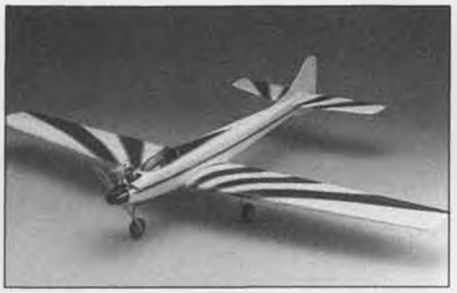
• • •

Watch out! There is a serious threat to your pocketbook, credit cards, and sanity coming out of Champaign, Illinois. It's called the "Tower Hobbies 1991 Catalog", and its exact location is Tower Hobbies, P.O. Box 778, zip code 61824-0778. If you're strong

continued on page 74



Batbug Cycler by James L. Wardrope Astrodata.



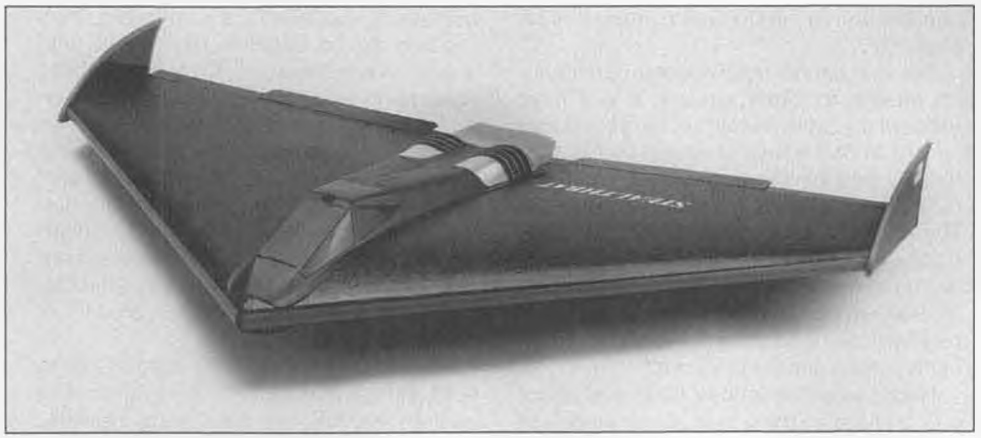
Birdie Ten from Global Hobby Distributors.

Baby Birdie from Global Hobby Distributors.

Elektro-Cat from Hobby Lobby.

Elektro-Akrobat from Hobby Lobby.

Graupner's DG-300 Club Sailplane from Hobby Lobby.



Stealthbat ARF glider by Wing Mfg.

R/C SOARING

BY BILL FORREY

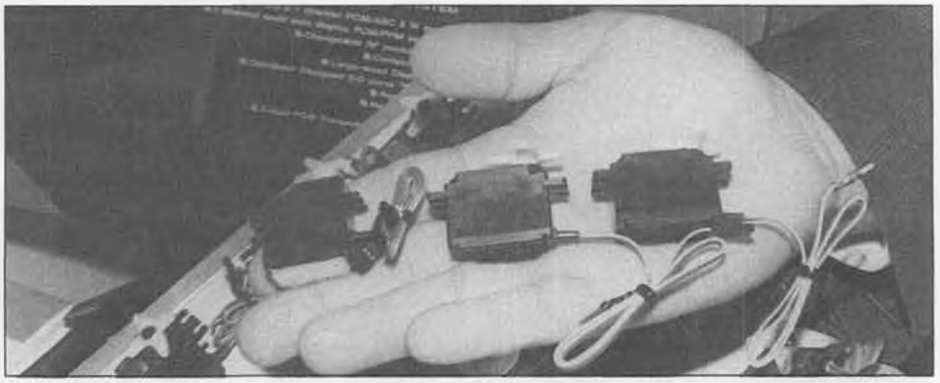
WHAT'S NEW FOR '91?

This year's RCHTA sponsored Chicago Model Hobby Show was a little light in the new sailplane products department compared to previous years. A complete tour of the exhibit hall uncovered no new glider kits. But if you take the nonpurist point of view, one new electric motorglider was discovered in the Robbe booth.

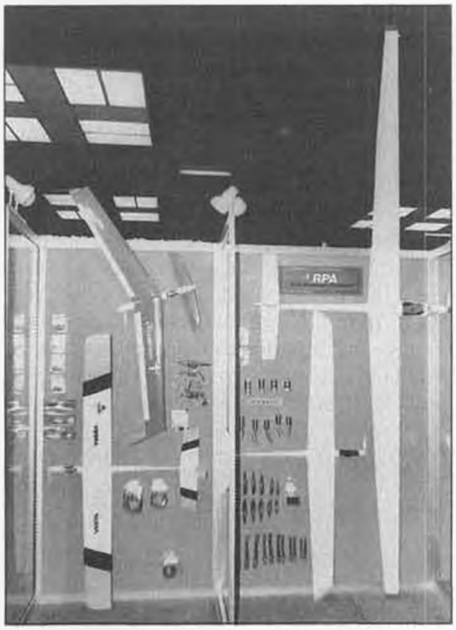
AIRTRONICS

Airtronics showed what amounted to pre-release transmitter samples of the new Infinity Series computer radios. Until the RCHTA Chicago Show, Airtronics had only given "sneak peeks" at a beautifully finished wooden mockup of the basic transmitter case. At those times, the press was asked not to print anything due to the fact it was far too early for a full announcement. Well, the Infinity Series is now close enough to production that we can show you an actual sample and tell you what it will do. By the time you read this (January 1991), at least one Infinity, the 600A six-channel, will be available.

Airtronic's revolutionary new Infinity 600A transmitter is a total visual departure from existing designs. Inside resides a computer programmable sailplane radio. See text.



Hobby Dynamic's JR Propo line of 1991 certified radios includes the computer programmable X-347 and these micro servos which have found favor with many sailplane modelers because they hide inside wings so well. L to R: JRS311 metal gear micro, JRS321 ball bearing micro, and JRS3021 coreless BB micro.



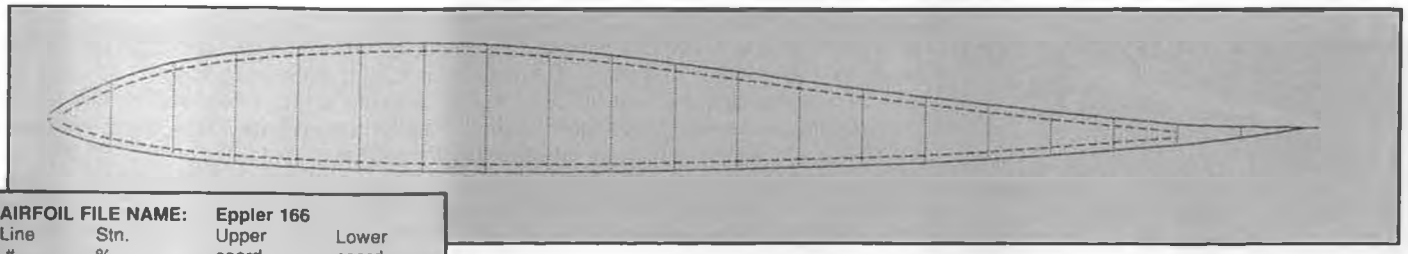
The Kormoran is one of many recent electric motorgliders in the Robbe stable. Clockwise from lower left: Varta Fly, Kormoran, 4-meter ASW 17 Royal motorglider, and the racy, 7-cell Arcus.

The six-channel Infinity system is of greatest interest to glider guiders. It will have many of the same features of the very popular Vision 8SP system, a system that I feel is today's best performing exclusively-glider radio, but will have a lower selling price. The retail price of a Vision 8SP PCM with standard servos is $919.95, and is usually discounted to around $550. The new Infinity 600A with standard servos and an FM receiver has a retail of $599.95 and will likely have a similar discount.

Here's what the Infinity 600A will do for you. It will store the setups of four models in its nonvolatile memory. It allows program access protection to minimize the chances of accidental program changes, electronic servo centering for stick functions, user selectable Mode I or II operation, FM or PCM receiver select switch, user assignable transmitter switches, two snap roll or slow roll programs, trainer system, bi-directional mixer for any two channels, compensation mixer for any two channels, adjustable servo travel volume on all channels, dual rate for aileron, elevator, and rudder, servo reversing for all channels, transmitter low voltage alarm, crow landing mix capability for sailplanes, aileron/rudder mixing, elevator/flap mixing, flap/elevator mixing, flaperon mixing, elevon mixing, V-tail mixing, aileron differential adjustment, proportional auxiliary channel, (are you out of breath yet?) two aileron servo capability, programmable failsafe, adjustable length and tension sticks, expanded scale voltmeter, high capacity Ni-Cd batteries, data reset, and finally, your choice of AMA listed, 1991 super narrow band gold label dual conversion receivers (FM or PCM). Depending on where you shop, you may also have the choice of standard "102" servos, metal gear coreless mini "141" servos (great for mounting in sailplane wings), or contest ball bearing coreless "732" servos. The least expensive way to order an Infinity 600A is the FM/102 combination at $599.95 (PCM/102 system lists at $649.95).

The transmitter case is as comfortable to hold and use as it appears. Anti-slip ribbing on the sides will help prevent any nervous, sweaty-palmed fliers from dropping the transmitter. One more advantage Infinity owners will have is the ability to easily wipe clean the transmitter case after a day's flying at a dusty field. A neck strap is also included.

Airtronics also showed a new 7-channel Vanguard FM system. It has among its features the following: aileron/rudder coupling, dual-rate aileron and elevator, throttle (flap)



AIRFOIL FILE NAME: Eppler 166

Line #	Stn. %	Upper coord.	Lower coord.
1	0.00	0.000	0.000
2	1.50	1.480	-1.200
3	2.50	2.055	-1.560
4	5.00	3.220	-2.180
5	7.50	4.140	-2.605
6	10.00	4.780	-2.960
7	15.00	5.600	-3.435
8	20.00	6.120	-3.645
9	30.00	6.540	-3.900
10	40.00	6.080	-3.920
11	50.00	5.000	-3.675
12	60.00	3.620	-3.380
13	70.00	2.360	-2.960
14	80.00	1.200	-2.280
15	90.00	0.245	-1.420
16	95.00	0.088	-0.770
17	100.00	0.007	-0.007

Max. Thickness... 10.44% at 30.0% chord
Maximum Camber... 1.32% at 30.0% chord

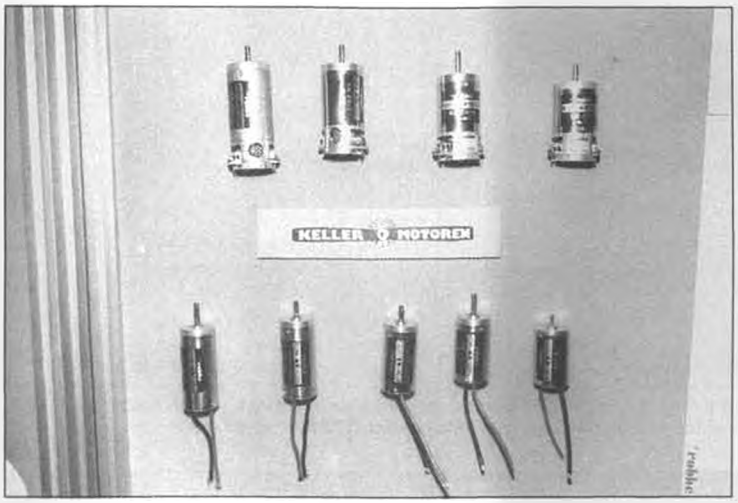
end point adjustments, adjustable low throttle (flap) trim, flap/elevator mixing, total servo travel adjustments on aileron/elevator/rudder, trainer system, and servo reversing. Its retail price will be $399.95 with four/"102" servos.

On the horizon at Airtronics is a VG4R-FM radio for sailplanes which will include "501" Microlite servos and a new dual conversion 92745 Micro Receiver. For electric fliers there will also be a VG4R-FM with "501" Microlite servos, 92745 Micro Receiver, and an MA-5 Speed Controller. The ten-channel version of the Infinity, the "Infinity 1000," will be coming out early in 1991. For singlestick lovers, both Infinity transmitters will be available as a singlestick, but this is further out on the agenda. Stay tuned.

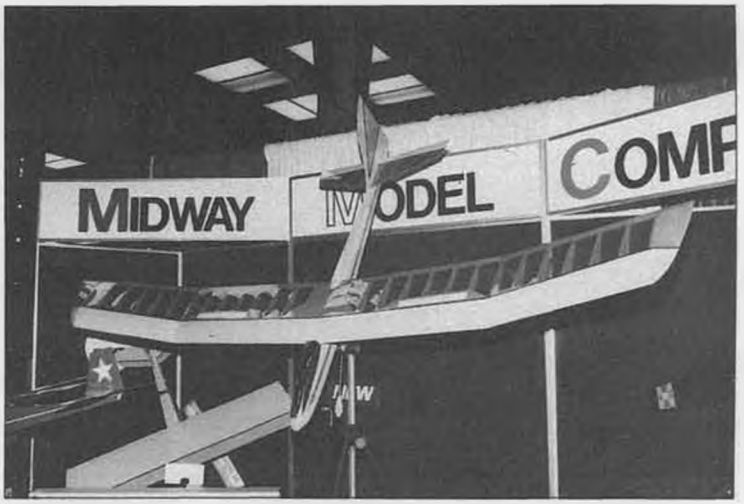
HOBBY DYNAMICS/JR PROPO

Hobby Dynamics was showing its fairly new X-347 radio system. This was meant to be a triple-use system (the "3" in the name) specifically: gliders, power planes, and helicopters. It has memory for four model setups (the "4" in the name), and it is a seven channel system (the "7").

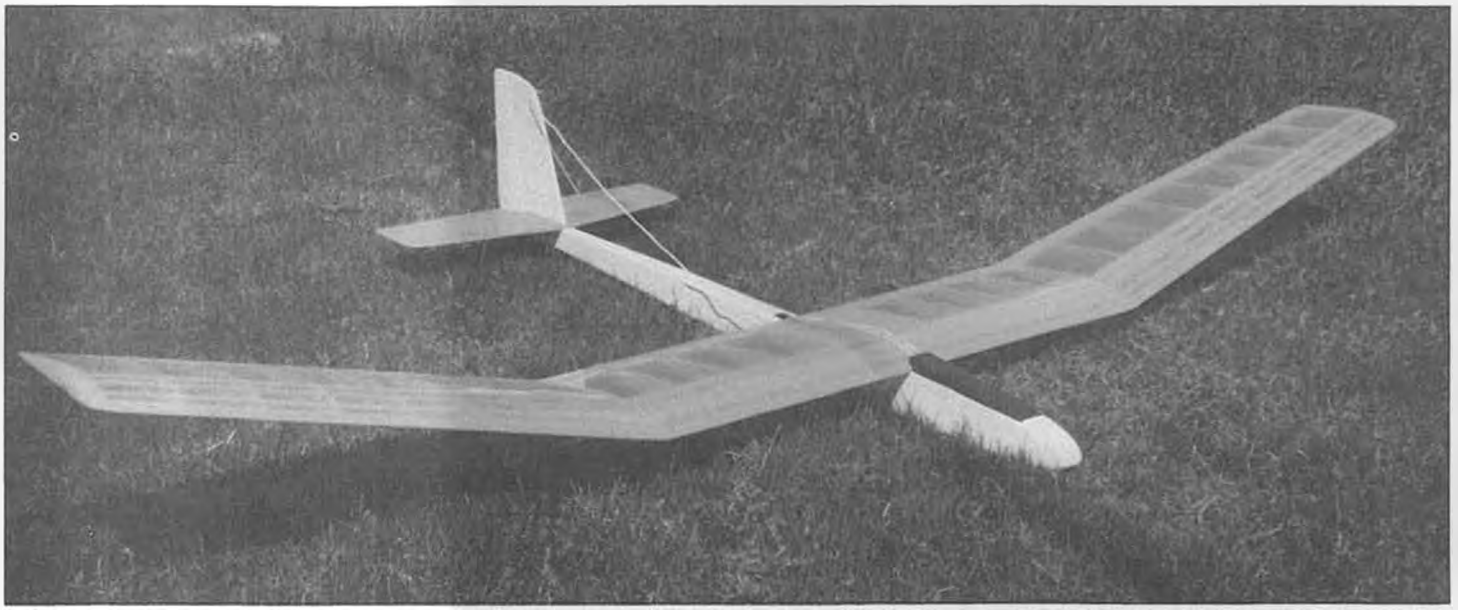
The X-347 can perform four programmable mixes and crow mixing, plus elevator to flap mixing, flap to elevator mixing, flap



The Keller line of high performance electric motors is now available through Robbe. Here is what they look like.



The Midway Models Gnome 2-meter was shown at Chicago, and although it's not new, I'll show it here because it hasn't seen much press lately, and it is very deserving.



A slick looking scratch-built, or original design Mini Mirage by Kevin Leazenby, of Niles, MI. Flies great according to its owner, who details a 12-minute flight in text.

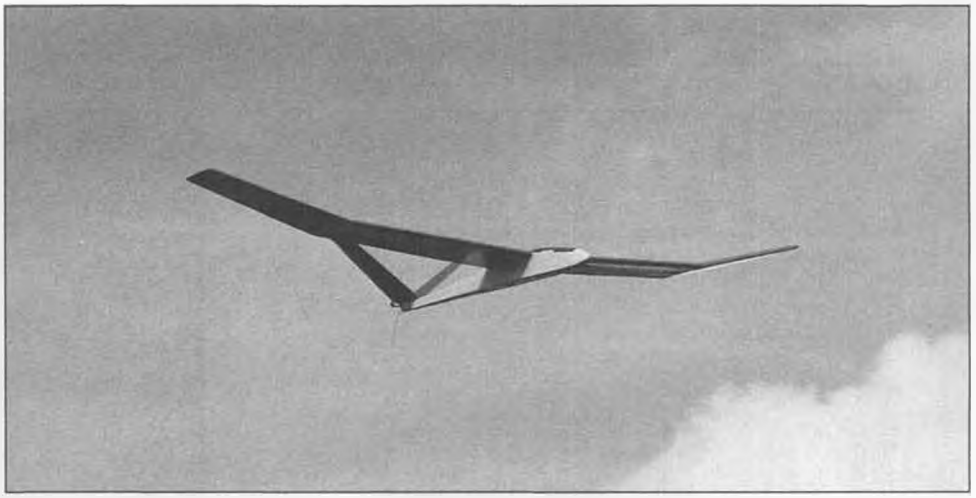
to aileron mixing (camber changing), aileron to flap mixing (full-span ailerons), aileron differential and aileron/rudder coupling. Glider guiders will be interested in the #J7XPG glider system which includes two JRS901 medium size servos and an AMA listed 1991 PCM/DC/NB receiver. This carries a $$644.99 retail and can be bought at a discount.

If the X-347 has any shortcoming that I can tell, it might be the flap control. Most glider fliers prefer the flap to be controlled by the left stick (throttle axis on most aircraft radios, Mode II). On the X-347, this stick is called out as "spoiler" in the instructions. Flaps are called out as a small knob at the left top of the TX case just above and behind the elevator dual rate and flap mixing switches. In a rapid deployment/retraction situation, this knob position and actuating technique might prove awkward or confusing. If you prefer landing spoilers over flaps, this configuration is actually better.

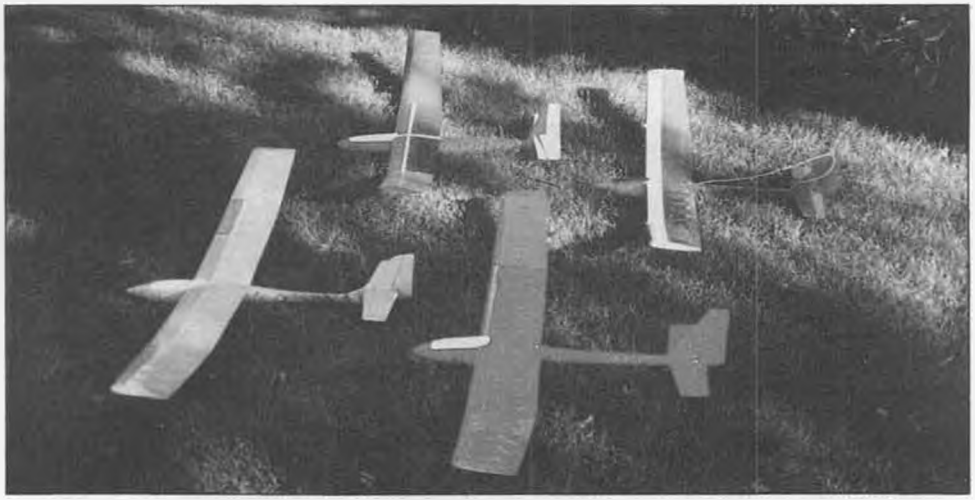
Airborne packs for X-347 glider radios are also available, #J7XGPK, for $179.99 retail. This includes: two JRS901 servos, 550 mAH receiver pack, and servo accessories (switch harness, aileron extension, charge receptacle, charger, DSC direct servo control cord, and three servo trays). Additional RF Packs (including transmitter RF module, NB receiver, and flags) allow quick and easy frequency changes, list price $199.99.

If you are interested in the smallest, most readily obtainable metal output gear servos, then JR Propo has them. Called the JRS305M, it measures 1.14" long (1.49" if you count the mounting lugs), 0.49" wide, and 1.37" tall (including output arm). Weight is 0.65 ounces. Torque is 28.0 oz-in. Speed is 0.25 seconds per 60 degrees. List $59.99. A nearly identical metal gear micro servo is the JRS311 which shares the same case dimensions but different gears.

A slightly longer, fatter, shorter micro servo which has dual ball bearing output for higher torque is the JRS321. The 321 is 0.57" wide, 1.30" long (1.73" with lugs), and 1.02" high. List $53.92.



Brian Agnew's Vertigo on a fly-by. The Eppler 387's undercamber is clearly visible on the bottom of left wing. This is a favorite airfoil among the foam-core-and-hot-wire RCHLG crowd.



Gary Schroeter's current gaggle of RCHLGs (minus one Gnome). L to R: Top Flite Wristocrat, Whitney Models Paraphrase, and two Larry Jolly Model Products Flingers (also an *MB* plan).

A coreless version of the 321 is also available for a little extra speed and torque, called the JRS3021. List $74.99.

FUTABA

Futaba has a new radio which it calls the Super 7. This is another 3-in-1 type radio like the JR X-347. No brochures were in print as

WIN A RADIO!

- The Spectra PCM Series radio control system is designed for the intermediate or advanced flier. The Airtronics Spectra offers compact size, light weight, and superior aircraft performance that outdistance other radio control systems.
- The SP7P has been created to answer the demands of fliers who want a radio that will encompass all types of pattern, scale, or sport flying. The SP7P is a superior R/C system in every respect.
- Features on the SP7P include servo reversing on all channels, adjustable travel volume, plug-in RF module, modular transmitter battery pack, RF output meter, programmable fail-safe with inhibit, high-visibility LED indicators, dual conversion FM/PCM super narrow band receiver, dual rates, and low transmitter battery voltage alarm
- 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.

From **AIRTRONICS**

HERE'S ALL YOU DO

Just by subscribing or renewing your subscription to *Model Builder*, you become eligible to win this outstanding Airtronics Spectra PCM radio system, or other valuable prizes for runner-ups.

We'll pick four names at random from the new and renewed subscriptions that have been received. The first-place winner will receive the Spectra PCM radio! Second place will win a complete Uber Skiver modeling knife set; and third and fourth place will receive a free additional six month's subscription to *Model Builder* magazine! What could be easier? There's nothing to do but subscribe or renew your subscription!

To be eligible, just subscribe to the finest all-around modeling magazine available, *Model Builder*, by sending your name and address, along with a check or money order for $25.00 for one year, or $47.00 for two years ($38.00 for one year [includes postage], outside U.S. including Mexico and Canada), to Model Builder, 898 W. 16th St., Newport Beach, CA 92663. *All payments must be in U.S. funds drawn on a U.S. bank.* Mastercard or Visa orders welcome. The easiest way to do this is to call our toll-free subscription hotline: (800) 243-9593 (In California: 714/645-8830) and place your order. If you've been thinking about subscribing or renewing your subscription, now's the time!

Void where prohibited

of the show, so I'm not really sure what it can do for glider guiders. I hear that it will not do crow mixing (flaps down, ailerons up) as both Airtronics and the JR radios will do.

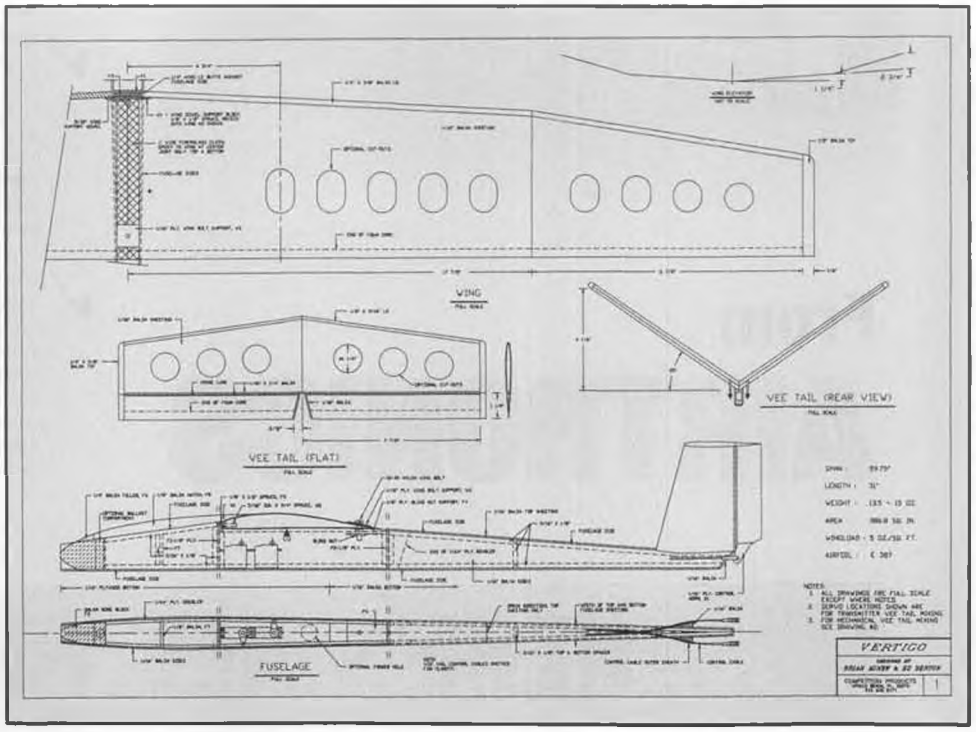
I do have an "Edit Display Mode" flow chart presumably from the Super 7 instruction manual. However, some of the abbreviations on the keys are a guess to me. It looks like two programmable mixing options can be selected (PMX1 and PMX2), STAT (??), ABRK (air brake?), 1 to 4 (elevator to flap?), STRM (spoiler-pitch compensation trim?), FLTR (flap-pitch compensation trim?), VTAL (V-tail?), FLPR (flaperon mixing?), and DIFF (aileron differential?). As you can see, I don't know much about this system, but I will try to find more info later.

ROBBE

The Robbe electric motorglider Kormoran made its debut at Chicago. This model is highly unusual in that it is a canard with a very short fuselage, and it is a pusher!

Not having a spec sheet for the Kormoran, I can only tell you what may be obvious from the photo. The Kormoran has a molded Robbe Plura fuselage, probably has Robbe Siros Balsa pre-sheeted foam core wings, and probably comes with a 7-cell motor and folding prop. The twin vertical fins and canard appear to be sheet balsa sanded to shape. The controls are probably canard mounted elevator, ailerons, and motor on/off. More info to follow as it is available.

The Top Flite Wristocrat is all covered and ready for test flying. Looks like Gary is also interested in model rockets and plastic scale models.



Reduced size plan of the Brian Agnew Vertigo.

Robbe also showed the full line of Keller electric motors (now a Robbe exclusive) and Robbe electronic speed controls.

Robbe now serves as its own distribution network and as such sells to dealers and modelers directly. Call (201) 359-2115 for information or ordering.

continued

GREAT PLANES MODEL MANUFACTURING

The GP booth had a beautiful, rainbow-colored Spectra electric powered motorglider perched high in its booth. The Spectra is a new motorized version of the relatively new Spirit two-meter sailplane.

Claimed to have "unmatched climbing ability" and capability of climbing from "zero to 500 feet in 60 seconds," the Spectra promises to be a very unusual motorglider from the performance viewpoint. Heretofore, this kind of performance from a "550" type can motor and a 48-ounce aircraft was not possible. It will be interesting to see if this claim is tested by magazine reviewers.

The kit is of the same very high quality you have come to expect from GP. The design is well thought out and pretty. It features a modified Selig 3010 airfoil. It includes some hardware, canopy, motor, prop and spinner. The plans are CAD drawn and the cutting dies were made from the same drawings. This should provide the modeler with a very accurately fitting kit. Snap-together construction will help the beginning model builder to quickly assemble his Spectra straight and true. The photo-illustrated instructions will give the modeler a good feel for the finished appearance of every part. In all, the kit is very nice.

MIDWAY MODEL CO.

Bob Sliff and Bruce McAvinew have been teaming together to reintroduce people to this fine line of model aircraft. Of greatest interest to sailplane buffs are the Gnome HLG and Gnome 2M sailplane kits. I've included a photo of the Gnome 2M with this report.

The Gnome 2M is one of the best performing, easiest flying 2-meter gliders I've come across. On a few occasions I have borrowed Gnome 2M's to fly in 2-meter class contests, and I've always done well with them. They handle superbly, and given six to eight ounces of lead, they penetrate better and climb better than when empty. This means you don't need to build the model light. You can add whatever you wish to improve glide path control (i.e. flaps, spoilers) or even fully sheet the wings to improve drag and strength. Stock Gnome 2M's can be zoom-towed from 12-volt winches without fear of destruction. They often out-launch 100-inch or bigger aircraft.

So . . . even though the Gnome 2M isn't new, give it a try. Call Hobby Horn (Bob Sliff's mail order company) or see your local dealer and pick one up soon. They retail for $56.95.

RCHLG MINI MIRAGE SCRATCH PROJECT

Kevin Leazenby of Niles, Michigan, called me one day in early 1990. He had seen my coverage of R/C hand launch glider flying over the years and wanted to give it a try. Being the inventive kind, he also wanted to design his own plane. His question to me was what airfoil to use. My answer came in the form of a verbal description of a very good HLG design and a set of computer

continued on page 75

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X-Cell dominates other makes by 2 to 1

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PYLON

BY WAYNE YEAGER

SMOOTH AT ROUGH RIVER

The TURN, (The United Racing Network) Quarter Midget Championship race was held at Rough River, Kentucky over the Labor Day weekend with great weather, work crew, and some pretty darn good racing.

Some of you probably have spent some time at Rough River either through this race or the "Mint Julep" and if you have, are aware of how great it is to compete at a site where everyone boards down at the same location, either in the lodge or in one of the many cabins, eats in the lodge dining room, and really has a chance to get together because everything, socializing, engine running, flying practice, you name it, happens in the same place. There is a great closeness here that I don't see anywhere else because of all activities happening in the same location.

There is also a nine-hole par 3 golf course in the park and this writer for the past ten years has been booked into the lodge about four days before the race, and gets in some great iron practice. Golfing is $5 a day and you can golf as much as you want. (Such a deal!) Several of my local club members have been coming down early and we have a Friday Golf Tournament every year before getting serious about racing model airplanes.

The flying is on a full size runway that closes down for the weekend with the pits being located on a slight rise off the side of the strip that puts you about pylon height and is really great for viewing. The whole park is nestled in the hills of Kentucky and the park itself is all mowed grass, making for one of the prettiest flying sites in the whole country, bar none.

The Louisville RC Club has hosted this race forever it seems (actually around 18 years). This year we had several new club members staffing the race and their enthusiasm was reflected in the quality of the race. There were hardly any re-flys and we were able to finish 11 full rounds plus running the "Doolittle."

The 1989 TURN Champion, Rick Moreland (l), awards the Championship Trophy to 1990 Champion, Joe Dodd (licking his chops).

Since things went well, the usual arguments we see from time to time were all but absent. It's unfortunate that we witness these things but they do occur and it's hard on workers who volunteer their time and effort to staff pylon racing.

On the other side, it's also tough on racers who get a bad call from a worker's mistake because there is a great desire to win in most competitor's blood and any bad call brings out the worst in many. Not everybody, but many. I try to tell the fliers that these workers are "just people." They are not machines and on occasion, in the heat of a race when things are happening very fast, they sometimes make an error. It's usually against someone in contention and this is when the baloney starts. We need thick skinned people because workers will eventually stuff it in our collective ears and then what do we do?

Didn't mean to get on my soapbox because most people don't even like to read about it but there are fliers who need to be reminded.

Anyway, Kentucky. We utilized a system I've been using at the Nats that I know from experience, really keeps things sorted out and that is, having an assistant starter. With two people following the race action and consulting each other on race finishes, the

mistakes are cut dramatically, scoring is completed at a faster rate, resulting in heats being run faster and more flying overall.

This requires an extra person when staffing races but worth it and I would encourage all racing CDs to consider utilizing the advantages of an extra person at the starting line.

Although there were only 24 entries at Rough River, the competitive level was super high. After round one, Joe Dodd, Gail Jacobson, Dave Gohn, Craig Grunkemeyer, Kevin Matney, Greg Doe, and Rick Bork were winners and tied for first except "Grunk" position was.

The trophy has a likeness of Jimmy Doolittle engraved on it and I understand the club obtained his permission when they first had the trophy made. It's quite a prestigious trophy and the competition is usually fierce!

Because of the low entry number, this year's race was cut to the top nine by time. If frequencies allow, the top three fliers are placed in three different heats along with the next three by time and then the final three by time. The theory is it's not fair to put the fastest guys in the same heat because they

"The Winners." (l-r) Joe Dodd-1st, Gail Jacobson-2nd, Craig Grunkemeyer-3rd, Dave Gohn-4th, and Kevin Matney-5th. In the rear is Jerry Salisbury (l), caller for Jacobson and right is Rick Bork, caller for Matney.

turned a nice 1:16.17 which actually put him in first. Did you know we have no rules covering timing at pylon races (Except FAI)? Sorry, I'm digressing, anyway, after Round 2 the tie was reduced to 5 people since Dave Gohn and Greg Doe did not win their heats.

After three rounds the tie for first was reduced to Dodd, Jacobson, Grunkemeyer, and Bork. After a short lunch break, four more rounds were completed for a full seven, and day one was put behind us. Joe Dodd still had a perfect score with a fast-time of 1:15.10, along with Craig Grunkemeyer with a 1:15.22.

We completed four more rounds on the morning of day two and called it a contest. At the finish, Joe Dodd was the winner, having finished only one point down and four points ahead of his nearest competitor. In second was Gail "Jake" Jacobson, who was all alone point-wise, which is especially nice because it meant no fly-off. Put your plane away because you are done! For third place, a tie existed between Grunkemeyer and Gohn so they "flew-off" which Grunk won. In fifth was Kevin Matney, who also had the luxury of being alone in points and no fly-off.

After a lunch break, the "Doolittle" was matrixed. For those who have never been to the QM Championship, the Doolittle is a special race run with usually the top 12 fliers, by time, regardless of what their finish would only knock each other out leaving a final with slower people. Of course, they have to win their heats or a final of slower people happens anyway.

In heat 1 was Kevin Matney with a fast time of 1:16.91, Dan Kane Jr. with a 1:16.17, and Craig Grunkemeyer with his 1:15.22. Grunk, as he's called, won the heat putting him in the final. The second heat contained Dave Gohn who made it with a time of 1:16.81, Rick Moreland with a time of 1:16.85, and Donny Weidman with a time of 1:17.8. Moreland won this heat putting himself in the final and the last heat was made up of Al Grove with a time of 1:15.99, "Racer" Rick Landers with a 1:17.78, and Joe Dodd with a 1:15.10. Dodd, who must have been floating above the ground over his contest win, was in another world and didn't do diddley, Landers caught the dreaded disease, "cut-i-tus," and Grove showed them where "it's at."

The final was set and if times are any indication, the race should have gone to "Grunk" or Grove, the "G" guys. However, old pro Moreland, who had nothing else to shoot for since he bombed out in the regular racing, showed the other guys how to win with a slower plane and captured the "Doolittle Trophy."

For those who stayed home this year, you missed a great race and whatever the reasons, hope you try again next year because the Louisville RC Club is all fired up about the race, and are going to construct some equipment that they need. Below are complete results of this year's race.

1. Joe Dodd	1:15.10
2. Gail Jacobson	1:17.87
3. Craig Grunkemeyer	1:15.22
4. Dave Gohn	1:16.81
5. Kevin Matney	1:16.91
6. Al Grove	1:15.99
7. Rick Landers	1:17.78
8. Donny Weidman	1:17.80
9. Dan Kane Jr.	1:16.17
10. Rex Knepper	1:17.82
11. Jerry Salisbury	1:21.54
12. Greg Doe	1:19.72
13. Neal Rehm	1:19.75
14. Rick Bork	1:18.44
15. Steve Kovach	1:19.75
16. Jon Lemmons	1:23.00
17. Rick Moreland	1:16.85
18. Dave Carpenter	1:24.48
19. Allen Booth	1:25.90
20. Jim Warner	1:24.70
21. Rick Cromer	1:30.60
22. Ray Blake	1:29.91
23. Rich VanHulle	1:40.43
24. Bob Petrinec	1:18.69

We have had some requests for the design of the flip-card system used at the Nats so next month we will include a how-to-build session along with drawings. ***MB***

The author (l) watches as Contest Director, Jimmy Allen, presents the second place award to Gail "Jake" Jacobson who still manages to win consistently even though he's not exactly a spring chicken. Let's hear it for us "older fellows," right Jake??

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BY RICK ALLISON

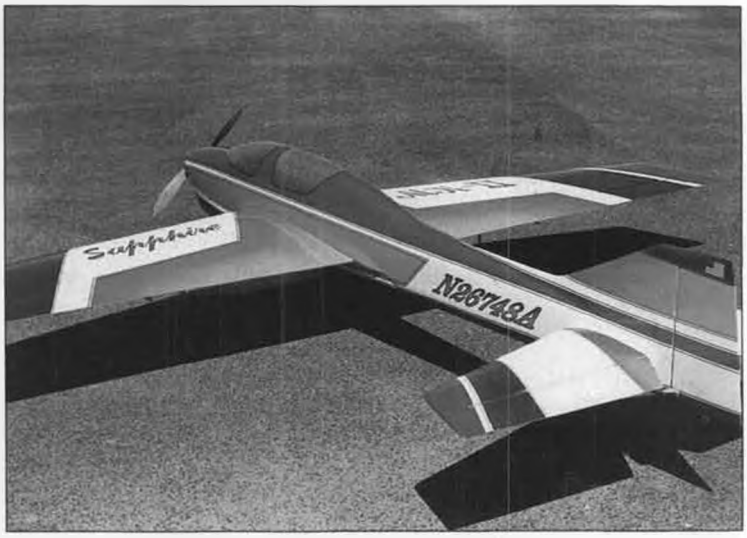
TURNAROUND STYLE

It is not exactly news to anyone that the "turnaround" style of flying has come from being the new kid on the AMA block back in the early '80s to being the big cheese for the '90s. For proof of this, we need look no further than the 1990 Nats, where 52% of all those who made an official flight were entered in the two turnaround classes, FAI F3A and Expert Turnaround. Proposals currently before the RC Aerobatics Contest Board of the AMA could conceivably replace the existing maneuver schedules with simplified or partial turnaround schedules all the way down to the Novice level by 1992.

Whether or not all of the turnaround proposals before the Board will pass is debatable, but it is a pretty safe bet that some or even most will, and that we will be flying more turnaround in the future rather than less. If I had to bet, I would bet that we will see solid turnaround schedules from the Advanced level on up in '92.

Wayne Apostolico used his Diamond Mk III to qualify in 1st place and finish in 2nd place in the Masters class at the '89 AMA Nats.

Don Coder displays his Beetle, a popular choice for turnaround pattern events. Don's a member of the Mid Cities R/C Club in Arlington, Texas.



Beautifully decorated Sapphire Mk II by Wayne Apostolico was unfortunately involved in a midair with Chip Hyde at the 1990 Nats. Wayne seems to favor trike gears on his models, instead of the tail dragger layout that is becoming increasingly more popular on modern turnaround designs.

If I read my mail properly, mine is not the only crystal ball tuned to this scenario. There seems to be plenty of enthusiasm out there in Patternland for the turnaround style, but also perhaps a bit of trepidation or anxiety on the part of many who have written. In most cases, this amounts to not much more than your basic fear of the unknown; the kind of thing that everyone experiences with a change in class, and which evaporates after a contest or two. Not that there won't be adjustments to be made, however. Make no mistake, the demands of turnaround are different. The technical demands *are* different, and the mental demands are the most different of all.

Reams of copy has been written about the technical aspects of turnaround, and I'm pretty sure that most people know by now that light, straight and overpowered airplanes are preferable, that flight speeds are a little lower by choice and necessity, and that vertical performance is emphasized. I don't see much point in rehashing all of the

technical stuff. The data is readily available, and most people won't have a problem properly equipping themselves for the new patterns. Very often, the only change necessary will be a different prop and pipe length. What I want to talk about is the mental side of turnaround flying. And because you really can't separate the two, we'll also touch on the *mental* aspects of judging turnaround.

To compare and contrast the old and the new, the procedure whacked into me as an unwashed student was to talk about the old stuff first. Voila, we begin! AMA pattern has a particular mental rhythm to it. The unscored turnarounds are taken an enormous distance (by turnaround standards) away from the center of the aerobatic frame. Most often, the aircraft is turned around by means of sort of a sloppy 1/2 Reverse Cuban 8 maneuver. (For some reason that has forever escaped me, this is commonly referred to as a "Split-S." It is not a Split-S. A Split-S is never entered in a climb.)

Whatever the turnaround may be called, the primary positioning of the aircraft for the next center maneuver takes place after the turnaround, and (hopefully) *before* the 120 degree aerobatic frame is entered. (As another aside, many pattern pilots are unaware that AMA pattern also has a 120 degree "box" in which the maneuvers must be performed. From the high scoring of some of the long and extremely close-in rolling maneuvers I've witnessed these past several years, it would seem that many judges are also unaware of this...). In any case, the sequence is something like this:

By hook or crook (often both), the airplane is turned around and positioned. The judge looks up from the score sheet as the caller murmurs to the pilot. As the plane nears the aerobatic frame, the next maneuver is called by the pilot, and both pilot and judge begin to build a mental image of the forthcoming maneuver. As the aircraft enters the frame, "Begin" is called, and both pilot and judge start to concentrate fiercely on their respective tasks. Judges don't blink, and pilots forget to breathe. The maneuver is accomplished, "Complete" is called, and the aircraft exits the frame. Both pilot and judge relax their intense concentration. The judge takes his eyes from the airplane and marks the decided upon score, and the pilot heaves a mental sigh, blocks out whatever mistakes he has just made, and turns the airplane around again. The judge looks back up, finds the airplane, the caller calls the next maneuver to the pilot, and the whole concentration/relaxation process starts again, sort of like mental contractions giving birth to a maneuver, followed by postpartum depression, followed by another pregnancy fathered by the caller, etc.

This process is fairly rapid in real time. At 100 mph, a pattern plane is moving at about 146 feet/second. Judging from the last several Nats, including one where I personally helped set up the flight lines, the AMA turnarounds are taking place about 2200 feet out from frame center on average. Call the total distance of a pass 4500 feet, and the number that rolls up on the old pocket sundial is 31 seconds, plus whatever extra time is consumed by the maneuver.

The lady is Di-Di McMasters (Jim McMasters' better half), and the model she's holding is R&K's big Super Chipmunk T.O.C. model. The Chipmunk is built to either 1/4 or 1/3 scale, we're not sure; you can get more info on it by calling R&K at (817) 268-4817.

The Sidewinder pattern ship, seen here with designer Dale Moore, is now available from 3 Men's Models in Spokane, Washington; call them at (509) 487-0026 for details.

The differences in turnaround flying are both many and obvious. For one thing, the numbers are totally different. On a line of flight 150 meters out from the zero line, the aerobatic frame or "box" is 1750 feet across instead of the 4500 feet we had available for the AMA pass. By flying farther out to the legal limit of 175 meters, we can add a couple of hundred feet to this; call it a generous 2000 feet across the FAI box at maximum depth. At a speed of 90 mph (most turnaround planes are faster, but no matter), we get about 132 feet/second, or just 15 seconds to cross the box. Suddenly AMA pattern doesn't look so fast, right?

The numbers aren't the big story. We looked at the rhythm of AMA pattern and found a comfortable and mostly time non-critical concentration/relaxation/concentration sequence for both pilot and judge. In turnaround this changes to a time critical concentration/concentration/concentration sequence which lasts from the box entry to box exit for both pilot and judge. The flight flows from one maneuver to the next in an uninterrupted fashion, with the end of one maneuver positioning the aircraft for the

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next. Any lapse in concentration on the part of the pilot can lead to a blown maneuver, which most often will lead to several more blown or semi-blown maneuvers because the aircraft is grossly out of position.

Any lapse in concentration by the judge is equally as disastrous; fumbling for a score for one maneuver leads to missing the next and getting behind and out of sequence with the flight. To get back to numbers for a moment, at 132 feet/second, most turnaround maneuver exit/entry lines take one to two seconds (less for many). This is the amount of time that a judge has to decide on a score and call it to the scribe. As a contrast, AMA pattern provides the judge with 15-20 seconds to score maneuvers! There is no question that turnaround is as mentally difficult to judge well as it is to fly well. Remember this the next time you are moved to complain about the judging.

All of this emphasis on the continuous intense concentration and the faster sequencing required has the effect of making turnaround seem incredibly difficult or maybe even impossible to fly well. The initial reaction of many who try it is frustration and even a little depression. Is it worth it? Can it even be done by the "average" competitor? Are we asking too much of our less experienced fliers? Should Joe Average burn his airplane and take up something simpler, such as high wire work without a net or wrestling alligators?

Well, throttle back and relax a little. It can be done, and you can do it. The emotion waiting for you just a little bit on the other side of all that frustration is exhilaration. A well flown turnaround flight provides the pilot who brings it off with a pretty nifty feeling of accomplishment. Some people see this as a combination of adrenaline rush and endorphin high, but I have been involved in competitive sports much of my life and I see it a little differently. I think it has more to do with achieving a very fine real-time focus on a task that marries the mind to the body so completely that the athlete (or pilot) is unaware of any difference between mentally seeing the act and doing it. Tennis players refer to it as playing "in the zone." To bowlers, it is "in the groove." Hitters in baseball talk about "seeing the ball well," and basketball types say so and so is "unconscious."

Call it an alpha state if you like. Pattern pilots most often talk about "smoking one." Whatever you call it, turnaround provides more of it, because that fine focus arrives in direct proportion to the concentration level that is achieved. So how do we get to this fine focus state where subjective time slows to a crawl and we can count the hairs on a frog at 200 meters while doing no wrong?

Well, turnaround pattern is no different from AMA pattern or a lot of other sports in many ways. Practice is important. Getting the repetitions helps, no doubt about it. Good coaching helps. Well-trimmed equipment helps. However, the biggest adjustment to be made in turnaround flying is the

continued on page 76

BY MITCH POLING

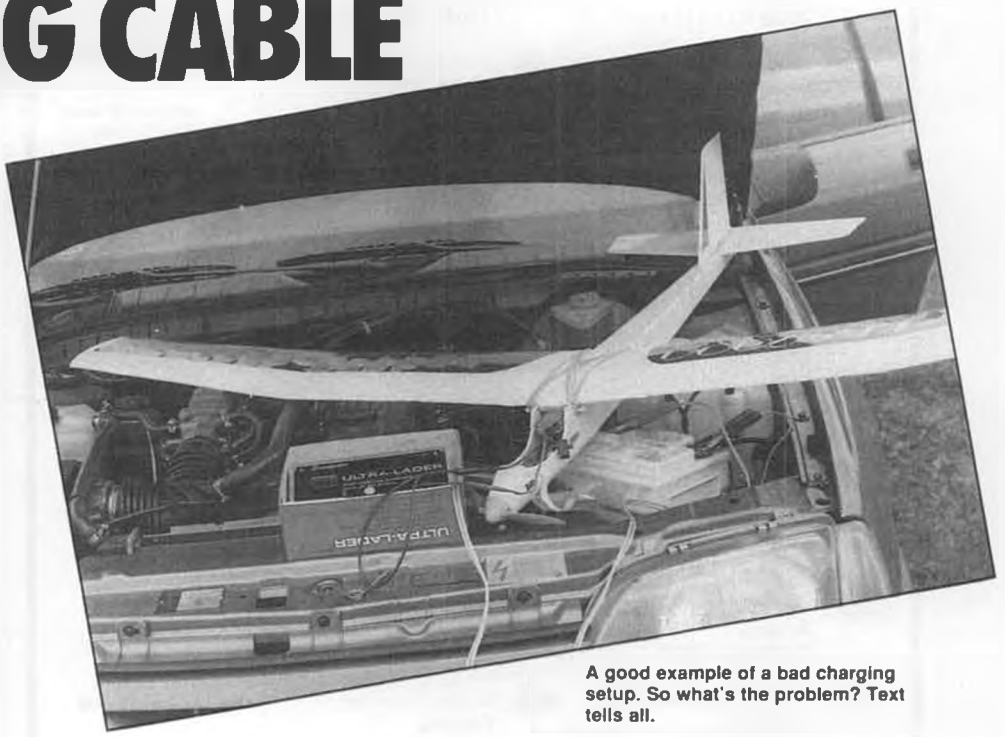
SIGHT SAVER CHARGING CABLE

In last month's column, I wrote that there were two safety items of concern in electrics: propellers and fire. I overlooked a major hazard! Dr. Fred Sauerberger, who is an ophthalmologist, visited me this summer. He has treated many patients who have had severe eye damage from exploding car batteries. These have occurred in attempts to jump start cars. The jumper cable was clamped to one car battery, then the victim clamps the other end to the other battery. The result is a big fat spark, and the battery explodes. Acid and shrapnel are thrown vertically, right in the victim's face.

I have not heard of any electric fliers hurt by exploding car batteries, but I think it has been because we have been lucky. Most of us do charge from a car battery, and most of us do it in very dangerous ways. The photo shows a charge setup seen at one of the local contests. It is typical of at least half of the setups I see. The charger is perched on top of the radiator, the plane is resting on top of the car battery, and the charger clamps are big and beefy with lots of bare metal showing. Please remember that the battery in a car has the negative terminal connected to the car chassis. This simplifies the wiring in the car considerably. It also means that you do not need to have something touch both terminals to get a short. All you need for a short is to have something touch the positive terminal and the metal of the car.

The setup in the photo is a recipe for disaster. Nothing happened when the charger was connected to the battery, despite the spark that occurs with this type of charger and many others. But all it would take is for the car to be jostled, the charger falls, or the plane, or the propped-up hood. You can imagine the rest.

The cure for these hazards is very simple. Imagine that jump start attempt I described earlier. This time we will use a modified cable, made by cutting a jumper cable in the middle and installing connectors. Now each half of the jumper cable can be clamped to the batteries. No spark, because there is nothing on the other end of the cable. Now you can stand away from the cars and plug together the two halves of the cable. There may be a spark then, but it is away from the batteries and will not cause an explosion.



A good example of a bad charging setup. So what's the problem? Text tells all.

Mitch's personal charging system has its own dedicated 12-volt charging battery in a plastic container, equipped with his "Sight Saver" charger input cable as described in text. The legs on the Astro Flight charger provide clearance for a small cooling fan mounted underneath.

Another example of a charger cooling fan, mounted atop a Robbe unit. If your charger gets too hot for your liking, one of these 12-volt fans (a Radio Shack item) will solve the problem nicely.

This is the basis for the most important piece of electric flying equipment you will ever have. I call it the "Sight Saver" cable. The photo shows the one I use. It is simple to make; mine took about fifteen minutes. I used three or four feet of "mega cable" that is so popular with the car sound systems that blow out neighborhoods. I think this is about #12 gauge. This cable is so heavy that I had to use a 40 watt pencil iron (usually I use a 25 watt iron) to get the wire fully pre-tinned. I used the clamps that were on the charger for the battery end of the cable. The other end should have a *female* connector, not a male! The female connectors are fully insulated. The male connectors usually have an exposed bare surface, which could, as

mentioned before, cause a short if it touches the car body. The connectors should be heavy duty, capable of handling at least 10 amperes. Sermos connectors are excellent, or marine or trailer hitch connectors. I use my homemade connectors as described in a column two months ago. Now your Sight Saver cable is done! Install matching male connectors on the charger input cable, and you are ready for business.

You could also make the Sight Saver cable by just cutting the charger input cable at the three-foot mark and installing the connectors. Female connectors on the battery cable

Ben Almojuela's great looking Boeing 247 with two Astro 15s was one of 60 electrics that participated in the annual Boeing Hawks/Puget Sound Electric Model Fliers Fly-In last June.

Best Gas Conversion award at the Boeing Hawks/PSEMF meet went to Steve Doyle for his pretty Astro 25 powered Curtiss Jenny, built from an Aerodrome kit.

side, please! This is really easy and would take less than ten minutes. However, I prefer making a Sight Saver cable from scratch. Use heavy duty wire and the voltage drop will be so small that it will not be noticed. The extra three feet of wire makes it easy to set the charger and battery pack (or plane) on the ground or on a work table away from the car.

Remember that first photo? For safety, don't put the charger or anything else under the car hood. My own personal preference is to use a separate battery to charge with, and leave the car battery alone. The photo showing the Sight Saver shows my field setup, a 44 Ah car battery (VW size) in a plastic case. This is very handy for the shop, too, as a reliable 12-volt source. If a car battery is too heavy, use a lawn tractor type battery; these are about 25 Ah, and do a good job. I used one made by Toro for many years. Build and use a Sight Saver cable, the eyes you save may be your own! Thank you, Fred, for reminding me of this very important safety item.

The Astro DC/DC charger shown in the photo along with the Sight Saver has been modified. It is one of my favorite chargers. However, it did get very hot. Keith Shaw modified his DC/DC charger with a small Radio Shack 12-volt DC cooling fan. This fan is small enough to install on the side of the charger case, or even inside. Keith found that this solves the heat problem. I could not find this small fan locally and had to settle for a 3-inch size fan. The only space large enough to install it was on the bottom of the charger. I used four 2-1/2 inch bolts as legs; this provides lots of room underneath for the fan. I used a one-inch hole saw to cut holes in the sides and bottom of the charger. The fan is connected directly to the charger input leads. Now the charger stays cool. The same idea applies to other chargers, such as the Robbe Automax 21 shown in one of the other photos. There the cooling fan has been placed on top. If your charger is getting hot, try it, your charger will thank you! Thanks, Keith, for the good idea.

Speaking of temperature, the temperature sensing method of charging has been around a long time, but has not been common. Now

The gang's almost all here! Here are most of the 31 fliers and 60 models that showed up for the Boeing Hawks/PSEMF Fly-In.

it is! The German car racers and competition fliers are using temperature sensing for charging, with excellent results. The fliers use the Sanyo SCR "cut off" cells (red jacket). The term "cut off" refers to the fact that these cells were originally designed for temperature sensing charging, that is, up to a "temperature cut off" point. The cut off temperature universally used here in Germany is 45° Celsius (113° Fahrenheit). The temperature sensor is inserted into a pocket in the groove between cells or is held to the cell by a magnet. The fliers use 1.5 to 3 amperes charge current for the SCR cells. The car guys break *all* the rules! They temperature charge SCE cells at 5 amps! I think the reason for the high current is to generate enough temperature fast enough to activate the temperature sensor. The SCE packs are only charged and used once a day when handled this way. Most car racers have six Sanyo SCE packs for a day's racing. As I said, it breaks all the rules. SCE packs are supposed to be charged at no more than 2 amps, and should not be allowed to get more than warm. However, the car racers say they get more power and duration this way, and their SCE packs last for a season of racing if used once a day. Impressive! Races here last five minutes, by the way, which makes the 1700 mAH SCE cells very popular. Who knows, temperature cutoff charging may become very popular.

If you wish to try it, RAM has had a simple temperature cutoff module available for many years, and may still have it. It costs less than $25, as I recall. This module plugs in line with any charger. The sensor is mounted on an aluminum plate. I used the module once and had some pack overheating problems. I think that if the sensor was mounted with a magnet instead of the plate, the sensor would respond faster to the pack temperature. Check the pack temperature for the first few runs; any thermometer that can show 120°F should serve to check this. RAM is at 4736 N. Milwaukee Ave., Chi-

continued on page 84

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PLUG SPARKS

BY JOHN POND

HOW ABOUT NOSTALGIA RC!

Quite a few years have passed since this writer visited England to attend the first English SAM Champs at Sculthorpe AFB.

Since then, the activity at Old Warden has steadily increased to the point where some of the popular rubber events such as O.T. Wakefield had to be held at Middle Wallop, where the Museum of Flying is located.

Such action has been spearheaded by Dave Baker and his SAM 1066 cohorts to the point where the events have become truly international, with six Italian and better than ten American fliers. This meet featured a program souvenir edited and printed by Dave that put some class into this meet, called "Vintage Model Flying Spectacular."

As a departure from the fun flying at Old Warden that attracts at least 50 to 60 modelers and hundreds of spectators, the competition in the Wakefield events at Middle Wallop was heavy. Of course, being in their own ballpark, the Brits dominated the meet, taking 12 of the first 15 places. The highly contested 8 ounce class was won by an Italian. Here are the results:

Wakefield 8 Oz. Class (25)

1. Gialanella	Italy (39 Ellila)	8:30
2. Turner	G/B (39 Korda)	8:30
3. Beals	G/B (Zombie)	8:13
4. Parkam	G/B (Gutheridge)	7:52
5. Alban	G/B (Voodoo)	7:37

Wakefield 4 Oz. Class (23)

1. Blyth	G/B Lanzo Duplex	8:16
2. Persson	USA Lanzo Duplex	7:37
3. Barr	G/B Lanzo Duplex	7:35
4. Aslet	G/B Lanzo Duplex	7:30
5. Michel	G/B Lanzo Duplex	7:07
6. Gallas	USA 36 Copland	6:42


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There were seven USA entries in the 4 ounce event, which was completely dominated by Great Britain. However, some redemption for the USA boys was accomplished by R.J. Mikkelson as he won the Earl Stahl "Battle of Britain" event. His total time was greater than the following two places combined.

The Auster (Taylorcraft) Army Observation event had only three British boys turn out with Don Knight emerging the victor.

Let's take a look at a few photos. Photo No. 1 shows the type model that took the first five places in 4 Ounce Wakefield, a Lanzo Duplex, being launched by American flier Jim Persson, from Livermore, California. This was Jim's first trip to England. He and his wife thoroughly enjoyed England and the model flying.

Seen in Photo No. 2 is Art Watkins, from Mountain View, California, holding his rubber scale "Viri" scale model at Barkston Heath. Art reports he didn't have too much luck in the afternoon wind.

When Mikkelson wasn't winning the flying scale event, he had time to take a few interesting shots such as Photo No. 3 featuring the trio of Reg Parkham, Stan Horne, SAM 35 President, and that perennial ambassador, "The Clown Prince of SAM," Danny Sheelds of Baltimore. Note the appreciative tee-shirt Danny is wearing as he did stay with Dave Baker and his wife.

Photo No. 4 shows quite graphically the extremes to which the English go in producing a faithful reproduction. Such is the case with Derek Ridley at Old Warden with a Miss Fortune X. This popular design with an O&R 23 used the color scheme as originally published in the *Model Builder* Plug Sparks column showing Karl Hatrak with his "Unit 20, Trenton, N.J." on the wing. Karl's model was orange trim on white. Both fly great!

One more shot and we will quit talking about the great time at Old Warden. Photo No. 5 shows Jack Thompsen, of SAM 1066, with his red and blue New Ruler. Of course, with a small area like Old Warden, flights by large models were pretty limited. However, when a particularly good flight was turned in, the spectators responded by applauding

(1) Art Watkins entered Rubber Scale at the English Champs with his rare "Viri," a vintage Finnish lightplane. Art hails from Mountain View, California. (2) Seen here is California modeler Jim Persson launching his Lanzo Duplex on a test flight at Middle Wallop, England, during the 1990 English SAM Champs. (3) America's Danny Sheelds (right) is more than a match for two Brits, Reg Parham (left) and SAM 35 prexy Stan Horne. Mik Mikkelson photo. (4) Great shot of Derek Ridley's "Miss Fortune X," an early Mickey DeAngelis design that perfectly exemplifies the spirit of Old Timer modeling. Photo taken at Old Warden by Mik Mikkelson. (5) Another Old Warden shot: a good looking New Ruler by SAM 1066 member Jack Thompsen. Jim Persson photo. (6) Ever heard of a Dallaire Speedster? We hadn't either, until we saw this framework of a 1/2A Texaco version by SAM 39's Stu Warner. Ship has exceptionally pretty lines. Bucky Walter photo. (7) Tom Boyle launches his twin pusher for what turned out to be an incredible 69-minute flight in the Denver area. More in text. (8) Howard James (left) congratulates John Pond for a twin pusher flight that didn't win! James photo. (9) You hotshot competition guys with your Lanzo Bombers had better look out, here comes Bob Rooman and his R/C "Rassitoodus"! This 1939 design is probably the most bizarre flying contraption to come out of the O.T. era. *MB* has plans available. . . (10) Italian model designs always seem to possess graceful lines, and these two T.412 Wakefields of 1942 vintage are certainly no exception. Both were built by Ferdi Gale (he's from Italy too). (11) Bill Brenchley's cute 1924 Dormoy Bathtub was built for the new 1/2A Texaco Scale RC event that is rapidly gaining in popularity on the East Coast.

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the action.

Bill Darkow, the former *SAM Speaks* editor, won the Concours event at Old Warden for the best control line model. Bill flew a replica of the Texas Wildcat.

Wrapping up this report, Peter Michel wrote to SAM president Jim Adams saying the meet was a great success with hot and sunny 80 degree weather, many contestants, and very good flying. Wind did not come up until later in the day. In short, a thoroughly enjoyable meet.

NOSTALGIA RC

Ever since Ralph Prey and his San Valeers F/F Club announced the idea of a Nostalgia event; i.e., models designed after the Dec. 31, 1942 SAM rule cutoff date, this writer has thought this would be just the thing for the younger modelers in this modeling game.

As an example, if you were twenty years old in 1950, you would now be 60 years old. However, back in 1950 very few of those age fellows ever really appreciated the pre-WW II designs. Let's face the facts men, most of us cut our teeth on these postwar power models and I am sure many of us would like to relive those days.

However, ever since the initial FF Nostalgia rules were circulated for review, we have been plagued with a plethora of rule restrictions. As a matter of fact, you must read almost two pages to find out what engine to use!

This columnist figures this is a hopeless case, although he has built three Nostalgia FF models (Zeek, Crescendo, and Past Due). The fun seems to have gone out of Nostalgia as I am constantly being queried about what engine I am using. Enough is enough! Rather than embark on a crusade for model engine and design simplification in free flight, I propose we have a *Nostalgia RC event.* There is no question in this columnist's mind that, for our age bracket, RC is just the thing to relive those days of easy starting glow engines and snappy climbs from a rise-off-ground (R.O.G.) position.

Therefore, this columnist will provide the prizes to any West Coast RC club that will sponsor a Nostalgia RC event at their regularly scheduled annual contest (annual of at least three years of age). Here are the rules that we will try out based on what we used in that era:

1. Model designs must have been designed, published, or kitted not earlier than January 1941 or later than January 1, 1957.

2. Any engine manufactured in that fifteen-year era can be used.

3. Proof of (1) and (2) above is strictly the responsibility of the contestant. This is a fun competition and we want to keep it that way.

4. Motor runs will be twenty seconds R.O.G.

5. Maximum length of each flight will be

(12) Beautifully decorated 1/2A F/F Texaco Powerhouse, complete with retrieval beeper, is the work of Bob Beecroft. Interesting wheels are modified Dave Brown tires with hub caps made from soda can bottoms. (13) Bob Laybourne (right) appears to be deep in thought as Bucky Walter graphically explains how Bob's Custom Cavalier should fly. SAM 28 contest in Fort Wayne, Indiana. (14) Bruce Abell (with Tx) checks out Dick Colter's huge Boehle Giant at the SAM 28 Annual. Bruce is a columnist for Australia's *Airborne* model mag. (15) Photographer Bruce Abell took this pretty shot of Herb Stokely's electric powered RC New Ruler about to touch down. O.T. RC Electric is another event that is starting to gain a real following, particularly on the West Coast. (16) Boy, this O.T. RC flying is *tough!* Larry Davidson (left) and timer Fred Quedenfeld demonstrate the strenuous art of flying RC Texaco. Don't fall asleep, you guys. . .

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five minutes, with a total of three flights determining the winner. Flyoff flights, if required, will be unlimited, and not taken until the regular portion of the meet is concluded.

Many of you free flighters will object to radio control, but the plain fact of the case is that RC has brought back a lot of old free flighters who would normally never have tried modeling again. This writer has seen many a former RC modeler, after viewing the FF end of things at a combined RC-FF meet, re-attracted to the fun via RC.

This writer stands ready to encourage all classes and forms of Nostalgia but for the present, will sponsor a combined 1/2A, A, B, and C type event. So, if you have been wondering why nobody ever jumped in and said, "Let's fly Nostalgia RC style," don't say you haven't heard it.

I expect at least three or four established SAM RC Annuals to try this event on the West Coast. We will keep you advised on how those Spacers, Zeeks, Ramrods, etc., fly with radio!

ENGINE OF THE MONTH

This month we are featuring an engine from the Pond collection: a Bantam 16 reproduction as manufactured by Karl Spielmaker. Credit should be given to Karl for his creation of this relatively rare engine designed and built originally by Ben Shereshaw.

Shereshaw first came to the attention of *Model Airplane News* readers with his rubber design, the General Aristocrat, appearing in the July 1931 issue. Very little by Ben was published thereafter until he broke open the gas model designs with his excellent Cavalier in 1935. The panatella cigar type fuselage found great favor with modelers looking for a streamlined design.

Ben started contributing to *Flying Aces* with a series of designs beginning with the Pioneer. Thereafter, it was a model about every other month. Ben was interested in smaller models as those huge floaters required a lot of space.

Around 1937-38 Shereshaw became interested in the production of a small size gas engine. As an art teacher, the building of many of his models was no problem, as many of his students constructed his designs. The production of a small engine called the Bantam was rather secretive, as Shereshaw produced them in his basement and made some parts at the school.

Of course, production was quite low and delivery slow. As Henry Struck put it, "I waited three months for my engine but it was worth every second." No question, Ben was producing a reliable, easy starting small engine with good power. Inasmuch as Ben was later employed by Bone Tool Co., it was no great surprise to find another Bantam, a 19 size, that was suddenly being produced in large numbers.

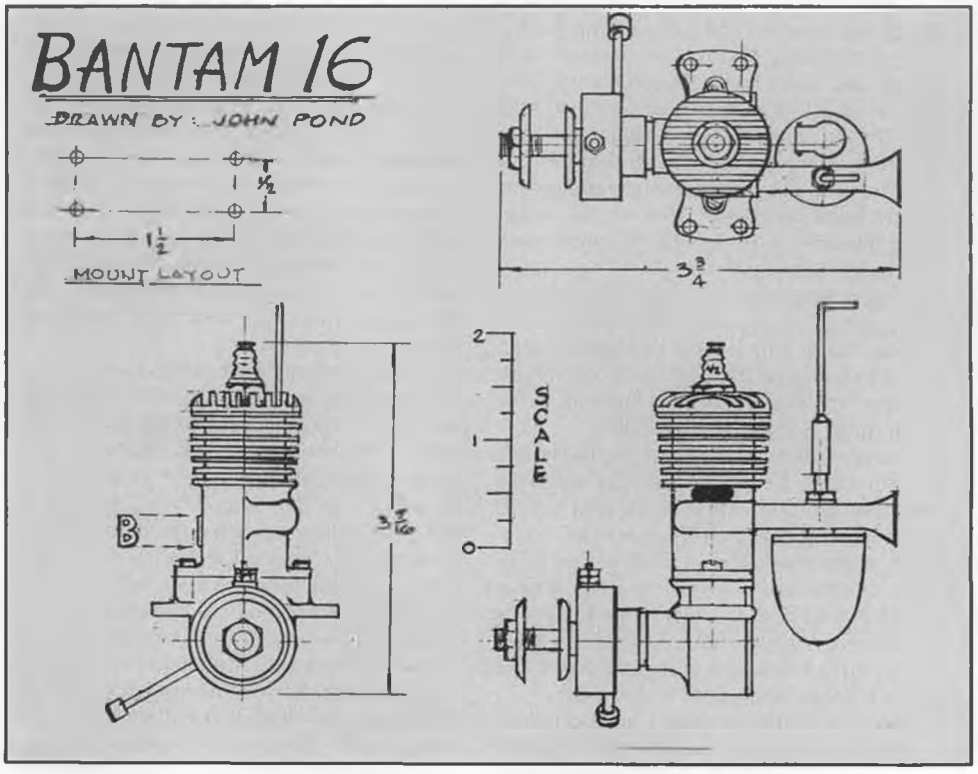
The Bantam 16 we are featuring is the later model, which had a plastic tank. Earlier models were fitted with a knurled aluminum tank bowl. The letter "B" was cast into the bypass. The earlier model also had four exhaust holes rather than the two exhaust tubes. The "repro" Bantam has a simplified exhaust by combining the two holes.

There were very few advertisements for the engine by Shereshaw himself, leaving this to the large supply houses such as Scientific Model Airplane Co., and Ed Beshar, of New York. Of course, there were slight variations in the photos as illustrators tried to clean up the photos with their airbrushes to the point where it is difficult to pinpoint just what was the first production run.

Regardless of the engine type, the price was still advertised at $16.50 and the manufacturer noted as "Miniature Motors, Inc., Nutley, New Jersey." The Bantam 16 was regarded by many to be the most beautifully machined engine of the pre-WW II days.

Interestingly enough, a continuation of the Bantam 16 was known as the Price .243 which enjoyed all the features of the original Bantam as far as quality machine work went. Naturally, the Price was a bored-out and stroked Bantam but still ran very well.

Eventually, the competition (Ohlsson, Arden, et al) caught up with the Bantam design. In 1947, the Bantam business and designs (there were experimental 23 and 29 size engines also) were sold to Herkimer Tool and Model Works. As discussed previously in the October 1989 issue of *Model Builder* (engine #160), inspection of the drawing reveals typical Shereshaw engine design. The diesel design shown was simply a variation of the ignition version.



FIFTY YEARS AGO, I WAS . . .

Gordon Plaxton, 242 Kyle Drive, Pueblo West, CO 81007, writes to say he was delighted and surprised to see the article on the Pee Wee engine appearing in the Plug Sparks column, July/August 1990 issue of *Model Builder*.

Gordon goes on to say he designed a model around the Pee Wee engine in 1937/38:

"I took it to the Detroit Nationals without a good test flight. Acting on my buddy's suggestion, I took a test flight. You know what happened!

"I launched the model (unofficially, of course!) without setting the timer and with a full tank of gas. Naturally, it went out of sight. That did it and I headed for home; first calling mother and getting that familiar question, `Did you win?' Mothers seem to think there is nothing to winning when it comes to their sons.

"Luckily, I put my name and address on the model. It was found shortly thereafter by a young boy. I picked up the model (with appropriate reward) and returned to the Nats. Now we'll gettum!

"Rats! The wind had come up. With three tries to get off, wouldn't you know it, the engine picked this time to get balky. I didn't feel so bad when I saw a beautiful Brown Jr. powered model take off and loop into the wind with predictable results. I guess you could call that fate.

"Later on, Frank Dallaire became interested in the model, and bought the design, model, and engine. This design was named the `Speedster.' Since then, Alan Pemberton of Streamwood, Illinois, bought my only plan of the Speedster and asked me to redraw it. Now I have a blueprint and a very good copy of the original. How about that?"

SPEEDSTER FOLLOW-ON

Talk about a coincidence. For those read

continued on page 85

ELECTRONICS CORNER

BY ELOY MAREZ

A MIXED BAG OF LETTERS

NARROW BAND—OMT!

As my steady readers know, I always like to mention my correspondents' names, especially those to whom credit is due for a particularly good idea or solution to an electronic problem. In the case of this writer, though I think it best we let him be forever anonymous. Read on:

"As you know from past correspondence, I am pretty dumb about radios. I have a couple of questions regarding this 1991 narrow band business, that perhaps you can help me with.

"My favorite radio is my Futaba 7FG/E, which was new in 1984. I'm thinking that by now it probably should be checked and tuned, and since Futaba has their upgrade offer in effect, it would be prudent to send this 7FG/E in and have it upgraded. My question is, if I get this changed to narrow band, will it still transmit to my older (not narrow band) receivers? Also, would a wide band transmitter work with the newer narrow band receivers?

"The reasons I ask all these dumb questions is that I have four other radios (not narrow band) which have not been used a lot and should be in good shape yet. I hate to spend the money to send them all in for upgrading, as they all work fine.

"I know what you are thinking, but here's the situation. I live out here in southern Minnesota, about forty miles past where Custer lost his overshoes. As far as RC activity is concerned, the nearest active RCer lives about ten miles from here and flies only at a club field about twenty miles away. I fly almost exclusively alone, here on my own farm. I do not fly at any club field. Heck, the nearest hobby shop is 45 miles away.

"Sorry, I tend to ramble! Can you help!"

Help yes! But first, I must say that any one who has a private flying field, doesn't have to drive freeways every day, and is no doubt breathing smog-free air, should not ever refer to himself as "dumb" . . . about anything! I personally try never to forget that while I am deeply interested in RC electronics, ours is in reality a flying hobby, not an electronic one. It is important to learn how to install, adjust and care for a radio system, but one can be a completely successful RCer and still leave the electrons to us. Not knowing them does not make one "dumb."

Initially, before answering our phantom friend, I intended to treat you (?) to a discussion about "narrow band," with as little electronic terminology and impressive language as possible. Personally, I don't recall ever having read such an explanation; too much of what has been written on the subject has done little more than confuse an already confused situation. But then again, maybe I missed that particular article, and there is no need for a repeat . . . after all, 1991 is here. However, if any of you feel a simplified explanation of "narrow band" will help, let me know and I will discuss it in an issue in the near future. *(One "yes" vote from the editor. wcn)*

As for our many-radio'ed friend, let me say first that I understand his feelings completely. I found it extremely difficult to retire my old Orbits . . . it is even harder to do when you have personally selected, tested and pre-aged, and soldered in every single component. Anyway, the answers to all of the above questions is almost always: Yes! With some exceptions, yes, narrow band transmitters will work with older non-narrow band receivers; and an older non-narrow band transmitter will work with new narrow band receivers.

The exceptions? First comes the question of crystal frequency tolerance. A transmitter and/or receiver marked for frequency 72.XXX MHz is not necessarily on that exact frequency down to the cycle. A certain tolerance is allowed by law, 0.005% at present, though it will be tightened down to 0.002 in March 1992. Older equipment was allowed even wider tolerances. Obviously, it is then possible that a mix of old and new will not necessarily work at optimum simply because the allowable tolerances puts one unit high and the other low in frequency. The use of narrow band equipment increases the requirement that both transmitter and receiver be closer to the same exact operating frequency. Sometimes, tuning the receiver to the transmitter (never the other way around) will bring the system into tune good enough to fly. The best test is the old "antenna-off" or "antenna-down" test; you know what kind of distance a properly working system should give you, and if your new mix-and-match is close to that, it should be safe to fly.

There is yet another exception which crops up occasionally, that of transmitter encoding and receiver decoding. Though rare, some incompatibilities do crop up. For example, my old Orbit receivers will not "play" to my Airtronics transmitters, though they are both AM. I never did take the time to investigate just why.

One more consideration exists, outside of that of the width of the transmitted signal. Some significant improvements, both mechanical and electronic have come along in recent years, which add up to a lot more reliability than that found in equipment of older design. If yours is an expensive airplane, one you really care about, give it the benefits of a modern radio. I recently talked to a rather dejected flier in Louisiana who had just lost a Kavan twin-powered 1/3rd scale Cub. The radio? A Kraft Sport! Imagine, an airplane of that type being flown with a ten-year-old radio that even when new was sold as a second grade system. What fools these mortal be!

BATTREES!

We can't let too long go by without talking about them! And that is not a typo . . . I was 14 - 15 back in Texas before I knew that the correct pronunciation was "batteries"! Whichever way you say the word, there is some news from a couple of the manufacturers . . . in spite of some common thinking, brands other than Sanyo do exist.

Gates Energy Products, Gainesville, Florida, has announced some advances in the NiCd battery war to pack as much energy into a given package as possible. It has a line of batteries called "Ultramax," which are rated as follows:

Size AA - 800 mAH
Size Cs - 2000 mAH
Size CsC - 2300 mAH
Size C - 2800 mAH

We all know what AAs and Cs (Sub-C) look like . . . the latter is the one that for years has been rated at 1200 mAH, probably the most common cell for electric powered models. The C is not common for RC uses, but is the same size as the familiar dry cell C. CsC is physically of an in-between size. All these cells are capable of accepting a one hour fast charge, which is the shortest charge time ever quoted by any NiCd manufacturer, all of whom blanch and quickly change the subject when you try to discuss the "boil" rates we insist on using.

Varta Batterie AG (no typo either) of Hannover, Germany, has announced the availability of its Nickel-Hydride cell in early 1991. Initially, such cells, which use

completely new chemistry, will be made in AA, Cs, and C sizes, and will boast capacities considerably higher than NiCds of the same physical size. Actually, the news release which I received said "50% higher," but it gets confusing what with new capacities being announced almost weekly. For example, the Varta AA is actually rated at one amp capacity, which makes it 200% percent better than the 500 cell we're so accustomed to seeing and using. On the other hand, it is only 25% better than the 800 mAH Gates AA just described.

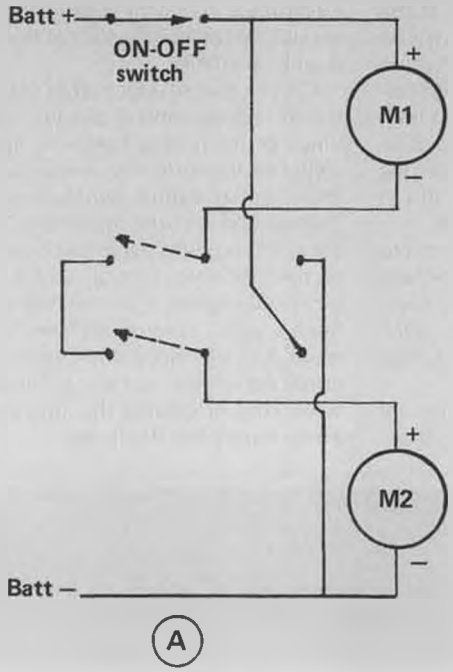
Regardless of the car salesman claims, it is good news, as in addition, the cells are announced as capable of surviving 1000 charge/discharge cycles.

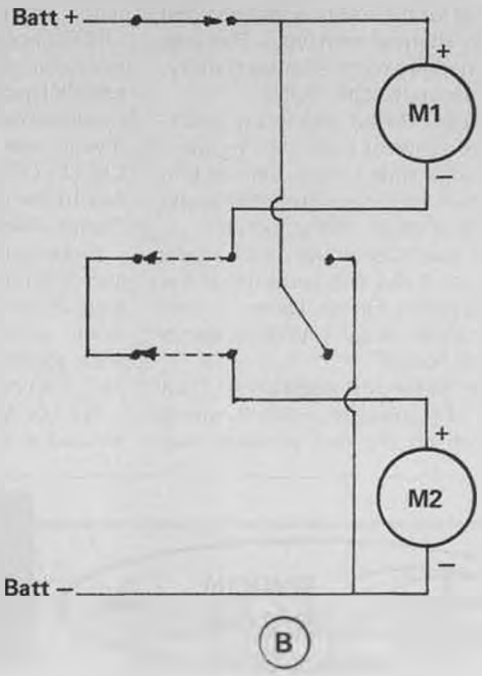
Let us hope that the next move on the parts of at least one of these "battree" makers will be to bring us smaller, higher capacity cells. True, we do have a use for the sizes and capacities mentioned, but there are also a lot of airplanes flying around in which even the AA pack is more than is really needed . . . wouldn't it be nice to be able to shed a couple of ugly ounces and still keep the same amount of flying time?

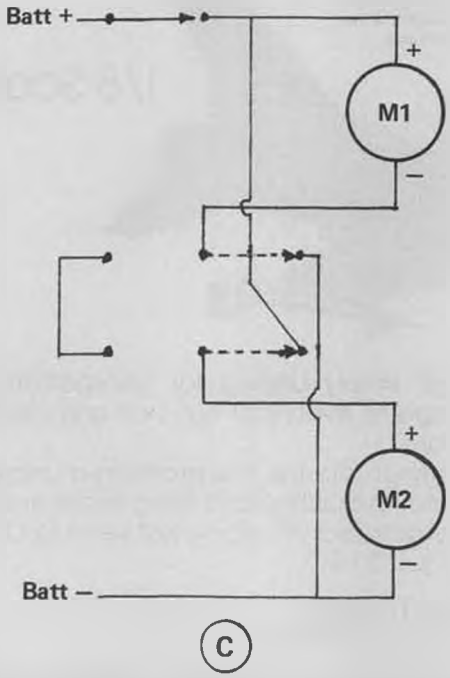
Here in the US of A, the company has a branch at: Varta Batteries Inc., 150 Clearbrook Rd., Elmsford, NY 10523.

BATTERY CHARGING

This is in the news also. A publication entitled "Mobile Radio Technology" recently reported a new NiCd charging technique invented by a gentleman named John Henkel. Using the Henkel method, the example given shows an 800 mAH pack being charged in only 3-1/2 minutes. Obviously, the method uses some rather high currents; the stated rate was 15 amperes. Few actual details are given, and no circuits, but apparently external impedances are used to maintain the charging voltage equal to that of the battery being charged, automatically increasing as does the voltage of the latter. This is claimed







A circuit for servo-operated micro switches to operate twin electric motors in series for low speed, and in parallel for high. The complete wiring is shown in (A), including an Off-On switch, and simplified drawings of the low (B) and high (C) hookups. For contrarotating motors, simply reverse the connections to the appropriate motor.

to reduce cell heating, doubtlessly the major killer of NiCd cells.

Sounds like just the ticket for those in a hurry . . . I have written to Mr. Henkel, and if further interesting information arrives I'll share it with you.

Electric Power fans should definitely benefit from the batteries and charging methods previously described once they become readily available. I get a lot of mail on the subject of electric powered models, mostly asking for basic information and which I answer personally and don't include in the column . . . space, you know! However, the following letter brought up a subject that my research, even my handy MB Electronics Index did not cover, and though it sounds like a simple request I had to scratch a bit for the solution and decided it was worth sharing with you. The one causing this mental exercise, Ernest Gaudry, of Orange, Massachusetts, writes:

"Did you ever do an article on series-parallel speed control? I am looking for a schematic using a slide switch, Off-On-On, to get Off-Slow-Fast, for a twin electric plane using opposite rotation on the motors.

"I enjoyed your December 1989 article on switches, as I did not know what the abbreviations meant. Do you know a source for a good slide switch? Would micro switches work better?"

The answer to the first question is: "Not before now!" Enclosed is a switch wiring scheme which, in the first position, will connect the motors in series, placing approximately half of the battery voltage across each one, and of course resulting in low speed operation. In the second position of the switch, it reconnects the motors in parallel, that is with the full battery voltage on each one, for high speed operation. For reverse rotation of any one motor, simply reverse the connections to it. For the sake of simplicity, I have redrawn the circuit in both its low and high speed positions.

Even though I had to try a couple of different sketches before I got all the wires in the proper place, that turned out to be the easy part. Much more difficult was locating a switch! And yes, micro switches would be better, as they require less force and are easier to operate mechanically. Unfortunately, micro switches are not made in the DPDT configuration required, so it will be necessary to physically gang two of them together to operate off the same servo wheel-mounted cam (use a longer pin to trip both levers). Nor are micro switches made in an Off-On-On configuration, so a separate one has to be installed to handle the Off-On chores, operating from the same cam.

Good quality high-current rating micro switches tend to be expensive, and the best sources are the many new-surplus electronic suppliers around the country. One such source is: All Electronics, P.O. Box 567, Van Nuys, CA 91408.

For Los Angeles area residents, stores are located at: 905 S. Vermont Ave., Los Angeles; and 6228 Sepulveda Blvd., Van Nuys.

The current All Electronics catalogs list a number of good roller actuated micro switches, with ratings of 10 and 15 amps, for $1.00-$1.25. Most switches of this size are made for spade quick-disconnect connectors, however, to keep down the losses, I recommend that all connections be properly soldered. Actually, the ratings for these and most switches are given at 125 VAC, and they will handle much more at the lower DC voltages involved. However, for the sake of longevity, it is best to use the heaviest components practical. And of course, heavy multi-strand wire is definitely called for.

Such wire, in sizes 16 and 14 gage, silicone insulated, is available from Novak Electronics . . . you'll have to try hobby shops that cater to the RC car trade, but it is readily available.

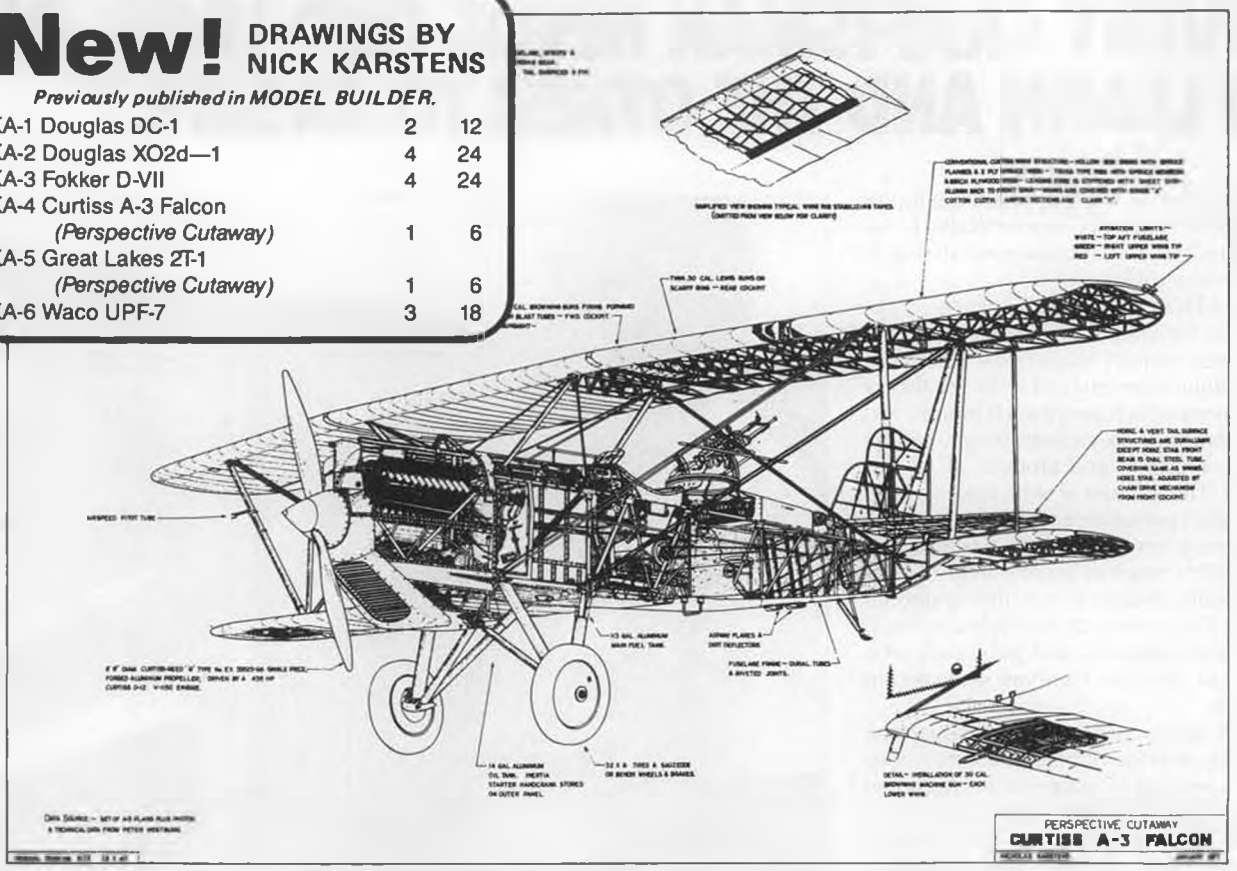
Oh yes, that All Electronics catalog is free for the asking, and it always includes all kinds of interesting bargains. Speaking of switches, the current issue even offers one of those dollar eating switches you find in change and vending machines. You know, the kind you slip a paper buck into, with the picture of George face up, which is rejected if old and worn or if it is inserted incorrectly. Such a deal . . . removed from new equipment, $15.00. No, I don't know what you could do with it, just wanted to show you what kind of catalog this one is! Anyway Ernie, happy electric flying. **MB**

Peter Westburg's
SCALE VIEWS

New! DRAWINGS BY NICK KARSTENS

Previously published in MODEL BUILDER.

KA-1 Douglas DC-1	2	12
KA-2 Douglas XO2d—1	4	24
KA-3 Fokker D-VII	4	24
KA-4 Curtiss A-3 Falcon *(Perspective Cutaway)*	1	6
KA-5 Great Lakes 2T-1 *(Perspective Cutaway)*	1	6
KA-6 Waco UPF-7	3	18



SUPER-ACCURATE AIRCRAFT DRAWINGS. USE FOR SCALE DOCUMENTATION AND/OR FOR DEVELOPING MODEL CONSTRUCTION PLANS. ALL DRAWINGS ARE 28 x 40 INCHES BORDER- TO-BORDER, AND ARE SCALED AS LISTED BELOW.

	No. of Shts.	$
1/24 scale: ½" = 1 ft.		
WE-18 Douglas O-35/B-71	1	6
WE-23 Douglas XO-36/XB-7	1	6
1/12th scale: 1" = 1 ft.		
WE-2 Boeing F4B-4/-3	4	24
WE-3 Boeing P-12E	3	18
WE-4 Curtiss A-8 Shrike	3	18
WE-7 Curtiss Gulfhawk 1A	2	12
WE-8 Curtiss N2C-2 Fledgling	4	24
WE-9 Curtiss O-1B/A-3 Falcon	3	18
WE-10 Curtiss P-1B Hawk	3	18
WE-12 Curtiss XP/YP-23	3	18
WE-13 Curtiss SBC-4 Helldiver	4	24
WE-14 Czech Avia B-534	2	12
WE-15 Davis D-1K	2	12
WE-16 Douglas O-25C	3	18
WE-17 Douglas O-31A/O-31B	3	18
WE-19 Douglas O-38/O-38B	2	12
WE-20 Douglas O-43A	3	18
WE-21 Douglas O-31C/Y10-43	3	18
WE-22 Douglas O-46A	3	18
WE-25 Fokker D-17	3	18
WE-26 General Western Meteor	1	6
WE-28 Grumman F2F-1	3	18
WE-29 Grumman F3F-2	3	18
WE-34 Stearman 4E Mailplane	2	12
WE-36 Travel Air 2000	2	12
WE-37 Waco ATO Taperwing	2	12
1/10 scale: 1.2" = 1 ft.	Shts.	$
WE-1 Berliner/Joyce P-16	4	24
WE-5 Curtiss BFC-2 Goshawk	4	24
WE-6 Curtiss F9C-2 Sparrowhawk	4	24
WE-11 Curtiss P-6E Hawk	4	24
WE-24 Fiat CR-32	3	18
WE-27 Great Lakes Trainer	4	24
WE-30 Hawker Fury Mk I	4	24
WE-31 Hawker High Speed Fury	3	18
WE-32 Hawker Persian Fury	3	18
WE-33 Monocoupe 90A	2	12
WE-35 Swedish Sparmann P-1	2	12

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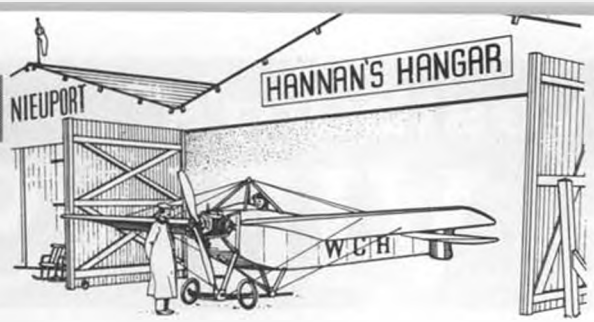


BY BILL HANNAN

"EVERY CRAFTSMAN NEEDS TWO LIVES, ONE TO LEARN AND THE OTHER TO CREATE."

Our lead-in line this month was found in *A Touch of Glass,* by Walter J. Hamilton, a craftsman specializing in stained glass.

PUBLICATIONS GALORE

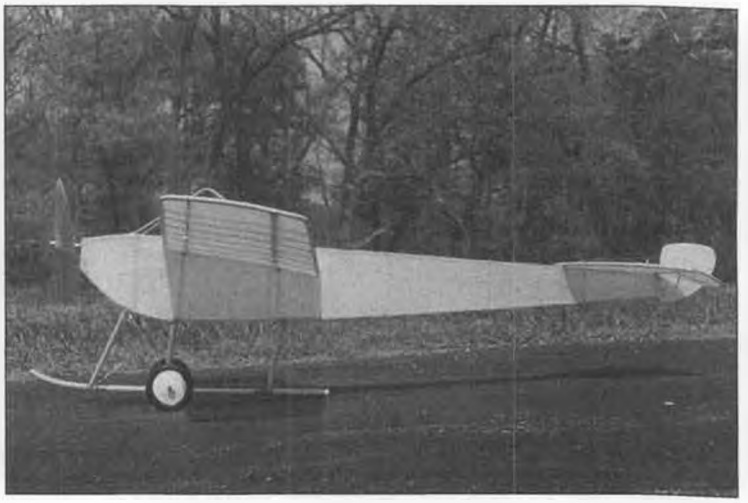
Anyone for aviation books? Three-views? Plans? Newsletters? Magazines? Evidently! We continue to be amazed at the number of publications which arrive each month, and marvel that there are so many people willing to write, illustrate and produce all of this material. The amount of skill, patience and (especially!) persistence needed to produce such items is enormous. Even this little column, which receives a great deal of help from readers, absorbs an astounding amount of effort. Thus, we salute the tireless authors, artists, photographers, and publishers who make it all possible. Here are some recent examples:

British Experimental Jet Aircraft. This book must receive pride of place by virtue of its massive amount of information. Authored *and* illustrated by Barrie Hygate, it presents some 42 aircraft dating from 1941 through 1986, documented with scale drawings, photographs, and informative text, which could serve admirably for model research purposes. Ducted-fan enthusiasts in particular should examine the variety of designs featured, which offer an exciting contrast to some of the more commonly-modeled types. Configurations range from conventional platforms though truly esoteric flying wings and canard layouts. You can choose from delta-wingers, adjustable-on-ground wing-sweep designs and even a jet flying boat. Interested in novel intake and

Dave Stott, co-promoter of the now-famous Flying Aces Club, couldn't be more delighted with his replica of a Lenape powered low-wing Bellanca. Photo by Tom Schmitt.

Well-dressed Benno Sabel, of Germany, with his delicate and extremely intricate Peanut Scale 1908 AVRO I. You have to admire these guys, both for their courage to tackle such a complex subject and for their ability to then build it and make it fly.

Rubber powered Nieuport was built by Vern McIntosh from circa. 1912 model plans. A fast and tricky model to trim, says Vern.



exhaust locations and shapes? If you can't find what you want here, it probably doesn't exist. How about unusual color schemes? Well, what could be more unusual than a salmon-pink Avro delta to garner attention at your next model contest?

Quite apart from the subject possibilities, we found the facts featured in this book to be presented in an entertaining manner. Example: One craft is described as having "all the shapeliness of a suitcase." And certainly the test pilots of these machines were a brave group, frequently encountering the most unlikely problems, and *usually* managing to surmount them.

From a modeler's point of view, it is the large-format scale drawings that are the heart of the publication. They show both sides, top, bottom and front aspects, and are nicely augmented in most cases by photographs. At about fifty dollars, this tome is costly; however, in light of its comprehensive coverage, it is certainly a good value. Published by Argus Books, of England, it is available in the US from Zenith Books.

ALSO FROM ARGUS

Operating Four-Stroke Engines, also from Argus, is compiled by Brian Winch, "Mr. Engine-ear" of the Australian magazine *Airborne*. Written in an informal, breezy style, information is imparted painlessly and entertainingly: ". . . you could encounter problems with the nut that turns the propeller at times (that's you)." Featured are history, operating principles, configurations and maintenance.

We were surprised to learn that in 1862, during the lifetime of pioneer French rubber-power model designer Alphonse Penaud, another Alphonse, Beau de Roc, had published his four-stroke internal combustion theories, which are still valid today. Because Alphonse Beau de Roc did not make any operational engines, credit for the invention is generally extended to German engine manufacturer Nikolaus Otto, who did.

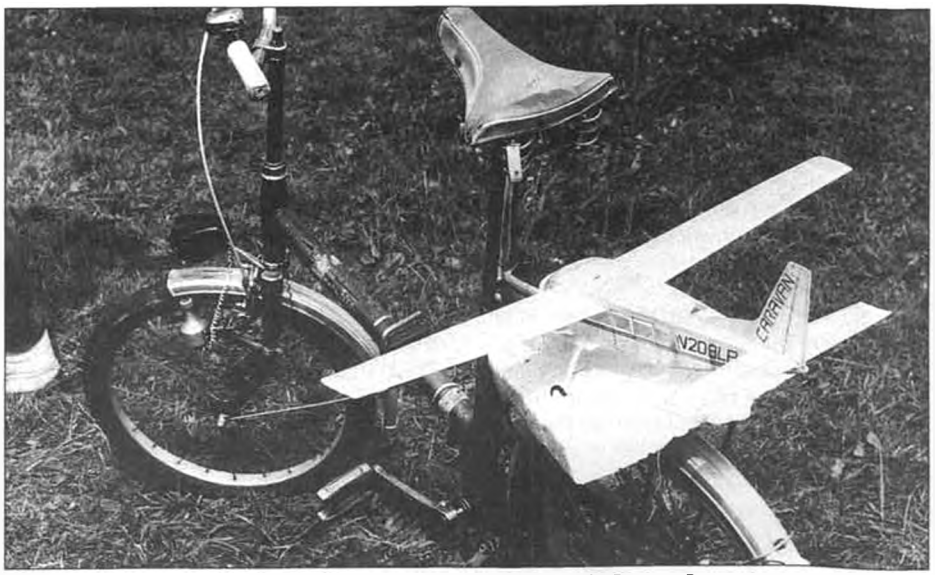
Sprinkled throughout this book are photos of production four-stroke model engines, homebuilt examples, and some of the models they have powered. Well-discussed are fuels, oils, starting procedures, filters, engine mounting, and a simple, inexpensive solution to internal corrosion problems.

Modelling Modern Soviet Fighter Aircraft. Another Argus production, this book, by Ken Duffey, is aimed at builders of plastic static-scale models. However, you ducted-fan model fliers may also find it useful, since it sorts out the major and minor differences among the formerly mysterious MiGs, Yaks and Sukhois.

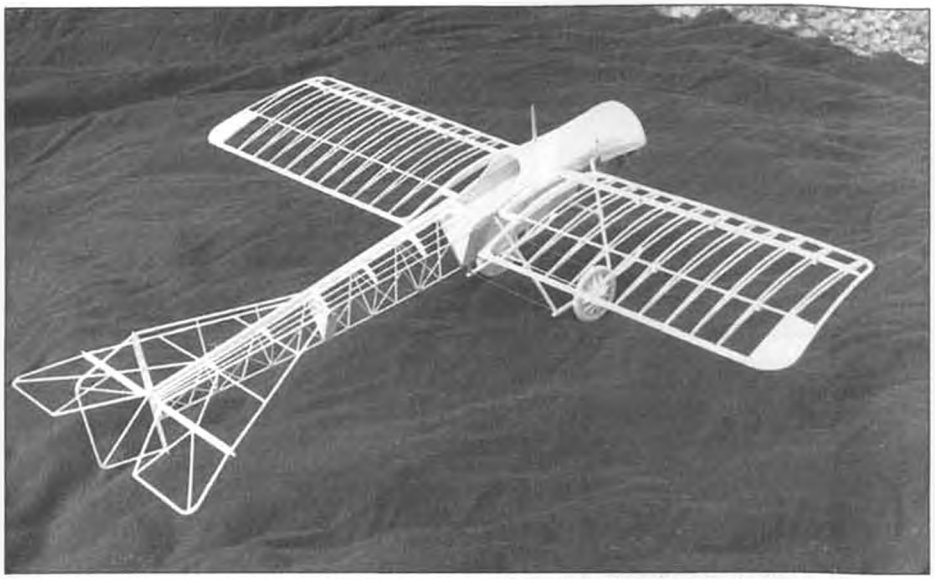
For more information on any of these Argus offerings, contact Argus Books, Argus House, Boundary Way, Hemel Hempstead, Herts., HP2 7ST, England. Their U.S. distributor is Zenith Books, Box 2, 729 Prospect Ave., Osceola, WI 54020.

ALSO FROM ENGLAND

Planes in Scale,Lockheed F-94 Starfire, is the second in a series of monographs compiled and illustrated by Brian A. Marshall.



Economical and ecological transportation to the flying field for this Cessna Caravan, as utilized by Peter Mikulasek, of Czechoslovakia. Photo by Lubomir Koutny.



Bones shot of John Blair's 7/8"=1' 1912 Blackburn reveals an exceptionally delicate structure.

Another Nieuport, a heavily detailed 56-inch RC version with O.S. 25 power by English modeler Denis Fairlie. Photo contributed by Ray Rimell.

Featured are eight pages of clear, 1/72nd scale drawings showing front, rear, top, bottom and both side views, cross-sections, specifications of the F-94A, B and C variations, plus a brief history. Information regarding these high-quality, low-cost publications, as well as other PAMAG items, may be obtained by sending a pre-addressed, stamped return envelope to J.J. Daileda, 4314 West 238th Street, Torrance, CA 90505.

AND IN FRANCE

Vol Libre, which translates to Free Flight, is a unique publication edited, partially illustrated and published by Andre Schandel, featuring plans, articles and ideas from many parts of the world. More elaborate than most newsletters, yet quite unlike commercial magazines, *Vol Libre* must be seen to be properly appreciated. Although the focus is on technical aspects of competition models (Wakefield, FAI Power, Towline and Microfilm types), there is also diversion into Peanut Scale plans and building hints for beginners.

A six-issue subscription is available through Peter Brocks, 313 Lynchburg Dr., Newport News, VA 23606, for $18. Also offered in very limited quantity (only 600 copies printed) is a 180 page book of plans, priced at $12.

TIGHT LINES

One of the most amusing newsletters we receive is not devoted to model building at all, but to kites! However, we know quite a number of modelers who are also kite enthusiasts, including such notables as Charlie Sotich, Frank Scott, Bill Winter, Ron Moulton, and Paul Garber. How they find time for more than one hobby is a good question, but perhaps that is the point—we all need to lighten up and not become too narrow in our specialties.

Anyhow, *Tight Lines* is anything but heavy reading, being aptly edited by Len Conover and T.E. O'Bear in such a manner as to make no special distinction between levity and facts. Published six times per year, subscriptions are a mere $6, on a money-back-if-not-satisfied basis, from Dirt Cheap Press, Box 888, Newfield, NJ 08344.

INDOOR SCALE MODEL FLYING

Fred Hall's 1976 book has been updated and reprinted, in case you may have missed it the first time around. Featured are sections on the philosophy of flight, how to select a subject to model, building materials, tools and accessories, construction hints, propellers, rubber motors, flight trimming and contest flying, all presented in a clearly-written and enlightening manner. Fred's experience dates back to the Comet 10-cent kit days, so he knows whereof he writes. Priced at $6.95, *Indoor Scale Model Flying* is available from Fred Hall, Box 658, Plaistow, NH 03865, or from Peck-Polymers, or Hannan's Runway.

FLYING START

School teacher Ernest M. Johnson has worked with youthful model builders for some 30 years, and has recently started a business devoted to the needs of beginners to the hobby, ranging from plans for basic gliders through rubber-powered models up to 25-inch wingspan. He also offers miscellaneous information from his extensive library of old-time books and magazines at minimal fees. One dollar will bring a complete catalog from: *Flying Start*, 10460 Ambassador, Rancho Cordova, CA 95670.

CONGRATULATIONS *AIRBORNE!*

Winding up our unusually lengthy publications coverage this month, we salute the staff of the fine Australian magazine *Airborne*, on reaching their milestone issue number 100. Editor Merv Buckmaster is quick to mention that *Model Builder* had reached number 222 in about the same length of time, however 100 issues of any publication represents a staggering number of deadlines and much midnight-oil burning. And, as one newsletter editor put it, "Lots of models which *didn't* get built."

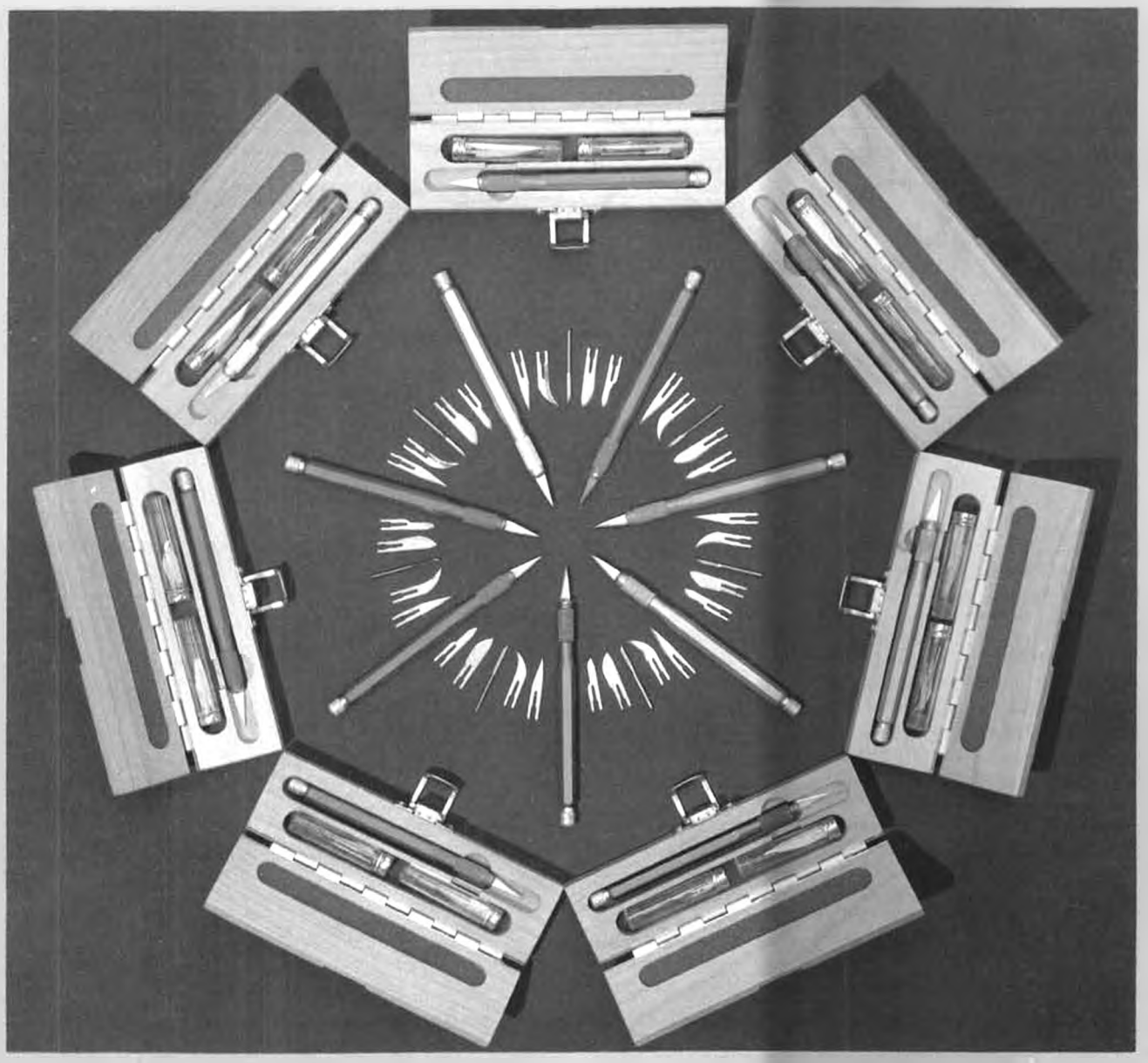
Rather sadly, *Airborne's* longest-running column, "Flight Analysis," by Martin Simons, concluded with the 100th issue. We hope to quote from some of Martin's parting words-of-wisdom in a future column, but for now, we wish him newly-found free time to spend at his drawing/building board!

OUR READERS WRITE

Pistachio size models have been around for quite a long time, according to Jerry Bockius, of Norwich, Connecticut, who sent in a 1934 advertisement for Modelcraft kits, of Los Angeles, California: "More fun than

continued on page 87

IN THE BEST CIRCLES, IT'S **über skiver**



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CHOPPER CHATTER

BY JAMES WANG

Hi folks. This month I will explain how rotor noise is generated by RC model helicopters. I will also talk some more about rotor blade tip design technology. Elsewhere in this issue, we have a review of GMP's Jet Ranger helicopter.

This past month I have been testing the new Schluter "Whopper" autogyro. It's quite a unique experience. It's unlike RC planes, and does not fly like a helicopter either. We will have the Whopper review for you soon. In next month's issue, we will show you how to program the Futaba 1024 9VH and JR PCM-10 radios for aerobatics, including how to program-mix different channels to enhance your model's handling qualities.

Before I get started on the heavy duty technical topic, let's chat a bit. I just got back from the 1990 European Rotorcraft Forum in Glasgow, Scotland. I had a great time! From this trip I learned quite a bit of technical and also cultural stuff. Regular readers of this column know that my real job is doing research on full-size helicopter rotor dynamics. The problem with having a job that involves research is that one must constantly read technical journals and attend technical conferences to keep up with what the Joneses are doing. Every year there is one full-size helicopter technical conference in the U.S., and one in Europe. The purpose is for researchers to gather and share the results of their work. I was at Glasgow presenting results from the wind tunnel tests that we did on a bearingless rotor head. I also listened to other researchers explaining what they have been investigating. The topics included new rotor designs, blade designs, new auto pilot systems, new mathematical methods to describe a helicopter's flight characteristics, ways of calculating rotor blade noise, etc. Since model helicopters are helicopters too, the theory of how full-size helicopters fly applies to models, too. Readers may wonder how I come up with new topics to write each month. Well, a lot of my ideas come from just flying my RC models, tinkering with new modifications, going to the flying fields to swap ideas, and attending contests and trade shows. The other topics of my monthly columns are triggered by new principles, concepts or theories that I learn at these full-size helicopter confer-

Cradled in the hands of Miss Lottie Cellini is James Wang's Schluter Magic with BERP (British Experimental Rotor Program) rotor blades. These blades work best on heavier ships, such as the Magic; text tells why. With BERP blades and a Rossi 60, James' Magic does close to 70 mph!

ences, by reading technical journals, and from my own research.

The trip to England itself was a blast. We rented a Ford Escort and drove on the left-hand side of the road. We had a grand tour of England; from London to Oxford, Bath, Stratford-on-Avon (where Shakespeare was born), Coventry, York (an old Roman town with a three-mile long wall that surrounds the town), Scarborough, Glasgow, Edingburgh, and Cambridge. We put 1500 miles on that little car. Unlike in America, the English cars travel on the left side of the road and the driver sits on the right. So the first five minutes for me behind the steering wheel was eye opening. The speed limit is also much higher. On a motorway (equivalent of a U.S. freeway) the speed limit is 70 mph, but if there is no traffic, most cars will be moving at up to 90 mph. In general, the Europeans seem to be much better drivers. They obey traffic laws, and are quite courteous. The slower moving cars automatically stay in the outside lane. The center lane is used only when people want to pass, or cruise at warp speed. Because of this policy, you will not see drivers constantly switching left and right, joggling for position like on American highways. Interestingly, their average speed is much faster, and there are fewer accidents, too.

Instead of motels, the British have what they call B&B, or "Bed and Breakfast." B&Bs are located all throughout England. These are family run businesses. For example, a couple may have a two-floor apartment, and may have five or six rooms extra to rent out to travelers. For about $30 per person per night you get a nice cozy room in a family house and a wholesome English breakfast the next day. The breakfast includes orange juice, cereal, cooked eggs, two slices of Canadian style bacon, sausage, half a tomato, as many slices of toast as you please, and of course, a pot of genuine English tea!

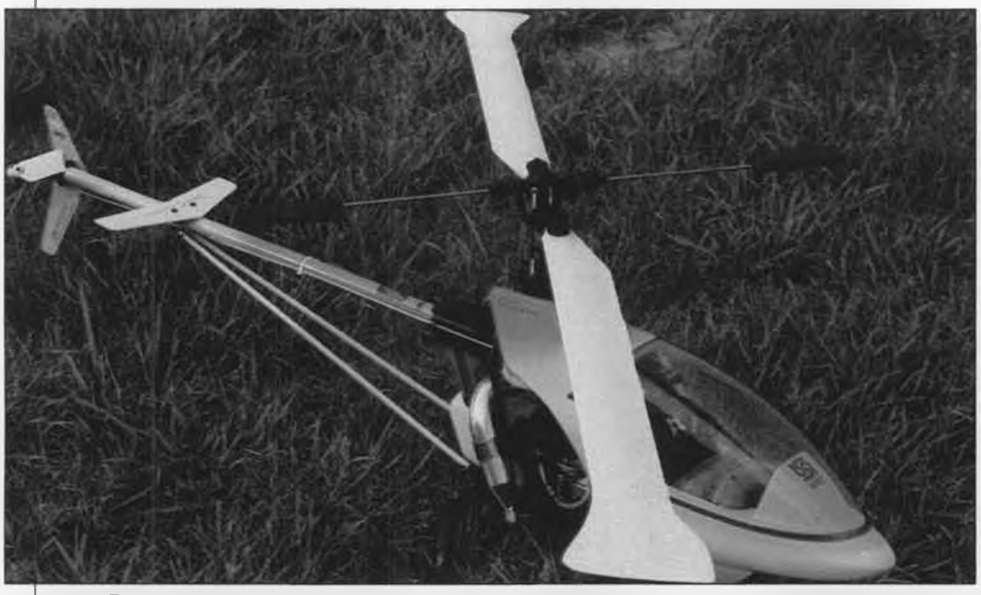
Finally, the highlight of the trip was a visit to the Rolls Royce aircraft engine plant. This was part of the conference. We were given an all-day tour of the facility where the world famous Rolls Royce jet engines are made and overhauled. RR engines are currently used on 747s, Airbuses, British F-4 Phantoms, and many other aircraft. If you think balancing the two blades on our model helicopters is tough, then you ought to have sympathy for the guys balancing the compressor fan and turbine blades. These compressors and turbines spin at 40,000 rpm and each has 40 or more fan blades! How jet engines work is both fascinating and easy; I will have to write a future article to show you guys how it ticks.

One requirement that every jet engine manufacturer must meet is the ability of a jet engine to suffer a bird ingestion. RR says that every day, somewhere in the world there is a jet whose engine has sucked in a bird. RR showed us a video of them testing a jet engine on the bench and purposely launching a two-pound, then a four-pound "dead" bird into the engine. The RR engineer told us that the FAA requires that after a jet engine has sucked in a four-pound bird, it must still be able to run at 70% power for at least a few minutes. The Russian MiG-29 that crashed at the Paris Air Show in 1989 was the result of a bird ingestion. Come to think of it, I have never seen a model helicopter encounter a bird strike, have you?

HELICOPTER ROTOR NOISE

Okay, finally we shall begin this month's Chopper Chatter. We will go over the physics of where model helicopter noise comes from. Basically, there are three categories of rotor noise: *rotating noise, broadband noise,* and *impulsive noise. Rotating noise* is a "thumping" type of noise. As a rotor blade swings through the air, it is actually chopping through the air, and thus generating a pressure wave. When we talk, we are generating vibrating pressure waves through the air so other people can hear us. If you put your hand in front of a hi-fi speaker, your palm will feel a vibrating pressure wave from the speaker.

If our model rotor is spinning at 1500 rpm, then the air surrounding the helicopter is being disturbed 1500 times per minute. Because it has two blades, every minute you will hear 3000 thumps. If you divide 3000 by 60, it means you will hear 50 thumps per second. Fifty vibration cycles per second is also called 50 "Hertz." Fifty Hertz is considered to be a very low frequency noise. Some men have a very low frequency voice; they might be able to sing down to 50 or 100 Hertz. Some women with high voices can squeak at 2000 Hertz. Normally, the music that we hear has a frequency content of from 50 Hertz to 5000 Hertz. The human ear can perceive sound from 20 to 20,000 Hertz. A frequency higher than 20,000 Hertz is not audible by humans, but may be audible by dogs and cats. For



(Left) The double swept tip blade design by James being tested on his Kalt Excalibur. (Right) Lottie Cellini again, this time with our columnist's "Whopper" autogyro produced by Schluter. We'll be taking a closer look at this intriguing model in an upcoming issue. Don't miss it!

example, the dog whistle used by canine trainers has such a high frequency that humans cannot hear it, but dogs can. Low frequency noise (20-50 Hertz) can be very annoying because it is more energetic, thus you can actually feel the "vibes." Because low frequency noise contains more energy, it also travels farther. High frequency noise does not travel very far, so the noise we hear from very distinct and sounds like thump, thump, thump, thump, thump. Rotational noise is what we hear most clearly when a full-size helicopter flies overhead.

Figure 1 also shows the *broadband noise*. Broadband noise does not have very distinct peaks. Broadband noise is generated by random fluctuations of air flowing past the blades. Broadband noise

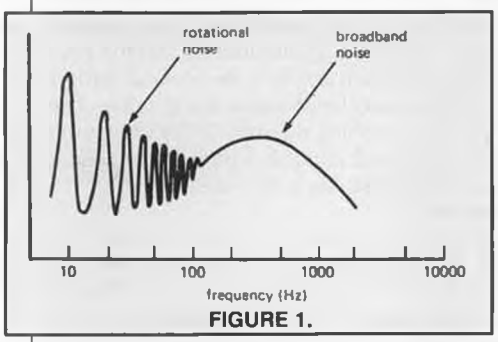


FIGURE 1.

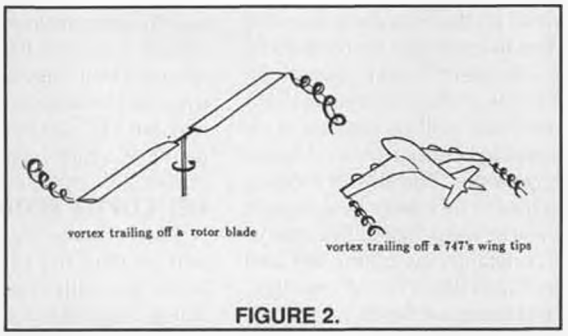


FIGURE 2.

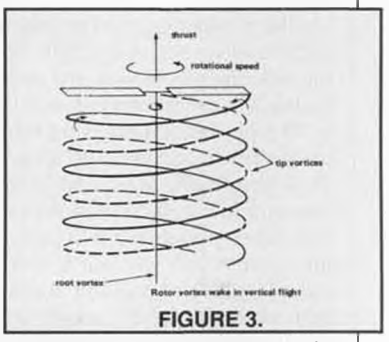


FIGURE 3.

(Figure 1) A typical frequency spectrum of the acoustic noise from a full-size helicopter. (Figure 2) Airplane wings and helicopter rotor blades always shed a swirling vortex at the tips, due to the higher pressure air below wanting to flow into the lower pressure region above. This phenomenon was explained in detail in the November 1989 column. (Figure 3) The core of the vortices from a helicopter's rotors are blown downward into a helical pattern. On a humid day you can see the trailed vortices from helicopter blade tips or from airplane wing tips.

helicopters far away is predominantly low and medium frequency noise. At close range, we will hear more high frequency noise.

Figure 1 illustrates the frequencies generated by a typical full-size helicopter. The individual spikes are the rotating noise. The lowest frequency spike is at the blade rotating frequency. For a model helicopter rotor at 1500 rpm, the first peak would be at 50 Hertz. The rest of the peaks always occur at the multiple of the fundamental frequency. Thus, the second peak would be at 100 Hertz, then is also called *vortex noise* because the random fluctuation of air currents is caused by the blade tip vortex mixing up the air flowing around the entire blade. The turbulent air shed behind leaves a "swishing" sound. Since it is turbulent in nature, it contains a broad band of frequencies. The frequency range of the swishing broadband noise is always higher than the rotating noise. Human hearing is particularly disturbed by this frequency range, but since it is of a higher frequency range, it attenuates rapidly with distance. (Any

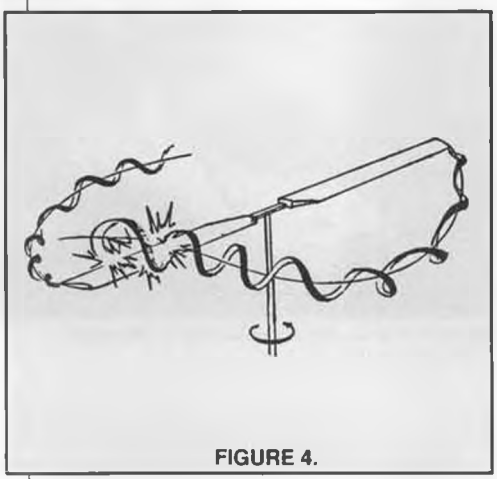


FIGURE 4.

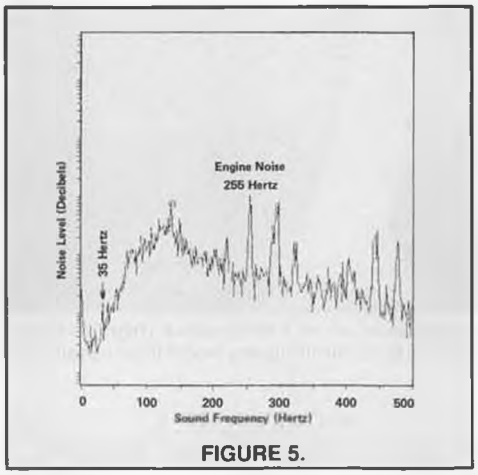


FIGURE 5.

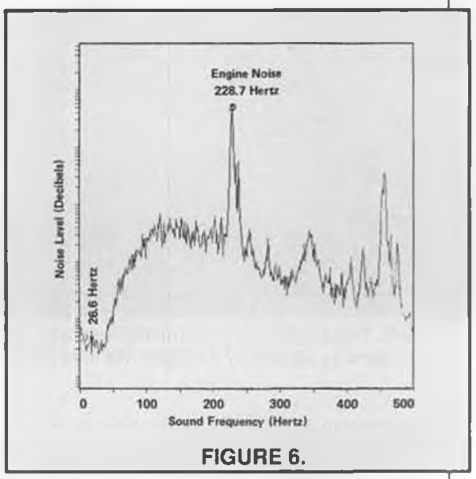


FIGURE 6.

(Figure 4) Blade slap noise is caused by a blade running into the trailed vortex from the previous blade. (Figure 5) This is the acoustic frequency spectrum that James measured from his GMP Cobra. The strong peak at 228 Hertz is the engine noise. The broadband noise is from turbulence over the blade (called vortex noise), gear mesh, air flow over the fuselage, etc. (Figure 6) The acoustic frequency spectrum recorded from a Schluter Junior. The engine noise peak is lower than the one in Figure 5 because a Whisper Tech muffler was used.

another at 150 Hertz, and another one at 200 Hertz, and so on. The reason these additional peaks exist is because every time the blade makes one revolution, the blade itself does not just flap up and down once, the blade is also vibrating up and down microscopically twice, three times, four times, and up to many, many times. Therefore, there are multiples of frequency peaks. Because the noise is all concentrated in a few distinct frequencies, the sound is also wing or rotor blade that generates lift will produce a tip vortex as a by-product. Figure 2 shows how the tip vortex is trailed off an aircraft wing or helicopter blade. Figure 3 shows how the core of the trailed vortices from a hovering helicopter always form a helical pattern. For a helicopter in forward flight, the helix is left behind continuously as the helicopter keeps moving forward. If you are lucky, on a humid day you can actually see the whirling trailed vortex coming

off airplane wing tips or helicopter blade tips.)

Finally, not shown in Figure 1 is the *blade slap noise*. Blade slap noise is what we hear when our RC helicopter is maneuvering, such as in a steep turn, loop, shallow descent, flare, etc. It actually sounds like the rotor blade is slapping the air. It is normal for RC helicopters doing aerobatics to make such a noise. Unfortunately, FAI judges sometimes downgrade maneuvers when blade slap noise is heard. Blade slap noise is generated when a following blade accidentally encounters the trailed tip vortex of the previous blade. This phenomenon is called *blade vortex interaction*. Figure 4 illustrates this. In level flight we normally would not hear blade slap noise because the tip vortex is blown downward by the rotor thrust. However, in maneuvering, such as at the top of a loop, the trailed vortex might not have a chance to get blown away. Hence, blade 2 comes and smashes into the trailed vortex of blade 1, and then blade 1 smashes into the trailed vortex of blade 2. Figure 4 illustrates the blade slap, or blade vortex interaction phenomenon.

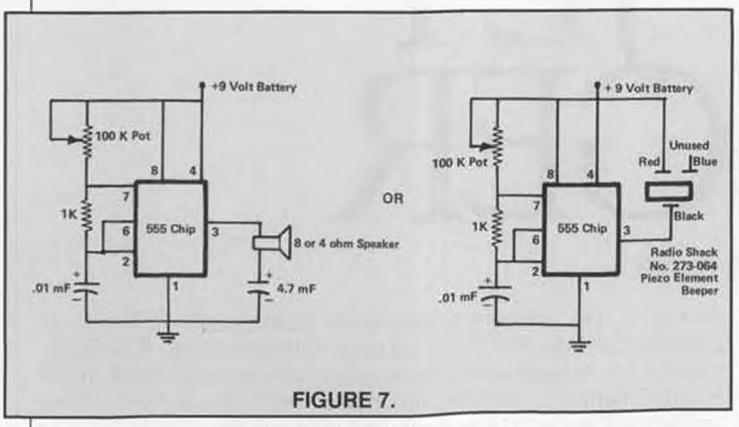


FIGURE 7.

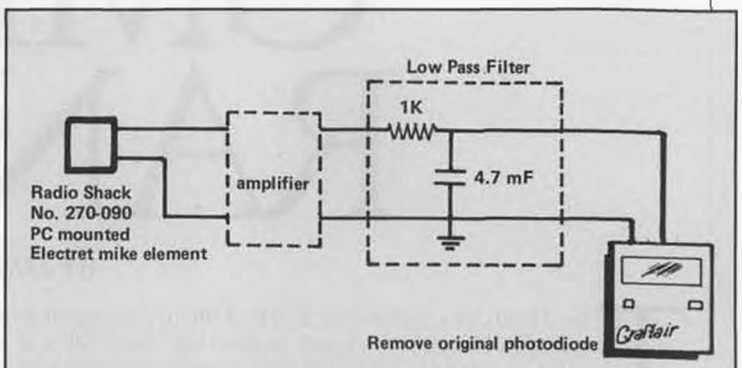


FIGURE 8.

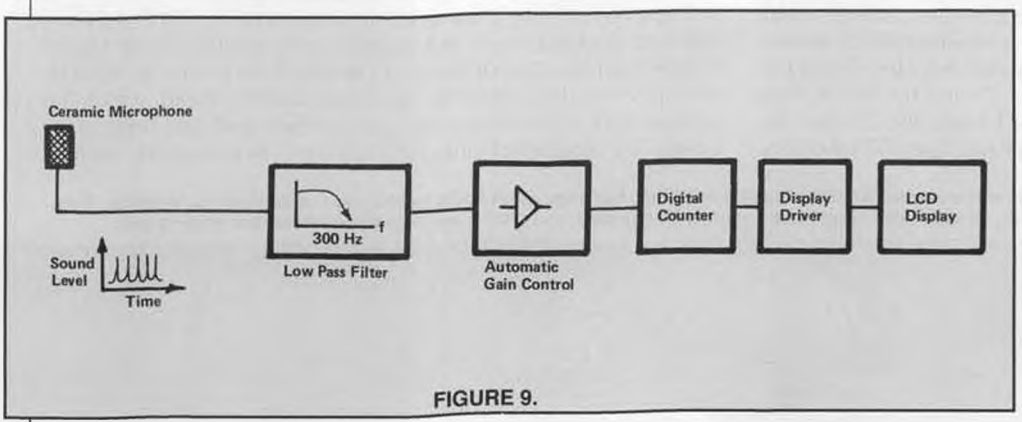


FIGURE 9.

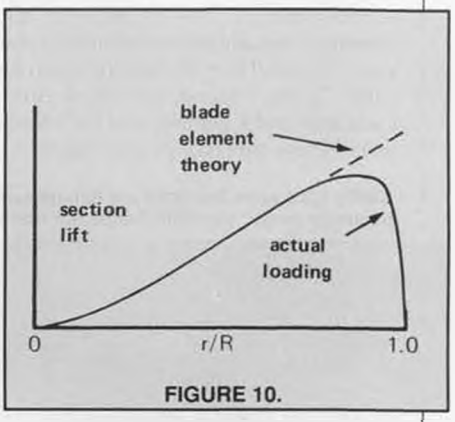


FIGURE 10.

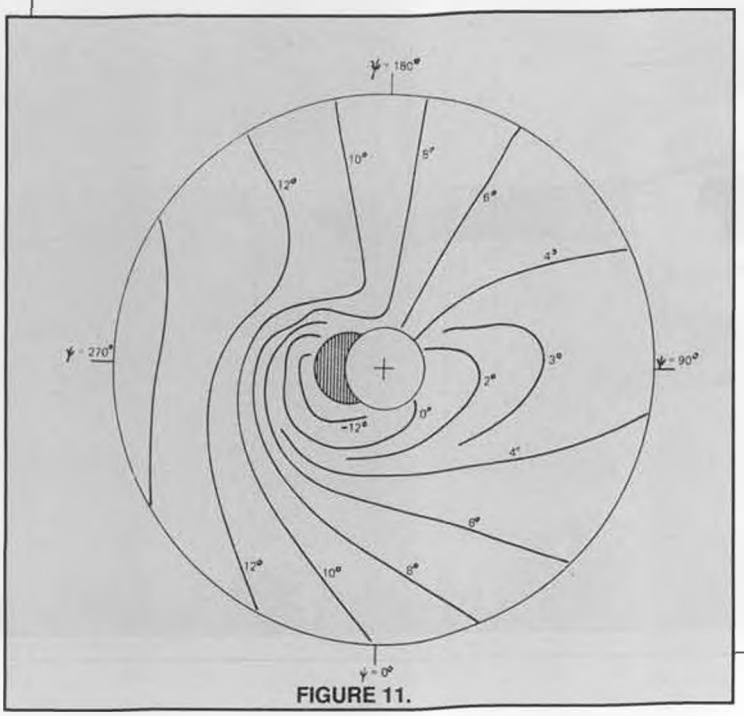


FIGURE 11.

(Figure 7) The schematic for an inexpensive audio tachometer that can be used to check a model helicopter's engine rpm in flight. Described in text. (Figure 8) James designed this audio tachometer modification of a stock Craft-Air optical tach. (Figure 9) For those with a good knowledge of electronics, here is a flow diagram for building an audio tach with digital rpm readout. (Figure 10) The lift distribution for a rotor blade in hover. The straight line represents the theoretical lift as calculated by a simple math formula; the solid curved line represents the actual lift produced. (Figure 11) The effective angle of attack (the true pitch angle that the air sees) for a model helicopter flying at about 60 mph.

Another source of blade slap noise is due to the advancing blade moving so fast that supersonic shock waves are formed at the blade tip. This phenomenon occurs on full-size UH-1 Huey helicopters in high speed flight. Their thick airfoil rotor blades chopping through the air at high rpm cause the blade tip speed to approach the speed of sound. This type of blade slap noise is called *thickness noise*. Since model rotor blade tip speed is only around 300 mph, which is nowhere near the speed of sound (776.5 mph at sea level), we do

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Helicopter WORLD

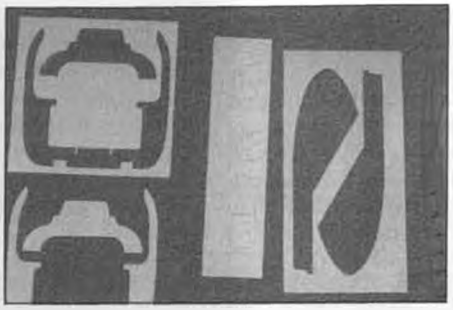
GMP JET RANGER

BY JAMES WANG

This month let's take a look at one of the most popular and successful scale helicopters in the U.S., the GMP 1:7.5 scale Bell Jet Ranger 206B. The GMP Jet Ranger has a nicely molded epoxy resin fiberglass fuselage, which is available as a kit by itself for a list price of $225 (GMP catalog number 800JR). The kit includes all the fiberglass pieces, clear windows, wood fins and a full-size plan. The fuselage will fit almost every 50 or 60 size RC helicopter on the market, which includes the GMP Cobra, Legend, Miniature Aircraft's 50 and 60 X-Cell, Kalt Excalibur and Cyclone, and the Hirobo SST Eagle and Condor. To install these mechanics into the Jet Ranger fuselage will take very little work. It took me one week of evenings to completely build and paint the fuselage and fit my old GMP Competitor into it. Schluter machines will not fit without some extra work because the Schluter Scout, Champion, Helistar, and Magic mechanics and servo trays are larger. But the 50-size Schluter Junior will fit.

If you do not have a spare RC helicopter handy, GMP sells two different mechanics kits that are designed specifically for the Jet Ranger fuselage. One of them is called the Cobra (number 800MP, lists for $449). It comes with the classic GMP Prohead, which has a flybar and is the same one used on their pod-and-boom King Cobra. The other mechanics kit is call the Cobra-Mustang, number

GMP's 1:7.5 scale Bell 206B Jet Ranger fuselage was designed for GMP Cobra mechanics, but most other 50-60 mechanics can be made to fit inside. This particular model has GMP Competitor mechanics, an O.S. 61SF Long Stroke engine, Magna pipe, and GMP's optional scale Jet Ranger landing gear.



(Left) The three major pieces of the GMP Jet Ranger fuselage kit are the molded fiberglass body section, top hatch, and tail boom. It's available as a fuselage kit only, or with your choice of GMP Cobra or Cobra-Mustang mechanics. (Center) Die-cut plywood fuselage formers are nicely done and literally fall right out of their sheets. (Right) The basic Jet Ranger fuselage assembled, with the plywood formers, hardwood mounting rails, and balsa stabilizer glued in place.

800MM. The only difference is that this kit comes with a flybarless rotor head like the one used on the flybarless Legend. This mechanics set lists for $489.

Let's talk a little bit about the origin of the full-size Jet Ranger design. Bell Helicopters designed the Jet Ranger for an a U.S. Army bid in 1960. The Army wanted a lightweight jet turbine powered general purpose helicopter with 400 pound payload capability and a minimum speed of 190 mph. When the design competition was over, Hughes Helicopter Company's OV-6 design had won the bid. The OV-6, called the Cayuse, became the most popular light observation helicopter used throughout the Vietnam War. Eventually, a civilian version of the Hughes OV-6 was designed and built; it is called the Hughes 500. This is the one that looks like a flying egg. Even though Bell did not win the Army contract, Bell's design went into production and became what we know as the Jet Ranger. In 1966 Bell marketed the Jet Ranger for the civilian market. With its sleek lines and easy handling two-bladed teetering rotor design, the Jet Ranger grew to be one of the most successful and popular civilian helicopters ever built. There have been more Jet Rangers sold than any other civilian helicopter. Its classic look has also won the hearts of model helicopter enthusiasts everywhere. Kavan, Schluter, Hirobo, Kalt, Kyosho, GMP, MAS, Heim, Vario, and many other independent model manufacturers all carry their own Jet Ranger helicopter fuselage kit. At the last World Helicopter Championships, 21 of the 41 competitors flew models that had a scale Jet Ranger fuselage. The third place winner, Curtiss Youngblood, and fifth place winner Robert Gorham both used the GMP Jet Ranger fuselage.

One of the reasons modelers choose the Jet Ranger over other scale designs is that the Ranger has a very clean look. It also seems to fly a lot better than other scale fuselage shapes. I have flown scale Hughes 500 bodies and Bell 22 bodies, but they just don't "feel" the same as models with the Jet Ranger fuselage. The Hughes 500 shape, especially with the T-tail, has a tendency to pitch nose-up in forward flight. With the Jet Ranger fuselage the model seems to fly just as fast, and my O.S. 50 powered Ranger seems to float down in autorotation at a slower pace than in the pod-and-boom mode. Due to the increased side area, the fuselage model weathervanes more in the wind (weathervaning means the model tends to yaw by itself into the direction of oncoming wind). For aerobatics, the Jet Ranger is slightly less responsive due to the extra weight. But the extra mass makes the model groove better in forward flight. The weight also makes the hover feel more solid, and the model definitely becomes easier to see at a distance. The bottom line is that when flying a scale helicopter, you tend to fly smoother; maybe it's because if you crash, you will have more to fix!

There is a difference between the 2-bladed teetering rotor head on

Robert Gorham's 1989 World Champs entry was this colorful Jet Ranger with GMP Legend mechanics, Elite rotor head, 58-inch rotors, Enya 60 XLF IV engine, and Hatori tuned pipe. If you decide to use Legend mechanics and want to retain the belt-driven tail rotor (Robert used a TSK wire-drive unit), the stock Legend tail boom will have to be mounted inside the fiberglass shell.

the full-size Jet Ranger and that of RC model helicopters. Model helicopter main rotors have a rubber damper or O-rings to provide a "spring stiffness" effect to the blade flapping action. The purpose is to increase the cyclic control power. This way, when the rotor disk tilts, the fuselage will follow immediately. In other words, the rubber damper allows the rotor's pitching and rolling moment to be transferred to the shaft and fuselage. It is because of this that our model helicopters can perform more bewildering aerobatics than full-size helicopters. The full-size Jet Ranger's teetering rotor head is truly a teetering rotor design: there is no rubber damper or any spring restraint. The two blades teeter up and down freely. The drawback is that the rotor disk tilting action will not cause the fuselage to follow directly. Instead, when a cyclic command is given, the main rotor disk will tilt, but the fuselage will not; the fuselage will move forward or sideways because the tilted rotor thrust pulls the helicopter forward or sideways.

Here we see the fuselage has been painted, the canopy has been tinted, and the Competitor mechanics are ready for installation through the fuselage top. Fuselage was finished with Pactra Formula U; Testors transparent blue paint on the canopy.

The full-size Bell 206B Jet Ranger employs a totally free teetering main rotor, which makes for a smooth ride but greatly reduced maneuverability. Text explains this in greater detail.

A totally free teetering rotor only has about 1/4 the cyclic control response rate of a stiff teetering rotor, such as that on our models. This is why the full-size Jet Ranger cannot loop or roll. In fact, any helicopter that has a free teetering rotor cannot perform near zero-G maneuvers, such as a pushover. If it does, the rotor disk will become unstable and the hub will bump into the main rotor shaft and causes damage and a crash. This is called mast bumping. Full-size helicopter main shafts are usually hollow to save weight, thus they are relatively less beefy than compared to a model's. However, the advantage of a free teetering rotor is that the main rotor vibration cannot be transmitted directly from the main rotor through the shaft to the cabin. For full-size helicopters, less vibration in the cabin is more important than being able to loop or roll. If you are experiencing vibration problems with your RC helicopter, try loosening the rubber damper (for GMP models), or use thinner washers or even remove washers between the O-rings (for X-Cell and Schluter helicopters).

Besides vibration and control response differences, a stiff teetering rotor also provides more rotor and fuselage aerodynamic damping to dampen fuselage oscillations and other perturbations. One of the reasons why the flybarless Legend seems to hover very well is because the rotor head is set very stiff. Try removing the bolts that hold the rubber damper inside the rotor head, and you will discover the model will wallow everywhere. The same is true for models with a flybar. Full-size helicopters can get away with slower cyclic response and less rotor aerodynamic damping because they fly in a more gentle manner, and the motion "reaction time constant r" is also longer. In the August 1989 column we explained in detail why models are more difficult to fly than full-size helicopters.

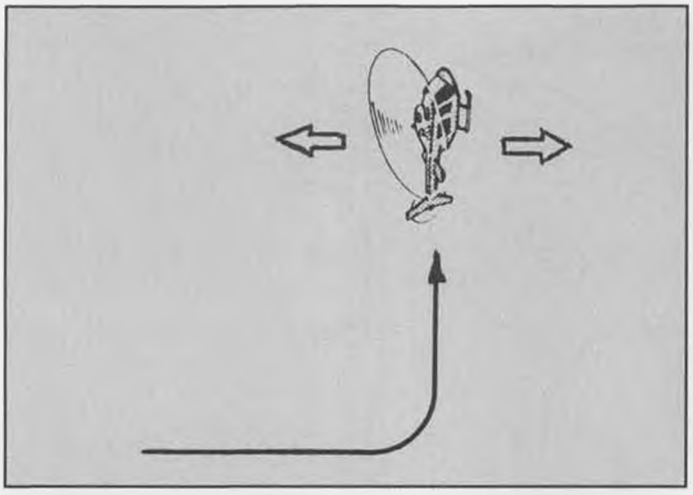
The GMP Jet Ranger fuselage is composed of three major pieces: the body section, the fiberglass tailboom, and the top cowling. The modeler has to glue the tailboom onto the body section. Before doing this, however, you have to decide whether the model will be a 50-size or a 60-size helicopter. The reason is that 60-size helicopters have a larger main rotor diameter, thus you should not push the fiberglass tailboom all the way onto the body section. Check to make sure the tip of the main rotor blade is about one inch away from the tail rotor disk. If the main rotor blade tip is too close to the tail rotor, the main rotor downwash can impinge on the tail rotor and create extra turbulence to destabilize yaw motions.

If you are using the 50-size GMP Cobra mechanics, the ideal rotor diameter will be around 53 inches. The O.S. 50FSR engine and GMP Cobra is a great combination for sport and scale modelers because this combination makes the Jet Ranger a very relaxed flying machine. My first GMP Jet Ranger had this combination. The one shown in the pictures is my second GMP Jet Ranger. This one has the tailboom pulled out slightly to accommodate my 60-size Competitor mechanics. The trend of modern FAI contest machines is leaning toward larger rotor diameters. In the May 1990 *Model Builder* we published a complete table of the model specs for the 41 contestants at the last model helicopter World Championships. The table shows the average main rotor diameter to be about 59 inches. Typical 60-size pod-and-boom helicopter kits, such as the Legend, X-Cell, Excalibur, and Schluter machines, have about 57-58 inch rotors. The GMP Ranger used by Robert Gorham at the World Champs had 58-inch rotors, and Curtiss Younglood's Rangers were 57 inches.

The Japanese team helicopters all had a 61.4-inch main rotor diameter. A larger diameter rotor improves a helicopter's *figure of merit*, which is a measure of rotor efficiency. Higher efficiency means lower fuel consumption and higher flight speed. A larger rotor disk also gives more cyclic control power, quicker collective response, and more rotor inertia for autorotation. Therefore, decide

on a rotor diameter before you glue on the Jet Ranger's tailboom.

Note that for this kit, a metal tailboom is not needed inside the fuselage. The kit comes with a steel tail rotor drive wire and brass tubing for wire-drive tail rotors such as used on the GMP Cobra, Kalt Excalibur, or X-Cell. The wire and brass tube are supported by two plywood bulkheads. The tail rotor gearbox is secured onto the last plywood former in the fiberglass tailboom. The GMP tail rotor gearbox has a collar that needs to be glued onto the plywood bulkhead, then the gearbox fits inside the collar. X-Cell and Schluter gearboxes are two of the best (and also the most expensive) on the market. The pitch control mechanism has almost no slop. The pitch control mechanism on the belt-drive Legend is also excellent because it uses a sliding bearing for pitch change, and each blade grip has three ball bearings inside. After using the belt-drive system on the Stork and Legend for about two years now, I find the system very smooth running and quiet. However, using the belt drive system means the original metal tailboom has to be kept inside the fuselage, which might lead to tail-heaviness. My Jet Ranger with the



Ray StOnge's "Shuffle" maneuver as described in text. Pull straight up to vertical, then alternate between full negative and full positive pitch. Ray has perfected it to the point where he can get up to five oscillations while the model appears to just hang there in one place.

Ray StOnge, hotdogger par excellance, with his stock Legend. If the wild paint scheme looks familiar, it's because he also painted the Excalibur that was reviewed in the August and September 1990 issues of *MB*. Ray does custom painting on a special order basis; call him at (203) 276-8465 for more info.

gearboxes are installed simply by bolting them directly to the plywood bulkhead.

The completely assembled helicopter mechanics can be dropped through the top fuselage opening into the body. There are two hardwood rails at the bottom of the fuselage; the mechanics are attached to the two rails with four 4mm bolts at the original landing gear location on the aluminum side frames. In the case of the GMP Legend, which has a belt-drive tail rotor, to maintain the belt's tension you would probably have to install the Legend's aluminum tailboom inside the fiberglass tailboom. However, a wire-drive tail rotor system can also be used for the Legend. The Legend was originally designed to have the flexibility of using either a belt-drive or a wire-drive tail rotor gearbox. Robert's machine used a TSK wire-drive tail rotor gearbox. The TSK and Kalt Excalibur tail rotor Competitor mechanics and wire-drive tail rotor came out with the vehicle's center of gravity right beneath the main rotor shaft. And I had to place the 1200 mAH receiver battery pack all the way forward. The gyro should also be mounted as far forward as possible to help keep the CG forward.

There really isn't anything difficult about building scale-looking model helicopters. They definitely look better than the flying fishheads. Rumor has it that contest judges tend to give extra points to people competing with scale models. The only headache is during maintenance. The nuts and bolts can be troublesome to get to. That's why the GMP Ranger design allows the entire helicopter mechanics to be pulled straight up and out just by removing four bolts. It is still not a trivial job; we are talking at least one hour just to pull the mechanics

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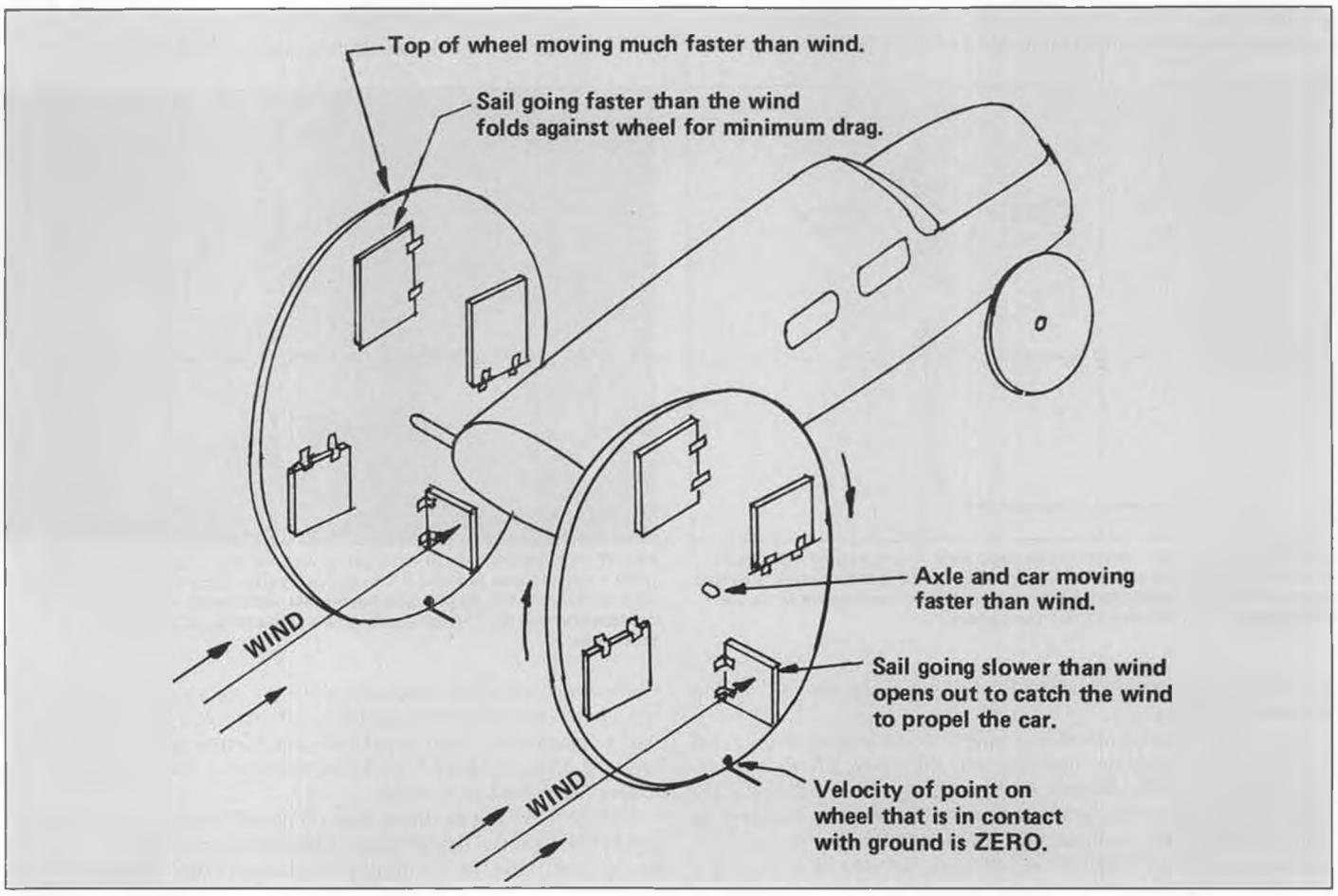
This shows the totally free teetering main rotor design on the full-size Jet Ranger. Main shaft is hollow. Doesn't it look like the GMP flybarless rotor head?

BY FRANCIS REYNOLDS

DA WINNAH... WILL KUHNLE



Will Kuhnle's Simplified Sailing Car.

At last we have a winner in our contest (See MD&TS for July/August 1990). The problem was to figure out whether a wheeled land sailing vehicle, with a windmill which is geared to the wheels, could be adjusted to sail directly into the wind, and whether it could be made to sail directly downwind faster than the wind. The answers will surprise all of you who wrote and said that it is impossible to sail faster than the wind downwind.

Will Kuhnle, of Richardson, Texas, was the first reader to correctly analyze the problem, and is the winner of the ten-dollar grand prize (Low budget column). By the way, Will's name has been seen in this column before. He provided me with the "pure" formula we use for wing cube loading, and other technical stuff.

Will writes, "The car can go directly into the wind and *can* go directly downwind faster than the wind. This answer is based on the idea that a propeller blade and sail are essentially the same and thus a propeller blade can do anything that a sail can do.

"An ice boat can go to a point directly upwind, but to do so it must make several tacks; a zigzag course windward. A propeller blade can also go to a point directly upwind. But since it is not confined to move along a flat surface, it needs to take only one tack, a helical course windward. The propeller hub and attached car move directly upwind.

"A sail cannot go directly downwind faster than the wind, but it can go downwind faster than the wind if it takes a course at an angle to the wind direction. A propeller blade also can go down wind faster than the wind. Its course at an angle to the wind is a helical path."

Nicely said, Will. He then went on to a theoretical analysis of the velocities and forces on the propeller blades, and presented vector diagrams of both the upwind and downwind cases, using sample numbers to show mathematically that it is indeed true. His analysis is too technical for most of our readers, so I'm not including it.

In part of his downwind-mode analysis Will writes, "—the propeller must be driven by the car." This is an essential insight to understanding the problem. In going to windward the windmill powers the wheels, but downwind the wheels power the "propeller" to generate aerodynamic thrust to make the car go faster than the wind. An-

other analysis, developed by Howard Rush, shows that if the efficiency of the entire machine is 50%, it will go downwind at twice wind speed, neglecting vehicle aerodynamic drag. At 75% total efficiency, a zero-drag vehicle would theoretically travel at four times wind speed. This may look like perpetual motion, but it is not, as the energy is still coming from the wind.

It makes no difference whether the air moves and the ground stands still or vice versa, and it is easier for most people to visualize the problem in still air. Therefore, imagine the sailing car on a moving flat horizontal belt. Now can you see that the spinning wheels could turn the propeller slowly to generate a little thrust to move the car with respect to the still air? Not the same problem, you say? Sorry. It is.

I know several other people (not MD&TS readers) who have correctly solved the problem, but interestingly, each used a different approach. Will Kuhnle is the first one, to my knowledge, to use the helical path of the propeller-blade "sail" in his explanation. I like it. Also, Will's vector analysis of the propeller blade alone to solve the whole problem is the first I've seen. Some of the others who "see" it consider the mechanical advantage of the transmission system, and the forces, input and output powers, and efficiencies of the entire system.

Those who tackle the problem usually have an intuitive feel about it to start with, but find a formal analysis difficult. Most technical people agree immediately that our machine should be able to sail directly to windward, but intuitively feel that it can't sail downwind faster than the wind. Once locked into a negative intuitive feeling, it is very difficult to see the problem correctly.

I have given it to two university engineering professors, and some sharp engineers, who would not be convinced that it could exceed windspeed downwind. Failing to see a way whereby anything traveling faster than the wind can extract useful energy from that wind, they hastily conclude that it is impossible. I am reminded of the stories of learned men who declared that the telephone, radio, airplane, etc., were impossible shortly before those inventions were made. *(It was also "declared" by learned aeronautical engineers that a bumblebee could not fly. However, someone forgot to inform the bumblebee of this situation . . . so it flies! wcn)*

Most people who work on the problem dream up one or more simpler "models" of the concept, such as the moving belt version, which they can understand more readily than the problem as presented. However, those who say it can't work usually won't accept the simplified models of others as representative of the problem.

Will Kuhnle also dreamed up a different model, and sent along a sketch of it. (See Figure 1.) I hadn't seen this model before, and I love it. Isn't it much easier to see that this car can go downwind faster than the wind than it is to see it in our original windmill sailing car? It doesn't appear that the wheel sails on Will's machine will open automatically as he intended, but a simple mechanism could be added to do the job.

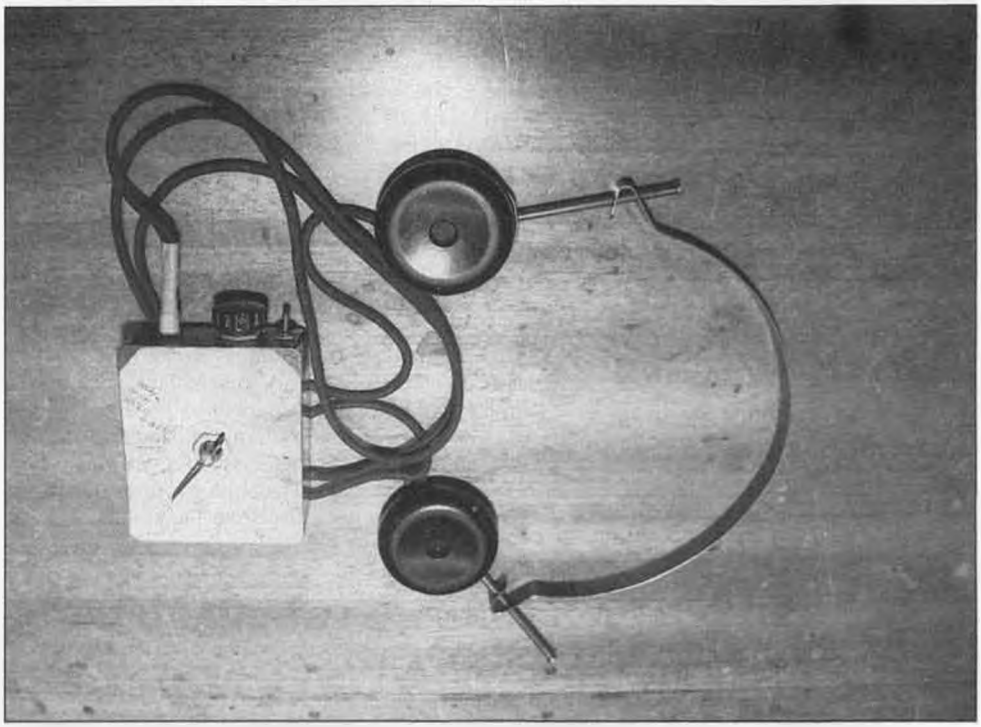
I didn't invent the windmill sailing car problem. The theoretical question, could anything sail downwind faster than the wind, has been around for a long time, with lots of disagreement on the correct answer. Andy Bauer, a retired Douglas Aircraft engineer, came up with the windmill car configuration, to prove that it was possible. He built one *and it did* go faster than the wind directly downwind.

Paul MacCready, of Kremer-prizes-for-man-powered-flight fame, has discussed Andy's windmill vehicle in some of his public lectures. My control line combat friend, Howard Rush, heard MacCready talk about it. Howard solved the problem analytically and showed it to me.

I had a long phone conversation, concerning the problem, with Dr. MacCready, and another with the vehicle's inventor, Andy Bauer, of Orange, California. Andy confirms Rush's numbers, and MacCready uses a propeller thrust formula in his analysis to show that it works.

I may have gone into more detail on all this than some of you were interested in. If so, please excuse my enthusiasm. This is the most fascinating little aerodynamic puzzle I've seen for years. So simple, yet so difficult. I'm going to present the problem to the senior engineering students at Seattle University, in a series of guest lectures I'm scheduled to present there. That should be interesting.

My congratulations to Will Kuhnle and others who solved it correctly, and thanks to all who wrote. Also, thanks to my son, Greg, a fellow engineer and airplane modeler. Greg and I argued vigorously for hours over the problem. We began to agree only after a couple of months. Both of us now understand downwind sailing much better.



The author's "Sonotach" measures engine rpm in flight. See text.

EARLY CONTROL LINE

In cleaning out some old files recently I ran across a 1939 letter I wrote to my folks while I was attending the University of Washington. Let me quote part of it. "I almost got myself a part time job flying gas models for $2.00 a day. This ad appeared in the paper, `Demonstrator for model airplanes for afternoon and Saturday work. Only men who have actually flown gas model airplanes need apply.'

"The Clipper Gas Company has a sales contest where they have someone fly gas models on the end of a string. They hold miniature air shows at different service stations every afternoon. The kids got free coupons when they have their dads buy Clipper gas. They could trade the coupons in for model airplane kits. The gas models they are demonstrating have movable elevators that are controlled from the ground by two strings attached to a wing tip. They can be made to take off, climb, dive, loop, and make three point landings.

"The kids at the demonstration were thicker than flies, all the way from three to eighty years old. When we tried to get them to clear a big circle so the plane could fly, they would only make a circle about six feet in diameter.

"When it was my turn to try to fly it, the boss and I were holding it together, and it hit a hole when it landed and broke the wing, so I didn't get the job."

I was a free flight gas modeler at that time, but this was my introduction to control line. I later learned the planes being demon-

strated for Clipper Gasoline were an early version of the Jim Walker Fireball. They were using Ohlsson .23s, on ignition, of course. I remember being impressed with the easy starting and reliability these professional demonstrators were getting out of the engines. They were also getting higher rpm as they were using smaller props than I was used to.

Immediately after that I designed, built, and learned to fly my first control line model. It was powered by a Baby Cyclone. My buddies and I once flew that model on a street in downtown Bellingham, Washington. We could get in a long flight before several cars would be forced to stop. They always waited patiently until the flight was over. Times have changed!

Some months later, I believe, control line flying was introduced by writers in the model magazines. My own introduction to model writing was an article I had published in *Air Trails* magazine, in the June 1946 issue, on the design of control line models for advanced aerobatics. In it I introduced the concepts of inverted-feeding tanks, little or no dihedral, and using airfoils with good inverted lift.

TACHOMETERS

Before the days of commercially-available optical tachometers for modeling, some of us used mechanical revolution counters and a stop watch. The rev counter was a little hand-held device with a shaft that engaged the end of a propshaft . . . much as we now engage starters . . . a hundred-to-one-ratio worm gear mesh, and a counter dial. Not a very satisfactory answer to measuring model engine speed. It was dangerous to try to engage the shaft, with whirling prop blades a fraction of an inch away, the friction of the counter further loaded the engine, reducing the rpm, and one had to count the number of revolutions of the device in a given time period, using a stop watch, and convert that to rpm.

The next tachometer to come along was the "Vibra-Tak." This was an inexpensive neat little device based on the resonant vibration frequency of a reed. Some industrial tachometers using this principle have a row of cantilever reeds, graduated in length. The frequency of vibration, and therefore the speed of an engine, was determined by which reed vibrated. The Vibra-Tak has a single reed, but the effective length of the reed was adjustable. One simply laid the pencil-shaped body of the device against a running engine, say the cylinder head, and slide the reed in or out until the amplitude of the vibration of the reed was maximum. The rpm was then read off the calibrated body. I still have a couple of Vibra-Taks, and still use them sometimes. It can't be read as accurately as an optical tach, but it is a simple, reliable gadget.

The only comments I will make on current optical tachometers is to repeat what others have written. The analog type is much less frustrating to use than the digital type, as minor variations in engine speed tend to keep a digital display jumping around. Expanded scale analog optical tachs with several ranges cost more, but are necessary if you are interested in knowing the higher engine speeds to the closest hundred rpm.

Unfortunately, all of the above types of tachometer can measure engine speed on the ground only. This isn't what we are most interested in, because the engine picks up speed in the air, as the prop unloads. It is the rpm in flight that we would most like to know, because flight rpm should be a factor in choosing the optimum prop, and flight rpm is also a major factor in our efforts to reduce noise.

I mentioned several months ago that there is a way to measure the speed of our model airplane engines in the air, and I have been doing it for forty-some years. To understand this, let's get a little basic. Any tachometer must be coupled to the engine in some way to "see" how fast it is going. In the revolution counter, this is done by temporarily coupling shafts together. With the Vibra-Tak, we transmitted engine vibration to the tach by direct contact. In the optical tach, the instrument actually looks at the rotating prop with a photocell.

We could get inflight rpm using any one of these methods if we connected an onboard tachometer to an onboard transmitter. The transmitted rpm data could be picked up by a radio receiver on the ground and decoded. Such "telemetry" is done all the time in connection with RPVs (remote-piloted vehicles), guided missiles and satellites.

Fortunately we don't have to get anywhere near that complex to get flight rpm, as it turns out that our internal combustion model engines are already transmitting rpm information to the ground. All we have to do is make use of it.

SONIC TACHOMETERS

The major source noise on any but the most thoroughly muffled internal-combustion-powered model airplane is the exhaust pop. That exhaust sound is being transmitted to the ground where we can receive it by a tachometer as well as by ear. We know whether we are flying a two-stroke or a four-stroke, and whether single or multiple cylinders, so we know whether the exhaust sound frequency is the same as the engine speed or some simple multiple or sub multiple of it. All we have to do is use a sonic or audio tachometer on the ground to measure the frequency of the exhaust sound and convert it to rpm in human-readable form. As the exhaust can be heard when the plane is on the ground as well as in the air, the same audio tach may be used for both static and flight readings.

Some of you, at this point, are ahead of me, and worrying about Doppler shift. Yes, if a sound source is moving toward us, its velocity is added to the frequency of the sound, and vice versa. This "Doppler effect" is what we experience when an approaching car horn suddenly seems to drop in pitch as the car passes us. In using a sonic ta-

chometer, Doppler isn't a serious problem as long as we recognize the phenomenon, and avoid taking readings when the plane is coming toward or going away from us. The best way to get a stable accurate reading is to fly the plane in a big constant-altitude circle, with the user of the audio tach roughly at the center of the circle.

The photograph shows my "Sonotach." This is the second one I have designed and built, the first being a vacuum-tube type, made in 1946 or '47. This one has been used in all kinds of model work, including its use in a Boeing RPV development that I had technical charge of about twenty years ago. The ancient-style earphones shown in the photo indicate the age of the instrument.

And why the earphones, you may justifiably ask? The better to hear the rpm, the wolf replied. Actually the earphones permit great simplification of the electronics by letting the human brain do the most difficult part of the job. The box contains only a precision audio oscillator. It's output tone is fed into the earphones. The operator hears that tone in the earphones as well as the engine exhaust pop, which comes around the edges of the phones. One simply adjusts the frequency of the oscillator until it is the same as (zero-beats with) the exhaust sound, then reads the engine rpm from the oscillator dial.

Before I forget, there are two features on my Sonotach which make it easier to use. First, there is a volume control on the oscillator as well as the calibrated frequency control. If I adjust the sound from the oscillator to about the same volume as the exhaust sound I hear, the frequency matching is greatly simplified. Also, the oscillator puts out spikes, which closely simulate the exhaust sound. It would be much more difficult to zero beat a sine wave against an exhaust sound.

DIRECT-READING SONIC TACHOMETERS

In theory one could forget the oscillator and the earphones, put a microphone on a tachometer instead of a photocell, and read rpm off a meter, as we do with optical tachs. Nothing wrong with the theory, but the practice might be difficult, expensive, and perhaps unsatisfactory.

According to Coe Wescott, my favorite electronics consultant, the human brain is capable of distinguishing and separating different sounds, sorting out harmonics, and matching two particular sounds much better than even a relatively complex electronic circuit could. It is partly a signal-to-noise ratio problem. The brain, with its amazing abilities, is much better at recognizing the one sound it wants to hear and rejecting other sounds that it is not interested in, even if the distracting sounds are louder than the sound of interest. Notice how you can carry on a conversation with someone at a party, while many other loud conversations are going on at the same time.

To directly measure the rpm of a single unmuffled engine at close range with a direct-reading sonic tachometer probably wouldn't be much more difficult than looking directly at the prop optically. However, trying to directly measure the rpm of your model flying with several other models doesn't sound promising, even though I have done it with little trouble using the zero-beat type. But my pessimism won't keep the direct sonic tachometer from being developed. "The impossible just takes a little longer." Do any of you have any progress to report in the field? Mail me a good proven circuit diagram and I will publish it in this column.

Meanwhile, do any of the RC electronics manufacturers think there would be enough market for a commercial zero-beat type sonic tachometer (with modern earphones)? I would buy one. The calibration of the one I made is off, and I'm too lazy to fix it. I've seen vague references to audio tachometers in our literature a couple of times, but I don't know of any on the market. Readers?

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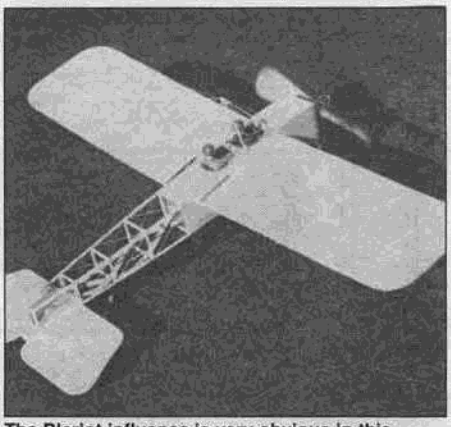
CONSTRUCTION

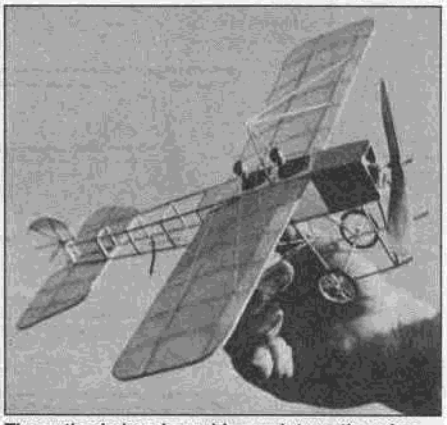
BY WALT MOONEY

CASTAIBERT IV
THE URUGUAYAN PEANUT

No aircraft, no matter how remote and/or little-known, seems to be able to escape being "PEANUTTED" by the King of the international 12 plus 1 set. Did you ever hear of this one?



The Bleriot influence is very obvious in this photo of Walt's Castaibert IV.



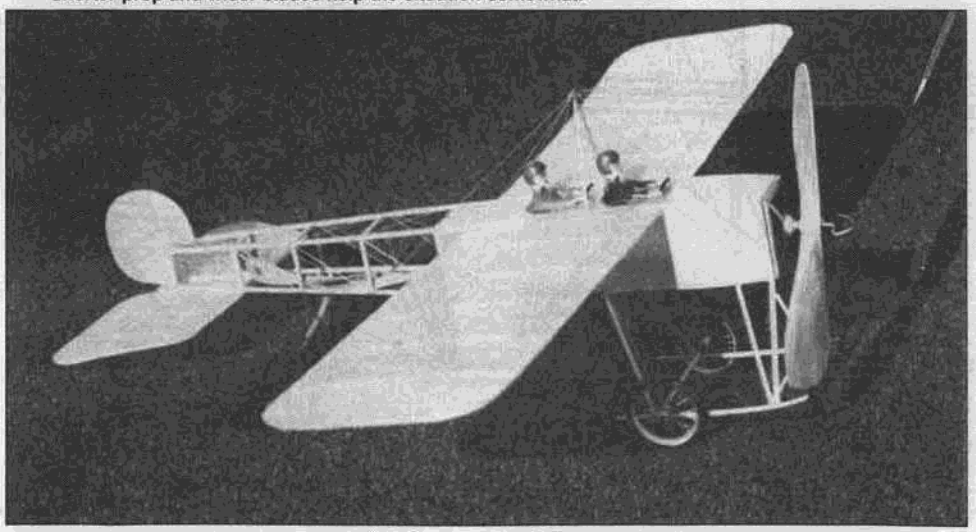
The author's hand provides an interesting size comparison in this photo. Hungerford wheels add the final touch.

In this little model can be seen the influence of Louis Bleriot on the creations of one of the pioneer aircraft designers in the new world.

The three-view that inspired this model was found in an Argentine aircraft magazine. The basic shape looked suitable for a lightweight peanut scale model. Unfortunately, the skid-type landing gear does limit the size of the propeller . . . unless you are willing to lose some scale points by shortening the skids in favor of getting more flight points with a larger diameter prop.

The original model flew right off the board, as we like to say. And this was true, as long as we kept the power down to where the model would just barely climb. But when attempting flights with maximum winds, the model was found to have inadequate vertical tail area, which would result in a tail wagging maneuver that would tend to end up in a spin. This obviously is due to the fact that the body is uncovered behind the wing. I filled the aft bay of the fuselage with a thin sheet of clear plastic, relieved to give clearance for the back end of the motor, and this cut down the problem. But the model still has a tendency to Dutch-roll. Probably the surest cure would be to cover the aft fuselage with thin celluloid, but don't do it until you find you have the problem; not all models built from the same plans fly exactly alike.

Decisions, decisions. Do you shorten the landing gear skids or the prop. One of 'em has to go! Shorter prop and wider blades help the situation somewhat.



The construction of the Castaibert IV is in the good old traditional style. It has a box structure fuselage, tail surfaces built directly over the plan, and a two-spar wing. Since the basic structure is so standard, we'll try to cover its few points that are unusual.

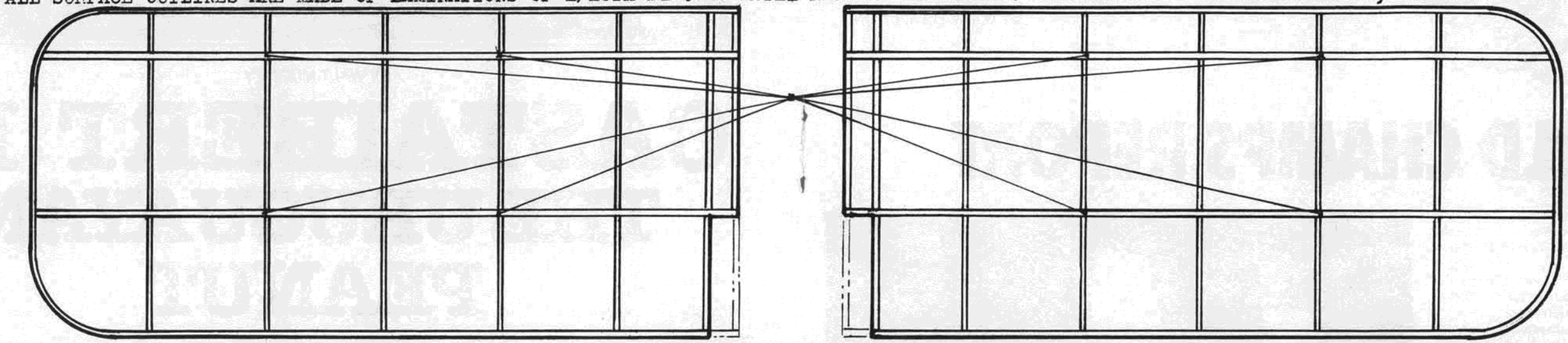
All of the flying surface outlines are made of laminations of model railroad basswood. The basic basswood size is .020 by 1/16 inch. Three laminations are used for the wing outline and two for outlines of the horizontal tail and rudder.

The wing spars are 1/32 by 1/16 basswood. Because the wing ribs are sliced, I decided not to notch them for the spars, but to simply cement the spars onto the top of the ribs. The result looks good and gives some turbulation to the upper surface wing airflow.

The front "bay" of the fuselage is filled in with 1/16 sheet; both sides, top, and bottom are filled. Note the grain direction.

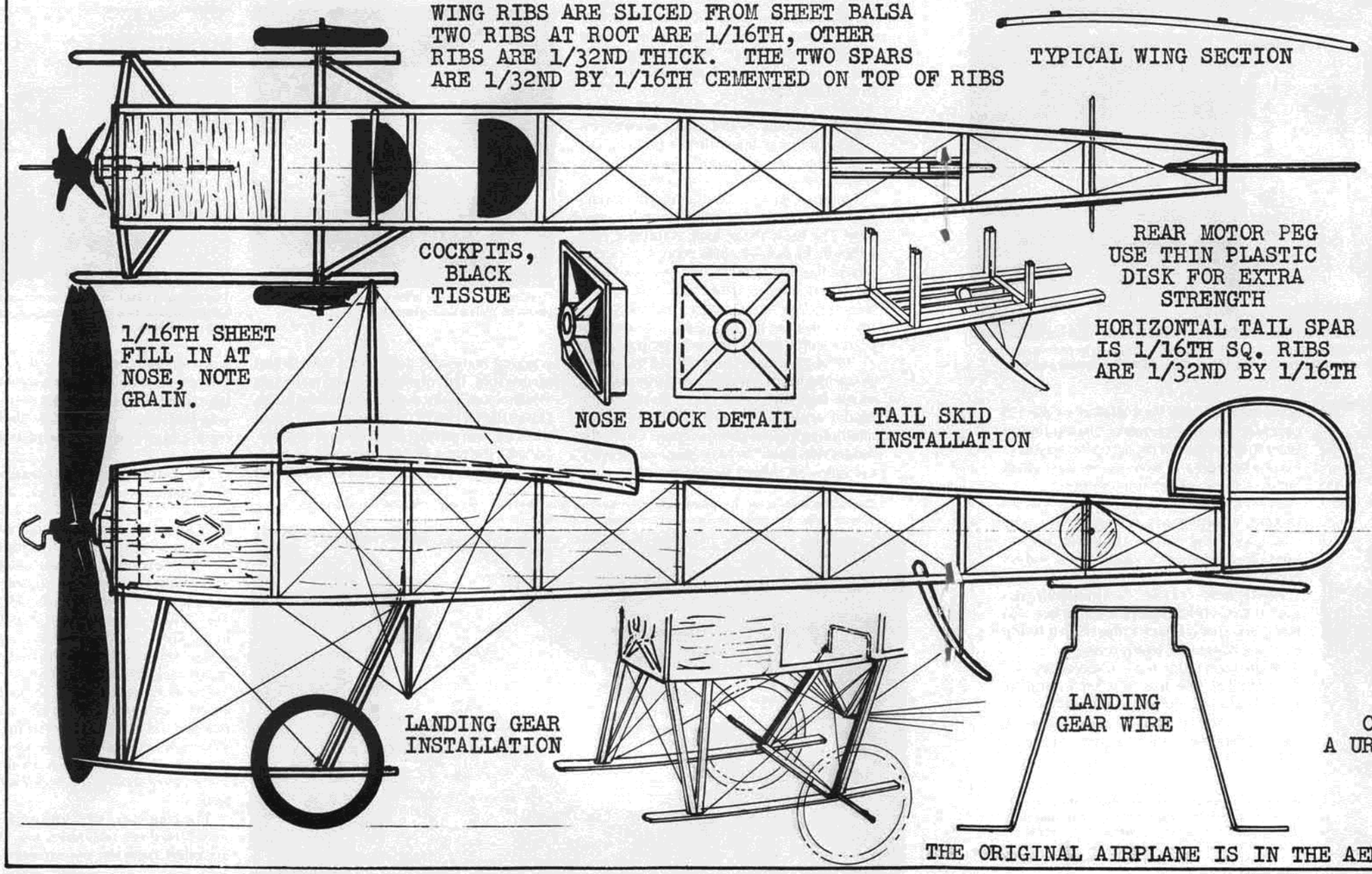
continued on page 107

ALL SURFACE OUTLINES ARE MADE OF LAMINATIONS OF 1/16TH BY .020 MODEL RAILROAD BASSWOOD. --- USE THREE LAYERS FOR WING, TWO FOR TAIL.



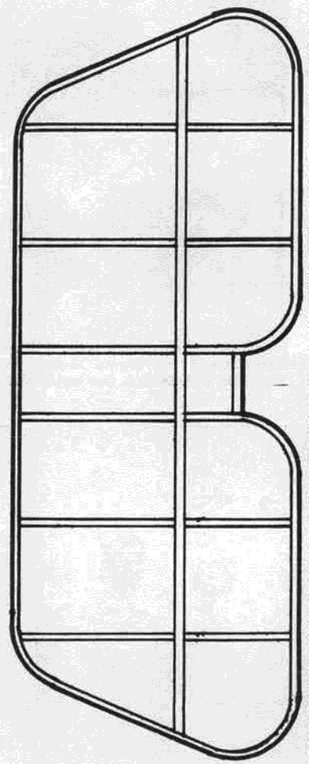
WING RIBS ARE SLICED FROM SHEET BALSA TWO RIBS AT ROOT ARE 1/16TH, OTHER RIBS ARE 1/32ND THICK. THE TWO SPARS ARE 1/32ND BY 1/16TH CEMENTED ON TOP OF RIBS

TYPICAL WING SECTION



REAR MOTOR PEG USE THIN PLASTIC DISK FOR EXTRA STRENGTH

HORIZONTAL TAIL SPAR IS 1/16TH SQ. RIBS ARE 1/32ND BY 1/16TH



ALL STRUTS ARE 1/32ND BY 1/16TH BASSWOOD. ROUND EDGES, AND TAPER AS REQUIRED.
ALL BRACING IS 2# TEST MONO-FILIMENT FISHING LEADER.
1"DIA. BY 1/8TH HUNGERFORD WHEELS ARE USED.
USE A PECK - POLYMER THRUST BUTTON.
FUSELAGE STRUCTURE IS 1/16TH SQUARE BALSA FOR LONGERONS, UPRIGHTS, AND CROSSBRACES.
USE 1/32ND OR THINNER, PIANO WIRE FOR THE LANDING GEAR AND PROPELLER SHAFT.
USE A CUT-DOWN PLASTIC PROP. DIAMETER IS LIMITED BY THE FRONT OF THE SKIDS.

CASTAIBERT IV
A URUGUAYAN PEANUT
BY Walt Mooney

THE ORIGINAL AIRPLANE IS IN THE AERONAUTICAL MUSEUM IN MONTEVIDEO.

CONTROL LINE

BY JOHN THOMPSON

WORLD CHAMPS REPORT

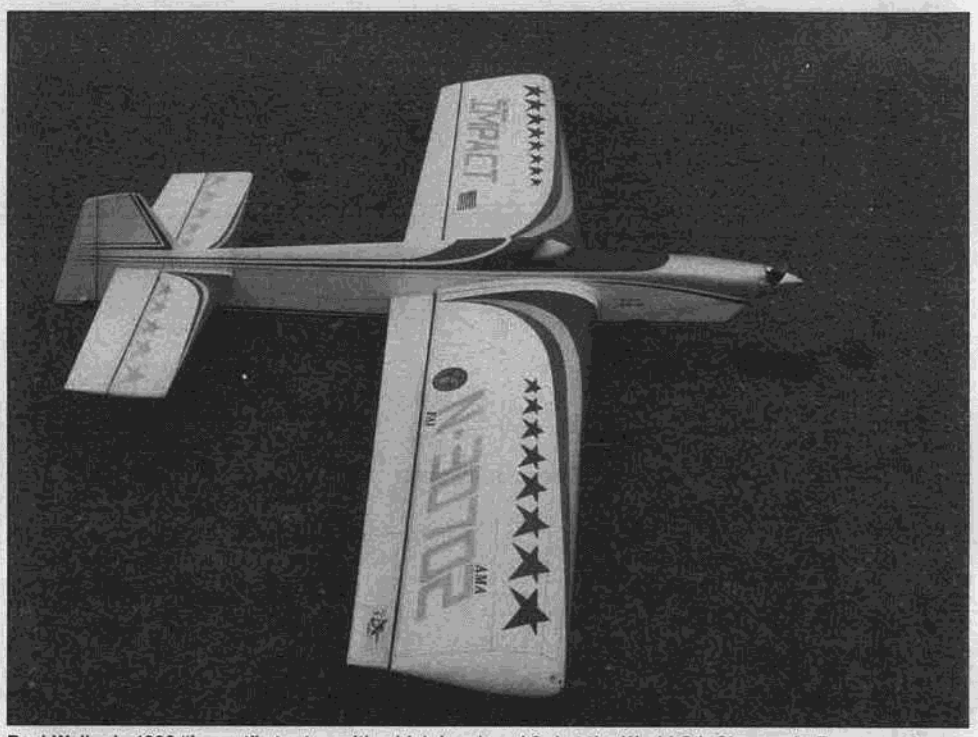
Control line flying activity comes in a wide variety of forms. For most of us, it's going out on Sunday afternoon with our latest project and flying a few lazy stunt patterns, whether it's the official AMA stunt pattern or our own freestyle meanderings through the sky.

Some of us become attracted by the more sporting opportunities the hobby provides and become involved in some kind of competitive activity.

It may be that we just enter our Ringmaster in the balloon bust event at the club fun-fly, or we may get more serious and become a competitor in AMA or regional competitive events. If we keep at it, we begin traveling to out-of-town contests and eventually we begin thinking of the Big Time—winning a national championship or even making the world championship team in our chosen events.

The few talented and dedicated individuals who actually make these teams and compete at a world level represent the rest of us in this fine sport and hobby. Their reports back to home about their travels and the lofty competition are the stuff that dreams are made of.

That's why it was such a delight to have an opportunity to ask Paul Walker of the US precision aerobatics world championship team to share a brief report on his travels to France last summer to represent the United States at the world championships.



Paul Walker's 1990 "Impact" stunter, with which he placed 3rd at the World C/L Champs in France and 1st at the '90 AMA Nats. See text for Paul's report on the C/L World Champs. John Thompson photo.

We encountered Paul at the Stunt-A-Thon in Kent, Washington last August, where he was competing in the comparatively relaxed atmosphere of a local contest and his home field.

Paul had not only finished third individually in the world championships, but also had come straight back to the US in July and won the National Championship!

As are most of the really top competitors, Paul Walker is a true gentleman and an excellent ambassador for our hobby. He quickly consented to give us the following report on the world championships from his perspective.

Our write-up on the 1990 Bladder Grabber fast combat tournament appeared in a previous issue; now here are the winners. From left: Phil Granderson (1st), Pete Athans (2nd), Mel Lyne (3rd), Mike Petri (4th), and Page Peterson (5th). Thompson photo.

But first, for those unfamiliar with the system, a word of explanation. Unlike a national championship contest, where fliers simply pay an entry fee and compete, the world championships is a gathering of teams of the top fliers from each country. In each country, team trial competitions are held the previous year to select three fliers or teams (in the case or racing) for each world championship event (speed, racing, combat, and precision aerobatics). The defending champion in each event is invited to compete.

Here is Paul's report on the 1990 championships:

"The world championships were in Blenod le Pont-a-Mousson. This is about halfway between Nancy and Metz (east of Paris). The facility was a sporting complex used for soccer. There were two new fields being prepared with an asphalt base (assumed covered with Astroturf). Timing of the world championships was such that it was just before the fields were finished. Thus it left us with freshly paved circles for team race, speed and stunt. Combat flew on a real grass soccer field. The contest was well run and administered.

"Opening ceremonies were in the main soccer stadium for the town of Pont-a-Mousson. The teams entered in formation in front of the filled stands. After the teams were introduced and the speeches read, a fireworks and theatrics show followed that lasted for more than an hour. Impressive!

"Official flying started the next day (Wednesday). The weather for the competition was nice, temperatures in the 80s, humidity acceptable and moderate winds.

"Things did not go well in combat for the US, as all three fliers lost their first round matches.

"In team race, the US had either poor times or disqualifications.

"Carl Dodge placed his 302 kilometers per hour speed on his first flight. This was the flight that was to win him his gold medal in speed!

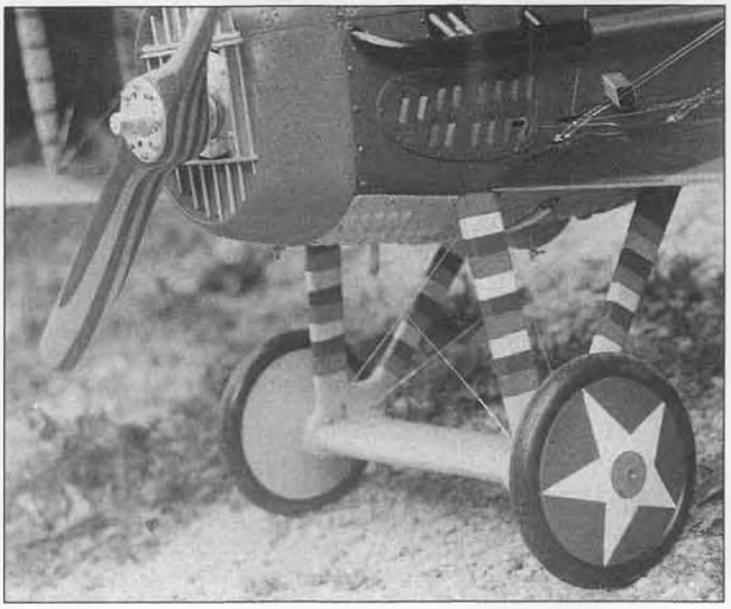
"Because of the large numbers of stunt entries the two rounds of qualifying were held over three days. Thus, only Paul Walker and Bill Werwage flew on Wednesday. On Thursday only Paul and Jim Casale flew, and on Friday Jim and Bill flew. The final round of 15 was taken from the highest score of either first or second round qualifying flights. All three US team members made the final rounds.

"The second round in combat saw all three US team members win their matches. Team race was still showing poorly and speed had two fliers in with official times.

"The first round of finals in stunt was held Friday afternoon after the qualifying round was finished. The second and third rounds were held Saturday. After two rounds of finals, Paul Walker was only 11 points out of the lead (3,197 to 3,208).

"At this point the judges looked over the scoreboard (which in my opinion should not be allowed) and saw the relative positions. It was to come down to the final round.

Control line scale at its very best! Stu Richmond relayed this photo of Czech modeler Ladislav Davidovich's immaculate scratch-built Spad XIII. Possibly uses one of his homemade model engines—note clockwise prop rotation.



Close-up of Ladislav's Spad reveals faultless detail and craftsmanship. Like Stu says, "Masterful work."

"Before the start of the third round, the Chinese judge passed Billy Werwage and asked him how he (Billy) expected to win without an American judge there to help him! At this point we knew we were in trouble.

"The final round was flown and the Chinese champion (Zhang Xiangdong) flew a pattern with 80-degree-tall maneuvers and beat Walker by 130 points. The total disregard for maneuver size by the judges was very disheartening *(the proper size for maneuvers that Paul is referring to, according to the rule book (tops of loops, etc.) is 45 degrees. jt)*. We in the US have been trying very hard for years now to fly at the proper heights, and once we are there, to get beat by someone flying almost twice the size is hard to take.

Final placings were:

1. Zhang Xiangdong	China	6,535.5
2. Anatoly Kolesnikov	USSR	6,439
3. Paul Walker	US	6,410
4. Wang Jianzhong	China	6,392
5. ZhuYouhan	China	6,309.5
6. Jim Casale	US	6,298.7
7. Bill Werwage	US	6,288
8. Sergei Clychkov	USSR	6,270
9. William Draper	UK	6,195.5
10. Philippe Rampnoux	France	6,194
11. Kaz Minato	Japan	6,184

Team placings were:

1. China
2. US
3. USSR
4. Japan

"Over in combat the third round saw both Tom Fluker and Rich Lopez lose and go out. Howard Rush won and went on to the fourth round. Howard lost in the fourth round after `only' three reflies.

"Team race finished with the poorest showing in years.

"In speed it was down to the final round and Bill Hughes still didn't have an official time. On his last try he got a time (267.86 kph) which was also enough to secure the team a second place in team standings. This is one of the speed team's best showings in many years.

"Overall the competition was well run. Most all involved had a good time and

probably would not mind going there again."

Paul didn't mention his triumphant return to the US and another national championship, so we will quote a few paragraphs from *Stunt News*, the publication of the Precision Aerobatics Model Pilots Association:

"Despite having to repair the 'Impulse' after an earlier mishap, Paul Walker captured his third national title on July 21.

"Direct from France, where he placed No. 3 individually at the world championships, Walker posted a 1,071.2 total in the best two-of-three flyoff. Thus, the aptly named Walker Cup resides in the Northwest this year.

"Another member of the Jet Lag Trio, Jim Casale, flew the whole spectrum of maneuvers to place second by just 1-6/10 points at 1,069.6 A four-time Nats champ himself, Jimmy was fresh from a sixth place in France.

"Third spot, with 1,065.6, was nailed by past world champion Bill Werwage of Berea, Ohio. The third member of the US FAI team, Bill finished 7th in France.

"(Ever flown the east-to-west transatlantic leg and then had to conduct important business? If so, you can truly appreciate the magnitude of this 1-2-3 finish.)

"Fourth, with 1,062.2 went to first-time finalist Gid Adkisson from Clovis, California. Soft-spoken Adkisson's placing was highly popular among his peers.

"Rounding out the top five, PAMPA President Ted Fancher posted a 1,047.6. Rather impressive for a guy who (a) underwent recent knee surgery, (b) lives on top of an earthquake fault, and (c) likes Old-Time Stunt."

Stunt News also mentions that John Davis of Indiana was first place in the Nats precision aerobatics advanced class and also took first in 1/2A and Old-Time Stunt. Nat Gifford of New Bedford, Massachusetts, repeated as senior national champion, and Derek Berry of Harlem, Georgia, was junior champion.

While we're in a precision aerobatics frame of mind, here's an update from Tom Dixon of Atlanta, Georgia, a supplier of many stunt kits, plans, engines and other accessories. Tom writes that he has been contacted by World Champion Zhang Xiangdong, who is offering to produce finished precision aerobatics models and engines for sale worldwide, with Dixon as distributor. Tom says he is following up on the offer and will have details about pricing, shipping, etc. later. These models are all of a "take-apart" type for convenient shipping, travel and storage. In addition, Tom is planning to try to obtain unfinished airframes to meet the US builder-of-the-model rule.

Some details are presented in Zhang Xiangdong's letter to Tom Dixon, which indicates that the flier is an engineer and a graduate of Shanghai Jao Tong University who works for the Shanghai Aeromodel Association. He has been on the Chinese world championship team six times and has won in 1988 and 1990, as well as placing second in 1986. His airplane and engine are of his own design. He proposes to build the airplanes for sale himself and have the engines produced by the Shanghai Miniature Engine Research Institute.

We'll be looking forward with interest to more details of this possible international precision aerobatics product exchange.

For information, write to Tom Dixon at Suite 401, 1938 Peachtree Road, Atlanta, GA 30309. Be sure to ask for Tom's product catalog while you're at it.

• • •

Some fliers like to keep track of their flights. It's particularly useful for precision aerobatics fliers, and it also comes in handy for scale pilots and sport fliers. A log book can help racing teams track the performance of planes and engines or combat fliers record the characteristics of plane designs. Now Twinn-K, the company that manufactures GloBee plugs and other competition products, offers for sale a piece of computer software called the Model Pilots Logbook. "The program allows the input of dates, aircraft names, sky conditions, wind, temperature, number of flights and a short descriptive note about the flights," says a Twinn-K release.

"The logbook program summarizes logbook entries when reviewed to give the total number of flights made and the average temperature and wind on the days when the flights were made. Flight summaries for individual types of aircraft can be obtained."

The software comes on a 5-1/4 inch floppy disk with instruction on the disk and user support from the author, along with free upgrades. The cost is $19.95.

For information, write Twinn-K at P.O. Box 31228, Indianapolis, IN 46231.

• • •

Now for a couple of previews. Photographs of both of these items will appear later, but I just couldn't wait for the photographs to say a few words about a couple of new products on the market.

At the Raider Roundup contest in Seattle, I got my first look at the new Shuriken .050 engine.

Oh, be still my heart!

This is the finest piece of workmanship (strictly from an appearance standpoint—I haven't seen one run) that I have ever seen in a model engine.

Anodized a deep red and polished to a high gloss, this stunningly beautiful tiny engine also promises exciting performance for people interested in Class II Mouse Race, 1/2A combat, and any other high-powered competitive event.

From the instruction manual: "Your Shuriken .050 and .061 develops its best horsepower in the 27,000 to 30,000 rpm range (ground run)."

This engine has a front intake, side or rear exhaust with a separate liner inside the case, and a button-style glow plug. It's a double ball-bearing engine that also comes with spinners. Tuned pipes are available. The parts list includes a diesel head conversion. Because you almost have to see it to believe it, we'll wait for our photographs before saying more. Watch this space.

The only drawback is the price. But if you don't mind eating beans for a couple of months to subsidize your hobby, the $200 for the .050 or $210 for the .061 may be worth it!

The Shuriken comes from BV Competition Engines, operated by Fred Baldwin and Jim Van Arsdall. For information, write BY Competition Engines at 1163 Country Club Road, Indianapolis, IN 46234.

I don't want to give away any secrets, so I won't say what I'm planning to use for engines on my 1991 1/2A combat planes. But I gotta step away for a moment now . . . gotta take a pot of beans off the stove. . . .

The second new product I mentioned above, also awaiting some photographic processing, is a new plastic propeller offered by Nat Comfort. This is a very nice looking 1/2A prop that Nat says is gaining wide acceptance among the free flight crowd. Nat suggests that the prop might work well with the Gievsky .049 that will be imported from the Soviet Union by Dan Rutherford and Bob Carver (mentioned in this column last year) or with the Shuriken. The prop has a fairly large hub hole but a brass bushing can be obtained to step down the size for engines with small studs such as the Cox .049.

For information, write Nat Comfort, 12324 Percival St., Chester, VA 23831.

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While we're on the subject of new and exotic products, we'll suggest that you send away for the product list from Motors and Memories in Seattle, Washington.

Motors and Memories is Dick Peterson, a CL flier in Seattle, who also is a collector and dealer in the old, odd, unusual, exotic or just plain interesting of all types of model products. Dick has a very eclectic list of products—it was he who had the Shuriken engine I was able to look at.

He has a large selection of new and used engines of all models and makes, ranging from OK Cub to Veco to Jetex to G-Mark to PAW and just about every brand in between.

Write Motors and Memories, P.O. Box 78388, Seattle, WA 98178, or Fax him at (206) 22-TRADE.

• • •

Finally, thanks to Stu Richmond for forwarding more fine pictures from his overseas friends.

This month we have photos of Ladislav Davidovich's control line Spad. It is scratch built from three-views and photographs provided by Bob Banka's Scale Model Research of 2334 Ticonderoga Way, Costa Mesa, CA 92626.

"Lada is also one of the world's most prolific makers of homemade model airplane engines," Stu says. "He lives in Plzen, Czechoslovakia. Masterful work, huh?"

Yes.

• • •

How about some club news, contest reports, photos and other local details? We're always looking for news of people and airplanes. Send them to John Thompson at 326 North K St., Cottage Grove, OR 97424. ***MB***

FREE FLIGHT

BY BOB STALICK

HIDDEN HEROES

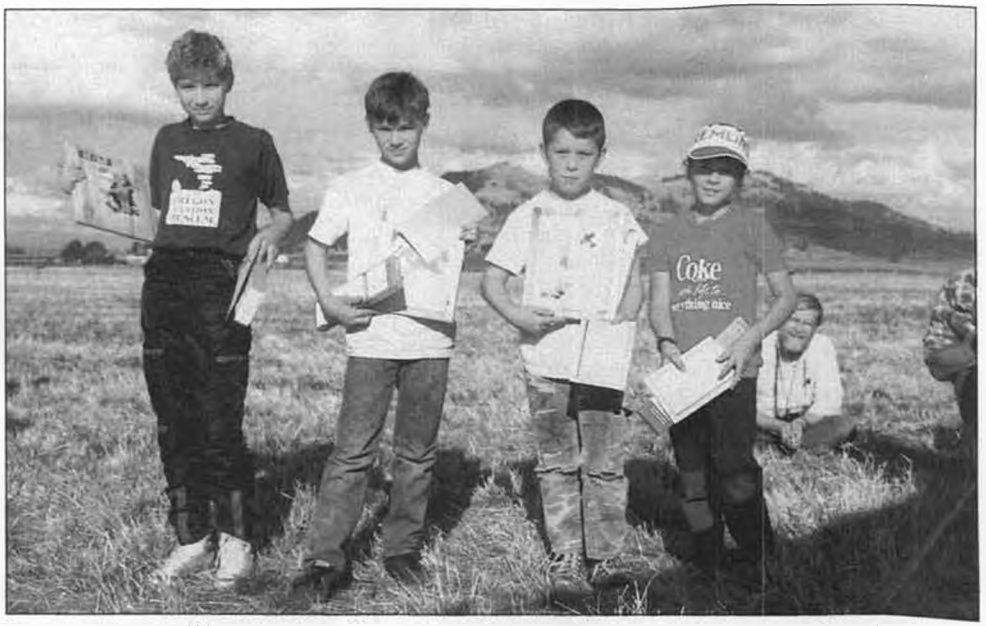
Personalities! In the thirty years that I have been active in free flight, one of the strongest ties to the hobby has been the people who are active in it. And I look back to those who have influenced me. The giants of free flight have had their contributions, and sometimes their lives, spread throughout the model press. Many of us know about these folks because of their contest prowess or their development of new ideas and their organizational abilities. Three of those I think of in the former category are Sal Taibi, Doug Galbreath and Bob White. I think of Carl Goldberg, Carl Fries, Hardy Brodersen and Pete Sotich in the latter.

Obviously, these are but a few of those who make the hobby both challenging and interesting. I also know that in various regions of the country, some people have attained stature for similar reasons but have not gained the kind of national audience that the aforementioned enjoy. These folks put forth their efforts in a quiet and distinguished way—not expecting any accolades or awards. These are the unsung contributors to free flight.

Here in the Northwest, we have been blessed by a number of these fine contributors. The late Don Zipoy was one: a consummate contest director until he met an untimely death from cancer. One other contributor is the feature of this month's article. That person is Albert Grell. In fact, it is really unfair to single out Al by himself, as his wife, Dee, is herself a free flight booster extraordinaire. So, I would like to take the next few paragraphs to let you know about Al and Dee Grell, my nomination for the Northwest's free flight unsung contributors.

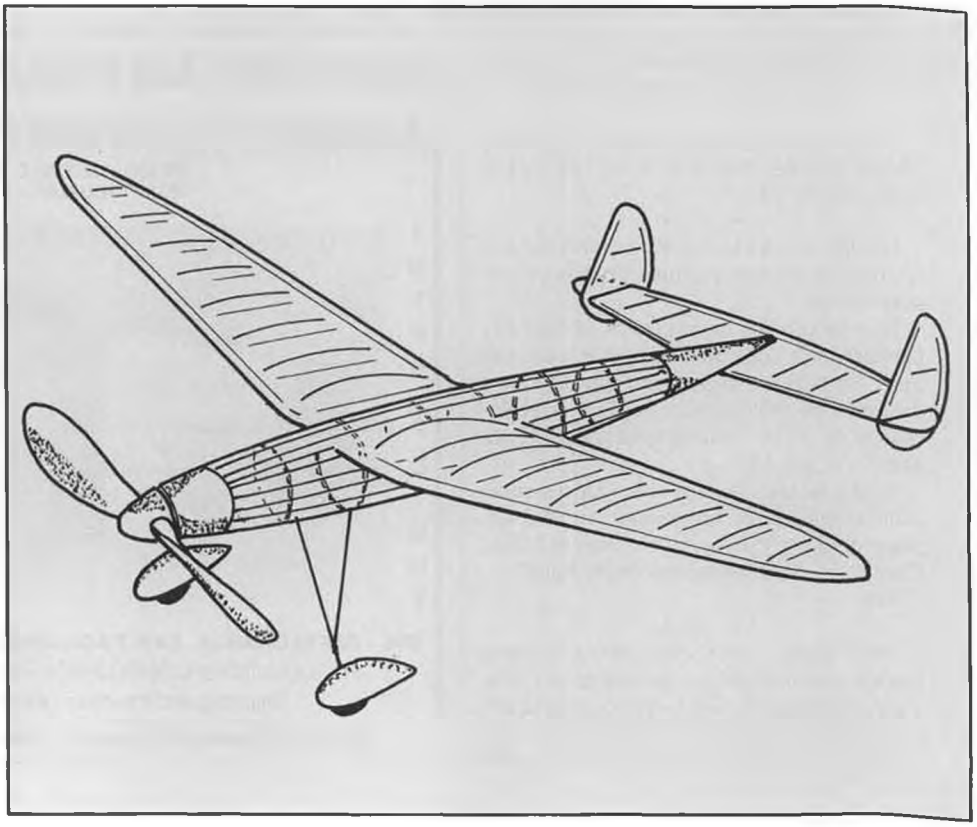
I first met Al and Dee Grell, and their three boys, Paul, Bruce and Glenn, in 1960, when the Willamette Modelers Club (WMC) was just getting started. The entire family was involved in flying and organizing for free flight. It helped that they lived on a 160 acre grass seed farm just a few miles south of Albany, Oregon, but the activity didn't end there. Al served as contest coordinator in the district during those early days. He taught model building at the local Boys and Girls Club, and held several AMA gas records.

Since those early days in the '60s, Al and Dee have been regular assistants with the club newsletter, they have been the primary constructors of the contest trophies, they have stored the club materials and equip-



Winners of the Kids H.L. Glider Competition at the WMC September Contest. All received kits and trophies designed by Shirley Shannon. From left to right: Mike Grell, Blaine Guilfoyle, Randy Grell, and Jeremy Greenwood. Photo by Bob Stalick.

FEBRUARY MYSTERY MODEL



The top five women's HLG event Winners: (From left to right): Rose Tarvin, Sue Grell, Linda Grell, Maggie Oldershaw, and Jaynette Ponnay. Photo by Bob Stalick.

Lineup of the women's HLG participants from the September WMC contest. Dee Grell, who wrote the story of the event for this month's column, is second from the right. She's also Bob Stalick's nomination for Co-Contributor. Photo by Bob Stalick.

Al Grell, Bob Stalick's nomination for Unsung Free Flight Co-Contributor, with one of his Bush Hopper HL gliders. Al built 10 of them to prepare for the Kid's and Women's contest. Photo by Shirley Shannon.

Clarence Bull poses here with his 9 ft. wingspan Gool, a Nostalgia design by Ted Enticknap, with which he won the Nostalgia Ignition Event. It is powered by an Anderson .65. Photo by Bob Stalick.

ment in their farm buildings, and they have annually sponsored the barbecue that accompanies the Northwest Free Flight Champs. Their farm has served as the location for modelers to camp out or sleep in some of the unused upstairs bedrooms. Their shop is a place for free flighters to repair or finish models during the contest weekends, and each one of them takes turns running the contest scoreboard or timing flights during the meets.

The Grell boys are now grown and have kids of their own, and the grandkids are involved in flying in Junior events or helping to time the flights of other contestants. The Grell wives are involved in helping with the barbecues or at the contest site.

In 1990, the Grell family, along with Shirley Shannon, helped sponsor the first women's and kid's hand launch glider meet held in this area. Participation was excellent, as were the prizes and certificates. (A report, written by Dee Grell, can be found elsewhere in this month's column.) The gliders were built principally by Al Grell, who mass produced about ten "Bush Hoppers" for the event.

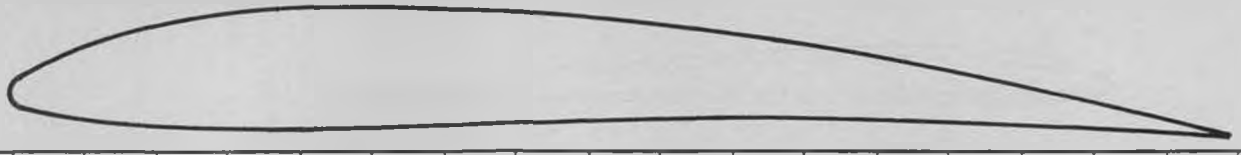
Al and Dee were timers and assistants at the 1969 Tri-Cities Nationals and made the trek to the 1989 SAM Champs just to see and help at this event. Al has curtailed his free flight competition of late in order to restore a full sized Cessna and serve as an officer of a group that plans to construct an Oregon Aviation Museum in the valley. In order to allow easier access to his farm, Al constructed a full sized hangar on his property and established a takeoff strip next to it. It is now used by a number of free flighters who fly to the farm with their full sized aircraft.

So, it is with great pleasure that I recommend to you my friends, Al and Dee Grell, truly the kind of unsung folks that make free flight a better event from a personal as well as a competitive standpoint.

FEBRUARY MYSTERY MODEL

I received the magazine that contained this model from John Crossetto several months ago, and I kept looking at the design to determine what to do with it. To tell the truth, I usually avoid mystery model designs

DARNED GOOD AIRFOIL — GOTTINGEN 602 Mod.



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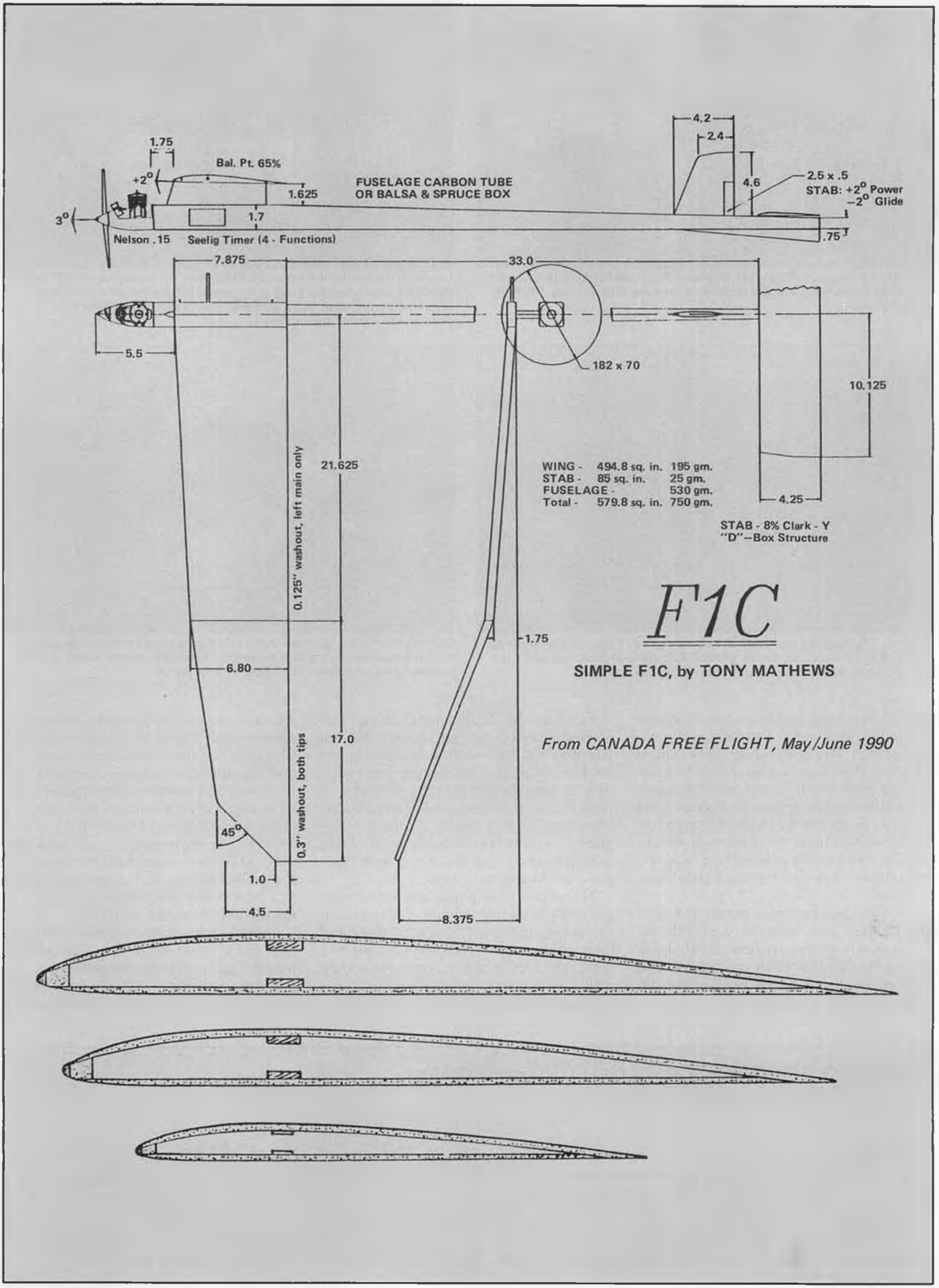
UPR	2.50	4.00	4.85	6.20	7.05	7.75	8.80	9.45	10.0	9.80	9.10	8.00	6.55	4.75	1.81	1.35	0.00	
LWR	2.50	1.48	1.15	0.75	0.50	0.40	0.20	0.00	0.40	0.65	1.00	1.25	1.15	1.00	0.60	0.30	0.00	



F1C

SIMPLE F1C, by TONY MATHEWS

From CANADA FREE FLIGHT, May/June 1990

that qualify for Old Timer designation. The reason is that even though the designs are distinctive, many of us don't recall them or don't have access to the magazines in which the plans appear. I am certain that such is the case with this month's model. However, it is too neat a design to ignore. So, here we go.

The January Mystery Model was published in a non-model airplane magazine in 1937. The designer is well-known by practically every free flighter who has been in the hobby for the past ten years, and the ship is a small rubber powered streamliner. If you know what it is, drop a line to Bill Northrop at *Model Builder*. You may be the only one to identify it. If so, you will get a free one year subscription to my favorite model magazine.

FEBRUARY DARNED GOOD AIRFOIL—GOTTINGEN 602 Mod.

I uncovered a copy of Ron Warring's Airfoil Sections book recently and perused it to see if I had neglected an airfoil that was contained in this book. Sure enough, there was the Gott. 602. Warring's book, which was published in 1946 in Great Britain, contains a number of old favorites. Here is what Ron has to say about this month's DGA.

"The profile of this airfoil, which is one of the Gottingen sections so useful to aeromodelers, has been modified slightly by giving the under surface a slightly greater camber than is usual. It is claimed that this increase in camber will improve the performance of slow flying models. This can be easily understood, as in fact, the increase in the camber of the under surface increases the camber of the centre line, which generally increases CL maximum. Usually this procedure has the disadvantage of increasing centre of pressure movement, but this can be rectified by giving the model a slightly greater tail area. The profile shown is for the modified airfoil."

FEBRUARY 3-VIEW—SIMPLE F1C BY TONY MATHEWS

This month's three view is from *Flyoff*, the newsletter from the Skyscrapers MAC, Bob Hatschek, editor. This newsletter is an excellent original source for free flight information and should be on your list of newsletters to have. Contact Bob at 316 Grosvenor St., Douglaston, NY 11363 for information. Send him 10 bucks for a year's subscription.

At any rate, Bob obtained this three-view from Canada Free Flight, and it is my pleasure to share it with you this month. As many of you know, F1C (FAI Power) has become a real horsepower and technology laden event. It is flown here in the USA by a smaller and smaller number of enthusiasts, but it is still exciting and enjoyable competition. If you are interested in getting a bit more challenge in your free flight action, you might consider F1C as the event for you. And if you do, I would suggest you study this three view, as it is a good starting point.

Here's what designer Tony Mathews has to say about it: "No, I haven't returned to active F1C flying yet . . . But here is an airplane I drew up for young John Wilson (New Brunswick), one of our Junior World Champs hopefuls. This model is a simplified version of my #10 F1C used in the '85 WC at Livno. Changes include: All-sheet wing for simplicity and strength (with either glass cloth finish or aluminum foil), rectangular planform stab, extra down thrust for stability, and a simplified fuselage construction. The fuselage can be made with either a carbon tube, a balsa and aluminum tube, or a simple balsa and spruce box.

"This model would make an excellent first F1C for anyone interested in sampling this exciting FAI event! The whole point is, don't be intimidated by all the high technology prevalent in modern FAI models, but build a model by whatever method or technique that you feel comfortable with, and get out there and fly the bloody thing! Flying F1C models is a blast!

"Dave Sugden has called it `vertical drag racing.' Don't assume that you need to immediately master the new building techniques to join in the fun! Enough of the soapbox already!

"Back to the model (incidentally, this is F1C No. 12), with the warps shown, the airplane should be set up with a slight amount of left rudder for a steep right hand spiral with approximately 3/4 turn in 7 seconds. Bring the autorudder in approximately 1/2 second before the engine shuts down. Stab

continued on page 103

JET TRAILS

BY SCOTT STAUFFER

NEW ENGLAND FAN-FLY

It's hard to believe that this is only the second year of the New England Fan Fly. It's one of those events that seems to have been around for years, and is fast becoming one of the premier events to attend. Despite rain on opening day, the two-day event was well attended. Hosted by the Mohawk Valley modelers, the Fan Fly is held each year in late August at Orange Airport, near the town of Orange, in the north central area of Massachusetts. There has been modeling activity at this site since just after WW II. This particular club though, is only ten years old and has about 45 active members, most of whom don't fly ducted fans. However, the club has the foresight to realize that ducted fans are one of the fastest growing interests in RC today. By working together, regardless of interest, the club has produced a truly memorable event!

(Left) Dan Fish won an award for Best Sport Plane with his Starfire II, one of the most popular high performance non-scale jet models on the market. (Right) Beautifully built Yellow Aircraft A-4 Skyhawk won the Pilots Choice award for Kevin Ballish. Of special note is that all markings, including the lettering, were masked off and painted on . . . a tedious job, to say the least.

There were approximately 50 aircraft registered; a nice mix of old, new, scratch, and kit-built planes. No one type of plane

Huge Byron F-15 made several impressive flights under the expert guidance of Bob Barkowski, of East Hampton, Massachusetts. Bob lost both engines during a slow roll on Sunday, but fortunately managed to get the model upright and back on the deck with only minor damage to the landing gear . . . whew!

dominated the event. Although it rained off and on Saturday, there were still about 200 people present and some good opening day flying. In addition to the registered planes, there were several on static display. The high humidity on Saturday caused some general engine problems, but all in all, the flying was good.

Right off the bat, Dwight Aube, the event C.D., and Dan Fish, both flying equally matched Starfire IIs, got into a sort of battle royal, with low fly-bys, sparkling high speed maneuvers, and fast knife-edge passes, only four feet off the deck! They seemed to be saying to each other, "Oh yeah! Well try this!" It really got the crowd on its feet and set the tone of the show. Dan eventually emerged as the victor, but Dwight made a good account of himself.

Keven Ballish, of Terryville, Connecticut, showed up with a very fine looking Yellow A-4. What's so special about that you say? Well, for starters, all the markings on the plane were stenciled or air brushed on, a long and tedious task. This effort won him Pilots' Choice in scale. The paint scheme he chose was that of an actual A-4 squadron based in Vietnam, in which all the pilots were black. Because of radio problems he made only one flight. Afterwards, he accessed his problem and decided to use, as part of his cure, a redundant battery back up system from Jomar Products Corp. of Cincinnati, Ohio. This system switches to a secondary battery in the event of a main battery failure. Kevin also incorporated the use of glass ferrite bead chokes and shielded servo cables to help reduce interference. The use of long servo leads has created a problem with radio operation for many years. The use of a PCM radio also seems to help. Congratulations on your win, Kevin.

Sharing the tent with Kevin was Chuck Thorton, of Bristol, Connecticut. He brought an old Parkinson fiberglass Avro Arrow 105. This was one of Bob Parkinson's first mass-produced kits and featured a rather large fiberglass fuselage. Chuck's weighs only 11 lbs. despite its size, and utilizes a Byron O.S. 91 fan system. It is painted in the traditional white and dayglow orange test scheme. Bob Parkinson was on hand to help Thorton set up the plane for its maiden flight. Shortly after takeoff on the first flight, the plane lost power, but landed safely. The radio's failsafe system pulled back the throttle, because of low battery power. This saved the plane. After Thorton changed the battery, the second flight was smooth and uneventful. A beautiful flying plane.

While I'm reminiscing about older planes, a J.H.H. Mirage 2008 built by Mike Tetreault, of Brossard, Quebec, Canada, caught my eye. My first jet was from one of these kits. It was even painted like mine. The big difference was the way it flew. Mine used a Turbax I and a Supertiger X45, while Mike had installed a Viojet KBV 72. For obvious reasons, his was a great deal faster than mine. This combination seemed to suit this plane, as it flew very well. I really enjoyed watching it fly, and it brought back a lot of

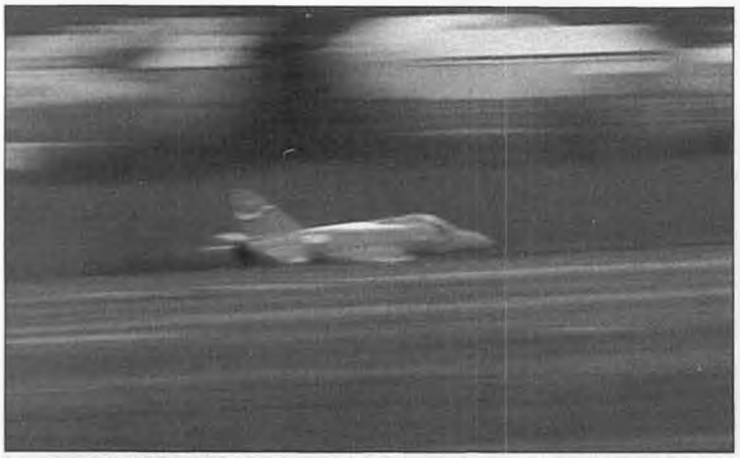
Canadian kit manufacturer, Bob Parkinson, put on a flying demonstration of his new #1 selling kit, the Regal Eagle Supreme, a non-scale ship inspired by the F-15 Eagle. Flights were smooth and stable.

Chuck Thorton's very nice flying Parkinson AVRO Arrow 105 was evidently one of Bob Parkinson's first production kits, as it had the old fiberglass fuselage. Power is an O.S. 91/Byron fan combo.

A pair of Parkinson Sabers . . . a good kit to start with if you're just getting into ducted fans.

The Saab JAS-39 Gripen was Sweden's front line fighter. Bob Kaliski built this one from an Innovative Model Products kit with an O.S. 91/Dynamax fan and fixed gear.

Mike Tetreault modified a JHH French Mirage 2000 kit to use a KBV 72/ Viojett fan system and boy, is it fast!



Dwight Aube took a break from his C.D. duties to get a couple of flights on his Starfire II. He and Dan Fish, also flying a Starfire, got into a kind of "Let's see you try *this*" duel that had everyone on their toes.

Ron Sweeney (left) came all the way from England to attend and to present an award for the Most Prolific Flier, won by Dan Fish (right). The inscription reads, "From Old England to New England."

memories of the old days. Mind you, the "old days" were only 12 years ago!

From the little we go to the large. Several impressive flights were made by Robert Barkowski's massive Byron F-15, powered by twin O.S. 91s. These big birds always put on an impressive, scale-like show. Robert had his all done up in the bicentennial red, white and blue paint scheme. It also featured brakes, flaps, and spoilers. Twelve servos were used to control this nine-foot-long, 29-pound monster. In addition to the big F-15, there were a number of twin-engine planes present; a couple of Lear Jets, and a Cessna Citation.

One of the most popular sport flying planes at the show was the Starfire. As I said earlier, Dwight Aube and Dan Fish seemed to have a ball with theirs . . . so much so that Dan won Best Sport Plane and was presented a special award by Ron Sweeney, who came all the way from England to present the award to the most prolific flier of the meet. The award was a plaque with an actual turbine blade used in a T-38 Talon engine. The inscription read, "From Old England to New England."

The final award went to Lou Lugero. He won the Best Crash award by sheer volume, as he lost three aircraft during the show; two Byron F-18 Hornets and a George Miller F-4 Phantom. It was an award he would rather not have received. However, Lou said that he is nearing completion of two George Miller T-38 Talons as well as a twin-engine project. You can't keep a good man down!

After the awards presentation, it was open flying again and we flew until it was time to head for home. Despite the initial bad weather, a lot of good fun flying went on, and the show was considered a success. I can highly recommend this show. Heck, it was worth it, just for the great seafood!

BUILD YOUR OWN TURNAROUND PIPE

About a year ago, I was building a Parkinson Vector Eagle, with a pusher fan. I had already decided to use the Picco 45 DF engine as my power source, when I discovered that no one made a 45-size turnaround pipe. I wanted to use the pusher fan because of its high static thrust. This would help me maneuver out of the rather short field where I fly. So I decided to make my own turnaround pipe.

I went through three prototypes before I found the combination that worked best. Figure 1 shows the basic layout of the pipe. I purchased all the materials needed at the local hobby store, starting with a stock .45 sized-nitro pipe. Then I bought a 12-inch long piece of K&S aluminum tubing to use as the return pipe. The idea is to select a tube with an I.D. the same as the O.D. of the stinger end of the nitro pipe. The easiest way to do this is to take the nitro pipe over to the K&S display and try different tubes until you find one that just slips over the stinger of the pipe. The reason for the slightly larger diameter tube is to help compensate for the increased back pressure caused by the return tube. Next, get a short piece of 1/8x1/2 inch bar stock aluminum, to use as a support for the return tube.

The first step in making the pipe is to bend the return tube. To do this, you will need a propane torch and a pipe bender. If you do not have a pipe bender, there are other ways. Hardware stores sell various size springs used in pipe bending. They are usually fairly cheap. Or you can fill the pipe with sand and cap it off. If you have a friend who's a plumber, he can also bend it for you. The trick is to heat the tube and bend it into a smooth curve without putting a kink in it. But you have to be careful not to heat it too hot, as the tube can melt. Bend a curved radius in one end of the tube, about 45-50 degrees. It's not necessary nor desirable to go much farther. After the tube is bent and allowed to cool, cut the tip of the bent end at a 45 degree angle facing the back of the pipe (refer to Fig. 1). The hard part is over.

Using a Dremel tool, grind out a hole at

Two views of the flight line. Something like 50 models were entered and flown during the two-day meet.

the largest diameter of the tuned pipe, to insert the return tube. Make the hole just big enough to fit the return tube. Insert the return tube into the tuned pipe so the angled tip is located in the middle of the pipe. Next cut a length of the 1/8x1/2-inch bar stock to act as a support for the return tube. Keep the return tube parallel with the rest of the pipe. Also, be sure it clears the side of your engine.

Now for the final step . . . welding it all together. Look in the local Yellow Pages of your phone book under Welding. It only took me about five minutes to find a shop to do the job. There are four weld points; two on the support bar, one at the stinger end of the pipe, and one where the return tube enters the pipe. You may want to crimp off the stinger in a vice to make it easier to weld.

Inform the welder that the metal is thin and soft, so he will be careful not to burn a hole in it. I had mine welded for $7.58. If you don't have access to a weld shop, I have heard that you can use high temperature RTV. I haven't tried this, so I can't say if it will work. If you can, weld it. My total cost for this project was less than $30, although your cost may vary. This is an easy, low cost way of making your own turnaround pipe of any size. Necessity is the mother of invention. I wonder if that is how Mac got started?

NITRO IS COOL

Byron Originals recommends the use of 20% nitro fuel in the Rossi 90 DF engine. I've been told that the higher nitro content is used to help cool the pipe. Some fan fliers disagree with this theory. They claim that increasing the nitro raises the exhaust temperature and has the reverse effect. Which is correct? I posed this question to a few experienced engine men. In their opinion, higher nitro fuel does keep the pipe cooler and provides additional power. Here's how (refer to Fig. 2). The engine exhaust exits the exhaust port of the engine and enters the tuned pipe. The exhaust accelerates as it enters the expansion chamber of the pipe. This acceleration pulls the exhaust out of the engine and along with it, some fresh fuel/air mixture from the intake ports. This fuel/air mixture is forced out along the inner wall of the pipe, because of the expansion of the exhaust as it passes through the expansion chamber of the pipe. It's this fuel/air mixture with its higher nitro content that cools the pipe. While it is true the exhaust flame is hotter, it is in the center of the pipe.

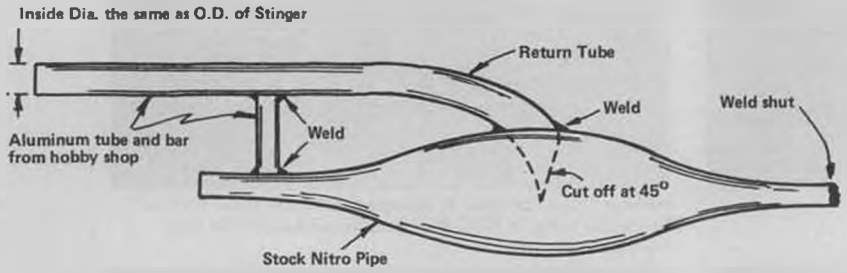


Figure 1 MAKE YOUR OWN TURNAROUND PIPE

Figure 2 EXHAUST FLOW IN TUNED PIPE

DECADE OF THE NI-STARTER

Did you know the Ni-Starter is ten years old? Recently in Florida, I talked to Bob McDaniel about the Ni-Starter. He told me that the Ni-Starter was introduced at the 1980 Toledo Show. It was classified as one of those revolutionary products that only come around every seven years or so (I still have my first Ni-Starter and yes, it still works).

A lot of changes have been made over the years to the Ni-Starter. It now feature a stainless steel PlugLok(TM) and spring, and a high temperature Teflon coated, silver plated copper wire with Beryllium copper electrode for high durability. You can also get them with a built-in dual-faced amp meter. The meter instantly indicates a good or failed glow plug. The #208 metered Ni-Starter has a 3.5-inch long output shaft. This is great for reaching through hatches and ducts on some planes. This is the one I have, and it works great on my Saber. The McDaniel product line has expanded to include an assortment of accessories and adapters, plus on-board igniters and navigation lights.

REVIEW OF RC REVIEW

In a past column I said I would give a review of R/C Video Review Magazine's guide to ducted fans. This is the best overall video Barry Cohen has produced to date. The guide features interviews with Ron Kemp, of Yellow Aircraft Supply, and Tom Cook, of Jet Model Products. It also has flight video of planes by Violett, Parkinson, Byron and others. There are two construction reviews on the tape, one on the Parkinson Vector Eagle and one on the Yellow A-4 Skyhawk. Both kits were built by Ralph DiBiase, of West Palm Beach, Florida. The Cloud Dancers also make an appearance on the tape. Most of the interviews were filmed at the Toledo Show and the flight video was done at the King Orange and in West Palm Beach. Running time is approximately one hour and 45 minutes, and it's well worth the $20 I paid for it.

Till next time, keep your gear up, your burners lit, and watch your six! ***MB***

BATTLE OF BRITAIN

50TH ANNIVERSARY

During a visit to England last summer, our hosts, Brian and Doreen Humpheries, were recounting a few of their childhood memories of wartime England after a day trip to London's Imperial War Museum. After listening to stories of air raid blackouts, ration books, and the Blitz Experience, Brian casually mentioned that 1990 would mark the 50th anniversary of the Battle of Britain, with airshows (called "flypasts" in *real* English) and special events planned to commemorate Britain's darkest days of WW II. When Brian, an ex-RAF airman himself, said, "Why don't you come over again next year and we'll go and see the flypasts?" I was tempted. "We'll see," I replied. As a WW II aviation enthusiast and scale modeler, it was the stuff of dreams; a once-in-a-lifetime

BY DAN SMITH

Spitfire Mk1 at Abington.

Hawker "Hind" bomber at Abington. Note the small bombs below the wing. In 1935, the Hind far outclassed the best fighters in the RAF.

Gloster "Gladiator" at Abington. An advanced design with enclosed cockpit in the 1930's, they were obsolete by the time hostilities started.

Battle of Britain Operations Room at Duxford, as it was in 1940. Note map board with croupier sticks and wall-mounted sector lights showing status of each squadron.

Hangar 1 at Duxford. German Junkers Ju-52 transport is at center. Clockwise from top left is an Avro Vulcan, Boeing B-29 Superfort, Short Sunderland flying boat, and Bristol Beaufighter.

DeHavilland "Mosquito" bomber, Hangar 1 at Duxford. Made of spruce and balsa, they were fast, lightly-armed, and constructed in converted furniture factories. They could carry almost as many bombs as a B-17. Yes, that's a Grumman TBF "Avenger" with Lt.(jg) George Bush's name on it.

Curtiss P-40 "Tomahawk" (that's right, Tomahawk) at Duxford's aircraft restoration hangar. Sold to Britain during the early days of WW II under Lend-Lease, many were eventually sent to the Soviet Union.

Republic P-47D at Duxford's aircraft restoration hangar. P-47's escorted B-17's across the Channel from Duxford during WW II.

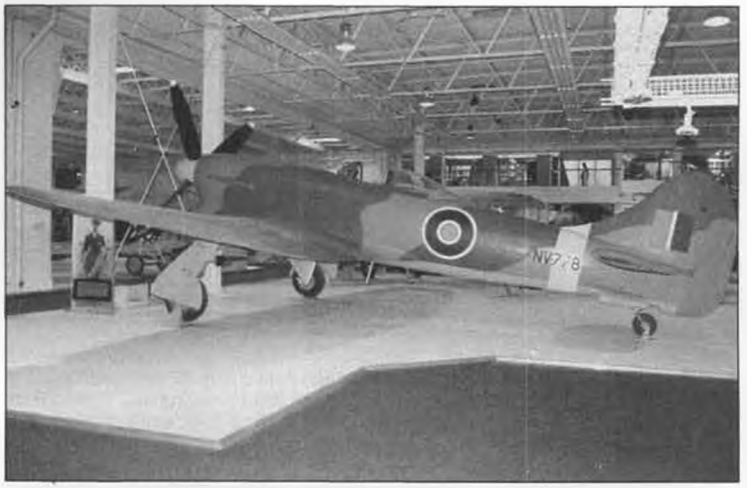
Jet-powered Me.163 "Komet" in front of pristine Vega-built B-17 at Duxford. The "Komet" had just eight minutes of 500 mph flight, but was a sitting duck after fuel was exhausted.

Bf109 at Hawkinge like that flown by Adolf Galland, Germany's famous fighter ace with over 100 kills. Note the trademark Mickey Mouse on the fuselage.

The plane that saved Britain . . . a Hawker "Hurricane" at Hawkinge. Though slower, and having a lower ceiling than the Spitfire, they were hardy fighters and were readily available in time for the Battle of Britain.

A rare Soviet Lavochkin La-7 at Duxford. Appears to be a trainer, judging by the elongated cockpit.

A Boulton-Paul "Defiant" at Hendon. Designed for knocking down unescorted bobmers, they were easy targets for Bf109 escorts attacking from below and behind.



A Hawker "Tempest" at Hendon, one of the fastest airplanes of WW II. The Napier-Saber engine was very temperamental, and had a tendency to catch fire. Tempests could intercept a V-1 buzz-bomb as it descended.

An Avro "Lancaster" heavy bomber that survived over 100 missions. Note the extremely large bomb-bay (and the extremely large bomb!).

A Vickers "Wellington," at Hendon. The workhorse of Bomber Command early in WW II, this example is the only one left out of nearly 11,000 built!

trip back in time to wartime England. I never thought it would happen, but there I was . . . winging it to Heathrow, hoping to recapture just a few seconds of what was truly Britain's "finest hour."

Fifty years ago, in June 1940, Britain stood alone against Germany. One country after another had fallen to Hitler's war machine. Nearly a third of a million British and French troops had been evacuated from Dunkirk and invasion was expected at any moment. In July, the Battle of Britain began in earnest as the Luftwaffe launched a series of attacks on Channel shipping and port cities to prepare for invasion. By the end of July, horrendous losses left RAF Fighter Command facing extinction within weeks. From August to September, waves of German bombers and their Bf109 escorts pressed further inland to smash Fighter Command's network of airfields, radar stations, and communication links. Vicious air battles high above Kent took a heavy toll on both sides as Hurricanes rose to meet the incoming bomber formations in head-on attacks while Spitfires tried to hold off the Bf109 escorts. Unaware of how close they were to success, the Luftwaffe suddenly switched to bombing London in September to avenge Bomber Command raids on Berlin. This gave Fighter Command a last-minute respite to regroup and replenish its decimated ranks. September 15th marks the turning point of the battle as the Luftwaffe, under pressure from Hitler to achieve a breakthrough, launched a massive attack to knock out what they thought were the last of Britain's fighters. Committing all reserves to meet the attack, Fighter Command was victorious—German losses were 60 to Fighter Command's 26 by day's end. Shortly afterwards, Hitler postponed the invasion indefinitely. Victory had cost Fighter Command 915 aircraft and 500 pilots and crew.

I had written Brian earlier, telling him that I was interested in seeing as many WW II airplanes as I could in the five days I had. On Day 1, Brian took me to see the WW II aerodrome at Hawkinge, in Kent. On Day 2, Battle of Britain Day, we visited the flypast at RAF Abingdon, near Oxford. On Day 3, we took in another flypast at RAF Duxford near Cambridge. Days 4 and 5 were spent at a more leisurely pace at the RAF Museum at Hendon, and London's Imperial War Museum. For an airplane nut, it was a dream vacation.

DAY 1—HAWKINGE

RAF Hawkinge is about an hour's ride south from Brian's house in Maidstone, Kent. The grass airfield lies beside a few olive-drab brick buildings and Quonset huts that, as the sign says, "in 1940, reverberated to the thunder of fire-breathing Rolls-Royce Merlin engines powering Hurricane, Spitfire, and Defiant aircraft as young RAF pilots took off to defend our country in its hour of greatest peril." The surrounding countryside looks much as it did back then, and it wasn't hard to imagine seeing the pilots scramble toward their Hurricanes.

The hangar in the main building has a small but very impressive collection of aircraft: a pair each of Hawker Hurricanes, Spitfires, and three Bf109s, the primary fighter combatants during the Battle of Britain. The Hurricanes and Spits are painted in buff and olive-drab camouflage; the Bf109 is painte lie the one flown by Germany's famous ace, Adolf Galland, with his trademark Mickey Mouse painted on the fuselage. One of the Bf109s (Bf is Bayerische Flugzeugwerke, the Messerschmidt factory) was evidently assembled from scrap with the forward fuselage left open to show the well-engineered Daimler-Benz engine and top-mounted machine guns. Numerous Merlin and Daimler-Benz engines are on display, many with severe battle damage.

A small Quonset hut near the main hangar

houses a V-1 buzz-bomb or "doodlebug," a jet-powered pilotless aircraft that was supposed to be one of Hitler's "secret weapons." They were fired toward London from bases in France; when they ran out of fuel, they glided in and exploded on impact, often with devastating results. Brian vividly remembers being out with his mum just as a buzz-bomb hit a nearby pub. When the dust settled, all that remained of the pub was a smoking hole in the ground.

The old armory at Hawkinge has a fine collection of uniforms and flight equipment, both British and German, and a collection of aircraft weaponry, mostly machine guns and air cannons.

Strangely enough, it was not the airplanes on display at Hawkinge that I remember most, much as I enjoyed seeing them—it was the collection of photos of the airmen, both German and British, displayed alongside the remnants of their final moments. American museums have a certain polish that is not evident here. Broken propellers, perspex canopy fragments, crumpled tailplanes, shredded hoses and cables, Merlins with grossly misshapen pistons and crankshafts, machine guns with barrels limp from intense heat, gave shockingly vivid testimony to the violence of air warfare and were arranged almost reverently, like keepsakes between the pages of an old family album.

DAY 2—RAF ABINGDON FLYPAST

On Battle of Britain Day, Saturday, September 15th, we set out for the flypast at RAF Abingdon, near Oxford. Traffic stalled completely as we got close to the airfield. Not wanting to miss anything, I decided to hoof it the last few miles and meet Brian later at the show. As I walked past lines of stalled cars, I could see that this flypast was going to be first-rate, with a fine collection of WW II and jet aircraft both flying and on display.

Aircraft flying that day were a Supermarine Spitfire, Fairey Swordfish "Stringbag," De Havilland Mosquito, and a B-17 Flying Fortress, the "Sally B," among others.

The highlight of the show was the awe-inspiring Battle of Britain Anniversary Flypast featuring 163 jet aircraft in close formation. The flypast appeared over Abingdon after flying over Buckingham Palace, where the last of the Battle of Britain veterans were being ceremoniously honored by Her Majesty, the Queen.

Another highlight was the Battle of Britain Memorial Flight—a Spitfire, Hurricane and Lancaster bomber flying in formation. The Hurricane, "Last of the Many," was painted like the one flown by RAF ace Douglas Bader The Spitfire, "In Memory of RJ Mitchell," was rescued from the scrap heap after being damaged during the Battle of Britain. The Lancaster was painted in the markings of Sqn. Ldr. John Nettleton's aircraft on the famous Augsburg raid, for which he won a Victoria Cross.

In addition to the many Harriers, Jaguars, and Tornado jets, the static displays included many types not often seen on this side of the pond—a Gloster Gladiator, Hawker Hind, Westland Lysander, Gloster Meteor, Mk18 Spitfire, and a MiG-21.

DAY 3—RAF DUXFORD

Brian and I, mindful of the crowds on the way to Abingdon, left at dawn Sunday for RAF Duxford. During WW II, Duxford was home to the 8th USAAF 78th Fighter Group; it's now the RAF aircraft disposal facility and an outstation of London's Imperial War Museum. They have what I believe is one of the finest collections of historical aircraft in the world, and first-rate aircraft restoration facilities.

The show at Duxford opened with the Red Arrows, Britain's equivalent of the USAF Thunderbirds. Out on the flightline awaiting their turn to fly were several' Spitfires, a Hurricane, a Messerschmidt Bf109, Fairey Swordfish, PBY Catalina, Fiesler Storch, and a candy company Stearman with the requisite wing-walker.

Away from the flightline were some outstanding static displays. The sleek-looking

continued on page 106

Yours truly beside a deadly-looking Focke-Wulf 190 at Hendon.

BIG BIRDS

BY AL ALMAN

PLANS HUNTIN' & KIT BASHING

Hey guys, I suddenly and unexpectedly got the hots to enlarge and add radio assist to one or more of the perky and deliciously different free flight designs conjured up by the prolific mind of one Keith Laumer. If my memory serves me right, these nifty models appeared in *Flying Models* back in the middle to late fifties when Keith was an Air Force Captain.

Can't remember the names of any of his airplanes, including the three or four I did build and enjoyed flying. And although I searched for them, I couldn't find any of the plans in my files either.

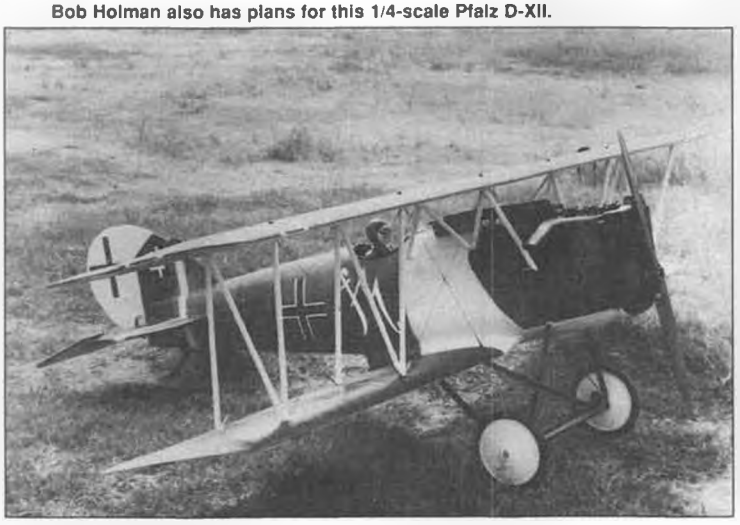
So I'd appreciate any help in locating some of Laumer's work. As a bit of trivia, I remember reading two science fiction novels Keith had published back about ten years ago, so it seems that he finally did break into the big-time.

I just realized that besides Laumer's designs, I also built a few of Roy Clough Jr.'s brainchildren. One in particular, a flying saucer, I built in 1951 while going through Radar Maintenance School at Keesler AFB in Biloxi, MS (I dare you to ask me about them thar Biloxi Blues).

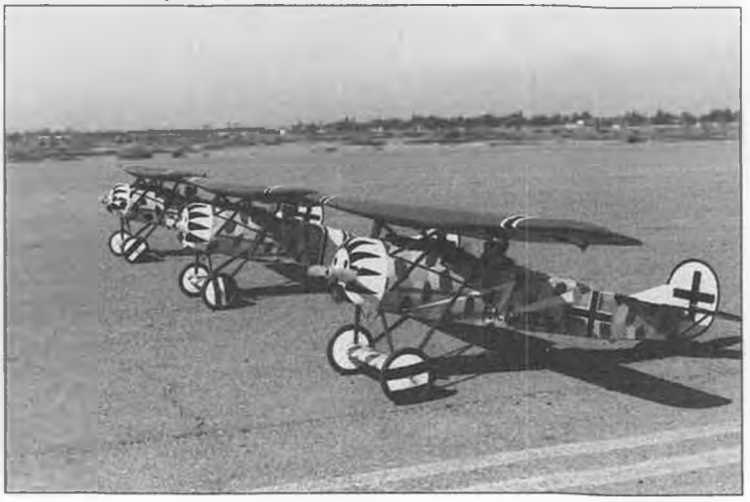
Clough also did some very interesting articles on most everything from flying saucers to ducted fans.

Art O'Donnell "kit bashed" a standard Ace 4-120 kit and came up with this much more realistic looking bipe. Goes to show what a difference a few subtle modifications can make.

Bob Holman also has plans for this 1/4-scale Pfalz D-XII.



The newest addition to Bob Holman's line of scale plans is the 1/4-scale Fokker D-VIII designed by Frank Comyns. More in text.



KIT BASHING

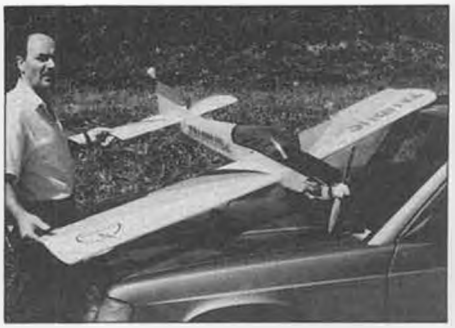
Something strange happens when any of us opens a new kit in the sanctity of our workshop. Although there's still no real scientific explanation for what actually takes place, we do know that, suddenly, as if by magic, hitherto dormant vital body fluids start to flow in abundance and are instantly transformed into . . . *creative juices!*

At first, Old Wives' Tales had us believing that this happened only to experienced modelers during the dark and forbidding hours of the night, but we've since discovered that this irresistible urge overcomes all modelers, regardless of their expertise or hour of the day.

Some recent kit-bashing by Art O'Donnell is a good example of this popular art form. He started with a regular off-the-shelf Ace 4-120 kit and, after untold nights of secretly burning incense, chanting incantations and sacrificing virgins, brought forth from his magic dungeon a classic-looking bipe.

So don't let inexperience or negative comments from others put you off. Go ahead and modify to your heart's content. Letting the creative "you" take over is fun and exciting. And while you're at it, why not conjure up a special finish or paint job for this one-of-a-kind original.

The "Vario" electric powered sail plane spans 140 inches—152 inches with the wing tip extensions in place. Another new Hobby Lobby offering.



The name's the same, but the shape bears no resemblance to Ed Kazmirski's famous 1960s pattern ship. This is the new "Taurus Plus" from Hobby Lobby, 90 inches of aerobatic airplane that looks like one heckuva lot of fun to fly.

TAIL BRACING THE ROBINHOOD

World Engines' big "Robinhood" is a good sport machine. She flies fine and lends herself well to just about any kind of modification. However, as many have discovered, some added insurance in the way of tail bracing is sometimes needed for longevity and peace of mind.

Of course, there are a number of variables involved that would affect airframe integrity and the need for tail braces, such as the type of glue used, quality of craftsmanship, the size, make and type of engine and how well the prop is balanced.

I've seen a few "Hoods" lose part of their tailfeathers in flight and have heard about others doing the same. And this problem seems to occur mainly when a very large rough-running engine and/or an unbalanced prop has been used.

Even though you do add some sort of tail bracing, take the time to balance your props and do what you can to get the engine itself running smoothly. The carb and/or the carb filter may need to be cleaned, or the engine mounting may need to be checked, tightened or changed.

FOKKER D-VIII PLANS

Bob Holman recently added Frank Comyns' Fokker D-VIII plans to his already impressive lineup. The plane is 1/4 scale and comes out weighing about 15 pounds. Any engine from a 1.08 up to a 2 cubic incher should do a good job of hauling this WW I aeroplane around.

The four sheets of plans are rolled and run $25 plus $5 for shipping. There aren't any written instructions, but the plans are so full of useful and informative sketches, 3-D drawings and tidbits that any experienced modeler should have no trouble building this bird. And, according to Bob, an epoxyglass cowl will be available at shops very soon.

For those who insist on driving themselves crazy painting on the famous German Lozenge Pattern Camouflage, sheet #4 gives all the details, including what you need to know about the cockpit and machine gun installations.

For your set of plans, write to: Bob Holman Plans, P.O. Box 741, San Bernardino, CA 92402.

HOBBY LOBBY'S NEW CATALOG

Jim Martin, Boss-Man at Hobby Lobby, has his new Catalog 17 hot off the press and ready for the shipping (they're FREE in the US). Host of the catalog's 120 pages are in color and feature dozens of new items.

Such as the "Best" Hatch Latch. It's easy to mount—only four small screws-and it's *strong*, great for Big Bird lovers.

And how about an exact scale Tiger Moth that's said to be as easy to fly as the full-scale original? Her 1300 square inch wings span 66 inches and can be flown with anything from a .40 to a .91 . . . although you can bet that more than one guy is gonna cram a hot, fuel-injected, supercharged 120 four-stroker inside that cowl and have the bipe screaming along like a raped ape.

Another new bird is their Taurus Plus and, although the name takes me back almost 30 years, this Taurus doesn't seem to be related to Ed Kazmirski design. Here's an aerobatic machine that would make good use of the fire-breathing 120 just mentioned. The Taurus Plus spans 7-1/2 feet and weighs in at (about) 12 pounds, and according to the Hobby Lobby people she's a great flier. And even though she's big, the TP has a two-piece plug-in wing that allows for easy transporting in a small auto.

Yet another new birdie is the Graupner ASW22BE, aka the "Vario." She's a big

continued on page 106

Len Bosman and his 137-inch span, 36-pound Avro Lancaster Mk I powered by two Quadra 4Os. Outboard props are freewheelers.

Hobby Lobby's new Tiger Moth looks great both on the ground and in the air. Her 66-inch span makes this bipe suitable for IMAA sanctioned events.

DEAR JAKE *Continued from page 5*

your flying field, don't blame me. I haven't lost anything since 1963, if you don't count my ex-wife Gloria, so I just can't relate to you absent-minded types who'd lose your hats if they weren't nailed down. Try dropping bread crumbs next time you leave the field, and maybe you'll be able to find your way back.

Jake

• • •

Dear Horse's Hind Quarters:

Several issues ago, I told you that I had lost the wing for my Byron F-86 ducted fan aircraft and asked you where I could get a replacement. You said not to bother, and that I could just use the fuselage as a leaf blower.

Sounded okay to me, so I tried it. Actually worked pretty well, if the truth be known. But my courteous neighbors and our local police authorities have informed me that I have violated several noise ordinances, and that my fine will exceed $500.

I oughta take it right out of your hide.

Clyde in Goshen, Michigan

Dear Clyde:

Sorry, I can't hear you. Some jerk next door is cleaning his driveway with an F-16.

Jake ***MB***

COUNTER *Continued from page 7*

willed enough to want a copy, you can request it by mail, or even call toll-free (800) 637-4948. Its cost is three bucks, refundable with your first order.

This 20th Anniversary edition contains 288 pages filled with more than 10,000 items offered by over 300 manufacturers of model products and accessories, all at discounted prices. Tower has also found room to include reference charts, helpful hints, and "how-to" information. Separate product and manufacturer indexes make it less troublesome to find specific items. It's also less risky this way, because otherwise, you'll find other stuff to buy while you're thumbing through all those pages. Sears catalog owners will understand!

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James L. Wardrope Astrodata, 421 S.W. Blakley Ct., Bend, Oregon 97702, phone (503) 389-2359, announces the Batgraph, Multi-Colored, Peak Indicating E.S.V. This is a small, 1/2 oz., completely encapsulated, on-board meter for monitoring the airborne pack. Colored LED's give battery condition or possible servo problems at a glance. Also available is the Batbug, a simple battery cycler that can be plugged into your receiver pack at the end of a flying session to discharge the batteries to the proper voltage for a complete recharge. More precision in this operation is achieved through a slower discharge rate than is normally used, ie, about four hours to properly discharge a pack that is down to half its capacity. Other units available for transmitter packs, etc. Call or write for further information.

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An unusual booklet, "Tips on Covering," is available from Coverite, 420 Babylon Rd., Horsham, PA 19044, phone (215) 672-6720, Fax (215) 672-9801. It contains a list of 39 do's and don'ts, as well as many, many ways to prevent sags, bubbles, and wrinkles in various iron-on covering materials. There is a section devoted to the history of model aircraft coverings, plus charts showing 54 different models and how they can be finished. There are step-by-step covering procedures by three different master builders; one on covering with films, another on fabrics, and the third on Micafilm. The catch is that in order to obtain the booklet, you have to send in the circle in the upper left corner of the instruction sheet that is included in every roll of Black Baron Film, that you will have to beg, borrow, steal, or maybe even buy! Certainly worth a try.

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Global Hobby Distributors, 10725 Ellis Ave., Suite E, Fountain Valley, CA 92728, phone (714) 963-0133, Fax (714) 962-6452, or toll-free (800) 346-6543, announces two new small RC sport aircraft manufactured by Global Quality Kits.

The "Birdie Ten" is a pattern-looking aircraft with only a 49-inch wingspan, for .10 to .15-size two-cycle engines. To make it more favorable to the noncompetitive sport flier, the wing airfoil transitions from semi-symmetrical at the root to almost flat-bottom at the tip, making it easier to fly. It is entirely built up of cleanly die-cut balsa and ply parts, and the kit includes pre-bent landing gear struts with steerable nose gear, glass-filled nylon engine mount, all hinges, all horns, canopy, and step-by-step instruction manual.

Not small enough? Maybe the "Baby Birdie" is more to your liking. Having the same, smooth, pattern-like appearance of the Ten, the Baby is designed for .049 to.074 two-cycle engines, and needs only aileron and elevator control, or you can add throttle and rudder. This one spans a pocket-size 37 inches, with about 200 sq. in. area, and is also entirely built up in a short time from die-cut balsa and ply parts.

Prices of these two pretty little Birdies are typically discounted to $27.99 and $21.99 respectively, with retails of $41.95 and $32.95.

• • •

The "Stealthbat" is the very contemporary name for a new RC glider from Wing Mfg. for slope or Hi-Start launches. Control is by mechanically mixed elevons, linked to aileron and elevator servos. A collapsible subfin permits straight Hi-Start launches. The airframe incorporates expanded polyfoam wings with hardwood leading edge, plastic fuselage fairing, pre-covered and finished balsa winglets and subfin, pre-finished and attached balsa elevons, plywood center spine with built-in Hi-Start slot, pockets for all radio gear, and mechanical mixer assembly. Check your dealer, or order direct from Wing Mfg., 306 E. Simmons, Galesburg, Il. 61401, phone (309) 342-3009. Complete

products catalog available for $4.50.

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As mentioned last month, Catalog No. 17 is now available, free to any address in the US, from Hobby Lobby International, 5614 Franklin Pike Circle, Brentwood, TN 37027, phone (615) 373-1444.

One new item shown is the Elecktro-Cat, sort of a powered glider, but equipped with a two-wheel landing gear so it can take off, fly in thermals, land, and taxi back the tho pilot. It spans 69 inches, and retails for $115.

Another new item is the Elektro-Akrobat, winner of the 1988 Electric Aerobatic World Championships. With drag minimized to get maximum duration from the electric motor, the Akrobat has a very high cruising speed, and is spectacular in the air. Span is 67 inches, and the price is $324.

The Graupner DG-300 sailplane, available through Hobby Lobby, spans 91 inches and features a modified Eppler 195 airfoil for slope and thermal flying. It also features a pivoting trailing edge speed brake for accurate landings and breaking out of boomer thermals (which can sometimes be very difficult to do!). It has an almost unbreakable, pre-assembled plastic fuselage, and foam core wings pre-sheeted with balsa; root ribs and dihedral tubes installed, preshaped leading edges. The DG-300 Club Sailplane retails for $259 at Hobby Lobby.

Call or write for that free catalog, and when you order (and you WILL order) be sure to mention that you read about it in *Model Builder*. Thanks. ***MB***

RC SOARING *Continued from page 14*

plotted ribs (from Foiled Again software and a Panasonic KX-P1080i dot matrix printer). The airfoil was my recently smoothed Mirage section (see Oct. '90 MB).

What follows is a letter from Kevin and a photo of the finished aircraft: "Dear Bill, I finished the Mini Mirage project the second week of August after our family vacation. The weather finally cooperated Labor Day weekend, and I got out to fly on Labor Day. Temps were in the 70s with a NE to east breeze (variable) up to about 10 mph.

"I went out late morning with plenty of cumulus cloud action. Being late in the season, I've been using a hi-start (50 feet of standard tubing and about 200 feet of line). I flew for about an hour and couldn't hook the big one. However, at about 12:30 I got off the hi-start, came down to about treetop level, and finally got into a strong thermal.

"I worked the lift downwind as far as I was comfortable then headed upwind. I had lots of altitude and the lift was strong everywhere. I wished I had had spoilers, but I put in down trim and circled. I got down to a safe visual altitude, the lift cycled through, and I came down to land. But, I found some lift and thermalled out again from low altitude. The total flight time was 12 minutes.

"The glider responds excellently to lift at low altitudes, and it circles tightly. It doesn't float, and yet it isn't a missile either. I would sum it up as smooth! It weighs 14.5 ounces. . . . If you come up with any more airfoils suitable for light air and hand launch please let me know.

"Thank you so very much for the time and effort you put into the rib plots and design info. Kevin Leazenby."

You are welcome, Kevin, and thank you for writing about your experiences with the Mirage airfoil and Mini Mirage layout. As for lightweight structure, light air RCHLG, I've found the Mirage section is about optimum.

BRIAN AGNEW'S VERTIGO RCHLG

The mail of late has been running heavy with RCHLG's, and the following is another example. Brian Agnew, Nats Champ and entrepreneur (i.e., Brian Agnew Model Products), has written to share with us his latest HLG project.

"Dear Bill, I have been a fan of your column for several years because of the great coverage you give to hand-launch sailplanes. I have been hooked on hand launch from the moment I read Dave Thornburg' classic article which started the whole craze. I first maxed from a hand launch with an Aquila Grande over 10 years ago and have not stopped since.

"Please find enclosed several pictures and a reduced copy of plans for my new RCHLG, the Vertigo. A prototype of this plane was flown to a 2nd place at the 1990 Nats. The kit version is a good bit better than what I flew at the Nats.

"Vertigo has been in development for nearly a year. Every configuration you can possibly think of was tried, including some very complicated `full house' designs. In the end, the best flying HLG I've ever flown was also to be the simplest. Vertigo was designed to be the highest-launching, best-flying, simplest, and most durable HLG on the market. It uses the Eppler 387 for the wing and the NACA 009 for the tail. Both the wing and stab are foam core and are sheeted with 1/32 balsa. The fuselage is of conventional construction.

"A V-tail on a HLG makes a lot of sense . . . it's clean, light, strong, provides great handling and looks great to boot! I couldn't believe it when I saw Joe Wurts' plane in your column last month (Oct. '90 MB, Joe took 1st place in the ISS HLG contest. -bf) . . . I guess it just goes to show what a good idea it really is.

"Vertigo is available direct from me for $59.95 (includes shipping) and comes complete with all wood, hardware and machine cut and sanded parts. The foam cores are of the highest quality, as are the CAD drawn plans. Nearly any radio will fit, although a 250mAH flat pack is a must. Micro to mini servos will be needed if the mechanical mixer shown on the plans is to be used. I will provide pre-sheeted Vertigo kits for an extra $45 if anyone is interested.

"The kit is a little different than that shown on the reduced plans . . . it has slightly more stab area and a little less tip area other than that it is the same. All the best, Brian Agnew."

Those interested in contacting Brian

Agnew can reach him by writing to Agnew Model Products, 5625 Youngquist Road, Unit #22, Ft. Myers, Florida, 33912. His phone number is (813) 433-5910.

RCHLG NEWS FROM CHICAGO

Once you are bit by the hand launch bug it is hard not to get enthusiastically involved. Case in point is the following letter from Gary Schroeter of Chicago. His experiences with several RCHLG designs are noteworthy.

"Bill, just thought you might like to see some photos of my RCHLG squadron. The group photo in my backyard was taken this summer. I forgot to include my Midway Gnome, however, in the shot." (It is in a separate shot. -bf)

"Clockwise from lower left is the Top Flite Wristocrat, the Whitney Paraphrase, the LJMP Flinger (#1, and well worn) and Flinger #2 (built from #1's `old' plans).

"The Flinger is a terrific flier. It has a very robust structure. I've rebuilt the nose on #1 twice and replaced the tail group once. Flinger #2 has not flown yet.

"The Top Flite Wristocrat in the photo is also a second subject. It is a tremendously well engineered and executed design. My first Wristocrat `bought the farm' about a year ago flying near a slope, when it was pushed flat on the ground by a downdraft at the slope's crest. The fuse shattered behind the bolt hold-down . . . I will not attempt to repair it.

"Wristocrat #2, pictured also on the workbench, needed an additional 35 grams of lead in the nose to bring the C/G to spec. It suffers from pitch-up on a hard toss, even looping in a fair breeze. No amount of down trim seems to help. I remember your talking about wing incidence angles in some RCHLG models, but the T/F Wristocrat wasn't one of them. Maybe that's the problem." (Sounds like you should move the C/G back and add positive trim to the stab until that looping tendency goes away. The Wristocrat has a full flying stab, so incidence angle is totally variable. -bf)

"I really share your enthusiasm for RCHLG's. I fly at a local park, about a mile from home, and when flying, I don't offend anyone. I don't make any noise, no exhaust, you just can't beat flying silently!

"When it's hot in the summer, you get a workout to boot! I always take a glider on vacations. I've flown them in Florida, Wisconsin, Minnesota, Indiana and Colorado. Dollar for dollar, ounce for ounce, these sailplanes can't be beat.

"I've been aero-modelling since I was seven or eight years old (I'm 41 now—ouch!) and I've never outgrown the hobby. I've been in RC about six years, but have served an apprenticeship in H/L balsa gliders, rubber F/F, gas F/F, gas C/L, Guillows kits, Comet kits, Goldberg kits, anything that promises to fly. All these aspects of model airplanes are fantastic, including a tremendous learning experience over the period of time I devoted to it.

"Building is my greatest therapy. I love working with wood (balsa) and turning a pile of lumber into something that really works and flies! Flying these R/C gliders is a terrific reward for all the time and expense involved.

"R/C HLG's provide the best of both of these worlds. I am not a competitor. I fly for fun, relaxation, and to lower my blood pressure (just kidding). I try to make each next model better than the one before, improve the building technique and improve the flight quality. I guess I compete against myself in the end. But that's what it's really about, isn't it?

"I enjoy and look forward to your column every month. I enjoy MB as a whole in aeromodelling. Keep-up the good work, keep flying silently, and don't leave the thermal you are in. Thanks, sincerely, Gary Schroeter."

Thank you, Gary. Your description of RCHLG flight is inspiring ... let me see . . . which one will I build next?

AIRFOIL OF THE MONTH: EPPLER 166

This month's airfoil comes courtesy of Fernando Gale and his great book on aerodynamics, Aerodynamic Design of Radioguided Sailplanes (for availability, contact Ing. Fernando Gale, Via Marconi 10, 28042 Baveno, Italy). You will find 300 unusual airfoils in this book on aerodynamics which is written in English and Italian.

The airfoils are suitable for hand plotting as they are given in simple NACA form. I've had to smooth out the coordinates on this month airfoil as the computer print out of the published ones turns out a little bumpy.

The Eppler 166 presented, is an airfoil I have never seen before and one which should be suitable for flying wings. Its reflexed (bent upwards) trailing edge area seems about perfect to counteract the negative pitching moment, or tendency to "tuck," found in every lifting airfoil (that's why conventional models need stabilizers).

Give it a try on a flying wing and let us all know how it goes! Send a photo and a brief write-up on what you built and how it flew, we'd love to know. ... And the same goes for any airfoil of the month you've seen here!

GOTTA RUN NOW, THERMALS TO ALL. Send information to Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, CA 92330, (714) 245-1702 after 7 p.m. PST. ***MB***

PRECISION *Continued from page 23*

pilot's method of thinking.

While flying AMA pattern, the flight is most often thought of as a series of maneuvers. It is possible to think about whole maneuvers by themselves as detached and discreet entities, and this is actually the way most people see the pattern. It is even possible (not easy!) to look beyond an upcoming simple maneuver to a harder one farther on in the schedule. Necessary adjustments to the flight path and height are made between maneuvers. The pilot has time to indulge in analytical thinking about what he or she is doing, has just done, and is about to do.

When flying turnaround, it is far better to mentally break what at first appears to be an enormous task into *elements*. A Square Loop with 1/2 Rolls becomes a simple quarter loop, followed by a straight line, followed by a half roll, followed by a straight line, followed by a quarter outside loop, and so on. The trick is to never see the maneuver as either whole or finished. Instead of individual and very complex maneuvers which are both unconnected and intimidating to think about and accomplish, the pattern breaks down into simple but connected aerobatic elements. The elements aren't intimidating, and can be flown very accurately once the old habit of thinking ". . . Now I've got to do a Square Loop with 1/2 Rolls" is replaced by ". . . quarter loop now, draw the line, half roll now, draw the line, etc."

The clear advantage of this way of looking at the pattern is that at the so-called "end" of the maneuver, the brain continues to think ". . . half roll now, draw the line, 1/8 loop to 45 degrees now, half roll now, 5/8 loop to entry height now, etc." through the turnaround maneuver. The essential ballet-like rhythm of the flow sequence takes over. Once the brain stops turning on and off between maneuvers as it did in AMA pattern, a magic thing happens. All of the time that seemed to be missing comes rushing back, and the pattern that seemed so impossibly hurried becomes relaxed and graceful. The trick is to do one perfect small element at a time and to stay mentally totally locked in the moment as you do it. No thinking ahead past the next element; no cursing mistakes in the last one. Any necessary adjustments are made as the elements are flown, and not "between maneuvers." Between maneuvers doesn't exist except as a straight line element which is flown the same as all the other elements, with total concentration.

This is hard to do initially, but becomes very easy and natural with a little practice. One thing which really is essential is mentally memorizing and physically internalizing the maneuver sequence so that the flow of elements into each other becomes automatic. Use your caller as a security blanket for contests, not as an excuse for failing to learn the pattern. On the flight line, you really can't afford the mental "computer time" it takes to process indecision. Your mind should be free to concentrate on lines, shapes, angles, wind corrections and keeping the aircraft heading straight.

For those of you beginning to fly turnaround, there are some simple exercises I can recommend. I've gathered some of these from well-known fliers and coaches around the country over the last several years, and some are my own:

1. Learn to fly a parallel heading to the zero line at 150 meters before you work on the pattern. Pick out some approximate landmarks for the box, and fly across, doing stall turns at each end. Once you can keep the airplane consistently on a line, vary the turnarounds. Use an Immelmann at one end an a Split-S at the other, or a 1/2 Reverse Cuban 8 on one end and a 1/2 Cuban 8 on

the other. Concentrate on keeping the aircraft parallel and out at the proper distance, but do read the maneuver descriptions of the turnarounds you are trying to fly, and do them as accurately as possible as well. This won't be easy. You are learning to see the airplane in a new way, and forming mental sight pictures. If the wings appear just so on a down line at the edge of the box, then the plane will be parallel to the flight line on the pullout, and so on. This is the most important skill you can develop for turnaround flying. It will be boring. Do it anyway.

2. Thoroughly practice all of the center maneuvers in the pattern you are attempting to learn without specific turnarounds or attempting to stay in the box. Move them out gradually as you do this until you can perform the maneuver well at the proper distance and height. You are forming sight pictures here as well; learning to see wings level at different distances, heights, and angles. Don't try to learn turnarounds and new center maneuvers simultaneously. It easily takes twice as long and leads to the formation of bad habits which must be broken later.

3. Memorize the pattern. Take your transmitter, close your eyes and fly through it completely. This takes a fair amount of concentration, but very little fuel. Think about flying one perfect element at a time.

4. Only after accomplishing 1, 2, and 3, fly through the pattern. Hopefully, do this with a coach. Try to fly through thinking about one element at a time. Do this several times, and take note of the places where you are consistently having problems. Once you have identified the problem area, break it down to a three-maneuver sequence with the problem in the middle, such as 1/2 Reverse Cuban 8 to Slow Roll to Humpty Bump for a problem with the Slow Roll. Practice the problem sequence until you can perform it well, and then go back to the pattern and start the process again to find the next problem area. This method of practice turns weaknesses into strengths.

5. Unless wind conditions absolutely preclude doing it, always fly the pattern both directions at least once during every session. If you have a favorite direction of flight, Murphy says that all the contests you go to will be flown in the other direction. Trust me on this.

That's the short list of secrets for now. One other skill that really helps is learning to look at your own flying analytically. Are you consistently heading diagonally across the box as you pull or push out of verticals on the turnarounds? If so, the problem is a bad sight picture (seeing too much or too little of the planform of the airplane) on the vertical line. Fixing this is much easier than learning to correct the bad heading with rudder after it has been established. Vertical lines which consistently lean either in or out mean that your wings are consistently banked at the start of the pull or push to vertical, which in turn means a bad sight picture for wings level at the element entry height. Fix the sight picture and the problem disappears.

The above is practically an ironclad rule in turnaround. If there is a consistent problem (as opposed to a simple physical goof), the real difficulty is almost always a habitually poorly flown element immediately preceding the element where the mistake becomes obvious. Poor stall turns or half rolls result from leaning lines, bad rolls or knife-edge maneuvers from climbing or diving entries or poor headings, and so on. When I coach turnaround, it is very easy for me to see a mistake coming before the pilot does. Learn to think about cause and effect in your flying, and it will pay large dividends.

As a general rule, I see far too much emphasis on learning to fix consistent mistakes after they happen, rather than on learning how to not make the mistake. In particular, newcomers to turnaround seem obsessed with rudder corrections. Learning the rudder is a fine thing to do, and certainly necessary, but learning how to not shoot a hole in the bottom of your boat has to be preferable to learning how to bail, right? Learn the basic skills first. After you have bought and paid for some solid fundamentals with a fair amount of fuel and practice, you can get sophisticated with the rudder.

A good coach is a tremendous help with learning turnaround or any other type of pattern. Another pair of eyes will often see things the pilot does not, in terms of the sight pictures we talked about. I can recall a time when I was absolutely convinced that I was centering a maneuver properly until several judges told me the same thing that my coach had been saying all along; the darn thing was always to the left! I listened to my coach, put the center where she said it should go, and the scores went up. After a few weeks, the new sight picture for center became natural. Listen and learn to believe. If you were right, you would be scoring better!

Everything I've talked about works for AMA pattern as well—in fact, it can be a big advantage to not take a mental vacation in the ozone just because you have time to do

continued on page 84

SIG MODEL AIRPLANE DOPE

"The Traditional Aircraft Finish"

SUPERCOAT

HIGH-GLOSS BUTYRATE DOPE

AVAILABLE IN 31 BRILLIANT HIGH-GLOSS COLORS — COMPLETELY FUEL PROOF

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Quart Clear	$9.19
Gallon Clear ...	$28.99
16 Ounce Spray .	$7.95

Cellulose acetate butyrate dope is a paint that was developed many years ago for use on full-scale airplanes. It is a light weight, fast drying, lacquer-related formulation. Ever since its first introduction, butyrate dope has been a favorite with model airplane builders due to its many unique properties.

Butyrate dope is excellent for finishing any type of wooden model airplane, especially when used in conjunction with an uncoated cloth or paper covering like Sig Koverall, Silk, Silkspan, or Plyspan Tissue. It has the ability to shrink these coverings drum tight and provide a fuel proof finish. Butyrate dope is very flexible, making it the very best paint to use on a model that has open areas in its structure where the covering is unsupported. It will not crack or split from vibration or flexing.

DOPE THINNER

For thinning Sig Supercoat Butyrate Dope, Lite-Coat Butyrate Dope, Flat-Coat Butyrate Dope, Sanding Sealer, and Nitrate Dope prior to application. Mix one part Dope Thinner to two parts paint for best results when brushing. Mix one part Dope Thinner to one part paint for best results when spraying. Also handy for cleaning dope from tools, brushes, and spray guns.

SD-025	4 Ounce	$1.95
SD-066	8 Ounce	$3.65
SD-106	Pint	$4.65
SD-146	Quart	$7.15
SD-162	Gallon	$20.95

SANDING SEALER

BUTYRATE DOPE PRIMER

Creates an ultra-smooth base for a prize winning butyrate dope finish. Quickly fills wood grain and covering materials.

Sanding Sealer is basically our Lite-Coat low-shrink butyrate dope with special light weight, easy-to-sand fillers added that make it the perfect surface primer for a dope finish. Two coats of Sanding Sealer, put on after your initial two coats of clear dope, then sanded thoroughly when dry, will provide an ultra-smooth base for the color dope. Sanding Sealer is completely compatible with all other Sig butyrate dope products.

SL-001	4 Ounce	$2.59
SL-003	8 Ounce	$3.79
SL-004	Pint	$5.99

DOPE RETARDER

Typically, when butyrate dope is used in a high humidity environment it will sometimes "blush" (meaning it will dry with a dull non-glossy finish). The best way to prevent blushing is to slow down the rate of drying by using Dope Retarder to thin the paint instead of regular Dope Thinner. Retarder can be used as a 1:1 substitute for regular Dope Thinner when a slower rate of drying is needed to prevent blushing.

DR-001	4 Ounce Jar	$1.99
DR-003	8 Ounce Jar	$3.69
DR-004	Pint Can	$4.89
DR-005	Quart Can	$7.69
DR-006	Gallon	$21.99

FLAT-COAT

NON-GLOSSY CLEAR BUTYRATE DOPE

Flat-Coat is a non-glossy version of Lite-Coat low-shrink dope. It's recommended as a final top coat on models that need a realistically dull, military type finish. Simply paint your model as usual with standard high-gloss Supercoat color dope, then spray Flat-Coat over all the color areas that should be non-glossy. Ideal for painting, WWII models, anti-glare panels, wheel wells, scale pilots, instrument panels, scale props, etc. Our tests show that Flat-Coat produces a more realistic dull finish at less cost than buying separate flat colors. Flat-Coat is completely compatible with all other Sig butyrate dope products.

FC-001	4 Ounce Jar	$2.19
FC-002	Pint Can	$5.49

LITE-COAT

LOW-SHRINK CLEAR BUTYRATE DOPE

Because of the high shrinkage of regular Supercoat clear butyrate dope, it can sometimes warp a thin or lightly built balsa model. To help eliminate this problem, Lite-Coat low-shrink clear butyrate dope was developed as a substitute in some applications. Lite-Coat has the exact same handling characteristics and high gloss of Supercoat clear, but with a lot less shrinkage. In fact, they are completely compatible and intermixable.

LC-001	4 Ounce Jar	$2.19
LC-003	8 Ounce Can	$3.79
LC-004	Pint Can	$5.49
LC-005	Quart Can	$9.39
LC-006	Gallon Can	$28.99

NITRATE

CLEAR DOPE

Nitrate Dope is sometimes preferred for the initial coats of a painted finish, instead of regular Supercoat clear or Lite-Coat clear dope, because of its superior adhesion to typical model structure materials. Acts as a sealer for the bare wood and makes a well bonded base for most commonly used model paints. Nitrate Dope is clear, fast drying, and high gloss. Nitrate Dope IS NOT FUEL PROOF! It should be used only for initial surface preparation and covering attachment, and then topcoated with a fuel proof paint such as Sig Butyrate Dope, epoxy, or enamel model paints.

ND-001	Pint Can	$5.99
ND-002	Quart Can	$9.79
ND-003	Gallon Can	$29.99

For a free detailed instructional pamphlet on finishing with SIG MODEL AIRPLANE DOPE, send a SA `E to the address below.

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TWICE AS EASY EEE-Z-FLI REVISITED

BY AL WHEELER

A twin seemed the logical outgrowth of the original EEE-Z-FLI series (*Model Builder*, September 1989), particularly when so many of the Maui RC pilots are nervous about being surrounded by so much water. After all, twins are safer, right?

Development of the twin followed the basic concepts of the earlier EEE-Z-FLI series. Ease of construction without exotic material requirements and good flight characteristics were prime considerations. A reasonable basic appearance and ease of repair were also felt to be important. In order to keep both size and cost within the acceptable range of a first-time twin builder, the aircraft was designed to use a pair of .25 size engines.

Flight testing with a pair of O.S. 25FPs has been a joy from the first takeoff. The initial flight was no less than "text book," requiring only one notch of down elevator. Ground handling and tracking are good, ease of rotation indicates proper main gear location, and all phases of normal flight indicate excellent stability with no slow flight problems. With reduced power, approaches are normal, and flare and touchdown on the mains can best be described as routine. The aircraft is fast, the roll rate is exciting and the climb is most satisfactory.

The most frequent comments from bystanders regard the sound—even on the ground a twin has a sound quite unlike anything else. The area of most concern to the writer was the loss of one engine and its resulting directional control effect. It was not possible to shut one down as both engines operate from the same throttle servo, so . . . fly it and someday one will quit! When that did happen it pointed out one of the most gratifying flight characteristics of all. TWICE AS EASY handles single engine flight with ease. Reduce power on the remaining engine, retaining sufficient power to keep flying, and there is no wing drop or yaw problem beyond what is easily controlled. Loss of the left engine on a climb out for a left-hand pattern was no problem; a reduction in power to about half throttle and the left pattern was continued with no problems

in turning into the dead engine. Approach and landing are normal on one engine, either right or left, but you cannot taxi, except in circles into the dead engine.

In summary, TWICE AS EASY is an ideal first twin. It's easy and inexpensive to build and its flight envelope doesn't seem to have any "hidden corners." So, if the sound of twin engines stirs your imagination, clean off the workbench and start cutting wood, it's TWICE AS EASY!

GENERAL NOTES

1. It is recommended that all parts be cut out prior to the start of construction, the same as a kit.

2. It is important that the wing be built flat, as this type of construction is quite rigid and resists corrective warping.

3. Numerous choices are left up to the builder, such as engine brand, covering material, fuel tank make and general hardware selection. Selections used on the prototype will be noted in the appropriate section of the instructions.

CONSTRUCTION

Fuselage

Select matched sheets of 1/8 medium hard balsa and cut FS-1 and FS-2. Edge join them on a flat surface. Cut FD-1 and FD-2 and cement them to the sides, starting with FD-1. Position FD-1 1/8 of an inch back from the front end of the fuselage side. Using a piece of scrap, position FD-2 1/8 of an inch behind the aft edge of FD-1. This provides a slot for the installation of B-2. Install the vertical 1/2x/8 pieces in the aft fuselage. Mark and cut the pushrod slots. Install B-2 in the slot on one fuselage side and B-3 flush against the aft side of FD-2. Join the fuselage sides by cementing B-2 and B-3 to the remaining side. Do this on a flat surface and use a square to align the sides at the aft end. Install FD-3 and FD-4. Align and install B1 in the slots at the forward end of the fuselage. Install the triangular vertical braces.

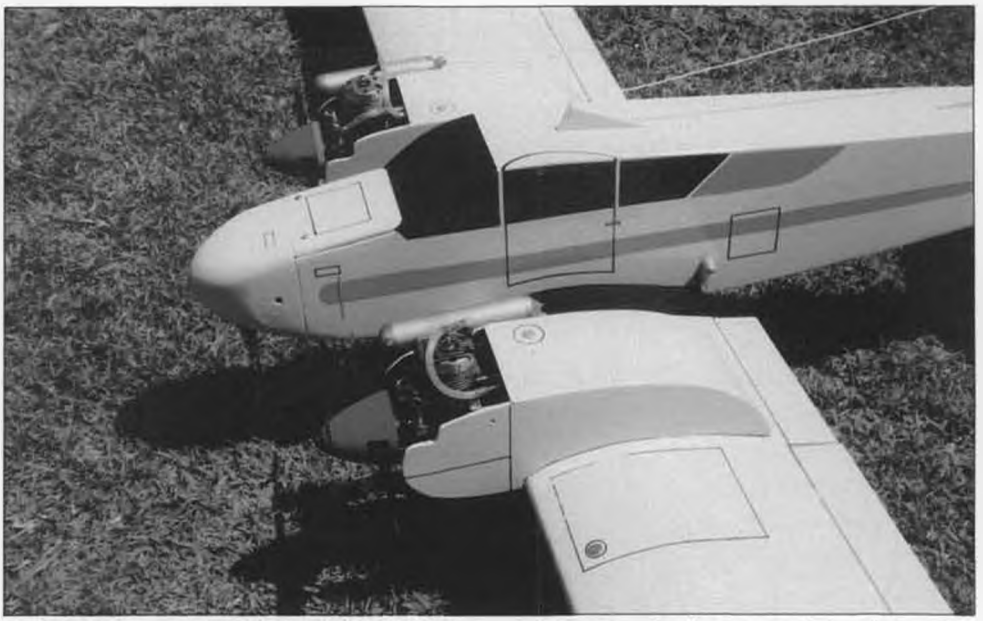
Pull the aft ends of the fuselage together, assure good alignment, secure with clothespins, and cement. Install the top and bottom braces in the aft fuselage. Install the filler block at the aft end of the fuselage and the mounting pad under the stabilizer attachment point. The bottom of the fuselage aft of B-4 may be covered with 1/16 balsa. Install the 1/2x1/8 cross brace at the top of the cabin area and cover the top of the fuselage from the base of the windshield back to the stab cutout with 1/16 balsa. Servo support rails may now be installed on the top face of FD-2. Position the aft support against the forward face of B-3 and the forward support to accommodate the servos to be used. The installation shown is Futaba. Golden Rod or wood pushrods may be used; the prototype used wood pushrods for less flex. The nose gear support may be installed on the aft side of B-1 and the nose block supports cemented to the front side. The nose block is carved from a blank laminated from 1/2-inch soft balsa as shown. The hatch and retainer tongue are made from 1/8 medium balsa and secured with two screws in the front corners. Cover the forward fuselage bottom from B-1 to B-2 with 1/8 balsa and provide a slot in the front edge to clear the nose landing gear. Install the hardwood skid at the aft bottom end of the fuselage. The fuselage may now be sanded and put aside for covering.

Tail Surfaces

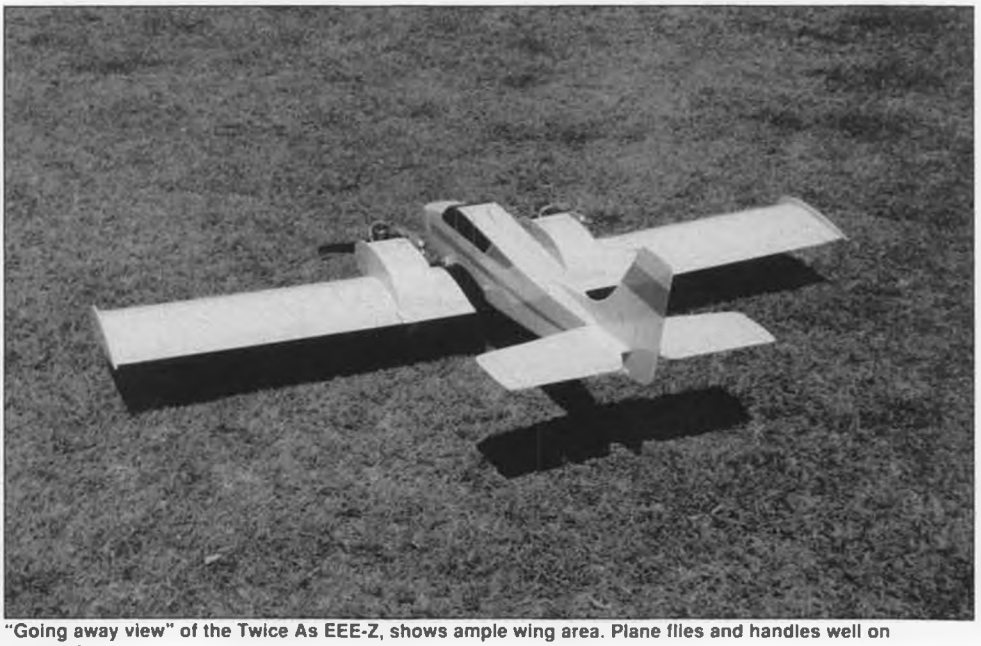
All surfaces are 3/16 medium hard balsa. Elevators are joined with 3/16 dowel as shown. Join them on a flat surface and be sure the leading edge is straight and that both elevator trailing edges are aligned. Cut hinge slots and cement the hinges into the stab only. Join the fin and dorsal. Cut hinge slots and install hinges in the fin and fuselage only. Trial fit the stabilizer and fin to the fuselage and trim if required. Do not attach the fin to the stab yet. Sand all edges round and put the tail surfaces aside for covering.

Wings

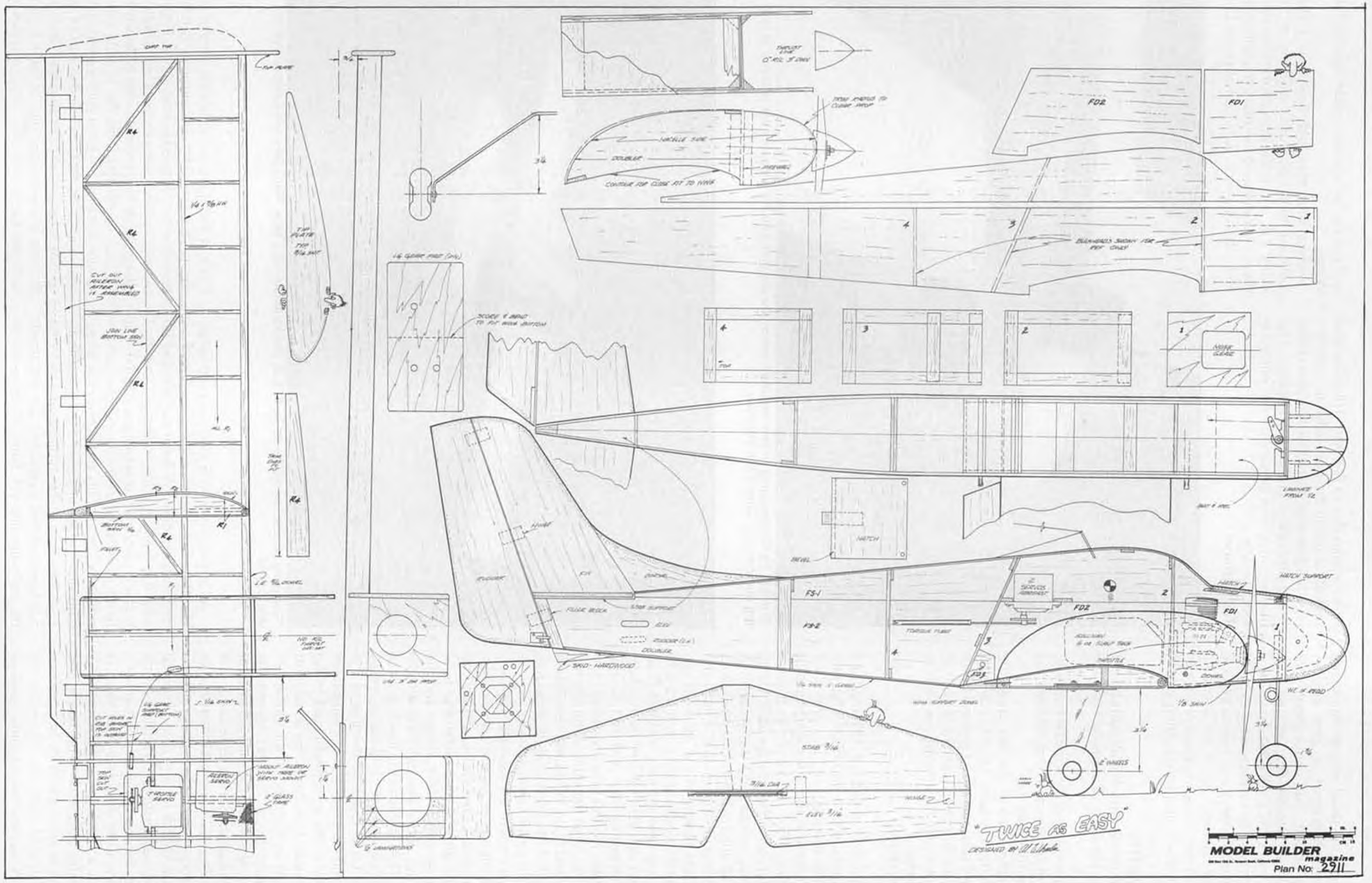
Select four matched sheets of 1/16x4 medium hard balsa and, working on the plans, cut and edge join the bottom wing sheets. Working on the plan, mark the spar and rib locations with a ballpoint pen. Cement the spars to the bottom sheets, assuring that the sides are vertical. Cut the preformed trailing edge material to length, mark its location and cement it to the bottom sheets. Now install the R-3 ribs between the aft face of the spar and the trailing edge. Assure that they are flush with the top of the spar and 1/16 inch below the top of the trailing edge. Install filler strips between the R-3 ribs at the forward face of the T.E. flush with the top of the ribs. This provides an



The O.S. 25 FPs are snug in their nacelles, which are not built into the wing, but are attached to the top surface only. Simple but effective.



"Going away view" of the Twice As EEE-Z, shows ample wing area. Plane flies and handles well on one engine.



FULL PAGE PLANS AVAILBLE, SEE PAGE 106.

attaching surface for the top skin. NOTE: Angle the butt ribs to accommodate the dihedral angle.

Now install the R-2 ribs. Assure that they are flush with the top face of the T.E. and 1/16 inch above the top of the spar. Bevel the ends of the R-4 ribs for a good fit and install, also 1/16 inch above the top of the spar and flush with the top of the T.E. On the R-1 ribs, be sure that the round cutouts for the leading edge allow it to seat on the bottom sheet, even with the front edge of the sheet. The rear edges of the ribs should be flush with the top of the spar. Install the R-1 ribs and cut the leading edge dowel to length. Cement it in place, assuring a good joint with the bottom sheet and the front of all ribs. Cut holes in the two ribs outboard of the inboard end rib to accommodate the engine control flex cable. Cut two lengths of cable housing and push it through the ribs. The top of the center section between the end R-3 ribs may be planked with 1/16 sheet, ending the planking at the center line of the spar. Cut a length of 1/16 sheet for the leading edge, trimmed as required to match the center section sheeting. Wet the top side and install flush with the rear face of the spar. Be sure to apply adequate cement on the spar top, the top of all ribs and the leading edge dowel. Tape around the leading edge as required to assure a tight joint.

The ailerons may now be cut from the trailing edge as shown. Trim the inboard ends and bevel the leading edges. Cut hinge slots in the wing T.E. and the ailerons, trial fit, and cement the hinges in the trailing edge only. Install actuating hardware as shown. Trim and sand the bottom sheets and top planking at the leading edge dowel to a round contour.

The wing halves may now be joined. With a 1-1/2 inch block under *one* wingtip, sand the butt ends to obtain a good fit, assuring that the leading edge is straight. When you're satisfied with the fit, punch small holes in both butt ribs to provide for better epoxy penetration. Recheck alignment and then join the panels with 5-minute epoxy. When the joint has cured the entire wing and aileron assemblies may be sanded. Install the glass reinforcement tape, double in the area of aileron servo mount. Fit and epoxy the landing gear support pad to the bottom of the center section, but do not drill the pad yet. Cut out the top skin at the center section to provide access to the throttle servo. Assuming your throttle arms will be on the right side of the engines, mark off a line denoting the inboard face of the right hand nacelle side, both right and left nacelles. Mark the appropriate exit point for the throttle cable and cut an elongated slot and fish the cable housing out. Make and install the throttle servo mounts. The center rib(s) will have to be trimmed to accommodate the servo. This will not weaken the wing due to the additional support provided by the landing gear support pad and the landing gear itself. Wing tips or tip plates may be fitted at this time.

Nacelles

Cut out four nacelle sides and four doublers. Make two firewall from 3/16 plywood, drill to match your engine mount(s) and install blind nuts as required. Assure that the thrust line is centered with the center of the firewall. Fuel, vent and throttle openings should remain the same regardless of the engine mount used. Cement the doublers to the nacelle sides to make two left and two right. Attach the firewalls against the front face of the doublers with 5-minute epoxy. Install the cross braces behind the firewall top and at the rear bottom of the nacelle sides. *Keep everything square.* Cement in the triangular braces both front and back of the firewall. Cover the top of the nacelles from the top of the firewall to the rear bottom edge with 1/16 balsa. Select a right and left nacelle and carefully fit them to the top of the wing, right and left sides. Sullivan 6 oz. flex tanks may now be trial fitted into the nacelles and removed for covering and fuel proofing. When fitting the nacelles to the wing top contours, slide the throttle cable housing through the firewall and check for fit against the right inside of the nacelles. Elongate the hole in the upper wing skin as required. The nacelles may now be sanded and fuel proofed, prior to covering.

Covering

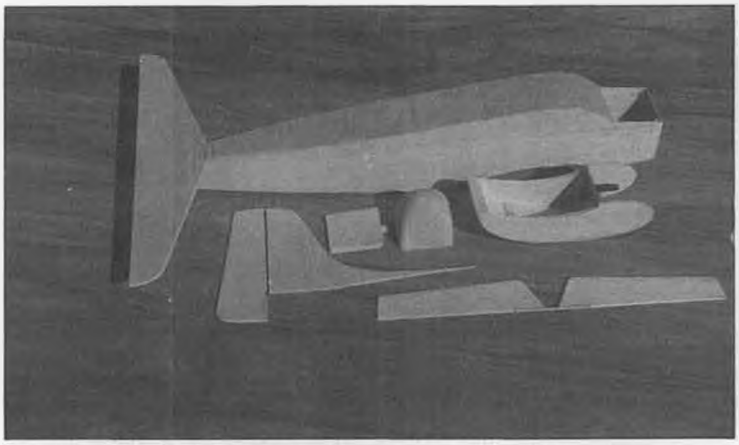
Sand all surfaces a final time. Covering may be done in the builder's choice of materials. The prototypes were covered and trimmed in Super MonoKote. Mark and cut the covering away from all assembly joints to assure a wood-to-wood cement joint.

Assembly

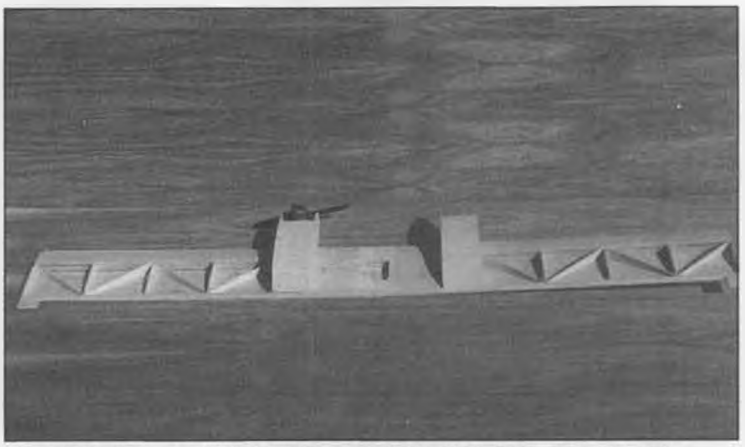
Cement the stabilizer to the fuselage, checking for proper alignment. Using a square to assure it is vertical, and be sure the dorsal is centered on the top of the fuselage. The elevators may now be installed and the hinges cemented, followed by the rudder. Mark the nacelle positions on the wings and remove all covering at the joint area. The base of the firewalls should be flush against the leading edge dowel and the nacelles aligned *straight* fore and aft. No knock-kneed pidgeon-toed assembly at this point, we want both engines pulling straight ahead! When satisfied with the alignment, cement both nacelles to the wing after installing the fuel tanks and lines and feeding the throttle controls through the firewalls. Install the nose gear, servos and control rods, and push the throttle cables through from the firewall end and into the connectors (Hobby Lobby HLH819) on the servo wheel; right cable to the top of the wheel and left to the bottom. This may be easier to do with the wheel off the servo due to limited working space. Now the housings may be positioned to end about a half-inch from the servo wheel when it is actuated toward the housing being positioned. Cement the housing at the forward face of the firewall but do not cut until after the engine installation.

The engines may now be installed and the fuel lines connected. With the throttle open (servo open position) and the control link and threaded coupler attached to the carb throttle arm, measure the point on the cable where it will bottom in the threaded coupler, then cut and solder the coupler to the cable. For final adjustments to the throttle system, use the threaded connector at the throttle arm. Initial settings should be made for full throttle on each engine. You will find that the idle pretty much falls in where you

continued on page 107



A bunch of the partially finished components during construction. Engine nacelle will hold a six-ounce Sullivan tank.



Wing structure is rigid. What warps you build is what warps you get. Don't build any in!

PRECISION *Continued from page 78*

it. Without worrying about the box, fly the turnarounds as if you were going to have them scored. The result will be better entries and exits and a much smoother and more graceful flight. Try it.

I see I've filled up my allotted space and then some this month. See ya at the field. Rick Allison, 15618 N.E. 56th Way, Redmond, WA 98052, (206) 883-3047. ***MB***

ELECTRIC *Continued from page 26*

cago, IL 60630. Be sure to include an SASE if you send inquiries.

If you would like to build a combination peak charger/temperature cutoff charger, Howard Cano had a very good article on this in the October 1989 issue of *Radio Control Modeller*. Howard offers a partial kit for the charger for $14 plus $2 postage. Contact him at Box 5627, Arvada, CO 80005-0627. Again, include an SASE if you send questions or want a catalog of Howard's other products.

• • •

Ben Almojuela sent photos from the Boeing Hawks/Puget Sound Electric Model Fliers Fly-In, held June 23-24. Thirty-one pilots brought 60 planes and enjoyed sunny weather. Equipment statistics showed that the most popular motors were the Astro cobalt 05 and 15 (ten each), and there were three Astro cobalt 40 planes. The most popular speed control was Jomar, with seven used. Ben is in the photo posing with his Boeing 247 powered by two Astro cobalt 15s, Jomar SC-6 throttle, and 20 cells in series with the motors also in series. The Boeing has 830 sq. in. and weighs 8-1/4 lbs. Ben had only three flights on it when he wrote, and felt that power was lacking. I suspect a problem in the power setup somewhere. The power/weight ratio is good, and so is the wing loading. I think this will be a good flier once the problem is discovered. It is a good looking plane, I remember the 247 from my younger days in Alaska.

The other photo shows Steve Doyle's Jenny, built from an Aerodrome kit and powered by an Astro 25. It required some trimming work, but once that was done, it flew in a very pretty scale manner, and won the Best Gas Conversion award on Saturday. Mike Kometz won the award on Sunday with his Warlord from a Bridi kit, powered by an Astro 40. The PSEMF club believes in awards; there were 15 categories and thirty winners (awards each day). Some of the others were: Best Scale, Bob Benjamin/Astro Porterfield; Longest Flight, Ted Randall/48:35; Best Multimotor, Rick Fischer/Astro Partenavia; Smallest Plane, Bernard Cawley/Electro-Flea; Most Aerobatic, Charlie Knudsen/Midway Models Fast Eddie. Thanks for the report, Ben. Wish I could have been there!

I just received a report on the F3E World Cup held at Freistadt, Austria in August. Congratulations to the USA teams which

came in second! That is a big accomplishment, as those of you who follow the column know. The technology in Europe is superb, and there is a constant round of F3E events here to sharpen fliers. In short, the F3E fliers here are really good. U.S. team flier Jason Perrin captured second place overall, Jerry Bridgeman came in eighth, and Steve Neu ninth. Those are very solid performances.

Congratulations also to Astro Flight. All on the USA team used the Astro FAI/6 cobalt motor, which is a 6-turn Astro 60. Bob Boucher says that this motor took the U.S. team planes up to altitude in 15 seconds, compared to 20 seconds for most of the other competitors. This is impressive, because the other motor that dominated the World Championships is the Hectoplett 355/40/(4,5,6). This is the Plettenberg motor I have mentioned before that powers those electric helicopters. Astro really did their homework to beat out that motor. The team used the new Astro 205 throttle to control all that power. Again impressive, because the throttle that most of the others used was the Sommerauer a real powerhouse, used in those electric helicopters. My conclusion is that Astro's technology is at the leading edge. Good work, Jason, Jerry, Steve, Bob Sliff and Bob Boucher!

Keep it hot, fly electric! My address is: Mitch Poling, 7100 CSW/MC, Box 734 PSC 2, APO NY 09220-5300. ***MB***

PLUG SPARKS *Continued from page 31*

ers who don't know what a Dallaire Speedster looks like, we were fortunate to receive a series of photos from Bucky Walter of SAM 39 which included Photo No. 6 showing the uncovered Speedster framework as built by Stu Warner.

As usual, he covered it with pink silk trimmed with maroon dope. This model, adapted to 1/2A Texaco, was so good looking, it placed third at the Toledo Weak Signals Trade Show. Bucky says he was robbed!

TWIN PUSHERS

A one hour flight with a twin pusher? Incredible! However, Art Grosheider of SAM 1 swears that the twin pusher built by Tom Boyle did do such a flight. Seen in Photo No. 7 is Boyle launching the twin pusher on its ill-fated flight (called that because the model was lost).

Art reports the model got caught in some "unusual" air as the model stayed over the field for one hour and nine minutes. Finally the stretched neck pain ended as the model disappeared from sight directly overhead. To date, there has been no report of the model being found.

MORE T.P.

Received from Howard James of Fresno, California, a photo (No. 8) of himself and John Pond at the SAM 21 "Miracle Meet" (so called because it didn't rain in that area of California). The twin pusher seen is a Simmons design that set an NAA record of 22

minutes. This design appeared in the 1937-38 Frank Zaic Year Book.

This particular design is a rugged all-weather type that climbs to excellent altitudes. Glide is typical twin pusher . . . Sink City!

1/2A TEXACO

Received a most interesting letter from Bob Beecroft of the San Diego Orbiteers, who writes to say this column gives excellent coverage to the 1/2A Texaco event but does note it is mostly on radio control.

Taken at the 1990 Orbiteers Annual, Photo No. 12 shows Beecroft's very well constructed 1/2A FF Powerhouse. The model weighs only 14 ounces and is a real pleasure to fly, says Bob. Further, the model is equipped with a Turner beeper which operates during the entire flight. Bob states this inexpensive $20 item is a heckuva lot cheaper than the excellent $600 Walston Retrieval System (which in actuality is what Bob wants!).

Beecroft offers an interesting comparison of the RC and FF 1/2A Texaco events. You will note the RC event is a little more restrictive. Hopefully, the following will clarify any misunderstandings about the two classes of 1/2A Texaco.

	RADIO CONTROL	FREE FLIGHT
Model:	Any competition legal O.T. or Antique design. Must have originally been gas powered (i.e, no rubber models).	Any pre-1939 model powered by a glow ignition engine.
Max Engine Disp. and type:	Must be Cox reed valve .049 with an integral fuel tank of not over 8cc capacity. Must be basically "stock" engines, typified by the Cox Black Widow or Golden Bee designs. Diesel conversions, or throttles of any sort are prohibited. The only modifications allowed are to move the fuel pickup to the bottom of the tank, addition of a muffler,and needle valve extension.	May be reed or rotary valve up to .051. No diesels or diesel conversions.
Size and Wt. Limits:	Minimum 8 oz./sq. ft. of planform wing area.	None.
Scaling:	Permitted.	Permitted.
Fuel type allowed:	Only commercially available glow fuel and alcohol-based home brews permitted. No gasoline fuels.	Only alcohol based fuel may be used.
Max fuel:	8 cc.	1/2 ounce.
Max flight:	15 minutes.	No max.
# flights:	Best 2 of 3.	All 3 count.
Props:	Maximum 8 inch diameter, fixed-pitch, folder, must be two-bladed.	No restrictions.

There are other small differences, such as number of attempts allowed, but the above represents what you will encounter if you fly both events. Of course, the old standby rule that timers must remain on the field is in force for both types.

WHAZZAT? A RASSITOODUS?

This is probably the most unique (and ugliest) model ever to be published in a model magazine. One, as built by former SAM 21 member, Bob Rooman, who now resides in Springfield, Missouri, can be seen in Photo No. 9.

The model has been converted to radio control and utilizes three access doors; at the tail for the receiver battery, at the belly for the receiver, and behind the noseblock for steering adjustment. The throttle pushrod comes out just behind the prop.

To date, the model has not been flown. Dave Bruner, Bob's correspondent, reports that Rooman is begging for help on the test flights. Bruner says it will fly as he made up a 10-inch mockup and found it indeed does fly, however the glide is rather poor with high sink rate.

ITALY

The Italian SAM Chapter 62 has been extremely active of late. This writer, regretfully, had to miss their Italian SAM Champs as plans to attend with Gordon Burford failed to materialize.

Ferdi Gale, located at Via Marconi, 10, 28042 Baveno (NO), sends in several photos of his handiwork. Seen in Photo No. 10 are two models known as the T.412. These Italian Wakefields of 1942 probably best represent the excellent craftsmanship found in their models.

READERS WRITE

Received a nice note and a flock of photos from Walt Geary, who notes the tremendous increase of entries in the 1/2A Flying Scale Texaco event. As this writer has repeatedly noted, this event should catch on or supplement the standard 1/2A Texaco event, as the Texaco type of event lends itself very well to the slow flying characteristics of flying scale designs.

We have picked out what we consider an excellent specimen of flying scale and the offbeat variety of designs that can be built. We particularly refer to Photo No. 11 showing Bill Brenchley of Baltimore with his Dormoy "Bathtub." The neat thing about these Cox Black Widow powered models is that they look simply great at 1,000 feet soaring in the clouds. The only apprehension this writer has is that the flying scale boys will insist on more scale than flying. This would be a shame as the real fun of modeling is to observe your jewel in full flight.

FORT WAYNE FLYING CIRCUITS

Here is another up-and-coming SAM Chapter (28) out of Fort Wayne who call themselves "The Old Fort Flyers." In holding a two-day contest on June 20-21, Wednesday and Thursday (now there's a switch!), they drew 39 contestants with 95 entries. Now, this is something for you weekend warriors to think about!

In retrospect, Dick Brace, C.D., reports that the foregoing is not too surprising as Ft. Wayne was a real hotbed for free flight contests. There are still quite a few old modelers in the area.

The contest enjoyed good weather on the first day but Thursday got pretty well blown away. To offset this, the WOOFFS (wives of Old Fort Flyers) put on an excellent feed consisting of a pot of beans. Topping this contest highlight was a keg on hand which kept things on an even keel.

To prove things don't change much, Bucky Walter is seen in Photo No. 13 explaining to Bob Laybourne how he should fly his Berkeley Custom Cavalier. Hmm! Kinda like the blind leading the blind, huh? The Cavalier is anything but a hot climbing model of the sort that Bucky seems to specialize in. Note the gorgeous field. Could hold a FF meet there!

Bruce Abell, that wandering Australian, is found in Photo No. 14 also attending this meet. For a guy who didn't bring a model, Bruce got in one heckuva lot of flying, starting in California at the Spring SAM 49 Annual where he garnered three firsts under the guidance of Don Bekins.

Bruce is seen checking out Dick Colter's Boehle "Giant." Bruce has flown some big gliders but this author will bet this is the biggest O.T. power model he has ever tackled. However, despite all efforts, he did not enter officially. No cigar, this time!

While Bruce was touring the United States, taking pictures and gathering info for his "Silent Wings" column for the Australia magazine, *Airborne,* he sent several interesting shots from back east. One of the best looking flight pics is seen in Photo No. 15, showing Herb Stokely's beautiful New Ruler coming in on final.

O.T. Electric is gradually catching on in the Eastern Seaboard. This is great stuff, as this writer has found this type of powered model can be flown in urban areas with no complaints of noise. Sure beats those long 100 mile trips out of town to fly!

OBIT NOTICE

SAM 30 President, Nick Nicholau, recently drew my attention to the demise of Harold Cullens, one of the original founders of SAM 30. Three people were responsible for the formation of SAM 30: Harold Cullens, Nick Nicholau, and Loren Schmidt.

Cullens, who died on September 16, 1990, at the age of 55, will be remembered for some of his novel ideas and events that have helped swell the membership of SAM 30. The original two-minute motor run event that featured four-man teams was extremely popular with all Northern California SAM Chapters. Cullens also spearheaded the Texaco Hydro event; the first meet being held at the Oroville After Bay. Despite the distance involved, this meet drew well and attracted numerous entries.

At the time of his death, Cullens was living in Baker, Louisiana, having moved there to accommodate his new work status with the Hunt Correctional Institute in Baton Rouge. Hal will be missed but not forgotten.

THE WRAP-UP

What better way to close off a column than to run Photo No. 16 showing how to really enjoy long Texaco flights.

Fred Quedenfeld sent this pic of Larry Davidson enjoying himself tremendously on a nice warm day at the May 20 Hatfield O.T. meet in New Jersey. Enjoying himself just as much is Fred Quedenfeld on the right doing the timing. What a way to go!

Lest someone get the idea that Larry Davidson is completely laid back, all one has to do is review the results of East Coast contests (including the Westover AFB Champs) and he will find Larry Davidson among the winners and in many cases, the sweepstakes winner! Best part of it all, he is such a nice guy you can't get mad at him for doing all that winning. Threats to step on his model don't seem to dampen his enthusiasm. Haw-w! ***MB***

HANNAN *Continued from page 38*

solid models: 8-inch Flying Model Kits." Offered were a Hawk, S.E.5, Bellanca, Monocoupe, Fokker D-8 and SuperFlying Ace. The price? Seventeen cents per kit, or three for 45 cents, postpaid!

George Ardwin, of Sabina, Ohio, wrote: "Looks like I'll have to start building some of the little critters. Not enough time anymore for the big ones."

Elisabet Ballin, who sent in a photo of an unidentified pioneer aeroplane suspended in the Budapest, Hungary, Hilton Hotel, has received information from Professor S. Veress, of Washington University, who says the craft was designed by Geza Kolbany during the 1909-1910 era.

JOE FITZGIBBON

The founder of Golden Age Models, Joe Fitzgibbon, passed away on September 22, 1990, according to reports from Sears McCorrison and Mark Fineman. Joe and his associates had manufactured a line of top-quality scale model kits for many years, and despite failing health he continued to support the hobby until the end. According to Mark: "He was never happier than when he could just sit and talk model building with everyone, telling of new kits, complimenting everyone on their workmanship and marveling at the models wheeling above him." He will be long remembered.

ECOLOGICAL MODELS

The new compressed-air powered models are being actively promoted in Italy from the standpoint of ecological qualities, according to Georges Chaulet, of France. Stressed is their simplicity and safety and

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ALL ABOUT ARFS

BY ART STEINBERG

MINICRAFT'S ULTIMA

I've never known an RC flier yet who doesn't have a soft spot in his heart for biplanes. There's something about a bipe that makes you kind of stop whatever you are doing on the field and pay attention as it wings its way through the sky. Maybe it's because there's something romantic and nostalgic about a plane with two wings, imparting to the onlooker a feeling for the aviation knights of old who did battle in flimsy wooden crates covered in cloth and paint. Or perhaps it's because they remind us of those barnstorming days between the great wars, when men with nerves of steel pitted their flying skills against the gods of flight.

Anyway, we all love bipes, and double decker fever seems to have really hit the fliers around my neck of the woods. Perhaps it all began when the Las Vegas Tournament of Champions became dominated by pilots competing with Ultimate biplanes, and we all came to realize that these were truly maneuverable machines. Until recently, such large models were out of reach for most of us, but Carl Goldberg Models company broke the barriers for all of us when it introduced a .60-size Ultimate Bipe. This model is so easy to build, and flies so well, that it seems almost everyone I know is either flying one or is in the process of building one. And if I had the time, I'd be right there doing the same thing.

Up until now, my only biplane experience has been with Chuck Cunningham's Lazy Ace, which I found to be an absolute delight to build and fly a number of years ago. It flew in a majestic and slow manner, performing almost any maneuver I desired, and it never gave me the slightest bit of trouble. It had a blue fuselage with yellow wings, was covered in Solartex, and was detailed to resemble a pre-war Navy trainer. I flew it with an O.S. .90 two stroke for a year or so, and then switched to one of the new fangled 1.20 four-strokes when they first became available. Eventually I grew bored with its dependable and predictable flying characteristics, so I sold it to a friend. It didn't take me long to regret it, and ever since then I've hankered for another biplane.

Imagine the thrill I felt when a box arrived containing a brand new ARF biplane, a model so new that mine was sent to me directly from the overseas manufacturer, Minicraft, located in Thailand. It was a pre-

The Ultima seems to fit nicely into the background supplied by the local airport. Production models will be finished in blue, similar to the look-alike Ultimate.

As you would say, "Better than your a-ver-age ARF," the Ultima looks great with the snazzy wheelpants.

production sample which was not yet available to the RC consumer. My eyes almost popped when I got the bright red components of the airframe out of the box, and it suddenly dawned on me that this wasn't just a beautiful .40 sized sport biplane. Actually, it appeared to be a miniature standoff copy of the Ultimate Bipe, but it was called the Minicraft "Ultima" biplane!

Wow! I don't remember when I got to work so feverishly on a model! Actually, there was so little to do that it looked like only the work of a few evenings. All components were completely constructed of balsa and light plywood, and were covered in MonoKote. Yes, I said MonoKote! Not that funny plastic used on most Arfs, but the real, genuine article, the stuff you can repair with the very same covering available from every hobby dealer! Everything was beautifully built, as good as most experienced model builders would do right in their own workshops. The MonoKote was expertly applied, and this meant I had only to do a number of fun jobs to get my Ultima ready for flight.

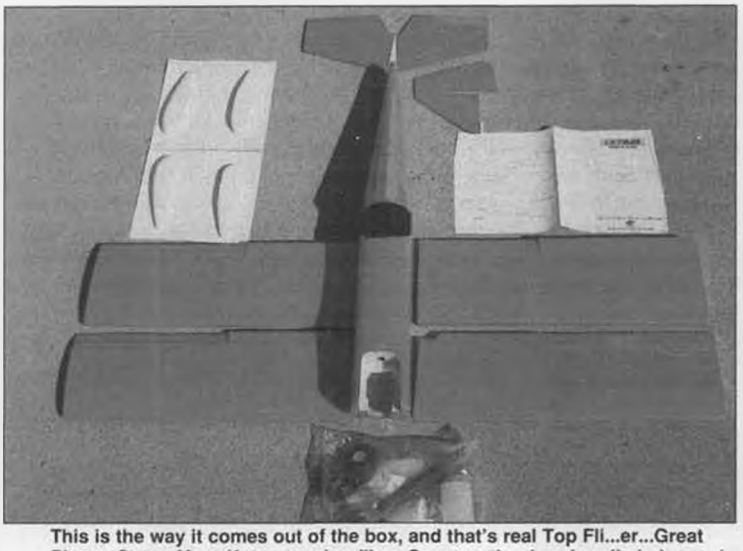
Now please understand, assembling and rigging up biplanes is no quickie undertaking, even when the airframe is handed to you completely constructed and covered. Depending on your working speed, plan on spending at least a few evenings if it is to be done properly. First of all, the wings come in two halves, so they have to be joined with plywood spars and epoxied together. The joints are then concealed with colored tape which matches the flaming red MonoKote perfectly.

Surprisingly, both wings have semi-barndoor ailerons, and the manufacturer should be commended for taking the extra time and trouble in going to the additional expense. Surely a single set of ailerons would have been quite adequate, but this kit is deluxe in every way.

All flying surfaces came slotted and hinged, but the final installation was left up to the builder, so I next attached the ailerons, elevators, and rudder. The hinges supplied were another product of Minicraft, and they were of the nylon variety with pin connectors. They worked smoothly and compared favorably with the best hinges I have ever used. As a matter of fact, the hardware supplied was of outstanding quality throughout, and believe me, there was plenty of it.

When you stop to think of all the extra fittings needed to connect the four ailerons, the split elevators, the wheelpants, linkages, etc., you would expect to pay quite a bit if it had to be purchased separately. But every single thing was supplied, including a top-notch fuel tank, heavy duty plastic spinner, and a complete set of main wheels and tailwheel.

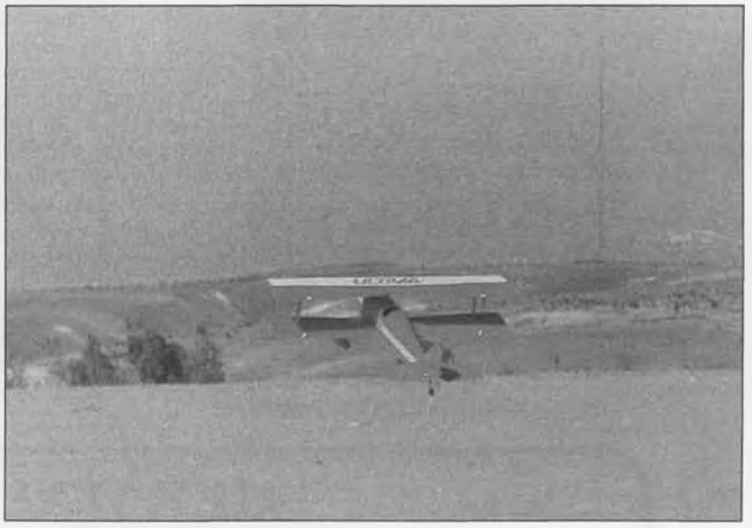
Also made by Minicraft, the wheels deserve honorable mention as they are not of the foam rubber type usually supplied with ARFs, but a newly designed style of solid rubber wheel which was very scale-like in appearance. Even the metal straps supplied for the landing gear and wheelpants were beautifully made, right up to the "Minicraft" logo prominently stamped on each one. The importer has told me that eventually the Minicraft line of hardware will be intro-



This is the way it comes out of the box, and that's real Top Fli...er...Great Planes Super MonoKote covering film. Construction is primarily balsa and ply.

The O.S. 40 FSR has plenty of room, and even bulkier four-strokes will fit, though the 40 two-stroke seems more at home.

Gary Bernstein and Cdr. Bill Benson with the Ultima and John Cutler's .60 size Ultimate from a Carl Goldberg Models kit.



The Ultima takes off with plenty of zest on its very first test flight, which like all flights since, was a piece of cake!

duced for sale here, and they can be expected to compete with anything available on the market today.

The tail feathers, which are constructed of sheet balsa, were easily mounted and the servos were installed. My Airtronic servos fit precisely into the plywood servo tray which came already mounted in the fuselage. All necessary materials were supplied to assemble the pushrods. These were made of thick balsa dowels, threaded metal rods, and shrink tubing. Being a little distrustful of attaching the rods to balsa, I wrapped them in windings of good strong thread, spread cyano glue liberally over the thread, and then covered the wrappings with the shrink tubing. Another unexpected feature was the split elevators, something one usually finds only on larger pattern type models. This necessitated fitting double threaded rods and double clevises to the elevator pushrod, and also requires a bit more work in wire bending and fitting to get everything to work smoothly.

The main landing gear was of the torsion bar type, and was of heavy duty construction, with a thickness of about 5/32. These slipped into a groove in the hardwood block in front of the lower wing and were quickly mounted using the metal straps and screws supplied.

Now it was time to tackle the wheelpants, a job nobody really enjoys doing. For a moment I considered going without them, especially as this plane was going to be flown from a dirt runway, but I realized that much of the charm and appeal of the Ultima bipe would be lost without them. True, this model is a state-of-the-art ARF, but there's nothing ARF about the wheelpants. They come vacuum formed on two sheets of thick ABS plastic and must be cut out and assembled. Actually, this took very little time to do and I had the wheelpant halves cut out and cyano glued together in about an hour. I smoothed the joints with a MotoTool drum sander, taped the seams with the red tape supplied, and spray painted with matching Formula U expoxy paint. The designated method of mounting the pants, using metal straps with nuts and bolts, proved to be both sturdy and practical. The pants have a built in self-aligning system which assures that they will be mounted straight and parallel to each other, while at the same time they have a springiness which absorbs landing shock without damage.

The plywood cabane which is the main support for the top wing was the only other unfinished component in the kit. Though it was die-stamped from plywood, it needed to have a finish applied, so it was also painted with Formula U and then epoxied into the ready-made slot on the top of the fuselage.

Next, the windshield was installed and it was time to apply the beautiful graphic design trim. This comprised a set of outstanding stripes and lettering which was placed on the top wing and both sides of the fuselage. To enhance visibility in flight, a snazzy checkerboard graphic was included for the bottom of the wing. All this went on smoothly and completely free of bubbles, and the end result looked as if it had been expertly painted on. Next, I had to decided what powerplant would be used.

Included among the specifications blazoned on the side of the kit box was the recommended engine size as follows: ".35-.45 2-cycle/.40-.53 3-cycle." That's right, *three cycle!* Never having heard of a three cycle engine, I assumed there had been a misprint, and that the reference was to a four cycle. I spoke to the distributor and was told that a four cycle engine might be preferable, because they are usually heavier, and biplanes often turn out somewhat tail-heavy, so the extra weight in the nose is quite useful. Besides, the Ultima looked a bit short-coupled, so some extra weight in the front might be desirable. I got out my brand new Saito .50 Golden Knight four-stroke engine and dropped it in the engine compartment, and it really looked eye-catching.

I couldn't tell if the balance point was correctly located because there was no mention of it in the instructions. As a matter of fact, there were no written instructions of any kind with the Ultima bipe. All that came with it was a single sheet of paper showing an exploded view of the model. Frankly, that's all a really experienced builder needs to put this plane together, but knowing exactly where it's supposed to balance would have been very helpful. For that matter,

there weren't eve any instructions about the amount of throw required for the ailerons, elevator, and rudder. As it turned out, the balance location I arrived at was a half inch behind the leading edge of the lower wing. The aileron and elevator throws were both set at 1/2-inch up and down, and just in case that turned out to be too much, I set the low rate adjustment on the transmitter for 1/4. I set the rudder for maximum throw as I always do, as you can't be a real wild showoff without a lot of rudder movement.

Anyway, after trying the Saito .50 just for appearance, I tried an O.S. .40 FSR, and while the gleaming gold head and black cylinder of the Saito looked flamboyant and showy, I liked the looks of the Ultima with the O.S. somewhat better. The two-cycle O.S. appeared less obtrusive and didn't seem to detract from the overall appearance. Consequently, the O.S. .40 was installed and an offset of about two degrees to the right was built in. This was made simple, as the mounting system consists of one of my favorite arrangements, bolting the engine to a pair of phenolic plates, which are in turn bolted to hardwood engine beams.

The remainder of the radio installation was then performed and it was determined that the radio compartment, while not overly spacious, was sufficiently large for any flight pack using standard sized servos.

The last remaining task was to attach the outer strut fittings to both wings. Hardwood blocks were factory installed in the wings so this job took very little time at all. Before attaching the wing struts, everything was checked for final alignment, and it was found that only one minor adjustment was needed, as the two wings were 1/4-inch out of parallel with each other. The plywood outer struts came completely formed and nicely covered in MonoKote, ready to be bolted in place. When the struts were installed I stood back and viewed the completely assembled Ultima for the first time, I couldn't remember when I was so pleased with the appearance of a model.

I got out the tape measure and kitchen scale and checked the specifications on the box again. Wingspan was listed as 42-3/8 inches, overall length was stated to be 38-1.8 inches, and these measurements were right on the nose. But all other specifications were incorrect. Their wing area was listed as 635 sq. in., but my calculations showed it to be only 570 sq. in. I really got a big scare when I compared their flying weight to my Ultima, as they quoted 64 to 71 oz., and my model tipped the scale at what seemed to be a grossly overweight 86 oz.! Actually, I had to write all these inconsistencies off to the fact that this was a pre-production kit as there was no way to shave off the thirteen ounces of weight over their maximum allowance. After all, it couldn't have been my fault as they built most of the plane, not me. Therefore, using my figures, the wing loading calculated out to be 21.7 oz./sq. ft., quite acceptable for most sport planes.

One of the most pleasant jobs in evaluating models comes when the project is completed and the photography session begins. The Ultima looked so pretty, so realistic, that I decided to take the static shots at the local airport, and when I looked at her through the viewfinder, with all the full scale airplanes in the background, she just seemed right at home.

It's been quite awhile since I've been able to pop an assembled airplane into the trunk of my car, but the Ultima slipped in with plenty of room to spare for my flight box and folding chair, plus a bottle of water and a drinking dish for Madeleine, the Wonder Whippet. The first test flight took place under dark and threatening clouds, with a mild crosswind hitting me in the back as I stood on the flight line. The O.S. engine had proved to be a little on the lightweight side after it was finally installed, so I removed the handsome white spinner and replaced it with a few ounces of noseweight in the form of a Harry Higley heavy safety nut.

The engine offset must have been just right because the Ultima tracked remarkably straight and true for a small tail dragger. The O.S. .40 put out plenty of power, as the model lifted off the ground in less than fifty feet. Application of aileron for the first turn startled me a bit, as the response was sudden, but not unexpected. After all, the ailerons on both wings added up to a lot of control in the turns. Realizing that restraint would be required in use of the ailerons, I gained extra altitude and started a straight run for trim purposes. With the throttle set at only half speed, the Ultima was moving fast enough for me, and it was maintaining level flight without needing even the slightest trim change. The balance location proved to be correct, as there were no erratic responses during maneuvers. I continued to fly through about half a tank of fuel, then did a couple practice landing approaches. These proved to be no problem at all and the Ultima kept her wings straight and level even when being dragged in on the edge of a stall.

Even in the crosswind, the first touchdown was smooth, and the wheelpants proved themselves capable of operating off dirt without suffering even the slightest damage. While the throws on the elevator and rudder were just right, I felt that the aileron movement should be reduced to 3/8-inch up and down. On subsequent flights the little bipe went on to perform all those maneuvers which bipes do so well. Spins, rolls, snaps, and stall turns were no problem, and the O.S. .40 offered more than enough power.

I do not recommend the Ultima for a first biplane, as it is quick and requires an experienced sport pilot at the helm. Nor is it suitable for modelers with little building experience, as it should be put together carefully and aligned properly in order to fly well. But for those who can handle high performance planes, this little bipe will be loads of fun. The Ultima is a really innovative ARF, being totally built of wood and ply, and covered with one of the best materials around, Super MonoKote, and there's nothing else available in its class. *continued*

The importer has informed me that the Ultima bipe will be available to the modeling public when this column appears in print, but the production model will be supplied in blue Super MonoKote. At the time of this writing no price has been set, but inquiries and orders should be directed to Cermark Electronic and Model Supply Co., P.O. Box 2406, 107 Edward Ave., Fullerton, CA 92633, telephone (714) 680-5888.

Reader questions and comments are always welcome and if you remember to enclose an SASE, I guarantee a prompt reply. Write me at 2267 Alta Vista Dr., Vista, CA 92084. My full time phone number is (619) 726-6636 and my FAX number is (619) 726-6907. ***MB***

HANNAN *Continued from page 87*

freedom from noise and smoke. The designers are presently working on a twin-cylinder version of their E.A.P. (Ecological Air Propulsion) powerplant intended specifically for RC models! The present "Jonathan" ready-to-fly compressed-air powered model and its motor are being imported into the US by Bert Pond and Tom Nallen, who offer a descriptive leaflet and price list for a pre-addressed stamped return envelope: B.P. Pond, 128 Warren Terrace, Longmeadow, MA 01106.

RACER ROUND-UP

Golden Age racing planes have long been popular subjects for model builders, and builders of full-size reproductions are also turning them out. Bill Turner, of Flabob Airport in California, is currently restoring the original Howard Pete, hoping to have it ready for Oshkosh '91, where up to 17 racers are expected.

Bill's Gee Bee Z reproduction now belongs to Walt Disney Studios, who plan to feature it in their upcoming movie, "The Rocketeer." Cartoonist Dave Steven's original concept of his Rocketeer story has undergone radical revision by the Disney people, and they apparently plan to incorporate Howard Hughes in their script. Yet, they are now talking of disposing of Hughes' masterpiece wooden flying boat (which they now own). Evidently they see the Spruce Goose as a White Elephant.

Meanwhile, in Connecticut, a full-size recreation of the Gee Bee R-1 is nearing completion, according to Henry Haffke. Although that particular Gee Bee will remain ground-bound as a static museum-piece, others are under construction elsewhere which are intended to fly.

We're told that the beautiful Crosby CR-4 racer is also undergoing restoration, and one exceptionally ambitious individual is commencing a full-size reproduction of the exotic Hall Springfield Bulldog racer. Stay tuned for further developments!

HOW'S THAT AGAIN?

Jack Larson, of Treasure Island, Florida, says model builders must "shun" a lot. Ingredients for success include: Inspira*shun*, prepara*shun*, atten*shun*, perspira*shun*, concentra*shun*, imagina*shun*, and sometimes even despera*shun*. One must, however, shun tempta*shun*, obfusca*shun*, and especially, procrastina*shun*!

THOSE HARMFUL PLASTIC BAGS

". . . it went to pieces all at once
All at once and nothing first
Just as bubbles do when they burst."
Oliver Wendell Holmes, in *The Deacon's Masterpiece."*

This was the reaction of Herb Weiss to our mention about rubber-rotting problems brought about by storage in certain types of plastic bags.

The difficulty had been noted by Bob Bailey, of England, and printed by the Danish editor Jorgen Korsgaard in his *Indoor News*, which is published in Germany. It was next discussed in the Australian magazine *Airborne*, by Boyd Felsted, who credited his information to Bernard Smith, so it can be readily seen how international our hobby really is!

Apparently the culprit is vinyl chloride, which slowly polymerizes and/or terminates the long rubber molecules. (How frightening! What about other things which may be stored in that type of product?)

By contrast, some types of plastic bags are inert and do not give off any such harmful fumes. Bernard also notes that translucent paper envelopes marketed for stamp collectors are chemically inert and thus suitable for rubber motor packaging.

Meanwhile, back in the United States, Aaron Peterson, of St. Paul, Minnesota, reports he has employed "Baggie" brand food storage bags since 1986, with no discernible harmful effects on FAI black rubber so stored, and that rubber kept in a freezer is additionally protected from heat and ultraviolet rays.

Evidently the sulphur and/or bleaching ingredients in both paper and cardboard are also detrimental to rubber.

Jorge Triana, a professional photographer and friend of Aaron, says that film, negatives and slides are also subject to damage caused by improper storage, and recommends "PrintFile" brand archival sheets which have been laboratory tested to be safe. Such sheets are marketed by photo supply stores catering to professionals. Jorge cautions that some discount-store products have not withstood the test of time, and should be avoided.

Our thanks to everyone concerned with this important subject. We would be willing to publish a list of brandname plastic bags thought to be safe for rubber storage. Some brands simply do not specify their chemical composition, and thus must be considered suspect for our purposes (and presumably, our food!).

SIGN-OFF

The nearby town of Paradise, California conducts an annual Johnny Appleseed festival, and in the newspaper advertisement for it, among such scheduled events as canine corps dog demonstrations and belly dancing exhibitions, was a line saying: "The U.S. Air Force Will Fly Over." Not wanting to miss a spectacle of such awesome magni-

tude, we hurried to be there at the specified time. Well, as it turned out, the media had "missed it a mile," and what actually appeared was a small group of U.S. Air Force *musicians!*

It was well worth our trip, however, as this highly talented combo put on a most enjoyable show, especially the delightful and vivacious vocalist. And oh yes, the name of the group, which had apparently been misinterpreted by the newspaper advertisers: "Free Flight!" ***MB***

CHATTER *Continued from page 43*

not have thickness noise problems.

How can we reduce helicopter noise? On model helicopters, the majority of the noise comes from the engine exhaust, hence a good muffler is the way to go. On full-size helicopters, the engine noise is well suppressed, hence the noise predominantly comes from the main and tail rotors. Rotor noise can be reduced most effectively by reducing rotor rpm. Increasing the rotor disk diameter to reduce disk loading and using a fancy blade tip design that diffuses the tip vortex will also reduce the rotating noise. Modern full-size helicopters are all designed to have a lower rotor rpm than those of a decade ago. Hueys from the 1960s have a main rotor that spins at 600 rpm, while modern helicopters typically have rotors that spin at 450 rpm. Rotor noise is not only a nuisance, it also sends off vibrating pressure waves that can shake the helicopter's fuselage, canopy, fins, and tail boom, and cause structural fatigue.

Figure 5 is the frequency spectrum that I measured from my 50-size GMP Cobra helicopter. The Cobra was hovering five feet above a cassette tape recorder. The tape was then played back into a $40,000 Zonic fast Fourier transform analyzer. The frequency content of my Cobra is plotted from 0 to 500 Hertz. The big peak at 226 Hertz is the engine noise. From this figure we can also determine the engine rpm. A quick calculation of 226 times 60 tells us that the O.S. 50 in my Cobra was turning at 13660 rpm. The second peak at 446 Hertz is the second harmonic of the engine noise. There are also third, fourth, fifth, and all sorts of higher engine harmonics existing. These higher harmonic peaks are due to the exhaust noise being bounced many times inside the muffler. The GMP Cobra has an engine-to-main-rotor gear ratio of 6.6:1. By dividing 13660 rpm by 6.6 we get a main rotor rpm of 1591. Thus, the frequency spectrum analyzer can be used very effectively as a tachometer to tell us our model helicopter rotor rpm from a safe distance.

In the previous paragraph we said that the main rotor rpm was 1591. Dividing 1591 rpm by 60 seconds gives 26.5 revolutions per second. And, looking at Figure 5, we do see a small peak at 26.5 Hertz. This is the blade rotating frequency noise. The hump from 50 Hertz and up to 500 Hertz is the broadband noise. The broadband noise includes the vortex noise that we explained previously, and also mechanical gear mesh noise. For full-size helicopters, the lower frequency rotating noise is louder than the high frequency broadband noise. For models, there is so much gear mesh, mechanical, aerodynamic turbulence, and engine noise that they mask the blade rotating noise.

Figure 6 is the frequency spectrum of a Schluter Junior powered by an O.S. 46SF. The interesting phenomenon here is that the fundamental noise of the engine (the peak at 255 Hertz) is of much lower magnitude than that of the Cobra. The reason is that this Junior had a Don Chapman Whisper Tech muffler, which is much quieter than the MAC's Heliball muffler used on the Cobra. Thus, a good muffler can reduce the engine noise to the level of the rotor noise. On Mr. Chapman's 60-size scale Hughes 500 helicopter, the Whisper Tech muffler was hidden inside the fuselage; this plus the fact that the model helicopter mechanics were insulated from the fiberglass fuselage by rubber mounts resulted in the majority of that model's noise being generated by the main rotor! I saw that model fly once, and it was quiet. Again, from Figure 6, we know the engine was running at 255 Hertz times 60 equals 15300 rpm. At 35 Hertz we see a little peak representing the main rotor blade's one-per-rev noise. Thus the main rotor was spinning at 35 times 60 equals 2100 rpm.

HELICOPTER TACHOMETERS

Mr. John Gorham had an excellent idea for an inexpensive RC helicopter tachometer. Using less than $5 worth of electronics, you can make an electronic audio oscillator that generates a pure tone sound. With a dial, the user adjusts the tone from his hand held audio oscillator to match the sound of the engine (which is the predominate noise from models), then can easily calculate the engine rpm. If he knows the gear ratio, then he can figure the rotor rpm, too. I built one with an NESSS timer chip from Radio Shack, and it really works! Radio Shack sells an NESSS hobby handbook for a dollar that shows you how to use the NESSS chip for many fun circuit projects. The NESSS chip itself is less than a buck. Figure 7 shows the circuitry for the audio tachometer that I built. The only drawback is that you need a reference source, such as an oscilloscope, to calibrate your audio sound generator so that you know what audio frequency sound you are generating.

I then carried the idea of using acoustics to measure engine and rotor rpm one step further. Figure 8 illustrates the second audio tachometer that I built. This one even includes a Craftair LCD readout. The idea is simple. The inexpensive microphone picks up the model helicopter sound, then the signal is amplified, and gated through a low pass filter that allows only signals under about 250 Hertz to pass through. The standard Craftair aircraft propeller tachometer is modified by removing its photodiode; the signal from the microphone is fed in there instead. This way, instead of flickering light causing the photodiode to produce a volt-

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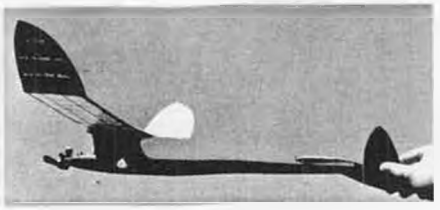

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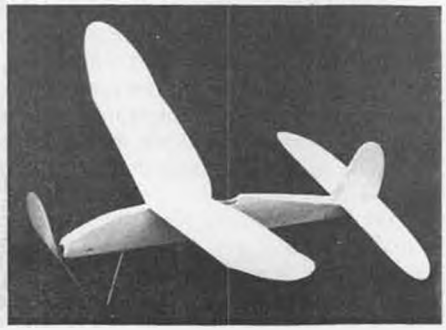

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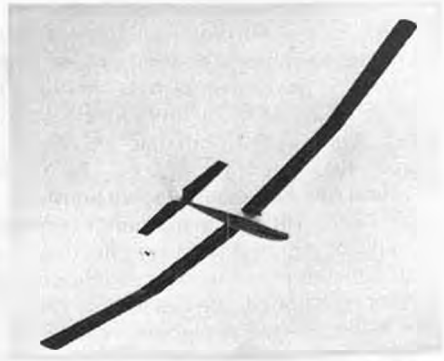

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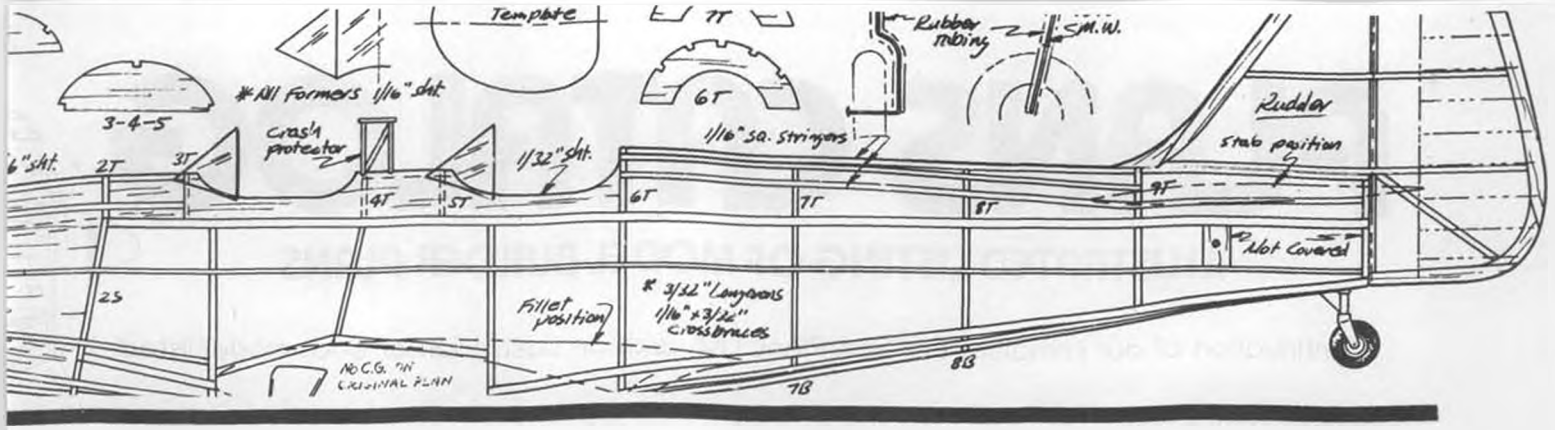

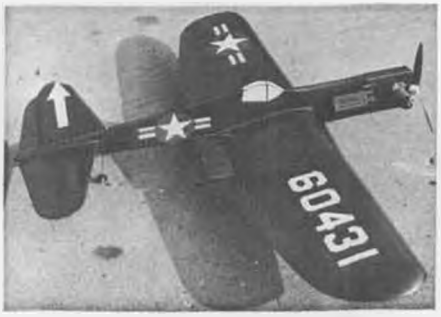

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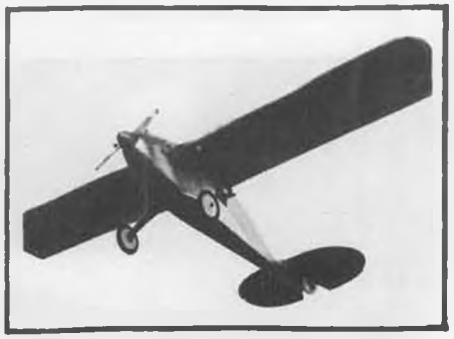

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Replica of 1941 Class A Nats winner. Span 30". Redesigned by Phil Bernhardt

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Winner of 1972 Nationals F/F Scale Gas event. Span 33-1/4". By Bill Warner

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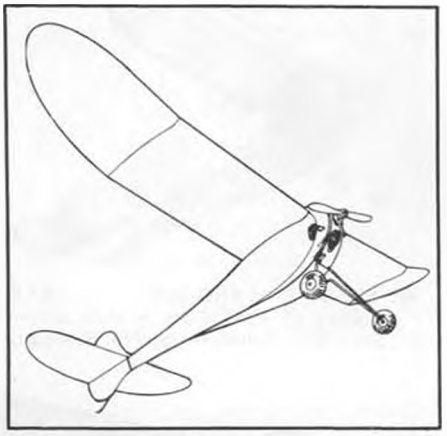

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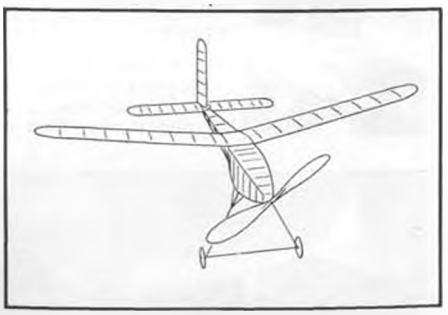

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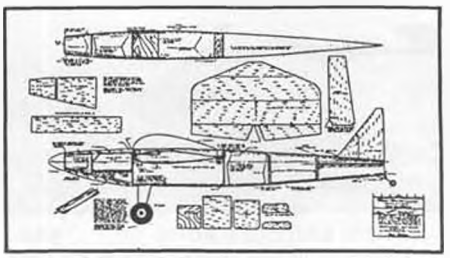

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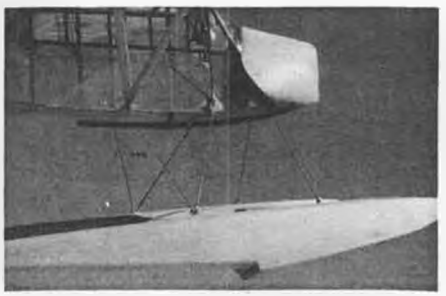

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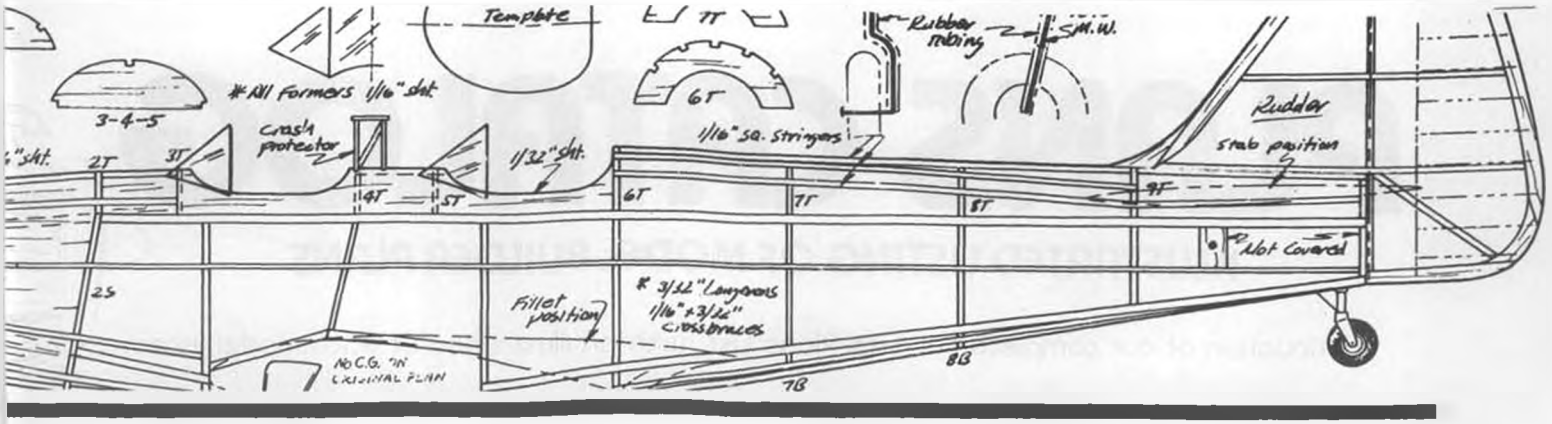

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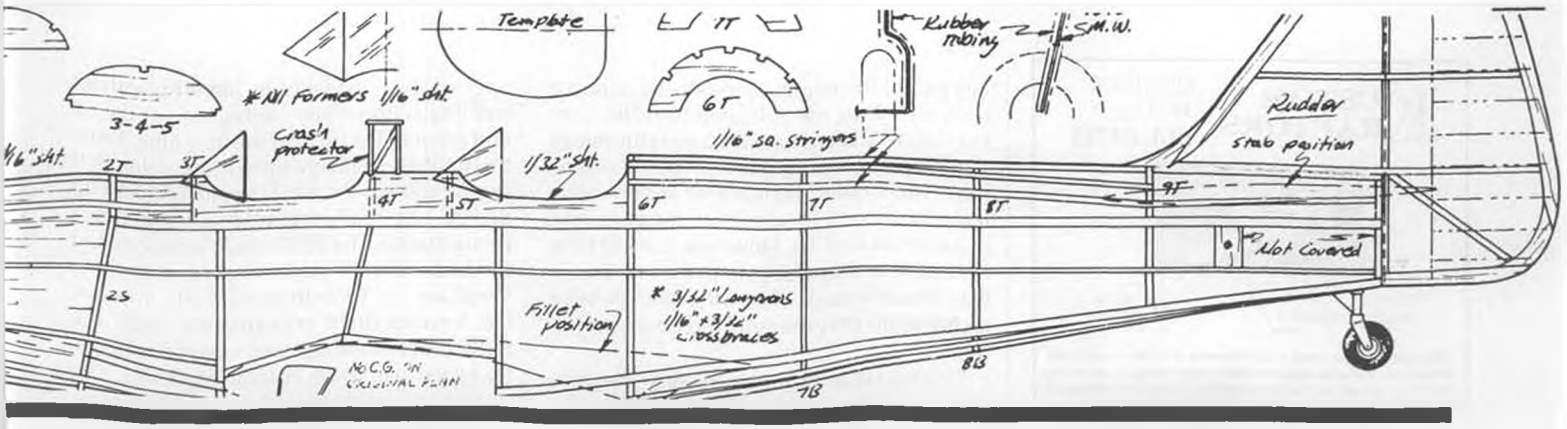
Between-wars Army attack, 1 1/2" scale. Combined U/C-R/C. By Charlie Smith.

No. 774-O.T. OUT O' SIGHT $7.50
Little known A/B gas, diamond fuselage, pylon ship. Redrawn by Phil Bernhardt.

No. 8741 WOODY PUSHER $8.50
Easy to build & fly semi-scale R/C home-built, like C.W. Jr, .09-.15. Chris Moes.

No. 8742 AMERICAN YANKEE $5.00
All sheet balsa 1/2A profile C/L scale. Sport or Proto Profile. By Bob Sargent.

No. 8743 MACCHI MB 308 $5.00
Rubber scale ship for floats or trike gear. Great flier, 26" span. By Walt Mooney.



No. 874-O.T. POWERHOUSE $12.50
Taibi's famous design for Forster 99 ign. Great for R/C O. T. By Phil Bernhardt.

No. 910741 LONE EAGLE $7.50
High performance rubber scale model of 1927 vintage monoplane. By Bob Oslan.

No. 91074-O.T. BUHL PUP $12.00
Semi-scale 8 ft. span model published in 1936 MAN. Redrawn by Phil Bernhardt.

No. 11741 CESSNA 150 $5.00
Small R/C semi-scale for 1 to 3 channels. Modified Ace foam wing. By Fred Reese.

No. 11742 HUGHES "300" $4.50
Lightweight 22" rotor span, rubber powered in-or-outdoor 'copter. Roy Foote.

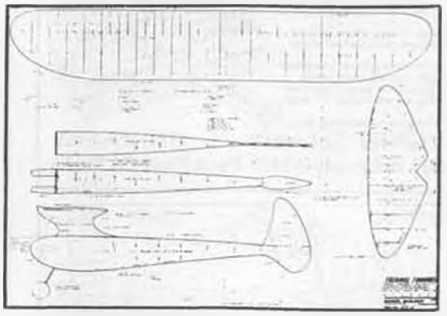
No. 11743 "C-QUELL" $10.00
Class B/C power model, co-designed by MB's F/F Editor; 76" span. Bob Stalick.

No. 1174-O.T. LANZO STICK $7.50
Rubber stick winner, '40 Nats. Span 4½'. Still good in Unlim. By Phil Bernhardt.

No. 12741 85' HARBOR TUG $15.00
Complete plasn (3 sheets) for R/C tug. All wood, 37" LOA. By Francis Smith.

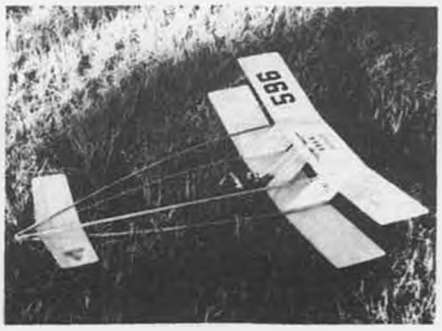
No. 12742 WACO SRE $9.50
Big (39" span) rubber powered scale cabin biplane. A classic! By George Clapp.

No. 12743 MOON DUST $6.50
C/L Stunt ship for .35 engines. Foam or built-up wing. Span 50". By Jack Sheeks.



No. 1274-O.T. THERM'L THUMBER $8.50
Hot Class A or B pylon type gas model. Span 48". Redrawn by Phil Bernhardt.

No. 1751 R/C TYRO TRAINER $8.00
Powered glider with removable .049 power pod/hatch. Span 74". By Hank Cohan.



No. 1752 BEACH'S FLYER $7.50
Stagger-wing-bipe, canard-tracter for .049 Super-simple, but wild! By Kloth/Beach.

age pulse, the engine one-per-rev acoustic peak is causing the voltage pulse. The Craftair digital LCD tachometer counts the pulses and displays the model helicopter engine rpm. The Craftair tachometer is very nice, it's only about $30 and it can measure rpm in increments of 10. However, the last time I checked at the hobby shop, they told me it was discontinued. Most other inexpensive tachometers only measure in 100 rpm increments.

Finally, Figure 9 shows the flow diagram of a complete audio tach with digital display. This should be reserved for people with electronics design experience. The sound is picked up by the mike, then it is conditioned by the low pass filter, an automatic gain control amplifier is used to raise the peak voltage to about five volts, then a cheap digital counter chip is used to count the number of voltage peaks per second, then a display driver and an LCD display are needed to show the engine rpm.

MORE ON ROTOR BLADE TIPS

Blade tip designs can affect helicopter performance and noise characteristics. As early as 1974, Bell Helicopter's research in tip design showed that tapered tip rotor blades produce very slightly less noise than squared tip blades. This is because tapered tip blades diffuse the tip vortex. Bell's research also showed that the tapered tip reduces power required for hover by 3% for a medium disk loading helicopter. Most RC helicopters have a low disk loading. A low disk loading means that for the given square feet of main rotor disk area, the rotor is not supporting a lot of helicopter weight. Typical model helicopters have a disk loading around 9 ounces per square foot. Full-size helicopters have a relatively higher disk loading than models (about 5 pounds per square foot). When the pilot increases the collective pitch, such as in maneuvers, or when carrying extra payload, the disk loading increases. For very heavy disk loadings, the square tip blades become more efficient in hover as compared to the 45 degree sawed-off tip. The picture shows my swept forward, double taper tip blade design being tested on a Kalt Excalibur. The benefit of this design is that it raises the blade stall angle at the tip to as much as 25 degrees. Even though conventional blades stall at about 10 degrees, this extra 15 degrees of lift capability is almost useless for RC models. This is because most model engines cannot supply enough torque to turn the blades at about 9 degrees already. Unless a more powerful engine is used, such as using a 90 in a 60-size helicopter, the extra lift capability of this forward swept tip blade will never even be utilized.

Since the velocity at the blade tip is much higher than near the inboard section, nearly all the lift is generated near the blade tip. Figure 10 shows the relative amount of lift generated at different points on a rotor blade in hover. The figure is for a helicopter with a rectangular blade tip. The straight line represents the amount of lift that could be generated if there were no losses at the blade tip. However, in reality the blade tip vortex's swirling action causes turbulence at the tip and reduces the lift near the tip a little. From this figure we see that since most of the lift is produced near the blade tip, an efficient tip design can really improve a helicopter's performance. The BERP blade was designed by the British full-size helicopter company, Westland, in 1986 to specifically improve the forward flight performance. With the BERP blade Westland set the world helicopter speed record on August 11, 1986. The record still holds at 249.6 mph. The principle of how BERP blade tip and many other blade tip designs work was explained in detail in the November and December 1989 *Model Builder.*

The picture this month shows the beautiful Miss Lottie Cellini with my Magic that has a set of BERP blades made by Vario of Germany. The model BERP blades have been tried on the Magic, Legend, X-Cell, and Excalibur. They improve the Magic's performance the most, however, on the Legend they did not perform as well as Hi-Product's fiberglass blade or Alex Gauss's three-airfoil swept tip glass blades. This is partly due to the fact that the Vario BERP blade is not an exact copy of the full-size BERP blade. Full-size BERP blades achieve their high lift because of advanced airfoil designs and because the tip is very sharp, like on delta wing jet fighters, to promote a strong rolled-up tip vortex for vortex induced lift. (Check out December 1989 *Model Builder's* illustration.) Of course, the exact specifications of the real BERP are proprietary, so the Vario model BERP just looks like the real BERP and captures partly what the real BERP is capable. Another reason the Vario BERP does better on the Magic than on the Legend is probably due to the real BERP blades being originally designed for high thrust conditions. In this case, the Magic is at least 10% heavier than the Legend and thus they benefit the Magic. BERP blades are sold in the U.S. by Rave's R/C Products or Mr. Reza Fetami at (213) 556-6060. Pictures of Alex Gauss's swept tip three-airfoil blade was shown in the April 1990 *Model Builder.* Alex's blades are great for almost any 60-size helicopter that I have tried themon. Alex's blades are so far the only ones I know that have three different airfoil shapes and also a swept tip. Alex's number is (604) 464-4210. All the glass blades mentioned above cost around $130 a pair. For these blades, I found that 190 grams per blade is a good value for lively aerobatics and plenty of inertia for autorotations.

Before I wrap up this month's column, let me discuss Figure 11. Figure 10 shows the lift distribution of a rotor blade in hover. Assuming there is no wind, then no matter at what azimuth location on the rotor, the blade would produce the same lift distribution. However, in forward flight, there is the difference of advancing and retreating sides. On the advancing side the blade sees greater velocity than on the retreating side. Therefore, the pilot has to feed in roll cyclic commands to correct for the uneven lift

produced across the rotor disk. In fact, the lift distribution for a main rotor in forward flight is very uneven on the entire disk. The pilot may set the collective pitch to eight degrees while he is doing forward flight, but due to the differences between the advancing and retreating sides and the fact that the outboard part of the blade is moving faster than the inboard, we actually get a very weird *effective pitch angle distribution*. The amount of lift that any airfoil section produces is not simply proportional to the physical pitch angle set on the blades; rather, the lift depends on the effective angle of attack that the airfoil sees. In hover, we get a nice linear distribution of effective angle of attack, but in forward flight, the effective angle of attack is really messed up! Figure 11 shows what the effective angle of attack distribution might look like for a model helicopter flying at about 60 mph. (This computer calculated result is reproduced from Johnson.) A precise calculation like this requires many hours of computer time. This is just one example of what full-size helicopter researchers do. Through better understanding of a helicopter's aerodynamics and dynamics, a more revolutionary solution can be discovered to further advance performance.

If you have any questions regarding helicopters, feel free to write me at P.O. Box 692, College Park, MD 20740. If you include a SASE I will try to respond back within three days. Or you can always call me at (301) 569-0655.

See you next month. **MB**

RANGER *Continued from page 47*

shaft off through the top cowling, then the main gear will pop out through the side window. The rudder servo is accessible by removing the top cowling, which is held on by six screws. The pitch and roll cyclic servos which sit on top are more difficult to service. The throttle and collective pitch servos are accessed through the right side window. The receiver, gyro and battery are accessed through the front window which is held on by four screws. Curtiss Youngblood modified his GMP Ranger by cutting the fuselage into front and rear halves. The cut is behind the rear window. The rear half is permanently attached to the mechanics; the front half can be removed and yields access to the complete mechanics and radio equipment.

The muffler and tuned pipe installation usually provides the biggest headache in scale helicopters. In this case I managed to fit a U-shaped Magna pipe inside the fuselage without any problem. The side exhaust header was bolted onto the engine before the complete mechanics were slid into the fuselage, then the Magna pipe was fitted through the left rear window. Even though I used a side exhaust engine, I would recommend a rear exhaust engine. It makes the Magna pipe header installation even easier. Or use the Kalt, Hirobo, or Century Imports

box style rear exhaust muffler. The rear exhaust box style muffler is the easiest to install, but you don't get the extra few percent power gain that's possible from a tuned pipe system.

Besides the light weight, another reason the GMP Jet Ranger flies so fast is because it is the most compact 50 to 60-size Jet Ranger on the market. The compactness reduces fuselage profile and parasitic drag to improve top speed. If you want to fly fast, the best way is to reduce body drag, because in forward flight the drag forces increase at the cube power of flight velocity. Fuselage models fly just as fast or faster than pod-and-boom models because air flows cleanly around the fuselage. Pod-and-boom models have so much drag and turbulence behind the canopy that the low pressure there just holds the model back. The effect is like hatchback cars and vans that have the rear end come to a stop suddenly; the air just cannot immediately change its flow path at 90 degrees. This is why, if you look at the Honda Civic Hatchback, there is a spoiler at the rear end to direct and force the air from the top of the roof downward along the rear window.

Overheating is a potential problem with scale helicopters. The engine itself is cooled nicely by the fan unit, but the heat from the hot tuned pipe or muffler can not radiate out effectively, so the temperature inside the fuselage goes up. The traditional solution is to run the engine rich to prevent overheating, but at the expense of some power. The modern solution is to use 30% nitro and high oil content fuel for scale and contest FAI machines. The engine is still set rich, but the 30% nitro helps boost the power and the high oil content keeps the engine well lubed and cool. The Japanese team at the World Champs were all using 30% high oil content fuel. At the 1990 U.S. Nats, some contestants were also using this type of fuel to extract more power while keeping the engine cool, even though a fuselage wasn't used. But for day-to-day flying, 10 to 15 percent nitro fuel will provide plenty of power. Most helicopter fliers choose fuel with synthetic lubricants instead of castor oil because synthetic does not leave a brown varnish on the cylinder and muffler.

Last weekend, our local club field a helicopter contest. Ray StOnge of Hybrid Hobby drove down from Connecticut to compete in the FAI class. He was using just 10 percent nitro, but during free fly time his GMP Legend was doing some incredible hot-dogging. This chap put on the best free-style hot-dogging that the author has ever seen. It was a stock pod-and-boom Legend with the Elite rotor head. The repertoire included

four-point rolls, knife-edge flight, loops and rolls while flying backward, knife-edge loops, shuffles, gizmos, and doohickies. To do a shuffle, you simply fly straight and pull into a vertical climb, then jam in full negative pitch, then full positive pitch, then full negative pitch again. If done right, the helicopter will look like it's hanging on its nose and translating sideways in the sky. A gizmo is almost like a shuffle, but after the shuffle, yank the helicopter into an inverted hover, quickly followed by a hovering roll. The doohicky is too wild, I don't even recall the whole sequence.

When Ray was flying that Legend, the model spent more time on its side or its back than right side up. He truly had that model pushed to the edge of its flying envelope. His four-point roll was almost like those done on pattern planes: very clean and crisp. In knife-edge flight he used the tail rotor to cock the nose up and the Legend would travel for at least 80 feet with the main rotor perpendicular to the ground. Occasionally Ray would give full tail rotor command and the model would do a knife-edge loop. The display was impressive! Well chaps, maybe we can't all fly like Ray, but we *can* try scale helicopters. Real helicopters are not supposed to do those crazy anti-gravity maneuvers anyway. ***MB***

FREE FLIGHT *Continued from page 63*

delay should be approximately 2 to 3 seconds. Or you could use a bunt if you wanted. Anyway, this model should be very stable and forgiving. Not like some of the twitchy, unforgiving models that some people fly!

"Have fun!"

By the way, if you are interested in being on the mailing list for the Canada Free Flight newsletter, drop a note to 213 Lakewood Dr., Oakville, Ont. L6K 1B3 Canada. Cost is $9 for six issues.

SPEAKING OF FAI, HERE'S THE USA OUTDOOR TEAM

The selection of the US Team to participate in the 1991 World Free Flight Championships was conducted at Lost Hills, California in September, 1990. The meet suffered a bit with wind, dust and rain, but the team was selected. Here they are: Wakefield (F1B): Roger Maves, George Xenakis, and Norm Furutani. The alternate is Bob Milligan. Power (F1C): Randy Archer, Ken Oliver, and Ken Phair. The alternate is Terry Kerger. Nordic (F1A): Bob Isaacson, Jim Parker, and Randy Weiler. The alternate is Matt Gewain.

It appears as though the team has a good mixture of experience and youth. We will be

hearing more about the preparation of this select group of outdoor fliers during the next few months. Congratulations to the winners. We wish you well.

FRANK EHLING NEEDS YOUR CARDS AND LETTERS

Just received a note from Tom Ogden from Norwich, New York, informing me that Frank Ehling, long time free flighter and technical director of the AMA is suffering from a stroke. According to Tom's note, "Have just learned that Frank Ehling has suffered a stroke. Has trouble walking and using his left arm. I am writing to you to ask you to put a small piece in your column asking the old timers and new old timers and his friends, or anyone who has ever built one of his great designs to send him a get-well card or note. I am sure that they will help him to recover quickly. There are not too many of the old masters left, and we can ill afford to lose them."

Tom did not send an address, but you can send them direct to AMA HQ with the request to forward them to Frank. The AMA address is: 1810 Samuel Morse Dr., Reston, VA 22090.

Frank has contributed more to the free flight scene than many of us realize. I recall how he suggested to Carl Fries and me that the NFFS should act to hold an annual Symposium at each Nationals. The papers should be published for all to read. It would be a logical and modern follow-up to the Zaic Yearbooks. And as we know, the Symposiums are now beyond their 20th year of successful activity, much thanks to Frank.

KID'S AND WOMEN'S HAND LAUNCH GLIDER CONTEST, by Dee Grell

As I noted earlier in this column, Dee Grell wrote this article as a report for a special meet held by the Willamette Modelers Club last September.

"Prior to the 1989 WMC contest season, Shirley Shannon decided to sponsor a children's hand launch glider contest to be held at the Silents Please/Old Timers Championships in September. This event was for children under 12. Membership in AMA was not required, and gliders were provided by club members. Because of the interest shown in this event and conversation over coffee and other beverages, she decided to add a women's hand launch glider contest for the 1990 season.

"Shirley painted trophies for the first three places in each event, made certificates for all entrants and contacted sponsors for merchandise prizes for all contestants. The event was to be held on Sunday, September 16, during the Silents Please/Old Timers contest.

"The weather on Saturday was unsettled with frequent wind and rain, and the contest was cancelled for the day in the early afternoon. Sunday looked more promising and those staying with us were fed and on their way to the flying field in time to start flying by starting time at 8 a.m. Linda and Sue Grell, Rose Tarvin, and I had another cup of coffee and started cleaning up and getting ready to go to the field. At about 8:30, Shirley called and said that she was ill and would not be able to attend the contest. She had the prizes and certificates at her home in Salem. After some consultations and coin tossing, Linda and Rose were dispatched to Salem to pick up the merchandise. Sue took me to the field to start setting up for the contest. Sue returned to the house to make sandwiches and coffee.

"When I arrived at the field, I found that Al (Grell) had set up the table and tent for the contest. He and I walked the line of vehicles to invite the women and children to the event. We found that everyone was eager to enter and by 10 o'clock, we were set up and ready to go. Linda and Rose arrived with the prizes, Sue was there with the food, and the first contestant walked up. It was a busy time for awhile. Al was busy trimming the gliders that he had made for the contest. Mel Chafin provided some gliders including one labelled `Lefty' which Wilma Chafin used. As soon as Al had one trimmed out, one of the women would take it to practice. All of the children brought their own gliders to the contest.

"Linda, Sue and I appointed Al as Contest Director in addition to trimming gliders and instructing the women. Linda, Sue and Mike Grell timed most of the flights and Randy Grell recorded the scores and helped at the table. He also timed and retrieved my practice flights that went over the fence.

"I can't remember when I have seen so many women outside of their motor homes,

campers and cars as at this contest. Everyone seemed to have a good time. I heard several remarks such as, `this is better than sitting inside,' and `it is better than listening to someone say they are bored.' A few of the women disappeared at lunch time to fix lunch for their husbands. Watch it guys, if this catches on, you will be on your own for lunch.

"There were a few unique styles attempting to get the glider in the air. Mine insisted on heading for the ground instead. Al said I was twisting my wrist. I tried to blame it on the glider, but Randy proved to me it would fly. Dustin (Grell) tried to help also, but I still threw it into the ground. I was happy to get 3 seconds. Georgia Gilbert had a unique underhand style, and she had some fairly good flights.

"Maggie Oldershaw broke her glider so many times that George (Oldershaw) was heard to say, `I will support you any way I can, but you are going to have to buy your own glue!'

"The only bad part of the day for me was when they insisted that I present the awards for this contest. I can talk to you one on one, I can write a good business letter, I can write an adequate story, but I cannot speak in public. (Note from Bob Stalick...Dee did a good job of talking and awarding the prizes to everyone who flew, contrary to what she believes.) All of them were winners. They were: Junior Event (in order of placement): Mike Grell, Blaine Guilfoyle, Randy Grell, Jeremy Greenwood, and Eric Adamic. Women's event (first five in order of placement): Rose Tarvin, Sue Grell, Linda Grell, Maggie Oldershaw, Jaynette Ponnay. Others who flew: Georgia Gilbert, Margaret Nordlund, Eunice Evensen, Pauline Katsanis, Dee Grell, Phyllis Lamb, Wilma Chafin.

"The longest single flight for Juniors was 32 seconds by Mike Grell. The longest single flight for the women was 33 seconds for Rose Tarvin.

"There was a request at the end of the competition and that was that perhaps a separate event should be held for `Senior' women."

FREE FLIGHT RULES CHANGE PROPOSALS

It's once again time to take a look at the proposed changes in the Free Flight rules. If you would get your November and December issues of *Model Aviation* and take a look at the Competition Newsletter (AMA) section, you will find a brief rundown of the proposals. It is important to look at not only the free flight proposals, but also to look at the general rules as well. Since I do not have the December issue available at the time this column is being written, I will wait until next month to do a comprehensive review of the proposals. Judging from the November issue, the proposals do not seem to be too controversial this year. A number of events are proposed for deletion: Outdoor Helicopter, Special Hand Launch Glider, AMA Cub, Time Target Gas, and Dawn Unlimited are suggested to be deep-sixed. A number of changes are proposed in Big E, CO_2, and Outdoor Catapult Glider.

In scale, it is proposed to add Pistachio Scale and to change Peanut Scale in a couple of ways intended to allow a wider range of models.

In Indoor, EZB would be allowed to use a motor stick guide, and Bostonian would be limited to one entry per contestant and require that the windshield must stand at least 3/4 inch above the fuselage.

None of these rules seems to this columnist to be much more than a cleanup of the rules in order to meet current or desired practice. However, you may not agree, and by the time you read this, you will have received the December issue of Competition Newsletter, so be advised. If you have concerns, contact your Free Flight, Scale, or Indoor Contest Board member and make your feelings known.

I'll have a review of all of the proposals next month, as I stated earlier.

HOW I GOT STARTED STORIES

Several months ago, I asked for "how you got started in Free Flight" stories. And I got several of them. I will begin to include them in the next issue of *Model Builder* Free Flight. Thanks to all of you for sharing your stories with me, and I look forward to sharing them with the readers.

THAT'S IT DEPT.

It looks like I have used up my allotted space once again this month. Thanks to all of you for your support, as Ernest and Julio say. And while you are at it, catch a thermal for me. ***MB***

BRITAIN *Continued from page 71*

Concorde was a top draw. A Grumman TBF Avenger painted with the markings of Lt. (jg) George Bush was also a popular exhibit. Hangar 1, devoted to bombers and transports, housed a Ju-52 transport, another DH Mosquito with interior woodwork clearly visible, a Bristol Beaufighter, Short Sunderland flying boat, B-29 Superfort, a monster delta-winged Avro Vulcan, and many others.

Another hangar housed several unusual exhibits not often seen anywhere. There was a Vega-built B-17 beside a German Me163 Komet rocket-propelled interceptor, another of Hitler's "secret weapons." A most unusual find was what looked like a Soviet Lavochkin La-7 trainer.

Still another hangar contained Duxford's aircraft restoration shop where several old warbirds were being made airworthy. A shiny-new Republic P-47 stood beside a grinning Curtiss P-40 Tomahawk. A beefy Grumman F-8 Bearcat nearby had just been through a repaint. A Hawker Tempest was in the midst of a complete teardown, with workers rebuilding the wings.

An outstanding exhibit was the Battle of Britain Operations Room, reconstructed as it was in 1940 with the telephone banks, operations map board, and sector light boards showing the status of each squadron in the sector. During a time when there were no computers to speak of, the speed and efficiency of the network of radar stations, observers, and operation rooms throughout Britain proved decisive.

DAY 4 - RAF MUSEUM, HENDON

By now, Brian and I had about worn out two pairs of shoes between us and were ready for something more leisurely, so on Day 4 we paid a visit to the RAF Museum in Hendon, a world-class air museum with exhibits every bit as spectacular as those we saw at Duxford. After seeing so many planes from far off, it was nice to see some up close.

The exhibits at Hendon spanned the era of powered fight, from Bleriot's monoplane to modern-day jet aircraft, with many from both World Wars. Battle of Britain Hall contained the usual Spitfires as well as an outstanding collection of WW II German bombers, including a Junkers Ju88, Dornier Do17 "Flying Pencil," and Ju-87 Stuka. A Boulton-Paul Defiant painted in night-fighter black is one of a very few that survived the Battle of Britain. Withdrawn after suffering near-total losses, they were relegated to night-fighting duties. Bomber Command Hall had an Avro Lancaster that survived over 100 missions, and a Vickers Wellington, the only remaining example of over 11,000 built.

DAY 5—IMPERIAL WAR MUSEUM

On Tuesday Brian woke up with a cold, so I took a train into London to pay a repeat visit to the Imperial War Museum. Devoted to the study of 20th-century warfare, the museum is housed in what was once an insane asylum, appropriately enough. The museum has several outstations, of which RAF Duxford is one; the other is the ship HMS Belfast, which saw action in the North Atlantic and is now tied up in the Thames. One can easily spend a whole afternoon browsing through fascinating exhibits of Nazi memorabilia, weapons, propaganda art, plane and ship models, and viewing the numerous documentaries on pushbutton TVs. In one exhibit, the "Blitz Experience," visitors enter an authentic air-raid shelter and listen to the bombs dropping outside until the all-clear sounds. There are a few planes; J.D. Landers' colorful P-51, "Big Beautiful Doll" hangs from the ceiling beside a battered Focke-Wulf 190.

Since this was a repeat visit for me, I skipped some of the exhibits and took the opportunity to visit the museum archives where I spent over an hour looking at old photo albums of the Battle of Britain. The clear, stark pictures of the young pilots beside their Hurricanes and Spitfires, exhausted faces set in resolute determination, braving fiery death in daily sorties against the enemy, made it clear why this had indeed been "their finest hour." ***MB***

BIG BIRDS *Continued from page 73*

electric sailplane that's one helluva fine aerobatic and thermal flier. She answers to the name "Vario" because you can change her wingspan from 140 to 152 inches. For slope soaring and aerobatics, or if it's windy, you can install the winglets. However, for max thermal performance Just use the tip extensions.

And how about Carbon Fiber tape to help strengthen that new bird you're building? It's .007 inch thick and can be cut easily with a pair of scissors, yet it has more tensile strength than steel. Jim says it has perfectly straight edges, which makes installation quite easy. The use of this tape could double the resistance of your airfame to breakage . . . like on the bottom of a wing spar being stressed when the plane is subjected to high positive "G" loads. The rolls of tape are 68 inches long and come in two widths, 1/2 and 1 inch.

For Catalog 17 and more info about their new goodies, call or write: Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, TN 37027; (615) 373-1444.

THOUGHTS FOR THE MONTH

Input this month came pouring in from Fritz Bruning, aka The Big Elf Of The Olympic Rain Forest up here in Western Washington.

If everything was perfect:

1. Every city and town would have more flying sites than golf courses.
2. CA glues wouldn't clog in the applicator tubes.
3. One call to 1-800-RCPLANS would get you the drawings for any scale plane you want—in any size you need—shipped rolled.

Multi-engined projects seem to be popular right now. Quite a few guys I know up here in the N'West are working on B-25s, Lancasters, B-17s and Fokker Ford Trimotors. How about pix of your pet project? Al Alman, 1910 154th Street Court South, Spanaway, WA 98387; Phone: (206) 535-1549. ***MB***

EEZ-Z-FLY *Continued from page 83*

want it.

Hang everything on the aircraft it will be flown with (props, spinners, receiver, battery, etc.). Place the main landing gear under the aircraft and move it fore and aft until you find the point where, when you push the tail to the ground, it will hesitate for a fraction of a second and then come up. Mark the point, drill the holes in the fuselage and attach the gear. You now have a properly balanced aircraft as far as good ground handling is concerned. Balance it for flight on the mark shown by moving the battery location and, if required, adding weight to the inside of the nose block. It should balance slightly nose down with the fuel tanks empty.

The wing saddle should seat the wing at +1-1/2 degrees with the stabilizer at 0. Also, with the stab at 0 the thrust line should be 3 degrees down. Rig the controls for the throws shown on the drawings and rig the ailerons for neutral with the bottom surface parallel to the bottom of the wing. Roll the aircraft on the ground to check alignment of the nose wheel; it should track in a straight line.

Flying

The prototype models were flown with O.S. 25FP engines turning Master Airscrew 9x6 props—a satisfactory combination. To properly adjust the engines and match their performance, the following is recommended:

1. With the throttle full open, adjust both carbs to open fully.

2. Start one engine and adjust the mixture for desired operation at full throttle. Check and set idle operation as required. Use a tach to measure max rpm.

3. Stop the first engine and start the second, following the same procedures. Again, check max rpm. If the top rpm differs from the first by more than 100 rpm, adjust as required.

Double check all control throws for proper amount of deflection and proper direction. Fill both fuel tanks and start both engines, with someone holding the aircraft. Check full throttle operation. A badly out-of-synch condition will be quite audible. Do a series of taxi and acceleration checks. Expect *rapid* responses to power application. If you feel that you and the airplane are both ready, GO DO IT! Add throttle slowly; directional control with rudder is excellent and in the case of one engine coming in quicker than the other, a little rudder will keep the model straight. By the time you get the throttle open and take a deep breath, a bit of back pressure will give you rotation and an easy liftoff. You will find pitch stability to be excellent, roll control quite positive and yaw (rudder only) good. The prototype is an excellent flight pattern airplane at half throttle. Approaches are easy and stable, however TWICE AS EASY is a slippery aircraft and throttle must be brought back close to idle to slow it down. Flare and touchdown are easy. If you lose an engine, don't panic, reduce power and just keep truckin' on around the pattern.

In Summary

TWICE AS EASY, the newest member of the EEE-Z-FLI clan, is a good choice for a first twin, as its ease of construction, moderate cost and gentle flight characteristics make it hard to beat with anything in the marketplace today. So, as we said earlier, if you like the sound of twins and want something new in your stable, saddle up and start building, it's TWICE AS EASY! ***MB***

PEANUT *Continued from page 53*

The nose block is built up to simulate the structure on the front of the original airplane. Use a 3/16 thick balsa back block just sized to fit snuggly in the nose of the fuselage. Cement to this a 1/32 plywood face exactly matching the outside dimensions of the fuselage. In the center of this is cemented a 1/8-inch length of hardwood which has been shaped into a 5/16 diameter bead with a hole in it sized to fit the Peck-Polymer thrust button. Small diagonals of scrap balsa run from near each corner of the front of the plywood to the center bead. The front face of the plywood is painted flat black and the diagonals, bead, and outline of the plywood are painted silver.

The landing gear wire is installed by cementing it in the proper place in the fuselage.

Before covering the fuselage, the diagonal bracing should be installed. Using two-pound test monofilament line, start at any corner and wrap the fuselage, going diagonally around it with a continuous strand. When you get to the other end, tape the strand in place and cement the brace at the corner of each bay. Proceed this way until all the brace wires are in place. Be careful while wrapping the braces on the fuselage not to pull the fuselage structure out of alignment.

Install the tail skid as indicated in the sketch. The skid can be plywood or hard balsa. The side braces are thin music wire.

Cover the proper panels of the fuselage with tissue paper, then add the king posts top and bottom for the wing brace wires.

The landing gear struts and skids can be added at this point. Again, model railroad basswood was used. When the strut installation is dry, add the brace wires.

Cover the wing and tail surfaces on both sides with tissue. It will have to be glued to the bottom of all the ribs.

Wings and tail pieces can be cemented in place on the fuselage and then the brace wires added.

The propeller installation is standard except that its diameter is limited by the nose of the skids. If you make the diameter of the propeller as large as possible . . . that is with minimum skid clearance . . . it will be important to balance the propeller to keep it from vibrating so much that it hits the skids and damages the model.

A really lightweight version of this model could be built by replacing all the basswood with firm balsa of the same dimensions. If

you only fly indoors, this is to be recommended. A stronger model, as designed, is recommended for outdoor flying.

Flight trimming has been discussed in many articles and there is not much to add here. One thing is worth suggesting, however. Use a winding tube when flying this model so as to protect the fuselage from breaking motors. With the fuselage structure open and full of diagonal braces, a blown motor can be disastrous, as it wraps up in the brace wires and pulls the model apart.

With that caution in mind, go have fun flying your Castaibert IV. ***MB***

WORKBENCH *Continued from page 5*

inch span Heinkel He 100-d rubber-powered flying scale model kitted by Flyline Models in Fairfax, Virginia, retails for only $15.95.

But this is not what the average modeler of today is buying, because the *average* hobbyist today is an RCer, and he buys models that are almost ready to fly, installs an engine, installs a radio, puts it all in his car or van along with the field box full of starting battery, control panel, a gallon of fuel, a dozen props, soup-to-nuts tools, glow driver, electric starter, etc., etc. Total cost is at least $500., and is more likely to be pushing $1,000.! No complaints, no criticism, I've been there myself (except I build my own), and it can be relaxing and get your mind off your troubles, but inexpensive it ain't! And inexpensive it won't ever be again, because the modeler and the industry is tuned to instant gratification through instant results . . . very little carving, very little shaping, very little sanding, and very little damage to fingers!

It can be significantly less expensive, though, without sacrificing enjoyment of the hobby. Perhaps now is the time for the real model builder to look back to when he or she hand-produced parts instead of buying them ready-made, and time for the newcomer who has only known "buy-and-fly" to experience the increased satisfaction (though a little slower coming) of saying to admirers, "Oh no, I built this myself. I know every piece that's in it and why it's there, and I figured out a neat way of installing the tailwheel bracket that works better and is stronger than the way they tell you to do it. See this little . . ." ***MB***

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	Before	After
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Cylinder Liner Bottom	.7681	.7685
Piston Diameter	.7657	.7657
Piston Pin Diameter	.1960	.1959
Crankshaft Pin	.1960	.1959
Wrist Pin Hole	.19685	.19685
Lower End Connecting Rod Bushing Inside Diameter	.19685	.19685

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