ICD 08545

R/C MODEL BUILDER

volume 10, number 96 $2.00 JANUARY 1980

ISSN 0194 7079

0 74820 08545 01

America's Waterways await you.

The Futaba 6JB makes maximum model boating more than possible, it makes it simple. Using the total performance electronics of the J-Series, the new 6JB gives you the control it takes for total scale realism. Built into our 6 channel system are a dual throttle mode, an exclusive throttle/rudder mixing circuit and heavy duty, watertight S107 servos. And, as with all J-Series systems, you've got Direct Servo Control, modular AM or FM RF boards, sophisticated logic circuitry, built-in servo reversing, adjustable, open-gimbal control sticks, ATV and even programming for rudder and throttle. But don't give our 6JB a twenty-one gun salute, just tell your ship that her radio has finally come in.

Program your boat cruise. Adjustable throw rudder and mixing controls are concealed in the back of the T6JB transmitter.

We've got your radio. Futaba.

555 West Victoria Street/Compton, CA 90220

✓ The ONE STOP BRAND K&B

See it at your local Hobby Shop.
They serve you better . . . they can provide assistance, answers and service!

K&B "MATCHED FINISH SYSTEM"— A COMPLETELY CORRELATED FINISH SYSTEM

all ingredients required to:

✓	A	COVER	**K&B FIBERGLASS** — 3 weights — highest quality.
✓	B	SEAL	**K&B SUPER POXY RESIN** — easily workable — requires minimum of sanding — does not become brittle.
✓	C	PRIME	**K&B PRIMER/PRIMER CATALYST** — the last step before painting — can be brushed on or sprayed — fills every crack — sands extremely easily to a smooth finish.
✓	D	PAINT	**K&B SUPER POXY PAINT** — the final step — 33 Colors — Spray or Brush/Satin or Gloss — unequaled quality — unmatched high gloss . . . mix and use — faster curing — no hard rubbing — lasts longer — the ultimate in model paint.
✓	E	REPAIR	**K&B MICRO-BALLOONS FILLER** — for damage repair or smoothing out surfaces.
✓	F	MIX	**K&B MIXING CUPS** — for your convenience — one ounce, unbreakable, plastic cups accurately graduated with milliliters and fluid ounces — ideal for mixing filler, resin, paint, etc., in small amounts.

K&B GLOW PLUGS

consistent peak performance

4 plugs — long reach, or short reach in standard or idle bar — (idle bar is a "must" for control from low idle to a constant maximum r.p.m.)

K&B FUEL

to meet ALL flying needs

7 blends . . . 4 with X2C oil, 3 with castor oil

K&B ENGINES

SUPER POWER PLANTS

powerful, dependable, durable — 12 model airplane engines . . . from .19 to .61 (standard and R/C); 4 model marine engines . . . 3 inboards 3.5 to 7.5R/C; 1 outboard 3.5R/C.

Here you have it all, everything you need to make your model plane, car, or boat tops in appearance and tops in performance, all from K&B, the leader in its field since 1946.

"THE CHOICE OF CHAMPIONS"

K&B MANUFACTURING

12152 WOODRUFF AVE., DOWNEY, CA. 90241

R/C MODEL BUILDER

JANUARY

1980

volume 10, number 96

621 West Nineteenth St., Costa Mesa, California 92627 Phone: (714) 645-8830

CONTENTS

FEATURES

SCALE VIEWS

CONSTRUCTION

Cover: The 1979 U.S. R/C Precision Aerobatic team and helpers in Johannesburg, South Africa, where it won First Place in the World Championships. Don Lowe, Team Manager, stands behind Sally and Dave Brown, Barbara and Dean Koger, Mark Radcliff, and Dick Penrod. Photo taken by Barbara Bertotti at Circle 2, Baragwanath Airport.

R/C MODEL BUILDER (ISSN 0194 7079) is published monthly by RCMB INC., 621 West Nineteenth Street, Costa Mesa, California 92627. Phone (714) 645-8830.

Subscriptions $20.00 per year, $37.00 for two years. Single copies $2.00. Add $3.50 per year for postage outside the U.S. (except APO and FPO).

Change of address notices must be received six weeks before date of issue that new address takes effect. Send old address with new; old label preferred. Post Office will not forward copies unless you pay extra postage. Duplicate issues cannot be sent.

Second class postage paid at Costa Mesa, California, and additional offices.

You won't throw these away by New Years!

The gift of radio control is one that won't get tossed out with the Christmas tree. The interest and excitement one finds in the hobby of radio control modeling can last a lifetime. It's important to start with the best equipment you can buy for optimum performance, success, and continued enjoyment. The Kraft name assures you of receiving the finest quality products, a reputation proven in over 20 active years in the sport.

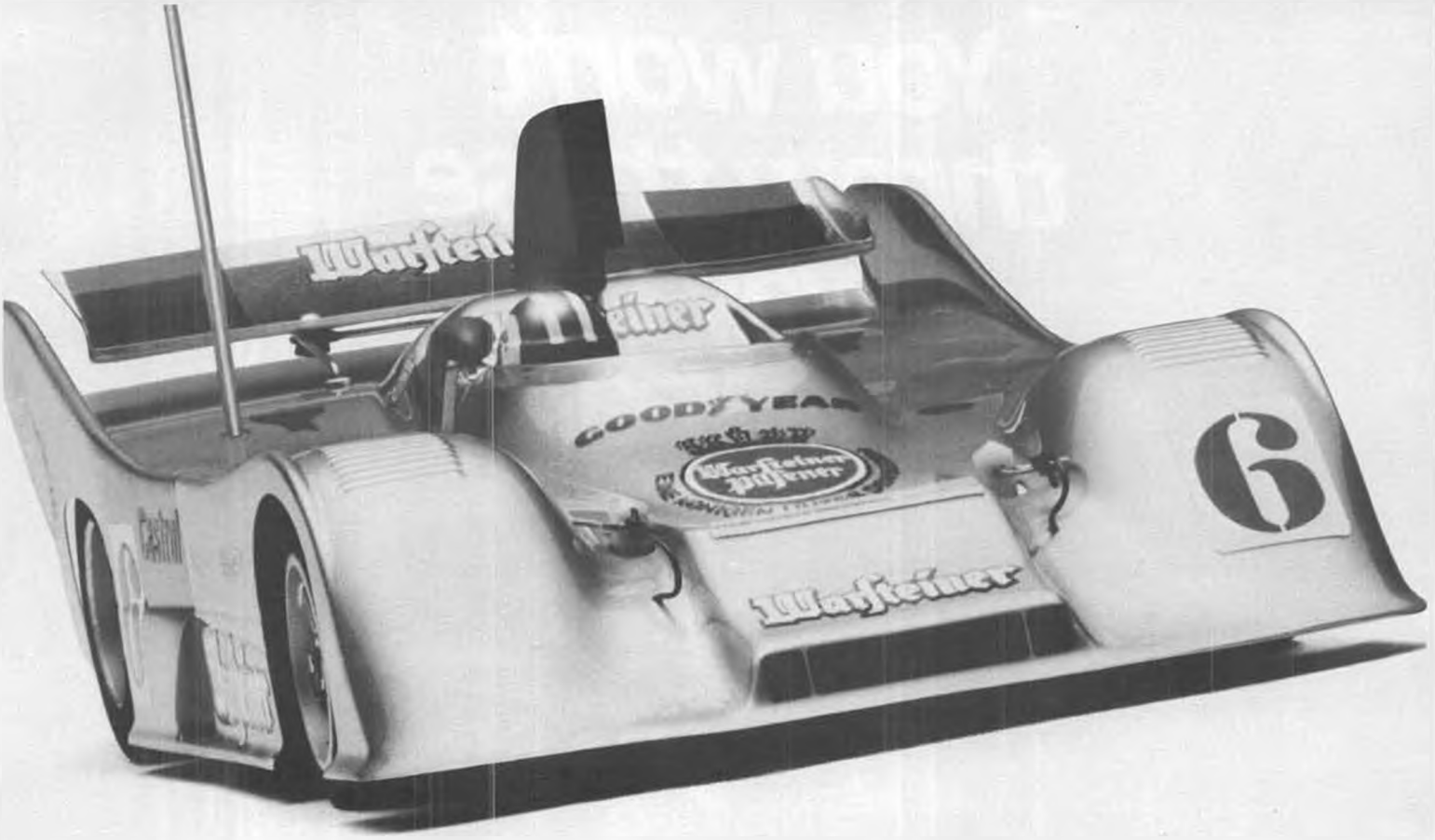
Introduce someone to R/C, or expand your modeling for the new flying season. We have a system, and a model for you!

Best wishes to all for the holidays, from "the friendly team."

Write for free catalog.

KRAFT SYSTEMS, INC.

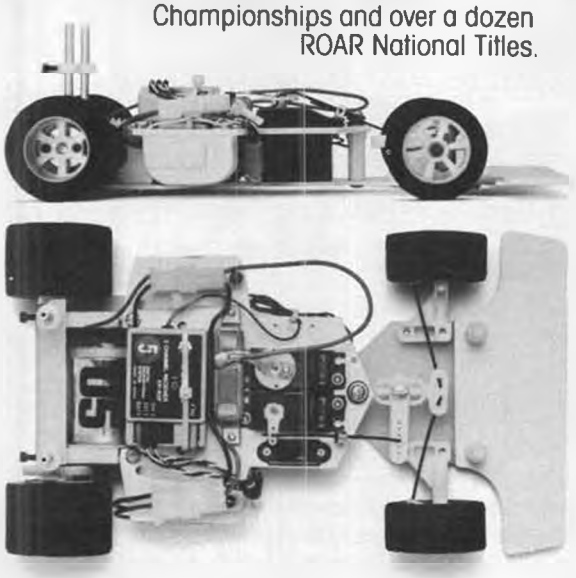
450 West California Avenue, P.O. Box 1268
Vista, California 92083. (714) 724-7146
TWX: 910 223 1471



Superscale detail your RC12E. Our Lexan® Toj-303/ Cosworth, vacuum-formed body featuring custom paint and hand-fabricated cold airbox, mirror and "Warsteiner" sponsor decals (not included in kit).

GO RACING WITH THE TEAM.

If racing is the name of your game, take to the track with Team Associated. In RC car competition, from Southern California to the South of France, we've built a track record that includes the World Championships and over a dozen ROAR National Titles.



The Nats-winning RC12E features die-cut fiberglass chassis, lightweight racing wheels and tires, tough glass-filled nylon pillow blocks and complete, detailed instructions including racing tips from Gene Husting and Roger Curtis. Approved for ROAR competition.

THE RC12E'S TRACK RECORD AT THE NATS

ROAR Nationals Expert Class 1:12 Scale Electrics				
		Production	Stock	Modified
1978	4cell	No event	MRP	**RC12E**
	6cell	No event	**RC12E**	**RC12E**
1979	4cell	No event	**RC12E**	No event
	6cell	**RC12E**	**RC12E**	**RC12E**

*4 cell cars run indoors, 6 cell cars outdoors. Chart shows all expert class main events under official ROAR sanction since the RC12E was introduced

The Team builds that experience into every RC300 and RC12E competition car kit. And now the phenomenal RC12E is even available assembled, tuned and ready-to-win. So whether you're ready for the high-powered gas class or looking for the easy maintenance and tight dicing of 1:12 electrics, we've got you covered.

It's a gas! The new 1:8 scale Associated RC300 sweeps the 1979 ROAR Winternats in Florida... 1-2-3!

So join forces with the Team. We've got the magic if you've got the touch.

TEAM ASSOCIATED

Associated Electric/1928 East Edinger/Santa Ana/CA/92705 (714) 547-4986

PLEASE WRITE FOR COMPLETE CATALOG AND DETAILED INFORMATION.

 Documentation of Race Results available from ROAR

New! Glen Sig's BEECHCRAFT Bonanza E33A

$77.50

Designed by HANK POHLMANN

ENGINE SIZE: 60 Cu. In.
Wing Span: 64"
Length: 44"
Wing Area: Approx. 652 Sq. In.
Weight: Approx. 7-1/2 lbs.
Approx. 8-1/2 lbs with Retracts

SIG®
KIT RC-41

RC SPORT SCALE
RC SPORT FLYING

KIT FEATURES:

FULL SIZE PLAN LAYOUT FOR RETRACTS

FOAM WING CORES WITH TIP CAMBER AND WASHOUT

The smooth lines of Beech's classic Bonanza are ideal for modeling and since one of the airplanes hangared at Sig Mfg. Co.'s home field is President Glen Sigafoose's E-33A, it was a natural choice for a kit. The Bonanza uses a basic balsa box fuselage and is finished by the addition of a full length formed cabin made of A.B.S. Clear molded windows fit into the inside of the top to provide an authentic, scale-like look. Since the conventionally constructed balsa main fuselage takes the vibration and flight loads, the plastic top is essentially only a decorative fairing and not a structural part. This combination gives excellent appearance without sacrifice of durability.

KIT CONTAINS:

* Full-Length Formed Plastic Fuselage Top
* Molded Clear Windshield and Windows
* Formed Plastic Cowling
* Precision-Cut Foam Wing Core
* Handy Printed Fuselage Sides-Build Directly on the Wood
* Formed Wire Landing Gears
* Die-Cut Plywood Parts
* Sig Quality Balsa and Plywood
* Large Full-Size Plan
* Decal Sheet
* Illustrated Step-by-Step Booklet
* Photos of Full-Size BONANZA
* Nylon Control Horns
* Nylon Screws for Bolt-On Wing Attachment
* Molded Plastic Hinges
* Tuf-Steel R-C Links
* Aluminum Motor Mounts
* Blind Nuts, Screws and Other Small Hardware

See your dealer first! Order direct if not available. Complete SIG Catalog - $2.00 Postpaid

SIG MANUFACTURING CO. . . . . Montezuma, IA 50171

These smiles were not all that easy for Ray and Phil Kraft on the evening of October 24, 1979, when the employees of Kraft Systems honored them with a farewell dinner in La Costa, California. The strikingly beautiful crystal seagull was presented to Phil by Arthur Leighton, new president of Kraft Systems, in behalf of the parent company, Carlisle Corporation. And in place of the typical gold watch, see below . . .

from Bill Northrop's workbench

• Spaces are filling rapidly for the Pasadena Trade Show to be put on by IMS on January 12 and 13 in the Pasadena Center Exhibition Hall, Pasadena, California. Tucked in between the Rose Bowl and Super Bowl, which will both take place in Pasadena, followed by the huge Hobby Industry of America show in Anaheim (not open to the public), it's going to be a busy January!

This 1980 Pasadena show will again feature the exciting indoor R/C record trials that were inaugurated last January, and resulted in the posting of a 23-minute heavier-than-air record by Hal Cover of Thousand Oaks. Technically, this record still stands, although Woody Blanchard, of Hampton, Virginia, has recently made a flight of over 38 minutes indoors. Woody's model, however, was powered with Yardney Silvercels, and the flight was made in a huge coliseum.

Although it was our desire to set up rules that would require the use of easily available equipment, particularly with respect to batteries, we do not wish to discourage progress in this interesting area of R/C modeling, and have therefore established two record categories. In both, the aircraft specs shall remain the same; 3-ounce loading and 24-ounce total maximum weight. That's surface loading, by the way . . . the sum of the horizontal projected area of the wing(s) and stabilizer(s). In accordance with Woody's suggestion, the maximum span limitation has been removed, allowing aspect ratios of greater than 8 to 1. No LTA assist is permitted.

The Limited category is the one first establishing last January; only readily-available dry cells and nickel-cadmium batteries to be allowed for powering the electric drive motor. Also limited to sites with a maximum ceiling clearance of 30 feet.

The Unlimited category allows any kind of airborne electric power source (silver cells, lithium cells, etc.) and indoor sites with ceiling clearance in excess of 30 feet. One 1980 entry has obtained over an hour-and-a-half running time on a VL Hytork motor using lithium cells!

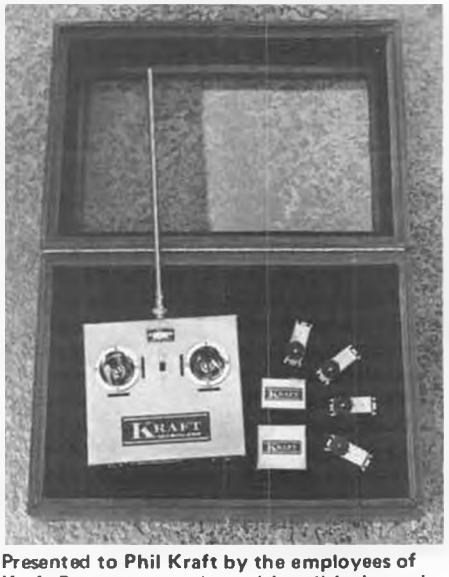
Lighter-than-air ships will also compete for records, but because of the potentially long flight possibilities, records will be based on the distance covered in 30 minutes flying time! There are no specified aircraft limits in this category except that the blimps must be of a size that can be maneuvered over a figure-8 course within the walls of the Exhibit Hall and within the altitude limits of 8 and 30 feet!

An optional gymkhana course will also be set up for the blimps, to test their pilot's maneuvering ability.

The Pasadena Trade Show will introduce another first in 1980, an R/C Robot competition. At least for openers, this event will be very loose on specifications; 150 pounds maximum weight, must be able to move forward, backward, left and right, and have a minimum of one additional function. Robots will be judged on appearance and the number and cleverness of operations above and beyond the minimum specified.

Frequency control for all R/C operations will be under one clothespin monitor, whether for HTA, LTA, Robots, inside demonstrations, or manufacturer's exhibits. Because of tight outdoor space and the amount of expected indoor R/C operations, there will be no outdoor demonstrations this year.

Anyone interested in entering the indoor R/C flying events MUST qualify themselves (or their pilot) and their aircraft on Thursday evening (6 to 10 p.m.), January 10, 1980 with a flight demonstration, or they WILL NOT be allowed to make any flights on Saturday and Sunday, the 12th and 13th. There will be no exceptions!



Presented to Phil Kraft by the employees of Kraft Systems, complete with polished wood case and glass top, this exact working duplicate of the famed Gold Medal Series system . . . . exact except that the whole thing has been GOLD PLATED!! Geez guys, how come you didn't throw in a gold Monokoted Ugly Stik!?

"YOUR PASSPORTS PLEASE"

We responded to this, or a reasonable facsimile about a dozen times throughout our recent three-week excursion to South Africa and the European continent during September and October. We won't bore you with a blow-by-blow account of the trip, nor will you have to sit through an eye-burning slide show as some of our nearby friends will. However, we'll pass on some observations.

First of all, until further investigation, if we were to be deported from the U.S.A. to a country of our own choice, it would be South Africa. The news media

Continued on page 107

"...THREE if by AIR"

(Letters to the Editor)

Since "...Three if by Air" first appeared in **R/C MB,** there have been months in which the letters received, though interesting in their own right, were not generally on subjects that would be attractive to our readers (such as, "Where the hell is my September issue?", etc.). And when the input was negligible, we simply skipped a month here and there.

Well...! That sure changed with the October issue! The letters from Bill Gieskieng and Steve Helmick, and our response, have opened a floodgate of letters, mostly from free flight modelers.

The last three words of that previous sentence, "free flight modelers," is the key to our point. There are free flight **MODELERS,** there are control line **MODELERS,** and there are radio control **MODELERS.** Next to being a bigot, there is nothing worse than one who generalizes ... though in some respects, the two are alike. A modeler is a modeler, no matter in which of the three major facets of aircraft modeling he is currently directing his ability.

There is no doubt in our mind that because so many new ... er, enthusiasts have come into the hobby through radio control, that there is a much higher percentage of "hackers" in R/C than in the other two categories. But because the percentage of R/C enthusiasts is so high, the number of genuine modelers within its ranks far outnumbers those in free flight or control line.

Free flight modelers are almost entirely competition oriented. For this reason, the expert F/Fers are highly visible. The **percentage** of competition-minded RCers is very small. Most R/Cers are sport fliers, but among those there are many highly skilled modelers. And among the latter you will find many "retired" free flighters. They haven't "moved up" to R/C, they have "moved over" ... to more relaxed flying, to less time consuming preparation, to less strenuous flying activity. But ... they have brought their design, building, and flight trimming skills with them. Because they are not enduring the rigors of free flight competition does not make them less of a modeler, nor does the fact that they may not be up on the latest prop-stopper or auto surface mechanics demote them to the status of "former modeler."

Anyway, we present a few of the interesting responses this month, and will continue to publish more as they come in.

Dear Bill,

I read with a great deal of interest the letters from Bill Gieskieng and Steve Helmick — and your comments — in the October letters column.

First, a word about Bill Gieskieng. He was the originator of the flapped wing feature on FAI Power ships (although the credit is commonly given to Thomas Koster of Denmark, who learned of it through correspondence with Gieskieng!). He has also experimented with folding wings, single-bladed props, and a number of other unconventional design ideas. He has perhaps the finest mind in American free flight ... certainly the most innovative.

His letter reveals why. He is able to look around for ideas. He doesn't automatically reject 90% of his aeromodeling input. If Gieskieng were to take up control line flying, say, FAI Combat, he would be one of the very best within a short time. The same would be true of Bob White, were he to turn to R/C Scale, or of Bill Warner if he were to actively pursue R/C Soaring.

Conversely, Howard Rush, Al Rabe, Les McDonald, and Skip Miller would all do very well if they were to compete in some form of F/F competition. The qualities that make all of these men tops in their specialties are qualities that are common to each of them: knowledge of aerodynamics, the ability to perform under pressure, thorough preparation, fine workmanship, and hours and hours of practice, etc. etc.

I happen to be a free flighter. But I don't condemn anyone who flies in the other forms of aeromodeling. Each type of modeling has its own rewards and frustrations. If I had the time and the income I'd pursue them all!

In 1969, I wrote the following in a term paper: "Becoming sophisticated involves voluntarily reducing the number of things that you are able to enjoy. It is a closing of doors." I was writing about Art, but the idea seems to apply here too.

Sincerely, Ed Hopkins
Fillmore, California

. . .

Dear Mr. Northrop,

I have wanted to write to you ever since you changed the title of your excellent periodical several months ago, but Steve Helmick's letter to you (October issue, Letters to the Editor) and your response, gave me the needed impetus to finally do so.

While it is true that every facet of our hobby has some brilliant modelers as well as those with relatively poor capabilities, the advent of ready-to-fly models has created an abundance of the latter in the radio controlled segment of the industry.

However, this is not the point of Mr. Helmick's letter. You indicate that only the free flight fraternity is complaining. If this is true, it is because the free flighters (and to a lesser extent, control liners also) are the ones who are being hurt by these "overnight" modelers. It would be interesting to see who would be writing to you, if you had changed the title of your magazine to "Free Flight Model Builder" or "U/Control Model Builder."

Why are you discriminating against the other aspects of modeling in the title of your publication? If you want an R/C magazine, just eliminate the control line and free flight columns (which happen to be about the best around today) and you could automatically create your "R/C" Model Builder.

I hope this letter will help clarify the feelings of both control liners and free flight enthusiasts on this issue.

Respectfully, Joel Chesler
Malverne Park, New York
Brooklyn Skyscrapers

. . .

Dear Bill,

Here's a counterpoint to Bill Gieskieng's letter in the October R/C MB. *I just moved from Tampa, Florida to Marion, Ohio. Through your*

Continued on page 104

OVER THE COUNTER

• Top Flite is adding yet another fine subject to its excellent line of Stand-Off Scale R/C models, which include a P-51 Mustang, P-40 Warhawk, P-39 Airacobra, P-47 Thunderbolt, and F4U-1A Corsair. The new one is the F8F-2 Bearcat . . . the same model, in fact, used by Hal Parenti to win 3rd in Stand-Off at the '79 Nats, securing him a place on the scale team that will represent the U.S. at the 1980 Scale World Championships in Ottawa, Canada. That's Hal posing with the model in one of the photos. Even though the Bearcat is classed as Stand-Off Scale, you can be sure that it's pretty darn close to being right on by the fact that Hal's model garnered 99.3 out of a possible 100 static points!

The Bearcat spans 60 inches, has 630 sq. in. of wing area, is 43 inches long, is designed for .60 size engines, and weighs 7-3/4 to 8-1/2 lbs. ready to fly . . . in other words, its size and weight range are in the same ballpark as the other Top Flite kits listed above. Construction is all balsa, with an injection-molded plastic cowl and clear plastic canopy. The fuselage sides are the familiar "Superform" pre-molded balsa shells to cut down greatly on the building time. Other kit features are precision die-cut parts, machined leading and trailing edges, machined crutch strips for positive alignment, full balsa sheeting for all surfaces, fuel-proof matte-finish Monokote markings, and maple engine bearers and wing mounting blocks. A fully illustrated checkoff instruction booklet is also included, as is a 3/16-inch formed landing gear, but we'd bet that 99% of the modelers building this ship will want to substitute retracts for the latter.

The icing on the cake is that the Bearcat kit also includes the 24-page book, *Grumman F8F Bearcat*, by Aero Publishers. The book contains historical comments and photographs covering all aspects of the aircraft, four pages of color drawings, and an extensive list of reference materials. A better proof-of-scale you couldn't ask for.

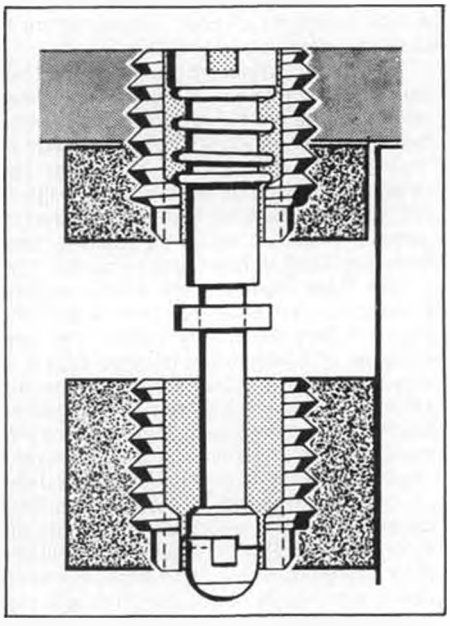
The press release didn't state a price for the kit, but we assume it's close to the other Top Flite kits in this series, or maybe just a little higher. If you need more information, write to Top Flite, 1901 N. Narragansett Ave., Chicago, IL 60639.

* * *

Those guys at Midwest Products are really on the ball! Last month we told you about the new Midwest RK-20B ducted fan unit, and mentioned that a kit for an airplane called the "Jetster 20," designed especially for the RK-20B, would soon be released. Well, as you've probably guessed by now, the kit is in full production and should be in your local hobby shop by the time you read this.

The Jetster 20 was designed by well-known modeler Dick Sarpolus and should be just the thing for the sport R/C flier who would like to try his hand at ducted fans. Construction looks to be as easy and quick as you can get. Due to the problems of hooking up twin rudders, no rudder control is used, relying instead on differential aileron throw to prevent adverse yaw in turns. Which means that the airplane could be flown on three channels, if you could figure out a way to connect the steerable nose wheel to the aileron servo. Or, leave the gear off altogether, put a skid on the bottom of the fuselage and hand launch. No need to worry about breaking props on landing on this model!

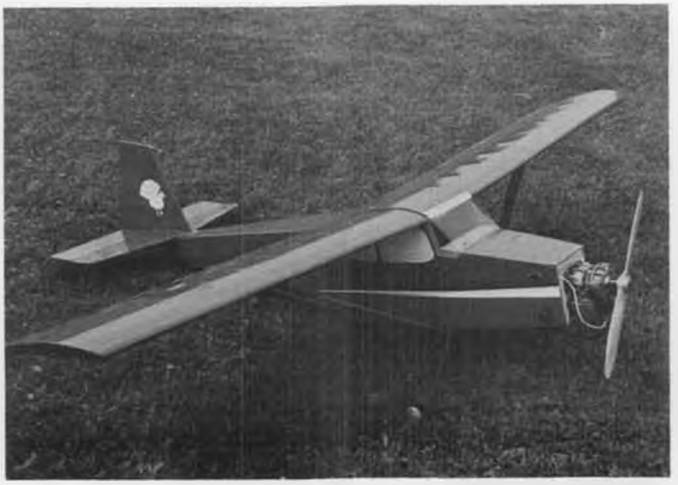
The Jetster 20 kit includes Midwest's



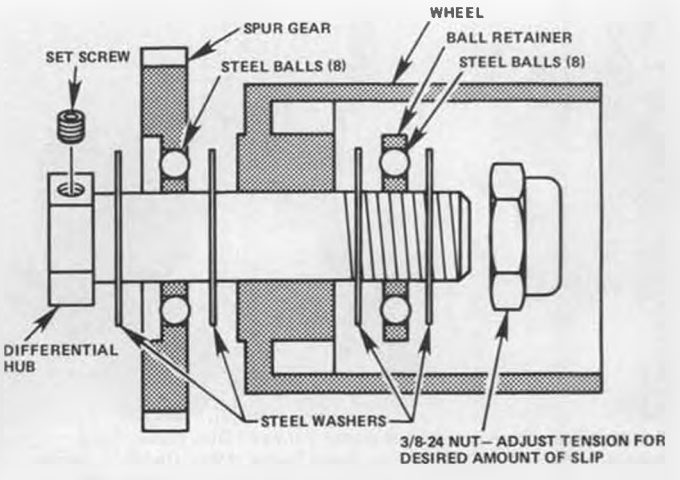
Detail drawing of new 1/4-Turn Latch from Du-Bro.

Top Flite's newest warbird, the F8F-2 Bearcat, shown here with Hal Parenti.

The Jetster 20 by Midwest Products, specially designed for the Axi-flo RK-20B fan unit.



The "Mammoth Turkey," a new biggie from J-5 Enterprises.



Assembly drawing of the new Super-Dif' differential for 1/12 scale cars, by Leisure Electronics.

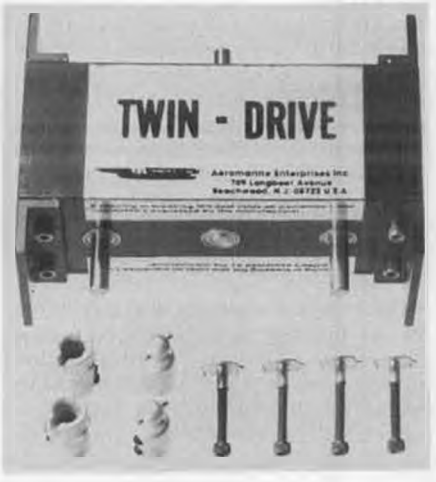
Micro-Cut balsa, machined and die-cut parts, hardware, a molded inlet cowl (apparently this item does not come with the RK-20B fan unit), and full-size plans. Wingspan is 48 inches, area is 430 sq. in. Recommended engine is the K&B 3.5cc.

From Midwest Products, 400 S. Indiana St., Hobart, IN 46342.

* * *

Two for one . . . or one for two. That's what model boaters get with the new "Twin Drive" from Aeromarine Enterprises (formerly Eastcraft Specialty Products, Marine Division). The Twin Drive is a precision, completely enclosed gearbox that has one shaft coming out of one side and two shafts on the other. The unit allows one engine to turn two props for scale type boats, or you can turn it around and drive a single prop with two engines for added performance. (With the latter set-up, the manufacturer recommends that the engines be hooked up to fire 180° apart, which helps produce more torque and rpm.) The outer case is aluminum and has a black anodized finish, which retards corrosion even in salt water. All three shafts are stainless steel. Each shaft is supported by two shielded stainless steel ball bearings for smooth running. The Twin Drive measures 5 inches wide, 2 inches long, and 2-1/4 inches high. The unit comes assembled and ready to run, and includes two sets of universals and all mounting bolts and blind nuts. Retail price is $125.

Check with your hobby dealer or order direct from Aeromarine Enterprises, 709 Longboat Ave., Beachwood, NJ 08722.



Aeromarine Enterprises' new "Twin Drive" gearbox for boats.

* * *

Du-Bro is expanding its line of plated brass wheel collars with two new sizes intended especially for use on Mammoth Scale models. These biggies fit 7/32 and 1/4-inch shafts and are complete with 8-32 set screws. Retail price of either size is two for a buck.

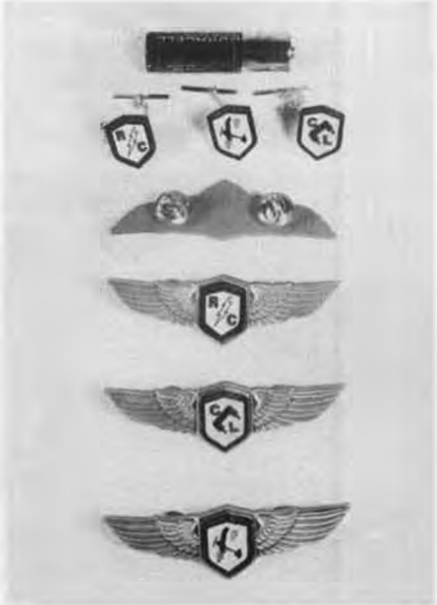
Another new item from Du-Bro, and one that can be used on all size models, is the 1/4-Turn Latch. This clever device is a quick-release fastener that can be used to hold cowls, hatches, canopies, inspection covers, or anything else that has to be made removable on your airplane, boat, or car. Turn the latch head 1/4 turn with a screwdriver and off comes your cowl or hatch or whatever . . . what could be easier? The latch assembly measures 1/4 inch in dia. by 3/4 of an inch long and is of all machined brass and steel parts. As shown in the drawing, the two brass threaded parts need to be seated in at least 1/4 inch of material, preferably hardwood. Also note that the top of the latch is flush with the outside surface of the model . . . makes for a very clean and neat appearance.

Installation is easier than you might think, and complete instructions are included. Two complete latch assemblies go for $2.50. For more information, write to Du-Bro Products, 480 Bonner Rd., Wauconda, IL 60084.

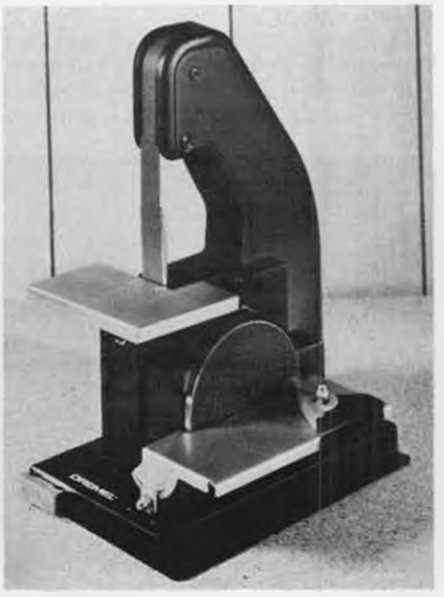
* * *

How would you like to build a model called the "Mammoth Turkey"? You would? Well, you're in luck, as J-5 Enterprises is making a kit available for just such a model. As the name implies, the Mammoth Turkey is one of the current breed of bigger-than-usual models, a boxy high-wing cabin model

Continued on page 105



Attractive wings and tie-tacks from Nico Engraving Co. Battery at top gives idea of size.



Dremel's new belt/disc sander, a great addition to any workshop.

The American team collects its awards: (l to r) Don Lowe, Dave Jenkins of SAARF, Dave Brown, Dean Koger, Mark Radcliff, Lettie Marincowitz, and Dr. James Gilliland, Chmn. of S.A. Aero Club.

The 2nd Place Italian team (l to r): Ruggero Pasqualini, Benito Bertolani, Manager Benito Dapporto, and Giuseppe Bertolozzi. They finished 7th, 8th, and 9th, only 1.6 points apart!

R/C WORLD

By BILL NORTHROP . . THE 1979 R/C AEROBATIC WORLD CHAMPIONSHIPS

PHOTOS BY BILL AND ANITA NORTHROP

• The following is our report on the 11th World Championships for Radio Controlled Precision Aerobatics. An affair such as this has so many facets that intermingle and affect one another that we have decided to take the easy way out and break the report into eight parts; the organization, the site, the weather, the pilot/contestants, the competition, the winners, the judging, and finally, a summary.

THE ORGANIZATION

Host for the Championships was the South African Association of Radio Flyers, SAARF, the recognized controlling body for R/C flying in South Africa, and an affiliate of the Aero Club of South Africa. The current president is Charles Marincowitz, who himself, has been a World Champs competitor and was on the South African team this year. Don Mackenzie, who judged at the 1977 W/C in Springfield, Ohio, was president prior to Charlie, and actually began much of the initial planning for the championships.

Other SAARF officers include Vice President John Brink (also a competitor), Secretary (and hardest worker) Lettie Marincowitz, and committee members Johan Ehlers, George Casson, and Bennie Cronje.

The Competition Staff included Contest Manager Charles Thompson, Flying Site Director George Casson, Flight Line Directors Mike Ward (Site 1) and Digby Cranke (Site 2), always smiling and helpful Championship Secretary Lettie Marincowitz, Problem Secretary George Collen, and PR Officers Brian Dawson (on the PA) and Colin Houghston.

Anyone planning to host a World Championships should have been in Johannesburg to see how it's done. Every team and official from out of the country was met by a SAARF member who was *assigned* to them for the duration of their visit. They took this host and guest thing seriously! Of course, everyone flew into Jan Smuts Airport, which was the international arrival/departure point for all overseas visitors. Our liaison man, who met us at the airport, and drove us to the headquarters hotel, the Milpark Holiday Inn, was John Mitchell-Adams, one of the 10 judges. As just pointed out, his services did not stop there. In addition to supplying Micro-Bus transportation to and from the flying site every day for the judges, he and his wife Kathy entertained us and ran errands whenever we needed help. Their sons, Dudley and Tim, kept this old man pretty busy on the tennis court one afternoon!

The Milpark Holiday Inn, incidentally, housed all contestants, officials, and supporters, which from a social point of view, and for total official communication, was terrific. As mentioned in "Workbench," the prices were very reasonable, and the hotel had a variety of built-in restaurants and bars that filled every need.

On Monday evening, the day before official practice, SAARF hosted an elegant welcoming dinner on the 3rd floor outside pool deck of the President Hotel in downtown Johannesburg. Large buses carried all pilots, officials, and recognized supporters to the hotel from the Holiday Inn, and returned them when festivities were over. The huge deck was completely open, and the dinner was actually a super barbecue, or in South Africaan, "Braaivleis," which roughly translates into "meat burning"!

The prize-giving buffet supper on Saturday, at the end of the contest, was another highlight of the excellent social

The West German team, with their wives, at the Awards Banquet (l to r): Rudi Eiff, Gunter Metterhausen, and Gunter Hoppe. Hoppe was 4th in the Qualifying and 4th in the Flyoffs.

Jerry Levy, Chief Liaison Officer, helps the Chief Judge count to 11. Every overseas participant was met and escorted throughout the Championships by a member of Jerry's committee. Great service!

World Champs Brass! (l to r) Contest Manager Charles Thompson, SAARF Pres. Charlie Marincowitz, S.A. Aero Club Chmn. Dr. James Gilliland, and FAI Executive Director, B. Larcher.

The team from Liechtenstein with their Arrows. Manager Gunther Matt at far right, fliers Norbert Matt far left, and Wolfgang Matt 3rd from right. Can't identify third flier Gunther Marxer.

organization displayed throughout the championships, held in the "Mayor's Parlour" of the Civic Centre, the Vice Mayor of Johannesburg headed up the hosting of the most lavish buffet supper we have ever seen or tasted.

Like we said, it will be difficult for any future host country to top this one!

THE SITE

Baragwanath Airfield is a small light plane and glider airport just south of Johannesburg. About 5,800 feet above sea level, it is equipped with two parallel runways around 200 yards apart. A fence separated the two runways, and the competition took place at each end of the glider strip. All personnel were located between the fence and the strip, facing away from the powered aircraft runway. Although the latter remained open during the competition, activity was light, and in no way interfered with the contest.

Because the blacktop glider runway was so narrow (about 15 feet), it was necessary for the organizers to build out a large enough hard surface to provide the required 30 meter circle at each end. Obviously, in spite of George Casson's best efforts, the center 15 feet of the circle was the smoothest.

Circle 1 was the primary location. In addition to a transmitter impound tent, it also included the tabulating tent, a trade show tent, a food wagon, the awards stand, and a large general shelter tent for the modelers. Circle 2 was "Siberia," having one small transmitter impound tent.

The site was oriented such that the sun, if it was shining (see "Weather"), would come from behind the judges and fliers, over their right shoulders, and by 1400 hours (2 p.m., if you must) made it impossible for the fliers to avoid going through it in any high maneuver. Consequently, flying started each day at 0730 and ended around 1400, giving everyone a long afternoon and evening to get some enjoyment (and/or repair time). Incidentally, the 24 hour clock is quite common in S.A., and we're all for it. Eliminates a lot of confusion. There's only one 0900 a day and only one 2100 . . . no A.M. or P.M. We own a cheapie 24-hour watch, but wish some of the better watch manufacturers would get into the act.

THE WEATHER

Well, we packed several shorts and T-shirts that never got used. As you know, South Africa is well below the equator, consequently, in September, it is their springtime. (Yes, the water spirals counterclockwise going down the drain.) Most of the competition days were cold and windy, with only occasional sunshine. On the other hand, the Saturday on which we played tennis prior to the competition was extremely warm and sunny . . . even a T-shirt was too much.

The wind was really bad at various times during the official flying, so bad that frequent checks were made at the airport control tower. There were occasional gusts that certainly exceeded the 12 meter/sec (almost 27 mph) limit allowed. The wind continually kept scores down, and no doubt had some effect on the results of the flyoff.

The only rain occurred on Wednesday morning, the first day of the contest. Official flying was only held up about a half-hour, however, and as it was still cloudy in the afternoon, a full round and a third could be flown without sun problems.

THE PILOTS

The most startling news was to learn that the reigning champion, Hanno Prettner, would not be competing. He was actually carrying some of his equipment down the stairs of his family's inn, when his feet became tangled in an extension cord that was being used by renovators. He put out his hand to break the fall, and broke one of the small bones in his left wrist. His new Magic Curare is larger than the original Curare, and features a variable pitch prop that can be adjusted from minus 5 to plus 11 inch pitch. He says the Aileron Turn maneuver, a straight down vertical roll, can be done at the same air speed as the

Anita Northrop couldn't talk Flight Line Director Digby Cranke out of his red sombrero.

Clever and very precise trimmable aileron tip used by Benito Bertolani on his Komet.

Functional dust boot fits over the nose of Ken Binks' Pacemaker English entry.

Hanno Prettner would have brought his Magic, with variable pitch prop, had he not fallen and broken a wrist bone days before the W/C.

Wolfgang Matt and his Arrow, with which he recaptured the World Championship. He was winner in 1975, in Switzerland.

The World Champion, Wolfgang Matt, from Liechtenstein, a popular and superb flier.

Quique Somenzini, 1978 Argentine Champion (l), age 12, and (l to r) his father, Mario, Daniel Falco, and Team Manager Alberto Farfaglia. Anita Northrop was their official interpreter.

straight up Vertical Roll, by using negative pitch in the prop. This guy is something else!

Quique Somenzini of Argentina was a notable contestant, even though he ended up in 47th out of 49 places. This 1978 R/C Champion is only 12 years old! He shows great promise, and may spend some time in the States, getting first-hand tutoring from a couple of our champions.

Warren Hitchcox, Canada's MAAC President, had to be the hard luck contestant. If having engine cuts wasn't enough, one flight was aborted when the engine would not start at all (maybe your engine was unhappy because it was possibly the only unpiped one at the contest!).

Both Ivan Kristensen of Canada, and Gunter Hoppe of Germany were still showing champion-like form and were right up there to take over if anyone made a mistake. Ivan finished 5th and Gunter was 4th in the flyoff.

The Italian team was amazing. After three days and four rounds of competition, Ruggero Pasqualini, Benito Bertolani, and Giuseppe Bertolozzi, finished 7th, 8th, and 9th, respectively, and their point spread was 398.8, 398.6, and 397.2. Benito's Komet will be a construction feature in the near future. Benito manufactures the clever knee-joint sprung landing gear that was used by several contestants.

The U.S. team is known to all who have any interest in pattern flying. Dave is flying the Tiporare this year (plans coming in the February issue), and was really in top form for the W/C. Mark Radcliff, flying Don Lowe's Phoenix 8 design, is always ready to lay on a "Barn Burner." Dean Koger's EU-1, a sensational performer at average altitudes, seemed to be suffering a bit because of its size and weight in the thin air at 5800 feet. Peaking the engine just a smidge over the utmost caused it to cut in the middle of his first official flight.

THE COMPETITION

The three days of qualifying were split into 1-1/3 rounds each, so that everyone would get two rounds each of Schedule A and Schedule B. One goof-up in procedures undoubtedly had effect on the final outcome. Fliers alternated between Circles 1 and 2, and flew an A schedule and then a B. Unfortunately, this arrangement made it possible for some fliers to fly an A and a B schedule both at Circle 1, or both at Circle 2, or one each. Obviously, if the judges scored higher at one circle than the other (Circle 1 judges were consistently higher than Circle 2 judges), there were positive cases of "unequal opportunity"!

Arguments in favor of one schedule per set of judges are similar to those justifying the totaling system used at our 1979 team trials, and described in the October '79 issue. It pretty well eliminates all unbalances except the weather factor.

For a first-hand report on the competition by a contestant, be sure to read Dave Brown's "Flight Instructor" column this month.

To the best of our knowledge, there were no unofficial crashes. In full scale parlance, a collapsed landing gear constitutes a crash, and there were several of these. One "enterprising" flier made his approach and found his gear hung up. Keeping on some throttle, he cruised past the landing circle, completely off of the hard surface, and mushed into some tall grass about 100 yards away. The judges naturally zeroed the landing. Halfway through the next flight, our flier appeared, holding his model aloft, with gear down, claiming that the gear dropped just before the plane contacted the grass, and asked for a landing score. The zeros remained.

The Jury (l to r): John Worth (U.S.A.), Chris Olsen (G.B.), and Dave Jenkins (S.A.). , with Lettie Marincowitz and Dr. Gilliland.

Brazil team member Victor Conde de Westarp puts his model on the engine noise test stand, as Dave Jenkins stands by. Passed on 3rd try.

THE WINNERS

After four rounds of Schedule A and B patterns, the top 15 fliers were Dave Brown (U.S.A.), Wolfgang Matt (Liechtenstein), Ivan Kristensen (Canada), Gunter Hoppe (West Germany), Mark Radcliff (U.S.A.), Bruno Giezendanner (Switzerland), Ruggero Pasqualini, Benito Bertolani, and Giuseppe Bertolozzi (Italy), Dieter Fritz (Austria), Ken Binks (England), Dean Koger (U.S.A.), Emil Giezendanner (Switzerland), Norbett Matt (Liechtenstein), and Rudi Eiff (West Germany).

At this point, the team standings were determined, showing U.S.A. (1244.2), Italy (1194.6), West Germany (1172.6), Switzerland (1159.8), and Liechtenstein (1148.4) as the top five.

In keeping with the FAI rules, the top 10% or first 5 fliers would compete in the flyoff for individual World Champion honors, and accordingly, it was soon announced on the PA system. Shortly thereafter, we were approached by Jury member Chris Olsen, was asked us if we thought that Bruno Giezendanner should be allowed to enter the flyoffs as he was only one point below fifth placer Mark Radcliff. Our answer was negative. In this world of adult competition you stick to the rules to avoid mind-over-matter decision, and in this case, a one-point miss is as good as a mile. It's a fact of competitive life and it happens all the time.

Although our opinion was not official . . . we were Chief Judge, and not a member of the Jury . . . we were still astonished when it was announced about 10 minutes later that Bruno was to compete in the flyoffs. There was considerable objection to the decision, but not because of Bruno, who is a very well-liked competitor and past World Champ in 1969 and 1971. The objection was to the breakdown of rules discipline.

Everyone was amazed at the weather situation on Saturday morning when the finals flyoff was to begin. The wind was all but non-existent! Jury member John Worth commented that perhaps the contest should be suspended on account of calm!

The six contestants drew lots for flying order in the two finals rounds. Mark Radcliff drew No. 1 for each and Hoppe drew 5th for each.

In our own opinion, Mark put up one of his barn burners on that first flight (3221). Psychologically, though, the first flight of the day always suffers. The idea of a warm-up flight, particularly for the judges, is very logical, and its worth has been proven at the Las Vegas Tournament of Champions.

Giezendanner was up next and was off-center quite often. Probably still correcting for the strong winds that had blown all week (3095). Dave Brown's flight was typically bold and confidently performed (3282).

Ivan Kristensen's flight showed frequent wing bobbles, particularly on the vertical rolls (3080).

Gunter Hoppe's flight seemed better than his score of 3160, though he lost heading on the Slow Roll. He performed the only Avalanche that we recall seeing.

The wind began to pick up slightly as Wolfgang started his flight. The last vertical of his Square Horizontal Eight was off-center. Rudder applications during the Slow Roll were very obvious, and quite a few maneuvers were off-center. His 3337 seemed too high.

We still felt Mark had the best flight in Round One.

Before starting Round Two, there was a delay while tabulating finished checking scores, so that the pilots would know their standing. Unfortunately, fate, and the weather, stepped in during this pause to make the second round useless . . . the strong wind came back, so that it was impossible for anyone to improve their first round scores.

Mark was again first up, and flew exceptionally well in spite of the wind, but could not improve on Round One (3061).

Wolfgang had a very poor takeoff, and was again way off on centering his Square Horizontal Eight, but still scored highest in the round (3259).

Ivan's flight showed the effect of the wind in many maneuvers, and scored only 2955.

Dave was 6-1/2 seconds on his Slow Roll, which, with the help of the wind, covered a lot of territory. An extra strong gust bobbled his Tiporare severely on the landing approach, but Dave settled it down well before getting below the 2 meter scoring altitude (3175).

Hoppe was only 13 points short of his first round 3160, showing excellent center in the wind.

Giezendanner made the last flight of the flyoff and the World Champs, posting a 3030.

Final tabulation verified what most

Continued on page 106

Jime Clark, in derby, from Ireland, crashed during practice, but managed to repair.

Emil Giezendanner, Switzerland, placed 13th, helped his team to 4th position.

Great Britain's Ken Binks was highest scorer on team, placing 11th. Nice looking ship.

And they're off! It's the start of a heat at the Warbirds Race held by the Spirits of St. Louis R/C Club. Looks like a fun event, sort of like an R/C version of Reno.

1 TO 1 SCALE

By BOB UNDERWOOD PHOTOS BY AUTHOR

• It's still warm, but that only comes after the refreshing moments of the fifties at night. Old Sol sleeps longer than we do and scoots away early to rest an extra bit for what is coming next. A bright red leaf or two is added to the collection of green on the tree outside the window and an occasional plaintive honking occurs as a long-necked northern neighbor heads south, sounding the death knell of summer, 1979.

Those of you who have never lived in a land of four seasons have missed an interesting experience. For someone as disorganized as I am, the seasons serve as a vivid reminder of passing time not always announced so dramatically by the calendar. Then too, we are in a way revitalized, by the element of change itself.

Of course, we are faced, in the more northern climes, with the winding down of flying activity. Then we can only look on with envious eyes as the southern brethren continue their quest for air time. Indeed, there are those who brave the elements and stand, cooled by evaporating fuel spilled on their hands, guiding their model through chilled air. This has never been a source of joy to me, so the workshop claims my soul for five months or so.

This year such a sojourn is vital, for preparation for the Internats becomes a prime concern. This becomes especially true for me, since my supply of models dwindled rapidly with the loss of two during the Nats. One must admit to a degree of frustration at the loss of two years of work; the words in your mind become "If I. . ." and are never fully answered. "If I . . . had not had to hold so long in the air and on the ground with the PE-2 might I have completed the flight without losing an engine?" "If I . . . had not flown in the airshow on Sunday might I not have lost the Hiperbipe to the unexplained interference?" But then "If I's" never rule the day, only the "I dids."

With the loss of the models, I was forced to use old reliable, the 8-year-old Stormovik Ilyushin IL-2, that rarely has failed me. With cracks of old age appearing with increasing regularity and oil-soaked wood that allows glue to let go, it has probably reached that happy day of retirement. It has led a productive life, including a first and second place at the Nats, along with its many local contest honors. It's strange how a model can become so much a part of a person. Only on very rare occasions did it ever fail to perform properly even when pressed into service at the last moment. I keep thinking I'll build another one; indeed, there's already tail surfaces and a fuselage started some four or five years ago.

Another unusual factor was the effect that the model had on others. Often people would ask what reasons I had for modeling a Russian aircraft, and in some cases they would puzzle over what it might be. Many found that it had a great appeal to them and remarked how well it flies. It is forgiving of the pilot's occasional stupidity and without excessive speed will perform most any type of maneuver. The spins are super and a big old barrel roll is a snap. It will axial roll as well. Give it just a little throttle and it will stay on its mains forever, then nudge the throttle and it lifts off smoothly. It sounds like a love affair, doesn't it? I only hope that sometime in your modeling experience you come across an aircraft that fills your needs in the same way.

RULES CYCLE

By the time this is published you probably will have in hand the final rules for the 1980-81 cycle. I know that you will find some exciting changes. Banking on previous votes by the Scale Contest Board, it seems reasonable to assume that we can expect to see such things as two classes of Sport Scale, a large-scale (Monster, Giant, Super, Big, or whatever it's called) event, and a host of other changes such as limitations on flight options.

There are, of course, a number of persons who put in a vast amount of time working on proposals and cross proposals. They are to be commended for their interest and desire to make scale a better event. At the risk of naming a few and not all, I feel that several need to be singled out for performing a yeoman task in not only formulating the proposals but handling the tremendous amount of correspondence associated with it.

As an example, John Preston, without a doubt, burned the candle at both ends and in the middle formulating a judging guide for flying. He in turn received much helpful input from Larry D'Attilio, Art Johnson, and Bob Karlsson, who in turn did their homework concerning that item. This is, of course, just one example, but it illustrates the dedication and determination involved in formulating a set of rules that hopefully will accommodate the event in the best way.

A monumental thank-you must be forwarded to the Scale Contest Board

Art Biehl ponders what kind of mantle would support that monster trophy. For a first-time contest, they sure have a lot of goodies to give away!

chairman, Claude McCullough. Claude's philosophy of "make haste slowly" is one which is supported by his very hard work and ability to analyze a problem and see all sides of it. For the first time, this rules cycle brought forth a myriad of cross proposals and ponderables. Claude's long and carefully developed analysis of the items, in the form of letters to the board members, were most helpful.

With gentlemen such as those mentioned working to improve the event, one can be certain that a good job will result and not a hasty patchwork that only serves to frustrate and harm. Granted, something less than the best can still result, but it will generally be a sin of omission rather than commission.

CORRECTIONS

In an earlier article, I stated that after pulling a muscle at the Mint Julep meet in April I spent the weekend "limping around like Festus." I have been informed that the limping character played on "Gunsmoke" was Chester. Sorry!

A second mistake crept in when a local hobby dealer friend stated that after reading my column, people wanted to buy some PVC by Pactra. Unless they start making some soon, "thar ain't no such animule," therefore you might like to try PFC by Hobbypoxy.

A HINT OR TWO

You say you've got an engine with a new Perry carb on it and you can't reach it to adjust it inside the cowl? Take your handy dandy Dremel with its cut-off disc and slot the end of the needle valve about 1/32-inch deep. All you'll need is about a 1/8-inch hole in the cowl to insert a small screwdriver for adjustment. If you're careful with the hole alignment, it won't easily slip. *Do* watch, however, when you remove the carb for any reason that you get it back in proper alignment.

Have you tried Softglas by Ohio Superstar? It goes on over bare balsa and acts as a filler and a resin. It sands like a dream and is a light gray primer color, which forms a perfect base for the application of color coats later. On a Pattern ship, I tried a combination of a light coat of standard K&B resin and 3/4-oz. cloth finished off with a fairly heavy coat of Softglas sanded down to the cloth (almost!). It resulted in a super-smooth, glass-like finish that accepted the color coats perfectly. The weight buildup was quite small and the working time was cut due to the ease of sanding the Softglas. The instructions *do* tell you to prevent using too great a thickness, since it may crack or checker. Check with your hobby dealer; it's manufactured by Ohio Superstar.

Art Biehl with his .40 size Mustang entry (a House of Balsa kit?).

Walt Wilson's Hawker Hurricane took Best Finish award at Warbirds Race, also was second in Best of Scale.

Don Allen's Martin Baker MB-5, flown by Mark Been, had the fastest race time of all the entries at the Warbirds Race.

Scale models often have a bunch of servos in the wing with a resulting rat's nest of wires to plug in every time you put the wing on. My PE-2, for instance, had five servos and a set of retract lines to hook up each time. Quite frequently one will find he has connected wires in strange ways. . . the retracts plugged into the flaps, for instance. At times the discovery occurs at the ready box or even at the flight line. As Mork might say, "Horror! Look of confusion! Dismay!"

Your hobby dealer may carry the neat little labels that can be looped about the servo plug ends and the corresponding receiver pigtails that will help prevent this problem. If not, code them with some 1/4-inch striping tape by color (red, black, white, etc.). Once you've done this you can bundle them up and wrap a loop of tape around them to help prevent them from wandering about. How frustrating it is to have one of those little devils sneak over and take a nap on the wing seat as you put the wing on, causing some very interesting alignment problems.

WARBIRDS RACE

We've included a few photos this month from the Spirits of St. Louis R/C Club's Warbirds Race held on September 15 and 16 here in St. Louis. The contestants enjoyed fantastically nice weather during the competition. The entries, unfortunately, were less than a dozen. A graduated wing area/engine size rule was set up and models were judged using standard AMA Sport Scale rules. Bonus points were given for operational features such as retracts, flaps, etc., and they had to be used in each flight heat. The contestant had to demonstrate taxi and idle capability as well. Points were awarded for each heat, and this was added to the static score.

The prizes were outstanding and included a radio system and numerous kits, etc. The trophy shown in one of the photos will contain the winner's names over the years.

The members of the club worked hard to make the event something special. I suspect they had hoped for a larger turnout, but I'm certain they are aware that any new event requires a while to get off the ground. Some of their unanticipated problems, such as a farmer who forced the moving of a pylon and

Continued on page 100

PHOTOS BY AUTHOR

✶✶✶ CESSNA 310 ✶✶✶

By D. G. PRENTICE . . . Nothing can match the sound of a twin in flight. This one offers scale appearance with high performance and no handling problems with one engine out. Economical, too . . . uses two .19's.

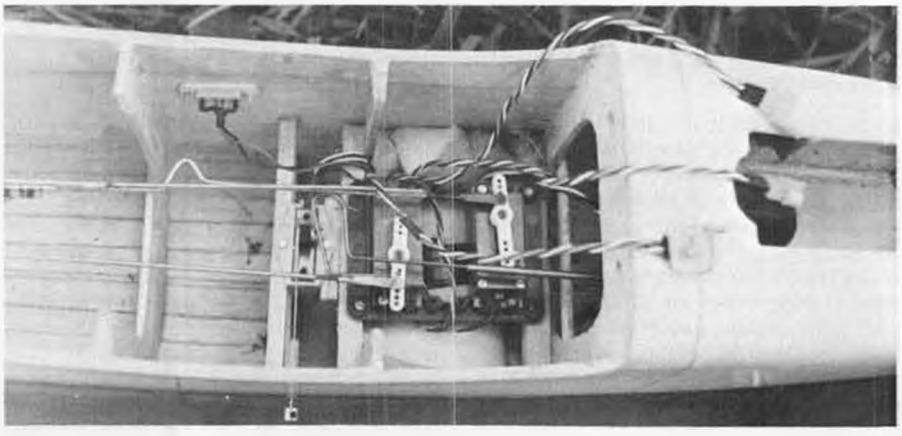
• The sound of a twin-engined model on the flight line usually brings all other activity to a standstill. Too few modelers make the effort to build a twin. This is understandable when one considers the extra effort involved, the extra cost, the size of the model, and the additional hazards of flight.

It is not possible to eliminate the extra problems involved in a twin, but with forethought and a little ingenuity, they can be reduced. The design presented in this article attempts to reduce the problems and still have a presentable model, i.e., a real miniature aircraft.

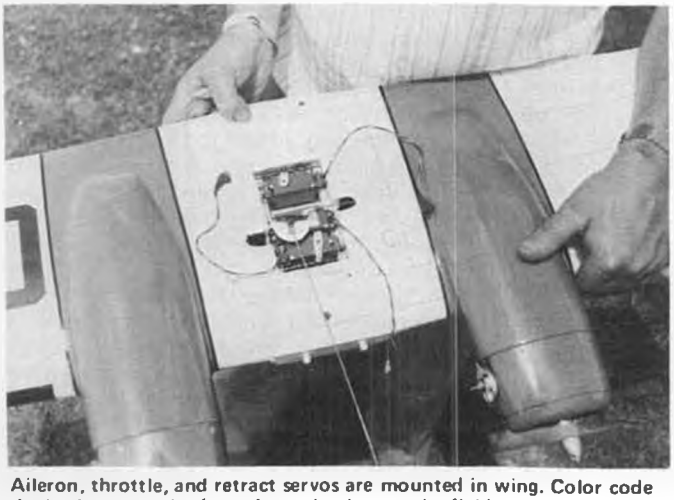
To reduce the number of problems, several design factors are to be noted. The model weighs just under 5 lbs., which is very light for a scale model with two engines and retracts. The fuselage top and bottom is planked with light weight balsa (this is almost a lost art). The wing is sheeted with 1/16 balsa, and wherever possible, the lightest balsa is used. All blocks are hollowed out to the minimum practical thickness. The fuselage is coated with 1/2 oz. fiberglass cloth and resin. Excess resin is removed by rolling a roll of toilet paper over the finish before the resin hardens. This soaks up the excess resin, and the outer layers of the roll are removed as they become soaked with the resin.

The fuselage width was reduced considerably to get the engines closer to the center line. The nacelles are placed as close to the fuselage as an adequate sized prop will allow.

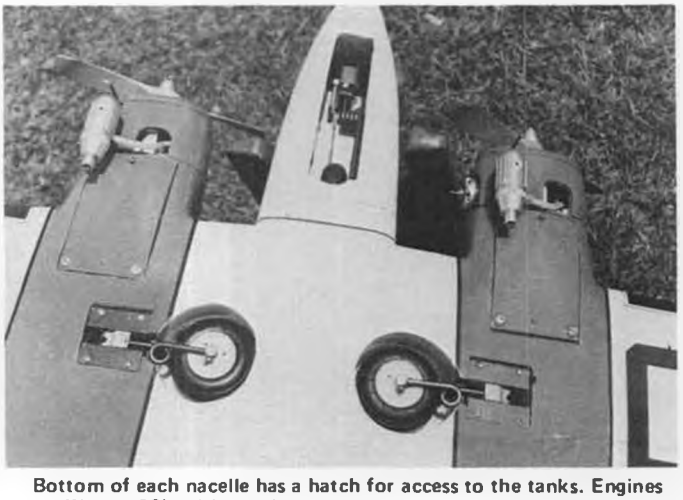
The rudder has maximum throw to take care of any engine-out problems. The most dependable engines I could find were used. The engines were Webra .20's, but any good .19's could be used.



Elevator and rudder servo installation in fuselage. Receiver is just forward of ply bulkhead. Note fuselage top planking, makes for a strong, light structure. Not hard to do, either.



Aileron, throttle, and retract servos are mounted in wing. Color code the leads so you don't get 'em mixed up at the field.



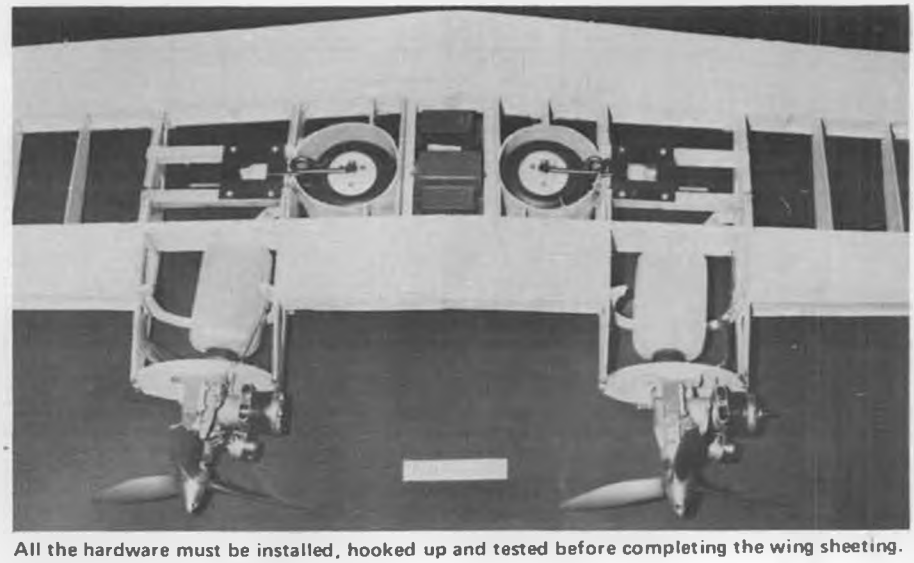
Bottom of each nacelle has a hatch for access to the tanks. Engines are Webra .20's with cut-down props.

First step in wing assembly is to join the spars to the ply doublers. Rest of wing is built on an angled board . . . see text.

Spars and ribs are notched egg-crate fashion for easy, strong assembly. Finished framework is sheeted with 1/16 balsa.

As a result of the above precautions in design and construction, the model flies as well as any single-engined scale model. On two occasions, landings were made with an engine out. No problems were encountered until we started to taxi. The model will not taxi in the grass on one engine, but chases its tail. The Violett retracts using a fifth servo have presented no problems, and their ease of throw adjustment made their installation simple. The wingspan of 52 inches makes the model easy to pack, and the small engines keep the fuel bill to a reasonable level.

As this is not a beginner's model, only the highlights of the construction will be discussed. Most experienced modelers have their own pet construction preferences and usually choose to go their own way on the smaller details.



All the hardware must be installed, hooked up and tested before completing the wing sheeting. Violett retracts used on original model.

WING

The wing is normally the most disliked part of a model to construct, so let's do them first. The wing is built on two half building boards propped up to the required dihedral. The ribs and spars are assembled in egg crate fashion, so assemble the spars first. This will allow the clamping of the spar doublers to the spars to ensure a strong wing joint. Lay the lower leading edge sheet balsa on the boards and place the front spar on them. Before fastening the spar to the board, glue it to the back edge of the front lower sheet. Pin this spar down securely. By placing it on the top of the lower leading edge sheeting at this stage, the lower front of the wing can be covered before removing the whole assembly from the board. Install the center rib temporarily and the two outer ribs so as to locate the rear spar. Raise the rear spar off the board with small blocks. Fit the other ribs in place temporarily and pin the rear spar in place. Now install the lower rear 3-inch sheeting in place. Prop up to get a straight trailing edge, and glue the whole assembly in place. Install the aileron end ribs and the hinge blocks. The idea is to cover the top and bottom of the leading and trailing edges before the wing is removed from the board. The ply nacelle sides should be installed before the wing is removed from the board, in addition to the firewalls. The metal motor mounts and the engine can be installed before the wing gets off the board.

The ailerons are cut out after the wing is removed from the board. The front of the aileron ribs is cut away at an angle and the balsa aileron leading edge is installed.

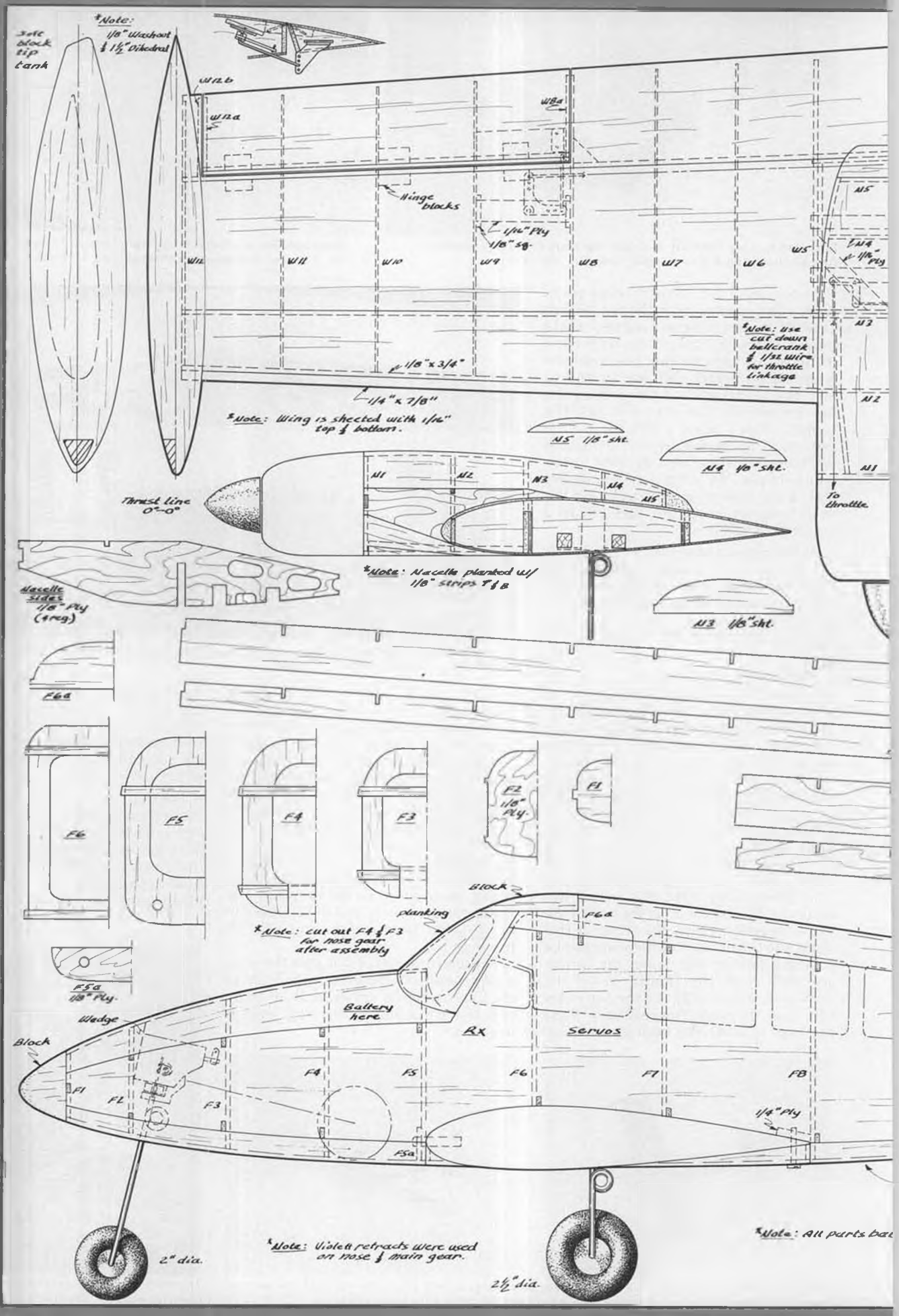
At this point, it is a good idea to install the servos, retracts, throttle connections, etc., and ensure that all is working with no binding. With everything working correctly, finish the covering of the wings and nacelles.

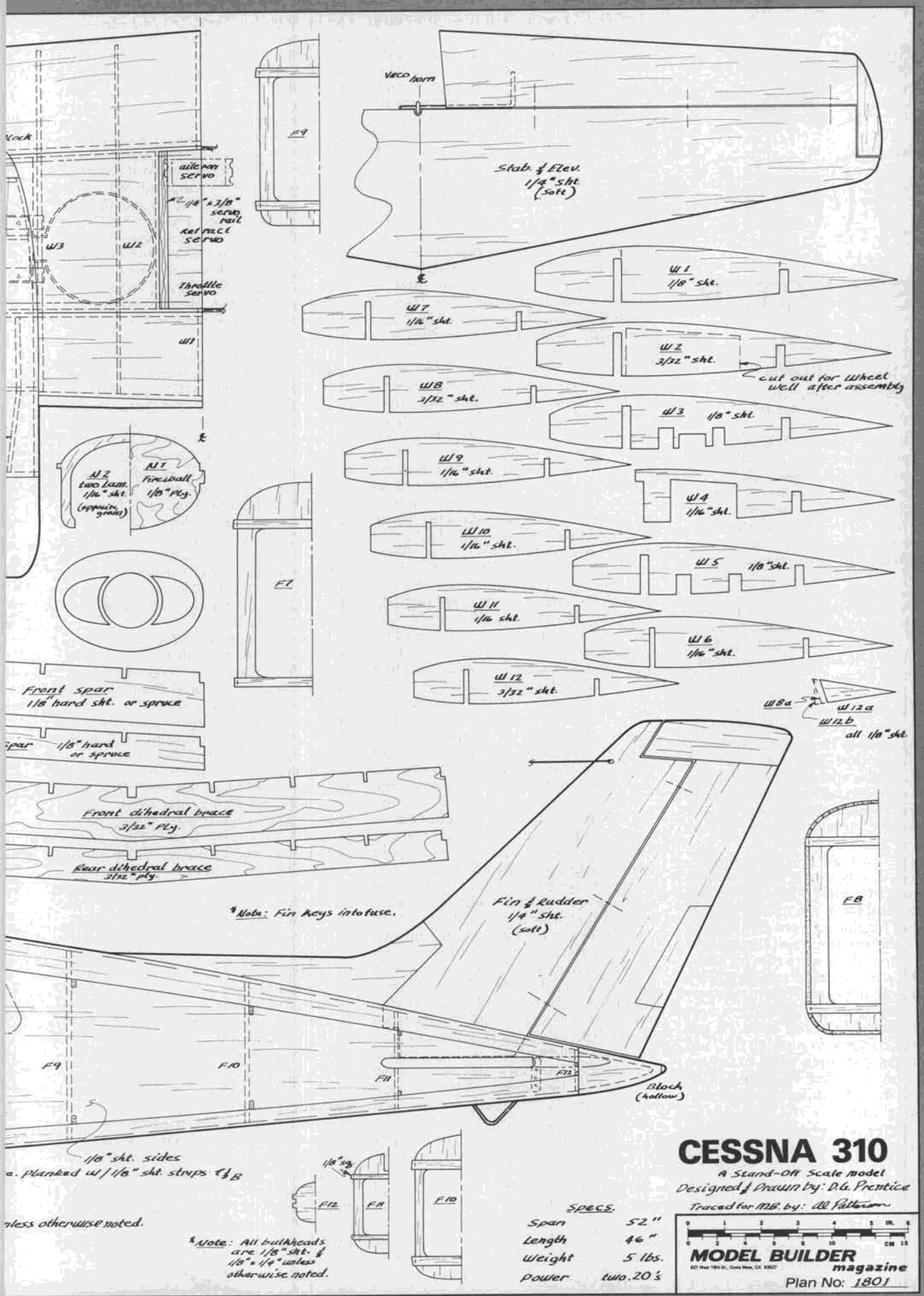
The hatches for the fuel tanks are located under the nacelles and are held in place with small screws. The inside of the nacelles is fiberglassed to ensure that the firewalls will not come off. The cowlings are built up of balsa, or may be made using the fiberglass routine. The

Continued on page 94

The Cessna 310 is a smooth, fast flier. Retract gear makes it look especially realistic. No vicious flight characteristics with one engine out, a common problem with most twins.

The author and his sweet-sounding bird. Colorful model is a real eye catcher.


Note: 1/8" Washout & 1½° Dihedral
Note: Use cut down bellcrank & 1/32 Wire for throttle linkage
1/4" x 7/8"
Note: Wing is sheeted with 1/16" top & bottom.
W5 1/8" sht.
W4 1/8" sht.
W3 1/8" sht.
Thrust line 0°-0°
To throttle
Note: Nacelle planked w/ 1/8" strips T & B
Nacelle sides 1/8" Ply (4 req.)
F6a
F6
F5
F4
F3
F2 1/8" Ply
F1
Block
planking
Note: cut out F4 & F3 for nose gear after assembly
F5a 1/8" Ply
Wedge
Block
Battery here
RX
Servos
1/4" Ply
2" dia.
Note: Violett retracts were used on nose & main gear.
2½" dia.
Note: All parts bal



CESSNA 310

A Stand-Off Scale model

Designed & Drawn by: D.G. Prentice

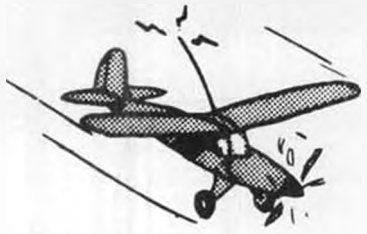
Traced for MB. by: Al Patterson

SPECS.	
Span	52"
Length	46"
Weight	5 lbs.
Power	two .20's

MODEL BUILDER magazine

621 West 19th St., Costa Mesa, CA. 92627

Plan No: 1801



Flight INSTRUCTOR

Conducted by
DAVE BROWN
8534 Huddleston Dr.
Cincinnati, OH 45236

• Well, the '79 World R/C Aerobatic Championships are over and Wolfgang Matt of Liechtenstein has regained the title he first won in '75 at Bern, Switzerland. I again have taken the silver medal and will have to try again in Mexico in 1981. The most significant event at this World Championships actually happened on the Wednesday prior to the contest, in Klagenfurt, Austria, when Hanno Prettner, the defending champion and obvious favorite, tripped on a cable on the stairs in his house and fell, breaking his left wrist. This required a cast from his elbow to his fingertips. He gallantly tried to fly at home, but it was impossible, particularly as he flies Mode 1, and he couldn't come to South Africa to defend his title. This news came to the World Championships and was met with disbelief, shock, and general dismay, as Hanno has always been a great competitor, and his absence cast a shadow on the meet. He, like myself, will have to look forward to Mexico in '81.

Our team of Don Lowe, team manager; myself with Sally as mechanic; Mark Radcliff with Dick Penrod as mechanic; and Dean Koger with his wife Barbara as mechanic went over about eight days before the meet to practice. Upon our arrival we were met by Gerry Levy, who was assigned to us as Team Liaison, and it became immediately obvious that he would become a very important member of our team. He got us through customs in nothing flat, and after loading our three team buses we took off on our first real challenge: driving on the left side of the road with the steering wheel on the right side of the car. Before the first week was over one of our vans had a small dent in it and Penrod and Dad Brown had been grounded! It is a good thing our team was to compete in flying and not driving.

During this first week, in addition to practice, we were hosted almost every evening to a party or dinner by one of the South African modelers. Early in the week, while we were at Gerry's house for dinner, we got a pleasant surprise when Dean Koger sat down at the piano and played beautifully. The very next night while the group was eating at the top of the Tower Restaurant, we were again surprised when his wife Barbara borrowed an accordian from the musician there and started belting out polkas! The hidden talents in those modelers are fascinating. She later played a tune that goes something like "Roll Out the Barrel" and dedicated it to Dad Brown, with some reference to the dent in the bus and a barrel bouncing off the highway.

During this week of practice everything went well for Dean and I, but Mark had problems with his engine quitting for no obvious reason. One time it resulted in an off-runway landing in a pile of rocks which beat up his Phoenix a little. That evening we got another example of South African hospitality. Not only did they find some filler to patch up the dings, but they also found some paint which matched. Changing plug types seemed to cure Mark's engine problem, and after a few more days of practice we were ready to compete. Processing was no sweat and at official practice we were able to watch some of our competition fly. Many were flying well, but I saw none who should present any problems for any of our team members, and we all felt real confident. One flier who really impressed me was Quiqui Somenzini, from Argentina. His looping maneuvers looked great and, with a little practice, his rolls could be just as good. Part of the reason I was so impressed with Quique was the fact that he is only twelve years old! This is one kid to watch, as he has the makings of a future champion. He is already the Argentine National Champion!

The U.S. Team went to bed that night feeling we had a chance to sweep the first three spots. The morning of the competition dawned (and we saw the dawn every day of the competition, as we started flying at 7 a.m.), and the first disaster struck: I was so sick I could hardly stand up! At first Sally thought I might just be a bit nervous, but by the time we got to the field it became obvious that wasn't the problem. Dean was the first up on our team, and our disastrous start continued when his engine quit in the middle of his first flight, due to a throttle servo problem. I laid down in the bus until my turn to fly, and then my engine quit in the spin when I flew! I thought Don was going to pull his hair out with our bad run of luck, but at least our luck would improve later. Mark flew next and flew well, putting him in 7th place for the first round. Dean flew once more on the first day, as they were flying 1-1/3 rounds per day, and improved his position somewhat.

At the end of round 1 we sat 40th, 22nd and 7th! Our delusions of a sweep had been dampened somewhat, but we still felt that if our luck improved a little we should be able to win the team trophy and put any or all of us in the finals. I spent the entire day in bed, and only due to the help of Gerry Levy in obtaining some medicine (he came through again) was ambulatory to start the second day. I was the first up of our group and put up a good flight in spite of feeling a little dizzy and scored a 216, which was the high flight to this point. Mark was next up on our crew and posted an excellent 200 for his second round flight. At the completion of the second round we had improved to 28th, 6th, and 3rd. Dean and I each flew our third round flight on this day and posted scores of 172 and 214 respectively. Things were looking up for Mark and I, but unfortunately Dean was the victim of losing that first flight in front of the high judges, and the extremely turbulent air prevented him from scoring well with his large, slow EU-1.

The last day of qualifying dawned clear and reasonably calm for a change, and Mark jumped on the chance to post a 210 for his third round flight, leaving the team in 16th (tie), 3rd, and 1st. Dean flew next and posted a great 219, which ended up being the 4th highest flight of qualifying. Too bad it was so turbulent earlier, because if it hadn't been Dean would have qualified for sure. I flew next and posted a meet high 227.5. Mark finished up with a disappointing 175 as the wind returned. Qualifying ended up with myself in 1st, Mark in 5th, and Dean in 12th, and the U.S. Team in first with 1244 points over Italy (1194) and West Germany (1172).

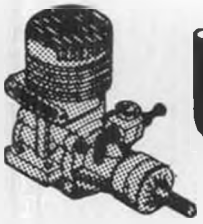
Finals day dawned windy and turbulent again, and the finalists (Dave Brown, USA; Wolfgang Matt, Liechtenstein; Ivan Kristensen, Canada; Gunter Hoppe, West Germany; Mark Radcliff, USA; and Bruno Giezendanner, Switzerland) would have to fight it out in the wind. Bruno was allowed in the finals by the jury because he was so close (one point!) to 5th place Mark Radcliff. The first round of the finals showed Wolfgang with a 3337, myself with a 3282, Mark with a 3221, Gunter with a 3160, Bruno with a 3095, and Ivan with a 3080. In the second finals round the wind got worse and no one improved their scores, so when these scores were combined with the qualifying scores the results were:

1) Wolfgang Matt 5531
2) Dave Brown 5493
3) Mark Radcliff 5275
4) Gunter Hoppe 5264
5) Ivan Kristensen 5189
6) Bruno Giezendanner 5144

The '79 World Championships are indeed over, but will never be forgotten. The hospitality shown to the modelers by the South Africans was outstanding, and the country is among the most beautiful in the world. The bad press this country has received is aggravating, and for the most part, unfounded. We are ready to go back anytime!

Leaving the country must be good for this column, as I've just returned to find a record number of letters in my mailbox. I'll dig into those next month. •

FUEL LINES



GEORGE ALDRICH
P.O. Box 817
Edinburg, TX 78539

DALE KIRN
283 N. Spruce Dr.
Anaheim, CA 92805

OTTO BERNHARDT
17119 S. Harvard
Gardena, CA 90247

Send in your questions, relative to glow or ignition engines, and these experts will give you the correct answers.

KLAUSE

SAFETY

Undoubtedly you've heard the expression, "Safety first. . ." So, I'll do that by passing along some most important information received from Marvin Denny of the Kansas Wichihawks. The information is plagiarized from an Air Force/Navy Safety Journal, but I'm sure they won't object.

The subject is MEKP. That's Methyl Ethyl Ketone Peroxide, and in case that sounds strange, it's the chemical frequently used as a catalyst for polyester resins. It's also a chemical that can blind you! A drop of it in the eye will destroy the tissue unless it is flushed out in less than four seconds! In one reported accident, which occurred while an individual was fiberglassing a chair, the victim did wash his eyes with water but only after about a minute had elapsed. Today, he's blind in both eyes.

Now you might be thinking, "Only a real klutz could manage to get it in his eyes. After all, you only put a couple drops in an ounce of resin." Maybe so, but the fact is that it *can* happen. Many of us extensively use resins in our model building (fiberglassing, micro balloon fillets, etc.). If you use resins, do so only in a well ventilated area, wear chemical safety glasses, and have an eyewash bottle or water hose, without pressure attachments, immediately available. Above all else, carefully read the labels of any product you use. These precautions amount to nothing when you realize that your eyesight is irreplaceable. I might also suggest that you immediately thoroughly wash your hands. If there's even a trace of a dangerous chemical on your hands, and if you rub your tired, sleepy eyes, the chances are that you'll contaminate them.

POWER LOSSES CONTINUED

Last month, mechanical power losses were discussed. There are other causes of poor performance. The principle one is atmospheric change. If one day your engine has a marked rpm loss, it is very commonly due to low barometric pressure. There are simply less oxygen molecules available per given volume to mix and burn with your fuel. Consequently, there will be less power. On several occasions, I've seen this happen quite dramatically at a flying site when a fast-moving weather front moved through the area. In ten or fifteen minutes, a thousand rpm were lost. Marked changes in temperature and dew point will also affect power output. That's why it is important to keep careful records on the performance of your engines. If you do, you'll be able to analyze the effects of atmospheric conditions on performance. The nice part about such knowledge is the realization that it affects other competitors as well. This is not only of some consolation if you're involved in racing events, but it will also give you an edge as far as knowing whether to change head spacing or nitro content. Next month, I intend to delve deeper into the effects of atmospheric change. This will include a series of charts that will enable you to apply correction factors to your observations. As you'll see, it is really quite simple to do.

For the present, I'll briefly mention two other things that we too often overlook. First, are you sure about the fuel you're using? If you mix your own, are you absolutely certain about the proportions? How about your ingredients? Remember, methanol sucks up moisture like a sponge. If you're using a commercial fuel, are you sure that it's fresh?

Finally, there's perhaps the least appreciated power factor: the prop. Even though you use the same brand and size prop under identical conditions, performance will vary from one prop to another. This is especially true with wooden props. It is less noticeable with injection molded props, however, there will still be variations. That's why it is so important to select and keep one prop as a test/reference prop. Use it only on a test stand with known fuel, etc., when you want to check up on the performance of an engine. By doing that you'll cut down on performance variables.

If you fly pylon and use wooden props, get a dozen or so of the props you intend to use. Number each one, go to the test stand, and find out how each one performs. Record the information in a notebook, and you'll be a leg up on your fellow competitors. For control line racers, the problem is simple. Number your props, and time your laps. This is especially useful if you use fiberglass props, where you'll find quite a difference from one prop to another. Certainly, you'll want to use the best when you race. Guys, the expression "It's what's up front that counts" really applies to racing. Get to know your props better.

In last month's article, and indeed in this one, I've used the terms power, performance, and rpm almost as if they were synonymous. Technically they are not, but under certain conditions, as a practical matter, they can be treated as being synonmous. This will become more apparent in next month's column. Until then, have some good flying sessions. •

BERNHARDT

• Quite often I receive letters from my readers bearing questions pertaining to ignition functions that may be of interest to other modelers. These questions have been put together into a general format and in the next few issues of this column I will do my best to answer them.

I have received many inquiries on exactly what a glow engine converted to ignition operation actually consists of.

Answer: A glow engine converted to ignition operation means that a set of ignition points, similar to those in an automobile (but smaller), have been fitted to the glow engine. This is the conversion. In addition, before you can operate on ignition you will also need a spark plug, ignition coil, condenser, batteries, switch, and hook-up wire. These items can be purchased separately from various manufacturers and are usually not included with the engine conversion simply because many modelers already possess them. Now, a word of caution to those who intend to use coils and condensers manufactured about forty years ago. Paper-wrapped condensers with solid lead wires are a potential source of trouble, and use of these should be avoided. Solid leads are prone to break from vibration and should never be used unsupported on anything that vibrates. I strongly advise using condensers with flexible leads and of modern manufacture if you wish to avoid a lot of frustration later on.

Old ignition coils have a tendency to lose the wax surrounding the internal wire windings, causing the inside guts to be unsupported. This will allow movement inside the shell of the coil, causing wires to crystalize and break. These coils can be salvaged by refilling with wax, but this should be done by someone who has experience in this sort of thing. Ignition coils of modern manufacture are available today, and again, I advise the use of modern reliable coils. On the other hand, don't throw any of that old stuff away. Model engine collectors go ape over it, especially if it is in its original box, and it is possible to acquire all new equipment for what you get for the old.

Another popular question is what causes an ignition engine to "miss" when running. This is a condition related strictly to the electrical system and has nothing to do with the carburetion

Continued on page 98

PRODUCT$ IN U$E

KRAFT SYSTEMS' ELECTRIC CESSNA CARDINAL AND KP-2AS RADIO, by PHIL BERNHARDT.

PHOTOS BY BILL NORTHROP

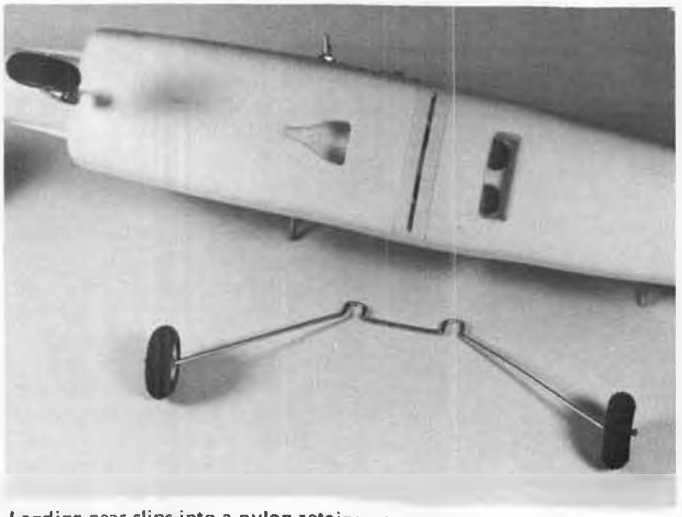
• As most R/C'ers probably know from recent ads, Kraft Systems is branching out into the ready-to-fly airplane field by offering two electric-powered all-foam models, a semi-scale Cessna Cardinal and DeHavilland Chipmunk. Kraft is also importing an electric-powered R/C motorcycle that is already proving to be such a hot selling item that hobby shops are hard put to keep them in stock. We've been playing with a Cardinal and motorcycle here at the **RCMB** office for a couple of months now, and have been having a lot of fun with them. Bill Northrop will be doing an article on the motorcycle soon, maybe in the next issue.

This review, in case you can't tell by the photos, is all about the Cardinal. Before we go any further, I'm going to be honest and say that I personally don't think much of all-foam models, mainly because I have a hard time believing that they are "real" model airplanes. However, these models are obviously filling a need; just look at the number of them being flown. Go to any active R/C field on any weekend and you'll more than likely see several. Foam is amazingly repairable with 5-minute epoxy, which makes these airplanes especially suitable for beginners. For the guy on the street who sees an R/C model flying and decides he would like to give it a try, an inexpensive ready-to-fly is unquestionably the most sensible choice. Same goes for the novice who wants to build up flight time without sinking a lot of time into a model that is so easily damaged during those first solo hours. For the experienced flier who wants a change of pace, or the fellow who has very little free time and would rather spend it flying instead of building, or even the guy who doesn't *like* to build, the molded foam airplane is a good way to go.

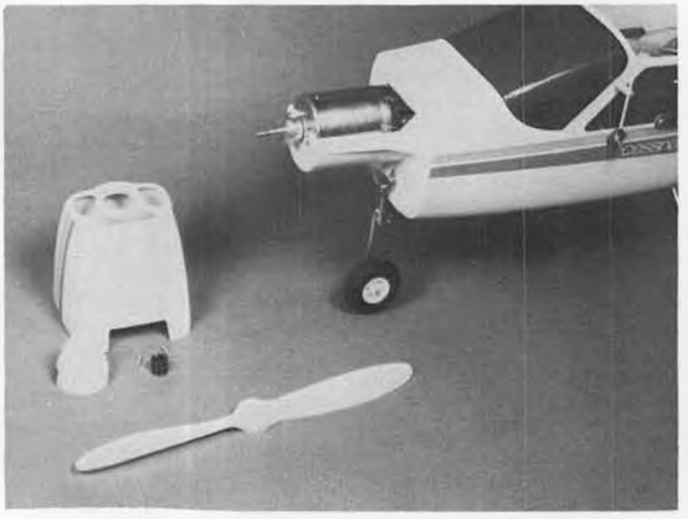
The Kraft Cardinal has something extra going for it, in the form of its electric power system. It's dead quiet, which means that many parks, schoolyards, and parking lots, places where you wouldn't have dreamed of flying your gas-powered ships, suddenly become potential flying sites. It's something to think about, especially if you have had it with waiting an hour or so between flights at your present R/C field, waiting for your turn to come up on your frequency.

The Cardinal spans 47-1/2 inches, has 295 sq. in. of wing area, and according to **RCMB's** postage scale, weighs 35 oz. In my opinion, it's the best-looking ready-to-fly foam airplane on the market. It has a clean, efficient look to it. Somebody was obviously trying to make it look like a real Cessna Cardinal . . . which is more than I can say for some of the other ready-to-flys on the market that sport the names of full-size aircraft but generally fall way short in the scale department.

The quality of the molding is also very impressive. Everything is smooth and there are no dents or scratches in any of the surfaces, although part of the fin on this model was broken (more on that later). The front of the foam fuselage has a molded hard plastic firewall glued on which acts as a motor mount and nose gear mount (see photo). The motor, nose gear, cowl, and all wiring is installed at the factory, so there is no way you can screw it up. The buyer is left with the job of putting on the mylar trim stickers (all but the long stripes on the



Landing gear slips into a nylon retainer, is easily removed for straightening. Note battery cooling air inlet and exit holes.



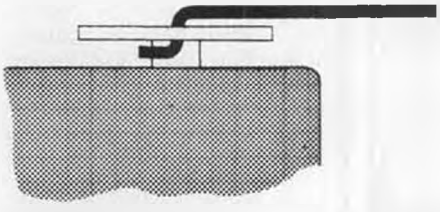
Motor is fastened to a plastic mount that also holds the nose gear. Two screws hold plastic cowl in place. Top Flite 8X4 prop.

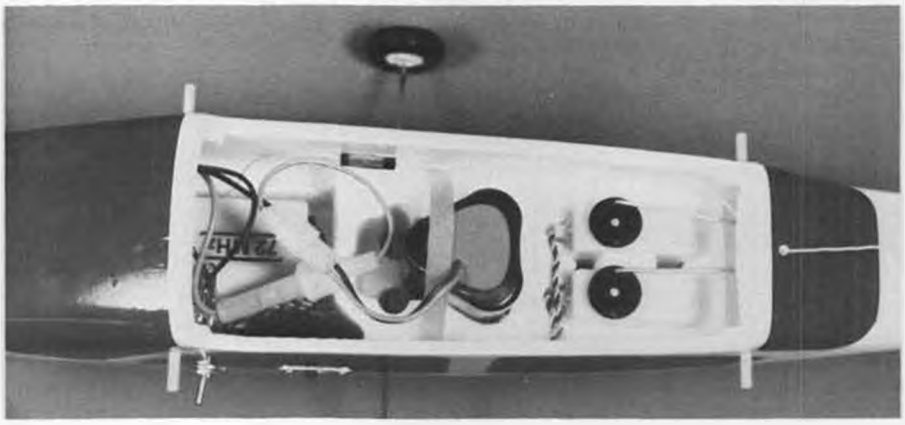
side, which are put on at the factory), snapping the main gear in place, putting the stab on, securing the two molded foam radio trays in the fuselage, gluing in the dowels for the wing rubber bands, and applying four pieces of heavy mylar tape to the wing to keep the rubber bands from digging into the foam. The instructions are clear and explicit and everything fits like it should.

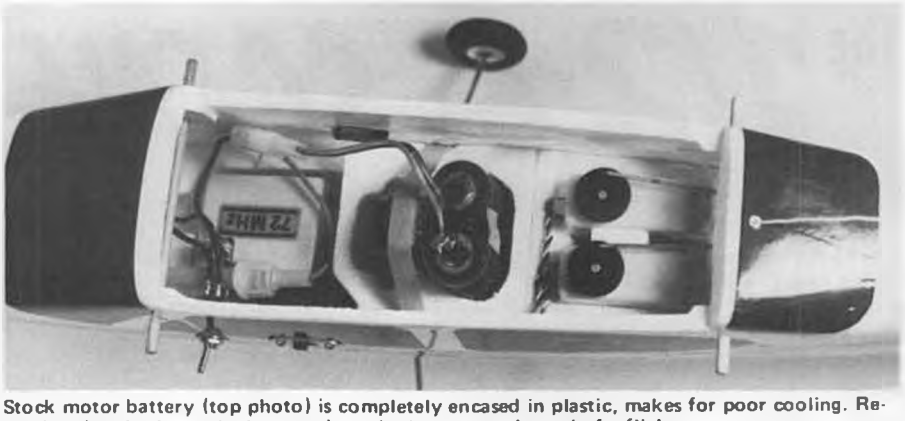
Now, about that broken fin. The fin has an extension that goes back over the rudder (see photo). This part was broken when we received the airplane, and I somehow managed to break it off again during assembly. The cure was to glue the part back on with 5-minute epoxy, then push a round toothpick into it from the rear. Even if yours isn't broken, I still recommend the toothpick treatment, as it will probably save you a repair job later.

Radio installation is equally quick and simple. A Kraft KP-2AS two-channel system was supplied along with the airplane, and it's obvious from the way the components fit that this is the rig the airplane was designed to use. The battery holder friction fits into a rectangular depression in the tray, the receiver is held down with double-sided tape, and the servos are pushed into a rectangular hole, then held tightly against the sides of the tray by means of a foam wedge inserted between them.

A word about the pushrods is in order here. They come already made up and have a Z-bend at the servo end and a nylon clevis on the other. The pushrods cross and pass one over the other somewhere aft of the servos, and you'll probably find that they are rubbing against each other and creating a bit of drag that the servos will have to overcome. To avoid this, turn one of the pushrods over, so that the pushrod wires exit the top of one servo wheel and the bottom of the other servo wheel. Here, I'll draw a picture. Make one like this:

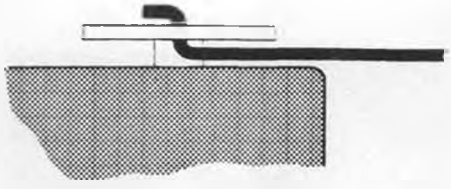






Stock motor battery (top photo) is completely encased in plastic, makes for poor cooling. Removing the plastic results in a much cooler battery at the end of a flight.

And the other like this:



So much for the pushrods.

Since we're talking about the radio, let's take a look at the two-channel Kraft Sport Series systems. What is basically the same system is available with three different transmitters, the system's designation depending on its transmitter type. The KP-2A unit has a Tx with two single-axis sticks; the KP-2AW has a wheel transmitter for cars and boats; and the KP-2AS has a Tx with a single, dual-axis, open-gimbal stick. The rest of the system components are the same. Included with the transmitter is the receiver, of course; two KPS-14IIA servos, a switch harness, and battery holders (for AA size dry cells) for both the transmitter and airborne gear. Optional install-it-yourself Ni-Cd packs for both Tx and Rx are also available. A charging jack and LED come already installed in the transmitter case, should you decide to go this route later.

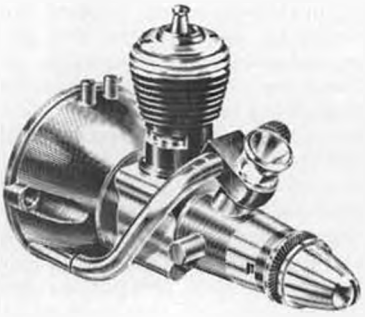
These two-channel Sport Series radios are the "low-priced spread" of the Kraft line. I didn't like the transmitter at first, as it is small enough that my fingers touch on the back of the case, but I've gotten used to it and it doesn't bother me any more. A nice feature of all Kraft Sport Series systems is that you can switch frequencies on both the Tx and Rx on the 27 and 53 mhz bands, but only on the Rx on 72 mhz. (I understand it is

Continued on page 95

Fin extension over rudder is prone to breaking, text tells how to cure this. Stab is held in place by friction and a plastic screw.

Mitch Poling, our "Electric Power" columnist, gets both feet off the ground while launching the Cardinal in a schoolyard near the RCMB office. Can't fly there with a gas model!

Really neat and clean-looking 1/2A C/L stunt model by Richard Byron looks like a scaled-down version of a modern .40-size ship, yet is almost 10 years old.



Sniff, sniff . . . gone forever after nearly a 20 year production run is the Cox .010. Sales aren't good enough to continue production.

The 1/2-A SCENE

By LARRY RENGER

PHOTOS BY AUTHOR

• Yet another month has flown by and I have a neat crop of new pictures to show you. In addition, I have received a lot of information on the Sky Fury Twin engine that was shown in a photograph in the August '79 issue. The information came from Francis Locklear (1820 Druid Hill Ave., Baltimore, MD 21217), James Westphal (1805 N. H Street, Fremont, NE 68025), and John Roberts (P.O. Box 332, Cantonment, FL 32533).

Basically, the Sky Fury and the twin versions were made by K&B Mfg. Co. (now a part of Leisure Dynamics, as is Cox, by the way) in and for just a few years after 1955. Three different sizes of the twin were made, in .099, .12, and .15 cu. in. displacements. The engines were also available in a marine and even an outboard version.

The engine's design was quite interesting, as it was an inline 180 degree firing design. The venturi was in the center and fed the two cylinders separately through a double-ported connecting drive shaft. It was noted that the best way to start the engine was with exhaust priming, as a venturi prime would invariably flood one cylinder and leave the other one dry. In addition, it was crucial that both plugs be provided with a good battery supply, preferrably independent. All three sizes were built with the same external dimensions, the casting being that of the .049 Sky Fury. Cylinder bores yielded .049, .060 and .075 cu. in. with the same stroke.

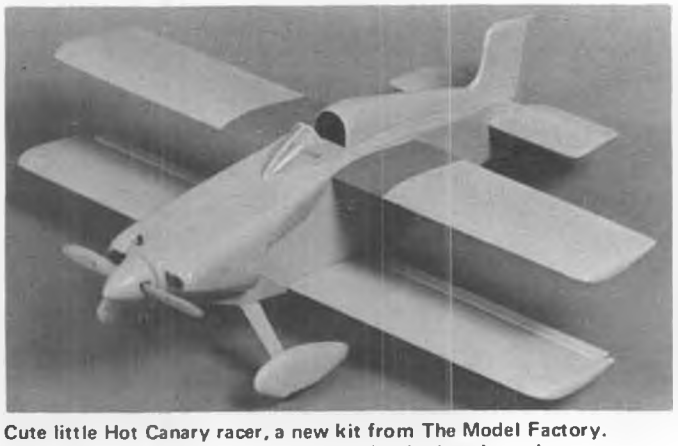
As is usual with multi-cylinder engines, the performance was not spectacular. Typical performance with an 8x4 prop was only 9,000 rpm on the .15 and went up to 14,200 with a thin blade 7x3 prop on that engine. Of course, the sound was something else, as you got two engine pulses per stroke, or over 28,000 per minute on that 7x3! It took nearly 20 years for the Cox .15 to make the same kind of sound again. The actual sound level was comparatively low, and vibration was extremely low. The real advantage to the engine was the remarkably small frontal area for an engine of that capacity. P.F.G. Chinn, in his article on the engine in the Nov. 1955 issue of *Model Aircraft* (a now-defunct British publication), judged the engines not to be comparable directly to single-cylinder engines of the same displacement, but to be of a very respectable performance on the basis of power to weight.

Super Tigre's newest, the Schuerle ported X-11. Also available with standard carb.

Thank you, gentlemen, for this enlightenment. It is interesting to see how different things have been made in the past. Kind of makes you wonder what could be done with the same concept with modern materials and engine design techniques. Such a clean configuration would sure go well in a pattern model, especially with a joint muffler and single carburetor. How about it, Mr. Brodbeck?

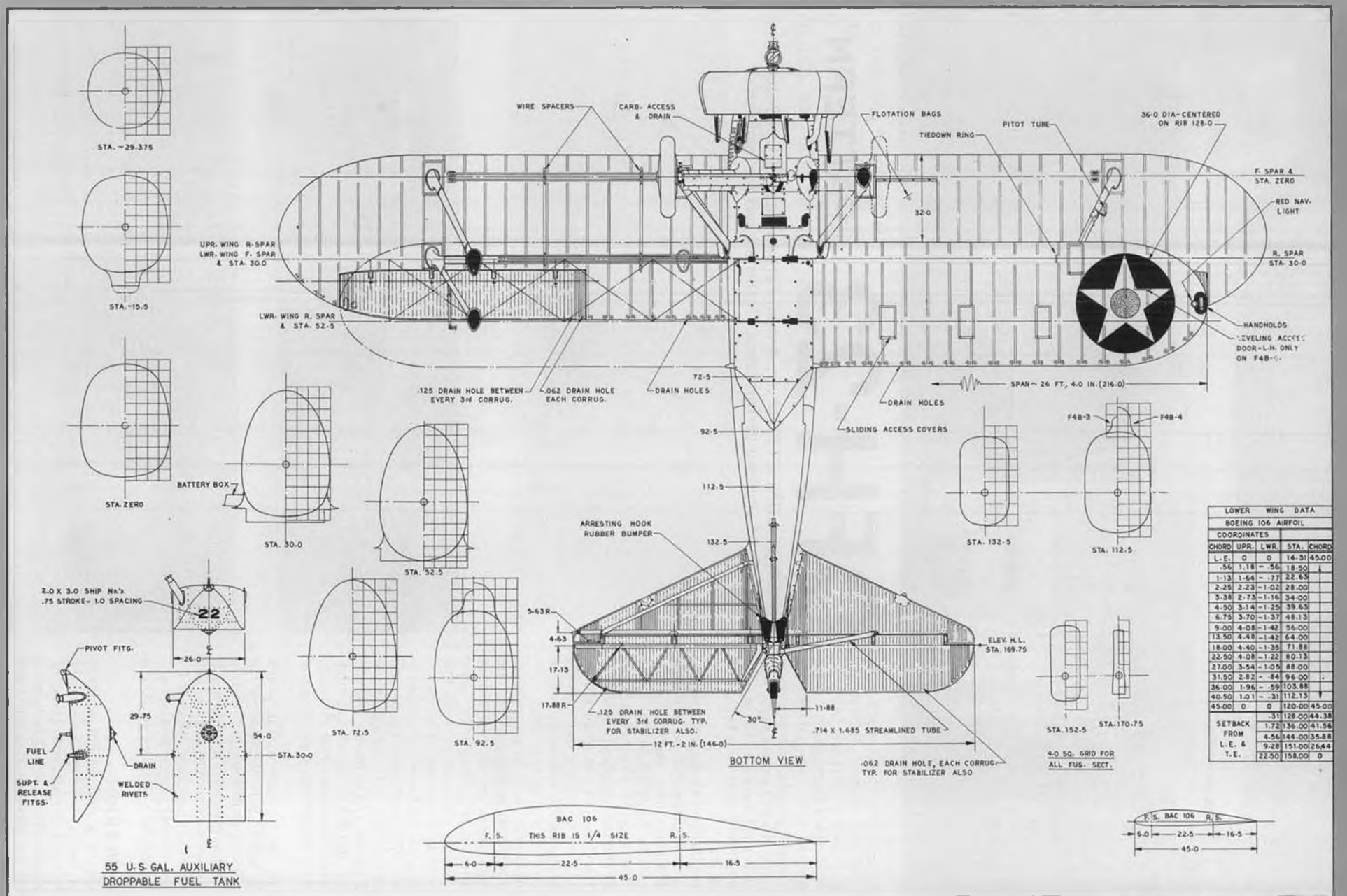
Next item came in a letter from an old friend, Curt Moss. He is an active 1/2A'er from Florida (6242 Royal Oak Dr., Orlando, FL 32809) and sent some nice, but color photographs (can't be reproduced) of his .049 twin engined models. He also described his method of designing models, which I will reprint here as the "Beginner's Workbench" for the month (I'm really getting lazy lately, but at least I won't plagiarize):

Continued on page 81



Cute little Hot Canary racer, a new kit from The Model Factory. Super fast and responsive, a slower version is also planned.

Sleek C/L delta by Tyrone Parker. Looks like a Tee Dee with a muffler in back. See text for construction details.



LOWER WING DATA				
BOEING 106 AIRFOIL COORDINATES				
CHORD	UPR.	LWR.	STA.	CHORD
L.E.	0	0	14-31	45.00
.56	1.18	- .56	18-50	
1-13	1-64	- .77	22-63	
2-25	2-23	-1-02	28-00	
3-38	2-73	-1-16	34-00	
4-50	3-14	-1-25	39-63	
6.75	3-70	-1-37	48-13	
9-00	4-08	-1-42	56-00	
13.50	4-48	-1-42	64-00	
18-00	4-40	-1-35	71-88	
22-50	4-08	-1-22	80-13	
27.00	3-54	-1-05	88-00	
31.50	2-82	- .84	96-00	
36-00	1-96	- .59	103.88	
40-50	1-01	- .31	112.13	
45-00	0	0	120-00	45-00
		.31	128-00	44.38
SETBACK FROM L.E. & T.E.		1.72	136-00	41.56
		4.56	144-00	35.88
		9.28	151.00	26.44
		22.50	158.00	0

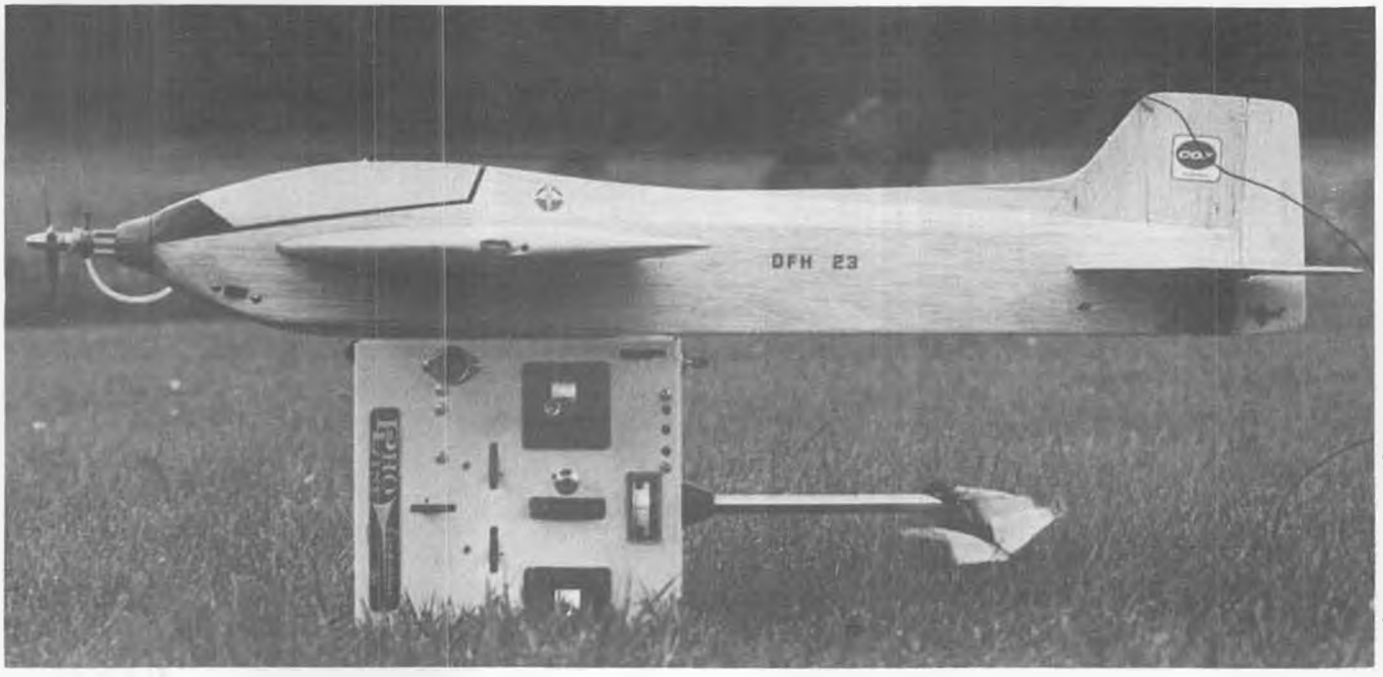
PETER WESTBURG — SANTA MONICA, CAL. — JUNE, 1979

SCALE-1/12 SIZE

BOEING F4B-4/-3

SCALE BAR .0833 = 1 IN. — 1 IN = 1 FT.

SHEET 4 OF



PHOTOS BY AUTHOR

DFH-23

.020 .020 .020 .020 .020 .020
.020 PATTERN .020
.020 .020 .020 .020 .020 .020

By BENGT LUNDSTROM . . . A mini Pattern model from Sweden that is capable of amazing performance. Definitely not for beginners!

• The combination of the very powerful Cox TD .020 and modern lightweight radio gear makes it possible to fly all maneuvers in the FAI program except start (no wheels), spin, inverted spin (no throttle), and landing (no wheels). Perhaps a rule cheater would argue that it is "scalelike performance" to catapult (hand launch) and land on a belly sled like the Me-163?

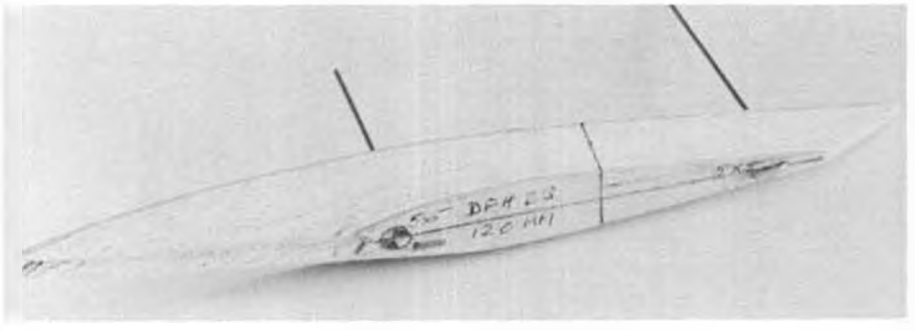
It is more difficult to do the maneuvers with a small plane. A 5-second slow roll feels like 15 seconds, and it is hard to keep it in stable knife-edge flight. The "full size" .60 engine is 30 times as big as the TD .020, but the big planes' weight is only 15 times that of the small plane. That makes all climbing maneuvers more difficult, as the power-to-weight ratio is only half that of the .60's.

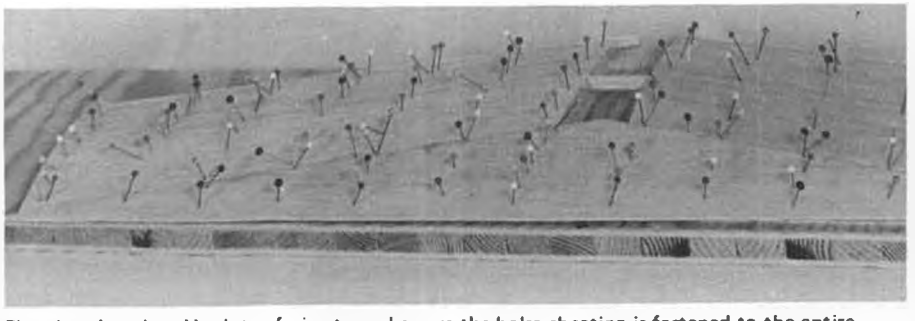
But think back 10-15 years and remember that the .60 engines of that time had only half the power of the modern OPS and similar .60's. That is the same power-to-weight relation as with this .020 model (if we forget about propeller efficiencies). We had world championships in the 60's with old Vecos and Super Tigres of that time, and all were impressed by the performance. Nowadays people grumble about too high speed, safety, cost, noise, field shortage, transportation problems, and so on and so forth.

Then why not fly Pattern .020, which we can do today? It is not suitable for beginners or old fumble fingers. And we can let Grandpa play with his ridiculous mammoth planes. He needs the size and slow movements because of slightly dimmy eyes, fumbly fingers and not-so-quick reactions. Let's all other go .020 (is anyone left?).

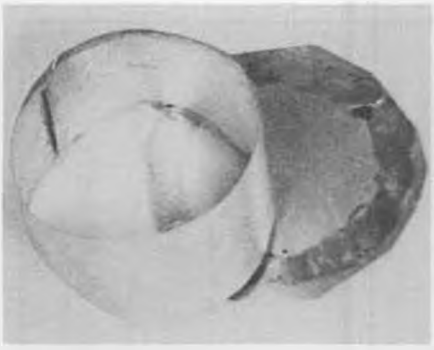
BUILDING THE MODEL

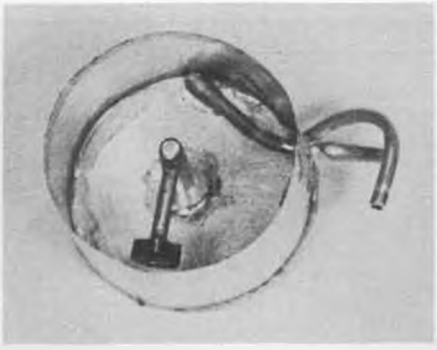
You must be a real weight watcher when you build it. First, always use lightweight balsa, then as little epoxy or white glue as possible. Use old-fashioned model glue or modern cyanoacrylate glue (Zap, Hot Stuff, etc.). Finish it with

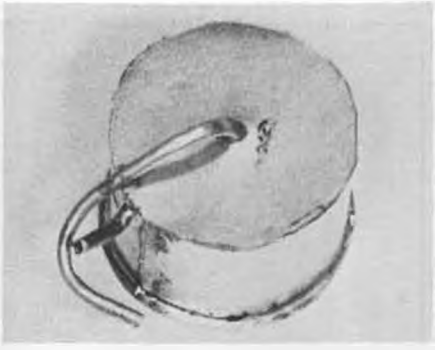




Sheeting the wing. Use lots of pins to make sure the balsa sheeting is fastened to the entire length of each rib.







Fuel tank space is limited, so a special tank is needed. This one is reminiscent of the old deBolt "clank" tank. The fuel pickup tube is weighted (see middle photo) and can swivel a full 360°, ensuring good fuel draw regardless of the model's attitude.

dope and only use an epoxy fuel-proof coating at the tank area back to the wing. The foam rubber around the R/C gear weighs a lot; use strips of Ace "Sticky Foam" instead. The R/C gear connecting wires can be shortened and even the servo connectors can be taken away.

THE WING

The rear part of the airfoil is flat, and as there is no dihedral, the whole rear part of the wing is flat. Therefore, if you have a flat building board, you just pin down the rear sheets and the wing will be straight and warp-free.

A) Make one wing rib pack as shown in the photo and use every second rib to the right and to the left (you won't feel the different thickness in flight). Mark where the flat part starts.

B) Cut one sheet covering the flat area.

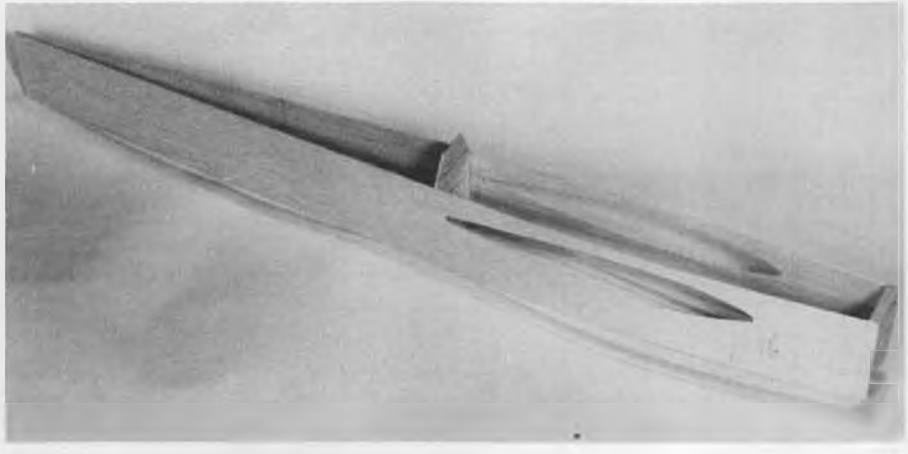
C) Pin it to the building board with the ribs on it. Fit the front spar and the short connecting center spars. Put on the top sheeting starting from the leading edge. Note that the wing is open in the front center except for the short center spars.

D) Turn the wing over and put on the front sheeting.

E) Mount the aileron torque rods and tubing.

THE TANK

The standard Cox tank is only used as a spacer because it is too small and won't work during inverted flying. The standard clunk tank won't work in this size. Therefore, a special homemade tank is needed.



First step in building the fuselage is to glue the firewall and main bulkhead in place, and glue the sides together at the tail.

A) Start by soldering an open cylinder.

B) Solder the front end.

C) Make the plumbing and solder it to the open tank. The moving part must rotate easily.

D) When satisfied, put on the back end.

E) Leak test under water.

THE FUSELAGE

A) Make the fuselage sides and bulkheads. Glue the sides to the big wing bulkhead and the front bulkhead and at the tail.

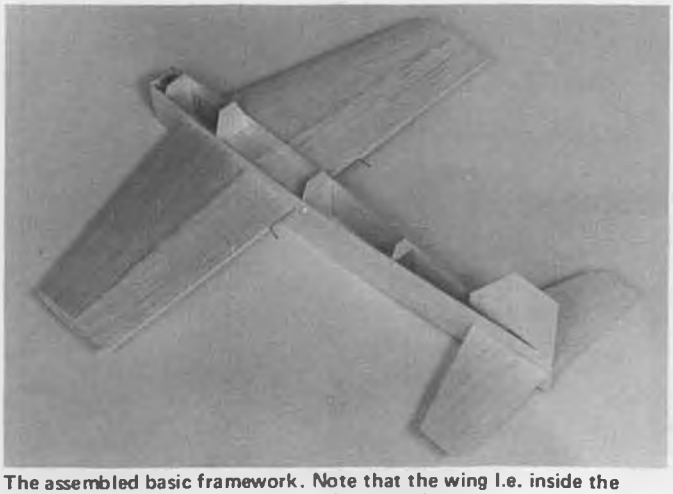
B) Put in the tank and all bulkheads.

C) Push in the wing and mount all details.

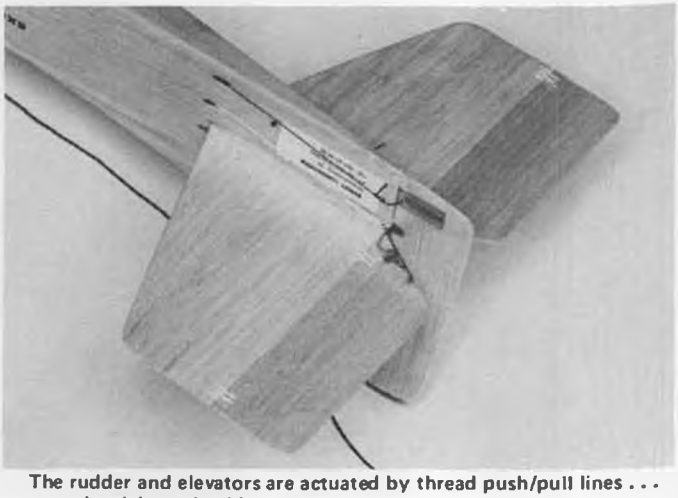
D) Mount the stabilizer and fin.

E) Put on the top angled sides and then the top sheet.

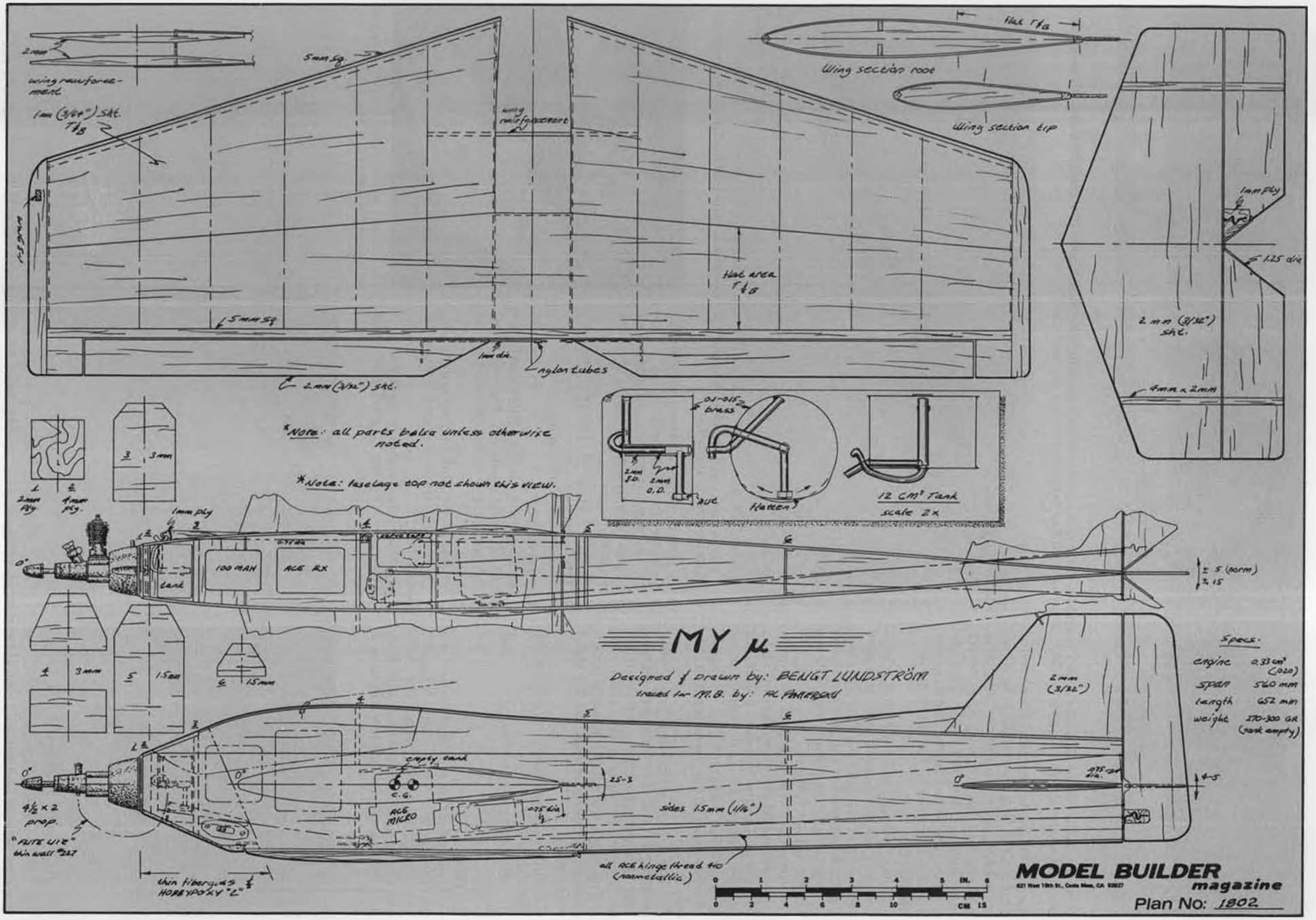
The DFH-23 with Proline transmitter to give an idea of the size of this wee beast.

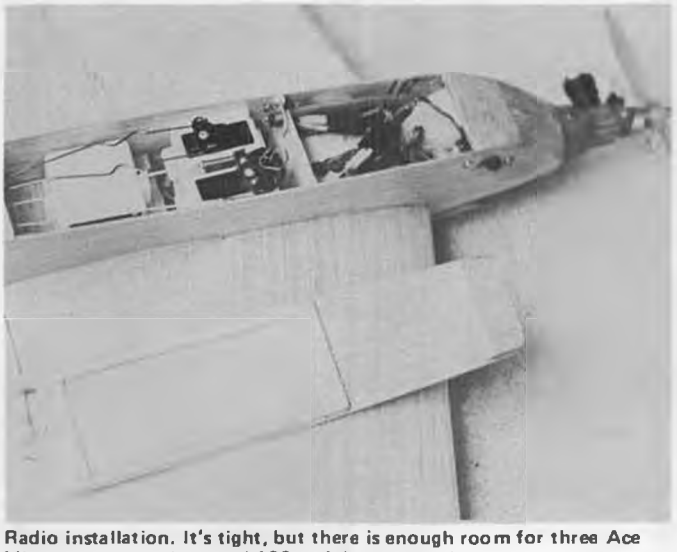


The assembled basic framework. Note that the wing l.e. inside the fuselage is cut away to make room for the R/C gear.



The rudder and elevators are actuated by thread push/pull lines . . . a good weight-saving idea.


wing reinforcement
1mm (3/64") sht.
5mm sq.
wing reinforcement
Wing section root
Wing section tip
1mm ply
1.25 dia
2 mm (3/32") sht.
4mm x 2mm
Hat area
5mm sq
1mm dia.
nylon tubes
2 mm (3/32") sht.
*Note: all parts balsa unless otherwise noted.
*Note: fuselage top not shown this view.
.01-.015 brass
2mm I.D. 2mm O.D.
Hatch
12 CM³ Tank
scale 2x
1mm ply
100 MAH
ACE RX
tank
MY μ
Designed & drawn by: BENGT LUNDSTRÖM
traced for M.B. by: AL PARKROW
2mm (3/32")
Specs.
engine 0.33 cm³ (.020)
span 560 mm
length 652 mm
weight 270-300 GR (tank empty)
empty tank
C.G.
ACE MICRO
sides 1.5mm (1/16")
4½ x 2 prop.
"ELITE LITE" thin wall #227
thin fiberglass HOBBYPOXY "L"
all ACE hinge thread #10 (nonmetallic)
MODEL BUILDER magazine
Plan No: 1802



Radio installation. It's tight, but there is enough room for three Ace Micro servos, receiver, and 100 mah battery pack.

The author getting ready for a flight. With this size airplane, you can fly at fields you wouldn't have dreamed of flying at before!

F) Make the nose part of scrap balsa.

G) Put on the bottom sheeting and make the hatch.

H) Mount the front ply bulkhead.

I) Make all movable control surfaces.

FINISHING

A) Fiberglass the nose as shown on the plan.

B) Dope the entire model, only 2 or 3 coats are needed.

C) Epoxy fuel proofer is needed on the fuselage in front of the wing.

RADIO INSTALLATION

A) Mount all movable surfaces. Put on the piano wire horns.

B) Use Ace hinge thread to move the elevator and rudder. For safety, use double threads to the elevator. This way there will be no looseness from servo to elevator and rudder.

C) With the threads put in and mounted to the servo, put servo tape on the servo and stretch the threads by moving the servo forwards. Mount the servo. To adjust flight trim, just bend the piano wire horns.

D) The aileron uses piano wire push-rods.

E) If you feel embarrassed by flying with a carb needle out of tune, mount an engine cut-out. It is actuated by applying full left rudder trim and full left rudder.

FLYING

A) Adjust the CG by adding lead to nose or tail.

B) Adjust all movable surface deflection as indicated on the drawing. Always try to use as low sensitivity as possible.

C) Fly.

D) The aileron throw should give 3 rolls in 5-6 seconds.

E) Adjust inside and outside loop radii to be the same and as big as you dare to have them. Always test the outside loop radius upwards from inverted flying.

F) Check the wing tips to make sure they weigh the same. This is very important. First, make a ground check. The left wing is usually a little too light because of the engine tilt. Now fly upright with straight trim. Roll to inverted and see which wing goes up. This tip needs 1-3 grams.

Now apply heavy G-loads. This is best done by doing outside loops downwards flying away from you. If the model has rolled to the left on top of the loop, the right wing is too light and needs .2-1 grams. This method works because the G-forces are added to the gravity at the bottom but vice-versa at the top.

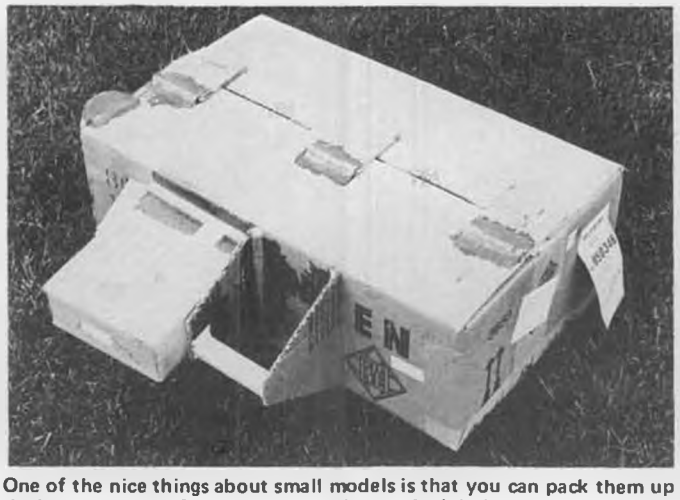
G) The TD .020 has a noise level without muffler which should be lower than the FAI level. Use 30-50% nitro.

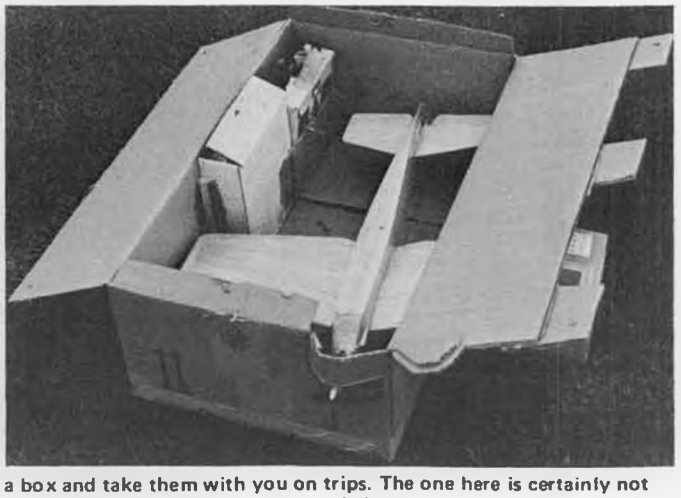
H) I am using an Ace "Micro Flite Pack" with a Proline transmitter, which works fine. If you want to improve climbing maneuvers you should install dual sensitivity at least on the ailerons. That extra aileron throw helps when you lack in power.

I) With an Ace 100 mah ni-cd battery you cannot make more than two safe 7-minute flights. The third flight is a borderline case. If needed, you can have a spare 100 mah ni-cd.

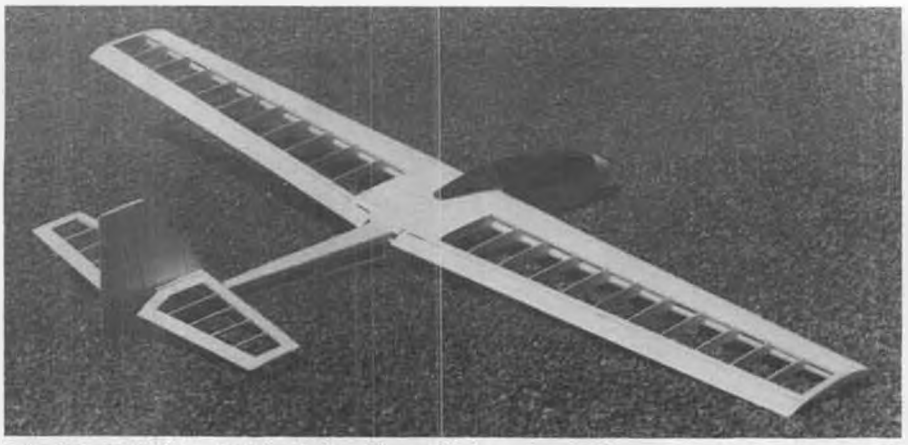
You can also field charge the battery from your car or starter 12-volt battery. Use a series connected dropping resistor of 200-220 ohms and 1/4-1/2 watts, which gives a 30 ma charging current. After 1-1/2 or 2 hours you can make another 2 flights.

J) One most pleasing feature of models of this size is that you easily can make a transportation box. Then it is a real joy to walk to your small nearby field and fly. •





One of the nice things about small models is that you can pack them up in a box and take them with you on trips. The one here is certainly not the best example of such a box, but it gets the job done. Carries the model, Tx, and all ground equipment needed.



Newest glider kit from Pilot is the Q.B. Slope 16, shown here before covering. Uses two or three channels and is designed for easy and quick assembly. Spans 63 inches.

The Q.B. Slope 16 in action at Torrey Pines. Looks like a good sport model.

R/C SOARING

by Dr. LARRY FOGEL

PHOTOS BY AUTHOR

• If you're looking for a project to fill those many long winter nights, *don't* build either of the Pilot Q.B. (Quick Built) glider kits currently offered by Hobby Shack. But if you're looking for an easy-to-build, good-looking sailplane . . . *this is it.* The Q.B. series now includes the Q.B. 2500, a smart-looking standard class two-channel thermal sailplane; and the Q.B. Slope 16, an aerobatic machine that goes together in one week's worth of evenings. Actually the Q.B. Slope 16 is very similar to another new Pilot kit, the Divine Wind, which has a 65-inch span, 527 square inches, and weighs almost 3 lbs. (for aileron, elevator, and rudder, if desired). For comparison, the Q.B. Slope 16 has a 63-inch span, 496 square inches, and weighs almost two pounds (for the same kinds of control).

I'm sure the Divine Wind is also a fine kit, but as far as I'm concerned, the Q.B. Slope 16 has a crucial advantage: it goes together almost without effort. You see, the Q.B. series kits include exact die-cut plywood fuselage sides and bulkheads, machined balsa wing ribs, and notched leading and trailing edges for the wings and stab. You simply press out the parts, snap them into place, and in a few hours the only thing left to do is sand the nose block, smooth the surfaces, cover the plane, and install the radio.

I used Hot Stuff to further speed the assembly process. Each joint was then sealed with a bead of Titebond, "just to be sure." The design layout is neat and clever. Before I knew it, construction was complete, and *without ever pinning pieces to paper.* What a joy!

If there's anything to complain about, the instructions could be more complete for the sake of the absolute novice. It's important to fully seat the spruce spars into each rib notch, to clip the webbing fill that joins these spars, to drill *straight* holes for the stab support wires, and to make certain the wing halves are aligned properly. Simply good building technique? Sure, but some of these important details may not be obvious to the beginner as he faces his first kit. The radio can be three servos or a brick with separate aileron servo (mounted inverted in the center section of the wing). It's a good idea to increase the length of the canopy hold-down screw. I chose to reconfigure the aft pushrod wires so that they come out of the fuselage sides rather than the top, this solely for the sake of appearance.

When finished it sure looks great, and performs accordingly. This lightweight configuration is handy for light lift conditions. I added a plywood ballast mount at the C.G. to allow adding up to 10 ounces of lead in successive steps. Got to be ready for that really big blow, whenever it comes.

In flight the Q.B. Slope 16 moves right along right side up or inverted. It loops inside and outside, but requires a bit of ballast for follow-through in the more complicated maneuvers. I prefer a more aft C.G. than that shown on the plans and greater aileron deflection. It also helps to seal the aileron gap with Monokote. Remember that direct sunlight on

Mike Condon is one determined young fellow. He's paralyzed from the neck down, yet flies a sailplane using his chin to move the stick. He's been at it a year, is quite good.

Jim Crisman's Sail Gull is one of the more successful bird-like models to come along. Has ailerons and elevator. Note clear plexiglass fin, almost invisible in flight.

Ken Raymond's new super-light 2-meter sailplane is proving to be a real threat in 2-meter events. Total weight is a mere 19 ozs.

Ken's bird uses a flat center section wing and 8% thick airfoil. Fuselage is open on top and bottom, covered with Monokote.

any plane stowed in a sealed space (such as the back of a car) is bad for the canopy, to say nothing of the radio inside the canopy.

Harvey Denton, of Mill Valley, California, is a senior Pan American pilot. You know, the kind who flies the 747 around the world. But when I met him, he was flying a very modified Spirit of '76 (the foam glider also offered by Hobby Shack). But now there's no dihedral and the wings are equipped with 1-1/8 by 9-inch ailerons. They're swept back at 10 degrees to increase the nose weight. A dorsal fin has been added to reduce adverse yaw, and there have been other changes to make this plane meet the needs of a low cost trainer with some aerobatic capability. Actually, Ken Brassler, a United Airlines pilot, provided the original idea for this modification, and Harvey has carried it through in flying style.

Jim Crisman, of Palm Desert, California, built the Sail Gull. This plane was originally designed by Dr. N. Cook in England. He called it the Golden Eagle. The attempt was to make a full-size model bird suitable for slope soaring.

This 63-inch span craft is built up of balsa and plywood, covered with Super Monokote, and uses a 1/8-inch clear plexiglass rudder. I understand that the plans for this plane can be purchased from Radio Modeller, 641 Wellington Road, Hampton Hill, Middlesex, England. The original plans call for covering in light to dark brown, but Jim preferred the gray/white/black to improve visibility and reduce heat absorption in the desert sun. The wing is undercambered and reflexed, using an I-beam spar system. The excitement may peak when you come upon another bird of similar configuration ... one that does not require radio control.

John Cooney decided to stretch his Olympic II. The following description is quoted from the "Silent Flyer," a publication of the South Bay Soaring Society: "The original 99-inch, two-piece wing design was extended to a four-piece, 152-inch wing . . . two inner panels with top sheeted leading edges (84 inches combined) and 34-inch plug-in tips. Turbulators and a built-up trailing edge run the full length, using the original chord. The rudder was enlarged 80% by extending the leading edge to meet the hinge line and extending the trailing edge 1-1/4-inches. Considering the extended wing, the tail's relative moments of inertia are not changed. Other modifications include 18-inch spoilers, two wing rods, and a spruce (rather than balsa) trailing edge spar.

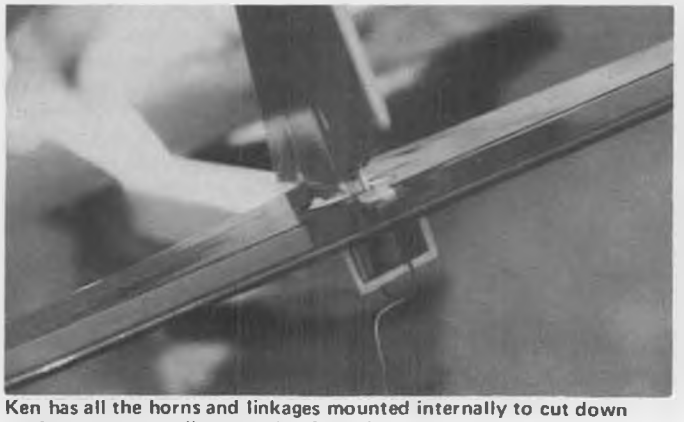
"John's stretched Oly flies at about 58 ounces, and he claims that it turns much like a standard Oly. It even slopes well without the tips. Performance will improve with the addition of plug-in anti-vortex tips. The 840 square inch wing area (without outer panels) is not much less than the regular Oly wing. Looking at his hybrid plane, if he had to do it over again, John would have added a little more dihedral."

Ken Raymond, of the Torrey Pines Gulls, has been determined to capitalize on light wing loading in the two-meter class. He's now come up with a 19-ounce bird that floats and penetrates, a remarkable combination. The 8 percent thick airfoil has Phillips entry. It has a

Going up on the line. Light weight and large wing area make for high launches.

9-1/2 inch chord, tapered in the outer panel to 5-1/2 inches; 12 degrees dihedral, the wing being held to the fuselage by rubber bands in the center section, thus reducing drag. The fuselage is a constant rectangle section throughout. This helps to eliminate flex in tight maneuvers. The top of the fuselage is Super Monokote over cross beams ... another weight saving. The tail is built-up, with all horns mounted internally. An Ace radio provides the two-channel control. In spite of the light weight, the plane has a 450 milliamp battery. It responds well, launches

Continued on page 88



Ken has all the horns and linkages mounted internally to cut down on drag, yet are easily accessible for adjustments.

Well, it's not the prettiest glider in the world, but it gets the job done. A highly modified Spirit of '76 by Harvey Denton.

A GLIB GLOSSARY OF .....

GLIDER GIBBERISH

PART TWO

By DAVE THORNBURG . . . Our resident glider sage presents the second part of his mini-dictionary of glider terminology. Study the terms and use them frequently . . . your friends will really be impressed!

• Here's the second half of the mini-dictionary of sailplane terminology begun last month. We've skipped over basic words like *fuselage* in order to concentrate on the words and phrases you won't find in your Funk & Wagnall's; terms peculiar to the art of radio-controlled soaring. File these two issues in a handy place, and use them to settle arguments. Or start them.

PENETRATION:

Not a sexual term, in spite of the curious nose shapes you find on modern fiberglass sailplanes. *Penetration*, as glider folk use it, refers to a plane's ability to move upwind. A plane is said to be a "good penetrator" if you can drive it around the sky pretty much at will despite the twenty-mile-an-hour breeze that every flying field comes equipped with.

Two things affect penetration: wing loading and drag. Raise your wing loading (read: "add ballast at your CG") and you raise your cruising speed, which increases penetration, right? But ballast also increases your landing speed (boo!) and the force with which you smite the earth at the end of each flight. Neither of these side effects are particularly desirable, and for that reason ballast has never been my drug of choice. I prefer to work at reducing drag, instead.

Beware of folk who tell you that reducing drag won't increase your penetration. They are arguing from full-scale formulas, which can be misleading. Drag is incredibly important in models, compared to full-scale. A man-carrying Libelle sailplane has a flying weight of around 850 pounds, and a total drag component (induced plus profile) of under 25 pounds. To match the Libelle in efficiency, a 40-ounce Olympic II would have to have a total drag of about 1.18 ounces! If such an Olympic II could be built, you could power it in level flight with the rubber band and propeller from a 49¢ "Sleek Streek," available at any drug store!

But how can you go about reducing drag on an existing model? You can't streamline the fuselage without building a new one. Even moving the wing-attachment rubbers from external (Windrifter, Oly II) to internal (Bird of Time, Paragon, Mirage) can become a major operation. Switches, antennas, skids can be cleaned up, but they are minor, and may not result in any visible difference.

What will make a difference is to attack the *induced drag* of your present plane. Almost every kit and magazine design is "balanced" aerodynamically for beginners; the CG is forward of the ideal, the decalage is higher than optimum. Planes set up this way are stable, easy to fly, and forgiving. Their elevators are relatively insensitive. They are really just free-flights, designed to be interfered with occasionally by radio. And not even modern free-flights, at that . . . they're antiques. They fly like pigs.

To make them penetrate you have to move the CG back (sometimes 1/4 inch is enough) and reduce their decalage until they are once more in aerodynamic balance. This makes their elevators very sensitive, and calls for reducing elevator throw a bit. But it's worth it . . . they become totally different machines. Back in the days when the Hobie Hawk was considered fast (read: "a good penetrator"), Steve Work used to outrun the Hawks easily in speed events with a stock Windrifter, just by moving the CG aft and adding a bit of ballast.

Try it. I guarantee it will increase your penetration. And if you go too fast and rip your wings off, don't come crying . . . that just means you were ready for a new plane anyway!

PHILLIPS' ENTRY:

Another way to increase penetration (see above) is to raise the entry point on a flat-bottomed airfoil. The entry point is that magic point at the very front of the airfoil where the air molecules part company, some going over the top and others going under the wing. Unless the airfoil is perfectly symmetrical, the molecules that go over the top have to travel farther than the molecules that go underneath. This requires time to move faster than the molecules below in order to get to the same place (the trailing edge) at the same time. And this extra speed lowers the air pressure above the wing, sucking the wing upwards. Behold: *lift!*

Sometimes too much lift, in fact, because lift is the chief cause of drag, and drag is a Great Evil. Most planes on the market today generate far more lift (read: drag) than they need. A sailplane wants only just enough lift to glide reasonably well between thermals. Let's face it, wing lift alone is never going to hold a plane up. Only rising air can do that. So why try to design for more lift . . . it will only slow you down when you're trying to get through the sink to the next thermal.

For this reason many people raise the entry point of flat-bottom airfoils. This helps to "even up" the distances that top and bottom molecules have to travel in getting back together at the trailing edge. Less lift is produced, but less drag as well. Raising the entry point is called "adding Phillips' entry." This is what Skip Miller did to the Aquila airfoil to win the World Champs back in '77.

POD AND BOOM:

When a water droplet falls out of the sky, we are told that it assumes the shape known as a "teardrop": rounded in the front, fattest about 1/3 of the way back, pointed at the rear. This information has caused some nature-lovers to conclude that the teardrop must be, of all possible shapes, the most aerodynamically perfect. So for many years people built bombs and aircraft drop tanks in this shape . . . perhaps to keep them from whistling and screeching as they fell, and unduly frightening the good folk below.

Inevitably, this "ideal" shape found its way into soaring. Back in 1942, William Hawley Bowlus created the amazing "Super Albatross" by building, from veneer plywood, a teardrop large enough to surround a man, and ramming a long pole up its rear, popsicle fashion. The result was the pod-and-boom fuselage. Today you can find pod-and-booms on the Airtronics "Grand Esprit" and on Cecil Haga's "Legionair" series. Are they really cleaner than conventional fuselages? Who knows? They're lovely.

RUDDER AND FIN:

Sometimes folk distinguish between these two, sometimes not. Technically, the *rudder* is the moving part, the *fin* the fixed part. The rudder and fin together are also referred to as the *vertical stabilizer*. How's them apples?

SCIENCE:

The simplest of many equally plausible explanations for the apparent facts, as we presently misunderstand them.

STALL:

The little air molecules that go humming across the top of a wing (see "Phillips' entry") try their best to follow the exact contour of the airfoil. For the first one-third of the trip this is easy; the wing contour is climbing toward its high point and forcing the little beggars to climb with it. But what happens *after* the high point, when the wing contour starts to fall away downhill like a ski slope? The molecules may try to follow, but their heart isn't in it, and at some point they run out of cohesive energy and break loose into chaos and pure drag. Airfoil designers use every trick they know to make those molecules hang on and contour the airfoil as long as possible.

But then along comes the stall, and frustrates both the designer and the molecules alike. A stall happens when the angle of attack (q.v.) of the wing becomes so high that the molecules can't hang on any longer; they give a collective shudder and turn loose all at once. Instantly the wing becomes all

Continued on page 96

A 1939 photo of Dennis Parker, now of East Bentleigh, Victoria, Australia, cranking on the Ohlsson .60 in his Curtiss Robin in Pretoria, South Africa. Dennis recently came to the U.S. to see the World F/F Champs, stayed over long enough to take in the John Pond Commemorative meet in San Luis Obispo, CA. You couldn't ask for a more pleasant or delightful guest.

Here's an old shot of Ed Lidgard with an old model that we can't even start to identify. How about filling us in on the model and its history, Ed?

PLUG SPARKS

PHOTOS BY AUTHOR

By JOHN POND

• When one mentions the Great Northwest, visions of tall trees, high mountains, cold rivers, and clean air immediately arise. The thought of flying models in these areas is a distant one at best, especially when the annual rainfall is between 40 and 60 inches in some of the more populous areas.

Where, then, in this land of Paul Bunyan and other fabulous woodsmen, do you find a delicate subject like model airplanes? Rather surprising to many is the sustained interest in models up there despite the natural hazards of outdoor free flight flying. Some pretty famous names such as Hubert Enthrop and Chuck Hollinger have come out of this area to prove these are some really capable modelers.

How about Old Timers? Well, this has been a slow-growing process that seems to be getting a little larger every year. Interest in Old Timers can be directly attributed to Bob Stalick, long-time newsletter editor of the "WMC (Willamette Model Club) Patter." If you want to know where SAM got its name, you'll have to blame Stalick, who thought up about three names, most of them ending up with the same initials as AMA.

Of late, since the AMPS spark plug, Dave Knight, moved to the Washington area, there has been a tremendous resurgence of interest in Old Timers there. This is not to depreciate Bob Stalick, as his club has yearly staged an Old Timer Annual. Matter of fact, early publicity was so good that this writer and his buddy, Bill Bowen, attended the first one in Oregon. These were great meets, but if anything, the WMC boys underestimated the amount of enthusiasm that would be generated by more meets.

This has been ably demonstrated by Dave Knight, who upon getting settled, immediately announced several O.T. contests and proceeded to get fields that most thought were unattainable. The net result has been the reorganization of SAM 8. You might say that with the publishing on a regular basis of a club newsletter, the chapter had arrived. They have also found that the lifeblood of any organization is a regular dissemination of the news of the club.

In that line, Dave Knight asked the members to take turns writing the newsletter, so Tom Cope volunteered for the first issue. I'll give you one guess what happened. Yep! Tom is still writing the newsletter and doing a pretty fair job of doing it, too, if this columnist is any judge of a newsletter.

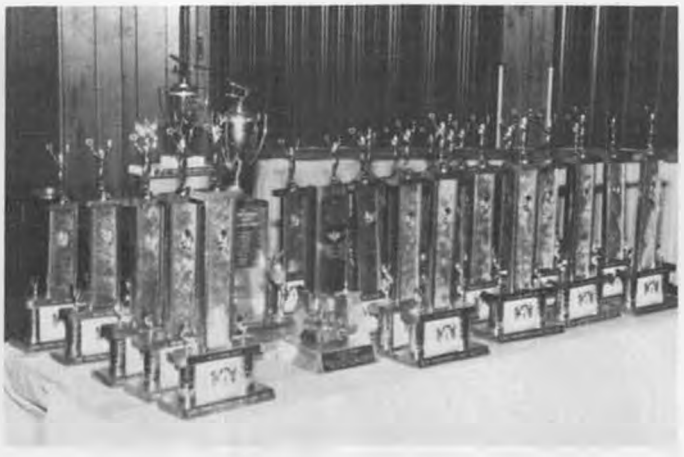
Of interest is the logo that SAM 8 employs. It is an eight ball with wings on each side (remember Walt Billet's 8-Ball Club?). You have no doubt as to whose newsletter you are reading with a masthead like that! Tom has sent all the back issues, so we will quickly condense all pertinent Old Timer action and bring you up-to-date on Northwest O.T. Flying.

The very first thing that struck this writer's attention was the revised 8-Ball logo on the second issue . . . it was a lazy eight! This was due, claims Tom Cope, to

Canadian Modelcraft Wasp with Torp .32 flew well enough to get Jay Jackson a 5th place in C Pylon at the Salt Lake SAM Champs.

A sailplane? Nope, it's a rare design by Don Wencell, called the Super Viking. Mitch Post flew this one at the SAM Champs.

James Buice was one of the younger contestants to win several trophies in the R/C events at the SAM Champs. Watts photo.



This is just one of four tables full of really nice trophies that were handed out at the SAM Champs! Watts photo.

his inability to get anyone to take the next turn at writing the newsletter. So, to commemorate this infamy, Cope redesigned the logo. Haw!

Most of the contests are held at Hart's Lake. Tom reports this is a good site, but unfortunately, the modelers have to play second fiddle to the Army whenever they decide to use the area. Would you believe the SAM Warmups (for the 1979 Salt Lake Champs) was postponed twice and finally held in a driving rain on Sept. 1 and 2? This was a real disaster, but there were a few hardy souls who flew between rain squalls.

Tom also points proudly to the fact that the SAM 8 boys did real fine at the Salt Lake SAM Champs, taking two firsts (.020 and Slag), one second, two thirds, and one fifth place trophy with only six guys! Ray Chalker, who provided most of the action photos of SAM 8 activity, placed sixth (out of the money) in two events. There ain't no justice!

Humor is always welcome, especially when it is on the other guy. Tom points out that Don Dodd has discovered a new way to hold a model. The main idea is to punch a hole in the Comet Clipper wing covering (Tom's model, of course!) to get a firm grip on the wing spar. Tom sez this is a never-fail system; besides, Don makes a pretty good cup of coffee. He can't be all bad!

Tom also pointed out at the Misery meet that Bob Schaffer has the retrieval vehicle to end all bikes, cars, etc. Bob has a deluxe golf cart (belongs to his wife, Darlene) that has definite advantages over any motorcycle. The cart comes equipped with a glass holder, roof to keep sun and rain out, a low C.G. for stability, and best of all, it won't throw you over the handlebars. Think about that, men!

In some respects, the Harts Lake flying site is a good one despite the Army interference. Tom sez in his newsletter that you can move on the base on Friday, set up a tent, and stay the weekend. Understand they *encourage* this! One typical Army regulation rears its ugly head, in that all motorcycle riders must wear helmets. Wonder if they send out the MPs to see if the rule is complied with?

Tom Cope, Dave Knight, and the rest of the SAM 8 boys are quite enthusiastic after the Salt Lake SAM Champs and are contemplating putting in their bid for the 1981 SAM Champs due to be held on the West Coast. The columnist can only comment, you don't know what you are letting yourself in for! However, it would be a nice change of pace to have a different site than Taft in California. Go gettum, fellows!

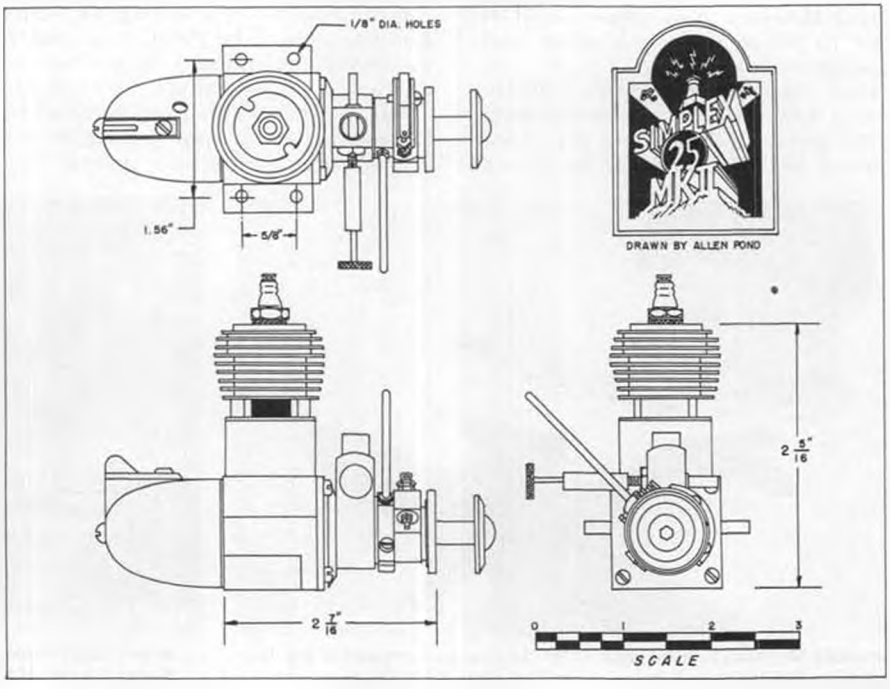
MOTOR OF THE MONTH

For those engine collectors and modelers who have been looking forward to the monthly three-views, we apologize for the lack of them in the last few issues. We had so much to report on the SAM Champs and Old Timer events at the AMA Nationals, we simply ran out of room.

For this month's motor, we have selected a "make your own" designed by Louis Garami. Drawings and instructions appeared as a two-part article in the March and April 1947 issues of *M.A.N.* Called the "Simplex 25," this was about the simplest machine shop project involving an engine that could have been presented. To help the inexperienced would-be machinist, many parts were the same as the Forster 29.

It remained for John Morrill to revive interest in this Garami motor. John built six engines as an experiment to see how they would run. Surprisingly, as pre-

Ser. No. 47 of the 50 Mk II Simplex engines built and being sold by John Morrill. Text has details. Morrill photo.



Don Nordlund setting up his Ehling Contest Gas Model at SAM 8 meet. Looks great in black and orange silk. Anderson power.

Nice Miss Tiny by Gordon Codding, of Kingman, Arizona. Powered by a Fox .15 (?). Plans in last month's RCMB.

dicted by Louie Garami, the engines ran quite well. However, when the engine was used in flight tests, it became apparent to Morrill the Simplex 25 needed more power to compete against the contemporary engines of its day.

So back to the drawing board to improve the power output. As John points out, the intention was not to produce a hot engine, but to make an engine with adequate power, keeping within the spirit of the Old Timer movement.

During the next two months of development, the major changes were altering the port timing, increasing the port openings, elimination of the con-rod/piston ball-and-socket joint, a separate cylinder head in place of the blind bore (popularized by Ohlsson), and a separate phosphor bronze main bearing was substituted for running the crankshaft in the front plate material. The timer proved unsatisfactory, so a new design was made up.

The prototype engine was designated the Mark II Simplex 25 and pleasantly exceeded all expectations. Starting was no problem, and best of all, after four-hours of running time (using a 9x4 Top Flite propeller), the engine ran at 11,000 rpm. With a 10x3-1/2 prop, power output was 10,000 rpm ... 2,000 rpm better than claimed for Garami's engine!

Of course, bugs always crop up, and the prototype was no exception. The crankshaft would have to be hardened, as the main bearing was galling. To keep the pressed-in crankpin feature, Morrill

Harry Murphy with his Beauty event winning Brooklyn Dodger. Photo by "Speedy."

decided to hard chrome plate the shaft and grind to fit.

With shop drawings now completed, 50 engines were built. Morrill did all the machine work, leaving the finishing (chrome plating, anodizing, and black oxidizing) to other sources. For the benefit of the engine collectors, Morrill states that Simplex engines were numbered as follows: Nos. 1 thru 6, original prototypes; No. 7, Mark II prototype; No. 8 and above, Mark II production run.

For the technically minded, the Mark II Simplex features a displacement of .25 cu. in. with a square bore and stroke of .688 inch. Weight is seven ounces with a clear plastic gas tank. Recommended fuel is 3 parts unleaded gasoline to one part SAE 70 wt. oil.

The engine itself is primarily machined from aluminum; cylinder head, crankcase, front plate, and timer frame. The cylinder is Ledloy steel, mehanite piston, steel crankpin, 2024 T-6 connecting rod, and tubular wristpin retained with wire circlips.

Simplex engines can be obtained from John Morrill, 143 Richmond St., El Segundo, CA 90245. Price is $160 without spark plug. If you want a plug, this is $3.50 extra. Be sure to include $2 for postage and $1.75 for insurance.

40 YEARS AGO I WAS...

The Product Review on the Brigadier plan offered by John Pond Old Time Plan Service brought out a rash of requests for this particular model, one of which was from Jack Minassian, the original draftsman then working for Berkeley Models. Jack writes as follows:

"In 1940, I must have been around 19 years old when I drew the Brigadier plan. Also working at Berkeley was Sal Taibi in the next room, sawing wood. (He is still doing it today under the name of Premier Balsa Co.)"

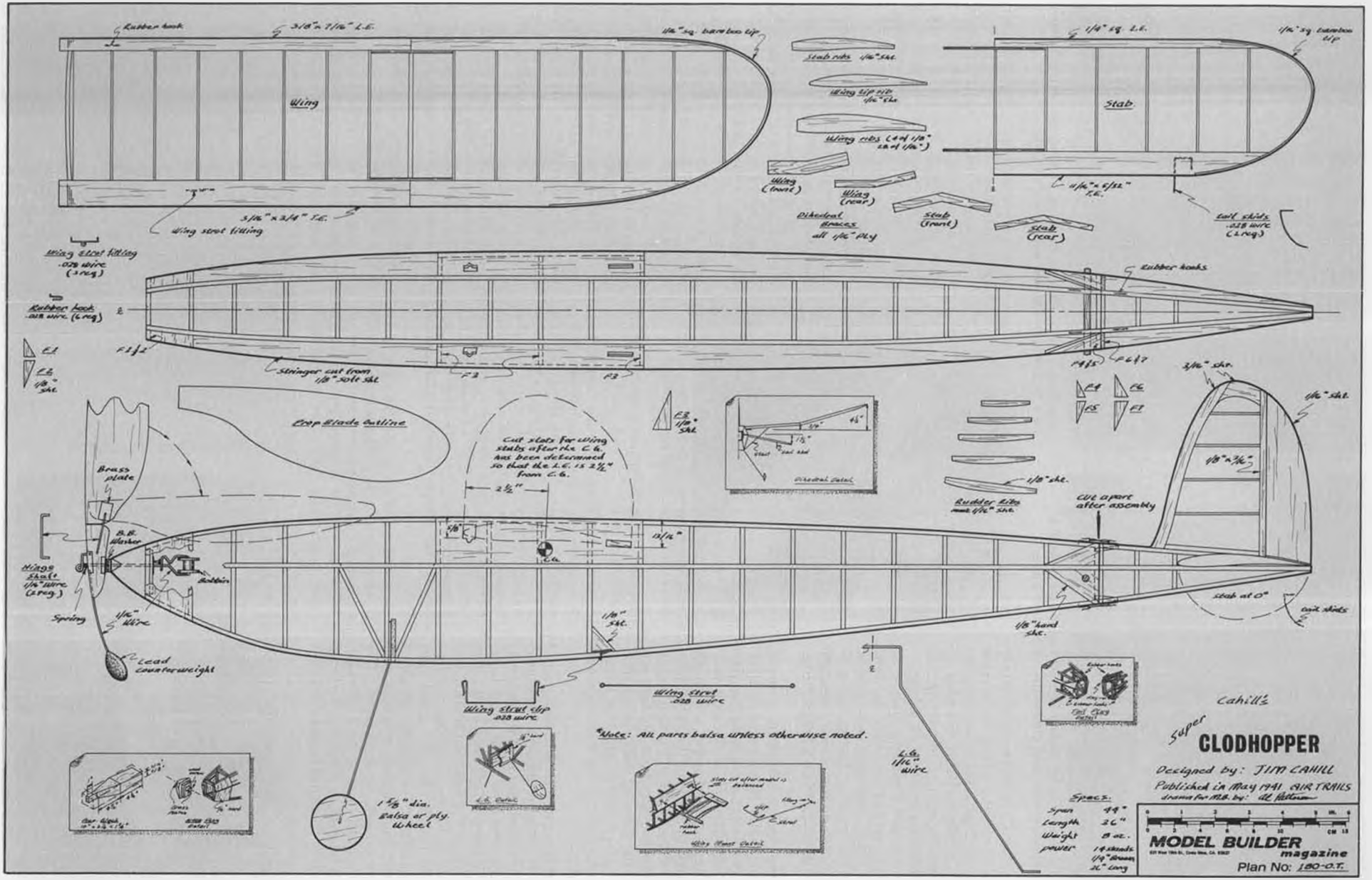
Jack sez he saw Sal at the 1979 U.S. Free Flight Champs at Taft:

"I flew Wakefield and came in tenth. As a twist, I flew the South African entry as a proxy in the 1939 Wakefield Championships at Bendix Field, New Jersey ... a gap of almost 40 years!

"I also saw Frank Zaic for a moment at the same Taft meet but was too busy to talk with him. He and Carmen (I over-

John Pond working on his ill-fated Dallaire just before his famous switch-off launch at the AMA Nats. You'll never live it down, John!

Orjan Gahn restored Arne Blomgren's 1952 Wakefield winner, held here by Arne Nohlberg, O.T. Contest Manager.


Rubber hook
3/16" x 7/16" L.E.
1/16" sq. bamboo tip
Wing
3/16" x 3/4" T.E.
Wing strut fitting
Stab ribs 1/16" Sht.
Wing tip rib 1/16" Sht.
Wing ribs (4@ 1/16" 2@ of 1/16")
Wing (front)
Wing (rear)
Dihedral Spaces all 1/16" Ply
1/4" sq. L.E.
1/16" sq. bamboo tip
Stab
Stab (front)
Stab (rear)
11/16" x 2/32" T.E.
Tail skids .028 wire (2 req)
Wing strut fitting .028 wire (2 req)
Rubber hook .028 wire (1 req)
Rubber hooks
F1 F2
Stringer cut from 1/8" Soft Sht.
F3
F4 F5
F6 F7
3/16" Sht.
1/16" Sht.
1/8" x 3/16"
Crop Blade Outline
Brass plate
Cut slots for Wing stubs after the C.G. has been determined so that the L.E. is 2 1/2" from C.G.
2 1/2"
C.G. 1/8" Sht.
1/8" Sht.
Dihedral Gauge
1/8" Sht.
Rudder Fits mat. 1/16" Sht.
Cut apart after assembly
B.B. Washer
Bobbin
Hinge Shaft 1/16" wire (2 req)
Spring
1/16" Wire
Lead counterweight
1/8" hard Sht.
Stab at 0°
Tail skids
Wing strut .028 wire
Wing strut clip .028 wire
*Note: All parts balsa unless otherwise noted.
1 5/8" dia. Balsa or ply Wheel
L.G. 1/16" wire
Cahill's
Super
CLODHOPPER
Designed by: JIM CAHILL
Published in May 1941 AIR TRAILS
drawn for M.B. by: Al Pallerson
Specs:
Span 49"
Length 26"
Weight 8 oz.
power 14 strands 1/4" Brown 24" Long
MODEL BUILDER magazine
Plan No: 180-O.T.

Larry Dowa likes them big. A Ted Enticknap "Gool," a mere nine-foot wingspan. Uses spoilers for DT. A real floater.

The Gool came in smaller sizes, too. This one looks quite different from the big one at left. Earl Welch built it, flies with a Bantam.

heard) were preparing to drive to their home in the mountains (Northridge is located on the south side of the Los Angeles mountain range). I remember when Zaic owned JASCO in Manhattan on 10th (or was it 11th) Street. I was going to high school at this time about five city blocks away. I and some of my friends spent many an afternoon at JASCO. This is where the absolutely best cutting and grading of balsa wood was done.

"At that time Henry Struck was also working at Berkeley Models. I was reminded of Hank when I saw an article recently on the American Ace 54 in one of the magazines (the American Ace was basically a reduced version of Struck's famous New Ruler design). The author of this article stated he thought the wingspan was 54 inches, when it turned out it was really 52 inches.

"When I started at Berkeley, Elton Ballas (who succeeded Struck for a short time) had started the American Ace plan, had the wing outline drawn, and a few ribs inked. I completed the job and incidentally, never measured the wingspan.

"After the kit was out, Mr. William Effinger, Sr. (not Bill) received all sorts of calls from irate customers. I was asked to handle the problems on the telephone. Of course, there was no good explanation about the 'missing' two inches. I believe in the promotional literature, Elton Ballas or Bill Effinger had the wrong dimension in mind. If memory serves me correctly, I believe I also drew the 'Sinbad' towline glider, some flying scale designs, and a few other models. I can't remember.

"There hasn't been enough time for me to get into Old Timers, but if my personal situation changes, I might get into it yet. Here, in the east, free flight is dying. Fields are too small and too far away. Maybe I should come to California!"

MARYLAND MOVEMENT

Bill Rauch, newsletter editor of the Prince Georges R/C Club, writes to say that Old Timers are coming on real fast in his area. We erroneously pointed out last month that the San Diego Aeroneers were going to be SAM 41. The Prince Georges boys appear to be the ones who have the inside track on that chapter number. Regardless of number, the main thing is that SAM is continuing to grow, with more and more chapters being organized. When the Los Angeles area boys took the number of 49, there was a gap of 14. Since then, the number of chapters between have decreased remarkably.

We mentioned it last month, but it will shortly be a reality as Woody Woodman and Pete Vano have come up with a beautiful SAM Chapter Charter form.

Continued on page 101

Super Clodhopper

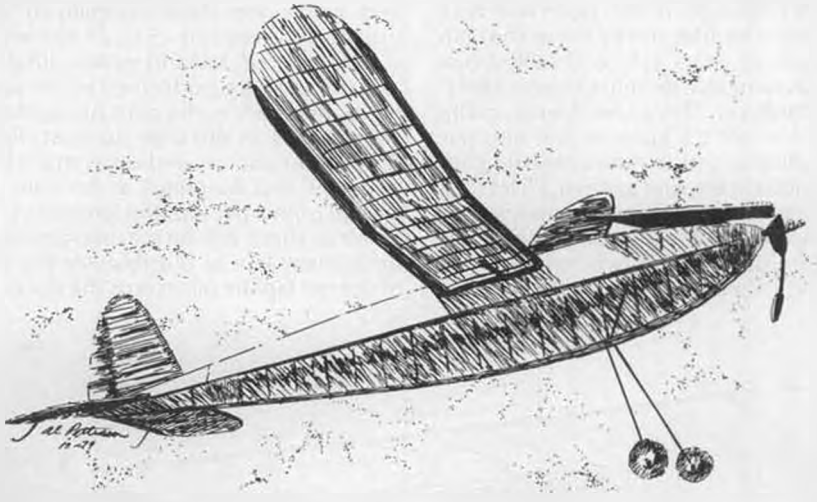
OLD TIMER Model of the Month

Designed by: Jim Cahill

Drawn by: Al Patterson

Text by: Phil Bernhardt

* * *

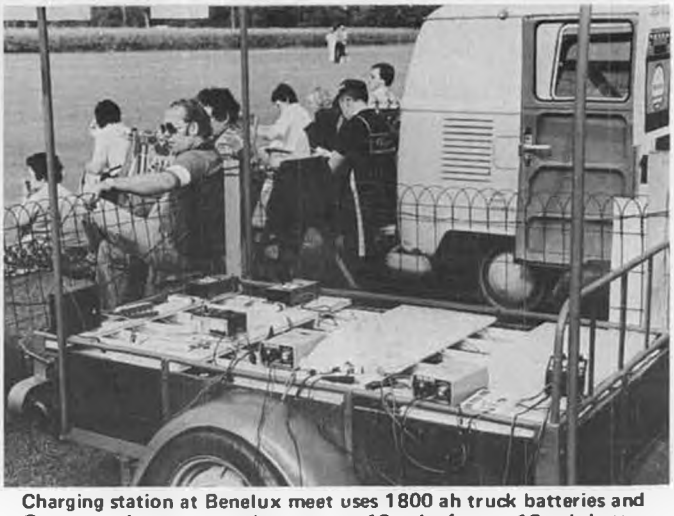


• Jim Cahill's Super Clodhopper, published in the May 1941 issue of *Air Trails*, was designed to be a simplified yet equally good flying version of his famous Clodhopper, the 1937 Moffett Trophy winner. It's simplified, all right. Instead of the Clodhopper's contoured, fully planked fuselage, this model uses a simple box with a single stringer on each side. Gone also are the built-up box spars in the wing and stab, the Super Clod depending instead on heavier leading and trailing edges to provide strength.

This model has a few interesting features that are worth mentioning. First and most striking is the anhedralled stab. What the anhedral is supposed to do is anyone's guess, but it's sure looks neat. The wing halves are designed to come off for easy transport and also to prevent damage when the inevitable happens. The airfoils look to be the same as those used on the original Clodhopper, including the undercambered stab section and airfoiled fin to give the model a right turn (the flight pattern is right-right, incidentally).

The original Super Clod was not fitted with any sort of DT (remember, those were the days of no-max flights), so the plans don't show one. It would be easy to rig one, though, as the rear end of the fuselage is made to be removable, and it would be a simple job to hinge this section at the top so the whole tail section would pop up the required 45° •

Dennis Kuhn, 17, Pattern winner at Benelux Electro Meeting. Model weighs 7-1/2 lbs., uses Keller 50/24 motor and 24 1.2 ah cells.



Charging station at Benelux meet uses 1800 ah truck batteries and Graupner chargers, can charge up to 18 volts from a 12-volt battery.

ELECTRIC POWER

By MITCH POLING

PHOTOS BY RICK RUYSINK

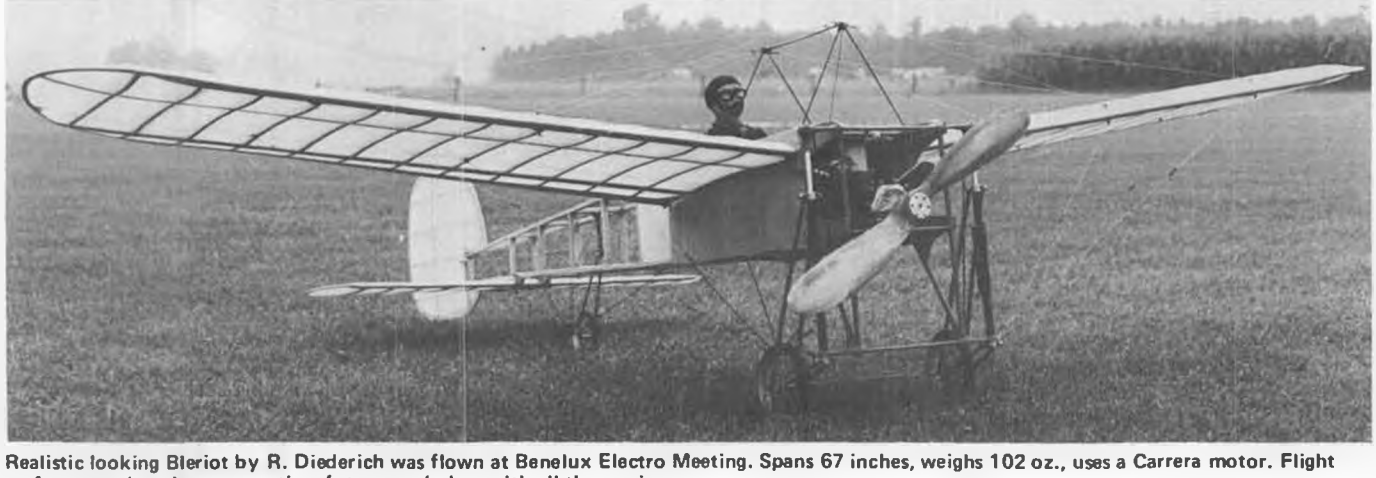
• In the last column, I mentioned that I would be in Europe during the summer. While I was there, I got to see quite a lot of the European modelers and their electrics. Man, was I impressed! They are something like three years ahead of us, partly because they put more effort into it, and partly because they have some really exotic motors, the samarium cobalt motors. These are space age type stuff; in fact, they are used in the scoop for the Viking Mars lander and the Space Shuttle (would you believe, a seventeen pound samarium cobalt motor in the Shuttle puts out seventeen horsepower?). I also got to visit again with Rick Ruysink, who had visited me in the USA a couple of years ago, and talked him into covering the Benelux Electro Meeting in Holland. This is the championship meet for all of Europe for electric competitors, and features electric gliders, pylon racers, and pattern. I'll let Rick tell the rest of the story in his own words.

"Thomas Levin won the first ever Europe Cup in the F3E two-task event for electric sailplanes at the fourth Benelux Electro Meet at Mill, Holland, September 9. The Cup was donated by the Carrera company (a leading model manufacturer in Europe) for the best individual performance in two out of the four major contests held in Europe each year. This year these were held in Switzerland, Germany (two), and Holland. Each of these contests saw between 48 and 81 entries with five nations (Germany, Switzerland, France, Belgium and Holland) participating in four classes (sailplane, pylon, pattern, and scale).

"The official F3E electric sailplane class (FAI) always attracts the most entries, between 35 and 51. Aerobatics and pylon are more specialized and usually get between 15 to 25 entries.

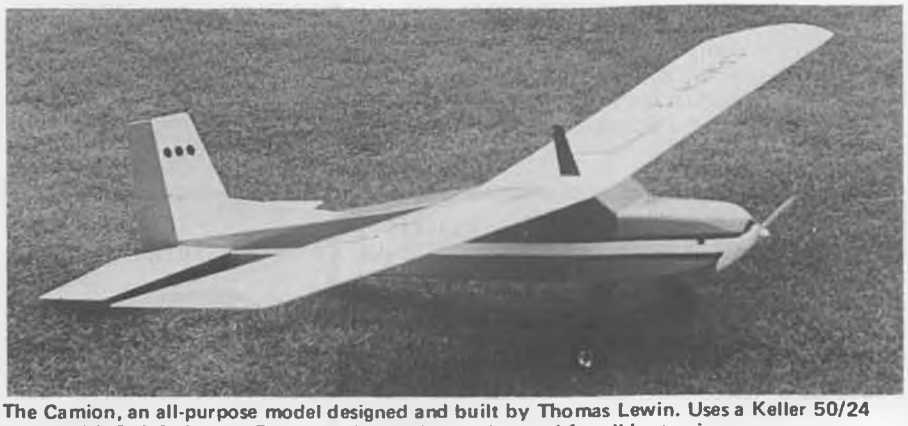
"F3E has two tasks in which duration and distance are performed in the same flight. In distance, the pilot has a total of 200 seconds. In this time he must climb, turn off the motor, and do as many laps between two baselines as he can. He gets 20 points per lap (this promotes fast climb so there will be maximum time to do as many laps as possible). At the end of the last lap the pilot starts the duration task with an allotment of 300 seconds. The pilot may turn on the motor any time he wishes, but the motor run time will be deducted from the glide time. Spot landings give 15 points in a 30-meter circle, or 30 points within a 15-meter circle. Models for this event have a higher wing loading than ones designed for soaring only. The performance gained in the distance (laps) task is almost cancelled in the duration task, but the all-weather performance gets better. Wing loadings of 15 oz./sq. ft. are common.

"The models here have a very fast climb, usually much better than the U.S. models *(I can vouch for this, seeing is believing. M.P.).* I have seen the electrics fly in America, and I have a glider with an Astro 05 (which is a good motor), so I think I know what I am talking about. Also, Mitch visited us and he can only agree. I am sure that the Sunday flier does not need or even want the rocket-like climb of the top competition models, which need only 30 to 40 seconds of climb to do 300 seconds of duration without thermals. This puts a



Realistic looking Bleriot by R. Diederich was flown at Benelux Electro Meeting. Spans 67 inches, weighs 102 oz., uses a Carrera motor. Flight performance is only so-so, as there's too much drag with all those wires.

Fritz Geist, maker of the excellent Geist motors, built this Wayfarer a Don Dewey/RCM design). Uses a Geist type 126 motor, geared to a folding prop.



The Camion, an all-purpose model designed and built by Thomas Lewin. Uses a Keller 50/24 motor with 2l 1.2 ah cells. Drops candy bon bons, also used for glider towing.

lot of strain on the motor as well as on the batteries, although it is quite amazing how well the modern ni-cds (GE, Sanyo, Varta) take this punishment. Although some of the top fliers use direct drive at the expense of high current (using the samarium cobalt motors made by Keller and by Geist), the best efficiency is with geared motors driving a large propeller. This is the set-up used successfully by most modelers *(Note: the Keller and Geist motors also come with gearing. M.P.)*.

"The Mabuchi 550 with a metal sleeve and a 3.3:1 gear driving a 15x12 folding prop powered by nine or ten .75 or 1.2 Ah. cells is standard in the inexpensive models. These are sold by Graupner, Robbe, and Carrera for $30 to $40 without ni-cds. Robbe and Carrera have a more powerful motor available for $60 without ni-cds. The undisputed top are the Keller and Geist motors with samarium cobalt magnets. This magnet material is many times stronger than ceramic magnets. It makes the motor more efficient, gives it a higher power-to-weight ratio, and allows a tremendous range in applied voltage and current.

"For example, the Keller 50/24 can drive a 10x6 prop on 24 cells at 10,400 rpm at 68% efficiency (quite good), and in the air this gets up to 73% efficient. It can also just as easily drive a 15x12 on 10 cells at 3300 rpm at 58% efficiency (64% in the air). The motor weighs 14 oz. and is a little smaller than the Astro 25. *(It has the power of an Astro 40. M.P.)* The reliability is very high, and so is the price: $140. The Keller 30/12 is about the same size as the Geist motors *(and the Astro 15. M.P.)* at 9 oz. and turns an 8x6 at 11,000 rpm on 180 watts. All these motors have other windings available for other voltage ranges.

"These motors are essential in aerobatics. I do not think any motor with ceramic magnets will allow you to perform a flight with 9 aerobatic maneuvers including a square loop as well as a top hat, beginning with a takeoff from grass, as was done routinely at the Benelux meeting.

"Aerobatic models generally have sheeted wings with balsa ribs (no foam), 4 channels with off, parallel, and series motor control (they use two block battery packs, usually 2x7, 2x12), semi-symmetrical airfoils of 10 to 12%, with a sharp leading edge to reduce drag. The landing gear ranges from tricycle to tail-dragger to none at all.

"The flying experience of the pattern (F3A) aces like Bruno Giezendanner and Wolfgang Kosche was obvious in the Switzerland contest, but the local (Holland) breed of electric aerobatic fliers is coming on strong. Seventeen-year-old Dennis Kuhn, the winner in Mill (Holland), is in his third season now and is improving every month. I predict that he will be the first world champion in electric aerobatics.

"The pylon racing is very attractive, both to see and to fly, judging from the number of entries in the Benelux contest. Twenty-three entered and 21 made two or three official flights. The races were close; Edgar Leip won with 127 and 128 seconds. The best flights of second place and third place were 128 and 130 seconds. The course had three legs of 120, 120, and 20 meters, with twelve laps, which means that, allowing for the distance lost in the curves, the models had an average speed of 70 mph during the whole race. Thirteen fliers stayed below 160 seconds. This is only the second year that the pylon races have been held, and the pilots and callers need more practice to corner more efficiently; not easy on such a small course.

"Each heat had three models flying together, with each timed individually to decide the winner of a round. Simultaneous starts are not possible with electrics because a false start means that everyone has to recharge for a restart. This is just not practical when running a contest with more than a few entries. There were already time problems in all the contests because of the many classes, so it was never possible to do three rounds for each class. Apart fron: the fact that the good weather did not arrive until 10:30 on Saturday and Sunday, the organizers of the Benelux meeting arranged everything well, including a

Continued on page 88

Slick pylon racer (foreground) by H. Winkelhoger was 2nd in Pylon at Benelux meet. Uses Keller 50/14 motor. In back is H. Krottenmuller's Carrera Primus, placed 9th in glider.

DUCTED FANS

By BOB KRESS . . . The conclusion of the author's three-part article on ducted fans. This time he discusses the Midwest Heinkel 162 and A4D Skyhawk, and presents some interesting ideas on catapult launching.

THE 1/2A HEINKEL 162 JET

Turning now to jet models, Fig. 16, showing the thrust and drag picture for the 1/2A Heinkel 162, has been prepared. This particular model was powered with the jet pod of Fig. 6 and weighed 35 oz., since it was built very heavy. The inlet cowl was not the final 1/2A production cowl, being a bored-out version of the original too-narrow-throated cowl. For reference, the cowl was that of Table IIA identified as having a 5.43 sq. in. throat area and a static thrust of 14 oz.

Comparison of the Me 109 and He 162 results of Figs. 15 (last month) and 16 reveals a marked performance degradation in terms of the size of the maneuverability zone. The particular items contributing to the differences between these models fall into two categories. The rough magnitude of effects in terms of rate of climb and maximum speed are illustrated in Table III.

In general, it's fair to state that a 1/2A jet model will always suffer the thrust loss, will be at least four oz. heavier, and will have more wetted area drag, be it the form of a pod or a fatter fuselage. These factors cause the jet model to be fundamentally inferior by roughly 200 ft./min. in rate of climb and perhaps 6 mph in maximum speed to the prop model. The latter speed loss may not necessarily materialize if the prop model is forced, by takeoff considerations, to use a larger or flatter-pitched prop than illustrated in Fig. 15 for the Me 109. This can sometimes be the case, as will be discussed later. Obviously, the landing gear and aspect ratio factors do not relate to the jet vs. prop issue at hand, but were present in the He 162. Its in-flight performance was quite obviously poorer than the Me 109 and quite marginal.

TABLE III

ITEM	MAGNITUDE OF EFFECT Rate of Climb Ft./Min.	Maximum Speed MPH
(1) A reduction in thrust of the jet with respect to the prop.	-100	-2
(2) A marked increase in drag of the He 162 compared to the Me 109. This stems from four factors:		
(a) The Me 109 has no landing gear.	-50	-6
(b) The Me 109 has a high aspect ratio wing.	-85	-2
(c) The He 162 is about six oz. heavier than the Me 109.	-80	-2
(d) Wetted area drag of the He 162 jet pod.	-20	-4

TABLE IV
1/2A PROP AND JET MODEL TAKEOFF GROUND ROLL

Model	Weight oz.	(T-D) ave. oz.	(T-D/W) ave.	SG ft.
Me-109	28.5	12.30	.432	78.7
He-162	35.0	9.8	.280	130.7
A4D Prototype	29.5	8.95	.303	118.8
A4D Original Production	31.0	6.60	.213	184.4
A4D Redesigned Production	31.0	10.70	.345	101.9

DRAG UNCERTAINTIES

There are fundamental uncertainties in the model drag estimates, which relates primarily to Reynold's number effects and secondarily to the crude drag estimating procedures used. The uncertainties take two forms:

1) The crude drag estimate plus Reynold's number yield zero lift/drag errors which are of the magnitude illustrated in Fig. 17 for the He 162. The major effect is a maximum speed uncertainty.

2) Premature stall can easily occur with 1/2A model wing chord lengths and flight speeds due to low Reynold's number. For instance, the He 162 wing tip flies at a Rn of about 100,000, and the A4D, to be discussed later, flies with a tip Rn of about 60,000. These numbers are in the deadly subtransition Rn regime where laminar separation can occur. The magnitude of the premature stall effect is very large, reflecting itself primarily in dramatic rate of climb losses as shown in Fig. 17. The maneuverability zone can be dramatically reduced in size by premature stall as shown by the shading. Whether the He 162 maneuverability zone was closer to that shown in

FIG. 16 – PREDICTED JET MODEL THRUST & DRAG

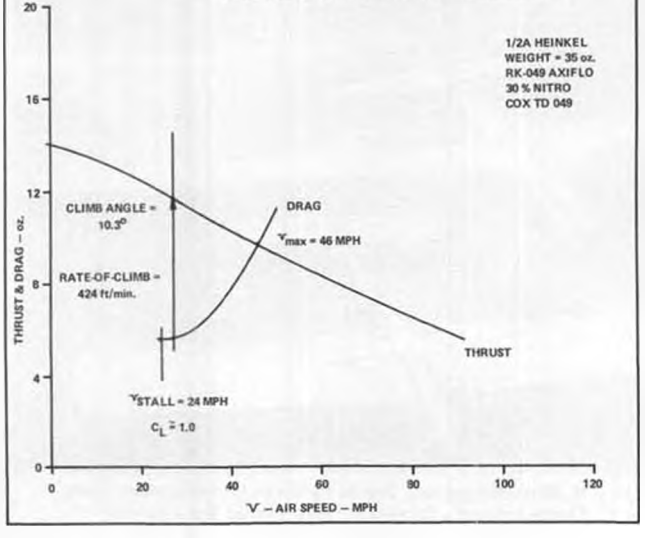
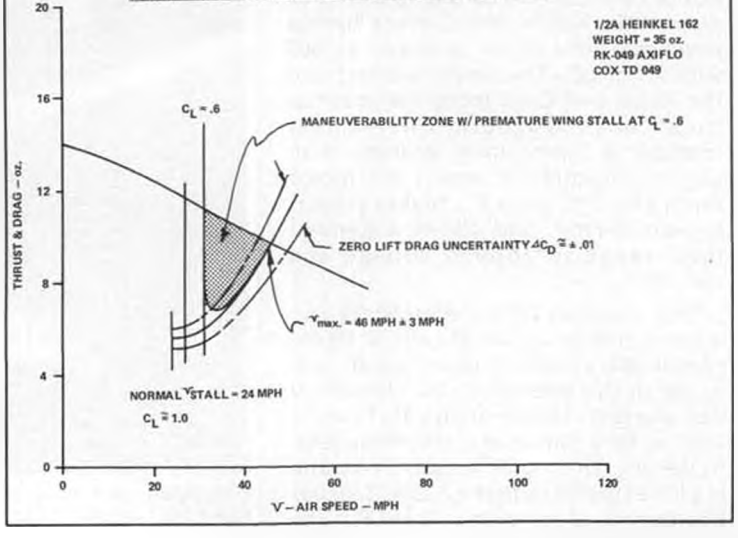
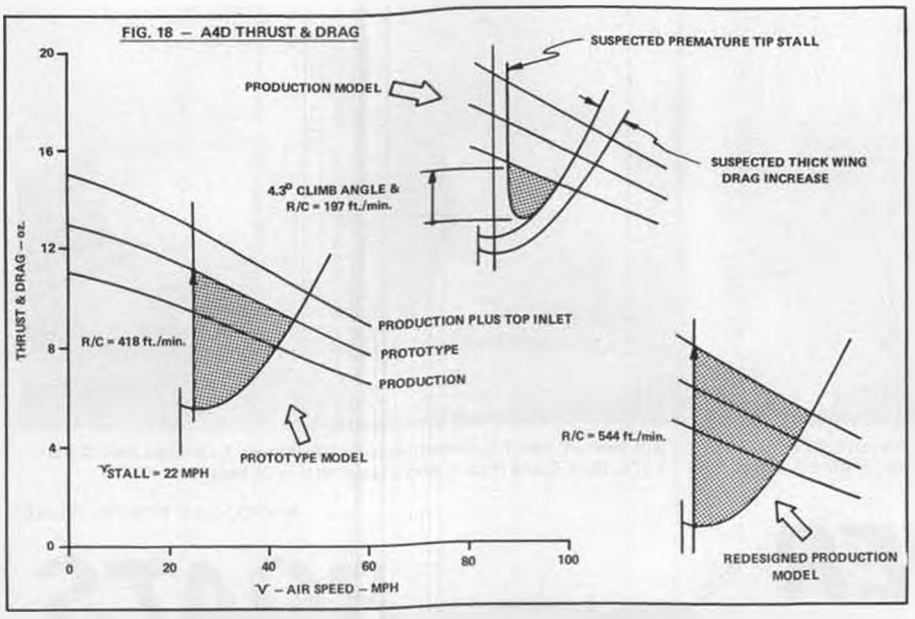
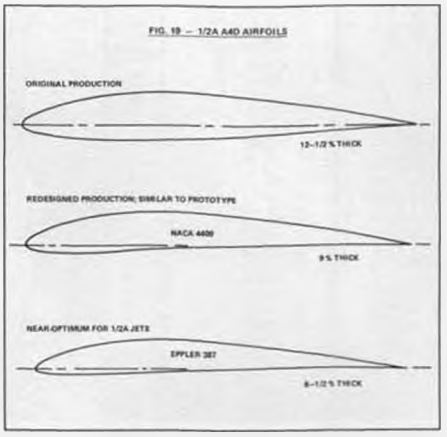
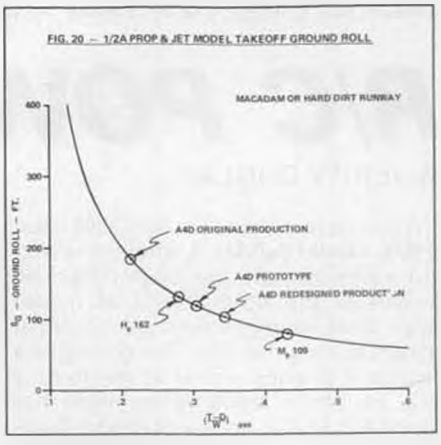


FIG. 17 – UNCERTAINTIES IN 1/2A MODEL DRAG ESTIMATES









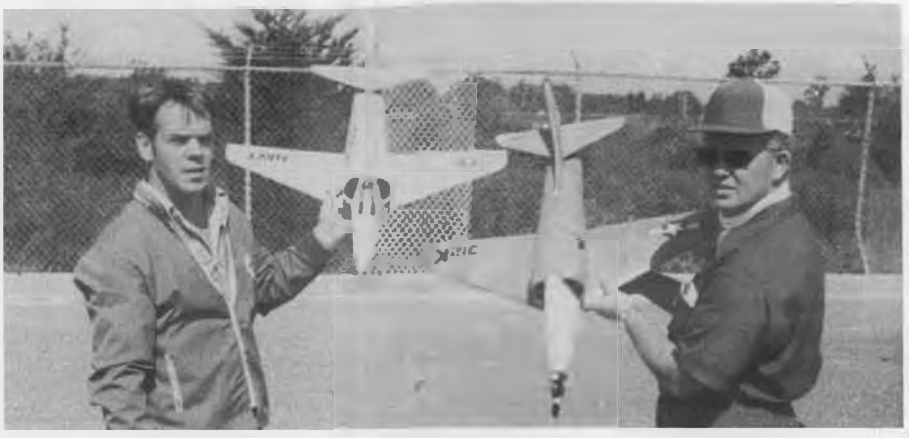


FIG. 21. Nick Ziroli and Jim Newman with the models used to compare flight performance between fans and props.

FIG. 22. The A4D fitted with a nose-mounted TD .049 prop engine.

Fig. 16 or the degraded zone shown in Fig. 17 is hard to say, but it certainly was a marginal performer, as stated earlier.

Whether or not the wing is stalling prematurely is hard to diagnose from flight tests because the model speed is hard to judge. If your model takes a long time to get off, seems to mush, climbs slowly and has only a small speed range between best climb speed and maximum level speed, premature stall could be the problem. Unfortunately, it is very hard to prove you have the problem except by performing careful flight test measurements or by making model airfoil changes. The latter requires great care, some science and lots of black magic.

THE A4D

The foregoing discussion sets the stage for discussion of the Midwest A4D. Fig. 18 shows the thrust and drag of this model as it progressed from the prototype to the final production stage.

The prototype model thrust and drag are shown in the left hand side of Fig. 18. Three thrust curves are identified:

1) The original production inlet with the lowest thrust. This was measured

Continued on page 74

FIGS. 23 (left) and 24. Before and after assembly photos of the RK-20 fan unit designed for .20 size engines. Midwest Products has the unit on the market now, called the RK-20B.

Some of the big names in boat racing, l to r: Wally Stewart, Bill LeFeber, Ron Erickson, and Bill Hornell. All placed at NAMBA Nats.

Bill Hornell and his record-holding Thriftway Too. Uses two K&B 7.5's. Won Scale Hydro and placed 4th in X Hydro.

PHOTOS BY FRANK WARD

R/C POWER BOATS

By JERRY DUNLAP

• Wow, here it is, the January 1980 issue of **R/C Model Builder.** A whole new year and a new decade just beginning. The growth of the hobby/sport of model powerboat racing showed phenomenal growth during the '70's. The closing of a decade is as good a time as any to do a little reflective thinking on what has happened in our hobby of model boating. I hope you'll bear with your writer as he does a little reminiscing.

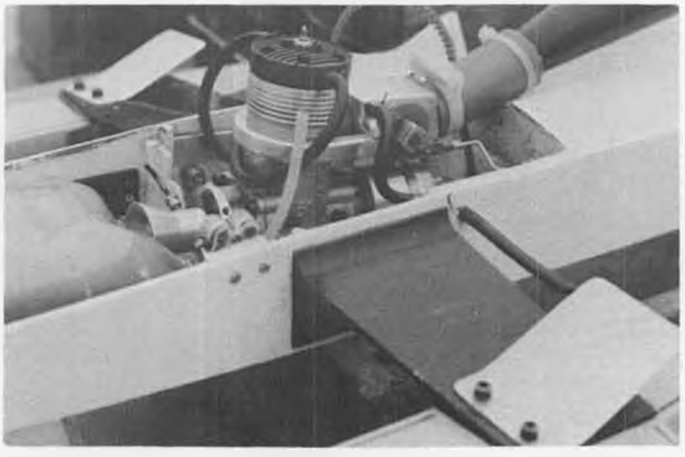
In terms of model boat designs, the '70's saw the emergence of the outrigger hydroplane as the dominant design in hydro racing. This period also spawned the wedge-shaped monoplane and the rise of the deep-vee design to the point where most monoplane events are entirely comprised of deep-vee hulls. Schnuerle ported engines provided us with more and more power. We started talking about 3.5's, 6.5's, and 7.5's rather than .19's and .40's. Tuned exhaust systems became the rule rather than the exception. Boats went faster with less noise. Proportional radio systems provided us with control. Boaters began racing models that looked like real boats with the acceptance of scale hydro, offshore enduros, and outboard tunnels. Organized model boating split into two camps. More manufacturers provided us with boats, engines, accessories, and radios. A truly competitive model outboard engine created an exciting new form of model boat racing. New friends were made through hobby contacts. A good friend passed away. The cost of fuel increased even more than the cost of gasoline. The '70's were truly an exciting time for model boating, and the '80's are certain to bring even greater advancements and achievements.

The focus of the remainder of this month's column will be on material I've received through the mail in recent months. From Mini Marine Racing Equipment, 542 N. Yale, Villa Park, IL 60181, Bill Pistello sent along some information and photos of the new 6.5-7.5 Hustler Mk II outrigger hydro. This is the big brother of the 3.5 Hustler Mk II reviewed in this column in the August '79 issue. If the new 34-1/2 inch version works as well as the one I ran this past year, it should be another winner. I managed to place second in the NAMBA District 8 points standings with my 3.5 Hustler Mk II. The 7.5 kit features the highest quality aircraft plywood parts, all precision cut on a band saw. Machined aluminum sponson brackets allow for adjustable front sponsons. An all new "Quick Change" aluminum motor mount is included. An additional running hardware package is also available. Suggested price is $125 for the boat kit.

Jim Gale, of J.G. Products, 8030 Fordham Rd., Los Angeles, CA 90045, also dropped me a line and sent along a new three-blade propeller. The new prop is the J.G. 31-21. It is similar to the popular 31-22 except that it has 2-1/16 inches of pitch. I haven't had an opportunity to try out the new prop. Jim says it is now available, so you might want to check it out. Sorry, he didn't provide me with a price. Or maybe it was on the package which I threw away. Check with your hobby dealer or write Jim directly.

After what seems like months of encouraging you readers to write in with some questions, I finally received a batch to answer. I would request that you send a self-addressed, stamped envelope if you wish to receive a fast response to your questions. The address is 119 Crestwood Dr. S.W., Tacoma, WA 98498. Let's get into the letters. Gosh,

Mike Wisniewski (right) can't quite believe that Wray Freitas won the X Class hydro event. Both Wray's boats are Wing Dings.



Closeup of the Rossi .61 installation in Freitas' Wing Ding. Note air deflectors on sponsons.

Frank Ward, designer of the Wardcraft Vee, was 6th in the X Hydro event with this mean-looking screamer.

The starting clock used at the NAMBA Nats. Under that black hat is Dick Norsihian, placed 2nd in Mono class.

View of the starting pits as a group of .60 Hydros wait for the heat to begin.

this is just like what that famous flier, Dave Brown, does in his "Flight Instructor" column!

Dave T., of Oxnard, California, writes, "I have a problem in getting an R/C boat together. My first problem is, no boat. What I'd like to do is take a plastic model and put an .049 into it. Trouble is, I understand that the ordinary model plastic melts in the gas. So what I'd like to know is how do I make a copy of the model hull. Could you, in your article, show me how to make a mold and then a strong but light fiberglass hull? After the hull is complete, I plan to use a brass rod for a drive shaft inside a brass tube packed with grease. How do I seal around the shaft tube? More fiberglass?"

Okay, let's see what we can do to help Dave with his questions. I took a bunch of plastic from one of those "easy to assemble" snap together airplane model kits (that didn't assemble easily or snap together) and soaked it in 50% nitro fuel for a couple of days. The nitro had no affect at all on the plastic, so maybe you can just use the plastic model. However, most plastic models are not intended for R/C use. As can be seen by the lack of photos, there isn't any info on how to make a fiberglass version of a plastic boat. I haven't messed that much with making molds to give good advice in this area. However, I can advise you that by the time you bought all the necessary material and probably screwed-up a few times, you could purchase a small fiberglass hull. I'd suggest the new Dumas Deep-Vee 10 as a good boat for a beginner and the .049 engine. By roughing up the brass stuffing tube, you can use fiberglass when installing it in a fiberglass or wood hull.

Robert C., of Niagara Falls, New York, writes, "First of all, I would like to express how much I have enjoyed your articles and special interest in the outboard tunnel hulls. I feel this is an excellent class for the new or economy minded boater.

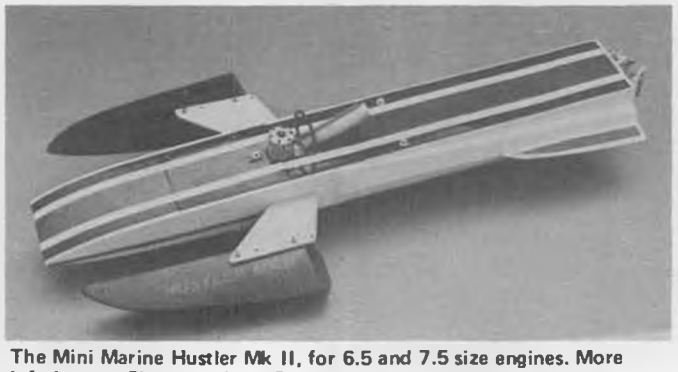
"I have read articles and heard a lot of good things about the fiberglass Excaliber II tunnel by R/C Glass. Is this hull still available? If so, how can one be obtained?

"Also, what are your personal feelings about this hull, or do you feel there is a better one available? Keep up the good work on tunnels and don't cut any buoys."

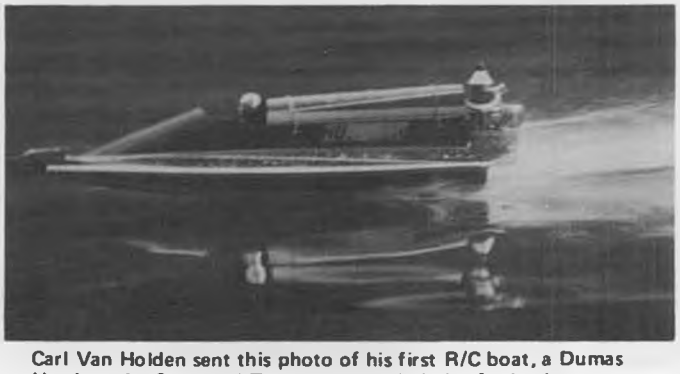
Thank you, Robert, for the kind words. Your observations about the outboard being a good place for the beginner are valid. And I should add that it's lots of fun for some of us who have been around awhile. I believe that Vic Drew, who operates R/C Glass, 1628 Corona, Medford, OR 97501 will still make glass versions of the Excaliber II. The plans for the boat (wood hull) appeared in the December 1979 issue of **RCMB.** G&M Models, in Chicago, is a distributor close to you who stocked the hull at one time. Your question about how I feel about the hull is certainly a loaded one. I think I'll answer it by telling you that wooden versions of the hull placed first, second, and third in the final standings of the 3.5 Outboard Class

Continued on page 99

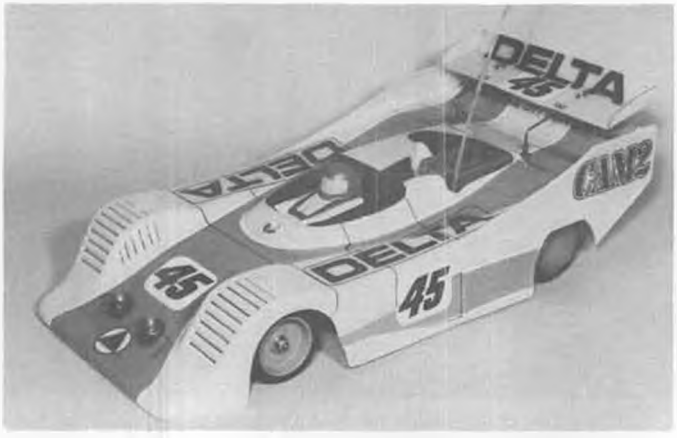
Gary Jensen calls for Frank Ward during a .40 Mono race. Frank won this event.



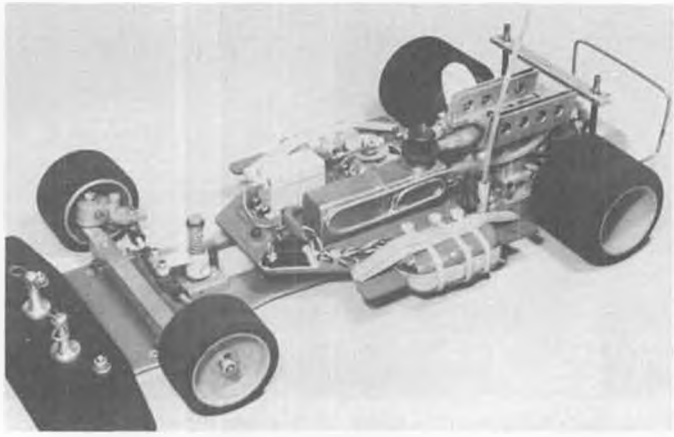
The Mini Marine Hustler Mk II, for 6.5 and 7.5 size engines. More info in text. Photo by Jerry Dunlap.



Carl Van Holden sent this photo of his first R/C boat, a Dumas Hotshot. An Outboard Tunnel is a good choice for beginners.



The Delta Super J chassis wrapped in MRP's TOJ-BMW Can-Am body. Standard Dirty racing colors, orange and yellow.



Complete Super J chassis, fitted with optional Delta pieces like tank, head, muffler, etc. Looks new, but has seen over a full year of action.

PRODUCT$ IN U$E

THE DELTA SUPER J, OPS .21, AND FUTABA FP-2F RADIO, by "DIRTY DAN" RUTHERFORD.

PHOTOS BY AUTHOR

• Know what I hate about most "product tests" that are published in modeling magazines? Several things. The guy doing the testing usually hasn't really *punished* the product, putting it to the test it is bound to see in the hands of many purchasers of the unit in question. In extreme cases the product hasn't been used at all, just assembled, posed for pictures and then on to writing the text.

And when writing the text it is all too obvious that the tester is pulling his punches. Don't want to perturb that fellow who sent the free stuff to test, no telling when he will send more goodies to his favored writers.

The other thing that bothers me is related to the first somewhat, and that is that the testing is not done over any extended period of time. As a rule, new stuff works pretty well . . . it's when it gets old that weak points start to show up. But by then the article is being read by you and I the consumer, and too many of us tend to believe that if it is in print, then it must be so.

SO WHAT ELSE IS NEW?

Maybe not so new, but as you have no doubt guessed, this product test will get right down to real testing. The Delta Super J, powered by an OPS .21 and controlled with Futaba radio system has, as of this writing, been actively raced for an entire year. Not just putt-putted around . . . *raced* in heads-up competition. And to answer my own objection to biased testing, I am in no way obligated to any of the people who sell this equipment. They know that, I know it, and now so do you. Hey, these people don't even know I am writing this test and won't until they see it in print, unless Unca' Bill tells them.

THE DELTA SUPER J

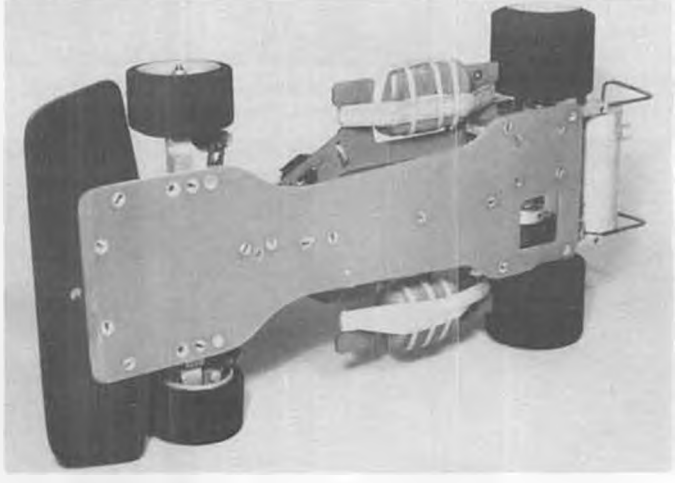
Right after they get an answer to the question, "How fast does that sucker go?", what most people want to know about any R/C car is how much it costs. If asking about the Super J, I always have to hesitate a bit. It is not cheap. The basic chassis sells for an even $200. (Suitable pause for those unaware of how good this car really is to catch their breath.) Added to this base price is a disc brake assembly at $36 (the Super J comes with a band brake, so the disc is an option, although an important one if you are serious about going fast), an accessory package that includes wing, wing wires, servo saver, air filter, antenna mount kit and a body mounting kit, all for $30.

From here it gets difficult to quote prices, as the tank can be made from a Hi Johnson flex-scope tank, several different mufflers are available, and use of a Perry carb would eliminate the need to buy Delta's slide valve number. However, it is highly recommended that Delta parts be used on the car, not so Delta can sell more stuff, but because the car and the offered bits and pieces are all designed to work as a unit.

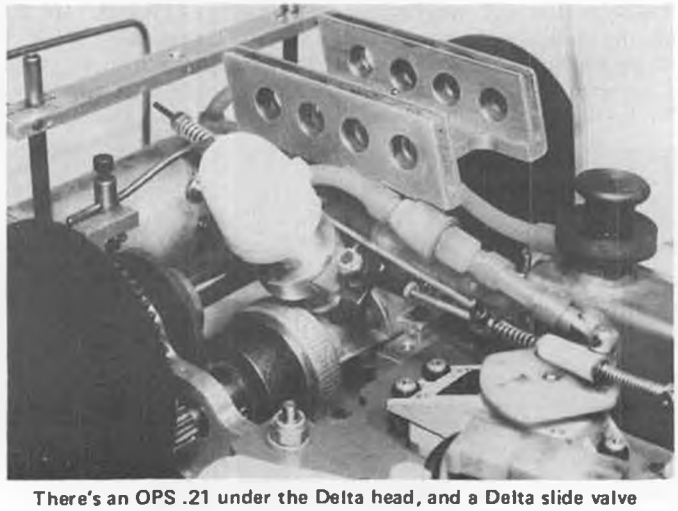
To duplicate the car pictured requires a slide valve carb at $35, built tank at $22, muffler/header combination totals $37, and the heat sink head is $9. Added in under nickel and dime stuff are Delta's own fuel filters, super duty output arms, silicone tubing, and so on.

For those not adding on their pudgies, the total comes to around $370. As I said before, not cheap. But before you pass it off as too expensive, remember that you pay for quality no matter where you find it, and in many instances buying the best equipment in the first place is a lot cheaper in the long run. In the case of the Super J, this is definitely true.

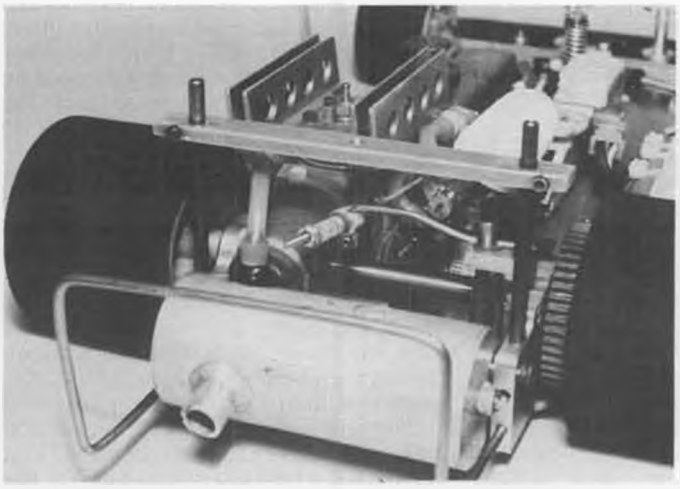
If you like finely machined parts that look pretty, fit just so and are functional to the extreme, you will look at this car as a piece of art. The front cross bar, aluminum hangars in the rear, motor



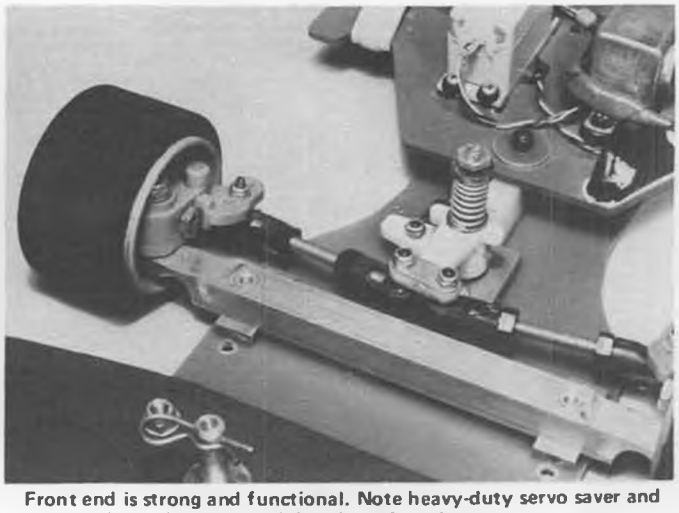
New fiberglass chassis pan from Delta, 1/8 inch thick and waisted for some flex. Screws are flat-head for a smooth undersurface.



There's an OPS .21 under the Delta head, and a Delta slide valve carb under the MRP "thumb" air cleaner.



Delta muffler mounts between hangers on chassis and is there to stay, will not come loose or slip silicone tubing to exhaust header.



Front end is strong and functional. Note heavy-duty servo saver and clevis ends on the steering links, all made to last.

mount blocks and so on are fully machined and the workmanship is all of the best quality.

The chassis pan I used for a year was the one supplied in the kit, a wide aluminum piece, and I had no problems with it. Pictured is a new fiberglass pan that Delta now offers and which I am trying out. So far, I haven't decided whether or not to use it next year or go back to the aluminum pan . . . the stock pan works very well. My kit was also supplied with fully machined steering blocks, but present kits come with the molded nylon blocks pictured. The nylon pieces are better in every way except class, and the trade-off is that with the nylon blocks being less expensive to manufacture, the kit now comes with four ball bearings for the front wheels.

Getting back to the chassis pan, all screws common to it are flathead, so the underside of the chassis is flat, allowing the car to be very low to the ground for smooth cornering on high traction tracks. Right here is a good illustration of why the Delta Super J costs more than the competition. These flathead screws aren't your garden variety type, they are of a very high grade and have a slot in them that is wider at the bottom than at the top. This necessitates use of a special bit, but then again, chances of ruining the head on one of these screws, even when tightening them up very snugly, is remote.

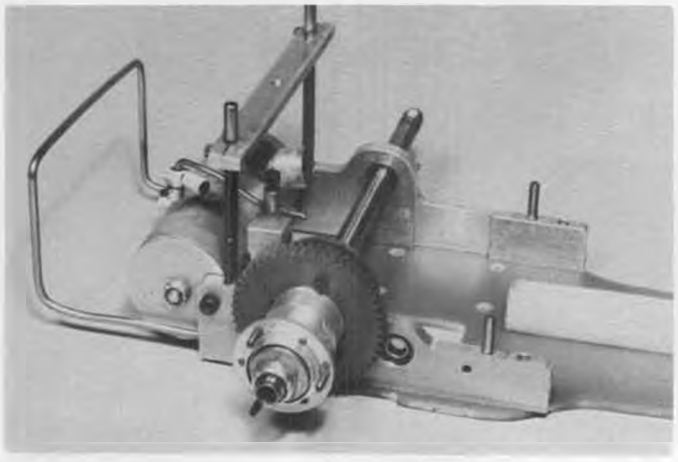
At the back the axle is a huge 3/8-inch in diameter. I have had absolutely no problem with bent axles, a relatively common problem on most R/C cars. The axle rides in sealed ball bearings which eliminates any problems with dirt or binding.

The clutch/flywheel combination is another example of bullet-proof construction. The small diameter flywheel is split and clamps onto the engine crankshaft, which must be cut down to an 11/16-inch stub before fitting the wheel to it. The wheel runs absolutely true and the chances of it coming loose . . . well, there is just no way for it to come loose. A carrier for the clutch shoes, of which there are three, is an integral part of the flywheel. These shoes are made of Rulon (Teflon) and run against a steel clutch bell. The combination gives some slip, which is desirable at slow speeds, yet locks up solid at high speed and the shoes evidently just do not wear out. The clutch requires no maintenance whatsoever; assemble it and forget it.

The pinion gear is a rather long affair, running in two sealed ball bearings. One of these bearings is in the right side hanger, the other is inside the flywheel. Again, a superior system where the centerline-to-centerline distance between the main gear and the pinion gear is constant. Gear mesh never changes, is right on to begin with, and ends up saving the racers bucks usually spent on replacement main gears. Another advantage is that Delta is able to use 9 and 10-tooth pinion gears where most everybody else can only get down to 11-tooth pinions. This results in the proper gearing being achieved with smaller main gears, which in turn results in a gear with lots of clearance between it and the track, with the bottom of the gear being above the top surface of the chassis pan. I ran the same main gear for a year and it is almost like new, where it is relatively common to replace gears on other cars at fairly frequent intervals . . . like in the middle of a race.

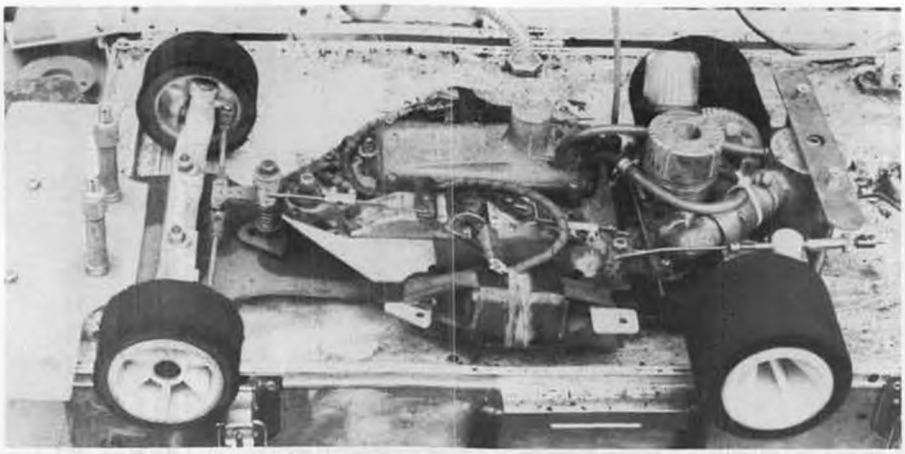
Supporting the radio equipment and tank is a pre-cut radio tray. The one I have always used is Kydex, but if I remember correctly, the kit cars come with a lighter weight tray made of poly. I just prefer Kydex, so I use it. The tank nestling in the tray is one built by Delta and it works very well. I personally have a hard time justifying spending over $20 on a ready-made tank, after so many years of making my own, but this tank does work, is reliable, easy to fill, and only requires mounting. It is a sort of chicken-hopper design with the muffler pressure line going to the bottom of the tank. The reasoning behind all of that

Continued on page 70



Delta's new limited slip differential mounted on the Super J chassis. It's the latest hot tip in 1/8-scale car technology.

Also typical are Delta's body mounting posts. They don't just sit on the bumper but actually clamp bumper to chassis pan.



What a mess! Franco Sabattini's S.G. car just after coming in from a heat. Uses fiberglass chassis, plastic front end and radio tray. Note wet-weather air cleaner.

R/C AUTO NEWS

By CHUCK HALLUM

PHOTOS BY AUTHOR

• Well, it's finally time to get into the technical end of the 2nd World R/C Car Championships held in Geneva, Switzerland in July 1979. First off, there was nothing really new that I saw . . . all the drivers were sticking with tried and true machinery. But there were lots of little trick ideas that drivers and teams were using.

Let's start with the Japanese cars, drivers and team first, since I was most impressed and surprised by them. In general, the Japanese racing technology is several years behind the U.S. and Europe, but the driver and team efforts were so fantastic that it almost compensated. Both the Phoenix and Kyosho cars had kingpins well toward the car centerline from the front wheels, reminding me of the very old Delta, MRP and Associated cars. Kingpins and front bearings were sloppy. The cars were relatively underpowered, with most using the O.S. Max Schnuerle ported ABC engine and a pot metal carb like the one that comes on the Veco .19, air bleed and all. The little carb is compensated for by using 50% nitro and tall gearing, probably below 5:1, giving good top speed and low speed controllability. Rumors said the cars weighed 4 pounds, but I hefted one and I'm sure it was at least 5 pounds. Because the delivered torque was low, not much aerodynamic down force (high C.G., etc., etc.) was required, so all the Japanese cars had very low, slippery bodies and wings on them.

What did all this mean? Well, it means that the cars were probably very easy to drive and would get good gas mileage. Ishihara drove his car to perfection. His normal line was on or within about a foot of the course markers, and when he overshot he was maybe 2 to 3 feet away. From the start line I think Ishihara could probably punch all the way to the straight without letting up. As a consequence, he almost always got a good start.

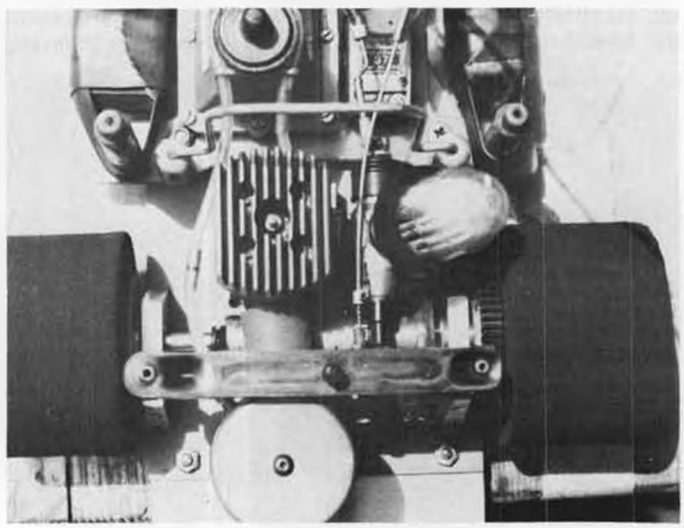
One of the Japanese team managers, Junichi Ishigami, was up in the stands recording driver commands to their cars. The rig had two servos, a receiver, centering pots, pens on extended servo arms, and a strip chart and motor drive. The program specified driver frequencies so that the proper crystal could be plugged into the receiver and the records made. There was also a 30 second time blip on the chart. After one of the heat races Kenji Masuda brought Ishigami over to my pit area to show and discuss with me a record of my first few laps in the race. The record is reproduced here so you can see what it looks like. Masuda and Ishigami pointed out what the traces and commands were, the top trace being throttle with up being high throttle and low being idle, and the lower trace being steering command with up being right turn and down being left turn. Fascinating. You could tell where you backed off for the corners, whether the car was understeering, and all kinds of things.

From comments made, it seemed that the Japanese cars probably handled quite similarly. Also, from the way Ishigami talked, I would guess that the recording technique was used to assist the Japanese drivers improve their driving as well as car handling. Many of the things that were said and done by the Japanese team made me feel that they worked together a fair amount. All the cars seemed to handle similarly.

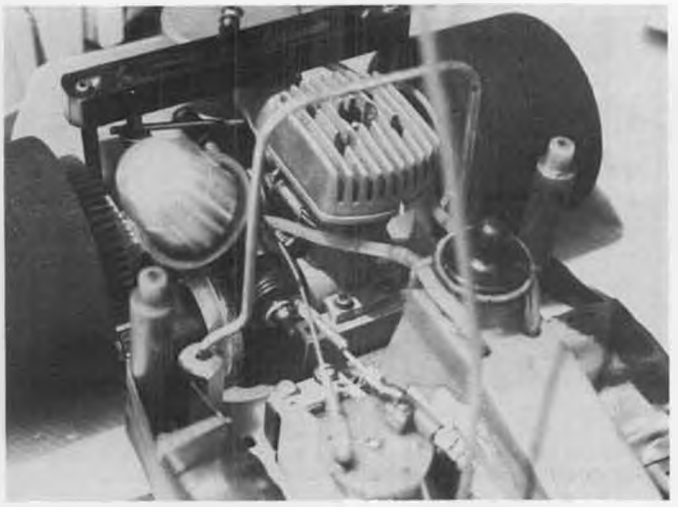
The chassis of the Kyosho and Phoenix cars were fiberglass, and the component layouts very similar to U.S. arrangements. An interesting item was the blow-molded fuel tank, which had an injection-molded quick fill/pickup/vent/overflow unit attached to the top. The vent may have been pressurized by the engine rather than the muffler. The head looked identical to a McCoy cool head, and McCoy can mufflers were used. I did not see any differentials on any Japanese cars. They didn't need them.

The British cars were mostly PB's, but Debbie Preston ran an Associated. Over the past few months there have been several pictures of component layouts used by Booth and Greeno. The cars at Geneva were no different. All the British cars I saw had differentials . . . either PB

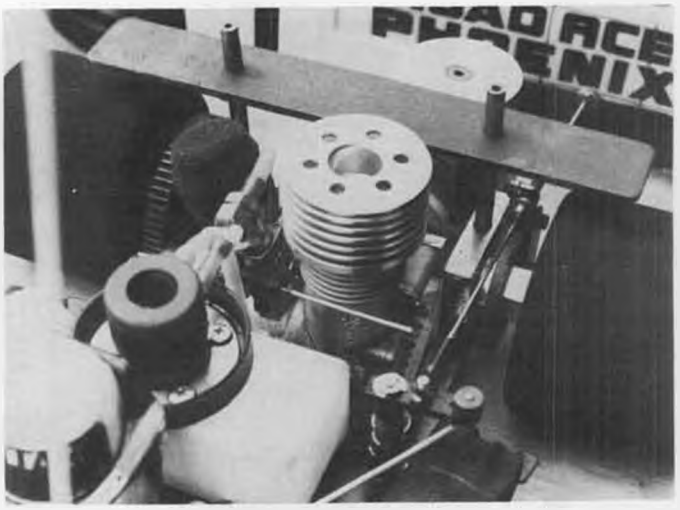
Pieter Bervoets' Serpent car. Wing is mounted farther forward than on most cars, is supposed to help car handling.



Rear end layout of the Serpent car showing Amps differential, gear-brake position, and rear wing mounts on radio tray.



OPS engine and new slide valve carb on Bervoets' car, with wet-weather air cleaner and Delta type fuel tank filler.



Layout of the Phoenix car, showing the O.S. Max .21 ABC and brake and throttle linkage.

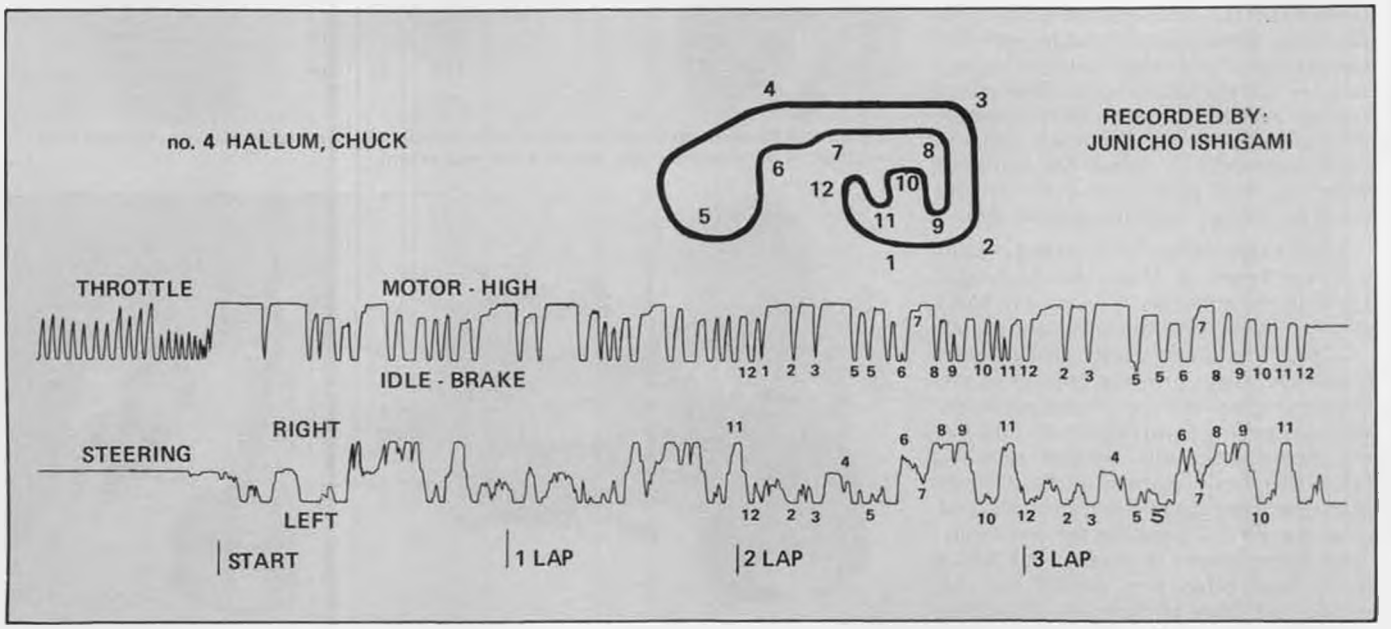
or Amps units. Two things struck you when you watched the British cars: the super go-power of the engines and the rather large appearance of the cars. Most of the cars were OPS powered with PB carbs running on 50% nitro fuel with about 10% synthetic oil. No wonder they went! For some reason most bodies were mounted rather high, so the cars looked big. One thing I noted is that Phil Booth trimmed about two-thirds of the rear body spoilers off. I have been saying to do this for many years because the wing can give much more downforce for the same drag, or the same down force with less drag, improving car speed and performance. The differentials in the British cars didn't seem to unload much when the inside rear wheel lifted, so very heavy oil or grease must have been used in the differentials.

The Netherlands and German cars were mostly Serpents. The cars had fiberglass chassis, aluminum beam front axle (a la RC-200) and a component layout similar to the British (steering servo way up front). Most of these cars were OPS powered with OPS slide valve carb and used Amps differentials. Ronnie Ton, Pieter Boervets, Reiner Dosch and Karlheinz Will were the top drivers. Ton really threw his car around the track with the engine screaming when the inside rear wheel lifted. If you look at the pictures of Boervets' car you will see that the wing is mounted forward of the engine, at about the rear of the radio tray. Pieter swears that this mounting location, with the same initial wing position, and angle, gives more front down force than mounting behind the rear axle. I suspect that what is really happening is that the wing flattens out at speed so that it appears that there is more front down force.

Most of the Italians were running S.G. cars, including Franco Sabattini of course, but Gino Ghersi was probably running an Associated car. All the Italian cars I watched had differentials. The S.G. cars were now sporting a fiberglass chassis, sturdy plastic front beam axle and a radio tray layout similar to a Delta, but reversed carb (which looked like a Perry). Both Ghersi and Sabattini had wild driving styles; they seemed to attack the race track, but it fought back. All the noise, smoke and aggressiveness made their runs rough and inconsistent most of the time. But I must admit, Ghersi had fantastic reactions.

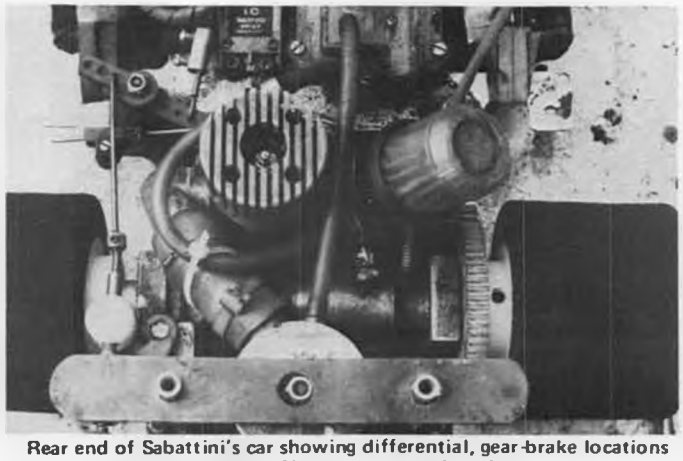
The American cars represented were one HRE, three Deltas, and the remainder Associateds. All components and layouts were similar to what I've seen for these cars for the last 6 months or a year. The only relatively new things were the G.M.S. adjustable clutch (on many cars), the Delta limited slip differential (on Carbonell's car), a prototype HRE limited slip differential, and the side tube muffler (a la Jianas and now McCoy). At this race I think all the cars used fiberglass chassis because of its durability and strength. Jianas, Phelps, Davis, the Hustings, and Lee were all running the side tube muffler; Rold and most of the rest of us used the rear can muffler. When Carbonell ran he had his differential tightened up as much as possible to lock it up, and I took mine out of my car.

But even though we thought our cars were pretty bullet proof, the huge disc track markers took their toll. I broke the



Command record (throttle-brake and steering) to Chuck Hallum's car during one of the Saturday heat races. Car is set up right for turns 2 and 3, slight understeer on turns 5 and 10. Average lap time for first four laps: 23.55 sec. Ran out of fuel on lap 20 or he might have done under 8 min.

Engine, carb, and fuel tank set-up on the Phoenix car. Note small metal carb (like Veco .19).



Rear end of Sabattini's car showing differential, gear-brake locations and throttle-brake linkage. Note severe turn in exhaust.

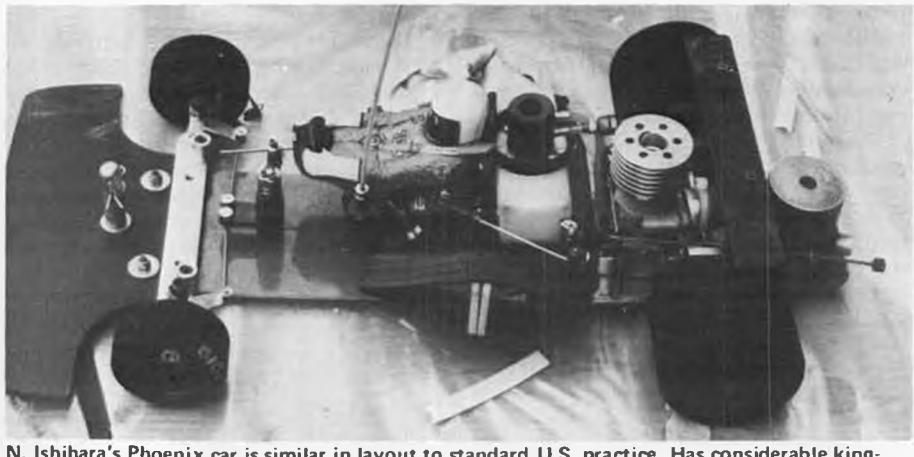
flange off a rear axle bearing and cocked it in the axle block during one heat. Don McKay completely collapsed his rear can muffler. Roger Curtis wiped out a complete rear end. Besides the track, the sun seemed to be super hot and affected tools and possibly some plastic car parts. Curtis Husting was working on his car, tried to tighten a screw, and the socket spun right out of the wrench handle! Whether the sun had anything to do with several large steering servo savers breaking, I don't know. Butch Kroells was trying to run an OPS engine, but had so much power he couldn't really handle it, finally putting in lots of clutch slip and almost getting it together.

As always, at big races, one of the best things was visiting with old friends and meeting new people. Breakfast at the Penta Hotel was enjoyable, not because of the food, but all the different people you could sit and visit with during the meal. I was able to re-establish contacts and friendships with the British and German team members. The Japanese team was also extremely friendly, even though we had quite a communication problem. Two Japanese enthusiasts (one was a driver) spoke English quite well and acted as interpreters. The Netherlands team was also quite friendly. The pit cuties were also enjoyable, with the German and Netherland girls taking top honors. On the last day one of the cuties had on a T-shirt dress (with nothing on underneath) which distracted and excited everyone . . . while her husband went out and destroyed them on the track while they were in a state of shock!

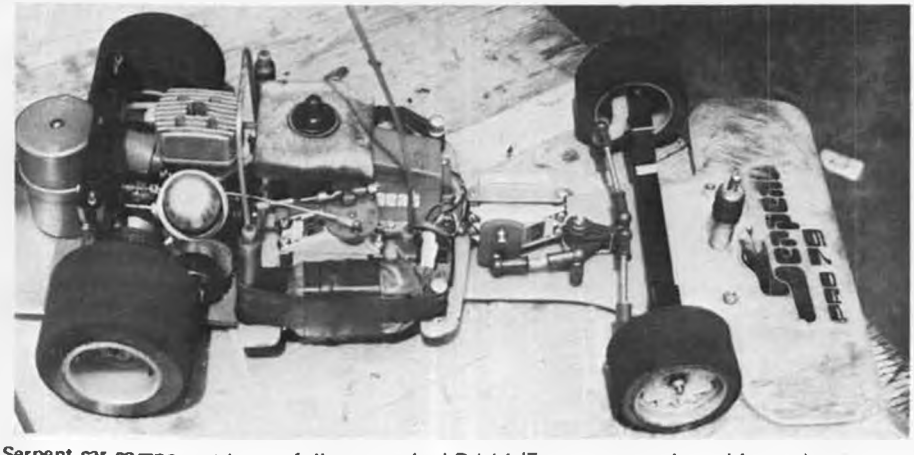
I don't know whether the Penta Hotel will ever forget us. About the third night I had to do some work using my hand grinder. I got ready, turned on the switch . . . ZAP . . . a big flash and instant blackness. I was groping around in the dark trying to find the phone while my wife was yelling from the tub about what the heck happened. Several minutes later the bell captain and assistant manager were up to the third floor and reset the circuit breakers for our room. That same night it seems that Mike Reedy and other U.S. drivers put the whole fifth floor in darkness. The thing that really got to me was that the Orange County (CA) club had a special meeting where the question about our tools and converters was asked of the drivers who went to Monaco. The Monaco travelers said no problem . . . but they blew out some hand grinders too. It seems that the high wattage converters are just a resistor, so that 220 volts is put across the appliance until current flows and the voltage is dropped. So the 220 volts zaps the diodes in the permanent magnet motor hand grinders. What you are supposed to do is use the small power converter, which is a transformer that steps the voltage down to 110 volts. You can't get full grinder power and the transformer gets hot, but you don't blow anything out.

Everything costs in Europe, and Switzerland in particular. We were happy that we rented and paid for a car (Opel Kadet wagon) a month before we left the U.S. We paid about $23 per day plus gas. Some racers rented the same car after they got there and paid over $50 per day. Several of the Associated team drivers got a micro bus (like a VW) and were socked $100 per day! At $2.50 per gallon for gas it was still a bargain, because you could blow a tankful of gas just having a good dessert for two people. Coffee was $1.25 per cup, as were soft drinks. At the track Cokes were $1.60 and hot dogs about $2. But if

Continued on page 92

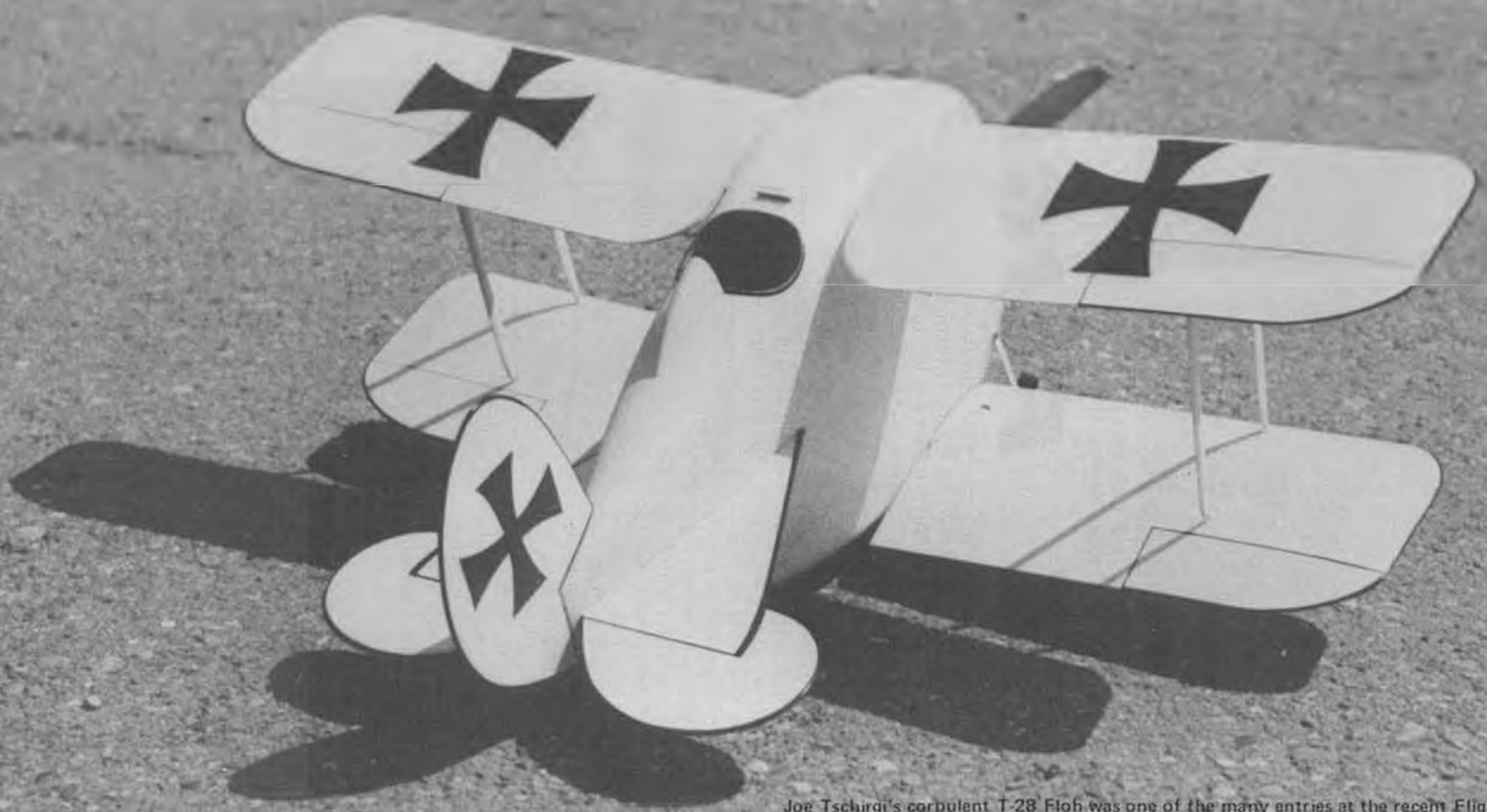


N. Ishihara's Phoenix car is similar in layout to standard U.S. practice. Has considerable kingpin offset to car centerline and lots of Ackerman action.



Serpent car component layout follows standard British/European practice, with steering servo well forward.

FREE FLIGHT AND CONTROL LINE



Joe Tschirgi's corpulent T-28 Floh was one of the many entries at the recent Flightmasters Scale Annual at Mile Square Park, Fountain Valley, CA. Everyone laughed when Joe first brought it out a few months ago, but he soon had them gaping in awe by putting in some rock-steady flights. Photo by F. Ramos.

Bill Langenberg won FAI Semi-Finals at Harts Lake. Rain gear was a definite necessity . . . rained all but 3 rounds. No wind, though.

At the '79 Denver FAI Semifinals, Roy Stevens tows up his Batiuk B-1 Nordic. Roy will go to the finals. Mike Lovins photo.

FREE FLIGHT

by TOM HUTCHINSON

PHOTOS BY AUTHOR

• Well, I made it through the first year! This column marks the beginning of my second year as editor of the free flight section of **RCMB.** One of the main reasons my job was made easier during the past 12 months has been the steady flow of newsletters across my desk, from all parts of the country. There are a bunch of devoted free flighters out there, in places you wouldn't expect. The articles in the newsletters I get make for some very interesting reading, which I've tried to share with you as much as possible. I've used excerpts from the *Batsheet, Bugs' Buzz, Free Flight News, Fresno Model News, FFFliar, CIA Informer, PMAC News, Satellite, Turbulator,* and *WMC Patter* in the year gone by. They weren't all the interesting stuff I read, just what fit the available space and hadn't been grabbed and used elsewhere. Thanks, you poor unsung newsletter editors . . . I know it's a thankless job (nobody notices until you miss an issue), but it serves as a very effective "grapevine" for spreading the news. Keep 'em coming.

I also welcome any photo contributions you send in. As I mentioned a while back, you'll probably get tired of seeing the same old Northwest faces here, unless I get photos from elsewhere, like Bill Lovins' shots of the Denver FAI semi-finals this month.

(If you're interested in getting any of the aforementioned newsletters, look up the addresses of the editors in AMA's list of Chartered Clubs and write for details.)

THE VICIOUS CIRCLE: Some circle tow observations by Paul Lagan
(From *South Island News*, edited by Paul Lagan, 8 Bermuda Drive, Christchurch 4, New Zealand. Subscriptions $5 per year)

"F1A is probably the hardest F/F class to fly to international standard and requires a lot of time and practice to master. No other class demands so much in the way of constructional skill, physical fitness, and 'match' practice. F1A design and construction is a whole bunch of performance versus stability versus strength compromises.

"In this article I won't discuss selections of designs or hooks or wing sections. I want to record my conclusions on some of the areas I found little written on and areas where few fliers have previously placed emphasis. The bits I pick out are not the only elements to good glider flying, but they may fill in the gaps for the inquisitive mind.

Dale Wangeman turns loose his Mini-Pearl for his first official contest flight EVER, while Dee Grell does the timing honors. Model maxed, naturally!

"To circle or not? To lay a few old ghosts to rest, let me state that if you want to do well in F1A, then you must fly a circle tow model *but* (and that should be a big BUT) unless you are prepared to do a lot of thinking and a lot of practice with your glider, the traps in circle towing will catch you out and cause your downfall. If you are a 'once a month' F/F'er, then stick to straight tow. If you're serious, then there is only one way to go, and that is with a Russian-hook system, catapult launch circle model.

"Is circling for everybody? To exploit circle towing to its fullest requires stamina, speed at moving over the ground. It is not for geriatrics or slow speed stompers. If you don't like exercise, then don't try circle towing or you may have a hernia or seizure to play with. One should be able to:

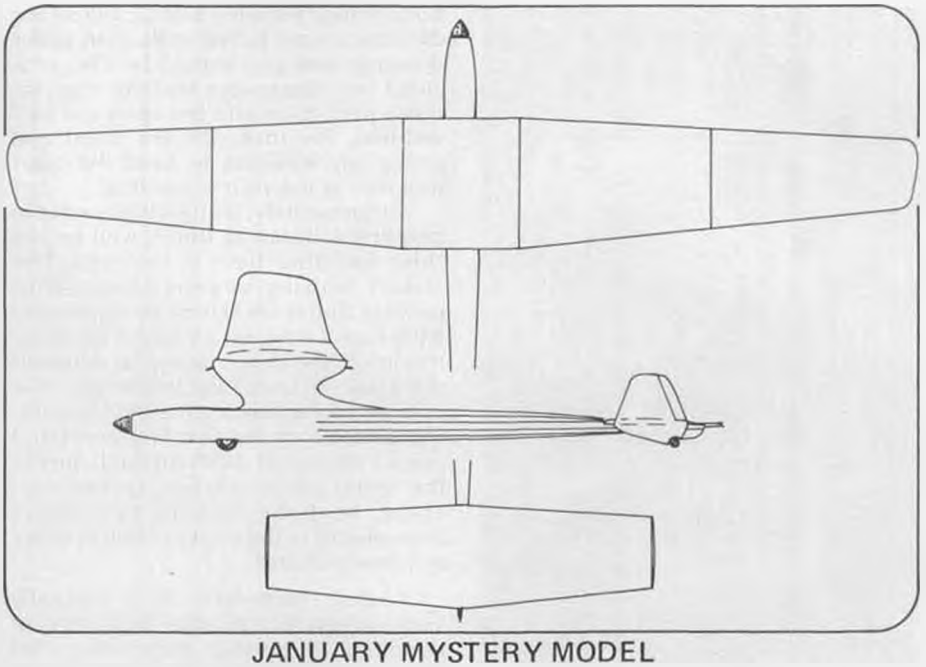
a) Sustain a sprint for 300-400 meters at a good clip for those downwind chases after thermaling models;

b) Jog steadily for 3/4 hour at about an 8-minute-per-mile pace to develop the stamina to sustain you through a 7-round contest;

c) Run *backwards* with some speed and with the ability and confidence not to trip and fall. Backwards running is very necessary to get good launch timing in calm and low lift conditions.

"Pitch Stability. Before the days of good zoom launches it was easy. The 'magic' 55% CG gave good glide stability

Mike Thacker gets an easy launch on his 1/2A-A ship at Pensacola meet.



JANUARY MYSTERY MODEL

with the normal size tails (5 sq. dm.) in all weather. With modern zooming, though, things get a bit more critical. If the CG is too far forward, the model is hard to accelerate on the line (too much drag) and once launched, it will pitch up too fast and be very 'loopy.' Anyone who has flown HLG will know that the cure is to push the CG back and reduce decalage until the climb just gives good recovery off the top. The same is true with F1A, but sometimes the right 'climb' CG/stability margin will give a model that stalls 'heavily' and is not quick enough in pitch upset recovery. Light extremities help here, but the best solution is to set up your calm or light-air model with with CG right back to give that super climb, just rolling out, and set up your thermal model with a slightly loopy zoom . . . on a given design, this means about a 5% CG shift.

"Roll Stability. F1A's need a bit of wing twist in the glide to guarantee that thermal turning doesn't develop into a spiral dive. In addition, with all that speed built up in your beautiful zoom launch, the wing twist will turn the climb yaw into a spiral climb. Only problem is that to prevent the launch from being overcooked, one needs either a very large amount of wing twist or a small amount of rudder deflection . . . without one of these, a hard launch in lift can easily spiral all the way down. Small rudder deflections may be OK in calm evening air, but aren't for good thermaling where a 20-25 second glide circle is needed. The glide circle can be quickened with moderate rudder by using tail tilt, and so a balance of small wing twist, small rudder deflection on the glide and tail tilt can give the desired zoom and glide performance.

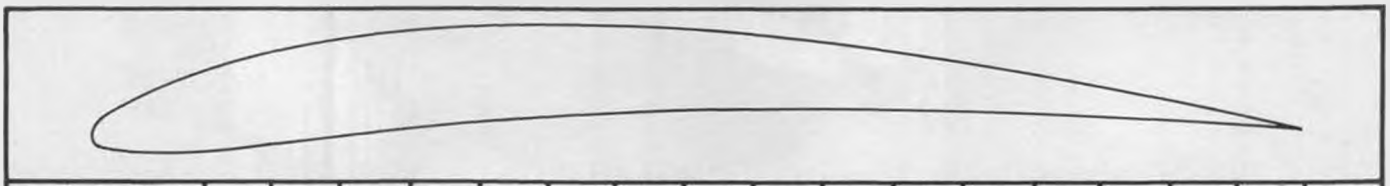
"An even better solution, and one that doesn't cause interaction between adjustments, is to use a delayed glide rudder. Students of the circle towhook art will know what I mean; the small 'zoom' rudder deflection is sustained for 2 to 3 seconds after the model is launched and at the top of the rollout, the rudder clicks over the proper glide setting. Such a device is difficult to engineer reliably and must, of course, be used with a timer start system that starts at release and with a Seelig or similar timer that can provide a 3 second function as well as DT function.

"In a similar manner to the pitch stability problem, it is possible and desirable to have the calm air model set up for an open glide circle and so, for that type of model, tail tilt and delayed rudder can be dispensed with. For the wind/thermal model, one or the other device is necessary.

"Be warned that too much wing twist will give nasty towing tendencies. One of my AL-29's (the still air one) has very little twist and tows like a dream in all weather. The other has a 'moderate' amount for thermal flying and is a lot more difficult to set up for a launch, as the roll induced by the wing warps is speed-sensitive at a different rate to the rudder, so it veers off on tow at varying

George Batiuk Jr. launches his rubber ship to a 1st place win in Wakefield at '79 Denver Semifinals. Lovins photo.

DARNED GOOD AIRFOIL — BOGART BO 545–38



STATION	0	1	3	5	7	10	15	20	25	30	40	50	60	70	80	90	100
UPPER	0	1.4	2.6	3.5	4.2	5.1	6.3	7.3	8.0	8.4	8.6	8.4	7.6	6.2	4.5	2.4	0
LOWER	0	-1.0	-1.3	-1.4	-1.3	-1.2	-0.8	-0.4	0.4	0.1	1.1	1.5	1.7	1.7	1.5	0.9	0

Bruce Kimball searches for lift with cattails. Model is a "Teacher's Pet" P-30 design.

amounts dependent on the tow speed.

"The best way to control and measure wing twist is to keep the inner panels free of warps, and to wash-out the tips a different amount. Tips seem easier to change by steaming if an adjustment is needed. A very small amount of tail twist may also be desirable (inside tip at a slightly increased angle of attack) for good thermal characteristics.

"Wing Strength. The modern zoom-launched glider seems to like to unlatch at about 3 kg. With this setting, it is best to get the zoom rudder movement started at around 3-1/2 kg and to have the hook 'bottom-out' (i.e., maximum zoom deflection) at 3-1/2 kg. For a clean model with low-cambered sections, a load on the line of 3-1/2 kg will mean it is moving very fast and the wings will be bending somewhat! Don't skimp on good strong spruce spars on top and bottom near the wing root . . . follow the dimensions published in Russian glider drawings and you should be OK, provided you also ensure that the root ribs don't peel apart and the spars are well webbed. Ply root ribs are good and strong ply webbing to hold the spars together at the root is essential.

"Unfortunately, many wings strong in bending will start to flutter well before their bending limit is reached. The D-box leading edge is essential to prevent flutter on skinny sections and I have found it necessary to put geodetic ribs inside the D-box (as well as between the 2 pairs of spars) and to fiberglass the outside of the box to give rigidity commensurate with the bending strength. I use a 1 oz./sq. yd. cloth on the D-box in the center panels and tips, applied with epoxy. Keep the covering tight (don't over-plasticize the dope) as well in order to prevent flutter.

"Launch Technique. It is naturally very necessary to practice in all sorts of conditions. One trap circle towers fall into is to launch too late. A piece of lift comes along and our flier feels it. He does a check circle to confirm, then he accelerates upwind and off. The thermal is meantime downwind. It is necessary to either chase the thermal downwind and creep up behind it (in the calm) or to work the model back into the best bit of the lift (in a breeze) so that the top of the climb at the moment of zoom is bang in the center of the thermal.

"If you intend to hang onto the end of the line at the moment of release, then you need to be able to reduce tension enough for the model to climb out and come off the hook. To do this, it is necessary to pull in a meter or two of line just before release. It is far better to be able to let the end of the line go at the moment of release. To do this, one must have the timer starting by means of the hook movement and tow without a winch. I use a small (4 cm. long) loop in the end of the line that hooks over the middle finger of my left hand. When pulling in line hand-over-hand, the loop goes down to the base of that finger; when I am intending to launch, the loop rests in the first joint of the finger so that the line comes off merely by straightening the finger at the critical moment. The loop is also held at its knot between the thumb and first finger of the left hand when nearing release. Make sure the hook is unlatched before throwing the end of the line into the air; if it isn't, then bye-bye glider! All this trickery and the ability to haul in line and not step into it or tangle it comes with plenty of practice."

Keith Martin used a little OOMPH and a howling Rossi to win FAI Semis at Harts Lake.

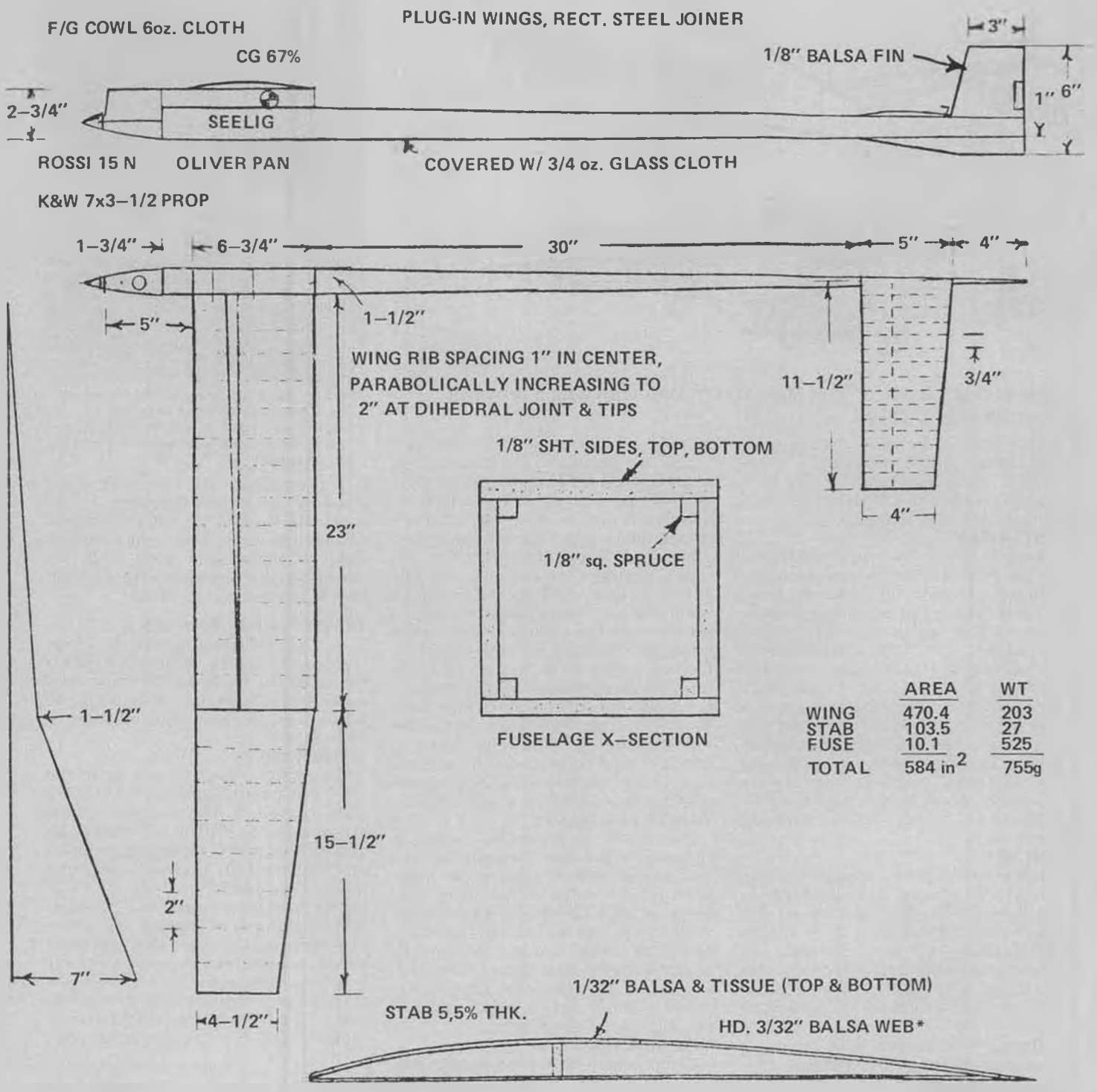
If you're interested in circle towing, Paul has hit upon a lot of the little, critical elements (like setting up the model for zoom launches) that may be common knowledge to the experts, but are totally bewildering if you try to reinvent the wheel by yourself. John Cooper's article in the July 1979 issue of *Aeromodeller* is also required reading before you start.

I don't quite agree with Paul that the Russian-style hook is the only way to go. A twanger system as outlined a few issues back, will enable you to begin circle towing with much less fuss, bother and broken gliders than the Russian-style hook. After all, I regard circle towing as a means of towing a glider until lift is found. All other functions are secondary. You don't need a zoom launch if you're in good lift, or, conversely, a good thermal will give you a good zoom with any system. For some

Continued on page 82

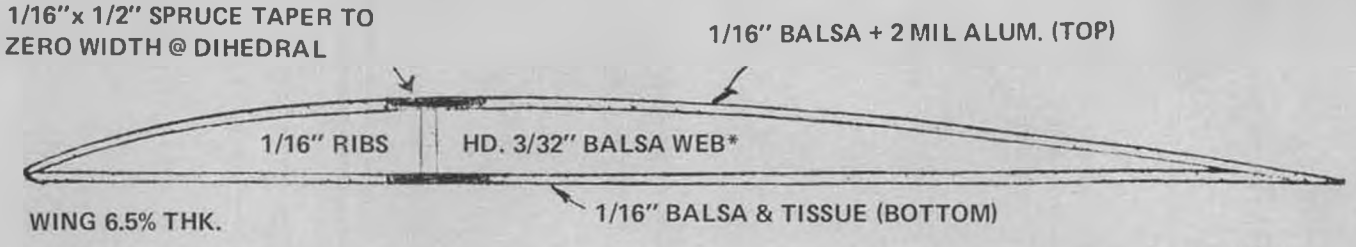
FAI Power winner at Denver Semifinals, Don McGhee, flew this original design "Stingaree" with Rossi power. Both feet off the ground to launch this one. Lovins pic.

Jim Crocket sent this photo of his new "Survival Kit," which can be used for a lot more than carrying soft drinks around. Text has all the details.



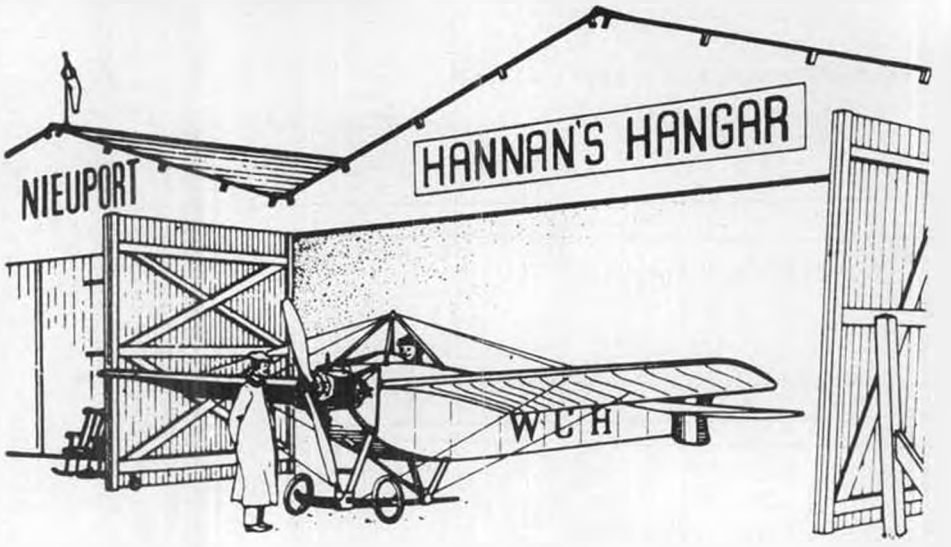
	AREA	WT
WING	470.4	203
STAB	103.5	27
FUSE	10.1	525
TOTAL	584 in^2	755g

*BALSA WEBS RUN FULL SPAN, GRAIN SPANWISE ALL RIBS CUT OUT FOR WEB.



CARL BOGART – USA
FIC – 1979

Tom Hutchinson
AUG. '79



"Aerial flight is one of that class of problems with which man will never be able to cope."

• Our lead-in line this month is by astronomer Simon Newcomb, who uttered this pronouncement during 1903, shortly before the Wright brothers contradicted him so forcefully!

JUST DUCKY

Regular readers may recall the saga of the word "CANARD," which continued through several Hangar columns. Now, intrepid French author George Chaulet has found yet another possible definition of the term: "The word CANARD has not five, but six interpretations. The sixth one is 'a bad sound or a false note made by an air instrument, such as a trumpet or clarin' (clarinette?). And, of course, the sound made by a trumpet playing in a bad manner is something like 'KOOAKK!', sounding like the cry of a duck." So we have come full-circle. A canard by another name is a duck just the same.

ARF, ARF!

Editor Bill Northrop appears to have coined the acronym (*A*lmost *R*eady to *F*ly) during his tenure with *Model Airplane News* some years ago. Before World War I, the firm of Mann and Grimmer in England offered completely fabricated twin pusher models guaranteed to cover a minimum distance of a quarter mile!

These manufacturers were also quick to recognize the need for proper promotion of their products in the best "show biz" tradition, and conducted model exhibition flying for the purpose of entertainment as well as advertisement. For a reasonable fee they demonstrated their wares at garden parties and other social gatherings. To quote *The Model Engineer and Electrician* for July 4, 1912: "This suggests what is perhaps a somewhat uncontemplated and novel use for model aeroplanes. Where space is available, exhibition flying with good models, ought to be a very attractive form of entertainment, and we doubt if the possibilities of this kind of show have been fully explored or attempted in the right direction. It is, however, essential that it should be practiced by experts, and with good flyers, otherwise disappointment and ridicule would result."

WHAT'S IN A NAME?

The origin of the term "blimp" is shrouded in the mists of aviation history, but several unlikely explanations have been offered so frequently as to have become "cliche" from repetition. Frank Scott sent in one we had not previously heard: It seems that pioneer aircraft manufacturer Horace Short, of England, was asked why the aerial gas-bag was called a blimp. "What else could you possibly call it?" he replied.

NEW MPA GOAL?

Philip Jarrett, of *Aeroplane Monthly*, has proposed that the next man-powered aircraft task should be a non-stop round-trip flight of the English Channel, following the example of C.S. Rolls, of Rolls-Royce fame, who first performed that feat flying a French-built Wright biplane during 1910.

Pete Farrimond prepares the Zlin Peanut of Milan Kacha (Czechoslovakia) at the '79 Woodvale scale meet. It was the only proxy flown model to achieve 30 seconds. Photo by John O'Donnell.

TRAVELING FOR PEANUTS

As a promotional gimmick, Texas International Airlines offered flights from Denver to Texas for those who qualified by bringing to the airport 59 horseshoes, 59 ways to fight inflation, or 59 Peanuts!

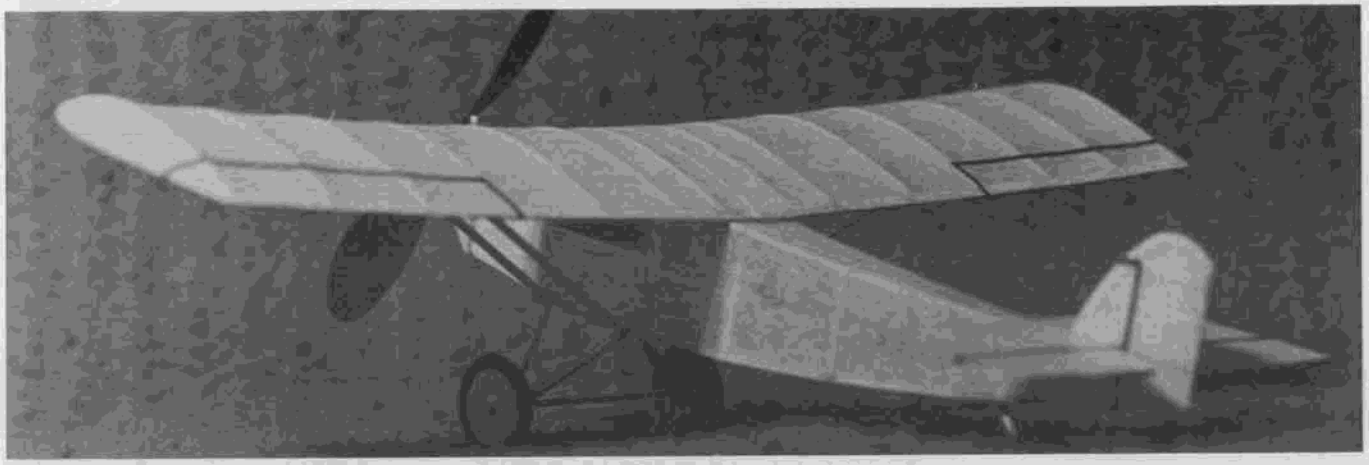
WOODVALE '79

Woodvale in England was again the site for an international free flight flying scale contest. While last year's meet attracted only British and American entries, the 1979 competition included models from four countries, only one short of the arbitrary FAI requirements for world class recognition. Thanks to John O'Donnell of England and Ichiro Yamada of Japan, we are able to present a few highlights, including John's graphic photographs. The F/F event was flown in very pleasant and calm conditions "far from the madding crowd (public)" and as in the case of last year,

Continued on page 93

Delightful Pauline Smith displays Walt Mooney's Peanut Upton Baby Ace (or hadn't you noticed?) at Woodvale scale meet. Model was proxy flown by Mike Colling. John O'Donnell photo.

Pete Branigan is the picture of concentration as he launches Ichiro Yamada's Polikarpov I-17, which was mailed to Woodvale all the way from Japan. O'Donnell photo.



PHOTOS BY AUTHOR

ALCO SPORT

By BERNARD SHULMAN . . . A simple model of an all-but-forgotten homebuilt from 1920. It would be a good choice for your first Peanut.

• In 1920 the Allison Airplane Company at Lawrence, Kansas started selling plans and parts for a small sport monoplane. The aircraft was to be powered with less than 65 hp and carried one or two people.

The model is shown with a Lawrence two-cylinder 28 hp engine. For more details on the Alco Sportplane, see the 1930 Flying and Glider Manual. Copies of this and other books can be obtained from the Experimental Aircraft Association, P.O. Box 229, Hales Corners, WI 53130.

The model Alco follows the full-size aircraft in construction. The only deviation from scale is the addition of dihedral to the wing, and the landing gear is longer. The wing, stab and rudder area are scale.

Construction is simple and standard. The right and left fuselage sides are *not* the same in the cabin area. The left side is cut down for access of the pilot and passenger. Note the details on the plans.

Start construction by building the fuselage sides over the plan. Build one on top of the other. When dry, remove from plans. Glue the tail post together and add cross braces at the cabin. Add the rest of the cross braces from the cabin to the tail. Let dry. Bring the nose together and add cross braces. Add the soft balsa nose cowl block and hollow out as shown on plans. Put in the 1/16 sheet on bottom of fuselage for tail skid. Sand the fuselage smooth. Bend the landing gear from .020 wire; be sure to bend one right and one left. Glue the wire to the front of the forward and back of the rear bottom cross braces. Add a 1/16 sq. cross brace to hold wire in place in front and rear of wire respectively. Glue very soft 1/32 sheet balsa in place on sides and bottom. Sand very thin and blend into the sides and bottom.

From 1/32 plywood, cut out nose former F-1 and engine mounts. Cut out F-2 and glue to back of F-1. Be sure that F-2 is a snug fit into front of fuselage. Glue the engine mounts to F-1 and sand smooth.

Build the Lawrence engine from balsa. Williams Brothers cylinders can be used and will help balance the model. The engine should be painted flat silver. Glue engine to mount. Fill space in back of engine with balsa.

The wing is built by cutting out 15 ribs from 1/32 balsa. The center rib is cut flush with back of front spar, and is added when putting in the dihedral. Pin the 1/16 x 1/8 trailing edge down. Pin down the 1/16 sq. spar. Glue the ribs in place (do not put center rib in at this time). Glue the 1/16 x 1/8 leading edge on. Add wing tips. Allow to dry. To add the dihedral, sand leading and trailing edges at the root. Prop up one wing tip 1/4 inch. Glue in the center rib. Add 1/16 sheet fill in front of center rib on top of spar. Sand wing smooth.

The tail is built from 1/16 sq. balsa. Leading edge of rudder is cut from 1/16 sheet.

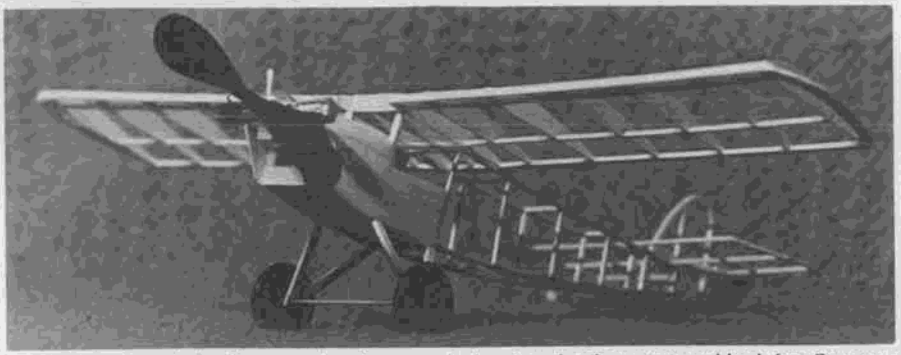
Cover model with white tissue. Wet with water. Give wing and tail one thin coat of low-shrink clear dope (Sig Lite-Coat is very good). The fuselage should get two or three thin coats of dope. With thin black tissue strips, outline the control surfaces.

Glue wing to top of fuselage. Add stab and rudder. Be certain that parts are aligned. The wheel axle is a 1/16-inch O.D. aluminum tube. Glue the tube to the landing gear. The landing gear struts are cut from 1/16 x 1/8 balsa. The balsa struts will hold the tubing in place. Add the wing struts from 1/32 x 1/8 balsa. Put a pin through each wheel. A slight bend should be put in the pin, then pushed in to the end of the tubing. Cut a hole for tail skid and glue in place.

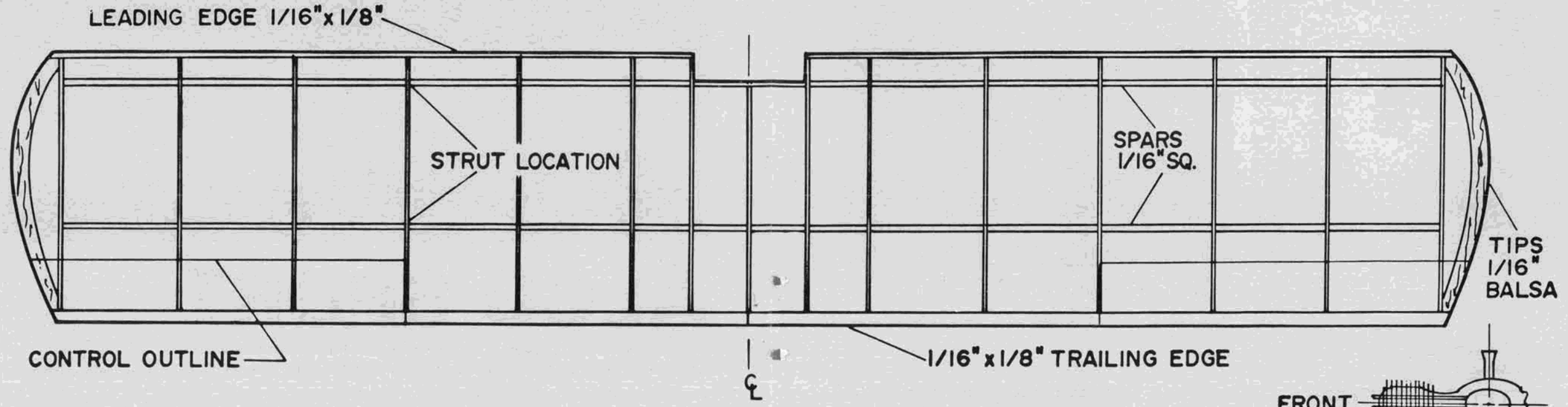
From what I have read and photos I have seen, there are no numbers or markings on the Alco Sport.

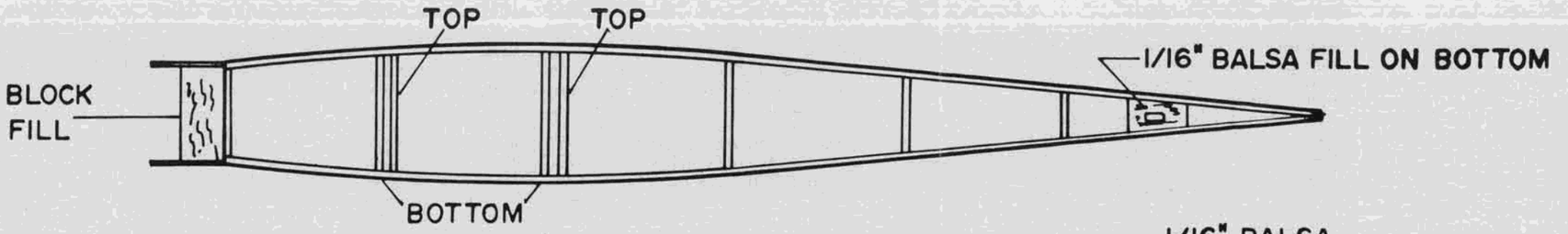
Flying the Alco is no trouble. The original model needed no weight to balance. Use a plastic prop of 4 to 4-1/2 inches. Check the model for warps. If warped, remove with steam. Check balance as indicated on plans. With the rubber motor in place, start with about a 7-inch loop of 1/8 rubber. Put in about 25 to 50 hand winds. The model should fly level with a slight hint of left turn. Add more winds and check flight. If model stalls, add a very small amount of down thrust. Keep adding down and side (left) thrust as needed. A small amount of left rudder can help take out a stall. After model is flying okay, add a longer motor. Use rubber lube and a mechanical winder. Be sure to recheck the balance.

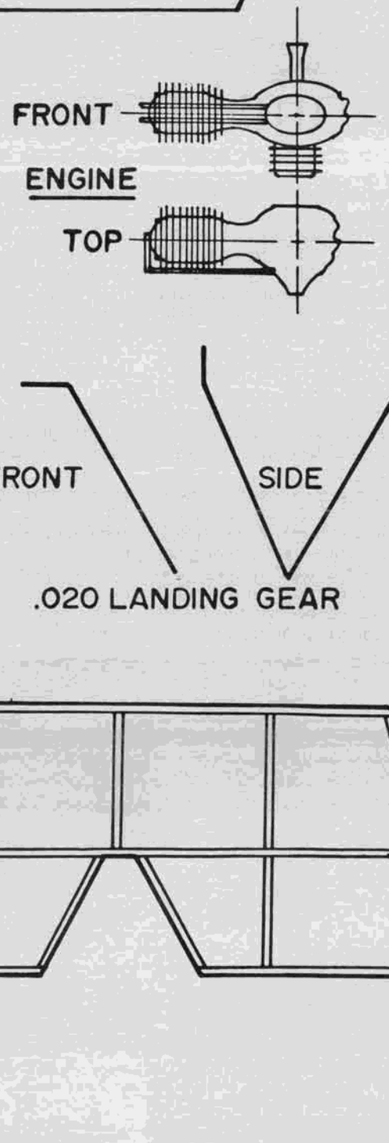
Make only one adjustment at a time. This is the first rule of free flight. Go slow with the adjustments, and the Alco will give many hours of enjoyment. •

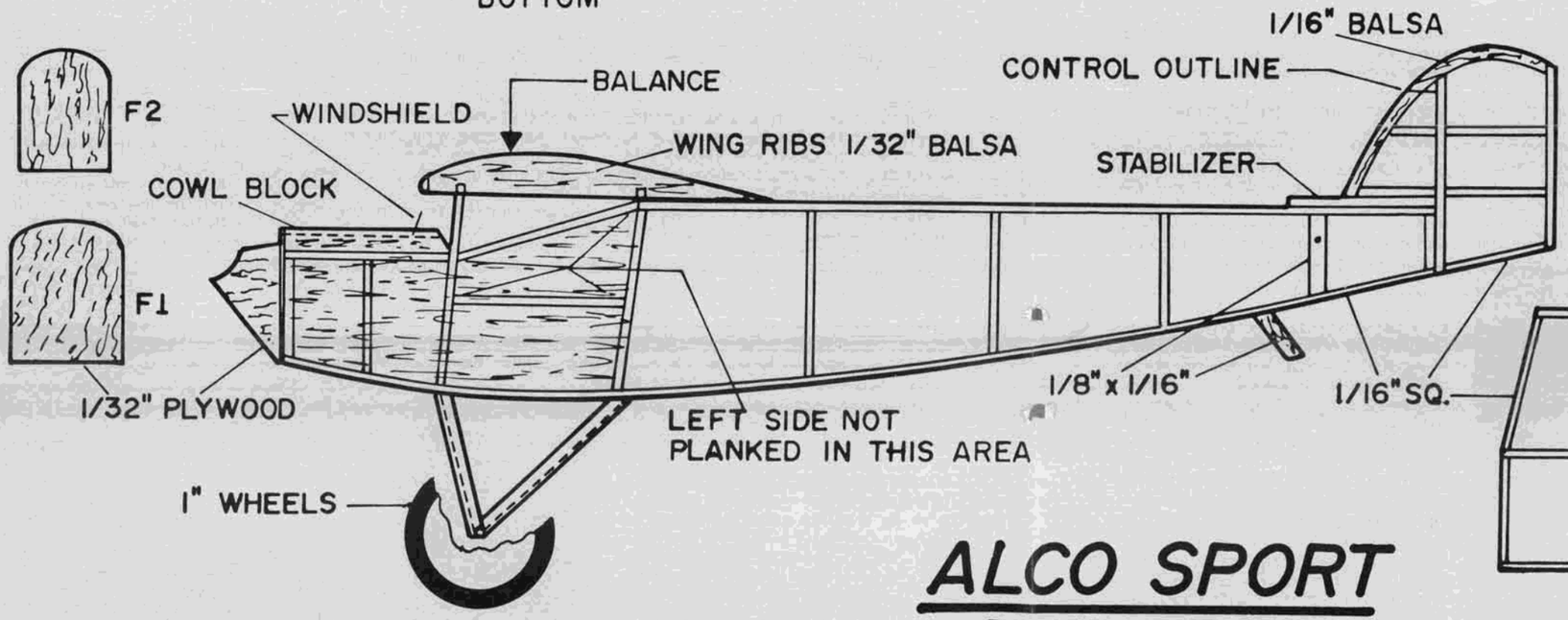


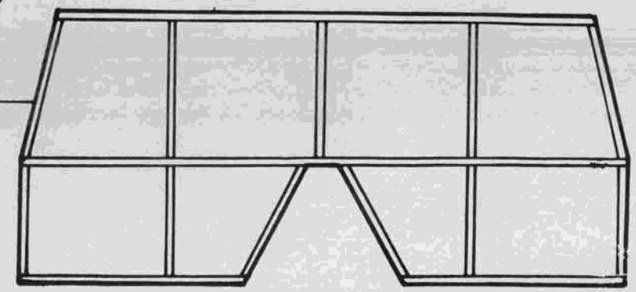
Framework shot of the Alco reveals a framework about as simple as you could ask for. Structure looks a bit stout, could probably be lightened for indoor-only flying.











ALCO SPORT

Bernie Shulman

Gary Stevens has one nasty Combat model, a Nemesis with a Fox .36 . . . and two-channel R/C! Outrageous performance!

"C'MON, DIRTY, TAKE YOUR STUPID PICTURE SO'S I CAN LET GO OF THIS THING!!" Gary hangs on for dear life.

Control line

By "DIRTY DAN" RUTHERFORD

P. 59 PHOTOS BY CHARLIE JOHNSON, ALL OTHERS BY AUTHOR

WE DARE YOU. . .

As there are probably as many R/C folk reading this column as there are C/L fliers tuning in (the balance may even be in favor of the R/C guys, believe it or not), I thought I would slip in some pictures of Gary Stevens' conversion of a standard Nemesis II kit into a radio controlled bomb.

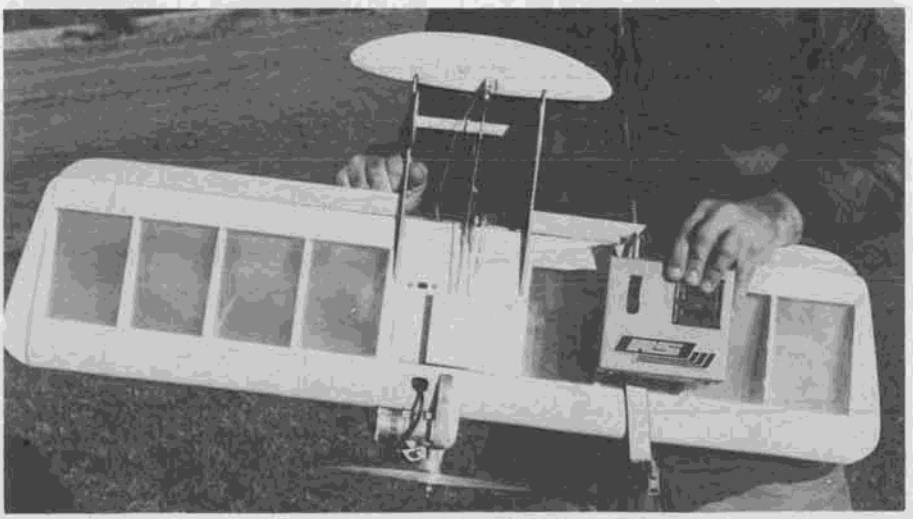
The model was actually built as a standard C/L Combat model, in fact had been flown in Combat before getting the R/C stuff installed. The top sheeting on the center section was opened up and bellcrank and leadouts removed before replacing it all with an RS radio system, just two channels' worth, one for ailerons, the other for the stabilator. Simple strip ailerons were hinged to the wing with plastic film, and the original control horn on the stab was swapped for a real long one, to cut the control down some. The simple rudders glued to the booms don't really do anything other than be a visual indicator of whether the model is inverted or not.

For the first flights a real healthy Super Tigre X-15 was used on extended motor mounts (adapter plates), and things were fast enough that nobody in their right mind would want more speed, a tighter turning radius or better vertical performance.

However, right there in the pit box was this honkin' Fox 36 Combat motor. Even Gary was a bit reluctant about putting it on but finally I talked him into it, although we did compromise and used a prop we knew would slow things down some. And it was fantastic. People who normally hang around our pit area withdrew to a safe distance . . . some even got in their cars. We launched that hummer and it went about like what you would expect when using a high output motor on an airframe that, without radio, weighs less than the powerplant.

Two flights later we slipped on the usual Top Flite 8-1/2 x 6-1/2 Pylon prop we use in C/L Combat and the R/C Nemesis came alive. From a hand launch it will not just climb vertically, it will do it rolling and so fast that you have to be quick to keep it from going out of sight. Passes in front of the flier are so quick that it's a joke, and so are the maneuvers. It doesn't seem to turn as tight and as quick as the same model did on lines, but then again it is packing a radio, so the loading went up some. And as any knowledgeable C/L flier knows, *nothing* turns as fast and as tight as a good Combat model on lines, with more and more models capable of doing up to 100 loops per minute, all the while maintaining an impressive rate of speed.

The particular model shown finally blew up one day. The motor mounts separated, the engine flew off and the model pitched up violently, blowing it to pieces. But what was neat about it was that it could be converted back to a pure C/L model in an hour or so.



Gary's Nemesis is stock, having been flown C/L before cutting it open and stuffing a radio inside. Originally flown with a .15, and was still way overpowered. Alas, model exists no more.

The "We Dare You" bit comes in as another challenge to Arlie Preszler and Company. Seems that my previous challenge to Arlie, concerning he and I flying R/C Combat, led to one of the clubs Arlie is associated with (Tokay R/C'ers) forming a couple of classes of R/C Combat and having at it on several occasions. Now that they have done that, maybe they will be interested in a class of model with "just slightly" higher performance potential!

DIPLOMATIC CORPS

Howard Rush was over the other evening to pick up some stuff, and had just returned from the FAI Combat Team Trials held in Buder Park, in St. Louis. Phil Granderson came out on top (long live the Jive Combat Team) with seven straight wins, no losses, to lead the team of himself, Sherwood Buckstaff, and

George Cleveland. I believe that the next C/L World Champs will be held in Poland, and can't you just imagine the possible happenings when these three guys are set down in that country?

Although I personally enjoy all three of them, each is known to be quite capable of handling any situation. Phil has a very sharp wit that can cut down anybody, although the message is sometimes pretty deep. Sherwood is of course well-known for his antics in and around the Combat circles, having picked up a most descriptive and usually accurate nickname, the same name he uses for his Combat design. The family nature of this magazine prevents us from publishing the name, by the way. George Cleveland is also one of those people you don't try to pull something over on, and he can be very assertive when it comes down to the nitty-gritty.

I don't know what life is like in Poland, but imagine it to be very structured. Pity the poor police who casually ask our FAI Combat Team where their passes are and to state their business. Even if fluent in the English language, their chances of getting any kind of straight answer will be very small.

As far as the actual flying goes, this looks to be the strongest team we have ever sent to the W/C's for FAI Combat. All three have been flying Combat for a long time and have proven themselves, not just in this Team Trials but in the Nationals as well. On any given day all three of them could beat anybody you would care to match them up with.

Sherwood and George have flown together for so long that George, a Louisiana boy, is now simply considered to be from Texas and is associated with the guys from Texas at all of the Nationals. Sherwood is a for-real Texas flier, and although I have poked some fun at Texas Combat fliers once in awhile, it has to be recognized that anybody who is successful in the Texas area is capable of winning anyplace else in the world.

Phil always has good models, plenty of them if it is an important contest, and above all is effective with whatever equipment he is using. Phil's only problem has been in allowing his laid-back attitude toward *everything* except the actual flying to hurt him when it comes time to be prepared for anything that might happen during a match. At least that has been the case at a few local contests, although he was obviously prepared for the Team Trials.

And the star of the show, Howard who? Received best dressed contestant award at Nats. Charlie Johnson pic.

If these three guys can hit it off well and adopt an attitude of it's-us-against-the-world, plus come up with some well qualified pit people, they can win and make it look easy, that is all there is to it.

Another factor going for us this time is that all three team members are known for being able to understand the rules (whatever they are) and all possible interpretations. In past W/C's it is well-known that some judges tend to favor certain fliers and to give them a "break" if the opportunity comes up. And sometimes the judges have been people who were given a trip to the W/C's as a favor and not because they were necessarily the best for the job. Any judge who is up against Granderson/Buckstaff/Cleveland had better have his head screwed on right or they will collectively unscrew it for him and hand it back on a tray.

If we ever had a team that did not need the services of a Team Manager, this is it.

Personal note: Thanks to Paul Smith for the tape describing all of the action at the Team Trials. Paul, please buy a better quality tape the next time. This cassette hung up like crazy and I missed a lot of the second side.

GETTIN' IT ALL TOGETHER

As I have said many times before, I am involved in a lot of modeling activities other than C/L. And of the things I can't get into, I keep close track of what is going on, even to the point of knowing what is the hot tip in Old Timer, both F/F and R/C. So I have a pretty good feel for things promotional and can recognize an activity that is potentially popular, only needing a shove in the right direction.

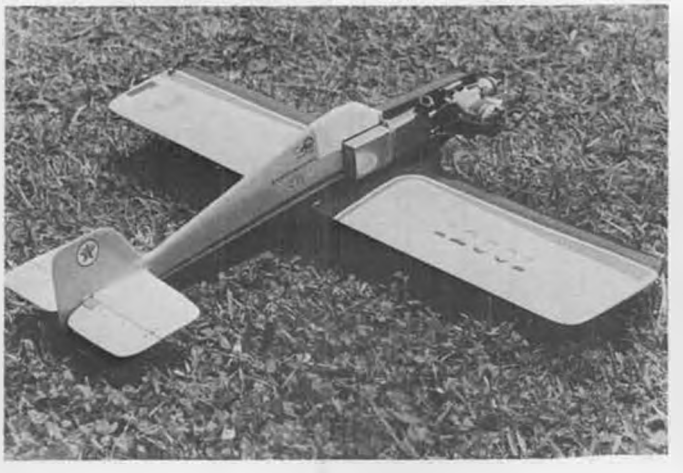
Looking at modeling in general, R/C flying is of course the big deal now and will be for many years to come. It is growing at a stable rate, is heavily promoted and so can be said to be very healthy at this period in time.

But look at C/L flying. It seems to stay at the same level, year after year. Some say it is dying, but they have been saying this for years and so are probably as wrong now as they were back then. But you have to go a long way to find anybody who is overly optimistic about C/L and its future, so the best bet is that C/L has ceased to grow to any noticeable degree, yet is hardly in danger of disappearing.

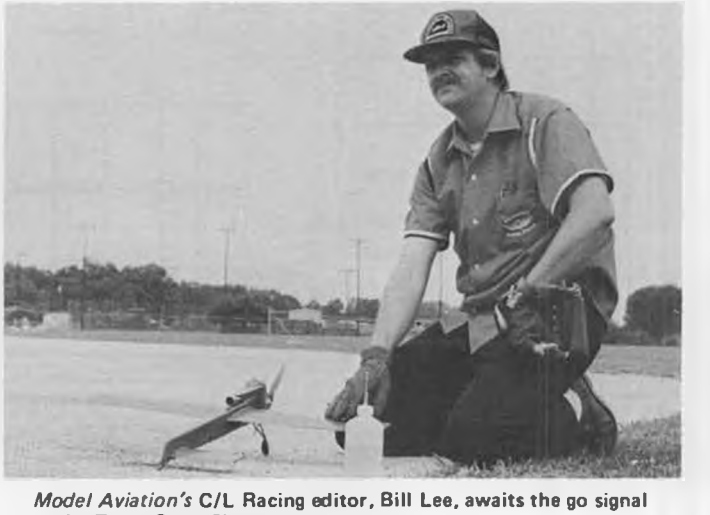
However, when you have any activity or business that is not growing at least a little, there is always the danger of complete liquidation coming along at some time.

For a minute, let's take a cold, hard look at F/F. Now, I truly love F/F modeling, but isn't it the dinosaur of dinosaurs in the world of modeling? You need a large field to fly in, the models are in no way controlled once they leave your hand, there are considerable building

Continued on page 86

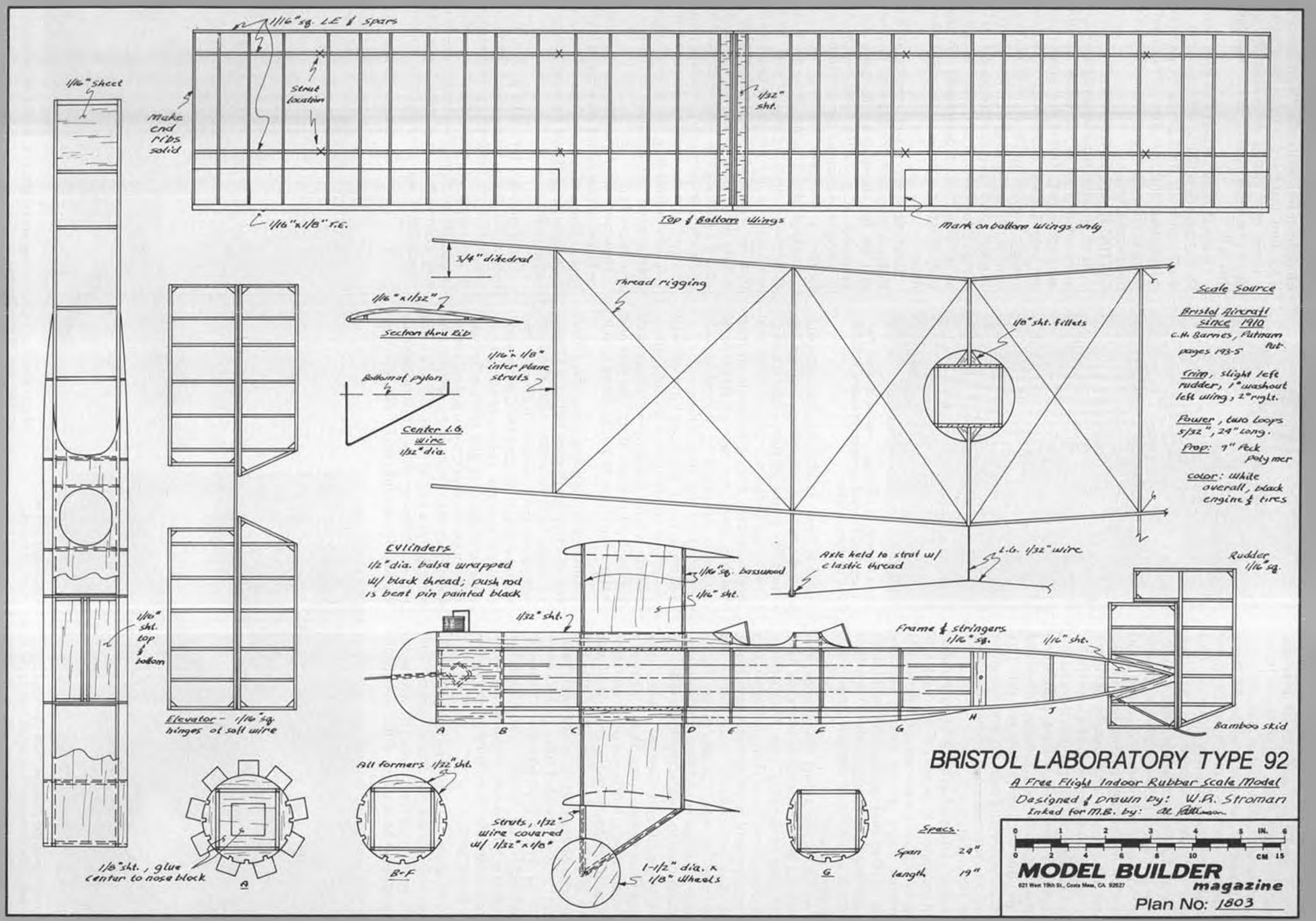


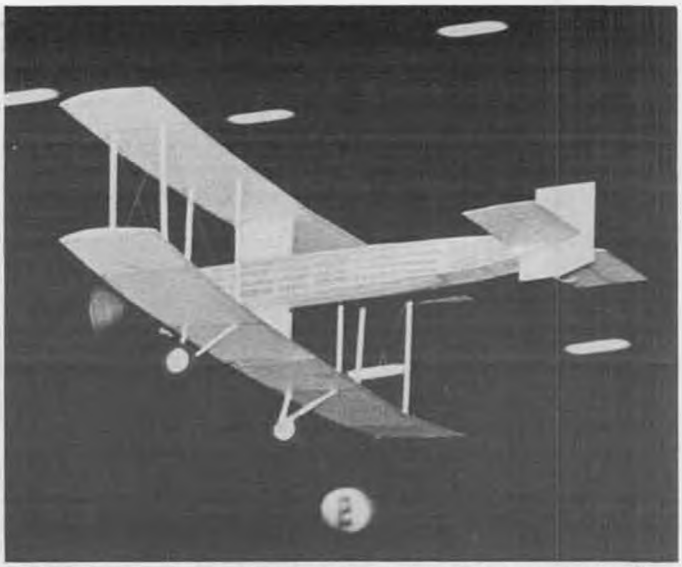
An unidentified modeler flew this neat plane in Quickie Rat at the Texas State Champs. You could build it in a night, but obviously this one has much labor put into its construction.



***Model Aviation's* C/L Racing editor, Bill Lee, awaits the go signal at the Texas State Champs.**

FULL SIZE PLANS AVAILABLE – SEE PAGE 108





PHOTOS BY AUTHOR

Bill's Bristol was one of the favorite models of the spectators and contestants alike at the '79 Nats. Both photos by John Preston.

BRISTOL *Flying* LABORATORY

By BILL STROMAN . . . The author is well known for his good-flying models of strange and obscure aircraft of the past. This time it's a flying test stand! Don't be fooled by its appearance, though . . . it's a great flier.

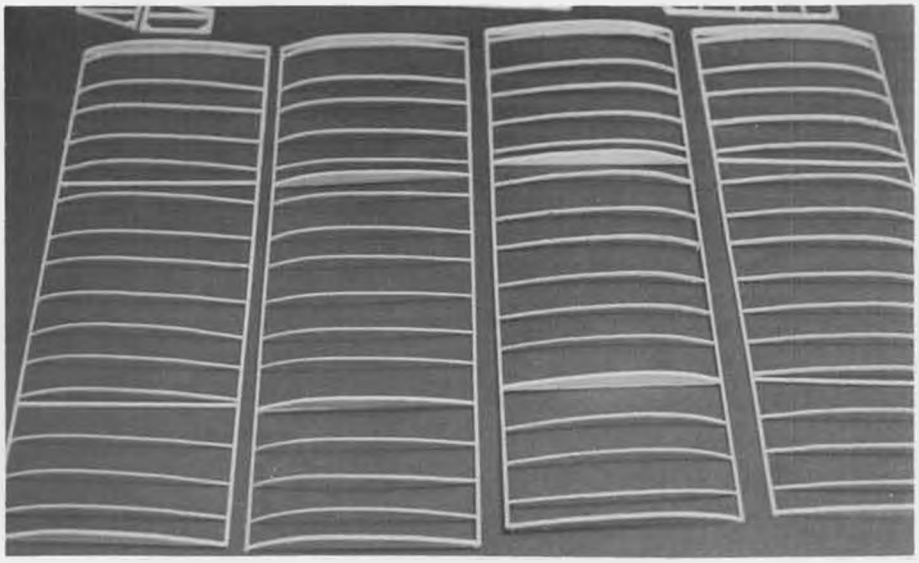
• "Good Grief, what the heck is that?" "Was there really a real airplane like that?" "You sure build the weird ones." These are a few of the statements you will have to endure if you build the Bristol Laboratory. But when you wind it up and watch it fly, it's worth it, for this is really a good model. It's not hard to build or trim, and it sure is a crowd pleaser.

The full-sized plane was built as a flying test stand to check the cooling problems of the Jupiter engines. It had a square plywood fuselage to which one or two round fairings could be attached. One was three feet in diameter, the other five (I chose to make the three foot one . . . less frontal profile). The large wing gap was to avoid any turbulence on the fuselage during the tests. The wide track landing gear was to avoid any ground looping. One good thing about this plane is that it was never registered, therefore, no markings appear on the wing or fuselage. Just to balance that, the one bad thing about it is that there were only two photos ever taken of the plane. Oh well, one can't have everything!!

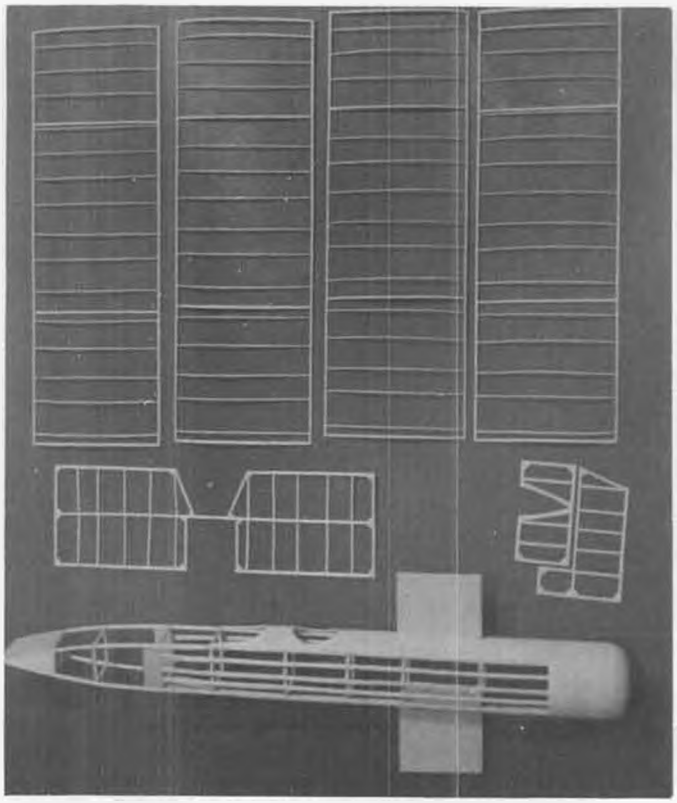
Before we start on the model itself, let's discuss the material we are going to use. I have not indicated on the plans what weight of balsa to use, and this is important. If the model is to be flown indoors, it should have the lighest balsa one can get. Take a small, accurate scale with you to the model shop and weigh each piece until you find the lightest piece. This may get some laughs from the R/C crowd in the place, but it will insure a better flying model. The same goes for the tissue; I used Peck-Polymer white Japanese tissue on mine and it worked great, so be selective. By the way, if you can't get light balsa, send for the price list from Superior Balsa, they have great stuff.

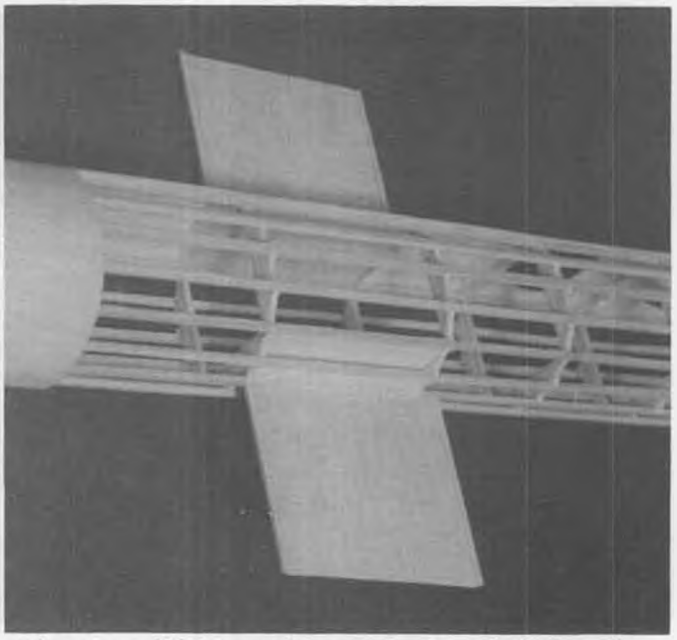
Well now, let's get to building. I like to build the fuselage first, as all the other things must fit onto this. Make the frame on the side view. Be sure to include the post for the rubber peg and the 1/16 sheet insert at the rear. Remove, and make another just like it. Put the two frames over the top view, and put in the cross pieces. While you are doing this, be sure to have the sides square to the table; use a small square or any right-sided object to do this. After this has dried, glue in the insert at the rear as shown; also put the 1/16 sheet on top and bottom between section "C" and "D."

Cut and fit the formers for the sides, top and bottom. By the way, do you have trouble getting the stringers straight from front to back? Here's a method I picked up from Jack McCracken. Cut the slots out on section "A" only. Then, cut slots in section "F." Now lay a straightedge from "A" to "F" and draw a line at each slot. This will insure a straight stringer when the remaining slots are cut. Install the stringers now, doing one on each side at a time so as not to warp the frame.



The four finished wing panels. Ribs are sliced from 1/32 sheet, is not really as tedious as it might sound at first. Plans show internal spars for more strength and warp resistance.





Wing pylon is 1/16 sheet with basswood strips on both edges. Use the lightest balsa you can get.

The basic components, ready for covering. Note extensive use of corner gussets on tail surfaces.

Make the center pylon for the wing now, using 1/16 square basswood for the front and back and 1/16 sheet balsa for the center. After it has dried, glue it to the 1/16 insert between "C" and "D," making sure it is square. You will have to remove the bottom stringer to insert the bottom pylon; replace this with a 1/16 square stringer on each side to have a place to attach the tissue to. This will also have to be done to the top pylon so the 1/32 sheet balsa can be glued in place. Now put the 1/8 balsa fillets in place to brace the pylons.

I made the top decking of 1/32 balsa in three pieces, the first from "A" to "C," the next from "C" to "D," and the last from "D" to "G." As the top is the same radius the length of the plane, it should be easy to glue on. After it has dried, sand the edges smooth, and mark and cut the cockpit holes. The rear one will be about 1/8 inch wide at section "G." Cover the sides and bottom between "A" and "B" with 1/32 sheet and sand smooth. Put the 1/8 balsa insert in the nose. Make the nose block from a piece of balsa, or laminate one from some 1/4-inch balsa, being sure to let it dry before carving it. (Didn't do this once, was just about done carving it when it came apart. Heard reports that people heard me as far away as Catalina!) Cut a 1/8-inch piece to fit firmly in the hole in section "A," glue this to the noseblock, then put it back in when dry and final carve and sand the noseblock to a final fit. I've found that an emery board is handy for this; it's firm and doesn't cost much (I learned this when I used to carve gun stocks. Never know when something from one hobby can help another, can you?). Now give the whole outside three coats of dope, sand between each coat, and sit down and admire it; that part is done!!

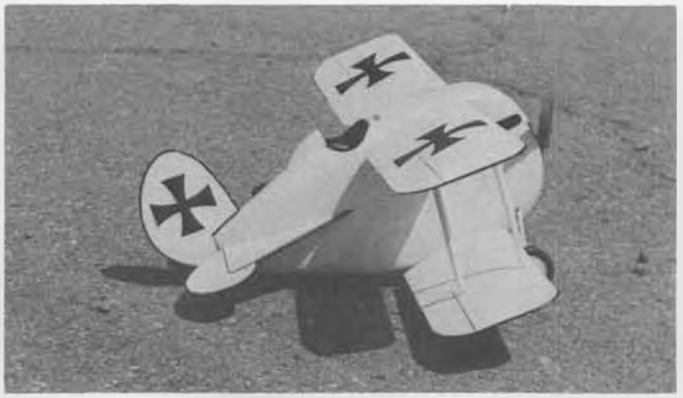
The rudder and elevator are made to be adjustable. This will add a little weight, but is handy when you fly in a smaller room and have to turn tighter or when climb is limited due to a lower ceiling. The hinges are made of small aluminum wire that is inserted between the moving surface and the stabilizing surface, then glued in place. Make the whole works out of light 1/16 square balsa. Don't forget the fillets where shown on the plans, they will reduce the chance of warping and of the tissue getting wrinkles at the corners. Give the surfaces three coats of dope and set aside.

The wings shown on the drawing are different from my original model. Mine didn't have the spars in the wing. Sure, it was lighter, but developed more warps than a Corsair, hence the spars in the drawing to reduce this problem. Lay

Continued on page 90

"I hate to build, but I love to cut out ribs."

Just a few of the models lined up for judging at the Flightmasters Annual. These are only the rubber models; gas and electric flown, too.



Everyone loves Joe Tschirgi's T-28 Floh, a smooth and stable flier. Makes any Gee Bee racer look skinny by comparison!

FREE FLIGHT SCALE

By FERNANDO RAMOS

PHOTOS BY AUTHOR AND BILL WARNER

• On the weekend of September 22 and 23, the Flightmasters held their 30th Annual Scale Contest. I'd have to rank this contest as one of the best that I have ever participated in during my sixteen years as an active member. One definite reason is that there was a contingency of modelers from afar, whose presence gave the event kind of a Nats flavor. There was Dick Allen, who came all the way from British Columbia, Joe Bressi from Sacramento (Joe also had a friend who competed along with him, but apologetically I have forgotten his name!), Bob Haight and Chuck West from Las Vegas, and Vic and Guy Larson and Bill Caldwell from Texas. Their modeling talents were greatly appreciated.

As usual, the judging took place on Saturday, and for the first time, the judging took place from 1 to 5 p.m., instead of the 7 to 11 p.m. time that the club has used for years. I believe everyone agreed that the earlier time was much better than rushing home to get some rest prior to the next morning's flying schedule.

In the past, the Flightmasters have always had a separate event for both CO_2 and electric. This was done in order to help the development of those two forms of power, however, this year it was decided to combine both CO_2 and electric along with gas under the heading of "Power." The other events were Peanut and Rubber, and a Novice event was included this year for anyone who had never placed in rubber in any of the Flightmasters' previous Annuals. At first, R/C Stand-Off Scale was also included as part of this big event, with the local Scale Squadron agreeing to run the whole R/C show. Two weeks prior to the contest, they advised Bill Stroman that they had decided not to run it after all. Without dwelling on a sore subject, let it be said that the Flightmasters will probably never offer to run another R/C event at their Annual. They are known for F/F Scale, so why bother with anything else?

There were more than eighty models entered in the four different classes, which I would call pretty fair representation. The quality of models keeps improving year after year. I know that you have read these words before, but it is a fact. It is hard to believe that there are so many talented modelers around. I've been around many of these competitors for many years, and it is only through their perseverance that they have excelled in their modeling. Instead of throwing in the towel after every contest

Nice engine and cockpit detail on this CO_2 powered Loening M-8 by Nick DeCarlis.

Nick's Loening has all the right proportions for a scale F/F model. Dihedral has obviously been increased over that of the full-size aircraft. Note separate ailerons for flight trim.

Bill Noonan's latest is this Missel Thrush rubber-powered bipe. Outstanding workmanship is typical of all Bill's models.

Highly unusual Siemens Schuchert SSW R-6 by Bob Barker is somewhat underpowered with two VL electrics, shows promise.

If it won't start, use a bigger electric starter, right, Fernando? Our F/F Scale columnist with diesel-powered ABC Robin.

Bill Caldwell hailing a taxi. That, or he's checking the wind. His CO_2 Monocoupe may be from a Flyline kit.

loss, they kept improving their building and flying techniques until they are presently on top. Unfortunately, there are still some who are still intimidated by the more proficient modelers, but as I've said before, none of us can improve unless we make an effort. Flying in fun-type contests like the Flightmasters hold can really be an asset for the neophyte modeler. Since there is no pressure he can see first-hand what it takes to be competitive, and work toward that goal.

Those who stick to it will obviously succeed, thus, the reason for so many top quality models.

Last landing by Bob Haight's Bellanca must not have been so smooth; note wheel, prop.

Surprisingly, there were about twenty-one models entered in Power. This is the first time in a long time that there has been that many entered in this event, and is partly due to the combining of the other two types of power. Even though the majority in this event were CO_2 and electric, there were several others that were powered with diesel or gas . . . hooray! Peanut was down from previous years, with about two dozen entries. Normally, there are about thirty to thirty-six Peanuts entered. I believe the decline is due, in part, that on a regular rubber model much more detailing can be done with little weight penalty.

Rubber appears to be the overall favorite, with about forty entries. Bill Noonan is the one others are trying to catch up to in this event, as far as pure quality and workmanship go. He had a Missel Thrush biplane that was just beautiful. All of Bill's models are pure art forms, and they give all of us something to shoot for. Not only do they look fantastic, they fly extremely well also.

The judges spent several hours getting the job at hand completed. This is no small task, considering both the number and quality of the models. Being a judge is hard work, but there is one reward of being able to see the models first hand, and to see how different details are made, attached, etc. This is one of the best ways to improve one's own building techniques.

Dick Baxter's Linberger flew great, met its end in an unusual manner . . . see text.

After the judging was over, forty-five contestants and their families attended a great banquet where the modeling scene continued.

Sunday morning was a letter perfect day for flying. For the first time ever, the Flightmasters tried using a type of score-

Irv Aker's Flyline Inland Sport flew well, but didn't do as well in static as some of the other models. Looks pretty good to us, though!

Good-looking Stuka by Joe Bressi flew in Rubber Scale, put in some good flights. Didn't say if it was from a kit or scratch.

New Arrow III from Cox. Three channel flying in 30 minutes.

Get all the challenge of three channel flying *plus* ready to fly simplicity, and more—the first throttle/muffler in ½A R/C and great scale appearance.

Taxi, take off, touch and go, even make prolonged inverted flights—all with our new RTF Piper Arrow III.

It's the ideal step-up plane to advanced, more exciting operation. High performance engineering and design make for great flying, with a big 41-inch wingspan to help smooth out every maneuver.

You also get a superbly scaled aircraft, featuring a wealth of accurate molded details like our authentic wing outline. The Arrow III has the sweep and detail of much larger scale models, plus a factory-finish in fuel-proof paint including windshield and windows. Here's total realism, in the air *or* on the ground.

Assembly and radio installation take only 30 minutes, using the same snap-installation system found in our Cox two channel Cessna Centurion and Sportavia sailplane. Those aircraft set the standards for ready to fly R/C. Now you get the same high performance and great value in three channel RTF.

The Arrow III also features our new, exclusive Cox R/C Bee .049. The first ½A engine designed just for R/C pilots, it offers a smooth proportional throttle and factory installed muffler—with no loss of top end power. Rear rotor induction gives you high output, improved dirt-resistance, and guaranteed *forward* starting.

Cox/Sanwa's 8031 system is perfectly matched to the Arrow III. Or you can lock the throttle and fly with any two channel system, like our 8020 or 8022. See your hobby dealer, and start out the way that's best for you.

Moving up to the new challenge of three channel flying? You're right on-target with the Cox Arrow III.

COX **#1 in Power Modeling.**

COX HOBBIES INC., a subsidiary of Leisure Dynamics, Inc.
1505 East Warner Ave., Santa Ana, CA 92702

Check the yellow pages for your nearest hobby store.

board to keep track of all flying activities. This was in the form of a kiosk which had four different bulletin boards, each one painted differently to represent a particular event. For example, green represented Power. There were green cards that the Power judges kept to write down the flight scores. These were in turn written on the big score sheet on the green bulletin board. Anyone flying Power would go to the green board and tell at a glance how he was progressing during the contest. The same was done for the other events. One addition which will be added to further aid the contestant, is that the timers will be given a colored vest, which will correspond to the color of a specific event. That way, all a contestant has to do is look around, and immediately he can locate the judge he needs. For the first time out, it really worked out great. The whole kiosk is made to come apart so that it can be transported easily. The only drawback is that someone has to take it home with him and store it. Guess who that is?!

I had too many models entered. Five is too many when you are trying to take pictures. These kept me busy most of the time and I'm sorry that I was unable to photograph more of the action. Many thanks to Bill Warner, who graciously gave me several pictures he had taken. One of the better flying rubber models on the scene was Flyline's Heinkel. There were four of these models entered. Chuck Conover's Heinkel was proxy flown by Mik Mikkelson and it was putting in some real long flights. In fact, it came in second overall in Open Rubber. Bob Curry also did OK with his in the Novice event. Dick Allen had his entered in Novice and I don't know just exactly what happened with his. Mine was the fourth one and it too was putting in some good times, with the best one of 100 seconds.

Mike Mulligan won the Rubber event flying a model of the Comper Swift. It even had a folding prop. Mike is one of those modelers who had difficulty being competitive when he first started, but that is no longer the case. His models are superbly built and fly like you wouldn't believe! Again, a lesson in perseverance! Dick Baxter won third with an unusual biplane model of the Linberger, a Swiss design. This model showed some of the big boys how it's really done. There were some modelers flying Wake or unlimited models, across from us, and Dick's Linberger was out-climbing and flying some of the out-and-out rubber models! Unfortunately, the model landed behind a car that was just backing out to leave. Needless to say, Dick now has a model that resembles Linberger cheese!

In Power, Bill Stroman put up a perfect flight with his electric Stinson SM-2 to beat the rest of the competition. Bill Hannan flew his infamous CO_2 Farman Moustique to a second place. Another electric model was that of Bill Warner, the most unusual Lee Richards Annular Wing. Joe Tschirgi finally finished the oddest of odd biplane designs, flying his German WW-I T-28 Floh (flea). Once again Joe gave the crowd a show that none of us will soon forget. He launched the Floh with a full tank of gas using the fishing line to keep the model from ground looping during takeoff. The same line acts similarly to a kite tail during the flight. Well, the Floh started to leave the area by flying over the adjacent golf course. (Golfers aren't too thrilled with *any* kind of model flying over their heads.) Everyone was certain that the end of the Floh was near. All of a sudden the darn thing circled back toward the flying field, only to land not far from the point of takeoff. The crowd gave Joe a jubilant applause, and accused him at the same time of having a radio buried somewhere deeply in that chubby fuselage . . . oh, what fun!

Irv Aker had a beautifully built Flyline Inland Sport which was also electric powered, and has very good flight characteristics. However, Irv was a bit down on static points, which hurt his overall score. Irv is another who isn't going to let this defeat put him back. He will study the score sheet to see where he can improve from the scale standpoint . . . then watch out! I believe that this was his first scale contest. My two gas entries (both diesels) were giving me fits as far as getting them started. However, I did get one sensational flight out of my General Aristocrat. This is really a stable flier. Flyline truly has a great product, and they were well represented. This ought to make them feel pretty good.

I didn't get a chance to see many of the Peanut fliers do their thing. How-

AL TUTTLE SAYS: "SUPER COVERITE IS ONE TOUGH BUGGA!"

Al comes from Maui out in the blue Pacific and he flies sailplanes. Here's what he thinks about using Coverite: "Recently I finished building two Aquilas, both covered with Super Coverite. This was my first experience using Coverite, as in the past I've used mylar, etc.

"I probably wouldn't have used Coverite, but the person that I built them for included the Super Coverite, so I had no choice.

"What a pleasant surprise! It was exceptionally easy to use and was actually fun covering for a change. The finished product turned out real nice. In fact I entered one of the ships in a static display show and it won a blue ribbon."

"Now for the good part: I test flew both of these birds before delivering them to the owner (in fact he was a witness), and to be quite frank, I was not expecting to see much difference in performance compared to my mylar covered Aquila which I have been flying for 3 years.

"Was I ever wrong. Both birds performed excellently right off the board with no trim changes required. You can actually 'hang' them in a thermal. The slow flight characteristics are far superior to the mylar covered Aquila, yet were just as fast. Thermal indication is far superior because of the ability to thermal seek at a slower speed. Control response is also more positive.

"The gentleman that I built the birds for is an excellent pilot, but like all of us, can have his share of hard luck. He stuck the fibreglas fuse straight in from a high altitude. The impact shattered the fuse and bent the ¼" wire to a 30° angle. The wings appeared to be unhurt, as well as the tail feathers.

"Upon inspecting the wings for damage, I noticed that the rib at the polyhedral (outboard) end felt punky. I slit the covering at that point and the outer wing panel fell off. Both dihedral braces were broken, and the rib was pulverized at the leading edge, as well as being split. **There was no outward sign of damage as the Coverite had no wrinkles or tears."**

"Conclusion: Super Coverite is strong, or as we say in the islands, 'one tough bugga', and is easily repairable. I'm using Coverite from now on."

Thanks Al (and to everyone else who wrote us about Coverite and sailplanes). The concensus is that Super Coverite is our best for sailplanes. To get maximum results, be sure to run the grain from root to tip, pull it tight before shrinking, give it lots of heat at 350° to 375°F. For those birds afflicted with flutter, more rigidity in the wings can be achieved by applying tautening dopes.

The advantages of Super Coverite vs. mylar are significant: superior handling plus dramatic reduction of scratches and rips. Old shiny stuff may look great at first, but after a few belly flops and skids, the shine wears a bit thin. Besides, you should see how Super Coverite looks with the sun peeping over its shoulder. It shimmers and sparkles, and is easy to track when it's flying real high.

Send a stamped envelope for your copy of the **Black Baron's** latest tip sheet. *21 Ways to Make Finishing Easier.*

THE COVERITE LINE—**Permagloss Coverite**. 100% polyester iron on covering. Prepainted, 38" x 43"/ 43" x 15 feet/ 5" x 36"/ Red, white, blue, yellow, orange, aluminum, olive, dayglow orange, dayglow yellow, black. **Super Coverite**. Same material as Permagloss, but not painted. 38" x 47"/ 47" x 15 feet/ Red, white, blue, yellow, orange, hi viz red and antique fabric. **Quickstik**. 1/2 pint & pint cans of iron on adhesive. **Silkspun Coverite**. 100% spun polyester that looks like tissue. Unpainted 38" x 54"/ 38" x 25 feet/ Red, white, blue, yellow, orange. **Balsarite**. 1/2 pint & full pint cans of wood conditioner. **Glaskote**. 1/2 pint cans of clear, fuelproof, final coat. Pint cans of thinner. **Trimit**. Micro sharp knives for cutting all coverings. **Graphics**. The only letters & numbers made of micro-thin vinyl. Die cut, pressure sensitive, totally fuelproof. 1", 2" or 3"/ Red, white or black.

COVERITE

420 BABYLON ROAD, HORSHAM, PENNSYLVANIA 19044

Coverite products are distributed world wide. Australia, Belgium, Canada, Denmark, England, Finland, France, Germany, Holland, Italy, Japan, New Zealand, Norway, South Africa, Sweden, Switzerland, United States.

INDY

INDY R/C SALES, INC.
10620 N. College, Indianapolis, In. 46280

1-800-428-4682
CALL TOLL FREE

INDY

ENGINE TRADE-IN

Send your old engine, along with $1.00 (return postage), with a note telling us what new engine you want. Then give us a toll free call on our WATTS LINE for our offer –1-800-428-4682. You will be surprised at our high trade-in allowances on good runners (15's – 60's). Premium prices for antiques. A couple of bucks for clunks and 1/2A's.

Send self-addressed stamped envelope for Indy's latest Used Engine List.

Indy 3 Channel

Unbeatable – Wet or Dry

The Indy 3 Channel R/C system recently reviewed in Flying Models and to be reviewed in RCM. This unbelievable limited time offer at the following prices.

Indy 3 Channel
2 Servo Dry - 2 axis stick. 85.00
Indy 3 Channel
3 Servo Dry - 2 axis stick. 94.95

Compare this to Hobby Lobby 3 Ch. advertised RCM July. 3 Ch. 3 servo system at $129.00 (Indy $94.95) or Hobby Shack's 3 Ch. (Adv. Oct. RCM) without 2 axis stick $129.00.

Indy 3 Channel 2 Servo
Charger; all nicad - 2 axis stick 99.95
Indy 3 Channel 3 Servo
Charger; all nicad - 2 axis stick 109.90

Compare this to Tower's 3 Channel w/2 servos and nicads in receiver only at $119.95 adv. RCM Oct. 79.

CURARE 40

MK's all balsa kit of Hanno Prettner's famous Curare 60. Comes complete with hardware and gas tank. 40 size engine.
List: $90.00. . . . . SPECIAL: $68.50

ENGINES

OS 15 R/C W/M

OS ENGINES	List	INDY
OS 10 FSR Std. .	31.00	23.25
OS 10 FSR R/C .	38.00	28.50
OS 15 Std.	35.00	26.25
OS 15 R/C.	42.00	31.50
OS 20 Std	38.00	28.50
OS 20 R/C.	46.00	34.50
OS 30 R/C.	53.00	39.75
OS 30 Std	48.00	36.00

OS 25 FSR R/C

OS 25 Std.	41.00	30.75
OS 25 R/C.	49.00	36.75
OS 25 FSR Std. .	57.00	42.75
OS 25 FSR R/C .	64.00	48.00
OS 35 Std	52.00	39.00
OS 35 R/C.	58.00	43.50
OS 40 Std	70.00	52.50
OS 40 R/C.	80.00	60.00
OS 40 FSR R/C .	93.00	69.75
OS 45 FSR R/C	109.00	81.75
OS 50 FSR. . . .	109.00	89.95
OS 60 FGR . . .	104.00	78.00
OS 60 FSR. . . .	135.00	101.25
OS 60 FSR w/pump & carb.	166.00	124.50
Wankel	119.95	93.00
OS 36	122.00	91.50
OS 61 FSR. . . .	159.95	119.57
OS 90 R/C. . . .	225.00	158.00

OS ENGINES WITHOUT MUFFLERS

OS 61 VF	159.95	119.57
OS 45 FSR-H . .	109.00	81.75
OS Four Cycle .	225.00	158.00
OS Four Cycle Twin.	695.00	486.50

OS MARINE ENGINES

OS 10 Sch Marine	46.00	34.50
OS 20 Marine . . .	55.00	41.25
OS 21 FSR ABC Marine	79.00	59.25
OS 30 Marine . . .	60.00	45.00
OS 45 RSR Marine ABC . . .	126.00	94.50
OS 90 RSR Marine.	299.00	209.00

OS 60 FSR w/Pump and Carb

Think Indy for HIGH Discounts

GOOD THRU 1-25-80

NEW SUPERTIGRE PRICES EFFECTIVE AUGUST 9, 1979

X-11 R/C w/m Plain Bearing . . .	37.95	28.50
X-11 R/C w/m Ball Bearing	44.95	33.75
X-21 Marine RV FRI ex. R/C	94.95	71.25
X-21 Car R/E w/Spcl. SG Shaft.	84.95	63.75
X-21 Car R/E w/¼x28 Shaft. . .	84.95	63.75
ST 23 R/C w/m. .	53.95	40.50
X-25 R/C Sch. Ring w/muffler	69.95	52.50

SUPERTIGRE 35 R/C

35 R/C w/Perry carb and muffler .	63.95	47.75
35 Combat PP Std. w/o M.	42.95	32.25
X-40 FI Ring R/C	94.95	71.25
G21/40 U/C w/o muffler	62.95	47.25
G21/40 R/C w/muffler	79.95	59.95
X-45 Marine RV R/C.	109.95	82.50
X-40 RV Speed ABC Sch. w/o M.	94.95	71.25
X-45 FI R/C RE w/o M	94.95	71.25
G21/46 R/C w/m	79.95	59.95
60 FI BB R/C w/M	84.95	63.75
X-60 R/C RE . .	129.95	97.50
X-60 R/C SE . .	129.95	97.50
X-60 R/C RE w/PP & Carb. . .	155.00	116.25
X-60 R/C SE w/PP & Carb. . .	155.00	116.25
G60 ABC Ring Blue Head	99.95	74.50
Tuned Exhaust Pipes X-60 SE.	36.15	27.50
X-60 RE	36.15	27.50

ST X-60 SIDE EXHAUST SCHNUERLE

Prices subject to change without notice

KUMAR DIESELS

Mills .075.	Specially Priced – $17.95
Mills 1.3cc	Specially Priced – $22.95
Kumar 1.5cc.	Specially Priced – $17.95
Kumar 2.0cc.	Specially Priced – $18.95
Kumar 2.5cc.	Specially Priced – $22.95
Kumar 3.5cc.	Specially Priced – $26.95

NOTE: Indy just obtained a large collection of new and used diesel engines. Send self-addressed stamped envelope for list.

U.S. I SERVO

Built in Dunham's dual rack output mechanics. The circuit is the new Signetics 544 amp. Uses Mitsumi 16mm motor.
Width . . . . . .76"
Length . . . . . 1.52"
Weight. . . . . 1.52 oz.
SPECIAL – $21.95

U.S. II SERVO

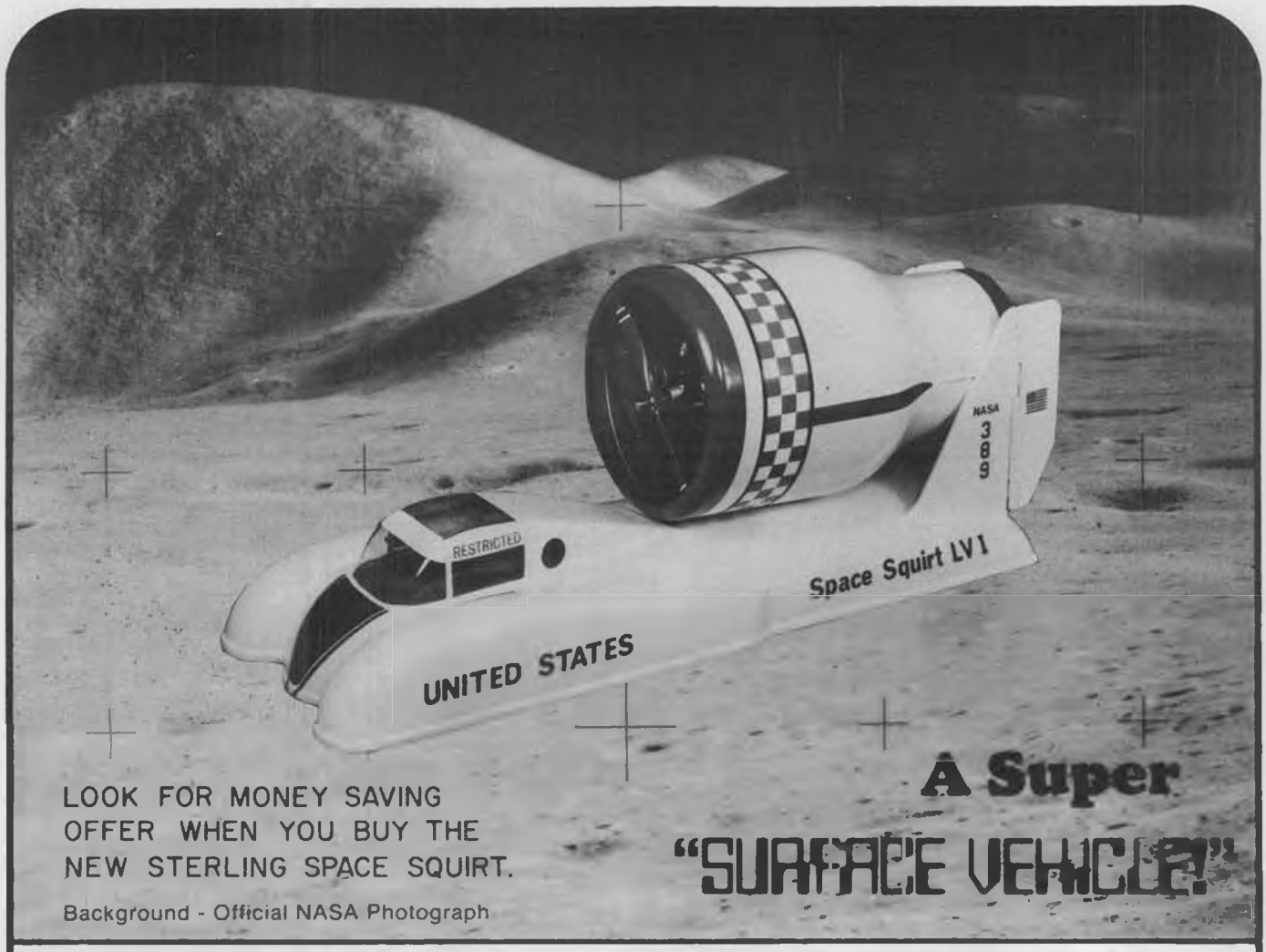
Heavy Duty. Uses OS mechanics and Signetics 544 amp. Comes with Mitsumi connector.
SPECIAL – $18.95

INDY

SPECIAL HOLIDAY VALUE

MRC - PORSCHE AND NEW GUIDANCE 2000 2 CHANNEL RADIO

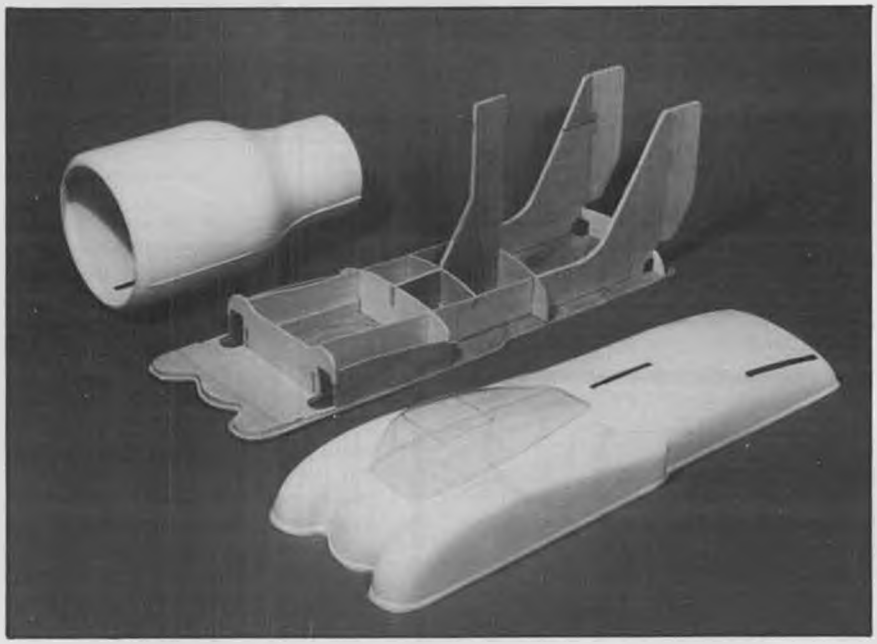
$171.00 Value . . . . . INDY SPECIAL ONLY $119.95



LOOK FOR MONEY SAVING OFFER WHEN YOU BUY THE NEW STERLING SPACE SQUIRT.

Background - Official NASA Photograph

A Super "SURFACE VEHICLE!"



SPACE SQUIRT

KIT LV I

Length 24"
Width 7¾"
Engine .049

$24.95

A snappy Land Vehicle developed for 2 channel R/C, expertly designed featuring accurately die-cut Balsa, precisely vacuum-formed parts, Hardware and detailed Plans and Instructions.

Sterling MODELS INC.
PHILA PA 19134 U.S.A.

ever, Mike Keville took the honors flying a Peck Cougar. Joe Bressi took second with a rather difficult subject, that of the Rivets racing plane. Bill Warner had a French design called the P.A.M.A. which looked and flew well enough to get him third place.

For five hours the sky over Mile Square Park was filled with beautiful models, and those five hours were over before anyone knew what had happened. Actually, more time could have been allotted, but that's really enough time. After the flying, the judges tallied up the scores and the trophies were awarded to the winners. Bob Peck provided the club with several of his outstanding kits as prizes. Incidentally, Peck is handling a product called "Primer." It is used in conjunction with the cyanoacrylate adhesives. A drop where you want to glue, let dry, then hit it with your favorite Hot Stuff type glue. The joint goes into a cloud of smoke, guaranteeing immediate bonding. How many times have you held a joint together after gluing with one of the more popular cyanoacralates, only to have the joint come apart after you let go? With this primer, this will never be the case. I don't have the price, but you know that it will be reasonable. It comes in a two-ounce bottle. Try it, you'll never be without it again!

So another outstanding Flightmasters Annual has come to a close, and I'm already looking forward to the one next year. The next scheduled contest sponsored by the Flightmasters will be their annual Jumbo/Peanut, and multi-engine contest. Probably included in this contest will be the mass launch WW-I event. The date of this affair will be December 9, 1979, at Mile Square Park in Fountain Valley. ●

Delta . . . . . *Continued from page 45*

extra tubing on the side of the tank is simply extra fuel mileage. At the end of a long straight there is considerable pressure built up in the tank and it wants to push fuel back out the pressure line and on through to the muffler. This is wasted fuel, of course, but with the long tubing this fuel has to travel quite a ways before it is lost. When full throttle is again given, the muffler pressure shoves this fuel back into the tank again and you're on your way without losing any fuel.

Although Delta sells a number of different rubber compounds and combinations for front and rear tires, the kit comes with what they have found to work best on most tracks. The front tires are made up of three rings of relatively hard rubber that give good traction, yet wear well. Rear rubber is their best stuff in the "A" grade. Here again is why the Delta car is worth the extra dollars. Some of the other manufacturers supply rubber that is useful only on very few surfaces. Later on you have to come

BUD NOSEN MODELS

INCORPORATED

BOX 105, TWO HARBORS, MINNESOTA 55616

All kits feature all wood construction, fast assembly, huge rolled plans, assembly instructions, machine and die cut parts, all necessary hardware and much, much more. Designed for .60 engines on up. Write for our illustrated catalog—50¢.

9' PIPER J-3 CUB

Standoff Scale Formed ABS cowl Kit - **$119.95**

3 or 4 Channels Flys like a trainer Kit - **$99.95**

9' CHAMPION CITABRIA

9' AERONCA "CHAMP"

1/4 size Standoff scale 3 or 4 Channels Kit - **$99.95**

3 or 4 Channels No foam or plastic Kit - **$79.95**

102" BUD NOSEN TRAINER

101" BIG STIK

101" Big Stik 4 Channels. Kit - **$129.95**

1/3 size Standoff scale 4 Channels required Kit - **$129.95**

8' 1933 GERE SPORT

9' "MR. MULLIGAN"

1/4 size Standoff scale 3 or 4 Channels Kit - **$139.95**

1/4 size Standoff scale Molded cowls Kit - **$169.95**

10' CESSNA 310 TWIN

OVERSEAS DISTRIBUTORS

AUSTRALIA
EK Logictrol Australia
44 Macquarie Road
Earlwood 2206
Sydney, Australia

SWITZERLAND
Blue Max
Modellflug-Technik AG
Alte Landstrasse 122
CH-8800 Thalwil Switzerland

SOUTH AFRICA
Radio Control World
202/4 Oceana House
Lower Burg St.
Capetown 8001 So. Africa

CANADA
John Klassen Hobby Central
400 Cuyler Street
Thunder Bay, Ontario

back and buy the good stuff.

GETTIN' IT ALL TOGETHER

Building the car is a bit more complicated than most 1/8 scale race cars. Nothing difficult, it is a pleasant way to spend a couple of evenings, but there are other cars that go together much faster. Helping out here are complete instructions, aided to a considerable degree by quite a number of detailed drawings. Although I found the instructions to be lacking in a few areas, most of these problems have since been corrected, and of all the 1/8 cars I am familiar with, Delta has the best instructions. If you are familiar at all with R/C cars you won't have any serious problems. If you are doing this for the first time there will be a couple of problems for you to work out, although the drawings and exploded views will probably help you solve them.

Getting back to the rubber, Delta supplies just rings which need to be glued to each other, glued to the wheels, and then trued to size. You'll end up doing this sooner or later no matter what car you buy, but it needs to be noted that several other manufacturers include in their kits wheel/tire combinations that are already glued and trued, ready for mounting on the chassis.

All of the pieces go together just as you would expect. Everything fits, the linkage works super, none of the separate assemblies foul others, and the whole car is laid out in a very logical manner. The only problem I had was that the mounting blocks had to be shimmed up, but it turned out the problem was in the motor itself. Seems that the distance between the mounting beams and the centerline of the crank on the OPS engines varies from engine to engine, making it impossible to make blocks that fit every engine. This is not a problem with K&B engines.

AFTER THE NEWNESS HAS GONE...

The OPS 21 has been very good and disappointing at the same time. When I first installed it, Delta had just set a new world record by racing a Super J for 24 hours and covering 539 miles (actual, not scale miles) while doing so. They used one OPS for the whole 24 hours and on tear-down found it ready to go another 24 hours. So I was expecting utter reliability, but was instead given something less. First a rear bearing blew and took with it the piston, cylinder and head. Fixed all that stuff, the motor ran super again but also blew another rear bearing, cleaning out the same parts as it did the first time. Once more with new parts, only this time I installed a Super Fafnir rear bearing, which costs an unbelievable $40 . . . but it won't blow up. By this time we were halfway through the '79 season and I figured the problems were cured, but by the time of the last race the piston/cylinder was gone and it was a real chore to just get the motor to run at all, plus the fuel mileage had dropped off to half of what it had been. The motor just barely limped through that last race.

It may be that I am being too hard on the OPS. Possibly that last piston/cylinder set was soft, too loose to begin with, or suffered from the square-piston-in-a-round-cylinder syndrome that is also known to show up in other engines. Maybe one of the air filters let some dirt go by, even though that is unlikely. Some dirt and crud does get by the Delta carb via the slide valve, but not enough to kill the motor so quickly.

What has bothered me personally about the OPS is that I know many people who have had excellent results with them, indeed regard the OPS as the most reliable engine available for R/C cars. And the OPS just plain feels right . . . you know it will run super and it does. Just the right power on the bottom and excellent top end. Plus, the motor is set up for R/C car racing when you buy it, having a heavy-duty con rod, huge heat sink head sitting on top of a button type head, choice of 40 or 60 size Perry carb, and an oil hole from directly below the carb base to the front bearing, keeping it nicely oiled.

The bottom line for me on the OPS is that I like the way it runs so much that I will give it another try before the next racing season and hope that the problems I have had with it so far prove to be just bad luck. But it won't take a lot to get me to search around for another brand, as the OPS parts, due evidently to being imported from Italy, are quite expensive. Piston/cylinder sets are now right around $40, for instance, and I don't run my car motors hard enough to expect short life from such expensive pieces.

The Futaba radio system is presently the *only* choice for those serious about racing. The servos are strong, the receiver is durable, and the transmitter is easy to use and comfortable. Go to any 1/8 scale R/C car race and look at the radios in use. It will be a rare thing to see anything but Futaba systems.

However, even here there is room for improvement. The S7 servos are strong, but slow. Even on a five-cell battery pack they are just a little too slow for my taste. During the season I had both the steering and the throttle servo fail, although they did give some warning and so never cost me a race. Both times it was trouble with the pots and was easily fixed. A spare servo is always on hand. Considering the considerable abuse heaped upon radios used in 1/8 scale R/C cars, I would judge this radio's performance to be outstanding, even though perfection is always hoped for.

As far as the Super J is concerned, it has lived up to all expectations. The car is reliable as a stone, fast, strong, and simply a pleasure to operate. In all of the racing I have done with the car there have only been two failures, both of which were my fault and related to the pinion bearing in the right side hanger. The first bearing failed because I had been overly ambitious when cleaning the car with alcohol applied with a pressure sprayer. The alky had penetrated the sealed bearing, done the lube inside no good and finally the bearing just blew its insides out from lack of lubrication. Don't forget that this bearing spins at engine rpm, so is stressed pretty well. The second bearing that went out was a simple shielded bearing that I installed by mistake when converting the car to the new Delta limited-slip differential. The bearing I used was a nose bearing from a K&B .21 and after running it dry for about an hour it too packed it in.

When stripping the car down for a thorough cleaning before taking the pictures, all pieces were carefully checked for wear. There simply isn't any of consequence. The clutch shoes show they are used, but are a long ways from needing replacement. Linkages are still tight and without slop. The pads for the disc brake were grooved slightly, but reversing them fixed that and so they are good for another season at least. A little extra looseness can be noticed in the fit of the slide in the carb, but it will easily go another year.

And so it is at this point in time that racers using Delta equipment realize that although they paid top dollar for their race car they also got a piece of equipment that will last them for a long time, and so ended up making a wise choice, no doubt coming out money ahead in the long run.

Still, there are a couple of things about the car I don't particularly care for. One is that it is heavy, and in theory, at least,

lighter cars will perform better. How the car could be made significantly lighter and retain the brutish reliability of a stock kit is in question, but I'm not trying to answer questions, only describe the car.

Access to the engine and clutch is poor. Normally you don't need to get at the engine very often, but I have grown to like playing with clutch slip to get a car dialed to each track. With a Delta you have to almost "run what ya brung" as far as clutch action is concerned. With the release of the Delta differential this has become less of a problem.

ICING ON THE CAKE

With differentials being all the rage among 1/8 racers, Delta has now released its own design. Instead of using gears, it utilizes a ball thrust bearing which can be pre-loaded with a locking nut. I am at a loss to explain it in words, but what you get is a differential that offers adjustable limited-slip. Very little limiting is used on slick tracks, while the limiting can be lots higher on high traction surfaces.

The advantages to the Delta differential show up quickly when driving the car. You can go deeper into corners before backing off, carry a lot more power through the corner and drive much more consistently. When powering all of the turns, as you have to do to go fast, the car is always close to spinning out. With the differential, chances of actually spinning are greatly reduced.

While differentials are not new (Thorp cars have had them for years), some of the newer ones, the Amps and Mini-Amps in particular, have been seen to fail occasionally. Again, Delta has it over most, as it seems to be the most reliable of all, with no gears to be concerned with. It will take a lot more racing to see just how reliable this differential is, but so far mine shows wear only measurable with a micrometer.

NO, AS A MATTER OF FACT. . .

I don't own any stock in Delta, I just feel that they make a superior race car, one that deserves to be written up. If you are thinking about getting involved in 1/8 racing, or just want to look for a new race car, you will be doing yourself a disservice if you don't seriously consider the Delta Super J. •

Fan . . . . . *Continued from page 41*

statically in the thrust stand as discussed before. *By the way, the original "production" A4D never went into production, so don't be afraid of getting stuck with one!*

2) A guesstimate of what the increased thrust level of the prototype probably was, since its inlets were somewhat larger than the production inlets. The prototype model flew quite well, although comparison of its maneuverability zone with that of the Me 109 of Fig. 15 shows it to not be in the same performance category.

3) The production inlet with top or gill type inlets added. This was also statically tested in the thrust stand. So what happened to the early production model? The answer lies in the upper middle inset of Fig. 18. The explanation is in three parts:

1) There was insufficient inlet area, which puts you on the low thrust curve.

2) The wing was thicker than the prototype, 12.5% vs. 9% at the tip. At low Reynold's numbers this change in wing thickness has a large effect on airfoil drag. The effect is as illustrated.

3) The model had a snap roll tendency due to tip stall, which was later relieved by tip washout. The tip stall contributed not only to snap rolling, but also was, in effect, a premature stall, which produced drag and a mushing flight tendency.

The shrinkage of the maneuverability zone was graphically demonstrated in the model's poor flight performance. At the macadam field where we tested it, the break ground point was typically about 100 feet short of a 6-foot-high line of bushes at the edge of the field. The 4.3° climb angle is only enough to get you 7 feet into the air in 100 feet. You can guess where the model landed most of the time!

The redesigned production model will have the upper thrust curve with the gill inlets and will be free of premature stall due to wing tip washout. Additionally, it will have thinner wings. The expected performance will be as shown in the bottom right hand section of Fig. 18. Comparison of the maneuverability

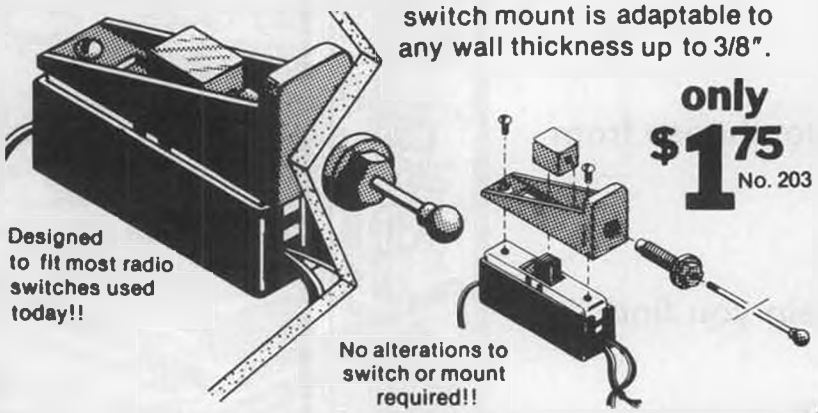
Continued on page 80

Season's Greetings

DU-BRO KWIK-SWITCH MOUNT

THE SIMPLEST, FASTEST AND EASIEST WAY TO MOUNT YOUR BATTERY SWITCH!

This complete switch mounting set enables you to install your battery switch in minutes, anywhere in the fuselage, by drilling ONE, 3/16" hole!!! Excellent for use in planes, helicopters, boats, and cars. This attractive, black nylon switch mount is adaptable to any wall thickness up to 3/8".



Designed to fit most radio switches used today!!

No alterations to switch or mount required!!

only $1.75 No. 203

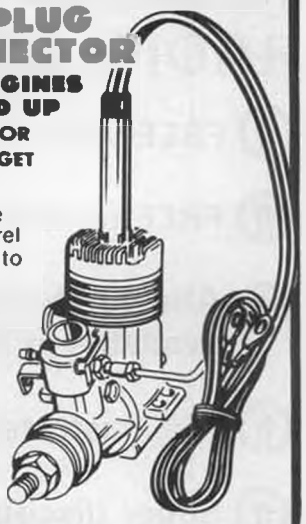
KWIK-GLO GLO PLUG CONNECTOR

FOR ENGINES .10 AND UP

PERFECT FOR HARD TO GET AT PLUGS

One piece brass barrel snaps on to plug for positive starting.

24 - 1/2" long with attached battery lugs.



No. 147 **2.25**

LARGE THREADED COUPLERS Cat. No. 212

These new threaded couplers are now designed to fit perfectly on Kwik-Link rods and flex cable. 5 for only $1.20

DU-BRO WORLDS FINEST MODEL PRODUCTS

A MER RY-CH RISTMAS

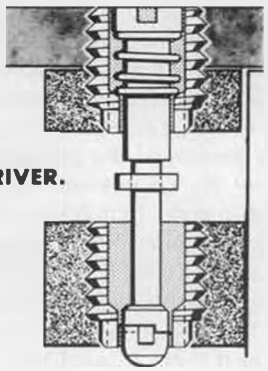
THE PERFECT WAY TO LATCH YOUR HATCH!

(OR YOUR COWL, CANOPY, INSPECTION COVER, MOLDED BODY, ETC.)

1/4-TURN LATCH

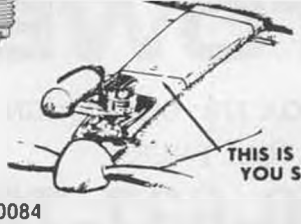
THEY LOOK AND WORK JUST LIKE THE REAL THING!

- **SIMPLE TO LINE UP AND INSTALL - A PERFECT ALIGNMENT EVERY TIME**
- **THE SPRING-LOADED MECHANISM POSITIVELY LOCKS OR RELEASES WITH A MERE ¼ TURN OF A SCREWDRIVER.**
- **← THIS IS ALL YOU SEE! THE HEAD FITS FLUSH WITH YOUR SURFACE AND CAN BE PAINTED THE COLOR OF YOUR MODEL.**



ACTUAL SIZE IS ONLY ¾" X ¼" ASSEMBLY REQUIRED

- ALL STEEL AND BRASS MACHINED PARTS.



THIS IS ALL YOU SEE!

CAT. NO. 242 **2 SETS FOR $2.50**

DU-BRO PRODUCTS INCORPORATED

480 BONNER ROAD WAUCONDA, ILL. 60084

1979-1980 TOWER HOBBIES RADIO CONTROL CATALOG!

NEW!

- FREE with your first order with Tower
- FREE to active Tower customers
- Absolutely the finest catalog available in RC
- 358 illustrated pages
- Super discounted prices
- Over 150 manufacturers to choose from
- Complete information
- Easy to use indexes to help you find what you need quickly
- Section introductions to answer your modeling questions

THE GUIDE TO ALL YOUR MODELING NEEDS!

Introducing the catalog you've been waiting for - the NEW 1979-1980 Tower Hobbies RC Catalog! This is the largest and most complete RC catalog ever published, by far! This new catalog is much more than just a list of available products at super low prices. It's actually a complete modeler's reference guide, featuring two indexes (manufacturer and product indexes) to make finding a needed item fast and easy.

We developed the actual descriptions from a modeler's point of view! We know from experience the questions you need answered in order to make that important buying decision. If after reading the descriptions, you still aren't sure of something, you can use the TOWER ACTION POST CARDS supplied inside the catalog to write directly to the manufacturer for more information. This is just another customer-oriented service you've come to expect from Tower! We've also included a revised and updated accessory completion guide in an easy to use chart format. This chart enables you to determine what accessories you will need to complete the kits listed in this catalog.

Other outstanding features of this catalog are the special section introductions that appear throughout. These introductions were written specifically to add to the general knowledge of someone new to the RC hobby. Even if you've been a Tower customer for years, we hope these introductions will answer some of your questions, provide you with helpful hints, and entertain you!

Remember, this 358 page Tower Hobbies RC Catalog was developed for you, the modeler, and contains everything you'll need to enjoy your hobby to its fullest! This Radio Control "Bible of the industry" will be included free of charge with your first merchandise order from Tower Hobbies. Or, it's available by itself for $2.50 postpaid. ORDER TODAY!

TOWER HOBBIES

P.O. BOX 778 CHAMPAIGN, ILLINOIS 61820 217 - 384 - 1010

CALL TOLL FREE: 800-637-7686

ILLINOIS TOLL FREE: 800-252-3336

TOWER HOBBIES

P.O. BOX 778 CHAMPAIGN, ILLINOIS 61820

217 - 384 - 1010

CALL TOLL FREE: 800-637-7686

ILLINOIS TOLL FREE: 800-252-3336

THESE SPECIALS ARE GOOD UNTIL THE 15th OF THE MONTH OF THIS ISSUE, ONLY.
AVAILABILITY, SPECIFICATIONS, AND PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.

TOP FLITE SEALING IRON — 30% OFF

This sealing iron is great for covering with Monokote, Solarfilm, etc. It features adjustable temperature, teflon shoe, and a handy shape. Excellent quality.

RETAIL $19.95 — NOW ONLY $13.98 — MBM313

DREMEL MODEL 381 MOTO–TOOL WITH FULL ACCESSORIES — 37% OFF

The Model 381 is the ultimate in hand grinders. It features variable speed control, ball bearings, and full accessories.

RETAIL $74.95 — NOW ONLY $46.98 — MBM153

MILLER No.2017 SPRAY SET — 40% OFF

Complete set includes a precision built genuine piston type air compressor, 12 ft. air hose, 16G siphon type spray gun & 14G air brush both with open & fine spray nozzles.

RETAIL $81.95 — NOW ONLY $48.98 — MBM228

QUADRA 2 CU. IN. ENGINE — 29% OFF

Develops 2 horsepower! An engine suitable for large models with its scale-like sound and realistic performance. Comes with a muffler, and a mount. Very economical.

RETAIL $139.95 — NOW ONLY $99.98 — MBM260

DEVCON 5 MINUTE EPOXY IN ECONOMY 9 OZ. SIZE — 36% OFF

Now in squeeze bottles for your convenience. Limit of 3 per order.

RETAIL $6.95 — NOW ONLY $4.48 — MBM151

DREMEL 572 MOTO SHOP — 37% OFF

This deluxe saw features a complete accessory set of blades, discs, etc. and flexible shaft.

RETAIL $99.95 — NOW ONLY $62.98 — MBM154

GOLDBERG FALCON 56 MK II — 40% OFF

This all time best seller is now redesigned with ailerons. 56" span. Uses a .30 -.40 engine, all balsa construction. An excellent trainer.

RETAIL $47.98 — NOW ONLY $28.78 — MBM392

K&B .40 RC ENGINE No. 8011 — 35% OFF

THE MOST POPULAR RC ENGINE EVER MADE!!

Features a unique design for high power; and a Irvine carburetor for excellent throttle response and easy adjustment - from a slow smooth idle to a roaring top speed.

RETAIL $72.50 — NOW ONLY $46.98 — MBM200

LATRAX CORVETTE W/RADIO — 31% OFF

Won a 1st & a 2nd in the ROAR NATS!

Add 8 AA pen cell batteries to the radio, charge the car for 15 minutes, & you're ready to race!

THIS IS A FANTASTIC VALUE! Comes with a powerful 2 ch. radio (w/wheel stick) already installed, 6 cell nicad battery pack, & a quick charger. 16" length. Runs up to 30 mph! Electronic speed control.

RETAIL $159.95 — NOW ONLY $109.98 — MBM212

GOLDBERG SKYLARK 56 MK II — 40% OFF

Extensively improved construction, strength, and flight performance! 56" span. Requires a .30 -.40 size engine and a 4 ch. radio. This fun to fly balsa sport plane has pattern capabilities. It makes a great low-wing trainer.

RETAIL $49.95 — NOW ONLY $29.98 — MBM181

SULLIVAN ELECTRIC STARTERS

HI - torque, hi - rpm 12 v. starters. These heavy duty, long life starters develop more torque and rpm's than any other starters!

RETAIL $38.95 — NOW ONLY $24.98 — MBM305

Dlx. model has V-groove in drive cone for starter belt. Starts copters, airplanes, boats, and cars.

RETAIL $41.95 — NOW ONLY $27.28 — MBM306

BOLINK ELECTRIC CAR

This 2 ch. 1/12 scale electric car comes already assembled with .05 motor, nicads, & charger. Goes over 25 miles per hour!

RETAIL $99.95 — NOW ONLY $79.98 — MBM118

Bolink kit for above car - must be assembled. BLX-1355.

RETAIL $79.95 — NOW ONLY $59.98 — MBM117

CRAFT-AIR FIELD BOX — 33% OFF

It's ready to use, not a kit, made of lightweight indestructible polyethelene. 22" long & holds everything. A SUPER BUY!

RETAIL $29.95 — NOW ONLY $19.98 — MBM148

CRAFT-AIR HI - START HEAVY DUTY — 34% OFF

Features reel, tubing, towline, parachute, stake, tow ring, and strong construction. For sailplanes of 100" wingspan and larger.

RETAIL $49.95 — NOW ONLY $32.98 — MBM141

CRAFT-AIR DRIFTER II — 30% OFF

Would you believe? A competition sailplane for only $13.98! It isn't just a trainer, it's a contest winner! 71½" span. Uses a 2 channel radio.

RETAIL $19.95 — NOW ONLY $13.98 — MBM142

O.S. MAX .40 RC w/MUFFLER — 30% OFF

A popular front rotor ball bearing engine featuring more than normal power, easy starting, dependable carburetion. This is a ringed engine and offers long hours of trouble-free operation. Comes w/muff.

RETAIL $80.00 — NOW ONLY $55.98 — MBM446

TOWER

P.O. BOX 778
CHAMPAIGN, ILLINOIS 61820

**THESE SPECIALS ARE GOOD UNTIL THE 15th OF THE MONTH OF THIS ISSUE, ONLY.
AVAILABILITY, SPECIFICATIONS, AND PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.**

HOW TO ORDER HOW TO ORDER HOW TO ORDER HOW TO ORDER HOW TO ORDER

BY MAIL ORDER

If you have a Tower order form, please use it. If not, then just use any piece of paper or stationery. Write down all of the items that you want along with their special stock numbers and prices. Total them up (Illinois residents add 5% sales tax) and add $2.50 for postage, handling, and full insurance, to obtain the grand total. Obtain a money order, certified check, bank check, or write a personal check for the grand total amount (personal checks may be delayed to allow for clearance). Foreign orders add $10.00 (excess will be refunded with order). Date of postmark determines special pericd eligibility. Send your order along with full payment to: TOWER HOBBIES, P.O. BOX 778, CHAMPAIGN, ILLINOIS 61820.

BY TOLL FREE PHONES

When you place your order over the phone we will ship it to you C.O.D., and you pay for it when it's delivered to your door. When you phone in your order, please have the stock numbers written down ready to give to the order taker.

Continental United States: **800 - 637 - 7686**

Illinois Residents Only: **800 - 252 - 3336**

The "800" WATS lines are open weekdays from 9:00 A.M. to 5:00 P.M., Monday through Thursday evenings 5:00 P.M. to 9:00 P.M., and 10:00 A. M. to 5:00 P.M. on Saturdays. Closed Friday evenings and Sunday.

STOCK NUMBER	DESCRIPTION	RETAIL	NOW ONLY
MBM417	Air Capital RTF FB-100	$149.95	$139.98
MBM105	Airtronics Aquila	74.95	52.48
MBM106	Airtronics Olympic II	49.95	34.98
MBM107	A-Justo-Jig Wing & Fuse Jig	59.95	41.98
MBM395	Andrews Aeromaster Too	84.95	51.98
MBM112	Associated RC-200 Car Kit	195.00	119.98
MBM411	Associated RC-300 Car Kit - NEW!!	190.00	129.98
MBM113	Associated 6-Cell Car Kit No.3012	102.00	69.98
MBM412	Associated 6-Cell Car Asmb. No.3024	119.50	82.98
MBM114	Badger 200-1 Air Brush Kit	32.95	22.98
MBM115	Badger 200-3 Deluxe Kit	42.95	29.98
MBM116	Badger 180-1 Compressor	85.00	63.78
MBM117	Bolink 6-Cell Car Kit	79.95	59.98
MBM118	Bolink 6-Cell Electric Car Assembled	99.95	79.95
MBM396	Bridi Deception	94.95	66.98
MBM121	Bridi Sun Fli 4-20	29.95	20.98
MBM123	Bridi RCM Trainer 40	54.95	37.38
MBM125	Bridi Dirty Birdy - wood	59.95	40.78
MBM126	Bridi RCM Trainer 60	62.95	42.78
MBM130	Bridi UFO - fiberglass	129.95	93.98
MBM132	Coverite Balsarite 8 oz	3.20	2.38
MBM447	Dumas DV-10 - glass	22.50	15.78
MBM400	Cox Hydroblaster w/.049 & Radio	110.95	74.98
MBM137	Cox RTF Cub w/Engine & Radio	99.95	69.98
MBM138	Cox RTF Cessna Centurion	69.95	48.98
MBM418	Cox RTF Piper Arrow	74.95	52.48
MBM139	Cox RTF Sportavia Trainer	89.95	62.98
MBM134	Cox Tee Dee .049 Engine	24.95	14.98
MBM135	Cox Tee Dee .09 Engine	26.95	18.88
MBM448	Dumas American Enterprise	75.00	49.98
MBM427	Cox Tradewinds Sailboat	169.95	84.98
MBM146	Craft-Air Butterfly II	49.95	32.48
MBM142	Craft-Air Drifter II	19.95	13.98
MBM141	Craft-Air H.D. Hi-Start	49.95	32.98
MBM148	Craft-Air Field Box	29.95	19.98
MBM423	Craft-Air Piece O' Cake	24.95	17.48
MBM409	Craft-Air Upstart (3/16 inch)	17.95	12.58
MBM145	Craft-Air Viking MK I Sailplane	79.95	49.98
MBM149	DAE Series IV Power Panel	38.95	24.98
MBM151	Devcon 5 min. Epoxy-9 oz	6.95	4.48
MBM416	Dremel No.730 Disc-Belt Sander	89.95	59.98
MBM152	Dremel 210 Drill Press	23.95	17.98
MBM153	Dremel 381 Moto Tool Kit	74.95	46.98
MBM154	Dremel 572 Deluxe Moto-Shop	99.95	62.98
MBM155	Dremel 580 Table Saw	99.95	62.98
MBM156	Dubro Lg. Nylon Hinges (15)	2.49	1.88
MBM157	Dubro Flex Cable 20"	1.49	1.18
MBM158	Dubro Kwik Fill Fuel Pump	10.98	6.98
MBM159	Dubro No. 203 Kwik-Switch Mount	1.75	1.38
MBM453	Lanier Jester	74.95	46.98
MBM163	Dumas Atlas Van Lines U-1	52.50	33.98
MBM162	Dumas Big Swamp Buggy	37.00	23.98
MBM164	Dumas Competition DV60 - glass	105.00	66.98
MBM401	Dumas Dauntless	75.00	47.98
MBM165	Dumas Hot Shot 24" Tunnelhull	33.50	21.78
MBM166	Dumas Hot Shot 21" - glass	72.50	46.98
MBM429	Dumas Sail Control Unit	55.00	39.98
MBM167	Edson Adjustable Motor Mount	6.95	5.58
	Enya Engines	Call For Low Prices	
MBM168	Fox .15 RC Schneurle	37.95	22.78
MBM169	Fox .19 RC Engine	36.95	22.98
MBM170	Fox .25 RC Engine	36.95	22.98
MBM338	Fox .35 U/C	26.95	17.98
MBM171	Fox .36 RC	$39.95	$25.98
MBM177	Fox 1.2 Cubic Inch Twin	250.00	174.98
MBM175	Fox .60 RC Eagle	69.95	41.98
MBM172	Fox .40 RC Schneurle	45.95	28.48
MBM174	Fox .45 RC Schneurle BB	64.95	39.98
MBM392	Goldberg Falcon 56 MK II	47.95	28.78
MBM181	Goldberg Skylark 56 MK II	49.95	29.98
MBM182	Goldberg Skylane 62	64.95	38.98
MBM183	Goldberg Senior Falcon	64.95	38.98
MBM184	Goldberg Handi-Tote	16.95	11.88
MBM403	Goldberg P6E Curtiss Hawk Bipe	44.95	29.98
MBM185	HB .12 RC BB w/Muffler	39.87	28.98
MBM186	HB .15 RC BB w/Muffler	43.23	31.98
MBM187	HB .25 RC BB w/Muffler	56.00	41.48
MBM188	HB .40 RC BB	69.44	49.98
MBM404	HB .40 RC BB PDP Marine	93.50	67.98
MBM189	HB .50 RC BB	76.27	54.98
MBM190	HB .40 RC BB PDP	84.34	62.98
MBM191	HB .61 RC BB PDP	119.26	88.98
MBM430	Hi-Flight Mirage	59.95	41.98
MBM192	Hobbypoxy Formula 2 Epoxy - 8 oz	4.25	2.98
MBM193	Hot Stuff Adhesive .5 oz	3.95	2.78
MBM194	House of Balsa P-51D (.29 to .40)	64.95	39.98
MBM389	House of Balsa .40 P-51D - glass	109.95	79.98
MBM197	Jemco F4U-1A Corsair	79.95	55.98
MBM424	K&B .19 RC	50.00	32.48
MBM205	K&B .21 Outboard	107.00	69.98
MBM406	K&B .21 RC Schneurle w/Muffler	72.50	49.98
MBM200	K&B .40 RC Engine	72.50	46.98
MBM201	K&B .40 RC Pressurized	105.00	67.98
MBM207	K&B .40 RC Sport Marine	82.50	52.98
MBM203	K&B .61 RC w/Muffler	96.50	59.98
MBM204	K&B .61 RC w/Muffler & Pump	125.00	76.98
MBM438	K&B .40 RC RE Schneurle w/Muff	110.00	69.98
MBM419	Kraft RTF Electric Cardinal	99.95	74.98
MBM420	Kraft Electric Motorcycle	79.95	59.98
MBM208	L&L On-Board Ignition System	23.95	17.98
MBM210	Lanier Caprice	74.95	46.98
MBM407	Lanier Comet II	64.95	40.98
MBM213	Leisure 1/8 Dune Buggy	199.95	163.98
MBM432	Mark's Bird of Time Glider	59.95	38.98
MBM215	Mark's Models Bushwacker w/Acces	52.95	33.98
MBM214	Mark's Models Wanderer 72"	23.95	14.98
MBM217	MEN Trainer .15-.25	31.95	23.98
MBM218	Microflame 4400 Dlx. Welding Kit	39.95	29.98
MBM220	Midwest RK-40 Axiflo Fan Kit	49.95	34.28
MBM221	Midwest Little Stik	33.95	21.98
MBM222	Midwest Cardinal ARF	32.95	21.38
MBM223	Midwest Super Chipmunk	33.95	21.98
MBM224	Midwest Sweet Stik	42.95	25.78
MBM226	Midwest Attacker	44.95	28.98
MBM228	Miller No.2017 Spray Set	81.95	48.98
MBM410	Monogram RC Electric Leopard Tank	49.95	29.98
	Monokote Reg. and Trans. Colors	9.00	5.38
	Monokote Metallic Colors	10.50	6.28
MBM230	MRC RTF Cessna w/Enya .35 RC	449.95	277.48
MBM231	MRC RTF Cherokee w/Enya .40 RC	499.95	314.98
MBM229	MRC RTF Hawk Trainer w/Enya .15	99.95	74.98
MBM441	MRC Lamborghini Cheetah	89.98	54.98
MBM237	MRC 1/12 Scale Leopard Tank	199.98	139.98
MBM442	MRC Lamborghini Countach LP500S	77.98	45.98
MBM443	MRC Martini Porsche 936 Turbo	68.98	42.98
MBM421	Bud Nosen P-51	169.95	119.98

HOBBIES

PHONE
(217) 384-1010

ILLINOIS TOLL FREE: 800-252-3336
CONTINENTAL UNITED STATES TOLL FREE: 800-637-7686

**THESE SPECIALS ARE GOOD UNTIL THE 15th OF THE MONTH OF THIS ISSUE, ONLY.
AVAILABILITY, SPECIFICATIONS, AND PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.**

STOCK NUMBER	DESCRIPTION	RETAIL	NOW ONLY
MBM238	Ohio Superstar Softglas - Qt	$9.95	$7.98
MBM449	O.S. Max .15 RC w/Muffler	42.00	29.98
MBM444	Bud Nosen Big Stick	129.95	97.48
MBM450	O.S. Max .35 RC w/Muffler	58.00	43.48
MBM451	O.S. Max .90 FSR RC w/Muffler	225.00	157.48
MBM242	Orline Fokker D VII	97.50	74.98
MBM428	Orline Sopwith Pup - NEW!!	119.50	89.98
MBM248	Pacer X-30 Adhesive .36 oz	3.50	2.28
MBM249	Pacer Zap Giant .36 oz	3.50	2.28
MBM251	Pica Cessna 182	99.95	66.98
MBM253	Pica T-28B	89.95	59.98
MBM255	Pica Waco	89.95	59.98
MBM256	Pica Duelist 2/40	89.95	59.98
MBM259	Power Pacer 9.6 v. Model 300	59.95	46.98
MBM260	Quadra 2 Cu. In. Aircraft Engine	139.95	99.98
MBM262	Robart Incidence Meter	15.95	10.98
MBM263	Robart Super Pumper Mark II	17.95	11.98
MBM264	Robart Auto Mix	9.95	7.48
MBM265	Rhom 2 Gear Mains	87.00	56.58
MBM266	Rhom 3 Gear-Firewall	125.00	79.98
MBM267	Rhom 3 Gear-Flat Mount	125.00	79.98
MBM268	Royal Photocell Tachometer	39.95	33.98
MBM272	S&O Battery Tester	29.95	19.98
MBM274	Sealector Custom Model Iron	28.35	18.98
MBM415	Sig Beechcraft Bonanza - NEW!!	77.50	54.98
MBM275	Sig Piper J-3 Cub	49.95	35.98
MBM276	Sig Kadet Trainer	43.95	31.68
MBM279	Sig Kavalier	49.95	35.98
MBM277	Sig Kougar	52.50	37.78
MBM278	Sig Smith Miniplane	59.95	42.98
MBM282	Skyglas Phoenix 5	55.00	36.98
MBM285	Slimline Std. Muffler for K&B .35-.40	9.95	5.98
	Solarfilm Reg. Colors	7.98	4.48
MBM304	Sonictronics No.1250 12 v. Fuel Pump	15.95	11.98
MBM431	Spickler Quickie 500	43.95	32.98
MBM212	Latrax Corvette w/Radio	159.95	109.98
MBM290	Stafford B-24D Liberator	199.95	139.98
MBM291	Stafford Twin Comanche - balsa	149.95	104.98
MBM293	Sterling Puddle Jumper	17.95	12.58
MBM294	Sterling Puddle Jumper MK II	41.95	29.38
MBM295	Sterling Fledgling	41.95	27.28
MBM296	Sterling ½A Corsair	31.95	20.98
MBM305	Sullivan Electric Starter	38.95	24.98
MBM306	Sullivan Deluxe Starter	41.95	27.28
MBM307	Sureflite Skylane 182	39.95	25.98
MBM308	Sureflite All Foam J-3 Cub	39.95	25.98
MBM309	Sureflite ½A J-3 - foam	29.95	19.48
MBM310	Sureflite Spitfire - foam	39.95	25.98
MBM390	L.R. Taylor Multi-Charger	24.95	19.98
MBM408	L.R. Taylor Super Power Panel	89.95	69.98
MBM425	Top Flite Contender 40	49.95	32.98
MBM316	Top Flite Contender 60	56.95	36.98
MBM320	Top Flite F4U-1A Corsair	99.95	59.98
MBM315	Top Flite Freshman Trainer	47.95	30.98
MBM314	Top Flite Heat Gun	29.95	19.98
MBM317	Top Flite P-51D Mustang	74.95	48.68
MBM313	Top Flite Sealing Iron	19.95	13.98
MBM413	Top Flite Trim Seal Tool	14.95	10.98
MBM311	Top Flite 10x6 (6) Super Maple	8.10	5.68
MBM312	Top Flite 11x7 (6) Super Maple	9.30	6.48
MBM321	Tower RC Long Plugs - 6 Plugs	8.94	4.68
MBM322	Tower 12 v. Starter Battery	25.95	12.98
MBM323	AFI 12 v. Battery Charger	8.95	6.98
MBM325	Tower Rubber Bands ¼ Lb. No. 64	1.50	.98
MBM445	VK Sopwith Camel	74.95	52.48
MBM452	Supertigre X-11 RC Schneurle w/Muff	37.95	26.58
MBM440	Webra .91 RC Schneurle	268.35	144.98
MBM331	Wing Mfg. The Love Machine	69.95	34.98
MBM334	X-Acto No. 5087 Knife & Tool Chest	29.95	20.98
MBM336	Zinger Props 9x6 6 each	7.80	5.48
MBM337	Zinger Props 10x6 6 each	8.40	5.88
MBM338	Zinger Props 11x7 6 each	9.60	6.68

Remember, these are only a few of the several thousand different items that Tower Hobbies stocks. If you need an item that does not appear in this issue, give us a call to see if we have it. The chances are good that we do. By all means compare our prices before you buy elsewhere; you'll be dollars ahead.

Radio Sale!

MODEL	NOW ONLY	STOCK NUMBER
TOWER HOBBIES	TOWER HOBBIES	TOWER HOBBIES
6 Channel w/2 KPS-14II Servos	$149.95	MBM397
6 Channel w/3 KPS-14II Servos	174.95	MBM398
6 Channel w/4 KPS-14II Servos	199.95	MBM339
6 Channel w/4 KPS-15II Servos	209.95	MBM340
Tower KPS-14II Servo	25.00	MBM399

THIS SALE IS NOT RETROACTIVE

MODEL	RETAIL	NOW ONLY	STOCK NUMBER
KRAFT	KRAFT	KRAFT	KRAFT
KP-2AW (Wheel) w/14IIA's	$139.95	$94.98	MBM344
KP-2AW (Wheel) w/15IIA's	145.95	98.98	MBM345
KP-2A (2 Stick) w/14IIA's	139.95	94.98	MBM346
KP-2A (2 Stick) w/15IIA's	145.95	98.98	MBM347
KP-2AS (1 Stick) w/14IIA's	139.95	94.98	MBM348
KP-2AS (1 Stick) w/15IIA's	145.95	98.98	MBM349
KP-3AS w/KPS-14IIA's	149.95	99.98	MBM433
KP-3AS w/KPS-15IIA's	155.95	104.98	MBM434
KP-4A w/KPS-14IIA's	309.95	196.98	MBM350
KP-4A w/KPS-15IIA's	321.95	204.98	MBM351
KP-6A w/KPS-14IIA's	339.95	216.98	MBM352
KP-6A w/KPS-15IIA's	351.95	224.98	MBM353
KP-5C w/14II's or 15II's	389.95	259.98	MBM354
KP-5CS w/14II's or 15II's	389.95	274.98	MBM355
KP-7C w/14II's or 15II's	529.95	377.98	MBM356
KP-7CS w/14II's or 15II's	529.95	377.98	MBM357
KPS-14II Servo	44.95	32.98	MBM358
KPS-15II Servo	44.95	32.98	MBM359
KPS-18 Servo (Super Mini)	54.95	43.98	MBM360
KPS-14IIA Servo	39.95	27.98	MBM361
KPS-15IIA Servo	42.95	29.98	MBM362
KPS-20 Ball Bearing Water Resistant Servo	49.95	38.98	MBM435
FUTABA	FUTABA	FUTABA	FUTABA
FP-2GS	109.95	72.98	MBM363
FP-2F w/S-7's	149.95	98.98	MBM364
FP-2F w/S-18's or S-22's	134.95	89.98	MBM365
FP-2E w/S-7's	149.95	98.98	MBM366
FP-2E w/S-22's	134.95	89.98	MBM367
FP-3S w/S-18's	144.98	94.98	MBM368
FP-3S w/S-20's	169.95	109.98	MBM369
FP-3FN w/S-18's or S-22's	219.95	139.98	MBM383
FP-4FN w/S-18's	289.95	179.98	MBM370
FP-4FN w/S-16's	319.95	199.98	MBM371
FP-5FN w/S-18's	319.95	204.98	MBM372
FP-5FN w/S-16's	359.95	222.98	MBM373
FP-6FN w/S-18's	339.95	209.98	MBM374
FP-6FN w/S-16's	369.95	234.98	MBM375
S-7 Servo	39.95	29.98	MBM379
S-16 Servo	39.95	29.98	MBM378
S-18 Servo	29.95	22.48	MBM377
S-20 Servo (Mini)	39.95	29.98	MBM437
SANWA	SANWA	SANWA	SANWA
No.8020 2 Channel	99.95	69.98	MBM380

zone with that of the Me 109 in Fig. 15 shows that the performance will at least approach that of the Me 109. With the exception of the thinner wings, the last test model we flew was in this configuration and it did fly well.

Fig. 19 shows the 12.5% production airfoil vs. a NACA 4409 which was selected for the redesigned production model. The 4409 is quite similar to the prototype airfoil. Also shown is an Eppler 387, which is about 8.5% thick. The message of Fig. 19 is that thin, essentially flat-bottomed, cambered airfoils are quite appropriate for jet models. The thin section reduces drag as discussed. The camber gives good drag at higher lift coefficients, which is needed for climbout on the somewhat heavier jet models. The near-flat bottom prevents undersurface flow separation and the attendant drag at higher speeds.

There is one thing that can be done to further improve the drag of the A4D relative to the Me 109 which would get it almost into the same performance category. That is, remove the landing gear as was the case for the Me 109, and belly-whop it in for landings on grass, which works particularly well for jets without the prop. The hitch is that the fat fuselage makes it very hard to hand launch (the Me 109 is no picnic either). So what can be done?

My suggestion is to try catapult launching. I have designed and am prototyping an .049-class catapult. The idea would be to sell all catapult parts except for an aluminum extruded angle rail for a moderate price. It would be easy to assemble and would only require an additional $10 for the aluminum rail at the lumber yard or hardware store. The catapult is 12 feet long and will launch a 2 lb. model at 30 mph. Actually, that is a very good heave and the model is well off and climbing at a 10° angle. The device can be disassembled into two six-foot sections by undoing four bolts. A couple of guys or a club can get together and acquire one, not just for jets, but for all 1/2A or A type models, props included. As we all know, hand launching 1/2A models frequently ends in disaster even with hot prop types. The catapult would end that problem. Better starts in 1/2A pylon races can also be accomplished. I will publish photos, drawings and results at a later date.

TAKEOFF GROUND ROLL

While on the subject of jet model performance, it is of interest to examine takeoff ground roll requirements. Ground roll can be calculated approximately for a smooth macadam or hard dirt runway as follows (assuming there are no stones to cause the model to jump and bounce all over the place!):

Ground roll = $SG = .0334 V^2$ takeoff/(T-D/W) ave. –.05 in feet

V takeoff = takeoff speed in mph

(T-D/W) ave. = average thrust minus drag over speed range up to takeoff divided by model weight.

The .05 is a guess at rolling friction.

All of the 1/2A models previously discussed had stall speeds around 22-24 mph. Thus, a safe takeoff speed would be about 30 mph. Table IV shows calculation of takeoff distance versus (T-D/W) ave. for a constant takeoff speed of 30 mph. The data are for the Me 109, He 162 and A4D previously discussed.

The data of Table IV are shown in Fig. 20. The jet-prop comparison of Fig. 20 is interesting in that the combination of lower prop model weight and higher thrust gives better takeoff performance than even the redesigned production A4D, which should be no surprise to anyone! How bad the situation was with the poor thrust of the original production A4D is reflected in its long ground roll. Note that the takeoff distance skyrockets as the (T-D) margin approaches zero!

PROP/JET MODEL COMPARATIVE FLIGHT TESTS

Nick Ziroli, Jim Newman, and the author recently ran some back-to-back flight tests on the same day with two Midwest A4D's, one with the RK-049 and one with a nose-mounted TD .049 prop engine. Fuel used was Cox Red Can, 30% nitro. Stock engines without pressure. Ambient temperature was about 85°F, dry. The models are shown in Fig. 21 with Nick Ziroli on the left and Jim Newman

on the right. Other photos of the models appear in Figs. 12 and 22. The prop job was ballasted to the same weight as the jet and still had the side air inlets and tailpipe, which caused some unnecessary drag. Both models weighed 31 oz. Twelve data flights occurred, interspersed with an almost equal number of crashes into the bushes due to either poor takeoff climbout in the case of the prop or the aforementioned snap-roll problem of the original "production" A4D (never produced!). There was a third model not shown in the photos, also flown that day, the prototype A4D. When the day was over we were well bushed, but the unequivocal results below were logged:

1) With racing props, the prop job would just barely fly. We never did get it clear of the brush at the edge of the field.

2) With 6x3 and 5-1/2x4 props, the aircraft would accelerate to takeoff faster than the jet, had an initial climbout at about the same angle as the jet, but was *much* slower in flight than the jet.

3) The prop model could not be looped or rolled without serious altitude loss, as opposed to the jet, which could.

4) The prop job was pulling around some unnecessary ballast and inlet drag which degraded its performance. I have calculated the inlet/tailpipe drag effect to result in roughly a 35 to 50 ft./min. degradation in rate of climb compared to 544 ft./min. obtainable with the redesigned production A4D. Thus the effect is not large.

5) The jet, while slow on takeoff and initial climbout, thoroughly outclassed the prop at the higher speeds.

6) The day was started with the jet being an original production A4D except for the added Gill I inlets of Fig. 12. As we went along, we modified the model on the field by adding wing tip washout and vertical/horizontal tail area. Thus was born the redesigned production A4D (except for thinner wings).

A FEW NOTES ON THE RK-20 AXIFLO

The prototype RK-20 AXIFLO has been built and tested. I have always felt that this would be the best of the fans because of the availability of several very high performance .20-class engines. The fan is also of a size giving nice, convenient sized models and is particularly well suited to moderate sized twin engine models.

The engine used was a stock K&B 3.5 without pressure or pipe on 30% nitro (Cox Red Can). Thrust measured was 3.9 lbs. at 22,700 rpm. The engine is a beautiful starter, idles well and is a smooth *animal* at the top end.

The RK-40 AXIFLO will be made in all injection molded nylon form. Only six self-tapping screws plus the four motor mount screws, and it is together. Figs. 23 and 24 show photos, assembled and disassembled, of a mockup RK-20. There are only six major parts in the kit. It will be as light as the wood prototype, which weighed 1.25 lbs. with engine. The tank has rotation locking provisions (which was a problem on the RK-049 and RK-40) plus a new piping system. Two molded nipples are provided for the upright and inverted flight vent lines. The stopper is a single-line, all-nylon design which eliminates "stopper frustration" for all time.

A four-blade rotor for the RK-20 will be marketed somewhat later, which adapts the unit for operation with some of the hotter .15's. •

Halt-A . . . . . *Continued from page 24*

"Getting back to the subject of original designs, I think that anyone who puts the time and effort into creating a good design should also spend time trying to make them easy to duplicate. I think I have taken a step in this direction, and I also believe this could be very helpful to anyone who designs models, as well as anyone who wishes to duplicate them.

"What I do is make accurately shaped patterns for all parts of the model. These are cut from thin, stiff cardboard. All drilled holes, notches, etc. are carefully done. The location of all attached or contacting parts is marked out, and the material thickness, hardness, and grain direction is noted. Some patterns must be folded for storage or mailing, and to do this I run a band of Scotch tape around the pattern and bend it along the tape strip. I give all the patterns a coating of clear varnish to preserve and toughen them. I also make a set of gauges to help

check the alignment to tail surfaces, wing dihedral, etc.

"I've found that making these patterns is easier than drawing plans, and their use in making parts assures better accuracy, better economy, and requires far less time than trying to make parts from drawings. Actually, I make these patterns as I go along in designing a new model. If the pattern fits, so will the finished part. And, cardboard is cheaper than balsa and plywood.

"I provide complete drawings for all my designs, and patterns help here too. All I do is trace the outlines of the patterns onto the plans with a fine-tip pen or pencil. Since the patterns came first, the model second and the plans third, the plans are accurate.

"Since this has proven to be so useful in my own activities, I thought I would pass it along. It works beautifully, and it makes it easier to reproduce a good design. The best design in the world is useless unless it can be reproduced."

About the only thing that can be added to Curt's technique is to consider using Formica for items which will see very repetitive use, such as rib patterns. I take my part drawing and rubber cement it to the Formica, then saw it out just a smigin oversize. Filing and sanding allow me to make a pattern just as accurately as I please to do it.

The photos for this month show quite a bit of variety. First is a beautiful bit of artwork presented in memory of a fine bit of the engine maker's art. The Cox .010 is officially no more. This little beauty never really saw the popularity it deserved, generally selling only a couple of thousand copies a year. I have owned three of them, and admittedly the piston/cylinder fit of one was too tight to run well, but it did loosen up eventually. The others ran so fast that it really struck terror into your heart the first time you fired one up. Generally they could be used best on sport models, as on a scale ship, if the model was large enough to handle the power, you completely blanked out the propeller with the cowling. I fondly remember flying absolutely spectacular high-performance free flights of a mere 110 to 150 sq. in. wing area. It is one of those engines destined to be a classic, I'd tuck one away if I were you. (I have already, so the rest are fair game.)

Second is a hot item from The Model Factory. Bob Lyons has made a scale model of the Warwick "Hot Canary" racing biplane. This model is set up to race, and has foam cores, balsa fuselage, and is sized for the Tee Dee .049. Any 2 to 5-channel R/C system will fit in the fuselage, but this kit is definitely NOT for beginners. Bob is planning to bring out a second version with longer wings and a fatter airfoil to be a more docile aircraft for the less brave of us (that translates as "more sensible"). Even so, the Canary will always be "Hot," due to the overall configuration of the airframe.

The next photo is one of a bunch sent to me by Tyrone Parker (205-1/2 N. Proctor, Tacoma, WA 98407). I'll show the other ones as the months go on. Tyrone didn't say, but I'd guess that he has some professional connection as an artist. The whole series are as graceful as this exciting pusher delta, and are as well built. The photo is by Dave Purchase. Construction is of conventional balsa, bass, and plywood with Aliphatic resin glue, cyanoacrylate, and epoxy adhesives. The finish is a bit unusual, in that it is silkspan with paper designs applied with thin glue, followed with 5 coats of 50-50 thinner and dope, followed by 2 coats of polyurethane varnish.

Fourth photo is of the new Super Tigre X- 11. This engine is imported by World Engines, so it is available directly from them or from any of their multitude of dealers. The new engine is Schnuerle ported and available as a standard or R/C version. It features a new throttle with a cam action to lean out the mixture at low speed for a reliable idle. Price of the R/C version with muffler is $37.95.

You may recall that a few months ago I mentioned a 1/2A C/L Stunt version of the Northrop F-5E fighter. I received a letter from its designer, Richard Byron (2506 So. 161st Circle, Omaha, NE 68130). He said that he built the model in 1972 and not only is still flying, but he flew it in this year's Cox 1/2A Stunt event at the Nationals. Bob included photos of an earlier 1/2A Stunt ship. This model used the same wing and stab design as the F-5, but did not fly as well. It is nice when your later efforts outperform the earlier ones!

Well, I guess that's enough for the month. See you same time, same magazine next month. •

F/F . . . . . *Continued from page 52*

conditions, a zoom hook is advantageous, but these are seldom encountered in most parts of the country. And a twanger hook does a pretty respectable job of zooming a Nordic, if you've practiced with it.

One additional comment about physical fitness. I've found that a circle tow system takes less energy for me than straight towing for the same length of time. That's because it enables you to "rest" and catch your breath part of the time, while hauling the model up with

SUPER JET

REVOLUTIONARY NEW
INSTANT GLUE

DOES JOBS THAT NO INSTANT GLUE COULD DO UNTIL NOW!

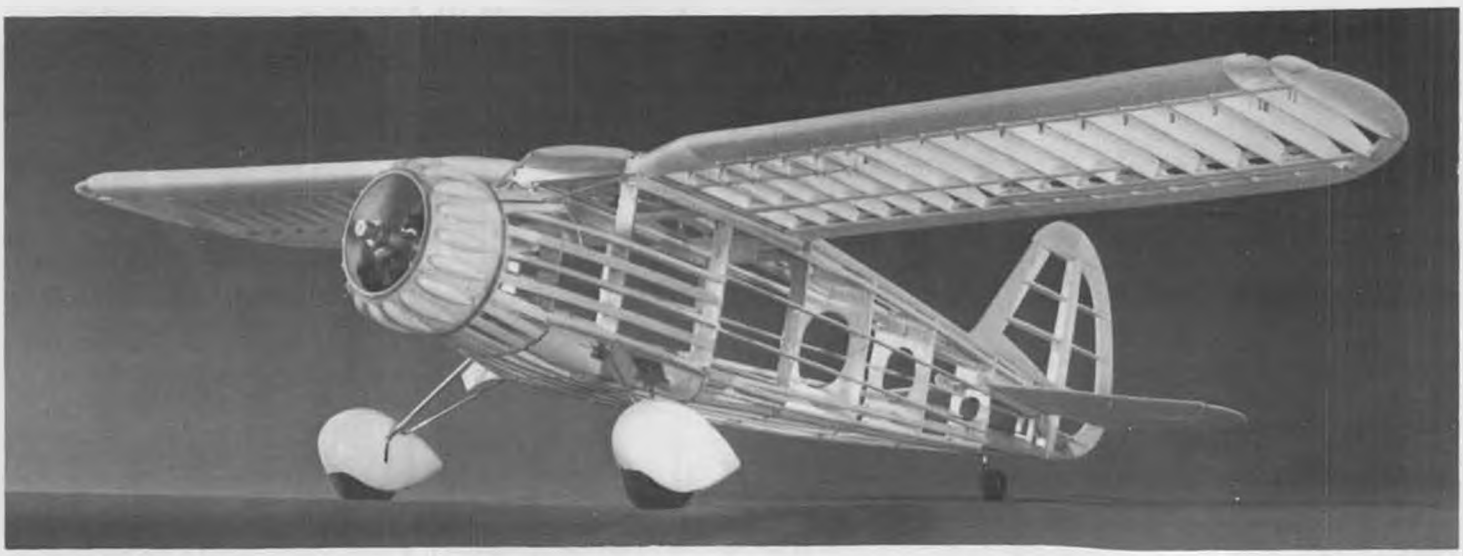
Normal model instant glues are watery-thin, and do a great job within their limits. But new SUPER JET has "body," just like regular model cement. Now you get the best of both worlds - the workability of model cement, and the high strength and quick-setting of instant glue. With SUPER JET you can now:

- Glue joints that are not perfect fits
- Laminate large area doublers
- Glue plywood to balsa
- Glue hardwood bearers to balsa
- Glue end-grain balsa
- Even glue old balsa

All These joints have been difficult or impossible with previous model Cyano-acrylates. SUPER JET is a new type - you use it like traditional model cement - but it sets in seconds! You can apply it to one side of the joint, then press the parts together briefly - and that's it! You can build the whole model with SUPER JET! Good modelers who've tried it are so enthusiastic they say you don't need any other kind of glue. Even put in firewalls with it. We just say, "Try it. We believe you'll like it!" Now at your Dealer's.

SUPER JET 1/2 Oz. (No.384) **$3.95** 1/4 Oz. (No.383) **$2.25**

We are pleased to show two outstanding examples of modeling structure. Above is the Quarter-Scale Fleet by Concept Models. Below is the 62" Stinson SR-6 by G-S Products. Whether Scale, Pattern, Sailplanes, or any of the many other fascinating aspects of modeling, SUPER JET will help you build it strong and faster than any other single glue.



AVAILABLE IN CANADA

CARL GOLDBERG MODELS, INC.
4736 West Chicago Avenue • Chicago, Illinois 60651

the line. You do have to run if you find a downdraft, but at least you don't have to worry about the model dropping off the line.

RESULTS OF THE FAI INDOOR TEAM FINALS, by Dr. John Martin (From *The Hangar Pilot,* MIAMA newsletter)

"Of the 3-man team that represented the USA in the World Indoor Champs in 1978 at Cardington, England, none remain on the 1980 team. Richmond, Hulbert, and Domina have been replaced by Harlan, Andrews, and Rodemsky. All new faces, but all seasoned veterans, and all members of previous U.S. world teams. Domina could have repeated on this year's team, as he qualified third in the competition finals held Labor Day weekend in Akron, Ohio, but he chose to give his place on the team to Irv Rodemsky, who had qualified in 4th place.

"It was a weekend of sensational flying, with 6 flights of over 40 minutes and 33 flights of over 35 minutes! Jim Richmond, in a very late flight, set a new Class D (Unlimited) record with a flight of FIFTY-TWO MINUTES, SIXTEEN SECONDS! (Pete Andrews set a new FAI record with his meet high time flight of 44:59.) The one-hour indoor flight seems to be looming strong.

"Top dog was Ray Harlan, who has been working very hard and very long to get his craft performing up to and beyond world standards. THREE CHEERS for the U.S. team, and for the many, many others who made the effort to qualify. Let's hope we will all convene at West Baden next June 20 for the best World Champs ever. (The MIAMA proposal for the World Champs has been accepted at a preliminary vote of the AMA Executive Council at the Nats, and will now be submitted to CIAM in Paris in December. We understand that Russia will also submit a bid.)"

THE CROCKET SURVIVAL KIT

A few weeks ago, I received a package in the mail from Jim Crocket containing the equipment shown in the photo. Jim told me it was his latest product, but I couldn't exactly ascertain its uses, so I wrote him for some more details. In the meantime, my oldest (3-year-old) son adopted it as his own and wore it during all 3 days at the Harts Lake FAI semi-finals. The fact that the bag survived the whole experience is adequate proof of its durability, so I'll let Jim tell you about the uses for his survival kit.

"The Survival Kit is designed to be used with or without the insulated pouch. You can pack a small lunch with beverage, a knife, some tools, a snake-bite and first aid kit and tie a sweater on top and hike off into the boonies chasing thermals or butterflies on foot, bike or motorcycle.

"Some people might like to use it as a field bag with all the necessary things to launch, fly, and retrieve a model without tying up your hands.

"Fishing, hiking, skiing, trail riding on horse, bike or motorcycle are some other activities that might use the kit. Or you could pack a small camera and insulate the film in the pouch. A new mother can carry and keep baby's formula warm for hours. I guess you get the idea."

The Survival Kit is available in an ecological rust color for $19.95 plus $2 packing and shipping, from Jim Crocket Replicas, 1442 N. Fruit, Fresno, CA 93728.

THE "IT'S NOT TOO LATE TO HINT FOR XMAS" DEPARTMENT

Here are some items I've noticed and used, that would be suitable as gift ideas for the confirmed free flighter:

If you're not interested in Jim's Survival Kit, you might try his "Copy Cutter." This is a really slick set-up for stripping spars, HLG fuselages, etc. from sheet balsa. With the price of balsa strips, you'll probably save the cost of the cutter in a year's time, plus having the advantage of being able to match spars exactly in weight and stiffness. Jim's gadget is unique in being able to cut tapered strips, too. It makes very uniform strips when set up. Only minor complaint I have is that the maximum strip size you can cut is about 3/4 inch wide, but that should suffice for most purposes. Two sizes are available: 18 inches ($9.95) and 38 inches ($12.95). If you only build Peanut size models, the 18-inch model is OK, but the 38-inch length is really the best bet.

One problem I've always had with metal motor mounts is drilling and tapping the holes accurately. If I get 3 out of 4 holes lined up, I consider it a

success. Now Prather Products has come to the rescue, with the Drill Jig and Tap Guide. IT WORKS! No more goofed-up FAI pans, or egg-shaped holes in your crankcase. Comes in various sizes, mostly for R/C .60's, but there are sizes for Rossi and Cox .15's, S.T. G21 .35's to .46's, O.S. .40, K&B .40, and Veco .19's. If your hobby shop doesn't stock, send $5.95 to Prather Products, 1660 Ravenna Ave., Wilmington, CA 90744.

Or perhaps your free flighter prefers to curl up with a good book while the glue's drying. An obvious choice would be a subscription to his favorite magazine (check inside the copy left behind in the bathroom for the address and yearly rates). If he's technically oriented, get a copy of this year's NFFS Symposium ($8.25 postpaid), which is especially full of good, practical articles. While ordering the Symposium, also ask for a copy of the NFFS Plansbook, containing over 100 drawings of models flown in this year's World Champs, plus additional technical data and historical slants on FAI and Wakefield competition. It's available for $10, plus $1 shipping, from NFFS Plans & Publications, 4858 Moorepark Ave., San Jose, CA 95129.

Another book I've sampled lately is *Model Aircraft Aerodynamics*, by Martin Simons. It's a very good attempt at presenting some standard aerodynamic theory in a practical, useful form for model builders. Lots of airfoil references, latest developments, and practical illustrations all serve to make this a "must" addition to any technically-minded modeler's collection. It's a bit spendy at approximately $18, and it probably won't make it here by Christmas if sent surface mail, but it's a good one. (Order from Model & Allied Publications, Argus Books Ltd., 14 St. James Road, Watford, Herts., England.)

A kit from one of our "cottage industries" free flight manufacturers would probably be most welcome. These will probably not be found in any local hobby shop, so write to Blue Ridge Models (P.O. Box 429, Skyland, NC 28776), Champion Model Products (880 Carmen Court, LaVerne, CA 91750), Kitco (4327 McDermed, Houston, TX 77035), or RM Enterprises (3225 NW Crocker Lane, Albany, OR 97321) for a catalog. Enclose an SASE for quickest service.

If you've got more bucks to spend, you could give a new engine, or a permanent fixture for the workshop. The Dremel company has several high-quality tools for the serious model builder. No shop should be without the Moto-Shop Jig Saw, the handiest single tool you'll ever use. The new Dremel Table Saw is a neat miniature that has drawn rave reviews from everyone

who's used it. One of the new miniature disk sanders available from Powr-Mite is a great addition, also.

A good scale for weighing balsa, finished parts, and completed models is a necessity for the competition-oriented free flighter. Knowing the weights of each component and being able to improve with each succeeding model is a sure way to make better models. The Ohaus Model 750S Triple Beam Balance costs about $75, but is a lifetime investment. It will measure to 0.1 gram, which is close enough for anything but Indoor models. Check your Yellow Pages under "Scales" for your local Ohaus supplier.

THIS MONTH'S THREE-VIEW:
Carl Bogart's F1C

Carl won his spot on this year's FAI Power Team by maxing out with some very consistent-flying models. The model shown in the 3-view is a new one that he made for this year's World Champs. It's got all the trendy "extras" such as a cowled engine, super-thin airfoils, and metal wing skins to stiffen the high aspect ratio wing. (This is one of the 3-views which will appear in the NFFS Planbook. Carl also sent along some photos of details of this model, but they were in color . . . nice for looking at, but difficult to reproduce.)

DARNED GOOD AIRFOIL:
Bogart Bo 545-38

I ran across this airfoil in a compilation of FAI Power airfoils by C. Hohls (*Free Flight News*, March 1974). All that he had to say about it was that at 5% maximum camber and 8% thickness, it looked good and to try it. So far as I know, nobody's taken him up on the suggestion. When I drew this up originally, it definitely did NOT look good, at least for FAI Power. Then I rechecked and found that the FFN article included the ordinates for Bogart's 545-28 airfoil (an easy mistake to make, since the 2 ordinate tables appeared next to each other in the 1971 NFFS Symposium), which has more undercamber and looks like it would be a more suitable glider section. Anyway, Hohls' suggestion still stands . . . it does look like a moderately undercambered section of 8 thickness that might work on an FAI ship. Which is as good a reason to use it as any.

MYSTERY MODEL

Now here's one that might be a stumper! A Class BC "pencil bomber," seven years of field testing and design refinement according to the article. Identification keys are the fully tapered wing, twin fins, and planked and stringered fuselage (with a Froom spinner at the nose!). Look for it on the cover of one of your old magazines, drawn by one of the classic model airplane artists. If you can figure out the design, send your guess to the **RCMB** office to see if you win the free subscription. •

C/L . . . . . *Continued from page 56*

skills involved, flight success is in no way guaranteed, and less-than-satisfactory flights often require a rebuilding session. In the present world of ready-to-fly everything it is difficult to find any kind of F/F that is R-T-F and that will turn in a pleasing flight. To be able to buy a contest winning F/F model is absolutely unheard of. I have never even heard of a F/F modeler who would consider borrowing a model to fly or compete with. It is a "man and his machine" world in F/F.

F/F modeling seems to be at odds with the world. Look at the model magazines. The F/F articles tell you how to *build* something right down to including 3-views with many columns. The rest of the magazine tells you where to *buy* the

CHRISTMAS SALE

aero sport six
Radio Control System

Aero Sport Six Systems Include: 6 channel receiver, 6 channel transmitter, all Ni-Cads for both transmitter & receiver airborne, dual charger (charges both sets of batteries at the same time), four (4) NS-IC servos, servo trays, extra servo wheels, instruction book, frequency flag and full 180 day warranty. 72 mHz only.

184.99

HIGHEST QUALITY - LOWEST PRICES!

DEPENDABLE, BEAUTIFUL, ECONOMICAL, QUALITY CRAFTSMANSHIP & ELECTRONIC DESIGN

SYSTEMS FEATURE

- SMOOTH OPEN GIMBAL ACTION WITH CLOSED DUST SHIELDS
- TRIPLE TUNED FRONT END RECEIVERS
- ACCESSORY PACKAGE WITH TRAYS AND EXTRA WHEELS OR ARMS

aero sport two — 79.99

Aero Sport Two Systems Include: 2 channel receiver, 2 channel transmitter, both for AA Alkaline battery operation (batteries not included), two (2) NS-IC servos, dry airborne battery box, switch harness, frequency flag, extra servo wheels and full 180 day warranty 72 mHz only.

aero sport three — 105.99

Aero Sport Three Systems Include: 3 channel receiver, 3 channel transmitter, both for AA Alkaline battery operation (batteries not included), two (2) NS-IC servos, dry airborne battery box, switch harness, frequency flag, servo trays and full 180 day warranty. Choice of 72 or 75 mHz.

aero sport four — 169.99

Aero Sport Four Systems Include: 4 channel receiver, 4 channel transmitter, all Ni-Cads for both transmitter and receiver airborne, dual charger (charges both batteries at the same time), four (4) NS-IC servos, servo trays, extra servo wheels, instruction book, frequency flag and full 180 day warranty. 72 mHz only.

There's only one place to get it!

CHARGE IT

BANKAMERICARD VISA OR MASTER CHARGE CARDS

Hobby Shack

18480 BANDILIER CIRCLE
FOUNTAIN VALLEY, CALIF. 92708

ORDER BY MAIL OR CALL US

Area 714
963-9881

Add $3.00 postage & handling
California residents add 6% state sales tax

latest trick or how so and so crashed his R/C model but borrowed another and went on to fame and glory.

I'm not trying to make a judgment here on what is the best approach; I'm only trying to show the problems with being involved in an age-old modeling form, good ol' F/F.

But look again at the modeling magazines. If you really look you will be as amazed as I am at the amount of space devoted to F/F. When it comes to getting "ink," the F/F guys have it over everybody else. And this is not unequal representation, there are a *whole bunch* of active F/F guys. Not only are there a lot of them, but their numbers keep swelling, if not at a great pace, at least at a consistent one.

We come back to C/L. In this area we have similar problems . . . an "old" modeling form, required building skills, roll-your-own models, and so on. Yet, just as in F/F, we have a modeling form that is very popular with many and quite attractive to others not yet involved. I guess we could refer to it as an easily promoted type of flying and over the years I have personally proven this, being involved in promotion of C/L here in the N.W. To the other side, I have seen what a let-down in promotion can do, as those of us heavily involved in C/L here have just simply not had the time to devote to it that we did in the past.

Unfortunately, the results have been clear and we presently do not have quite the activity that we used to, although there are signs of it coming back again stronger than ever.

THINK ON IT. . .

I was going to wrap this column up with my own conclusions, but have decided to leave things hanging for a month. Until then I ask that all C/L modelers reading this take the next 30 days or so to look around them, hopefully seeing what I see. Read through all of the F/F articles and columns you can find . . . go further, read **R/C MB** from cover to cover if you don't already (and you really should, you know). Take note of the fact that the F/F World Champs were held in the U.S. this last fall.

I know that most of my stuff is kinda off-the-wall writing and usually I expect you to take it that way. But this time I am serious, being concerned about whether or not C/L flying is going to grow as it should, or if we are just going to keep putting along as we have for too many years. •

Electric . . . . . *Continued from page 39*

charging station with 1800 Ah truck batteries, a cafeteria, a first aid station, and a toilet van. The announcer was Peter Blommaart, who informed the competitors and the more than 200 spectators constantly about what happened or should have happened. Peter is the initiator of the Benelux meeting, a contest that has had many firsts, including: 1) The first international all-electric contest with five FAI nations competing; 2) The first electric contest with low-wing aerobatic models with retractable landing gear, doing the whole FAI aerobatic schedule; and 3) The first contest where all-electric pylon races were held.

"Peter is also chairman of the FAI-CIAM subcommittee for R/C electric. Joe Beshar is the U.S. member, and I am the Dutch representative.

"I hope to see you all next year when the fifth Benelux Electric Meet is held in Belgium on September 5-7."

Thank you, Rick, for an impressive report on the European contest scene. I would like to be there next year. As I said, what's going on over there is impressive! Rick also included the aerobatic schedule, I'll save it for the next column so I can pack in as many photos in this one as the friendly editor will allow, since Rick sent in over a dozen! Until next time, enjoy electrics! •

Soaring . . . . . *Continued from page 31*

easily, and flies when there's nothing apparent to keep it up. Proof? This plane placed first and third in the first two-meter contest it entered (two different pilots flying the same ship).

Where there's a will there's a way. Michael Condon, of San Diego, flies his Windrifter by means of chin control. You see, he's paralyzed from the neck down, but with the help of Larry Burger (of the Harbor Soaring Society), he now

flies an R/C sailplane in the usual manner, except for the fact that he actuates the rubber cushioned control stick using only his chin. Mike has been at this since Christmas and is now quite adept. In fact, he and Larry are designing and are building a symmetrical wing 10-foot span aerobatic craft. We look forward to seeing this one in operation.

If you read this column regularly, you know that I generally refrain from describing details of contests and the conditions at local soaring sites. But the present situation calls for an exception. You see, it's now illegal to fly R/C sailplanes at Torrey Pines on odd-numbered days.

This unique slope site is recognized the world over as one of the very best. The 350-foot ocean cliff faces the prevailing wind and, with the very predictable San Diego weather, this means good lift year round. Full-scale sailplane activities have been in effect at Torrey Pines gliderport for half a century. R/C soaring began in the late '60's. In 1970 it became the home of the Torrey Pines Gulls. Flight safety regulations were agreed to and observed by the full-scale clubs and the Gulls.

In the past five years, hang glider activity has increased from an occasional flight to extensive flight operations. There were even attempts to operate powered hang gliders at Torrey, but the police helped to supress this breach of the gliderport restriction against powered flight. A number of responsible hang glider pilots then formed the Ultralight Fliers Organization and agreed upon flight safety regulations consistent with R/C and full-scale soaring . . . but these rules were regularly disregarded by a few hang glider pilots, and so the city of San Diego prohibited hang gliders at Torrey Pines.

A new hang glider organization was then formed in the hope of renewing the Use Permit. But here again, enforcement of the flight safety regulations was a sometimes thing. Each hang glider pilot was required to call the intended direction of his flight before launch, to fly through the quarter-mile model airspace only once, and this in a northerly direction, and to land inland, behind the model flight operations pit. It's difficult to judge the relative range of a model and hang glider; worse yet, to find you're on a head-on course without warning of the glider's coming into view.

Without permission, the hang glider pilots reconfigured the parking area and built themselves a clubhouse on the cliff edge. This separated the spectators from the model launching and pit areas. The San Diego Soaring Advisory Council was formed and a new ordinance passed to require concordance with flight safety regulations. But nothing was done about reconfiguring the cliff landing

zone.

Although the majority of the hang glider pilots carefully followed the regulations, there was sufficient disregard of safety on the part of a few to require separating the airspace for R/C and hang glider operations. The modelers suggested that they only fly north from the launch point, while the hang gliders only fly south. This gives the radio control fliers a half mile of cliff lift, while the hang gliders have the southern 3-1/4 miles of lift. There were some problems with this, so the city imposed an odd-even day restriction. Hang gliders can fly on odd days, R/C models on even days. In the meantime, the state suspended full-scale operations in view of the uncertain flight safety conditions prevailing at Torrey.

The police have now been challenged to enforce the odd-even day airspace allocation. Citations have been issued to model pilots who flew at the wrong time. If you plan to visit Torrey, please observe the posted schedule and safety regulations for flight operations. I'm hopeful that the hang glider pilots will come to agree to share the airspace as we recommended, so that we can simultaneously benefit from the unique features of Torrey. Presently the FAA does *not* regulate hang gliders; it is a self-regulated sport, like scuba diving. No license is required, and you can buy or sell a man-carrying glider without safety certification. In my view, FAA regulation of these aircraft is long overdue. Perhaps interest on the part of the FAA would correct the attitude of those few who claim they are free to fly anywhere in any way they like, in spite of their impact on others who have been using this special airspace. •

Flying Lab . . . *Continued from page 62*

down the leading and trailing edges on the plan. Make a rib curve template from cardboard or sheet aluminum. Get a piece of light 1/32 balsa sheet, and lay the template at the top edge of the sheet. Follow the template with a sharp knife on the balsa, and remove the piece. Now, lower the template 1/16 inch and make another cut. How about that, you made your first rib!! Do this 68 more times and all the ribs are done . . . doesn't take as long as it sounds. Pin down the forward spar on the plan, then glue each rib to the leading edge, the spar, and the trailing edge. Both the top and bottom wings are the same, so when one is done, remove it and make the other one. Turn the wing upside down on the plan and add the rear spar, and add the bottom of the ribs also. You guessed it, give it three coats of dope and set aside.

Make the landing struts by first bending some 1/32 wire as shown, and let the wire project a little into the wing to serve as a firm attachment. Then make the strut from 1/32 x 1/8 balsa, make a groove in this for the wire (a pencil can be used for this), and glue a second sheet of 1/32 x 1/8 balsa to cover the wire. Make two of these, as the plane won't R.O.G. with one wing dragging on the floor. Speaking of landing gear, make the tailskid from 1/32 round bamboo. Where does one buy 1/32 bamboo? Buy some bamboo skewers in a market and split them down to size, or do the same with bamboo chopsticks. Bend the end by holding it over a soldering iron until its flexible, bend to the curve and remove from the heat. It will keep the curve from now on.

I made my 1/8 x 1-1/2 wheels on a small lathe, but one can chuck them in a 1/4-inch drill, or hand carve them to shape. Paint a black tire on them (if you are using gloss black dope, put a pinch of cornstarch in a capful of dope . . . makes a flat velvet finish like rubber). Put a 1/16 aluminum tube in the center for the axle, and you are done.

Now that all the structure is built, let's cover it. The fuselage is the most time consuming, so do it first. Cut a piece that will cover the back flat part of the bottom, from section "G" to the back. Put dope on the frame, lay the tissue on it, pull out all the wrinkles, and dope over all the frame areas on top of the tissue. Trim off the excess on the sides with a new razor blade. Now do each side and the top in the same way from section "G" aft. Cut a piece of tissue slightly wider than the width of the stringers, and starting from the bottom-most stringer, dope on the tissue. This strip should cover from section "B" to section "G." Trim off both sides of the

first strip, and working up from both sides, cover the bottom and the sides. Now use one sheet to cover the sides and bottom from "A" to "B." Cover the top from "D" to "G" in one piece, then use two pieces on each side of the pylon at "C" and "D," then one piece from "A" to "C." Cover both sides of the pylon now, top and bottom, and the fuselage is done.

The tail is next. Cover the bottom of the elevator first, trim to the edges, then cover the top and lap over about 1/16 tissue to the bottom. I find it best to cut a slit about every 1/8 inch around the edges before I fold the tissue over; this seems to keep the stuff from wrinkling. Do the rudder in the same manner.

Cover the bottom of the wings first, then the top. Lap over the same as the tail section.

The best way I have found to shrink the tissue is to spray a mist *over* the work and let a fine mist fall on the tissue. If it is done in this way, all the large drops will go beyond the work and not make a puddle on the tissue that may produce a wrinkle later. Wet all the surfaces and let dry, then pin the wings and tail down for 24 hours. While this is pinned, give the fuselage two coats of 50-50 dope and thinner mixture. Dope the wings and tail the same way and pin down for another 24 hours. No sense sitting around all that time with nothing to do, so let's make the cylinders now. Get or carve a piece of 1/2-inch diameter balsa about seven inches long. Smear some glue on this and wrap some black thread around it, as one would wrap a fishing pole. When this is dry, cut it into 1/2-inch sections and glue around the fuselage as shown. Paint the tops with black paint. Now take a pin, cut off the head, and bend with pliers as shown in the drawing to form the pushrods, paint black and stick two in the top of each cylinder. Now would be a good time to form the landing gear wire also; just bend as shown in the front view. Make the interplane struts from 1/16 x 1/8 balsa, measuring from the side view (they will be the length from the bottom of the top wing to the top of the bottom wing at the rib section). Put a cut-off pin at each end of the struts to form a good attachment point to the wings.

Take the pins off the wings and tail, and check for warps. If any are found, remove by placing over steam or dry heat (a very low flame on the stove) and bending the warp out, then holding the piece, remove from the heat and check again.

Mark the ailerons on the bottom wing only with a strip of black tissue, a fine black marking pen, or black India ink in a drafting pen. Place the bottom wings on the pylon and shim the tip up as shown in the drawing, then glue in place. Put a 1/16 shim in the front and rear of the pylon to fill the gap, let dry, and then do the same with the top wing. Next, put the interplane struts in, checking that you don't warp the wings doing it (sometimes the struts need some

cutting to fit properly).

The tail can be put on next. Make sure that the rudder is on straight and is square with the fuselage. The same goes for the elevator. There is a dashed line on the side view to show where the elevator is located.

Rig the wings next. Gray thread looks better than black to me, but suit yourself. Start at the pylon, and bring a thread down to the first interplane strut, loop around the pin, and continue to the next strut. Check that you haven't bent the wing, and glue the thread in. Bring a thread from the bottom of the pylon to the top of the first interplane strut, then down the bottom of the other strut, check and glue. Make an "X" at each interplane strut from back to front; check from the end of the wing and from the back to see if the wings have the amount of washout as called for in the drawing; if they do, glue in place. Now, rig the rear interplane struts the same way, checking for warps before gluing in.

The landing gear struts can now be glued to the wing. Make sure they are straight. After these are dry, put the triangular wire on the bottom of the pylon; be sure this is glued in well. Lay the axle on this wire, center it and bind with thread and glue. Bind the axle to the landing gear struts with elastic thread (can be found in dime stores, or remove from an old pair of socks), glue to the landing gear strut but *not* to the axle . . . this will help absorb landing shock. Glue the tailskid to the right side of the rudder (really, the real one is that way!).

Remove the nose block and drill a hole (note the angle shown in the drawing) to receive the 1/16 inside diameter tubing. Glue the tubing in place. Bend a piece of 1/16 wire to form the shaft, place a small washer on it, then the prop, and bend it at right angle to form the freewheeler.

Install the rubber, wind it about 50 turns, and glide it across some tall grass. If it stalls, add some clay to the nose until it glides smooth. Increase the winds and trim for a left circle of about 50 feet. Good flying!! •

R/C Auto . . . . *Continued from page 48*

you looked around you could find restaurants that had great meals in the $8-$9 range per person. The best thing to do for lunch was to go to a supermarket and get bread, salami, cheese, etc., and the drinks, then make your own.

After paying these prices, the Micro Racing party one night was fantastic. Huge soft drinks, ham, sausage (beef and pork), rolls, chips, dip, wines, etc. were provided at no cost. There was also disco dancing on the lawn. Needless to say, that was our dinner that night. I also enjoyed the presentations banquet held at the Penta Sunday night when all the smoke had cleared. Even at $15 per person it was good. Wine, mineral water, good food, dessert, and coffee were provided. Even the talk and committee introductions in French by the race chairman were not too boring. Finally the awards were presented, then we all talked for a while, then it was sack time. I think the Geneva Model Car Club did a fantastic job of putting on the 2nd World R/C Car Championship.

On Monday morning there was a meeting of EFRA (Europe), ROAR (United States), and JMRCA (Japan) representatives and other interested parties to discuss the formation of a World R/C car organization to promote and control world class events. Ted Longshaw, the current EFRA president and newly elected world organization chairman, summarized the meeting quite well in a recent EFRA newsletter. The newsletter is too long to be reproduced here, but several topics were discussed, the most important one being that the 3rd World R/C Car Championships will probably be held in the U.S. I haven't heard of much happening in ROAR concerning site selection. We better get on the ball. The three-block (Europe, American, Asia) approach is being taken so that things could be accomplished in a reasonable time. New countries entering the organization can join any block they want. They can join the smallest group to have the greatest influence and greatest allotment of drivers for world events, if they so desire. The suggested 150 driver limit for the World Championships seems rea-

sonable. I do think the host block should get the greater number of drivers, mostly because I don't think the best 50 American drivers would be able to go to Europe (or Japan) or that the top 50 European drivers would come to America (or Japan). I think the split should be 60-45-45 or 70-40-40.

I have more to jabber about but I've gone on too long now. If you have any comments or questions, please write to Chuck Hallum, 18276 Foxglove Way, Irvine, CA 92715 USA. Have a good off season. •

Hannan . . . . . *Continued from page 54*

the top places went to powered models. Thus John feels the rubber-driven entries should have a separate event. Results were as follows:

1) Eric Coates D.H.9A
2) Terry Manley . . . . . Blackburn Swift
3) Bill Dennis . . . . . Armstrong Whitworth F.K.B.
4) Tony Creedy D.H.9A
5) Milan Kacha . . . . . Zlin Z XII
6) Ken Brown B.E.2C
7) Mike Colling . . . . Church Midwing
8) Walt Mooney . . . Upton Baby Ace
9) Dave Binns . . . . . Flanders F3
10) Bill Warner . . . . . MacDonald S21
11) Hugh Stevenson S.E.5A
12) Ichiro Yamada . . . . . Polikarpov I-17
13) Richard Falconer . . . . . SAAB 21A

Note that Milan's Kacha's, Walt Mooney's, and Ichiro Yamada's entries were all Peanuts!

Our congratulations to C.D. Bernie Sinclair, proxy-flyers M. Colling, Pete Farrimond, Pete Branigan, and Dave Yates, and the crew of Woodvale judges and helpers.

A movement is underway to conduct a free flight scale event in conjunction with the 1980 Canadian Internats, but confirmation of the concept is still pending.

BELGIUM BASH

Jean Frugoli, of France, reports on another international free flight scale contest, an indoor event held in Flemalle, Belgium, in which models from six countries took part. Included were representatives from Belgium, England, France, Germany, Japan, and the USA. A modeler from Holland was also on hand, but did not make official flights.

Duration times under the relatively low ceiling (8.5 meters, or less that 26 feet) were truly remarkable. For example, Jean Montaperto's Lacey managed 110 seconds and Mark Hinton's Santos-Dumont 14-biz canard also did 110 seconds. As Frugoli put it: "Against these flyers, the 50 second flights of Roger Aime (Folkerts) and myself (Hirondelle) only allowed us to sit down on the flap-seats!"

The contest was described as a particularly friendly one with good fun and fellowship the order of the day. Another contest of similar proportions is anticipated in the south of France, in honor of the late Jacques Pouliquen, probably near the end of autumn.

HOW MANY WAYS?

While on the subject of international participation, AIR MAIL is something that most of us take for granted. The words are almost universally recognized, however there are a large number of other terms used in various countries of the world. Second in acceptance after AIR MAIL would likely be the French PAR AVION, with the German MIT LUFTPOST not far behind. But what of these more obscure examples?: LOTNICZA, LOFTLEIDIS, PER LUCHTPOST, VIA AEREA, POS UDARA, PER LUGPOS, LENTOPOSTI, AER-PHOST, FLYGPOST, AVIONOM . . . well, you get the general idea. And we haven't given even a single example of those which fall outside our typesetting capability!

BIRDS OF A FEATHER

From the *Hangar Pilot*, voice of the Miami, Florida modelers, a news item that is causing ripples among archiologists, evolutionists, and paleontologists. Evidently some ancient fossils are being reexamined with more analytical eyes. In this instance, it is casts of the winged dinosaurs archaeopteryx, and specifically their feathers, which are asymmetrical in form. Flightless birds, it is pointed out, have symmetrical feathers, with equal areas fore and aft of a central "spar." Good fliers, by contrast, have feathers with spars disposed towards the leading edge of their feathers, which help to form a more efficient airfoil. Thus it is theorized that the archaeopteryx may very well have been capable of at least gliding flight. One paleontologist had previously advanced the rather curious notion that these wings were used only for capturing insects. Somehow we feel there are a few bugs in that logic.

CROSS-COUNTRY ULTRALIGHT

Jack Peterson recently completed a trip from Long Beach, California to Kill Devil Hill, North Carolina, in his 140 pound motorized hang glider. Averaging about 40 miles per hour, the craft covered about 300 miles per day, and

arrived appropriately near the historic site of the Wright brothers' 1903 flight.

BAKER'S DOZEN

Paul Garber, Historian Emeritus of the Smithsonian Air and Space Museum, recently spoke at the San Diego Aero-Space Museum. His subject was the most significant aircraft in aero history. In compiling the selection some years ago, Paul enlisted the help of a distinguished panel of aviation notables including Charles Lindbergh, Jimmy Doolittle, and Grover Loening. After a long drawn-out give-and-take discussion, the "jury" arrived at these choices:

1) Wright Flyer
2) Bleriot Channel crosser
3) Curtiss hydro-aeroplane
4) Junkers F-13
5) Verville racer
6) Spirit of St. Louis
7) Piper J-3 Cub
8) Douglas DC-3
9) Sikorsky helicopter
10) Bell X-1
11) D.H. Comet (jet airliner)
12) Boeing 707
13) Lockheed X-15

When asked if he would like to add a personal favorite, Garber unhesitatingly replied, "The Jenny I soloed in!"

Paul Garber was the individual who talked Lindbergh into presenting the Spirit of St. Louis to the Smithsonian, and he also supervised the unpacking of the Wright Flyer upon its return from England. We asked why the vertical tail assembly of this famous aircraft was a dark brownish color, whereas the remainder of the covering is a very light color. He replied that only the tailplanes have original fabric, the remainder having been replaced. Over the years the early material has altered in appearance to its present color. (Note that the Wright Flyer was restored before being shipped to England, having been severely damaged at Kitty Hawk, and subsequently by floods in Dayton, Ohio. Thus even the "original" fabric is a replacement, but was of the same type, and even sewed on the same sewing machine by the Wright crew. W.C.H.)

Paul Garber has long been a dedicated model builder. His continuing enthusiasm for the subject became instantly evident when he graciously autographed the Hangar copy of his classic 1928 book "Building and Flying Model Aircraft."

HOW'S THAT AGAIN?

England's C.G. Grey, probably the most controversial aviation magazine editor of all time, made this comment to Captain Frank T. Courtney, many years ago: "I don't have a very good memory, but I do have a good forgettery!" •

Cessna 310 . . . *Continued from page 17*

engines are on their side to keep the carburetors level with the fuel tanks. This also gets the mufflers under the model.

FUSELAGE

The fuselage sides and bulkheads lock together by means of the 1/8 x 1/4 strips of balsa attached to the bulkheads and the slots in the fuselage sides. The top and bottom of the fuselage is planked. The inside is given a coat of resin to keep the planking from sagging between the bulkheads. As the nose gear is installed at an angle, it must be installed before the upper and lower covering is added.

The tail assembly is installed before the lower covering is added, as the pushrods are inside the model. Make them right, as you will not see them again . . . one hopes. The windows are painted on to avoid reducing the strength of the fuselage.

RADIO

The radio must be installed as far forward as possible. A compartment for the batteries can be made above the retracted nose wheel. Should additional weight be required to get the C.G. correct, add it in the area in front of the nose wheel. The original had to have 4 oz. added. To do this, a square opening was cut under the nose, weight and foam added, and the cut out portion was glued back in place. A cover is made to go over the servos in the wing. This ensures that the leads, etc. from the servos in the fuselage do not jam the wing servos.

FLYING

The engines must be run until they are thoroughly reliable. To sync the engines, set up one at peak rpm, then back off a little on the needle valve. Start the second engine and adjust it until sync is reached. You will know it, as it is one sweet sound. Don't worry about sync at idle or low rpm. You may also note that your installation has a sympathetic vibration point or excessive vibration at one particular rpm. If so, stay off this speed and pass through it quickly. No problems have been encountered in flying this model. The tip tanks and small amount of washout provide the confidence necessary to make long low approaches during landings. Happy Landings. •

Cardinal . . . . . *Continued from page 23*

now illegal to change transmitter crystals on 72 mhz, something I wasn't aware of before.) The ability to change frequencies is a valuable asset if you run your models at crowded sites, and I've taken advantage of it many times with my Futaba systems. It's something to consider if you're in the market for a two-channel rig.

All of the two-channel Sport Series radios sell for $139.95, which is a hard price to beat. Since we've been using it for such a short time, it wouldn't be right to pour out all sorts of praise about high reliability and performance over a long period of time. Best bet is to ask the modelers in your area for their opinion. After all, the consumers are the best salesmen a manufacturer can have.

The motor in the Cessna Cardinal is powered by a six-cell rechargeable Ni-Cd battery pack, which is *not* included with the airplane. It will run you an extra $24.95, as will the charger, so instead of the $99.95 price quoted in the ad you are really looking at about $150 to get the airplane into the air. The charger is a nicely-made unit that has a clockwork timer with automatic current cut-off and LED to indicate that the batteries are indeed being charged. It can charge the motor batteries in 15 minutes from the 12-volt battery in your car, and has a special plug that fits into the lighter socket in your car's dashboard.

Right away I'm in trouble. My car, a '65 VW Bug, doesn't have one of these sockets, and even if it did, the car has a six-volt electrical system, so I wouldn't be able to use it anyway. Fortunately, there's a simple way to get around this. The lighter sockets are available in any auto parts store for a couple of bucks, and it's an easy job to put two wire leads on one (the center terminal is positive), then use alligator clips to connect the leads to a 12-volt motorcycle battery. It's simple to do and works every bit as well as charging from your car. I might add that when field charging the battery, you have to take the wing off and take the battery out of the fuselage every time you charge. This is a pain in the butt, to be sure, but is necessary to avoid overheating the battery during charging.

Flying the Cardinal is a cinch. A beginner couldn't ask for an airplane that is easier to fly and which still looks like an airplane. The balance point is at a rather far forward 20%, which makes for a very docile and predictable airplane that will not snap or spin. The nose wheel is not steerable, but the plane can easily be steered with the rudder after a roll of 15 or 20 feet. Takeoff roll is typically 40 to 60 feet, depending on the wind. The airplane has absolutely no bad handling characteristics and is quite stable. The only aerobatic maneuver we could get out of it was a loop, although Marty Barry at Kraft tells me that the Cardinal becomes quite aerobatic with the balance point moved back and the control throws stepped up, but don't try this until you are thoroughly familiar with how the stock airplane flies.

The flights are rather short, three to four minutes being the average. Four and a half minutes is about tops, and this is with no fooling around, just going for altitude and flying at minimum sink all the way down. The first flights are noticeably shorter, as it takes five to ten charges and discharges to get the Ni-Cds up to peak performance. The batteries are pretty well pooped out by the time you start your approach, so the landings are slow and easy and not at all "hot," as is the case with most electrics without motor control.

A nice safety feature of the Cardinal is that it comes equipped with a 15-amp fuse in the motor circuit. If you should get crossed up on the controls and run the airplane into the weeds on takeoff and manage to stall the prop, the fuse will blow and break the circuit. If the fuse wasn't there, the motor would most likely burn up before you could get to it to turn off the power.

If the Cardinal has a fault, it is in the battery cooling. Anyone who has flown electrics can tell you that good battery cooling is essential. The airplane has a sort of triangular hole in the bottom of the fuselage that lets air enter, cool the battery, and then is exhausted through another hole aft of the main landing gear. Air also comes in through the cowl, where it cools the motor, then travels through a hole in the firewall and goes down the fuselage to the batteries.

So far so good. The problem lies in the way the batteries are put together into a pack. There is a piece of brownish-red fiber insulation material at each end, and then the whole thing is totally encased in black heat-shrink plastic, making a completely sealed unit. What we end up with, then, is an airplane designed to let cooling air in, and a battery pack designed to keep cooling air out!!

Indeed, the stock battery does get quite hot during flight, so much so that I sometimes had to wait as much as 10 minutes for them to cool down to the point where I could put them on charge again, which of course takes another 15 minutes. That makes for a pretty long wait between flights. To cure this, I carefully cut away the plastic cover and removed the fiber end panels, and put a piece of tape around the pack at each end to hold everything together. This seemed to do the trick, as the battery is now much cooler (although still warm) at the end of each flight, and can be plugged onto the charger as soon as it is removed from the fuselage.

One big advantage of electric power becomes evident after every flying session: there's nothing to clean up! This is an especially nice feature if you have to make field repairs to the foam. A friend of mine recently pranged his 1/2A foam model on a landing approach, breaking out the nose gear and part of the bottom of the nose section. He was going to fix it right on the spot with 5-minute epoxy (the best glue for fixing foam, incidentally) until he saw that oil had gotten into the cracks and made a mess all over the broken parts. He had to take the airplane home for a thorough cleaning. Needless to say, this would never be a problem with an electric model.

I'll conclude by saying that the Kraft Cardinal is not for everyone. The flier who likes and flies high-powered R/C models would be bored stiff with it before the end of his first flight. But what this airplane lacks in dazzling performance is made up for by the fact that it's quiet, clean, and can be flown almost anywhere, which are some pretty strong points in its favor, especially in these days of dwindling flying sites. The Cardinal is now available in hobby shops, or you can get one directly from Kraft Systems, 450 W. California Ave., Vista, CA 92083. •

Gibberish . . . . *Continued from page 32*

drag and no lift, and the plane falls out of the sky like a wad of spaghetti. With any luck (read: "with enough altitude") the plane will drop nose-first, gradually gain airspeed at this new and much lower angle of attack, and eventually begin to generate sufficient lift to start flying again. Without luck it will smite the earth with a loud thump. Moral: *Do not stall too close to the earth. Keep the nose down and the airspeed up.*

TAIL MOMENT, NOSE MOMENT:

Technically, the word *moment* refers to a rotational force around a point or axis. But that is Physics, and here we speak only Sailplane, which is another

language, and simpler. When a Sailplaner says, "Your plane has a short nose moment," he simply means it has a short nose, like my cousin Wanda Mae in Hackensack. A short nose means it's going to be hard to balance . . . you'll probably have to add lead up front to get the required CG. A longer nose would give the weight of the batteries and radio more leverage (more *moment*, see?) about the CG, and then maybe the extra lead wouldn't be necessary. The stab works the same way: it needs a certain amount of leverage to keep the wing stabilized and flying at the proper angle of attack. If you shorten your "tail moment," you may have to increase the size of your stab to provide the needed leverage. As a rule of thumb, most sailplane noses are at least one wing chord in length. Most tail moments are around two chords, measured from the trailing edge of the wing to the leading edge of the stab.

TIP STALL:

This is a Very Bad Thing that happens to models and full-scale aircraft alike. Because of the poor efficiency of all wingtips (see "Tip Vortex"), a tip will usually stall long before the rest of the wing gets around to doing so. When a wingtip stalls, the effect is about like dropping a sack of fertilizer on it: it falls out of the sky instantly, dragging the rest of the plane with it. The pilot's report usually sounds something like this:

"I dunno what happened. It was just flying along normally, and next thing I know it done a quick snap-roll into the ground and bust itself all to hell and gone. I dunno what happened."

Tip stalls are more common among power planes than gliders, because power planes have heavier wing loadings. But even the lightest glider can have tip stall problems. Try pulling lots of up-elevator at the top of your launch. Does the plane stall straight, or does it always fall off to the same side? If it falls to one side consistently, chances are you have a tip-stall problem in that wing panel. Try twisting in a little washout (q.v.) until the plane stalls straight ahead . . . you'll have a more stable and predictable glider for your trouble.

TIP VORTEX:

For a wing to produce lift, it has to generate a low-pressure area above itself and a relatively high-pressure area below. All that separates these two pressure zones is the wing itself, and out at the tip the wing stops abruptly. So the high-pressure air underneath comes rolling around the end of the wing into the low-pressure zone on top, and this action generates a long, horizontal tornado of spinning air that trails out behind each wingtip as the model flies . . . a tip vortex. Tip vortices are responsible for a big chunk of the wing's *induced drag*, and that's why designers spend so much time and energy trying to find the perfect wingtip for their plane.

Reduce the tip vortex and you cut your "tip losses," making the wing not only cleaner and more efficient, but less prone to tip stalls as well. Turned-up wingtips, turned-down wingtips, flat plates on the wingtip, tapering tips to reduce chord, parabolic shapes, raked tips like WW-I Fokkers . . . everything has been tried. But the final wingtip, like the final, perfect airfoil, is yet to be found. It's a field wide open to experimenters.

WASHOUT:

Refers to negative twist in a model's wingtip. To keep tip stalls from happening, you sometimes have to twist, or warp, the last few inches of each wingtip into a more negative angle of attack than the rest of the wing. This may make the wingtip look, to the critical eye, more like a propeller blade than a lifting surface, but it can save you from vicious and unexpected snaprolls into the earth (see "Tip Stall"). Especially if you build heavy.

Some designers build in washout "aerodynamically," by fattening or blunting their tip airfoil slightly. As a rule, an airfoil with a blunter leading edge will be less prone to stall than a sharper airfoil. Therefore, blunting the tip usually prevents tip stalls. Fattening (thickening) the airfoil a couple of percent out toward the tip can have the same effect.

WING LOADING:

A measurement of a model's weight per unit of wing area. Sport gliders weigh anywhere from 4 ounces per square foot (too light) to 12 ounces per square foot (too heavy). Six to eight ounces per foot is average for most kits on the U.S. market today. European kits tend to run a bit heavier than U.S., because slope soaring is more popular over there.

Wing loading figures are useful for comparing gliders within a similar size range, but they can be deceptive if the planes vary too much in size. For example, a 500-square-inch plane may perform well at five ounces per square foot, but the same plane scaled up to 1500 square inches may need a wing loading of 12-14 ounces per square foot to perform as well. How come? The answer has to do with "scale effect," a catch-all term that refers to the fact that big wings fly "better" (more efficiently) than little ones. Five to eight ounces per square foot is a good figure for two-meter models; full-scale sailplanes seem to perform best at around 100 ounces per square foot. And there you have wing loading bracketed.

YAW:

An ignorant-sounding word that refers to the weather vane movements a fuselage makes while it's flying.

Picture a normal, healthy, middle-aged glider in smooth, straight, horizontal flight. Now turn the rudder a few degrees to the left. Watch how the nose swings left, just like a weather vane in a shifting wind. This is yaw. Yaw does not make an airplane turn. Dihedral does that . . . have you forgotten already? Go back and read "Dihedral" in last month's **R/C MB,** dummy. How do you ever expect to pass the final exam, anyway? I oughta flunk you right outa here! Why, I remember your older brother, he was so smart he coulda *taught* this class. . . •

Fuel Lines . . . . *Continued from page 21*

or fuel system. It is caused by a fault somewhere in the electrical system and is usually in the form of a mechanical failure such as a wire being loose or broken. Look for weak areas in some of the following:

A) Batteries loose in battery box. All points of contact should be soldered.

B) Defective switch.

C) All terminations of wires should be soldered or screwed.

D) Tungsten rivet may be loose in stationary or movable point. Should be repaired or replaced if found loose.

E) Loose wire *inside* ignition coil.

F) Defective condenser. Usually determined by very short spark.

G) Dirty or defective spark plug.

H) Dirty ignition points.

I) Weak batteries.

J) Spark plug gap too wide.

K) Ignition points too close together.

You can minimize your electrical problems by keeping all connections tight and clean. Incidentally, vibration is probably the main cause of broken wires and loose connections. Anchor down all electrical components, including strands of wire. Don't give anything a chance to rattle around. To minimize vibration be sure the motor mounts are sturdy and firm. All propellers should be balanced before using.

What size hook-up wire should you use to make an ignition system? Only two things to remember. First, never use solid wire; it's too prone to vibration failure. And when selecting stranded wire, choose a wire with as many strands per gauge as you can find. It will also be the most flexible. Second, never use a wire smaller than No. 20. This is to ensure against excessive voltage drop, and in turn, a below average spark. Remember, the longer the wire length, the heavier gauge it should be. Better too large than too small. Insulation thickness is not too important because of the low voltage, and you can get away with about as thin an insulation as is possible to purchase. Note: this does not pertain to the high tension lead, which should be well protected and kept away from all other wires and any grounded metal surfaces of the model.

"How many and what size batteries do I need?" Now here you have a great deal of leeway, and it depends completely on the type of model you are fitting up along with your own desires for performance. I have produced a suitable spark capable of running an ignition

engine from an ignition package that weighed a total of two ounces complete with coil, condenser, and battery. This would be ideal for a class A free flight model that would only be expected to put up four or five flights of thirty seconds each before running out of juice. If you want more engine duration in the air, increase the size of the battery or add additional batteries in a parallel hook-up. If you desire a hotter spark, add batteries in series, which will increase the voltage. Keep in mind that there is a limit that you can impose on your ignition coil, above which you could damage it by overheating, burnout, etc. For a simple ignition system that will keep you out of trouble, I recommend not exceeding 3.6 volts, which is the equivalent of three ni-cd cells in series. These can be of whatever size you desire, but don't mix batteries of different sizes. It is best to stick with one size, one brand, and the same age. If they need replacing, replace them all at the same time, and it is a good idea to write the purchase date right on the battery itself for future reference. I have never found that the polarity of the hook-up is of any importance in a conventional system, and whether the positive or negative is grounded to the motor is immaterial. However, if you are using external booster batteries to start the engine, make sure that they are hooked up to the engine with the same polarity as the internal system.

Batteries used in a transistorized ignition system (T.I.S.) for interference-free R/C operation are usually rechargeable ni-cds, and a quantity of three is the usual requirement. Regardless of size, the voltage is 1.2 volts per cell, however, the ampere hour rating of the cell is what determines how long you can fly before recharging; the larger the batteries, the longer the flight time. Batteries used in ignition-powered free flight models are usually of the smallest size that will keep the engine running steady, and sometimes they are so small that difficulty is experienced in starting by hand flipping. This is overcome by the temporary use of external booster batteries of the same voltage and hooked in parallel by use of alligator clips or plug and jack, and are disconnected after the engine is started.

More next issue. •

Power Boats . . *Continued from page 43*

after seven NAMBA District 8 races in 1979. Unfortunately, I wasn't one of the three, but the design did well.

Eric E. writes, "I am sixteen years old. I am trying to get started in R/C power boating. I was given an old string-controlled boat that is missing the motor. It is a fiberglass prop propelled boat. I was wondering if and how it can be converted to R/C. If it can, what system and motor would you recommend?"

Eric, I'm afraid I really can't give you much information based on what you've told me. How big is the boat? How big is the motor? Do you have a means of sealing the radio equipment? I *can* tell you that a two-channel radio is adequate to run model boats. Any of the radio manufacturers who advertise in **RCMB** are reputable. The cost for a two-channel can range from just under $100 to around $150. My suggestion is to consider purchasing a .21 size deep-vee like those offered by Dumas Boats, Steve Muck, or 3-D. It is a good size and type for a beginner.

Ed M., of Pleasantville, New Jersey, writes, "I would like to begin by saying what a terrific job you are doing in your column in **R/C Model Builder** magazine.

"This is my first summer with model boats. I have learned many things from your column in building my first boat, which is a Dumas Hotshot tunnel with a K&B Outboard.

"This winter I intend to build a .20 size Dumas Deep-Vee for my outboard. In your column, November 1978, there are two items that interest me, but I have a few questions.

1) Is the K&B .40 carb a marine or airplane carb?

2) Could you explain the barrel opening being reduced more thoroughly?

3) Do you replace the spray bar with a longer one?

"Finally, could you please tell me if the two items below can be purchased from a model marine supplier or straight from Hughey Boats?

1) Outboard adjustable mounts.

2) Left hand rudder mount."

Ed, I'm pleased that my articles have been of assistance to you. I couldn't locate a November '78 issue of **RCMB** to review what I'd said about the K&B .40 carb. However, I'll try to answer your questions anyway. The straight intake carb that comes on the K&B 6.5 and 7.5 engines is used for both marine and aircraft applications. Without any changes, the carb can be used on the K&B Outboard using the exhaust slide throttle for controlling the engine speed. Brass tubing can be inserted into the intake to reduce the amount of air. However, I've seen the 3.5 outboard run super with the 6.5/7.5 intake carb. Remember, in NAMBA that would not be considered stock. I use the spray bar that comes stock with the 6.5/7.5 intake carb. If your hobby dealer doesn't have a supply of the Hughey hardware you need, I'm sure Ed will be happy to have you order direct. His address is: P.O. Box 68328, Indianapolis, IN 46268. You can obtain one of his brochures by sending $.50.

Another Dumas Hotshot builder, Carl V., of Elmore, Alabama, wrote, "The 'Hustler,' a disguised Dumas Hotshot, was my pick for my first R/C model. It took me approximately two weeks to build my model. I was well pleased with the kit and simple assembly of the boat. She's powered by a K&B .21 with a stock prop. This combination of boat and engine is more than a handful on top end. The boat's chines and dorsal fin combined make handling a cinch. For the modeler who's interested, the tunnel hull and K&B .21 is all you need to get a taste of the thrilling and wild excitement a boat gives you."

Thanks, Carl, for the letter and also the two photos you sent. Your boat looks very nice. Unfortunately, the prints you sent were in color, and I'm not sure our editor will be able to use them. Black-and-white photos can be used much easier and I hope that more of our readers will send in photos of their boats.

My last bit of information for this month's column concerns the 1980 NAMBA Nationals. This event will be hosted by the Puget Sound Model Boat Club at Ft. Steilacoom Park near Tacoma, Washington. The dates are August 4 to 10. More information will be forthcoming in the NAMBA Propwash or can be obtained by writing to me. Seems like I get to be the director and I hope that many of you will be able to join us up here in early August. •

1 to 1 . . . . . *Continued from page 15*

some rules interpretations, will be ironed out for future events. It's refreshing to see groups testing new and uncharted ground in an effort to reach even more interested persons.

Winners included Ralph White of Fliteglas as the overall big winner and Best of Scale. Walt Wilson was second in Best of Scale and Wayne Menniger third. Don Allen's model, flown by Mark Been, had the best race time, and Walt Wilson took the Best Finish award.

A CLOSING THOUGHT

A recent conversation with friend Monty Groves in California prompted a little thought on my part, followed by a little investigation. (Please remember the key word "little," since this is not to be treated as any in-depth study on my part.) Monty and wife Patty have been very much interested in the color aspects of presentations and have invested in a most expensive color identification system utilized by museums in an effort to lock in the understanding and communication of colors. In addition, Monty has checked into standardizing procedures for chips, etc.

All of us recognize the frustration and anguish at all levels of documentation, building, and competition associated with that little old section entitled "Color, finish, and markings." In addition to the flat-out problem of duplicating hues, tints, shades, etc., Monty posed another interesting and provocative thought. What do we do with the significant number of the male population who lack proper color discrimination capabilities? The reference here is not only to those who are so-called "color blind," but those who can "see" color but are unable to adequately discriminate various shades or tints. They may see a "red," but not nearly the same red you and I do.

In an effort to gain more expert advice, I called a doctor friend and posed the concept to him. While his answers were not to be considered as any in-depth study either, they only amplify the basic feeling of frustration. Without stating numbers, he felt that it seems safe to assume that a fairly signifi-

cant number of males have some color discrimination problem ranging from the state commonly referred to as "color blind" to a little problem, especially with reds.

Most persons who are color blind suffer from a condition called "dichromatic vision" and tend to confuse reds with greens and some reds or greens with yellows. In general, they have a fairly wide range of yellows and blues.

The true (complete) color blind are said to have "achromatic vision" and see the world in shades of white, gray, and black. This type tends to be rare, however, the condition referred to earlier as dichromatic occurs in more than 4 out of every hundred.

In addition, we have tended to compound our color discrimination with a number of man-made problems. The obvious problem comes when viewing the model under artificial light which drastically varies with the type of lighting system. Perhaps some of you can recall the effect of the lights under which models were judged in Dayton in 1976. The beautiful Chipmunk yellow of Bob Nelitz's model became an unreal shade of something that's hard to describe.

A second factor along this line is the more frequent use of photo gray or photo sunglasses. When used under indoor conditions, mine tend to be more neutral than outdoor when the lenses darken.

It seems logical at first to assume that a person would see the same color, even if somewhat incorrectly, in both the model he is viewing and the picture he is comparing it with. If that were the case, no problem exists, since he perceives the same color internally, just as the next person. However, that would appear not to be the case, since the photo or printing used may appear quite different than the live color being viewed on the model. This can be due in part to several things such as the materials involved (ink versus paint, paper versus wood), viewing angles, etc.

My thoughts here, prompted by Monty's, are not given to cloud the issue but, hopefully, to stimulate some considerations in our procedures. Heaven knows, we don't have to make Scale any more frustrating, but if we take some of our possible natural limitations into consideration, we may well improve our enjoyment through the educative process.

There are those who have voiced an opinion that perhaps color presentation needs to be de-emphasized to some degree. Others have steadfastly maintained that it should not be. I wonder if some more exacting research could be done to determine whether indeed we do have a real problem? Can you see the next rules cycle when someone submits a proposal to require all static judges to undergo a color discrimination vision test? Anybody for a Hardy-Rand-Rittler or Ishihara test?

Do you have any information, research, or plain old thoughts on the subject? •

Plug Sparks . . . *Continued from page 37*

These will be issued to all currently active SAM chapters and to all new chapters being formed.

SCAMPS "SILENTS PLEASE"

It has been a long time since we have had a genuine contest report from Gene Wallock of the SCAMPS, but he was so enthused over the turnout of would-be rubber fliers, he simply had to drop this columnist a line.

In California (and other places, I daresay), all rubber contests generally draw only the old diehards who regard

gas power as heresy. However, for just plain out-and-out fun, this new "Commercial" event as dreamed up by the SCAMPS drew 22 entries!

Well knowing the wind conditions after 11 a.m. at Mile Square, Wallock established two-minute flight maximums despite the screams of those who claimed their models could do three minutes all day. You guessed it, no one maxed across the board despite absolutely gorgeous weather.

Bill Crovella's fiance, Aggie Smith, made the boys sit up and take notice with a beautifully built Hi-Climber. Except for some bad luck, she might have placed higher than sixth! Bill better marry her and get Aggie off the flying field!

The all-rubber contest also featured the Twin Pusher event, which is gradually gaining popularity. Hal Cover outlasted Ernie Wrisley and Randy Wrisley, but regardless, it was quite a show watching those twin pushers seemingly climb effortlessly into the blue.

The SCIF (Southern Calif. Ignition Fliers) club was ably represented by Ken Sykora, who showed how careful trimming and patience gave rewarding flights out of his Sturdi-Built "Corrigan's Robin" (a Curtiss Robin in reality). This enabled Ken to ace out Al Heinrich with a Stahl Stinson O-49. Abe Gallas invented his own version of the Megow Motor Hum Device (remember that for fellows who liked their models to sound like real airplanes?) by the simple method of leaving the pins holding the nose block, fully extended. A new way to customize your prop! The hilarious part of it all was that his next two flights were of lower duration with the offending pins removed. Haw!

If anyone sees a Taylorcraft O-57 in the area surrounding Mile Square, Hal Cover wants it back. He was simply taking a test flight when it disappeared to the east at about 500 feet.

We haven't published results of a rubber contest in a long time, so here goes:

SCALE	
1) Ken Sykora (Corrigan Robin)	3:56
2) Al Heinrich (Stinson O-49)	3:46
3) Abe Gallas (Interstate Cadet)	3:45
TWIN PUSHER	
1) Hal Cover	5:20
2) Warren Williams (1937 Original)	4:24
3) Ernie Wrisley (1934 Zaic)	4:00
COMMERCIAL RUBBER	
1) Wade Wiley (Chilvers Record)	5:54
2) Bill Crovella (One and a Half)	5:45
3) Cliff McBain (Light Ranger)	5:32

Gene Wallock is to be commended on promoting such a good contest. With the tremendous emphasis on gas models and radio control nowadays, it is a refreshing change to report a very successful rubber meet. This may be the answer to those who complain that they can't fly in a metropolitan area. Try rubber power with short fuses!

M.A.N. POSTAL MEET

Just received a letter from Dave Linstrum of M.A.N.'s "VTO" column, and he complains that no one entered his announced postal meet. Truly a shame, as the SCAMPS Twin Pusher event could have been used for this portion of the postal meet. The trouble, apparently, is that there are just too many good contests in California without resorting to postal meets. Sorry, we'll do better next time!

NOFFA ANNUAL

Ted Katsanis writes to let us know that the Northern Ohio Free Flight Association held its annual on August 19 at Plum Brook Station, Sandusky, Ohio.

Among the firsts for that area was the inclusion of O.T. radio control. Eleven people registered official flights. As Ted sez, it wasn't the greatest, but the event is a distinct possibility for Old Timer events.

The use of Plum Brook Station (Lewis Research Station), although a real boon for free flighters, requires that all contestants pre-register one week ahead of time. This means that whether you are sure of going or not, you had better get your name on the list. They won't let you past the guard gate otherwise. Actually, a very small price to pay for the use of this good field.

Inasmuch as an R/C event was being staged for the first time, there were two contest directors, Karl Emde for free flight and Ted Katsanis for R/C. This turned out to be just what the doctor ordered.

In the free flight events, all lost models were finally located by Warren Weisenbach using a Pietenpol Air Camper (now there is a slow and lazy flier!). He has painted the airplane with the same color scheme as his model. Results looked something like this:

.020 REPLICA

1) John Peck	257
2) Merl Shammo	239
3) Rudy Kluiber	236

CLASS A

1) Merl Shammo	270
2) Rudy Kluiber	266
3) Tad Jones	223

CLASS B

1) Merl Shammo	266
2) Rudy Kluiber	249
3) Warren Weisenbach	205

CLASS C

1) Rudy Kluiber	191
2) Clifford McMillan	191
3) John Peck	141

R/C (all classes)

1) Ted Katsanis	780
2) Dick Sturgis	745
3) Joe Elgin	702

Interesting to note that the winner of Class C was determined by a flip of the coin, as Cliff said he was too tired to chase. Tough luck boy of the meet was Jim Robinson, taking three fourths and one fifth place (all out of the money!).

On the other side of the coin, all places in the radio control event were taken by Playboys. That Tyro Playboy kit is a tough one to beat!

To wrap things up, Rudy Kluiber was awarded the Bob Reuter Memorial Trophy for being the High Point Winner. Hope this trophy survives for a long time, as Bob Reuter was one of those great guys well worth remembering.

JIMMY DEAN LEAVES

Jimmy Dean, the perennial newsletter editor of "Hot Leads," the SCAMPS publication, is moving to Oregon. Rather than let their editor get away, the members have arranged to have the duplicating machine moved with Jim. The strange part of it all is that Dean has agreed to be their long distance editor. Hope he is able to continue. We wouldn't want to miss that caustic wit of his.

FLORIDA FLASHES:

Terry Rimert writes to say that a real neat contest was had by one and all. Terry staged a precision event that allowed one point for every second of flight time. The target was 100 points, with any flight over 100 seconds being deducted at the rate of one point per second.

Most of the fellows used short motor runs, as evidenced by the winner, Al Wright, with 8, 10, and 10 seconds, giving flights of 79, 96, and 94. Runner-ups were Van Thaxton and John Hemphill.

With 20 contestants and 52 event entries, Ron Sharpton won the District 5 Championships. His .020 FOO 2-U-2 model is extremely popular in Florida. This design, published by **Model Builder,** has been winning steadily. In an effort to outfox the opposition, Ron has built a slightly larger version which appears to outfly the rest of the competition. Terry will ruefully vouch for the performance of these models, as he is still looking for his. Try one!

INDIANA "INFORMER"

According to Harry Murphy, newsletter editor of the "C.I.A. Informer," the C.I.A.'s annual Old Timer Meet at Wright-Patterson AFB came off without a hitch. This, despite fears of the gas "crunch" and the sudden overlapping of dates by the Chicago Aeronuts Spring O.T. Meet. Murf reports the meet drew only six less than last year!

The guys who make contests possible came in for their share of kudos, as Harry pointed to Gil Robbins, Joe Rambaud, and Dick Smith as great volunteer timers. Of course, Joe Guylas had to be thanked for a tent that didn't blow down like last year. Also, Bob Larsh scored points by donating an O&R .23 for a fund-raising raffle. Last, but no less credit was given to Meredith "Goofy" Chamberlain for being Contest Director. The big thanks to COFFC, as they were the principals who obtained the use of Wright-Patterson AFB.

Flying results looked pretty much as in the past. (Seems like the names just shuffle around in the event.) Event winners were Wayne Cain in Class A, Bill Hale for Class B, Bruno Markiewicz in Class C with the only perfect score. Jim Robinson topped 20 entries to win .020 Replica, while Frank Heeb still proved he is the man to beat in Rubber. The O.T. Hand Launched Glider event, being promoted by Bob Larsh, was won by Larry Willis.

We had to look hard to find out who won the Beauty event; who else but our modest C.I.A. editor, Harry Samuel Murphy! The most coveted prize, the Ohlsson .23, was won by Richard Brace amid the disappointed faces of collectors and would-be users.

Some bad crackups in the early wind (which died gradually during the day) were noted, among the more spectacular being Warren Weisenbach's Playboy, which looped following a max flight. Then a shower of two-inch-long balsa sticks greeted spectators when Dick Smith powdered his Spitfire powered Powerhouse in the hard, hard concrete.

At the end of the contest, Bob Placier was seen to put up beautiful flights with his Gladiator. Unfortunately, as the wind died, so did the thermals. Ain't it always that way?

OHLSSON 23 CONTEST

We wrote this one up before, but no one seemed to pay any attention to the fact that the Southern California Antique Model Plane Society (SCAMPS) has been staging such a meet for the last three years. This event must be pretty good, otherwise it would have died for lack of participation.

The only problem with staging a "one-shot" contest such as the Ohlsson .23 event is that it is only staged once a year. Not too many modelers care to build a special model, as time always seems to be short to keep your regular models in shape. Regardless, this columnist would like to see this event picked up by other clubs in the hopes that it will expand and provide even more fun than presently enjoyed.

This year's meet was finally won by someone other than Gene Wallock, although it must be admitted Joe Maher only edged Gene by 21 seconds. Joe had to use a So-Long in order to top Gene's So-Long. Just goes to prove the old saying, "If you can't beat 'em, join 'em"! Incidentally, Joe finally retired the Cameron .23 prize so kindly put up by Bill Daniels. Another one, Bill?

THE WRAPUP

Whenever you think *you* have it bad, read what Neil Stewart of Karratha, West Australia, has to say.

"Here in the wilds of northwestern Australia, about 1000 miles from anyone of any note, we have ideal flying conditions with wide open spaces, plus a hot although somewhat windy climate. The country is pretty rugged, but there are few places which remain inaccessible to a trail bike for retrieval of wayward models. While a lot of potential exists for the formation of a flying club, the few dedicated modelers in the area are a pretty individualistic lot who want only to build and fly without the hassles of having a mob of kids around. Most of us are middle-aged engineers of various sorts with one or another of the several iron ore mining companies operating up here. Having brought up our families, we now seek a little quiet relaxation for ourselves on Sunday . . . the one day a week we can call our own."

This columnist says modelers in the USA who complain don't know how lucky they are. I am reminded of the story of the fellow who was complaining about his shoes until he saw a man with no feet. Remember, fellows, the name of the game is *FUN!* •

Letters . . . . . *Continued from page 7*

staff's efforts, I never missed one issue. It was also the first mail to arrive at our new home with the correct address. If you have some special way of doing things like that, I'll be happy to send you a list (a long list) of companies who have yet to get my address right.

I also want to let you know how much I enjoy

R/C MB. *I read every issue from cover to cover. During my reading I have often encountered a reference to some books available through* R/C MB, *but I've never found any list of what is available and at what price. If you have such a list available, please point one in my direction ASAP. I've been attempting to be a model builder for a long time and can use any help I can get. Your articles are VERY helpful, but I can't stand letting a problem sit for months waiting for* R/C MB *to discuss it.*

One last comment. I agree with your answer to Steve Helmick (Free Flight vs. R/C) 1,000,000,000,000%. I like Scale free flight and especially Peanuts, but I see nothing wrong with someone else enjoying R/C or Control Line or what have you. This sure would be a dull world if everyone liked and did the same thing. Could you picture walking into a hobby shop that had nothing but Comet P-40 kits with a 20-inch span? How could you possibly kill an hour there while your wife was buying shoes?

Donald Punke
Marion, Ohio

•

Counter . . . . . *Continued from page 9*

for Quadras and other large 2-cycle gasoline engines. Wingspan is 93-1/4 inches, length is 66 inches. The Turkey features all-wood construction, with 1/8 mahogany ply wing ribs and forward fuselage sides, 1/2 in. sq. main wing spars and rear fuselage members, a 1/2-inch ply firewall, and built-up tail surfaces. Flying weight is 18 to 22 lbs. A 1/4-inch diameter landing gear is supplied to carry all that weight. (Hey! This would be a good place for those new Du-Bro wheel collars described earlier.) The single I-beam wing struts are functional, which means that the wing is probably made to come apart in the center (or plugs into the fuselage sides, the press release didn't say).

The Mammoth Turkey kit is now available for $84.50 through retail outlets or direct from J-5 Enterprises, P.O. Box 82, Belmont, Ontario, Canada N0L 1B0.

* * *

This issue ought to be hitting the stands about three weeks before Christmas. It's cutting it close, and you've probably done most of your holiday shopping, but there might still be time for your wife or girlfriend to get you one of the really neat Model Pilot wings or tie-tacks being offered by Nico Engraving Co. They make great gifts and are available in R/C, Free Flight, and Control Line versions to suit your field of interest. We might also suggest that these would make great club awards also.

Russell Nitsch, President of Nico Engraving, sent us some samples that really made us sit up and take notice. The wings are made of nickel-silver with hard fired Cloisonne (a type of enamel) multi-colored center shields. The wings are 2-7/8 inches across and feature extremely good detail on the feathers. Matching tie-tacks using only the colored center shield are also available.

What the heck, even if you can't get them in time for Christmas, you can be sure that either of these items will be greatly appreciated at any time. The wings sell for $6.95, and the tie-tacks go for $3.50. To either of these, add 50¢ for postage and handling. When you see them you will agree that they are indeed worth the money . . . if anything, the price should be higher! When ordering, be sure to specify your choice of R/C, F/F, or C/L. The wings and tie-tacks are available from Nico Engraving Co., 2800 Briggs Rd., Columbus, OH 43204.

* * *

One-twelfth scale R/C car racers who are looking for a big jump in performance with a minimum of fooling around ought to check out the new Super-Dif' differential being offered by Leisure Electronics. This little goodie is deceptively simple in operation and comes completely assembled, ready to mount rubber and run. In addition, three different spur gears (46, 48, and 50 tooth) are supplied so that you can change gear ratios for top performance on any track.

Most of the major parts (the wheel, spur gear, and ball retainer) are molded from nylon, and the hub is machined from aluminum. Having played around with one of these things, we have a suggestion to make: whenever assembling or disassembling the unit, do it over a large pan or bucket. The reason for this is that as soon as you remove the nut and start to take the unit apart, the little ball bearings fall out and roll all over the place. As anyone can tell you,

eight ball bearings dropped on the floor will roll in eight different directions, and the chances are mightly slim that you'll get 'em all back. At any rate, it's nice to know that if you do manage to lose any of the parts, replacements are readily available from Leisure at a nominal cost.

The Super-Dif' fits all 1/12-scale cars and was used by the winners of both Team Leisure and Team Associated at the 1979 ROAR Nationals, so you know it's got to be a good one. Retail price is $19.95. See your dealer or order direct from Leisure Electronics, 11 Deerspring, Irvine, CA 92714.

* * *

Modelers' wives who are having a devil of a time trying to figure out what to get for their husbands for Christmas would do well to check out the new belt/disc sander from Dremel. This long-needed item is the only one of its kind that we know of and can be used for all sorts of sanding, grinding, sharpening, and polishing operations. It's our bet that this machine will quickly become one of the most-used pieces of equipment in any modeler's workshop.

The sander measures 15 inches high by 10 inches wide by 11 inches deep. A single electric motor drives both the 1-inch-wide sanding belt and 5-inch aluminum sanding disc (no floppy rubber disc used here, which is completely useless for any sort of precision work). The 6x3-inch work table for the belt sander is fixed, while the table for the disc can be tilted up to 45° for jobs such as sanding the ends of wing spars to the proper dihedral angle, and also features an adjustable miter gauge. In addition, the machine comes with a removable platen which provides a rigid sanding surface behind the belt . . . just the thing for sanding a stack of bandsawed ribs, etc.

The Dremel Model 730 Disc/Belt Sander sells for $89.95 . . . seems kind of high at first, but don't forget, this is an extremely useful tool and will last for years. Replacement belts and adhesive-backed sandpaper discs are also available. See your hobby dealer, or write to Dremel, 4915 Twenty First St., Racine, WI 53406.

* * *

From Vortac Mfg. comes word that its simulated exploding bombs are now available in a bright orange color, in addition to the usual chromate green. The orange bombs are a lot easier to see and find in the grass and add an extra touch of fun and realism to just about any model. They are molded from high-impact polyethelene and are said to be almost indestructible. They measure 5-7/8 inches long and 1-1/2 inches in diameter, and weigh one ounce. The insides can be packed with flour, chalk, or charcoal ash to simulate an explosion on impact. Vortac says that the bombs are so popular that the price of the single-pack bombs, both colors, is being lowered (in this day and age?!) by one buck, to $4.98! A package of two still goes for the regular price of $9.98. The bombs and their release mechanisms should be in your favorite hobby shop; if not you can get them from Vortac Mfg., P.O. Box 469, Oak Lawn, IL 60453. •

R/C World . . . *Continued from page 13*

everyone present had concluded . . . Wolfgang Matt was again World Champion, having won in Switzerland, 1975, then losing to Hanno Prettner in Springfield, Ohio, 1977.

THE JUDGING

Judging at any major contest is always the subject of long and heated discussions, and by its very nature, becomes branded as the personal, biased endorsement or condemnation of a lot of contestants by a few officials.

A thorough analysis of the system as established by the FAI, with recommendations that sometimes border on becoming frantic pleas, is being prepared by this writer, who was Chief Judge in South Africa. There is simply not enough space here to go into the matter completely. However, because of what happened in South Africa, we are compelled to adopt our best Howard Coselian manner and "tell it like it is."

Had there not been national prejudice on the part of at least one judge in the flyoff, Dave Brown could have been the 1979 World Champion.

Throughout the four rounds of qualifying, it was noted that two European judges definitely "went up" when a contestant from their country flew for them. Ordinarily, to avoid shifting consistency in the middle of a contest, officials do not "tamper" with the judges once things are underway. However, because of the importance of the World Championships, it was agreed by the jury that the Chief Judge should caution these two judges about their inconsistency before Round One was completed, when such a change would be less serious than the consequences of allowing it to continue. By the way, the nationalistic tendency of these two judges was already known to the FAI, but because of last minute cancellations by other judging appointees, these two were invited to South Africa.

Following our cautionary discussion with the two judges, the prejudiced scoring declined, though not completely. Then came the finals. . . One of the two judges continued to hold the line, even though one of his countrymen was in the finals. However, the other judge went beserk. In the face of 8's and 9's for Dave's landing in Round Two of the finals, this judge gave him a 6. In Matt's flight, the same judge was consistently 1 or 2 points higher per maneuver than all

INDEX TO ADVERTISERS

of the others. Though still "telling it like it is," we hardly need to mention what country this judge was from.

On another point; no matter how judges are split up, one group will be the high or "easy" judges, and another will be the low or "tough" judges. Several factors can bring this about. Luck of the draw has a lot to do with it. However, if consistency and equal exposure is maintained, it's no problem. As mentioned earlier, exposure was not equal in S.A.

Pilots commented also that the wind-driven air was considerably bumpier at Circle 2, where lower scores persisted. There were rows of trees more or less perpendicular to the wind direction and several hundred yards upwind. Turbulence from these tree rows undoubtedly stirred up the smooth flow. Circle 1 did not have this situation.

Quite frequently before and during the contest, there was comment on the idea of lining up the judges, one behind the other, on the centerline of the landing circle. In theory, this might be better than the present method, but in practice, it has many disadvantages. It was not used in S.A., and we'd rather discuss it another time, when we can give it full attention.

SUMMARY

It is very frustrating to try to write a story about an affair such as this R/C Aerobatic World Championships. As we attempt to bring it to a conclusion, hundreds of incidents and anecdotes that have not been mentioned flash across our mind; new acquaintances we'd like to have mentioned, the funniest joke we've heard in years (about chocolate ice cream), the jeweler who trusted us with a book manuscript, the long discussions about aeromodelling, the delightful but sometimes confusing South African English accent, the fresh carrots on a dirt road, the lengthy and spirited debates with FAI R/C Subcommittee Chairman Chris Olsen, saying, "Do you speak English?" to an Austrian stranger in Vienna and finding out he spent four years in Amarillo, Texas, and so on and so on.

Attending and/or officiating at a World Championships is far more than merely going to a contest. Even though we've been to others, each one continues to be a special chapter in our lifetime that we enjoy reading over and over. •

Workbench . . . *Continued from page 6*

has done its usual job of screwing up facts and exaggerating the racial situation. "Whites Only" signs have all but disappeared. Nearly everyone is working. Prices are very reasonable . . . Our Holiday Inn room was above average and $27 per day for two. Chateaubriand for two is $15 with all the fixings. They

CLASSIFIED ADS

Non-commercial (personal items) Rate is 25 cents per word with a minimum of $3.00 Commercial Rate is 40 cents per word, with a minimum of $5.00 No mail-order discount house ads knowingly accepted No advertising agency discounts allowed
All ads are payable with order, and may be for any consecutive insertion period specified Name and address free, phone number counts as two words Send ad and payment to MODEL BUILDER Magazine, Classified Ads, 621 West 19th St., Costa Mesa, CA 92627

MATTEL VAC-U-FORMS. S.A.S.E. for sale list. O. Bibbs, 53 Tompkins St., Kingston, NY 12401.

REMARKABLE NEW BOOKLET: Basic Aerodynamics and Airfoil History by Jule Neville Dews, 7703 Baltimore National Pike, Frederick, MD 21701. $2.50 postpaid.

GLASS CLOTH: 0.6 oz., finest woven quality 38" wide, continuous length 5 yds. $13.95. 10 yds. $24.95. Dan Parsons, 11809 Fulmer N.E., Albuquerque, NM 87111.

WANTED: Old model airplane engines, gas model race cars, kits, magazines, parts, related items, 1935-55. Arthur Suhr, W218 N5866 Maclynn Court, Menomonee Falls, WI 53051.

HOBBY SWAP MEET — M.E.C.A. COLLECTOGETHER. Got lots of hobby things you don't need? Want to buy engines, kits, etc. cheap? Come to the M.E.C.A. collectogether — swap-sell-buy. Sat., Dec. 29, 1979. Mercury S&L, 4100 Long Beach Blvd., Long Beach, CA. 9 a.m.-1 p.m. Info: (714) 826-0589 eves.

FOR SALE: Original vintage model airplane plans. Cleveland (Dwarfs), Megow, Whitman, Comet, Peerless, and other misc. Send 50¢ for large list. Donald Kirkpatrick, 1922 Ethran Way #31, Sacramento, CA 95825.

MODEL ENGINES parts, castings, props, accessories, stick and tissue gas/rubber kits. List 25¢. T. Crouss, 100 Smyrna, West Springfield, MA 01089.

drive on the left side of the road (when sober), but you can get used to this, however, those right turns from the left lane were still kinda scary, even after 10 days of practice!

Europe is expensive! London is pricing itself right out of the tourist business. Our room in a cheapy hotel was $45 and there was only room for one-way traffic past the foot of the bed! The Continental breakfast consisted of a roll with which you could drive nails and dirty water identified as coffee. A beautiful room in the very nice Sheraton Skyline, near London Airport, Heathrow, was $100 per day, as was the Europapark in Vienna. But each time we kinda felt like we were getting our money's worth.

Fear not, Europe has an endless supply of 400 Wet-or-Dry. They call it toilet paper! Over here, the advertising word is "Absorb." Over there, it has to be "Scrape"!

Getting back to the "Passports Please," we must be the picture of innocence. Not once was our baggage inspected. Only twice were we asked about the value of merchandise we might be carrying. However, every security check insisted on running our film through the X-ray machine. We purchased a lead-lined film bag before leaving the States, but were warned that some X-ray machines could even penetrate that. Only once were we absolutely refused the courtesy of hand inspection of the film bag. At another, the inspector kept the writer waiting until all other passengers had been checked, and then checked each roll, even opening the sealed boxes of unused film! Through all of this, and without even thinking about it, we carried in our shoulder bag about half-a-dozen Uber Skiver knives, complete with No. 11 blades, in the clear plastic tubes. Why these never showed up on the X-ray is beyond us.

Our most frustrating experience was in trying to visit Hanno Prettner. When we heard about the unfortunate accident that prevented his flying in South Africa, we decided to honor his repeated wishes in the past that we visit him and his parents in his home town of Klagenfurt, Austria.

We had signed for a "triangle" detour to London, but we were unable to change our Apex tickets and divert to Frankfurt (from where we could fly to Klagenfurt). From London we were able to catch a plane to Vienna, and from there we would go by train to Klagenfurt. We telephoned and talked to Hanno's father, Hans, explaining our plane and train schedule.

Following two days of exceptionally delightful visits with Henry J. Nicholls, Ron Moulton, and the MAP offices of *Aeromodeller* and *RCM&E* magazines, we boarded a British Airways flight to Vienna. Arriving a couple of hours later, we breezed through Vienna customs and jumped into a diesel Mercedes taxi to the Sudbanhof (railway station for trains going south) and were soon taking a relaxed 4-1/2-hour train ride through the beautiful mountains and valleys of Austria.

When we arrived in Klagenfurt, there was no one to meet us... When we took

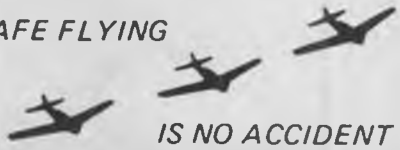
STATEMENT OF OWNERSHIP
MANAGEMENT AND CIRCULATION
(Act of August 12, 1970: Section 3685, Title 39, United States Code)

1. Date of Filing: September 27, 1979.
2. Title of Publication: R/C MODEL BUILDER MAGAZINE.
3. Frequency of issue: Monthly.
4. Location of known office of publication (street, city, county, state, zip code): 621 West 19th Street, Costa Mesa, Orange County, CA 92627.
5. Location of the headquarters or general business offices of the publishers (not printers): 621 West 19th Street, Costa Mesa, CA 92627.
6. Name and addresses of Publisher, Editor, and Managing Editor:
Publisher: Walter L. Schroder, 621 West 19th Street, Costa Mesa, CA 92627.
Editor: W.C. Northrop, Jr., 621 West 19th Street, Costa Mesa, CA 92627.
Managing Editor: NONE.
7. Owner: RCMB Inc., Wm. C. Northrop, Jr., President; Anita Northrop, Treasurer, 621 West 19th Street, Costa Mesa, CA 92627.
8. Known bondholders, mortgagees and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages or other securities: NONE.
11. Extent and Nature of Circulation

		Average no copies each issue during preceding 12 months	Actual no copies of single issue published nearest to filing date
A	Total No. Copies Printed (Net Press Run)	57,817	65,793
B	Paid Circulation		
	1. Sales thru Dealers and Carriers, Street Vendors and Counter Sales	39,025	45,275
	2. Mail Subscriptions	15,180	16,120
C	Total Paid Circulation	54,203	61,395
D	Free Distribution by Mail, Carrier or other means Samples, Complimentary and Other Free Copies	1,310	1,385
E	Total Distribution (Sum of C and D)	55,513	62,780
F	Copies not distributed		
	1. Office use, left over, unaccounted, spoiled after printing	635	650
	2. Returns from News Agents	1,669	2,363
G	Total (Sum of E and F — should equal net press run shown in A)	57,817	65,793

I certify that the statements made by the above are correct and complete. Walter L. Schroder, Publisher

SAFE FLYING



IS NO ACCIDENT

a taxi to the small inn owned and operated by the Prettners, there was no one to meet us . . . Ever hear about the kid who came home from school one day to find his parents had moved out without telling him? We managed to find a room at a hotel, and on the following day, went to the airport to see about changing our air tickets for an earlier return . . . At last! We learned at the airport that Hanno had been trying to contact us from Vienna!

We left word about our hotel reservation in Vienna and got back on the train. That evening we finally talked to Hanno. He and his family in one car, and Joe and Jean Bridi with daughter Ann Marie (who were also visiting the Prettners), in another car, had driven to Vienna to meet us. British Airways informed them that we were *not* on the flight that we were on, and which we had told the Prettners about (nuts to B.A.!). They had made reservations for us in a hotel in Vienna where we would all get together for the evening and then drive to Klagenfurt on the next day!

Hanno, phoning from Klagenfurt, insisted on having breakfast with us the following morning in Vienna, and rode that same train during the night to be with us for several hours the following day. A tough mess-up of circumstances for all of us!

To sum up, overseas travel is a great experience. We met very many fascinating people, ran across Americans most everywhere, made some interesting new friends. But, as most everyone will tell you at the end of a trip outside of the United States, it's great to be back and it's still the best damn country on this planet Earth!

SNEAKY MOONEY

Our resident Peanut Perpetrator, Walt Mooney, put one over on us in the October issue. The Polish Lublin R-XII in that issue was designed around the experimental "Miami Peanut" rules, which calls for a 9-inch fuselage length limitation, rather than a 13-inch wingspan limitation. The wingspan of the Lublin Peanut thus turns out to be 14 inches.

You could say that Walt pulled a Polish joked on us! •

BYRON ORIGINALS

A product of Midwest Industries, Inc. Ida Grove, Iowa. 51445 Ph. 712-364-3165

Quick-Build Exact Scale

Less than one year ago, Byron Originals introduced its Pitts Special with optional Byro-Drive reduction unit. We made some pretty strong product claims and were more than ready to back them up. We have since learned, from actual applications by customers both in this country and overseas, that the Pitts and drive unit have far exceeded our own ratings. Whether it be packaging, overall parts fit, ease of assembly, fidelity to scale, flight performance, materials quality, overall appeal or completeness, these firsts from Byron Originals have firmly established a new standard of excellence for the entire modeling industry.

No one will agree more than the proud and satisified Pitts and Byro-Drive owner. He'll be the first to recommend a Byron Originals kit for your next project. And you can count on him giving you a long list of reasons why.

We suggest you take his advice and look to Byron Originals for the newest and most intriguing concepts in recent modeling history. You'll agree it's like a breath of fresh air.

$98.50

Factory Direct Price

Prop. & Spinner Inc.

The Proven Pitts with Byro Drive

Order Byro-Drive model number for matching engine.

Model No.	for Engine
MFR-10-	.60 & .65 O.S. Max, frt. & r. valve
RR-11-	.61 & .65 Rossi, rear valve
RF-12-	.61 & .65 Rossi, front valve
WFR-14-	.61 speed Webra, frt. & r. valve
TFR-13-	X.60 Supertigre, frt. valve, r. exhaust
KF-15-	.61 Kraft
HPFR-16-	Silver Star or Gold Cup, frt. & r. valve
OPSR-17-	OPS .60 Speed, rear valve

$212.95

Factory Direct Price

'78-'79 SCALE KIT OF THE YEAR

Wing Span: 68"
Wing Area: 1400 sq. in.
Length: 62"

Weight: ready-to-fly, less fuel,
★ Under 15 lbs. with Econokote finish.
★ Under 17 lbs. with Epoxy/Fiberglass finish.

master charge THE INTERBANK CARD

VISA®

Send me
_____ Pitts Kit(s) at $212.95 ea. plus $12.00 shipping & handling.
_____ Fiberglassing kit(s) at $39.00 ea. plus $2.50 shipping
_____ Byro-Drive(s) Model No._____ (See chart at left) at $98.50 ea. plus $2.50 shipping.
_____ Mig-15 kit(s) at $168.00 ea. plus $8.00 shipping
_____ Fiberglassing kit(s) at $22.50 ea. plus $2.50 shipping

Name _____

Address _____

City _____ State _____ Zip _____

__ I have enclosed check or money order for $_____
__ Please charge to Master Charge or Visa Account.

Master Charge # _____ Expires_____ Visa# _____ Expires_____

(Prices subject to change without notice)
Send to: Byron Originals, P.O. Box 279, Ida Grove, Iowa 51445. Ph. 712-364-3165

Kits... Includes ALL ITEMS to complete models as shown!

Engine, radio, and final paint not included

BYRON ORIGINALS

A product of Midwest Industries, Inc. Ida Grove, Iowa. 51445 Ph. 712-364-3165

MiG-15

Wing Span - 57"
Length - 55"
Ready-to-fly wt. - 8½ lbs.
Wing area - 600 sq. inches
For .60 size engines and 4 channel radio

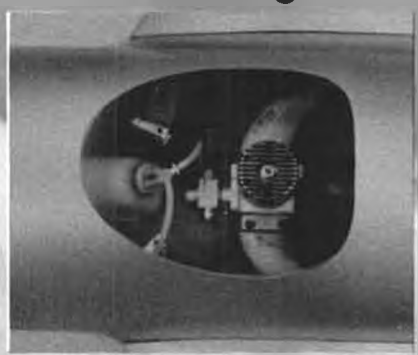
The First Practical Approach to Realistic Jet Performance That:

- Is designed for the average R/C enthusiasts.
- Allows short grass strip take-offs
- Offers fast and easy starting without having to remove and assemble hatches.
- Eliminates complicated belt-start procedures
- Readily accepts most standard .60 size engines
- Does not require high nitro fuel for satisfactory performance
- Arrives factory installed (standard equipment) and ready for engine.
- Produces up to 8½ lbs. of static thrust with Schnuerle .60 and low nitro fuel.

With factory installed

BYRON ORIGINALS **Byrojet** Ducted Fan

Quick Assembly
Scale Accuracy
Easy Access to Radio and Engine



Pat. Pending

Unlike other quick-build kits that often sacrifice authentic detail for fast assembly, Byron Originals has kept both authenticity and simplicity high on the priority list. All die-cut wood parts and 11 foam components needed for completion are designed with quick assembly, scale accuracy and minimized weight in mind. All foam modules consist of light-weight yet impact resistant injection molded polystyrene.

Fuselage consists of hand-layed fiberglass and arrives with fan unit, thrust tube, radio compartment and push rods already installed. All decals and color scheme templates also included.

All control surfaces utilize center point hinging requiring standard servos. Every last item, except radio, engine and final paint are included in kit. No shaping or carving required. No guesswork involved. Only quick, accurate and enjoyable building.

Optional epoxy/fiberglass kit for glassing wings and tail surfaces available for $22.50.

The ducted fan with exclusive quick-start capabilities.

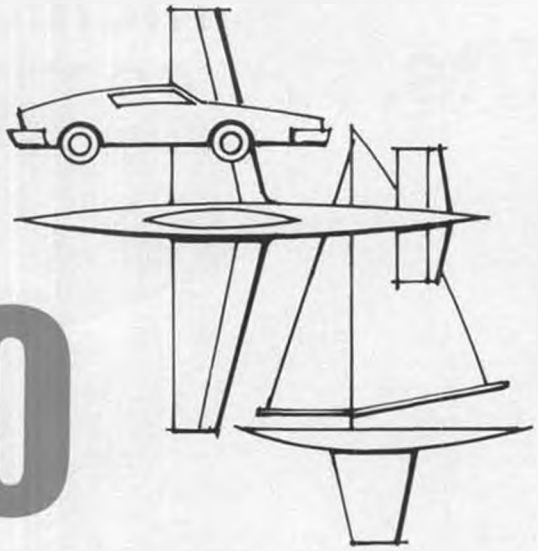
Starter extension provided with kit.

Add $8.00 for shipping to any U.S. address. Items shipped by United Parcel Service.

$168.00

Factory Direct Price

WRAM SHOW '80



Westchester County Center, White Plains, New York
Don't miss our 12th annual show. It'll be the biggest and best ever!

Keep that last weekend in February open...the 1980 WRAM's Show is going to be the largest yet. Well over 150 manufacturers and other exhibiters have already signed up to bring you everything that's new in the hobby...kits, engines, radios, accessories and everything in between. And, our famous Swap Shop will be in full operation with thousands of items, including built-up planes, almost new radios, engines and on and on and on with something for just about everyone.

Static Competition

Make sure your latest creation is finished up and polished so you'll have a chance to take home one of the dozens of trophies to be offered in these events:

WW I
POST WW I (Military)
POST WW I (Non-Military)
PATTERN
SPORT BIPLANE
OLD TIMERS
SPORT
PYLON
GLIDERS
HELICOPTERS
SCALE R/C BOATS
RACING R/C BOATS
STAND-OFF SCALE
JUNIOR EVENTS
R/C CARS
BEST-IN-SHOW

Judging takes place Sunday afternoon. Entries accepted until 12 Noon Sunday.

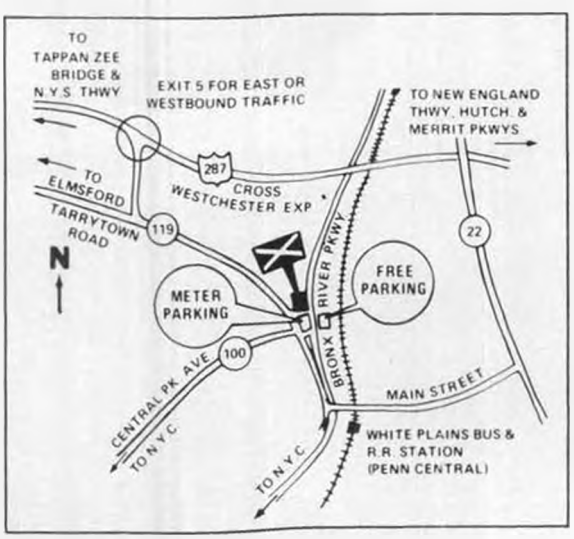
SWAP SHOP

The WRAM's Swap Shop has become one of the major show attractions with thousands of individual items changing hands. To help eliminate "registration crush", the 1980 Swap Shop will have a special pre-registration line for those who have completed a pre-registration form. To receive these forms send a *self-addressed stamped* envelope to:
John Isbister, 4 Devon Rd.
Larchmont, N.Y. 10528

SPECIAL NOTE

Because of the increased volume of items being brought to the Swap Shop, combined with space limitations, only one built-up model will be accepted from each Swap Shop registrant.

For further information, write to Larry DiRubbo, 167 Lindsey Ave., Buchanan, N.Y. 10511, (914) 739-2827.



The Westchester County Center is centrally located in the city of White Plains, N.Y., at the intersection of Rt. 119, Central Park Ave., and the Bronx River Parkway. White Plains is just 22 miles north of N.Y.C.

WESTCHESTER RADIO AEROMODELERS, INC.

February 23/24

10 A.M. to 6 P.M.

SuperTigre

NEW

X-11 PB R/C*. . .45.95
X-21 CAR R/C .104.95
ST-35 R/C* 69.95
ST-35 Std. 57.95
X-25 R/C* 74.95
G 21/40 R/C*. . .79.95
G 21/46 R/C*. . .84.95
X-40 Pylon. . . .104.95
X-40 F.I.R.E. . . .99.95
X-45 F.I.R.E. . .104.95
ST-60 R/C* 89.95
G 60 ABC 109.95
X-60 S.E. 134.95
X-60 R.E. 134.95
X-45 Marine . . .124.95
*with muffler

Schnuerle X-11 & X-25

The picture above of the two engines is a head-on shot of a Supertigre X-11 and Supertigre X-25. Both of these are Schnuerle engines. The X-25 is a ball bearing engine with ring. We present a head-on view as this is the way the engines are seen by a molecule of air about to be sucked up and spit out the muffler. The cameo inset illustrates a scaled-down King Kombat (RCM plans) built by World Engines' John Gerhardt and Tony Frackowiak. This is powered with a little X-11 which, even though brand new, is turning a Top Flite 7/4 at 16,500 without a throttle. 2 oz. is producing 6 minutes of wide open fury. This kind of flying puts a zip in your zipper. The baby tiger will yank a 23 oz. model like this about straight up.

The X-25 replaces the G.20/23 in the Supertigre line. It is .02 cu. in. larger and has twin ball bearings instead of the single large ball bearing in the 23. Also, it is Schnuerle ported and what is really interesting about this engine is that it is a ringed engine instead of a lapped engine. This is interesting because in many sport models that might require this engine the demand is for an engine that can be flown right out of the box and ringed engines generally break in much easier than lapped ones. Send 50 cents to World Engines for a catalog which contains the mounting dimensions for these engines as well as the parts list.

Fly Supertigre engines. They run smooth and provide exciting performances.

WORLD ENGINES
WORLD ENGINES
WORLD ENGINES
WORLD ENGINES
WORLD ENGINES

8960 Rossash Ave., Cincinnati, Ohio 45236
Telephone (513)793-5900 Telex 214557

When AMA's Alpha Squadron show team puts the Red Baron up for a crowd pleasing dogfight, MRC's four channel R/C guidance system radio is in command

GIVING THE RED BARON THE SIGNAL . . . There's little room for error when you're flying high, fast and furiously in a simulated dogfight. You've got to make your moves instinctively and depend on your radio to respond instantly without error. That's what Jack Salmon, Alpha Squadron's manager, told us following the air show at Willow Grove Naval Air Station September 3. That's why his traveling show team put their trust in an MRC R/C Guidance 4000 radio to keep the Red Baron on the move.

The Guidance 4000 puts the Red Baron through loops, rolls and free wheeling aerobatic patterns designed to keep the crowd on the edge of their seats.

DESIGNED FOR MAXIMUM PERFORMANCE . . . These two, three, and four channel radios were engineered for this kind of reliability with features like Hi-Tech open gimbal sticks; limited 1 year warranty; and carefully selected components including military spec connectors. During our engineering phase we put these radios through tough testing to prove their reliability. This included some spectacular long range tests to make sure their signal was strong . . . and a severe frequency stability evaluation to assure they met standards above and beyond FCC requirements. And to top it off, every MRC R/C Guidance System we sell is range tested twice before it leaves our plant. Not once, but twice. It's all part of our stringent quality control.

MRC builds these radios to last . . . whether performing during AMA SHOW Team exhibitions, or Sunday sport flying. After all, it takes a dependable radio to keep the Red Baron happy and a reliable one to give you the confidence to enjoy your hobby to the fullest.

MRC's NEW R/C GUIDANCE SYSTEMS AVAILABLE IN 2, 3, AND 4 CHANNELS

MRC MRC'S R/C GUIDANCE SYSTEMS . . . PROVEN RELIABLE WHERE IT COUNTS

MODEL RECTIFIER CORPORATION, 2500 WOODBRIDGE AVENUE, EDISON, N.J. 08817