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The Futaba FP-3S provides precise, single-stick control of rudder and elevator.

RC glider and ½A pilots rejoice. The long anticipated single-stick version of our popular dual-stick 2E is now available. Plus, we've added something extra... a third channel. That makes our new FP-3S system ideal for additional throttle, flap or spoiler control.

And each 3S system includes a matched set of our incredible S20's, the micro-mini servos that proved good things (and high performance) come in very small packages.

Three channels. Dual S20's. Single-stick. And just $149.95. The FP-3S. It's our formula for soaring.

The 3S system sports two tiny S20 servos and a double-tuned, RF amplified 3 channel receiver.

Futaba

Futaba Industries, U.S.A.
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The FP-3S. Worth the wait.

VOLUME 15 1978 NUMBER 8

RCM MODELER

FEATURES

AUGUST

This Month's Cover features Dallas Cowboys cheerleader, Janice Garner, showing off a Top Flite P-39 built by Bill Kimbrell and utilizing a Veco .61, flaps, retracts and a World 7 channel radio. Ektachrome transparency by Jerry Farr.

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From The SHOP

DON DEWEY

MACS 1978

Staff members from our Editorial Offices attended the 1978 Model and Crafts Show (MACS) in the new Long Beach, California, Convention Center. With an audited attendance exceeding 25,000 (a 15% increase over 1977), MACS has become a popular traditional event for west coast modelers and the model industry. The spacious Long Beach facilities provided wide aisles that made the massive spectator movement most comfortable.

The MACS has been a long-time favorite show with the RCM staff as it allows a yearly opportunity for us to greet and visit with many of our long standing friends. We were priviledged this year to have one of the most fabulous personalities in model aviation spend a good bit of time in our booth. This person is Jim Grier and his unending anecdotes can brighten anyone's life. We all love him even if he was wearing a badge identifying himself as Don Dewey.

Jim Grier's picture has been prominent for many years in the RCM promotional booklet *Radio Control - - - From The Ground Up*". Also in the booklet is a photo of Mrs. Loretta Hall, a lady who has been highly competitive in R/C Scale and Formula I racing. Loretta and her husband, Ken, stopped by the booth for a happy exchange of greetings.

To the many, many other friends who stopped by, our sincere thanks.

A highlight of the weekend was the Model Aviation Hall Of Fame award to Ken Willard at a roast-type banquet aboard the Queen Mary. The testimonial speeches followed a generous happy hour and dinner and were so hilarious that the Master of Ceremonies, Dick Barnard, had difficulties in maintaining his composure (that's a nice way of saying that he came unglued). He was not alone — we all did.

Visiting with the industry people is always a pleasure for us; there are some terrific people making merchandise available to we modelers.

Our commendations are extended to the MACS officers for continued professionally organized and conducted shows. MACS President, Dick Barnard, frightened a lot of us with his energetic activity following his heart attack in March. He passed his physical check-up after the show with flying colors.

Recognition must also be given to the dozens of Orange Coast R/C Club members who worked long and hard at the hundreds of thankless chores required to make the 1978 MACS the best ever. 'Til next year . . .

•

There has been a lot written in the past about the "dangers" of using cyanoacrylate adhesives incorrectly, or accidents occurring while using them. The following is some good advice about first aid treatment reprinted from the "Journal of the Indiana State Medical Association". Our thanks to George Vakkur, for bringing it to our attention.

First Aid Treatment

Human skin can become accidentally bonded to itself by a cyanoacrylate adhesive — a strong, fast setting material which can bond human tissue in seconds. "In the event of such an accident, surgery should never be necessary to separate the bonded skin — simple first aid procedures are the best treatment," according to Dr. Martin Hauser, Vice President Research & Development, Loctite Corporation (North Mountain Road, Newington, Conn. 06111).

Produced in the United States by several companies, cyanoacrylates are sold widely in the consumer market. Accidents caused by the adhesives should be treated using the following techniques:

Skin bonds: Do **not** try to pull the bonded surfaces apart with a direct opposing action. Immerse the surfaces in warm, soapy water. Peel or roll the surfaces apart by using a blunt edge such as a spoon handle. Wash adhesive off the skin with soap and water.

Eyelid to eyelid or eyeball bonds: Do **not** try to open the eyes by manipulation. If eyes are stuck together or bonded to the eyeball, wash thoroughly with warm water and apply a gauze patch. The eye will open without further action, typically in one to four days.

Adhesive on the eyeball: Cyanoacrylate introduced into the eyes will attach itself to the eye protein and will disassociate from it within a matter of hours, even if gross contamination has occurred. During the period of contamination before clearance takes place, weeping will occur and double vision may be experienced.

Mouth: If lips are accidentally stuck togehter, apply a stream of warm water to the lips and encourage maximum wetting and pressure from saliva inside the mouth. Peel or roll lips apart gently: do not try to pull the lips with a direct opposing action.

It is almost impossible to swallow cyanoacrylate. The adhesive solidifies and adheres to the mouth. Saliva will lift the adhesive in one-half to two days. If a lump forms in the mouth, position the patient to prevent ingestion of the lump when it detaches.

Burns: Cyanoacrylates give off heat on solidification. In rare cases, a large drop may cause a burn. Burns should be treated normally after the lump of cyanoacrylate is released from the tissue as described above.

•

An interesting letter from Darrell Yonker of Anchorage, Alaska, tells about some new maneuvers he would like our readers to know about.

Dear Don,

Though I many have missed a written description of them somewhere, there are a couple of variations of a stall turn that I would like to present to your readers. One I have seen performed by a full size aircraft and one I have seen performed with a certain amount of repeatability by yours truly flying an R/C model.

A couple of years ago during an aerobatic exhibition by the late Dave Rohm in his modified Bucker Jungman, Dave performed a very nice four point stall turn. It had a crisp clean hesitation every 45 degrees during the the turn and I was very impressed because I, at least, had never even heard of such a maneuver.

to page 181

You won't believe this until you open the box, *but* . . . all these beautiful balsa and Polyflite planes are A-R-F's!

(Almost-Ready-to-Fly)

HERE'S WHAT'S IN THE BOX:

The wings are made of cut foam or injection-molded foam, and are **already sheeted with balsa.** The tip blocks are in place and then the wing is sanded smooth. You only need to sand the edges and apply the finish. (Try Superkote and your wing will look like it was painted.)

The stab, fin, elevator and rudder are all balsa and are nicely **precut.** You just sand the edges, finish with Superkote or paint, and install hinges.

The **fuselages are fully built** with wood bulkheads, and doublers. Originally all the J.L. Modelcraft kits had fiberglass fuselages. But, J.L.M. discovered a **better material than fiberglass.** They call it Polyflite. You might think that it's fiberglass when you see it (it paints and glues like fiberglass) but it's better. No pin holes to fill, no uneven thicknesses, no brittleness. You just sand the seam (if you like) and spray paint it—it's done.

Just a few hours after you open the box you can have the best looking most durable RC airplane you've ever seen. You can fib to your friends that you built it—we won't tell on you.

Did you ever see a better looking seaplane? Here's the **easiest** way for you to start flying off the water. 57" span, 540 sq. in. wing area for .35-.40 engines and 4 RC channels. A nice feature is that the pre-built polyflite fuselage is automatically water tight.

This is a 4 CHANNEL **beginner's plane**—a very gentle flyer that's stable, recovers quickly from unusual attitudes and is very EASY to assemble. 57" span, 540 sq. in. wing area, for .35 to .40 engines. The very clear plans are ideal for a first-time RCer.

Designed by Jim Newman. Gemini is a **spectacular performer.** J.L.M's clever engineering solves a host of biplane building problems: Fuselage and cabane strut—completed; wings—4 panels all sheeted with tip blocks in place; wheel pants mounting plates—soldered in place! 46" span, 740 sq. in. area. For .60 size engines and 4 channels.

Very, very swift! This is an all-out large pattern plane with a **very low drag factor.** CF-5 Tiger is 61" wing span, 660 sq. in. wing area. Fuselage is 48" long! For 4 channels and hot .60 engine.

A very **hot performer!** 50" span, 460 sq. in. wing area, for .35-.46 engines. A mid-sized pattern-sport plane in the European style. For 4 channels.

BIG—the fuselage is 6" wide at cabin! Near scale model that makes a great beginner's plane or beautiful expert model. 66" wing span, 680 sq. in. wing area, for 4 RC channels and .40-.60 engine.

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3 sizes

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200 Hinges only **$2.99**
Compare at $9.50

BULK PACKAGE RC Metal Clevises
35 Clevises only **$4.99**
Compare at $13.12
2-56 threaded, plated—can be soldered!

BULK PACKAGE Nylon Tube Pushrod
25 feet Nylon Outer Tube
25 feet Nylon Inner Tube
only **$3.99**

BULK PACKAGE Brass Threaded Couplers
35 Couplers only **$3.99**

BULK PACKAGE Mini Nylon Pop Clevises
20 Clevises only **$3.99**
Compare at $7.25

BULK PACKAGE Mini Nylon Pin Hinges
66 Hinges only **$3.99**
Compare at $8.68

BULK PACKAGE 8 Wheels
only **$5.99**
4 Pairs:
2" thru 2¾"
Compare at $18.76

These are lightweight, high quality air-inflated wheels on strong molded nylon hubs. We think these are comparable to, or better than wheels that sell for twice the price. We absolutely guarantee that you'll like them. If you don't think they're comparable to wheels that sell for twice the price, return them and we'll give you your $5.99 back.

BULK PACKAGE RC Steel Links with 10" Rods
25 Links only **$4.99**
Compare at $12.25

BULK PACKAGE Flex Cable Pushrod
20 feet nylon tubing
20 feet 1/16" bronze cable
only **$3.99**

BULK PACKAGE Wing Fasteners
20 threaded wood blocks
20 ¼-20 nylon bolts
Compare at $8.50
only **$3.99**

7 Fuel Filters
only **$3.99**

BULK PACKAGE 10 FEET Surgical Fuel Line Tubing
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BULK PACKAGE Mini Nylon Pop Clevises with 10" Rods
25 Clevises only **$3.99**
Compare at $7.00

BULK PACKAGE Threaded Ball Links
10 Sets only ~~$3.99~~
NEW!
Compare at $8.50

NEW! *Pre-veneered foam wing, pre-veneered foam fuselage sections and much more!*

HOBBY LOBBY/TRUELINE

HAWKER TYPHOON

$88.00
List price $115

53 inch wing span near scale model of the famous WWII fighter and ground attack aircraft. For .40 size engines and 4 or 5 RC channels. The kit is a truly deluxe Trueline product: pre-shaped balsa parts, veneered foam wing panels, 3 large veneered foam fuselage sections, formed wing fairings, cowling and detail parts, authentic spun aluminum spinner, decals, accessory packs, detailed drawings and step-by-step building sketches. Typhoon is an excellent stand-off scale subject because model engines can be effectively hidden in the unusual deep scale cowling.

BULK BALSA WOOD

There are three things wrong with this wood: It still has the sawdust on it; it's a little longer than 36"; it doesn't have anyone's name stamped on it.

20–1/16x3x36	**$7.77**
20–1/16x4x36	**$11.11**
20–3/32x3x36	**$9.99**
15–3/32x4x36	**$11.11**
10–1/8x4x36	**$8.88**
10–3/16x4x36	**$9.99**
10–1/4x3x36	**$7.77**

I GUARANTEE you'll like SUPERKOTE. If you don't — I'll buy it back from you!

Hobby Lobby's

SUPERKOTE

Superkote is a new plastic heat shrink Model covering material. It irons on to an airplane structure at very low heat. Because of this low heat requirement it is also an excellent covering for foam aircraft. 1. Superkote shrinks and keeps on shrinking as you iron it. Very few wrinkles are so bad that Superkote's tremendous shrinkability can't eliminate them. 2. Superkote adheres to sheeted surfaces with a remarkable absence of air bubbles. 3. Superkote adheres to itself so well that joints are nearly invisible. 4. Superkote is strong, resists sagging, and is more easily repairable than other covering materials.

SUPERKOTE 27" wide, 6 foot roll . . . **$3.99**
list price $6.95

Cessna White	Midnight Black
Beechcraft Red	Campaign Brown
Piper Yellow	Terra Green
Waco (dark) Blue	Taylorcraft Cream
Ryan Orange	Metallic Gold
Aero (light) Blue	Aluminum

NEW! *METALLIC COLORS*
Metallic Blue — Metallic Green — Metallic Plum

NEW! *NO ADAPTERS NEEDED! These will fit any engine!*

KAVAN ALUMINUM SPINNERS

1½" (40mm) diameter	$4.80
1¾" (45mm) diameter	$5.10
2" (50mm) diameter	$5.40
2¼" (55mm) diameter	$5.70
2½" (60mm) diameter	$6.00
Kavan Four-way wrench	$2.50

The deeply in-set flange is held directly against the prop by the prop nut eliminating adapter bolts. You can use a socket wrench or the Kavan 4-way wrench to tighten the prop nut. A soft rubber plug caps the spinner. Spinners are cast and polished aluminum that'll last when used with an electric starter.

Any beginner can build it . . . Every beginner can fly it!

Hobby Lobby RECRUIT
$21.95

Assembles in an evening—fly it the next day. Ready-built fuselage, foam wings that only need joining. Designed to be flown by a beginner with NO HELP FROM AN EXPERIENCED RCer. 2 channels required and a Cox Babe Bee.

SURE-FLITE A-R-F FOAM KITS

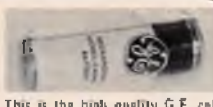
SPITFIRE MK I $28.85
List price $37.95
Brand new injection molded all foam kit. Clear canopy and molded radiators. Decal sheet. 50" span, 450 sq. in. wing area. For 2 to 4 channels, .29-.40 engine.

CESSNA SKYLANE 182 FOAM ARF $28.85
List price $37.95
For .15-.19 engine, 53" span, 420 sq. inch area, 2 to 4 channels. Steerable nose gear, 2 hour assembly.

PIPER J-3 CUB FOAM ARF $28.85
List price $37.95
For .15-.19 engine. 52" span, 442 sq. inch area. 2 to 4 channels. Includes semi-scale engine cylinders, vinyl numbers, stripes. Cub decals, steerable tail wheel.

HOWARD "PETE" $18.96
List price $24.95
36" span, 250 sq. inch wing area, all foam RTF for .051-.10 engines. Classic racer of 1930's, includes decals, hardware, nylon pushrod material. For 2 RC Channels.

SPECIAL!
G.E. Nickel-Cadmium Batteries
1.2 volt 500 mah. Pencell size
4 for $9.99
Regular $3.20 each



This is the high quality G.E. cell that's original equipment in the best radio outfits. Cells have solder tabs.

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We have an excellent Radio Service Department. We specialize only in these two brands of radios. We will return your radio to you, properly repaired, 5 working days after we receive it from you.

Brand New Design! Lower Price!

STARTS, CHARGES, LIGHTS, FILLS, DE-FUELS, TESTS!

Hobby Lobby POWER CENTER
$17.88
List price $29.95

This is the ideal field box accessory. With your 12 volt battery you can run your starter, your electric fuel pump and fill or de-fuel right from the Panel! It will also fast charge your airborne Nicad pack and your transmitter battery right at the flying field. It will power your 1½ volt glow plug on the "HI" plug position and a 2 volt plug on the "LO" position . . . or you can use it to burn off too much fuel prime on your 1½ volt glow plug on the "LO" position. The meter gives indication of glow plug condition and current flow during fast charging. It won't fly the plane or clean it up when you go home, but it sure will just about do everything else you need in starting and getting your plane fueled, started and staying in the air. Size: 6" x 3 5/8".

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NEW! 3 New Kits from SIG

SIG **KAVALIER** List price $39.95... **$34.38**

56" wing span for .29-.40 engines and 4 RC channels. Excellent choice for your first aileron-controlled airplane. The wings have built-in "washout". This eliminates tip stall (which in turn means that the airplane has less tendency to roll in a stall, and aileron control is made more effective at low airspeeds.) All balsa construction.

SIG **KIWI** List price $37.50 ..... **$32.25**

54" span all balsa 4 channel sport plane for .35-.45 engines.

SIG **COLT** List price $20.95 ..... **$17.99**

45" span molded foam wing plane (balsa fuselage and tail) for .09-.15 engines. For 3 channels. Easy to build, easy to fly. The flat-bottom wing makes it a good trainer.

EXTRA SPECIAL!

If you'll buy a
SENIOR TELEMASTER ***NOW***
you can get a
FOX EAGLE 60 RC ENGINE with it
for only ***$29.00!***

Special Combination Price of $128.50 for Senior Telemaster Kit with Fox Eagle 60 RC Engine will be in effect until August 15, 1978.

NEW! KDH Hand-Painted Pilots

(A) Hand-Painted Full Body Pilot, 1/10th Scale $6.25
From bottom of seat to top of head is 4".

(B) Hand-Painted Full Body Pilot, 1/8" Scale $6.99
From bottom of seat to top of head is 4½".

(C) Hand-Painted Sport Pilot, 2¼" Tall $2.59

NEW! Revolutionary! Variable Pitch Prop!

MULTI PROP

This is the most revolutionary model airplane prop we've ever seen. It is 10 inches in diameter and comes with 3 blades. Extra or replacement blades are available from open stock for 99 cents each. You can set it up as a 2, 3, or 6 blade prop. It is scale in appearance—both the blade shape and the hub. The 3 blade version runs noticeably quieter than a conventional model airplane propeller. It's made of glass fiber filled black nylon. It will run on engines from .29 to .60 displacement because it can be adjusted to any pitch you want! With 3 blades the prop looks like a Hamilton Standard with the hydraulic pitch control type of hub. With 2 blades it looks like most private plane props. With 6 blades it looks unearthly! Since the pitch can be minutely adjusted through a range of about 4 to 10 pitch it is capable of getting the absolute maximum out of any engine you put it on. You can't imagine what happens to engine performance when you can adjust prop pitch to any value you select.

HERE'S HOW IT WORKS:

Hobby Lobby/S.L.E.C. 10" Multi-Prop $9.99
List price $14.50
Hobby Lobby/S.L.E.C. 12" Multi-Prop ..$11.99
List price $15.95
Spare 10" Blade for Multi-Prop ..... 99¢
Spare 12" Blade for Multi-Prop $1.49

NEW! Clean engine parts quickly!

SONAC CLEANER $24.95

SONAC vibrates at a low frequency. It uses R&S Engine Cleaning Solution as the cleaner (odorless, water soluble, and not harmful to plastic parts). 30 minutes cleaning will usually clean the dirtiest parts.

R&S Engine Cleaning Solution, 8 oz. $2.50

This outfit starts you flying R/C with a full 4 channel plane!

JUNIOR TELEMASTER BEGINNERS OUTFIT $277

A Hobby Lobby JUNIOR TELEMASTER

C Fox 15 R/C ENGINE

B Hobby Lobby 6 RADIO

D 2 rolls/Hobby Lobby SUPERKOTE

Combo price in effect until August 31, 1978

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Hobby Lobby CANADA prices . . .

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12" Multi-Prop	$15.95	Revolution 40	$359.95
Superkote	$5.75	Revolution 60	$449.95
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Z-10 Adhesive	$3.75	M.E.N. Trainer	$34.95
HL Power Center	$26.95	M.E.N. Buzzard Bombshell	$53.95
Sureflite Cessna Skylane 182 ARF	$42.95	K&B 61R/C w/pumper	$122.00
Sureflite Spitfire ARF	$42.95	K&B 40 RC	$74.95
Sureflite Piper J-3 Cub	$42.95	OS 25 R/C	$45.95
Sig Kadet	$38.95	OS 40 R/C	$74.95
		OS 60 Schnuerle R/C	$149.95

Hobby Lobby Catalog—$2.00. By First Class Mail—$3.00

Prices in effect until August 31, 1978

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($2.75 HANDLING)
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Hobby Lobby's 4 Channel Beginner's Plane

"... you instructors out there, the next time you are asked to recommend a kit to a beginner, remember the Hobby Lobby Junior Telemaster." (from Flying Models Product Review.)

Hobby Lobby JUNIOR TELEMASTER $33.44
List price $42.95

You'll see many good radios in this magazine. Here's the BEST one.

HOBBY LOBBY 6 DIGITAL PROPORTIONAL $219.00

(Includes Transmitter, Receiver, 4 servos, Rechargeable nicads for transmitter and airborne, Charger, 6 month limited warranty, extra servo outputs, mounting grommets, Illustrated Owner's Manual. Available on all 27 mhz. and 72-75 mhz. frequencies.)

"... Received the Taig Lathe the other day and it sure looks like it will do what I want it to ... I am a machinist and took it down to the shop to show the other fellows ... my boss called out the big boss and told him they should have a small one like (the Taig) ... I have a Unimat and the Unimat looks sick compared to the Taig."
W.L.–Hayward, Calif.

Hobby Lobby/Taig MICRO LATHE $189.00

About half the price of competitive precision metal-working lathes! Taig Lathe is a heavily overbuilt machine that was originally designed for light industrial use. 4½" turning diameter, 7⅜" length capacity. Cross slide travel 1¼". Accuracy 5/10,000". Included are Taig 15" bed lathe, 1/10 HP Dayton motor, mounting board, 3 jaw chuck, 1/4" Jacobs drill chuck, 7 piece tool set, tailstock, stepped pulley & belt set, self-adjusting motor bracket. Many other accessories are also available.

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Sensational Plastic Heat-Shrink Model Covering!

EASIEST TO APPLY! TREMENDOUS SHRINKABILITY! STRONG! NO AIR BUBBLES! REQUIRES LOW HEAT! INVISIBLE JOINTS! GREAT FOR FOAM AIRPLANES! RESISTS SAGGING!

SUPERKOTE 27" wide, 6 foot roll List price $6.95 **$3.99**

Cessna White	Ryan Orange	Terra Green
Beechcraft Red	Aero (light) Blue	Taylorcraft Cream
Piper Yellow	Midnight Black	Metallic Gold
Waco (dark) Blue	Campaign Brown	Aluminum

This beautiful little plane can be flown in confined areas or in the wide open spaces. Its slow, gentle flight is perfect for a beginner. For 2 channels (rudder and elevator). Papillon will perform aerobatics or just hang itself on a thermal or slope updraft. Heat shrink plastic "sock" wing covering is included.

PAPILLON

- 45½" wing span
- 278 sq. in. wing area
- 2-Channel powered glider, slope soarer and sport plane!

ONLY **$15.96**

Hobby Lobby SENIOR TELEMASTER $99.50

Don't deny yourself the PLEASURE of building and flying the Senior Telemaster. It's been described as both: "... the best kit ever produced", and as "... the greatest flying RC airplane in history." Probably the world's best TRAINER, but it also entertains the experts with its 3 foot takeoff runs, side-slip landings, and 7 to 70 mph speed range.

NEW! BUILD YOUR OWN CRUISE MISSILE!

Hobby Lobby/Wik-Modelle DELTA 40 ..... $49.50

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Cunningham On RC

CHUCK CUNNINGHAM

What are "normal" things? Anything we understand, or are able to relate to. How about the same thought to your interest and ideas in radio controlled miniature aircraft. It is good for all of us to get our eyes open to see what the other fellow is doing, whether he is pitting right next to you at the flying field, or doing his flying across the country, or across the world. Just because the modelers in your area fly one type of model, or participate in one type of event, doesn't mean that builders/flyers in other parts of the country who are doing something else aren't having just as much fun. Just because you like to fly .60 pattern aircraft, doesn't mean that the lad flying a 1/2A with a single channel radio isn't enjoying himself just as much and, maybe, even more. And, that's what is so great about this hobby/sport. It offers something for just about everyone to enjoy. So, get out and enjoy it, it's never been better. From tiny radios, even smaller this year, to big, more powerful servos to haul around the surfaces of the really big aircraft. It's there, give it a try, and if you're tired of your particular interest, then don't scoff at the other phases of the hobby — try one. If you're tired of flying and practicing pattern all of the time, build an Antique, and try relaxing flying - - - it's fun. And, if you entered R/C by the sailplane route, then try flying an aircraft with ailerons, and power. Get help, but try it.

This past weekend my wife and I went down to a farm in East Texas to spend a weekend with some of our close friends playing tennis, swimming, eating, and just relaxing. But, by a wonderful coincidence, at an airport just about a mile from the farm, an airshow was being presented. We took time out from the tennis court to drive over to see the airshow. It was small by big city standards, but one pilot was flying aerobatics with a Citabria, and another with what looked to be a Great Lakes. They weren't in the class of a Charlie Hillard, or a Duane Cole, but they were pretty good, and we really enjoyed watching them. The flying of these aircraft were very much like the flying done by the current crop of "Biggie" R/C models. I could almost feel the transmitter in my hands as I watched the Citabria going through loops, rolls, tail slides, etc. It came home even more strongly than I had realized the the **big** models fly so much more realistically than do the small, very over-powered, birds that we normally fly. The Citabria and the Great Lakes were flying on engine and wing, not by engine alone. When the pilot of the Great Lakes went into a loop he climbed a bit, put the nose down slightly to build up speed, then pulled up and over, same for his rolls. After many years of watching pattern type aircraft blast through the air doing machine like maneuvers, I had almost forgotten what it was like to watch full sized aircraft doing aerobatics. It was refreshing, and made me happy that the big R/C phase has come about. Take a trip out to your local airport and see if any aerobatics are being flown, then you will know what I'm talking about.

If you will recall last month I wrote about a letter received from Graham Foster in England. Graham mentioned a rumor about a 1/2 size SE5A being built for the upcoming Westvale scale event (see June '78 RCM for the '77 Westvale write up).

I received another letter from Graham enclosing a clipping from "Radio Control Models & Electronics", one of Great Britain's leading model magazines. This page showed pictures of the SE5A, and believe me, it's big enough to ride in. Well, at least Dewey could ride in it, there's no way I could get in that bird. I can't reproduce the pictures for you, but I can reprint part of the write up, so borrowing from RCM & E, here goes:

"Graham Brown, John Bridge, Pete Nichol and Chris Rigby are busy producing a true 1/2 size SE5A! This huge model will span over 13' and is expected to weigh around 150 lbs. A 110cc Rowena industrial motor, converted to glow plug, will provide the power. Futaba 'Mammoth' 30 lb. pull servos will operate the controls. One for each aileron 'ganged' to the single aileron Rx output, two for the elevators, again ganged to the single output and one each for the rudder and the throttle. A separate power supply will be used to operate the servos. The project is the brainchild of Graham Brown, scale detail and other useful information was provided by Wing Commander W.G. Wood O.B.E. RAF (Ret.) of the Hendon Museum.

"Cost of the project can be imagined — 64 sheets of 4' x 4" x 1/4" balsa were used for the wing ribs alone! A much smaller propeller than the scale type shown under construction will be used to fly the model, using direct drive motor.

"Test flights will be carried out on an operational airfield, and all systems are expected to be "go" for Woodvale. Don't miss this one."

Wish that I were going to be in England in August to attend the Woodvale meet. The wheels on this little bird are only 12" in diameter.

If you think that the big airplanes are not here to stay, think again, cause this is the newest horizon in R/C modeling.

While thinking about big aircraft, I have been doing a lot of thinking about the control surfaces, how to move them, how to design them, etc. One thing that is most important, no matter how big an aircraft that you build, is to be sure that the control surfaces move when you want them to, and hold the control position that you control them to hold. By that I mean that the control surfaces do not "blow" back to the neutral position due to faulty pushrod or other control design. I have often wondered just how many aircraft crashes were caused by the elevator streamlining itself in a loop, or a dive. Suddenly the pilot cries, "I ain't got it" — and blames the crash first on the radio, perhaps second on the batteries, and never on the control system. If you can move the elevator to full up with the radio, and then grab it with your fingers and return it to the neutral position, against the control of the radio - - - then you're an "I ain't got it" waiting to happen. Most models are designed with the elevator control horn located on the bottom of the elevator. To give the elevator an upward movement, the control rod must push the surface up. This is where the trouble can, and does, creep in. You can return the control surface to neutral by pressing against the elevator with your fingers, because you have caused the pushrod to bow. The gears in the servo are more than adequate to hold the surface in the up position, but the control rod, or wire portion, has bowed out to allow the elevator movement. All of the aircraft that I have designed have the control horn on the bottom of the elevator because I like semi-scale aircraft and, generally speaking, the horizontal stab is located on the top of the fuselage, thus

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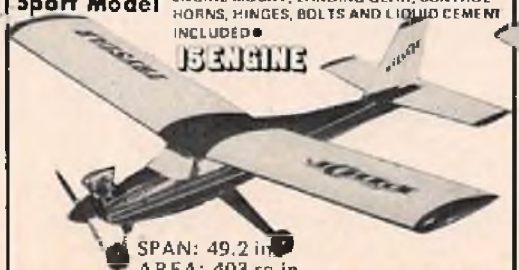

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Engine Clinic

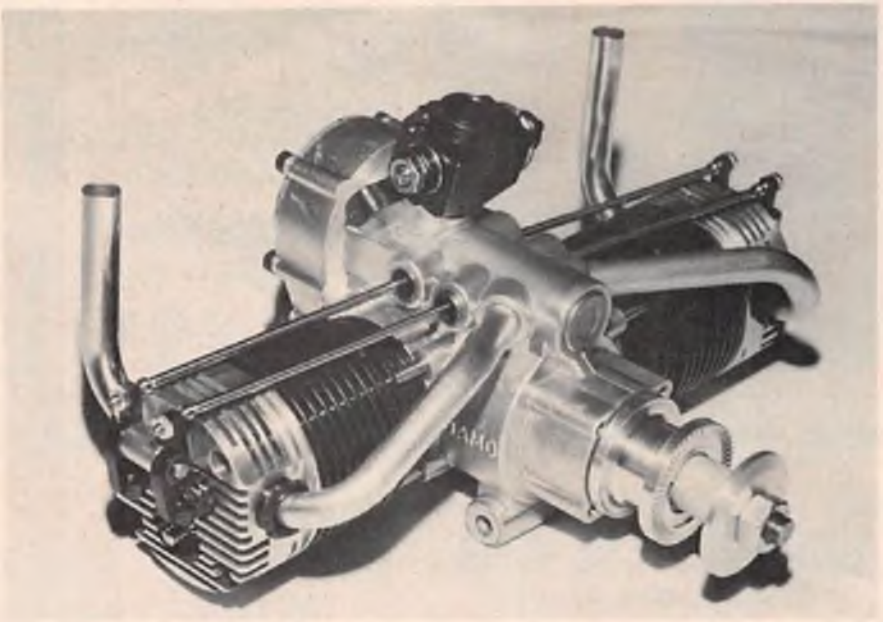
CLARENCE LEE

Photos By Karen Lee

This month, I am finally able to give you a report on the Damo 218 four stroke twin cylinder engine imported from Sweden. One of the most beautifully built and engineered model engines I have had the pleasure of testing.

Last October an advertising packet was sent to the various model magazines announcing introduction of the Damo 218. Advance orders were being taken for delivery the first part of 1978. It was obvious from the pictures (and price) that this was to be a high quality piece of merchandise. Unlike other utility and chain saw engines, modified for model use, the Damo 218 was designed specifically for use in the 1/4-1/3 scale model airplanes. Of particular interest was the statement that **no oil** was needed in the fuel. The lubricative qualities of the methanol fuel alone supplies sufficient lubrication. Needless to say I found this a bit hard to swallow knowing that methanol has very little lubricative value. The fact that the engine utilized needle bearings at both ends of the con-rods, needle bearings for the cam shaft, and four ball bearings for the crankshaft, would certainly aid in the use of low oil content fuel. However, there are still two conventional aluminum pistons with cast iron rings going up and down in hardened steel cylinders — the same as any other model engine. Lack of oil usually results in piston/cylinder scoring or seizing.

Knowing that this **no oil** feature would certainly be most appealing to scale type modelers, who would no longer have to put up with the dreaded mess on their airplanes, I got a letter off to Mr. Anders Wahl of Marketing Consulting Corporation, the exporter of the engine, suggesting that he send an engine to us for testing and review. This past March the engine was received. One of the very first engines off the production line. Needless to say, I was most anxious to start conducting my tests but unfortunately the drought in California had come to an abrupt halt with torrential rains, flooding, and mud slides. Southern California and the Sunland/Tujunga area, in particular, hit very hard. My place of business being in Tujunga and my home in Sunland. For four months there was never more than



a few days at a time when the weather cleared. And would you believe that at the time of this writing (last week in April) it is raining again? With over 50" of rain in Sunland/Tujunga, the jokes about California washing out to the Pacific Ocean are almost becoming a reality.

I always like to perform engine tests during halfway decent weather. This means temperature above 65° and preferably in the 70's with the relative

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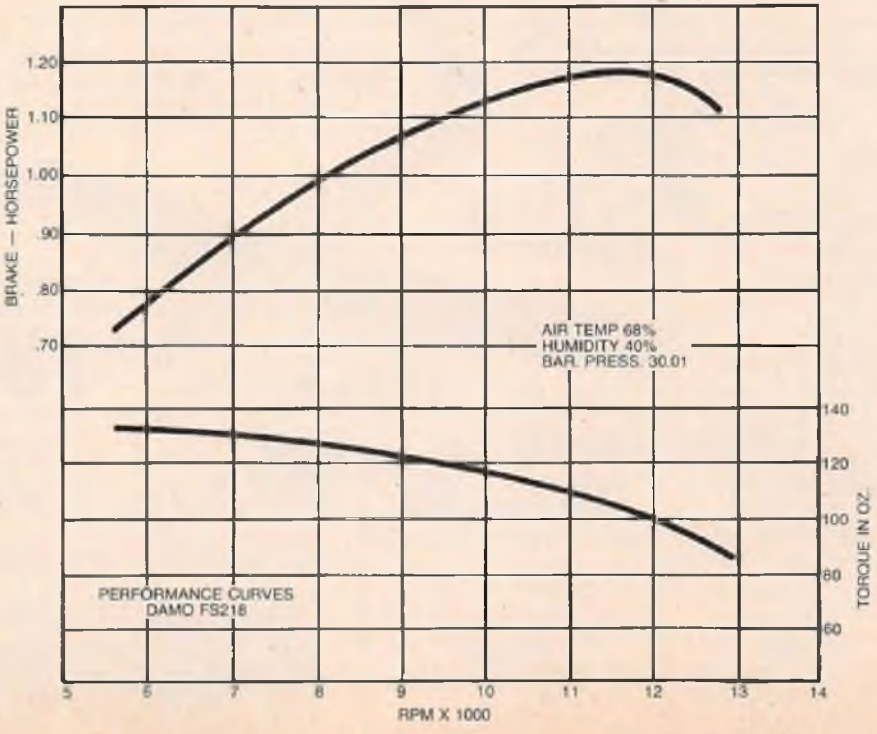

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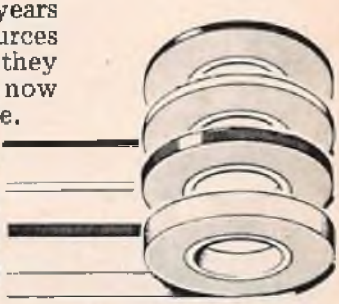

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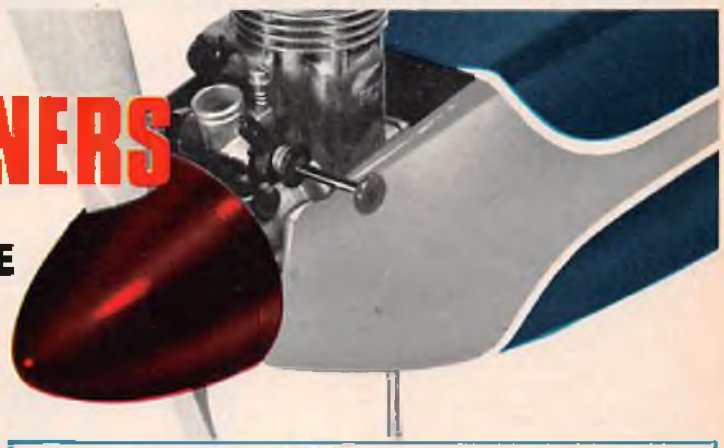

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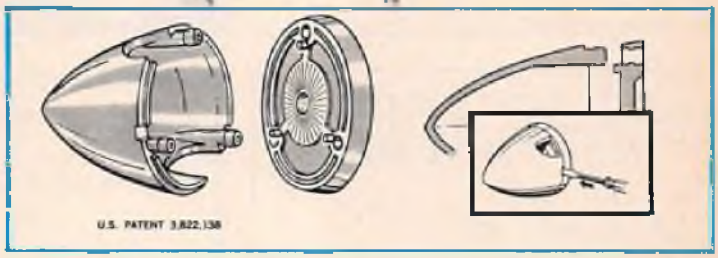

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from page 10

humidity below 40%. In the last four months there hasn't been more than half a dozen days that would meet this requirement. My engine testing is done out of doors and with my test site knee deep in mud I had to wait until things dried out. Fortunately we did get enough sunshine the first part of May for me to conclude testing of the Damo 218.

Before getting to the actual review, I would like to give you a little background on the people who developed and are manufacturing the engine.

Two gentlemen named Sten Dal and Lars Molin of Stockholm are owners of a specialized machine shop. The name Damo being derived from the first two letters of their last names. Sten Dal had been building four stroke model engines for several years as a hobby. About a year ago, Anders Wahl a modeler and engine buff of long standing, and banker by trade, met with Sten Dal and Lars Molin and suggested the idea of producing one of Sten Dal's designs on a limited production basis. From this meeting the partnership was formed. Several more prototypes were made and considerable testing performed - - - burning much midnight oil before the final version of the Damo four stroke twin was perfected and production started. Sten Dal is not only the designer of the engine but makes all the tooling, casting dies, and fixtures to produce the engine. Lars Molin runs the machine shop as head of production with 12 employees. Anders Wahl handles the distribution and exporting of the engine.

The Damo 218 has a bore of .9449 (24mm) and stroke of .7874 (20mm) for a displacement of 1.10 cu. in. or 18cc. The 218 designation coming from 2 cylinder and 18cc displacement.

Correspondence with Mr. Wahl, prior to testing the engine, did result in a slight change in the recommended oil content of the fuel. As a safety factor, the recommended oil content now being 1/2%-5%. This recommendation came after considerable testing by Swedish modelers. However, one engine being run to destruction now has over 150 hours of bench time using **no oil** fuel and is still in good operating condition with only slight wear at critical areas such as cam lobes and lifters.

Still being a bit skeptical myself, I chose to go with 5% oil, 5% nitromethane, and balance alcohol. I also used castor oil knowing that none of the synthetics have yet to equal castor oil when it comes to straight lubrication. Normally I prefer the synthetics for their cleaner burning but figured with the use of only 5% castor there would be far less carbon and varnish build up.

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from page 12/10

Mr. Wahl recommends a three hour break-in period for the engine, however, I did not find this length of time necessary. Normally I like to break engines in, in an aircraft. An hour of air time being equal to several hours of bench time. However, not having an airplane that would accommodate the Damo 218, I had to resort to bench running.

The Damo 218 differs from most two stroke twins in that it is alternate firing rather than opposed firing. This means that there is one power stroke every revolution of the crankshaft, so that starting procedure is the same as for a single cylinder two stroke engine, i.e., there is a cylinder on compression every flip of the prop. This is unlike the O.S. .60 four stroke where starting compression occurs every other revolution which takes some getting used to when hand cranking.

Although Mr. Wahl recommended using an electric starter for initial start up, I had no trouble whatsoever hand starting the engine and had it running in three or four flips of the prop. Although the engine had good starting compression and gave no starting problems, I did have a bit of trouble keeping it running after removing the starting batteries. Note I said starting **batteries**. When running a twin, you have to use either two starting batteries or the method I prefer and recommend — using two batteries in series. Then one lead goes to one glow plug and the other lead to the other glow plug. This way only the normal two leads are required.

Figuring the engine just needed a little more running time before it would operate with the starting batteries removed (this is often common even with single cylinder two stroke engines), I proceeded to run the engine. The smoothness of the engine was quite impressive, as well as the lack of noise, considering this was a 1.1 cu. in. engine. Quietness is one of the strong features of a four stroke design. I soon noticed quite a bit of raw fuel dripping off the back of the cylinders and further examination revealed slight fuel bubbling between the heads and the top of the cylinders. The engine was stopped and the heads checked for tightness but were okay in this respect. So the heads were removed for examination. The Damo does not use head gaskets depending on the machined fit for sealing. Although nothing out of the ordinary appeared to be wrong, the tops of the sleeves were surfaced on a piece of emory paper and the heads lapped to the cylinders with fine lapping compound. Reinstalling the heads and starting the engine for the second time showed a considerable improvement in power, and this time I could remove the starting batteries with the engine continuing to run as one would expect. Evidently the cylinders are finished machined, heat treated, and finish honed for piston fit. The top of the cylinders receive no further finishing. It would appear that a very slight warpage takes place during the heat treat that accounted for the leaking heads. This has been pointed out to Mr. Wahl and I am sure will be corrected by the time any production engines are shipped to this country for release.

With the engine running properly, our break-in consisted of short three to four minute runs, stopping the engine in-between and allowing it to cool, for the first half hour. The second half hour the engine was allowed to run a 10 ounce tank out. At the end of the first hour of running, preliminary rpm checks were made and the engine given another hour of running time - - - this time with a 16 ounce tank and allowing the engine to run the tank out. At the end of two hours running time, there was little improvement in rpm so it was safe to assume the engine was broken-in enough for test purposes without running it an additional hour.

Coming up with propellers to test the engine with did present a bit of a problem in that I could not get the sizes that I wanted all in the same make, so I had to resort to a variety of makes. The largest Top Flite I was able to get was a 14/6. I called Larry Jenno who, along with his partner Joe Zingali, manufactures the "Zinger" line of propellers, but the only large propeller they had at the time was an 18/6 — their 14/6 and 16/6 not being available. I next contacted Bill Schwagerman who manufactures the old Y & O (Yates & Orwick) line of props that were so popular back in the late 40's and are again being manufactured by Bill. Bill had both a 14/6 and 16/6 so I now had the three sizes I needed to test the engine and proceeded with the tests.

The engine turned the 14/6 Top Flite 9,300 rpm and the 14/6 Y & O 9,700 rpm. This was a little surprising in that the Y & O has considerably more blade area than the Top Flite but evidently the blade shape was allowing the higher rpm. The Y & O is wider closer to the hub and the Top Flite has a wider section farther out towards the tip. The engine would turn the 16/6 Y & O 7,900 and the 18/6 Zinger 5,900. The 18/6 did seem to be just a little too much prop for the engine since needle setting was more critical, and there was more of a tendency for the engine to "knock" with a leaned out setting. This was one operating characteristic that I noticed when the engine was leaned for maximum power. This is a sound that diesel owners are familiar with but you do not encounter in a two stroke glow engine. Richening the mixture slightly would drop the rpm several hundred, but stop the spark knock.

The engine came equipped with the Fireball hot glow plugs. I tried using a colder heat range plug but it did not help the spark knock and the engine slowed considerably when removing the starting battery. A recent letter from Anders Wahl states that they have found the Enya glow plug in either hot or medium heat range performs even better than the Fireball but the Enya plugs were not available in the local hobby shops.

So, although the Damo can turn the 18/6 propeller at a respectable rpm, it did seem to be happier with the 14/6 and 16/6 sizes. I might add, however, that the 18/6 Zinger is a real hefty propeller and if someone wanted to use a propeller with this diameter he could probably narrow the blades slightly especially towards the tips and experience a gain in rpm.

The manufacturer lists in the specification sheet a minimum idle speed of 1,200 rpm. As most of you know this is pretty darn slow. However, you are accustomed to two stroke engines and lower idle speeds are possible with a four stroke. I was able to get the engine to idle at 1,200 rpm but did have to leave the starting batteries connected. This was with the 16/6 propeller. Minimum idle with the starting batteries removed was 1,800 but there was considerable hesitation on acceleration. The throttle had to be opened slowly allowing the engine to clear itself out. Snapping the throttle open would result in the engine sputtering and dying. Minimum safe idle speed at which the engine could be accelerated fairly rapidly was 2,000-2,200 rpm. Even then there was a bit of loading that could not be compensated for by leaning the Perry carburetor idle mixture disc. Again I tried several makes of idle bars and non-idle bar glow plugs to see if they would perform better than the Fireball, but they did not. Possibly the Enya plug would have helped the mid-range loading had they been available. Although there would be no real need to idle the engine below the safe 2,000-2,200 rpm figure, if someone did want to idle the engine lower than this, it would be a good idea to use a couple of nicads connected to the glow plugs that would be turned on with a micro switch at low throttle.

Next the engine was tested for peak horsepower and torque. I was quite surprised to find that the engine developed its maximum horsepower of just a hair under 1.2 bhp at 11,800 rpm. As the load was reduced, the rpm kept climbing to the 11,800 maximum reading with a sharp drop off in torque to

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Sunday Flier

KEN WILLARD

Typical launch scene at start of countdown. Note unusual "toothpaste tube" design with checkerboard tail markings. Fast, but not able to stay up in light lift.

Jerry Arana and his "Grand Boss." Awarded trophy for Best Design, also for fastest lap time. Jerry placed third overall.

Severed wingtip on my "Superdude" as a result of mid-air with Bill Watson. Required constant application of right aileron in order to complete the flyoff race.

In the greatest series of races ever held for the RCM Slope Racing Trophy, Rick Walters won First Place in the 1978 competition. It was his third time to win the races, thus retiring the "permanent" trophy - - - which will be replaced by a new one for 1979.

But it wasn't easy for Rick — he just barely nosed out Mike Mitchell, winner in 1976, and Jerry Arana, who also had two legs on the trophy through his two previous first places. And it was the total versatility of Mike's racer, the Mongoose, with its ability to fly in light lift, that enabled Mike to win the fly-off for Second Place against Jerry, whose new design, the "Grand Boss," won both the fastest lap time trophy, and the contestants' award for best design. So Jerry placed third overall in the racing.

And guess who was nipping at Jerry's heels? None other than your old Chief Sunday Flier, whose "Super Dude," unchanged from last year (even though I had planned to make some), took advantage of light lift conditions on two occasions to out run the competition, and come up with Fourth Place.

Fifth Place went to Bill Watson, a newcomer to the races, but flying one of Blaine Rawdons's variable incidence wing designs, as I described last year. Bill and I had a fly-off for Fourth Place, since we were tied at the end of the regular rounds - - - and that was one of the times when the "Super Dude" proved its ability to go fast in light lift. Oh, maybe there was another reason. Bill and I had a mid-air collision on one of the pylon turns; it knocked off about 3" of the left wing tip on my plane, but the aileron was still functioning, and I recovered to continue on the course, holding a bit of right aileron. Bill also continued, but it took him a bit longer to get squared away and back on course, and by that time I had him. Gad! it was exciting!

But I'm getting ahead of myself, let me tell you the whole story.

This year, the RCM Trophy Races were held on private property, instead of Thornton Beach or Sunset Beach, both of which are State beaches and require all of the complicated processes for approval, plus a limitation on the number of contestants, and the added requirement that spectators have to watch from the beach below. Also, a ranger had to be hired to protect the ecology of the area for public use. Now don't misunderstand me - - - the constraints were necessary, in the eyes of the State Department of Recreation and Parks, because the public use of

Rick Walters with his 1977 version of his racer which he placed second. In 1978, with a vertical fin and flying stab as the only mods, he placed first.

Rich Spicer and his sleek low wing design, "Sunkist." Great potential, as soon as Rich gets a little racing experience. I voted it Best New Design.

Four very wet, but very happy winners. Rick Walters, on left, with the RCM Permanent Trophy which he retired by winning for the third time; Mike Mitchell, who was a close second; Ken Willard, fourth in a flyoff with Bill Watson to Ken's left. Jerry Arana, who was third, had left before the photo was taken.

public lands has to be fair to all concerned. The officials have a job to do, and they can't "play favorites".

They have been more than fair in granting certain rights to the sponsors of the RCM Trophy Races in the past - - - for which we are grateful - - - but they just don't have the flexibility of that which is available to an owner of private land - - - like Bud McCrary.

Bud McCrary is an unusual - - - I might almost say unique - - - man. He owns an outfit called the Big Creek Lumber Company, which has considerable land holdings along the coast of California between Santa Cruz and Half Moon Bay, in the general area of Davenport. Bud's family has been there since 1869, serving the needs of the community. About fifteen years ago, Bud bought the parcel of land where he is now located — and it wasn't by chance. Bud checked out the weather, prevailing winds, fog conditions, and everything he could think of. Not for logging; you can do that in most any weather. Bud wanted to have a strip of land where he could put in a runway, so he could fly his private plane.

The strip proved out fine - - - so long as you were a good pilot and could handle the turbulence created when the wind came up the hill and then went into a "rotor" as it traversed the runway. Bud installed the runway, built a hangar for his Cessna 182, then, when hang gliding became popular, permitted qualified pilots to use the strip, and also, Bud became interested in radio controlled gliders, learned to slope soar, joined the South Bay Soaring Society, and arranged for the club to use his site for slope racing.

So, this year, he agreed to let the club use the site for the RCM Trophy Races. From the standpoint of a racing site, the course was ideal - - - 621' long, as accurately surveyed by Jerry Arana, using standard surveyor's transit measurements. The one drawback was that the wind was fickle; it tended to run parallel to the hill at times, rather than right angled. And when that happened, the wind could be blowing twenty miles an hour, and the lift would be zilch. Just what happened late Saturday afternoon on April 29th.

But that was a minor factor, compared to the freedom of permitting spectators to watch from vantage points along the course. Sure - - - they had to mind their step to avoid poison oak - - - but nothing's perfect.

There was another minor problem, which the South Bay Soaring Society solved with their usual ingenuity. Parking space was limited; the runway couldn't be used since it is an active emergency field. So, John Baxter enlisted the aid of his father to drive a shuttle bus from a public parking area about three quarters of a mile down the road. Worked fine.

Some time ago, we established the arbitrary rule that the RCM Trophy Races could not be official unless at least four rounds were flown. And more often than not, that's all we were able to complete. It was unfortunate, because, in several instances, one of the leaders could have a mid-air collision, not complete the round, and get no credit for that heat. On the other hand, if more than four rounds were flown the worst round could be discarded, and the points for the best four races would be counted. That eliminated the bad luck factor of a mid-air.

Would you believe it? This year, we flew eight rounds! Five on Saturday, and three on Sunday. One round could be thrown out by each contestant (his individual worst showing) and the other seven counted. For example, Mike Mitchell had placed first in all his races up to the sixth round, when he had a mid-air. His plane went into a flat spin from which he couldn't recover — but he was able to discard that race. Similarly, Jerry Arana and Rick Walters had races where they didn't place first, but discarded them. Mike was the winner in each case. So, on Sunday, the draw was made so that, in the last race, Rick, Jerry, Mike, and Rich Spicer were pitted against each other. Rick won, and that gave him the trophy. Then, the way the points added up, Mike and Jerry were

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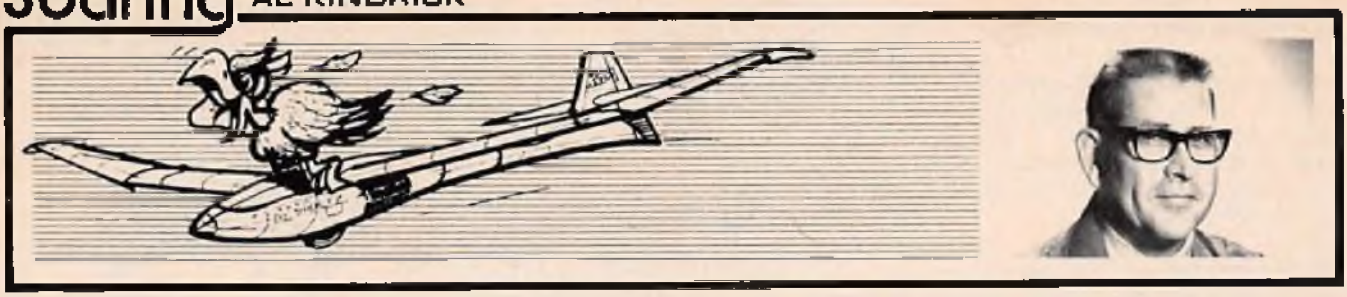
Soaring

AL KINDRICK



Aspect ratio. We have all talked about it. What is it? Let's again shoot for a non-technical explanation with information supplied by Hilton F. Lusk from General Aeronautics.

The aspect ratio, R, is the ratio of the span to the chord of a rectangular airfoil. It is found from the ratio of the span squared to the area, (b^2/s), for tapered and irregular shaped airfoils. The airfoil characteristics are modified by change in aspect ratio and, if the wing of an airplane has an aspect ratio different from that of the model, a correction is required. A decrease in aspect ratio reduces the lift and increases the drag, as a result of the larger proportion of the wing area influenced by tip vortices.

On the upper surface of an airfoil, the pressure is sub-atmospheric (less than atmospheric) and, on the lower surface, the pressure is super-atmospheric (greater than atmospheric). The flow of air is therefore inward and to the rear, over the upper surface at the tips. The resulting increase in pressure destroys the effect of the induced lift at the tips.

The super-atmospheric pressure below the lower surface forces air outward against the adjacent atmospheric pressure, creating a flow of air outward and to the rear below the tip of the lower surface destroying the dynamic lift in that region.

The combination of the inward flowing air above the wing tip and the outward flowing air below the tip, produce a spiraling airfoil called tip vortice at each wing tip.

The effect of the tip vortices is to destroy the lift of the wing tips, producing the commonly experienced tip losses. By increasing the span of the wing, the percentage of loss due to tip effects is reduced, thereby improving the overall L/D of the wing. In order to provide the same area, the chord of the wing is reduced. A wing of tapered planform which reduces the chord at the tip accomplishes this purpose.

By increasing the aspect ratio, the percentage of tip loss is reduced and the effectiveness is increased. The very evident effect of this factor in the design of airplanes is indicated by the exceedingly high efficiency of the long, narrow and tapered wings of soaring gliders, which indicates an L/D ratio as high as 24, where there is an aspect ratio of 18 or more.

★

I believe there is a conspiracy between our government and all of the fine model and trade shows that have been put on from coast to coast. They are timed so that the modeler and his tax refund are soon parted. Many new great items were shown and are too numerous to mention. I have room to talk about a few of the goodies that lean toward sailplaning displayed at the MAC Show.

Don Goughnour's winch retrieval system looks and works like a king size spinning reel. It utilizes a light monofilament line that is carried up with the winch line and is played out with no friction, then when the winch line is released from the sailplane, it is wound in rapidly by a starter motor similar to the winch motor. Don feels that one winch and retriever unit could service a contest, every pilot using the same winch. He also claims the additional drag on the sailplane is negligible. Sounds and looks great. The winch master would have double duty, also, with more use of one winch; additional 6 volt batteries would have to be ready for winch and retriever.

Windspiel Models had the complete line of Wanitschek Sailplanes on display with excellent quality fiberglass fuselages. Peter also had the new carbon fibre's available for strengthening those wing spars and any large non-former area in the fuselage.

To protect your sailplane wings from home to field, "Wing Sox" of Burbank, California, has a complete line of polyester material wing sleeves in five colors, that are custom made to fit 16 of the popular sailplanes.

Kraft Systems showed their new radios and the new KPS-18 servo. Seems like our sailplanes are getting larger and the guidance electronics are getting smaller.

Alhambra Model Factory with the "Intruder" Slope Racer, looks very clean. More on this sailplane at a later date.

House of Balsa had their 100" "Santana" which is about to be released.

Bridi Hobby Enterprises was there with their two meter "Soar Birdy". This is their introduction into the sailplane field.

Superior Aircraft Materials presented a beautiful line of balsa wood for the serious scratch builder.

I could go on and on but space just does not allow. One more item that was very impressive throughout the show, was the abundance of video-cassette television. This enabled a person to hold a product, airplane, or accessory, while it was being flown or used or shown on the TV screen. Very professional.

★

Pacific Soaring Society's weather station. Sensing units are mounted on pole above recorder.

When you fly with the Pacific Soaring Association in Anaheim, California, they tell you everything a pilot would want to know except when to go to lunch. Their field unit visually shows wind speed and direction, temperature and relative humidity, and records it all on a strip chart recorder. The complete unit is portable and very compact.

Mike Reagan proudly shows his new "Mirage" Open Class sailplane. Blaine Rawdon, the designer, supplied some very impressive statistics. Minimum sink rate 1.2 feet/sec. at 18 feet/sec. Maximum L/D 17 at 25 feet/sec. Span is 114" with 923 square inches. 32 ounces of total weight gives a 5 ounce wing loading. Three unusual features of the "Mirage": Offset vertical fin, elevator hinged on right side only, and the center

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MINI-NY-STEEL PUSHROD ASSEMBLY

- NO-SHRINK, NO-STRETCH, FREE RUNNING PUSHROD ASSEMBLY - PERFECT FOR 1/2 A AIRPLANES. LIGHTWEIGHT, FLEXIBLE AND STRONG
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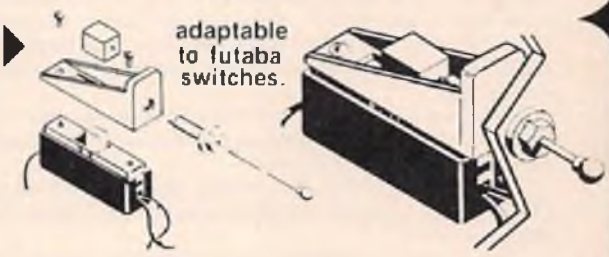
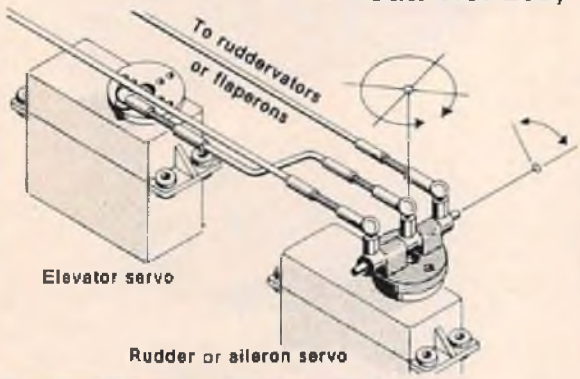
- NEW SPRING-THREAD COUPLERS AT BOTH ENDS FOR MICRO TRIM ADJUSTMENTS *(SEE OTHER SIDE)* *CAT. NO. 113* *2 COMPLETE SETS* **$1.49**

KWIK-SWITCH MOUNT

Mounts your battery switch anywhere in the fuselage in minutes, by merely drilling one, 3/16" hole. This is the best one yet!
Cat. No. 203, $1.75





V-TAIL MIXER

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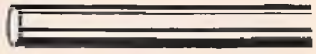

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CAT. NO. 233 FOR 1/16" WIRE OR SMALLER.

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$100.00 COMPLETELY ASSEMBLED LESS ENGINE AND PROP.
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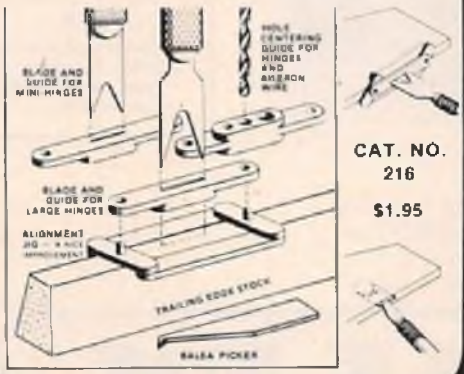

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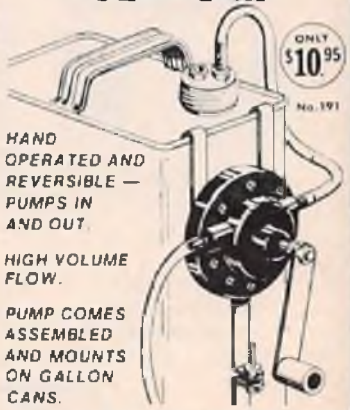

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Now we are adding another dimension to this concept: transmitter conversion kits so the Three Channel System can be upgraded to five or seven channel operation . . . the builder can start at an economical novice level with a Three Channel System and, as he gains competence, he can add functions at a minimum of expense; none of his equipment is obsoleted.

The conversion contains an additional stick assembly, a new case, and complete instructions for performing the conversion. All existing electronics and hardware are utilized.

Since the receiver has eight channel capability, all that needs to be added is more wires and connectors plus additional servos for each additional channel.

If you didn't buy a Three Channel before because you knew you would want to go to more channels later, you no longer have any excuse.

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TRANSMITTER
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- Double deck design for small aircraft.
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- GE 450 mah or 100 mah Ni-cds.
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- Quality D & R Bantam or Dunham Micro mechanics.
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A sophisticated piece of lab quality equipment for cycling ni-cd batteries. Accurate, dependable, and attractive.

--Automatic discharging and recharging of both receiver and transmitter batteries, simultaneously or independently.

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--Four digit LED readout; no mechanical clock motors.

--Modern design and tight tolerance components insure total accuracy down to 1% and 1/10 of a minute.

--Available in kit form or assembled and tested.

34G15	Ace Digipace I, assembled	$94.95
34G16	Ace Digipace I, kit	79.95

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SHIRT TRANSFERS

Be proud of your hobby! Put some iron-on transfers on your jacket, shirt, or jump suit. Works on any cotton or cotton blend material.

"R/C Ace" is on a light purple background and looks good on blue, black, and white. It measures about 10" high.

"I Love R/C" is on a warm yellow background and looks best on green, brown, or yellow. It's also about 10" tall.

The Ace R/C logo measures about 4" X 10" and is red in the middle blending to blue. Looks good on red, blue, black, or white.

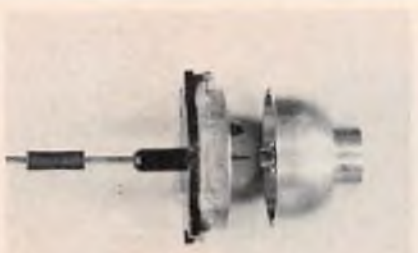
24K108	"I Love R/C" Shirt Transfer	$1.98
24K109	"R/C Ace" Shirt Transfer	1.98
24K110	Ace R/C Logo Shirt Transfer	1.49

1/2A BLEND MODEL ENGINE FUEL

1/2A Blend, from Ace R/C, is specially formulated for use in model engines in the 1/2A or smaller category. It contains a high percent of nitro for strong, consistent performance but not so much that engine life suffers. Such additives as anti-oxidents, igniters, and detergents plus a non-foaming agent and a wetting agent produce a fuel that is perfect for all around use in 1/2A planes, cars, and boats.

Much study and experience went into the development of this top quality fuel which assures you peak performance and long life from your 1/2A engine.

16L440 Ace 1/2A Blend Fuel, 1/2 gal. $10.95



REED VALVE ENGINE THROTTLE

This simple, yet ingenious throttle designed by Ralph Cooney of Fourmost Racing Products will fit all Cox rear reed valve .049 engines: the Babe Bee, Golden Bee, Black Widow, and ORC.

It doesn't cut any RPM's off the top and as an exhaust restrictor would and effectively idles the engine down to less than 3000 RPM's--adds only a few grams of weight. Still allows use of a muffler.

50L630--Ace Reed Valve Throttle $2.50

STICKY FOAM

Protecting the receiver and battery pack in small airplane installations is always a problem because there is no room for a bunch of foam rubber.

Ace R/C has found a solution with this fairly dense black foam rubber that is only 1/8" thick and has an adhesive backing to adhere to the receiver or battery pack case so minimum room is taken up and yet the components are isolated from vibration and offered some crash protection. Also makes good wing saddle cushion material.

50L330--Ace Sticky Foam 1/8" X 2" X 36" roll $1.49

Please send me your complete catalog. Enclosed is $1.00 which is refunded on my first order. (Add $.50 for 1st class mail return; add $1.00 handling on all other orders.)

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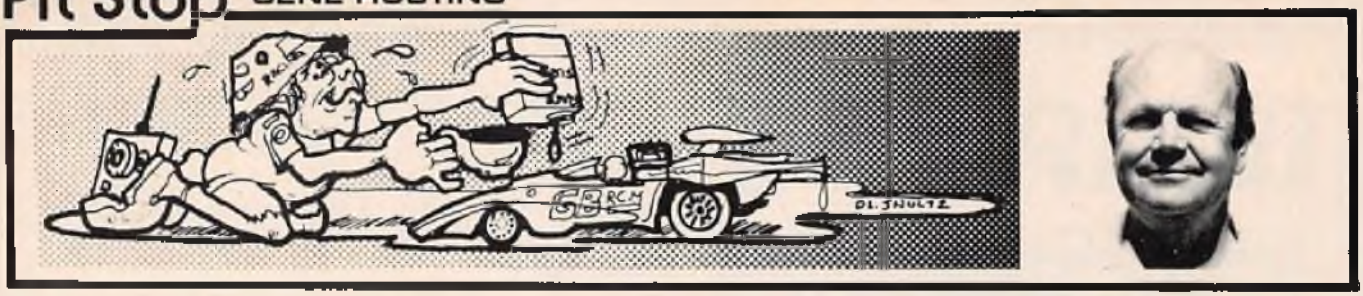

How To Install & Tune Perry Carburetors

John Perry has made a few changes in his latest Perry carburetors which will really help the R/C car racers. To begin with, the high speed needle valve now uses a rubber "O" ring instead of a spring, to keep the needle valve from vibrating in or out. If you've ever had your needle valve back out while leading a race, you'll really appreciate this improvement. This change will be made throughout the complete Perry carb line.

The big change that really fascinates me is the tuning possibilities with the new Veco .61 carb. Before we go any further, let's distinguish the difference between the Perry Veco .61 carb #104, which we'll call the "61 carb", and the Perry Veco .61 pump carb #900, which we'll simply call the "pump carb". The 61 carb is used on the Veco .61 engine. The pump carb is also used on the Veco .61 engine, but it must be used in conjunction with a Perry fuel pump. Without the fuel pump, the carb would lean out as an airplane goes through certain maneuvers, which would cause the engine to die. With the pump, it doesn't make any difference what attitude the plane is in, the carb will always have a sufficient fuel supply.

Now we come to the R/C cars which

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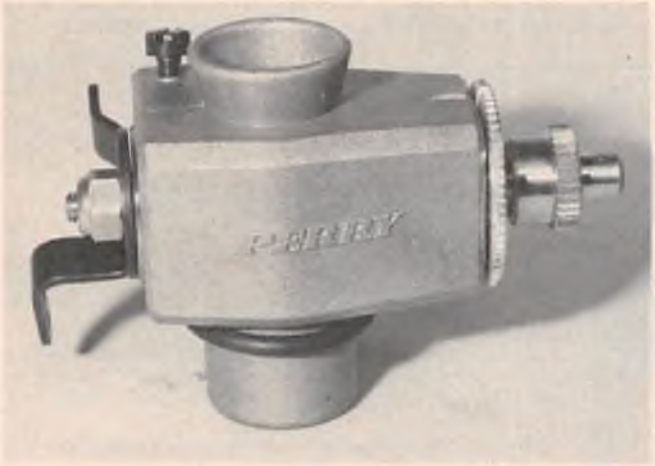
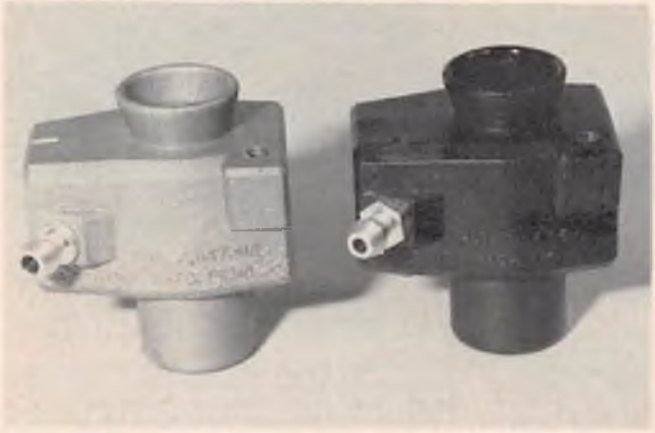
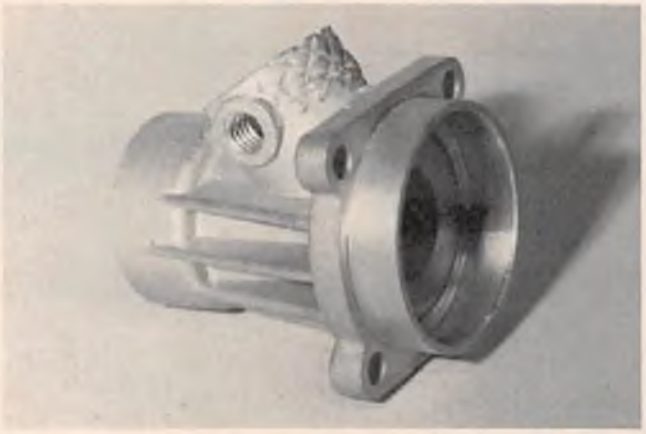


Perry's new Veco .61 carb now uses the same basic plastic body as their Veco .61 pump carb.

The new Perry Veco .61 carb barrel is shown on the left with its .275 bore. On the right is the Perry Veco .61 pump carb barrel with its .375 bore, which is almost twice as big in square inches.



The new Veco .61 carb plastic body is shown on the left. The Veco .61 pump carb body, on the right. The only difference between the two is that the pump carb has the 2 extra small holes on the top and bottom of the carb by the fuel inlet fitting. You've also noticed one is silver in color and one is black. They are both made in the same exact plastic, except for color, which will vary from batch to batch. The silver one has also been scratched with an X-Acto knife so the epoxy can stick to it. The base must be turned down to 7/16" to fit into a K & B .21 case. This can be easily done by inserting a bolt through the bore, then a finger tight nut installed and the bolt held in a lathe.



Epoxy works best when it has something coarse to stick to. That's why it's important to rough up the plastic carb body and even the aluminum case. The case has been cross hatched with a Dremel. Both surfaces must be very clean and dry for the epoxy to stick well. Perry recommends using gasoline, kerosene or alcohol only for cleaning, and to dry the carb immediately after cleaning. I use acetone on the aluminum for cleaning which dries fast without any residue.

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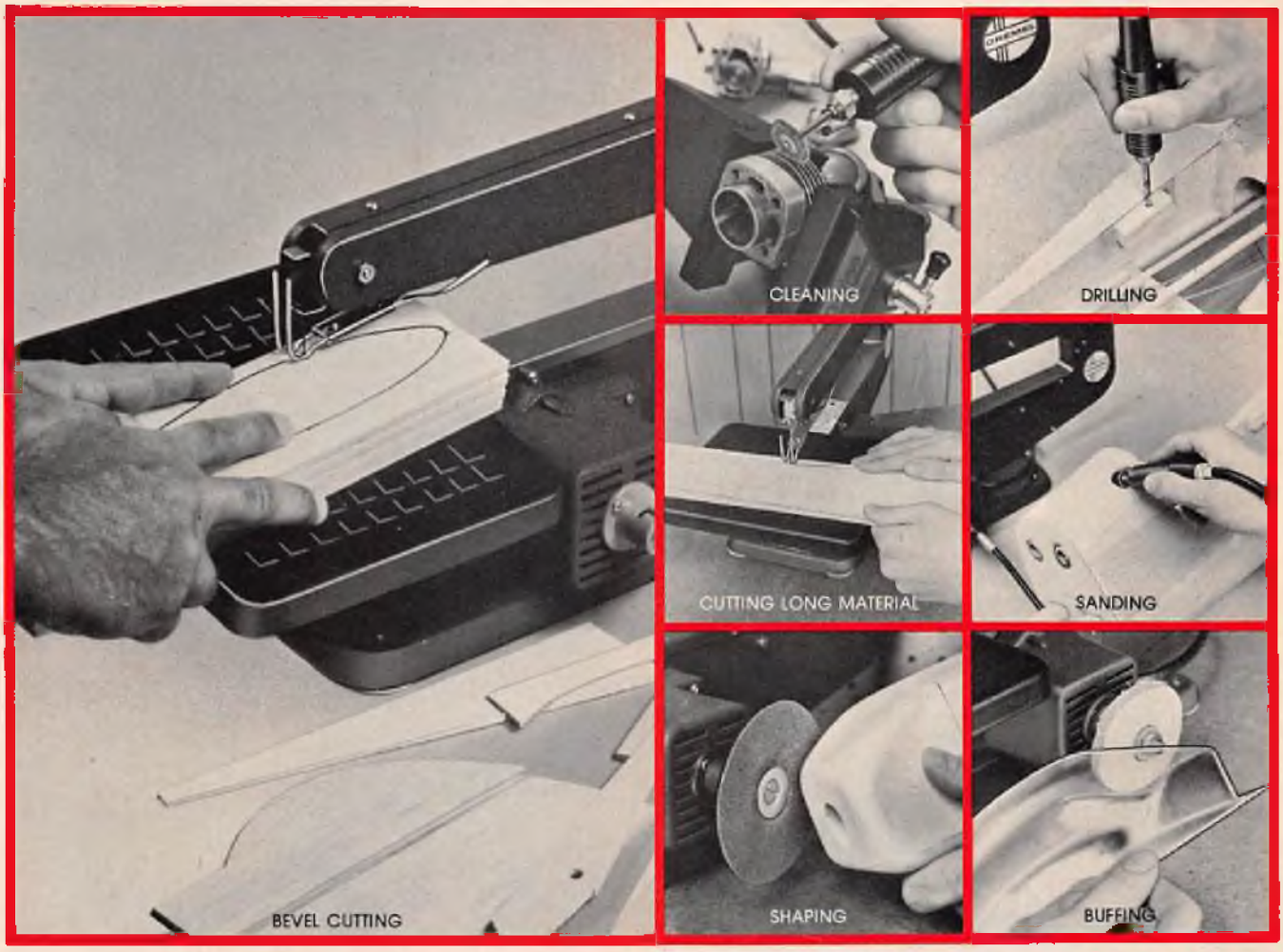

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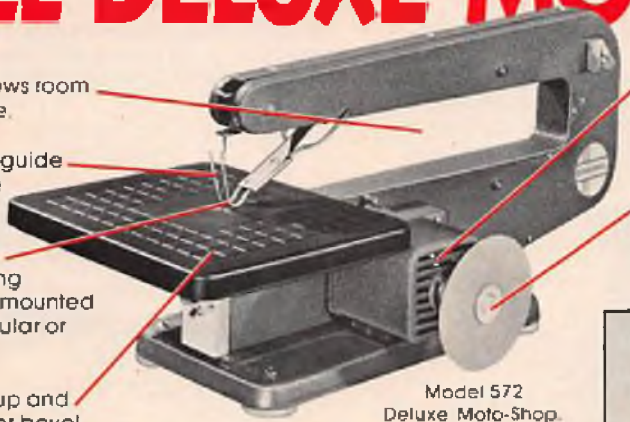

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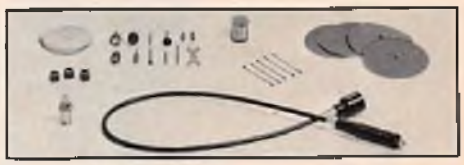

Dremel Deluxe Moto-Shop includes accessories for cutting, carving, grinding, polishing

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from page 22

have different requirements than airplanes. We had been running the 61 carbs on our Veco-McCoy engines, when Perry announced his new pump carbs and fuel pumps. At first, the thought of the pump carb with the fuel pump seemed to be a great idea for R/C cars too, but when we couldn't find a way to install a 61 size pump on a .19 size engine, the pump had to go. Everyone said there was no possible way we could

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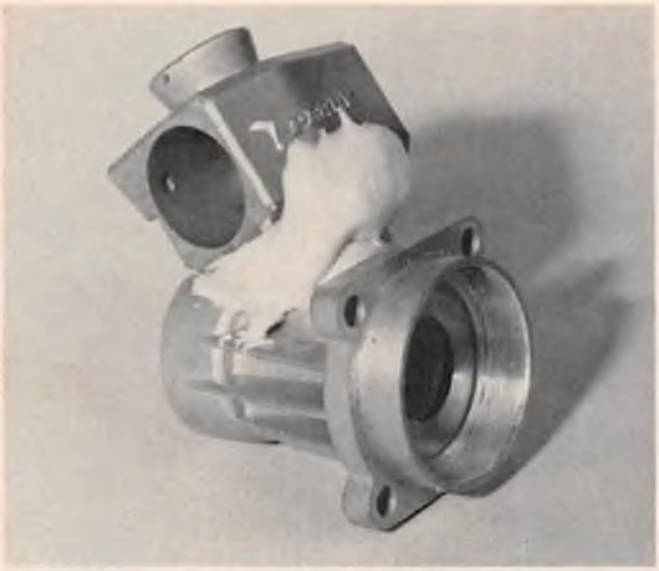
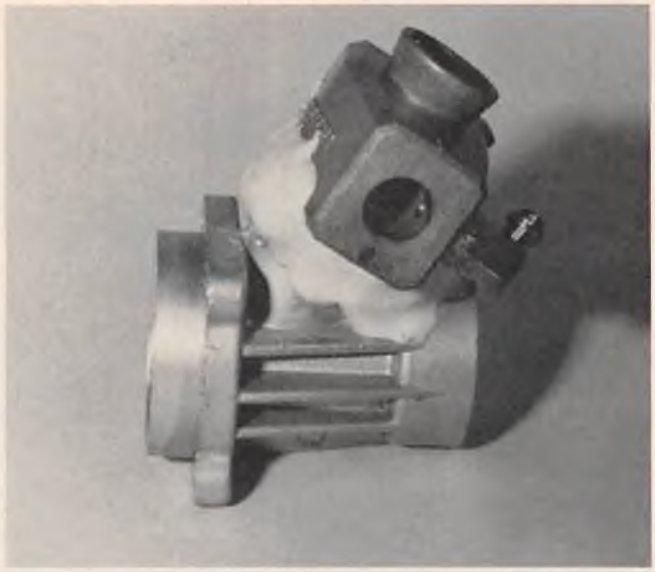


Most epoxies will work well, but the one I've found best for carbs is the Hysol brand, available from Associated, Part #SP30. This is a very thick paste type epoxy that will stay where you put it without running off. Before you slip the carb into the case, put a very thin coat of Dow or G.E. silicone cement on the round base only and slip it in. This makes a better air seal than epoxy, which might crack later causing an air leak and erratic idle. Then build up the epoxy, as shown, to securely attach the carb. You do not have to use the 2 screws to attach the carb.



Put the epoxy all the way around the base of the carb. It will harden overnight. You'll also notice the 90° fuel fitting, which is made by McCoy, Part #MC 25. This allows the fuel line to easily clear the flywheel. You can use silicone cement, or epoxy, if it's a loose fit.

When using the Perry Veco .61 pump carb in an RC car, this slot in the idle disc, must be widened to .012. This can be easily done with an X-Acto saw. Don't make the slot any longer than original. This step is not necessary with the standard Perry Veco .61 carb.

The new high speed needle adjustment screws on the Perry carbs now have a rubber gasket to keep the screw from backing out due to vibration. A slot can be cut in the outside end of the screw with a Dremel, so that it can be easily adjusted in the car with a small screwdriver.

This is the high speed fuel adjustment screw on the Perry carbs. The Veco .61 standard and pump carbs in cars should be initially set at 1½ turns open. This will put them on the rich side. Turning this screw clockwise leans down the high speed mixture and turning it counter clockwise richens the high speed mixture. Only move this about 1/32 of a turn at a time.

This is the low speed fuel adjustment mixture. First the idle air flow must be set so that the barrel is open approximately 1/32". This adjustment is made with the small black screw on top of the carb near the linkage. With the standard Veco .61 carb you can start with the slot in the idle disc centered to the mark on top of the carb. On the Veco .61 pump carb, in an RC car, the slot in the idle disc should be about .100 to the left of center. These are starting points only, but they will be close. When adjusting the idle disc, clockwise is lean, counter clockwise is to richen up the idle mixture only. Only move the idle disc .010 at a time. This will make a difference in the idle.

3 Ways to Operate 2 Channels

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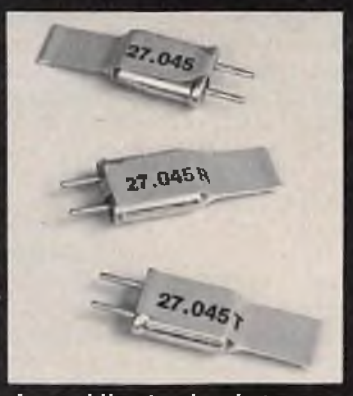

A special feature with the Sport Series 2-channel line is plug-in transmitter and receiver frequency crystals currently available on the 27 MHz band.

3 The KP-2A transmitter features the popular two stick configuration.

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KRAFT SYSTEMS, INC.

PIT STOP

from page 24/22

run the pump carb, with its .375 bore, on a .19 size engine. We did have a lean out problem in the mid-range, but that was rather easily solved. The slot in the idle disc on the pump carb is only .005 wide. This is wide enough when using a fuel pump but, without a fuel pump, it doesn't allow enough fuel through for part throttle operation in an R/C car. The car will lean out too much and lose power or the engine will die completely. The solution was simple. Widen the slot to .012. A simple way was also found to do this. An X-Acto saw blade, with the fine teeth, will cut the idle disc slot to .012! Instant horsepower!

Now this was all fine with the Veco-McCoy engines. The cars could handle this horsepower okay. Then K & B comes out with their new K & B .21. Naturally we install the pump carbs on them. Wow!! What a combination! Totally uncontrollable horsepower, except on the very best of tracks that have super traction. What's the solution? Some of the guys, such as Roger Curtis, the 1977 ROAR National Road Champion, went back to the 61 carb, so he could have more control over the available horsepower. Obviously it paid off for him. But the vast majority of guys stayed with the pump carbs, even on slippery tracks, and managed to go slower around the tracks, by being out of control everywhere. Why didn't they simply use part throttle, you ask? Good question. But they did use part throttle. The problem is, the pump carb's bore is so big, that even at what would be considered "part throttle", it would have an opening that would be as large in size as a wide open 40 size carb! This is like having an on-off switch for the carb. A totally uncontrollable situation, except on super high traction tracks.

Now we can have the best of both worlds. Perry's new 61 carb is based on the same identical plastic carb body as the pump carb, except the 61 carb does not have the two screws for the floating valve, which we do not use anyway.

Now we can build an engine and use either the 61 carb or the pump carb, without worrying whether or not we made the right choice. Let's say we decide to install the 61 carb, which would be the most logical decision as a first choice. This will give more than enough horsepower for 80% of the tracks, plus it will give the driver good control over the throttle response. Then when we run on a track with super traction, we can take the 61 carb brass barrel and idle disc out of the plastic body, and then install the pump carb brass barrel and idle disc. Make sure you always do this in matched sets. Don't mix the 61 carb barrel with the pump carb idle disc or vice versa. You'll either be too rich or too lean in the mid-range.

Of course not everyone will take advantage of this obvious tuning "speed" **secret**. At least half the racers will feel that anything that cuts down on horsepower, in any way, cannot be good for them. Even though it would help them to get "around the track" faster, on lower traction tracks. If it's at all slower on the straightaways, they're not the least interested. These racers are very easy to pick out on the track. They're the ones that are always sideways coming out of corners, overshooting corners and running out of track at the end of the straightaway. While the one who's winning his races appears to be a better driver. In reality, he has his car set up so it's easy for him to control and he's winning races. He's the one who's using this **"tuning secret"**.

Make sure you use a good paper type air filter, such as a Fram CG7 on your carb. Also, if you run on very dusty tracks, you can make a 7/8" diameter washer out of thin brass or steel and put it on the barrel threaded end, behind the black linkage. You can also put a piece of felt washer between the metal washer and the carb plastic body. This will keep any dirt from getting to the barrel.

Good luck in your racing. □

Hover

DON CHAPMAN

The Toledo Show this year had many new interesting happenings for the helicopter enthusiast. You know there will **never** be as many people flying helicopters as airplanes, just as there aren't as many helicopters as airplanes in the full sized world. There are several reasons for this but I won't go into that here because I'll be showing my prejudices and I realize that helicopters aren't everybody's thing. At a model show like the Toledo Show, 98% of the show is going to be covering things that have nothing to do with helicopters and that's just about the percentage of helicopter enthusiasts to the rest of the hobby — 98 to 2. At one of these shows one might think that there's not much new in helicopters when there really is. For its size, there are more new advancements than in any other division, but this is only recognized by the people who are in to helicopters.

It was just a few short years ago when helicopters were first flown at the Toledo Show. Everyone went to watch them fly because it was so different. Then it got to the point that the spectators had since learned that the fatality rate was high on a helicopter so now they went to watch, not the flying, but the crashes. To them it was a way of convincing themselves that helicopters were not for them because they crashed too often and you really couldn't do much with them anyway. But all of the dedicated people who have stayed with helicopters all these years flying and developing them, they are the winners.

This year, as always, there were helicopter demonstrations, but things were truly different. John Simone and Dieter Schluter flew their respective machines through loops, rolls, Split S's, Cuban Eights, and on and on, and really wowed the spectators. Here were helicopters that can do what their airplanes can do, aerobatics. Plus it hovers, flys sideways, backwards, and all the things that an airplane can't do and there were no crashes. Now that's real progress. How far has the rest of the hobby advanced in this past year? Not that far. But it's just getting started.

The point I'm trying to make I guess is that it might seem to some that there's not much new in helicopters because there isn't fifteen new helicopters coming out every year like all the new airplanes, boats, and car models you see at show time. But helicopters are definitely growing in popularity everyday and I still say if you want a challenge and you're looking for something in your hobby that's never going to get boring, it's time to get into helicopters. John Simone flew his Ridged Rotor Flybarless Revolution through heretofore only airplane aerobatics. Also, John demonstrated their new 4 Bladed System which, to me, shows promise of even greater things to come in the following year. John said it would probably be available later on this year.

Schluter flew his new machine, the Heli-Boy, also very aerobatic with even hovering loops and hovering rolls thrown in. What everyone was seeing was aerobatic helicopters. What I was seeing was technical advancements, and all this in just the last year. I can't wait to see what next year is going to bring. But keep in mind one big thing, everything begins and ends with a hover so you must learn to hover first.

★

This brings me up to helicopter contests. Should helicopter contests be airplane contests where we use helicopters instead of airplanes? Aerobatics are fine but let's fact it, helicopters can do more than just aerobatics, they also can fly in confined areas. That's one of the neatest things about flying an R/C helicopter is that you don't have to have a field to fly them in.

From the beginning, learning to control the machine is the object - - - you controlling the machine, not the machine controlling you - - - making the machine do something on purpose. Now that the technology has progressed to aerobatics, should we now only concentrate on loops, rolls, Cuban Eights and all the other airplane maneuvers for contest work? No, I don't think so. There is so much more to flying a helicopter than aerobatics. Sure it has a place at contests but I don't think that's what the contests should be built around. It should be built around all the difficult aspects of flying a helicopter. Not everyone who enters a radio control contest flys pattern airplanes. There's a variety of different contests. Here we have a machine that is so flexible in what it can do and the most ultimate contest work is based around aerobatics. That should only be a portion of the contest.

I've had guys tell me that they can do everything that can be done with a helicopter, but they are only thinking in terms of aerobatics. They can't hover from the nose, do a pilot walk around, fly through a gate with 1" rotor clearance, etc. But this precision flying is also difficult and is also a part of helicopter flying.

I get a lot of questions about what kind of fuel to run in a helicopter. Well I can tell you only my own personal ideas on the subject and I'm sure there are plenty of different viewpoints, but this is what I've found to work best. Use only 5% nitro - - - no more - - - and a synthetic oil (only 5% nitro because any more makes more heat than more power and more heat is one of the last things we want). If you feel you have to run more nitro to get the power you desire, better be thinking about going to another engine that makes more power to start with. Why synthetic oil over castor? For the simple reason that over the long run, the engine doesn't get all varnished up using synthetic. Sure castor will hold up under higher operating temperatures before it breaks down, but why is the engine running that hot to start with? Too much nitro? Engine not enough for the application? If the engine is running that hot that you have to run castor oil, you've got problems elsewhere and the castor is covering up the real problem and creating a problem of its own, varnish.

As far as engine wear is concerned, I've never had an engine wear out in anything under 75 gallons of fuel (and that's all in a helicopter) and that's also the least amount of time before it finally needed a new ring and cylinder. So if you can see my viewpoint, I see no need for castor oil and anything more than 5% nitro. Now I assume that you will be using top shelf fuel and not some trash that you're not really sure what's in it for nitro or what kind of oil and how much.

★

In a previous column, I went over how to adjust the needle valves on the helicopter engine, but for those who missed it, let's go through it again. First, make provisions to tie the machine down securely. It's nice, but not necessary, to have it elevated on a table or test stand, or whatever, but after you have it securely tied down, get the machine running and run it at least 3 or 4 minutes at half throttle or more. This is to get the

to page 162

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Cap'n Dicks Cockpit

BY DICK BRADFORD

Kelly Props

"Ladies and gentlemen, we're just leaving 39,000 feet in our descent for Chicago. Indianapolis is just off to our right. Please check to see that your seat belts are securely fastened just in case we should encounter some unexpected turbulence in our descent. Thank you."

I hung up the mike, reduced the EPR, and began the descent for O'Hare. It had been a nice flight from Miami, and I was looking forward to the Chicago layover. Al Kelly had invited me over to his shop in Western Springs, and would be waiting for me at the airport.

Al produces those 'Kelly Green' glass fiber props that are showing up regularly at the flying fields.

Al's home is about twenty minutes from O'Hare. During the drive, Al explained that his business has developed into a full time affair; and his plans are to soon expand.

"Right now I put out about 100 props a day," Kelly said. "If things jell for next year, my output will be 10,000. I can't make 'em fast enough."

"What are the advantages of a glass

Molds are first coated with automobile wax, then sprayed with a silicone release agent.

Al Kelly shows us one of his largest props – specially built for a military drone.

Resin (tinted 'Kelly Green') is carefully weighed - - - two part resin/hardener is mixed by weight, not volume.

Fiber strands are cut to length and layed in the female half of the mold.

Just a few of Kelly's many male/female molds – he produces these from steel filled epoxy.

Epoxy is added to Kelly's special 'fiber bath' – note the two raw fiber strands running into the bath.

Fiberglass cloth 'patches' are added at prop tips – to prevent logitudinal tip splintering – mold is then filled with raw epoxy.

The largest and smallest molds in the shop – military drone and 6/3.

The impregnated strands of fiber being pulled from the bottom of the 'fiber bath'.

Molds are clamped together and excess epoxy and air are 'squeezed' out.

Molds are placed in oven to cure.

A days production waiting, trimming and balancing – assembly time per prop is 15 min. – finishing time 7 minutes.

Dave Sears of Midwest Model Supply holding a special 'scimitar' prop.

Al Kelly in production.

10/6 fresh out of the mold.

Excess is trimmed – then smooth filed, and finally balanced (on larger props).

fiber prop?" I asked.

"Rigidity — my prop doesn't 'flutter' — and it remains stable in flight. Because of its weight, it improves throttling, and it's the strongest prop on the market. And, over grass it has a longer life (about 10 to 1) than wooden props."

"What sizes do you produce, and what do they cost?"

"6/3, 7/4, 7/5½, 8/7, 10/6, and 11/7, right now. Prices range from $1.98 to $11.75."

When we arrived at Kelly's home, I found a small but efficient production set-up in his basement.

"Let's make a couple of 10/6's."

Al went to work, and I got my camera. While the props were curing, Dave Sears of Midwest Model Supply dropped by (Midwest and A & L distribute Kelly props). Dave is an interesting guy - - - he really digs the hobby - - - business is truly pleasure to him. Dave told me about the Damo Swedish engine that Midwest is distributing.

"It's a 1.1 cu. in. four stroke, alternate firing, horizontally opposed two cylinder engine — with Perry carb. It's light and powerful — weighs just 19½ oz., and will turn a 16/6 Top Flite Super M at 8,000 rpm. Right now the Damo is produced with glow ignition, but plans are to

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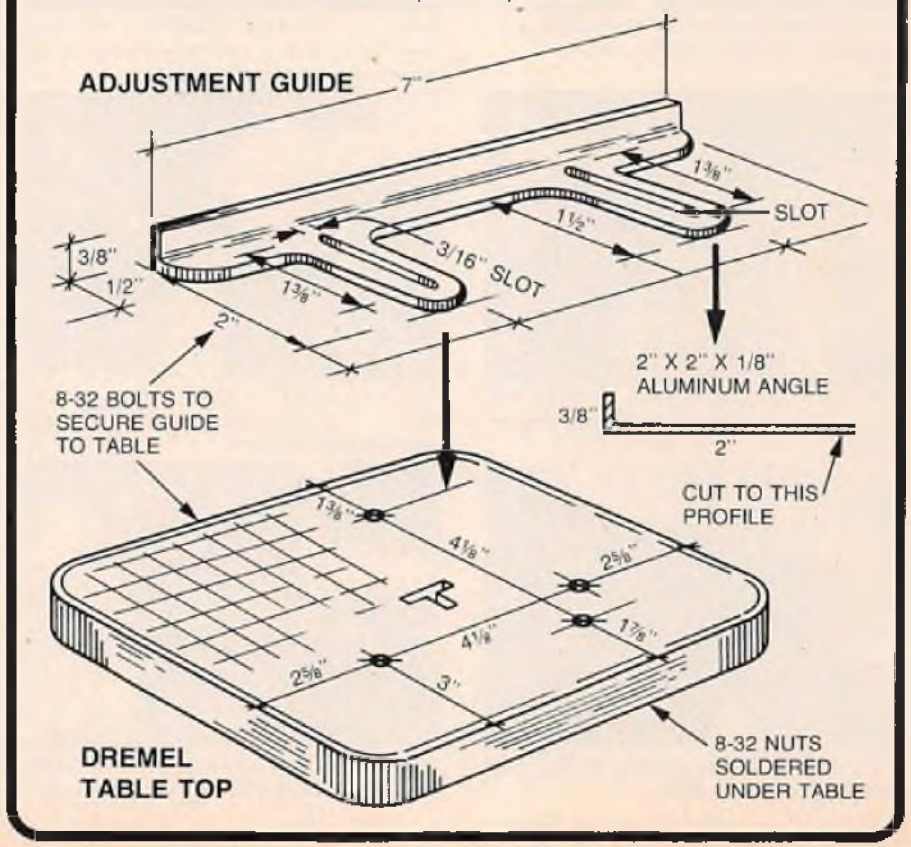
A DREMEL IMPROVEMENT

By Al Bristow

Reprinted from Forest City Flyers Newsletter, "The Fliar, London, Canada



TOP FLITE is REALLY BIG in props

As the world's really big name in props, Top Flite has the right size for every kind of flying. From free flight to today's really big R/C birds, each Top Flite prop is precision machined from only the finest straight grain, rock hard maple wood with a high luster fuel-proof finish. Expertly designed and accurately balanced to deliver maximum thrust, a Top Flite prop is the perfect companion for the plane you're now flying, as well as that newest design still on the workbench. Regardless of the diameter and pitch you choose, our rock hard maple not only reduces vibration, splintering, and nicking, but also allows you to tighten your prop securely.

Top Flite has a complete line of props for free flight, control line, slow and fast combat, speed, R/C Racing, R/C Sport Scale, R/C Scale, and R/C Pattern . . . ask for Super M Top Flite and Power Prop designs, Pylon, Speed and Nylon props.

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Introducing Large Diameter Props

16"	4
	6
18"	6
	8
	10
20"	6
	8
	10

TOP FLITE

Top Flite Models, Inc.
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Chicago, Illinois 60639

Working together several years ago in response to the need for a sturdy, predictable trainer that would do more than just fly big circles in the sky, Don Dewey and Joe Bridi hatched the well-known RCM Trainer .60. Since then, requests from R/C flyers stimulated the development of the RCM Trainer .40, RCM Trainer .20, and the RCM Trainer .10 which can be built in either a high or low wing configuration. Now, their RCM Trainer 5 makes its debut.

The 5 is intended to be a flying for fun schoolyard type R/C model airplane. While a radio using servos (especially the new tiny jobs) fits easiest in the design, offers the greatest flexibility in installation, and is usually lighter than a brick, a brick can be used with a simple modification we'll discuss later. For power, a Cox QRC .049 or Cox Tee Dee .051 with a fuel tank/engine mount is recommended.

PREPARATIONS

Begin by building yourself a kit. That means cutting the fuselage sides, ribs, bulkheads, rudder, nose blocks, cabin sides — which are slanted at the front and back — the elevator halves, and wing center tapered piece. Don't cut the wing center tapered piece to the wing contour. That's more easily done later when the wing panels are joined. Also cut out the fin. When you do so, note that the bottom edge of the fin extends down into the slot provided in the stab for a strong glue joint.

Incidentally, if you have only one set of plans, an easy way to do the job of cutting out these parts accurately and easily is to Xerox the parts of the plans needed for the parts. Cut out the parts from the Xerox copy, coat the back side with rubber cement, and stick them to the wood. After the parts are cut out, simply peel off the paper and rub off any excess adhesive residue. Easy.

To assure that all of the ribs are exactly the same size from front to back after they're cut out, pin all of the ribs together aligned at the spar cut-out. Sand the leading and trailing edge of the stack with a sanding block. Then, stack up the smaller ribs, pin them together and use your sanding block lightly to make the airfoil contour exactly the same on all of the ribs. Do the same with the larger ribs.

Final preparations include marking and drilling the pilot holes for the engine mount screws in bulkhead #1 and the holes for the NyRod pushrods in bulkhead #3. Also mark and cut the battery compartment access hole in bulkhead #2. Two ways of bending the landing gear wire are shown on the plans. While the version with the 90° bend at the center is recommended to provide a more sturdy mount, the alternative version may be used if the battery compartment access hole must be larger than the cut-out shown on the plans. Also cut the notch in the front edge of the rudder for the elevator hardwood piece. Cut the bottom of the front and back of the fin so it will fit into the slot provided in the stab. When cutting the bottom of the fin, note that the trailing edge of the fin should align with the trailing edge of the stab when properly installed.

If you're going to fly out of a grass or weed covered field, you may want to consider leaving the landing gear off and adding a 1/8" ply skid 1" wide on the bottom of the sheeted fuselage from the nose to the location of bulkhead #3 so the aircraft won't nose over when you touch down.

Bend the landing gear to the desired shape.

Building the Fuselage:

With the fuselage side view on the plans covered with plastic kitchen wrap, work over the plans to butt glue the cabin sides to the fuselage sides. Wipe off excess adhesive before it sets up. Mark the location of bulkheads #2 and #3 and the balsa stiffener aft of bulkhead #3 on the inside of both fuselage sides. Glue in the 1/8" x 1/4" balsa stiffener and the ply wing dowel plates on the inside of the fuselage sides. Then, after the adhesive has set up, you can remove the fuselage sides from your building board, drill the holes through the ply plates for the wing elastic hold-down dowels and the pushrod exit holes at the back end of the fuselage sides as shown on the plans.

Next you'll need to mount the landing gear wire to the front of bulkhead #2. Using the landing gear as a guide, drill the holes for the landing gear mounting wire and use non-stranded wire to tie it in place. Coat the landing gear and wire with 5-minute epoxy. Also coat the wire on the back side of the bulkhead as well.

Assemble the Fuselage:

With one fuselage side laying on your workbench, use 5-minute epoxy to glue bulkheads #1, #2, and #3 to that fuselage side. Because the landing gear is fixed to bulkhead #2, orient the fuselage side on your workbench so the landing gear wire hangs over the edge. Work very carefully to make certain that the bulkheads are perfectly aligned with the marks you made earlier on the fuselage side and are at 90° to it. This is critical to assure you will end up with a straight fuselage. Then, glue the other fuselage side to the upright bulkheads. Bulkhead #1 can be used to align the fuselage side at the nose. Use a carpenter's square to carefully align the fuselage sides at the wing saddle and at the tail. Using the plans as a guide, sand the wedge shaped tail block as necessary and glue it only to the bottom fuselage side.

After the adhesive has had plenty of time to set up, remove the fuselage from your building board. Re-orient the plans on your workbench so you will be able to pin the fuselage to the top view with the

RCM 5 TRAINER

Designed By: Joe Bridi

TYPE AIRCRAFT
1/2A Fun Fly
WINGSPAN
36¾ Inches
WING CHORD
7⅛ Inches
TOTAL WING AREA
255 Square Inches
WING LOCATION
High Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
1¼ Inches
O.A. FUSELAGE LENGTH
28 Inches
RADIO COMPARTMENT AREA
(L) 9¼" X (W) 2" X (H) 2"
STABILIZER SPAN
12 Inches
STABILIZER CHORD (incl. elev.)
5⅛ Inches
STABILIZER AREA
58½ Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
3⅝ Inches
VERTICAL FIN WIDTH (incl. rudder)
4 Inches (Avg.)
REC. ENGINE SIZE
.049-.051 cu. in.
FUEL TANK SIZE
Tank Mount
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Rudder & Elevator
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa
Empennage	Balsa
Weight Ready-To-Fly	20 Ounces
Wing Loading	11.3 oz./sq. ft.

RCM TRAINER 5

By Joe Bridi

TEXT AND PHOTOS
BY BEN STRASSER

It finally happened, the arrival of the new born Trainer 5 from the long line of well-known RCM Trainers.

landing gear hanging over the edge. Pin the fuselage to the plans top view and glue the fuselage sides together at the tail. Then, add the 1/16" top sheeting cross grain and the front and back wing elastic hold-down dowels. Prepare the custom fit wedge shaped pieces that are to be installed at the top of the front and rear of the cabin. Glue them in place. Add the 1/16" sheeting to the front and rear of the cabin.

With the fuselage still pinned in place, add the triangular stock along the fuselage sides behind bulkheads #1 and #2. If you are going to use a brick receiver/servo configuration, the triangular stock shown on the inside of the fuselage sides at the wing saddle is to be glued to the outside — so there will be enough room for the unit. Glue the wing saddle triangular stock in place. If you are putting the triangular stock on the outside of the fuselage sides, add a piece of triangular stock along the sides of bulkhead #3 for additional strength. Add the triangular stock stiffeners on the outside of the fuselage sides in the area under the stab. Prepare and install the balsa battery compartment top piece.

Remove the fuselage from your building board and turn it upside down. Block up the tail. Add the triangular stock along the bottom back of bulkheads #1 and #2 and along the bottom edge of the fuselage sides between these bulkheads. Install the outer NyRod pushrod tubes and glue them in place to the bulkhead and to the fuselage side at their exit. Wrap and tie the pushrods together at the point at which they cross, and coat the thread with some epoxy.

Add the bottom sheeting, cross grain. The sheeting will have to be notched out a little at the location of the landing gear. Drill the hole for the tail skid. Add the 3/8" balsa nose blocks. Relieve the top of bulkheads #2 and #3 in a gentle "V" shape to fit the wing dihedral as shown on the plans.

Building the Stab & Elevator:

Build the stab over the kitchen wrap covered plans. Use the fin as a spacer when gluing the two center blocks in place. Lay the elevator halves up to the back of the stab when gluing them to the hardwood connector piece. Use a piece of kitchen wrap between the elevator and stab so you won't glue the elevator and stab together.

Building the Wing:

First, the right wing panel: Begin by covering the plans with some kitchen wrap and pin down the spar. Glue the larger ribs #3-#7 in place onto the spar. Add the leading and trailing edge. Use one of the smaller ribs as a spacer to get the proper spar to leading edge distance at the location of ribs #1 and #2 and pin the leading edge down. Do the same for the trailing edge. Add the bottom center section sheeting between the leading edge and spar and between the spar and the trailing edge. Add the smaller ribs #1 and #2 and the top sheeting. Trim the leading and trailing edge flush with the tip rib. Do the same with the spar and add the triangular stock wing tip. When sanded to the rib contour, the tip will assume the desired top view.

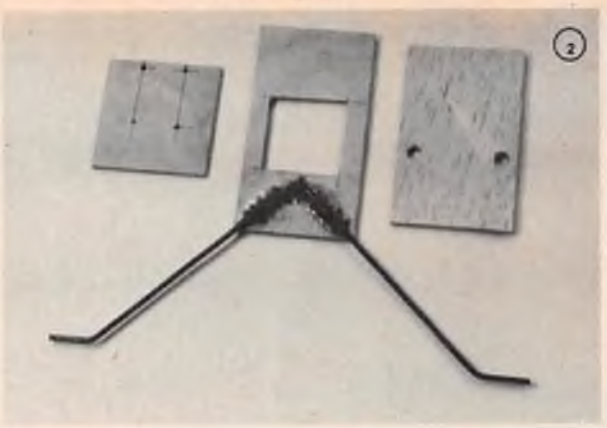
After the right wing panel has had overnight to set up, remove it from your building board and sand the leading edge and tip. Do not feather the wing trailing edge; just smooth off the sharp corners.

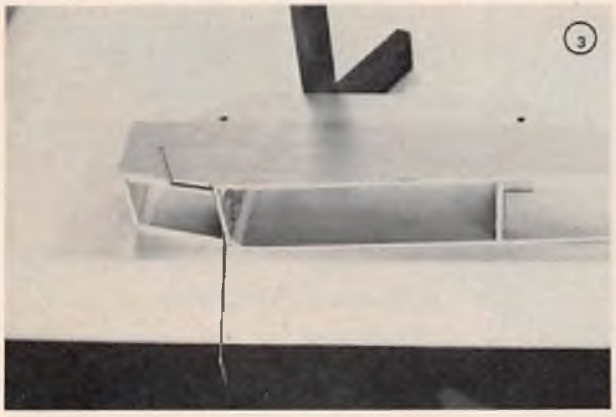
To build the left wing panel, turn the plans over and wipe them with an oily rag in the area of the wing panel. That should make the paper transparent so you can see the wing plans through the paper. With the plans pinned down, cover them with kitchen wrap and build the left wing panel in the same way the right wing panel was built.

Prepare to join the wing panels by cutting the spar, leading and trailing edge on each wing planel flush with the root rib. Glue the wedge shaped wing center piece to the root rib of one wing panel and sand it to the wing contour. Glue the wing panels together using 5-minute epoxy with one wing panel flat on your building board and the tip of the other blocked up 2½" for the proper dihedral. After the adhesive has had plenty of time to set-up, reinforce the wing center section with Celastic, glass cloth and epoxy or resin. The width of the center section reinforcement should extend 1/2" beyond the fuselage sides to offer protection from the elastic bands.

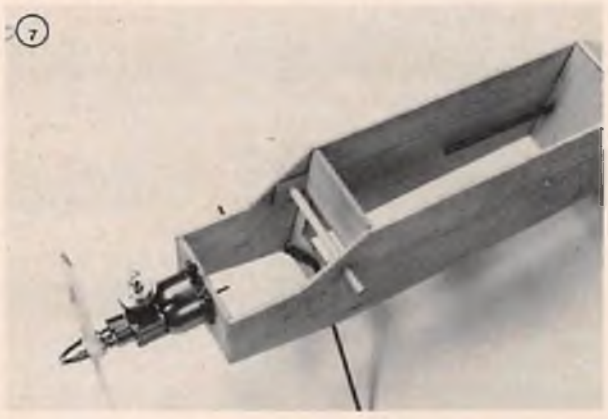
Finishing:

Finish sand the fuselage, stab, fin,



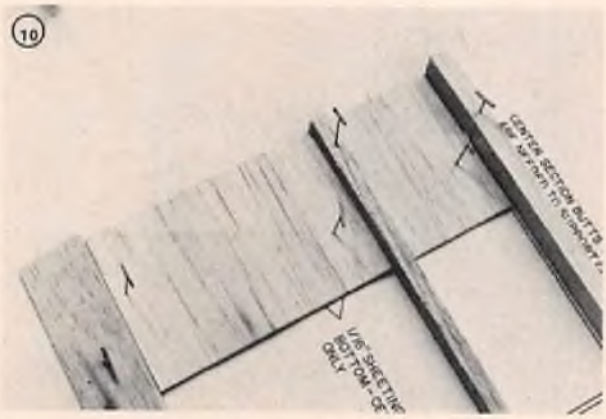


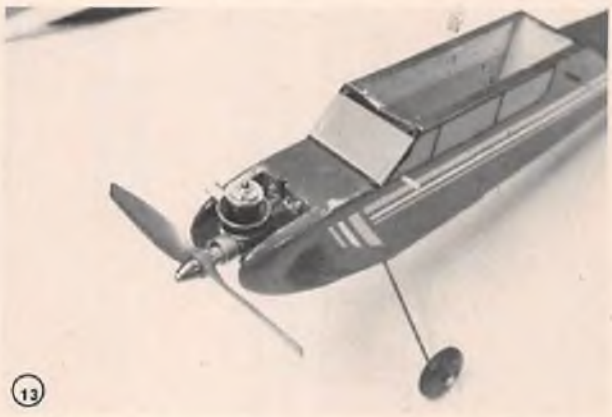
(1) Prepared fuselage side marked for bulkheads and stiffner. (2) Bulkheads prepared for installation. (3) Using a carpenter's square to align the fuselage sides. (4) Top sheeting added, cross grain. (5) Triangle stock added behind bulkheads #1 and #2. (6) Outer pushrod tubing installed so they are crossed at the back of the fuselage. (7) Nose detail.

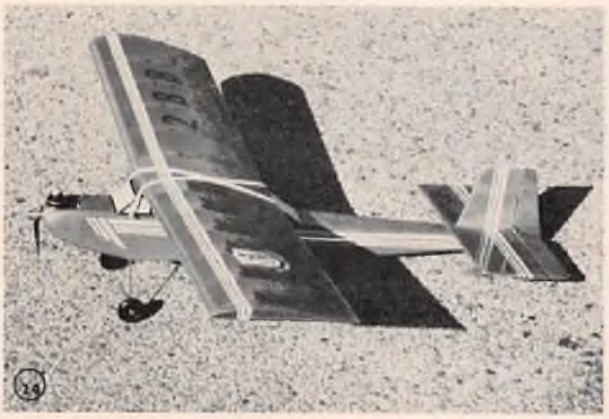


rudder, elevator, and wing as necessary. Cover the fuselage, wing and tail pieces. Remove the covering in the areas where the stab and fin will glue to the fuselage. Use 5-minute epoxy to glue these parts in place, carefully checking their alignment as you do so. Hinge the elevator and rudder and install the control horns. Check the operation of your servos as you install the horns to make certain which NyRod end goes to which control surface so the control horns can be properly aligned.

Paint the front of bulkhead #1 and the inside of the balsa nose blocks with resin or fuel proofing dope to prevent fuel penetration. Install your R/C equipment and engine, control horns, tail skid, and wheels. The battery pack and receiver should be installed in a nest of foam rubber to protect them from vibration. Check the C.G. as you install the R/C equipment. It is better to move the battery, receivers, or servos forward or







(8) Prepared fin and rudder showing notches cut in the fin and rudder. (9) Built stab. Note the slot for the fin between the center blocks. (10) Adding bottom center section sheeting between the leading edge, spar, and trailing edge. (11) Completed wing panel. (12) Wing leading edge and tip sanded to the rib contour. (13) Completed fuselage showing the top of bulkheads #2 and #3 relieved for the wing dihedral. (14) The completed RCM T 5.

back to achieve the proper C.G., than to have to add weight.

Check your wing, stab, elevator, fin, and rudder for warps. Reheat the plastic film covering as necessary and straighten out any warps you discover.

First Flights:

With the fuel tank empty, recheck the C.G. Perform the radio distance check as recommended by the manufacturer. Check the operation of your control surfaces; pushing the elevator control stick forward should give you down elevator, pulling it back should give up elevator. Pushing the rudder control stick to the right should cause the rudder to move to the right, and vise versa. Recheck your hinging job by tugging slightly on the elevator and rudder. Recheck the engine mounting, servo mounting, and servo arm screws to make certain that they are snug. Start up the engine once or twice so you'll know

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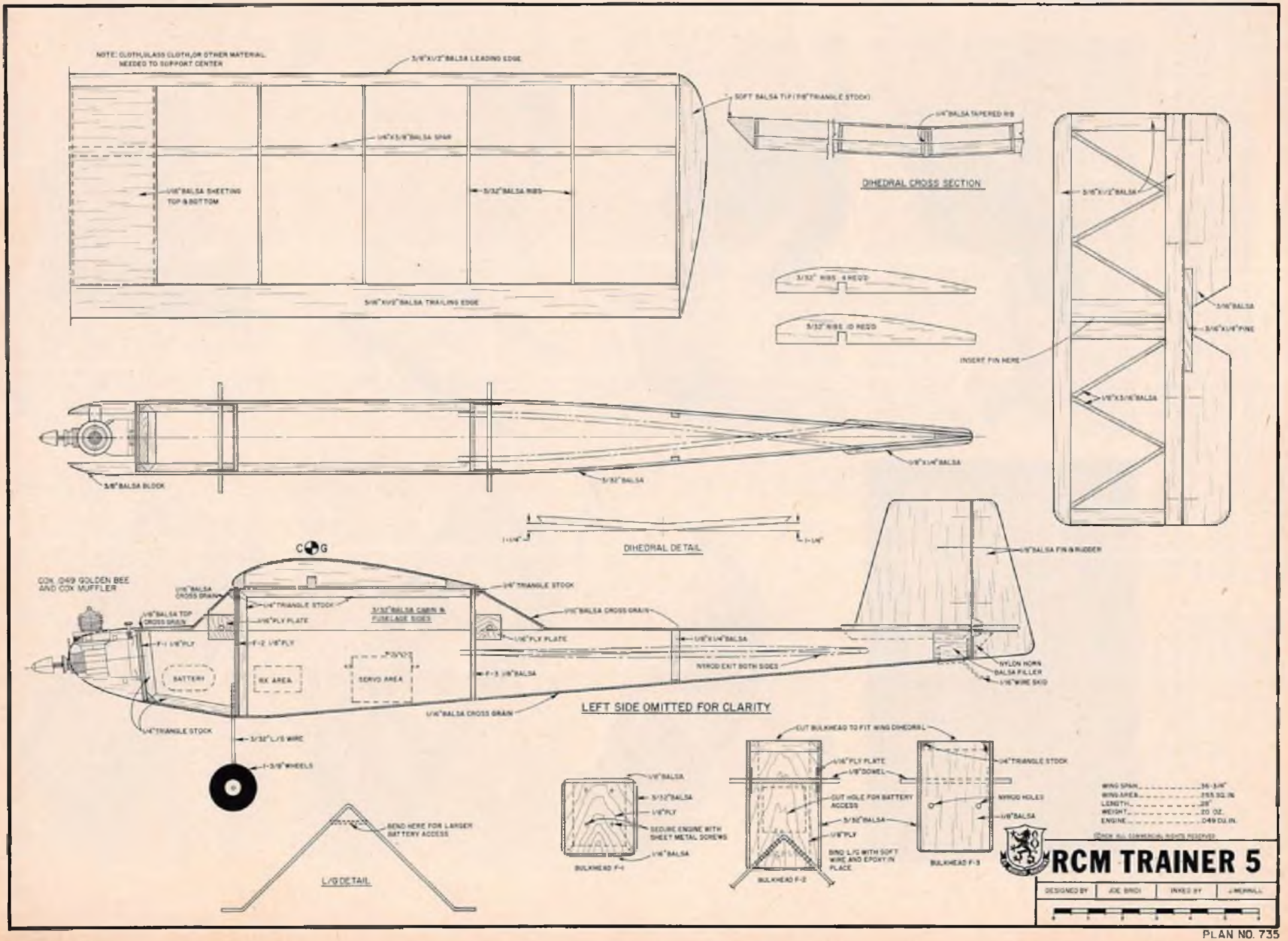

PLAN NO. 735

RADIO SPECS

KRAFT SYSTEMS
KP-3C
3 CHANNEL R/C SYSTEM

MARKETED BY

KRAFT SYSTEMS, INC.
450 W. CALIFORNIA AVE.
VISTA, CALIF. 92083

FEATURES

TRANSMITTER

- Number of Channels: Three.
- Case Material: Vinyl clad aluminum.
- Type Gimbals: One convertible self-neutralizing left hand control stick, one 2-axis precision open gimbal stick.
- Type Pots: Wire wound.
- Power Supply: 9.6 volt Nicad batteries, rechargeable.
- Type Meter: Monitors RF output and gives relative indication of Tx performance.
- Modes available: Single stick.
- Frequencies Available: All 53, 27, 72 MHz.
- Weight: 1 lb., 15 oz. (0.88 Kg.).
- Size: 6.4" x 6" x 2".
- Unique Features: Plug in RF section easily accessible by removing the Tx's back.

RECEIVER

- Case Material: Molded plastic.
- Size: 2.78" x 1.36" x .83" (7.06 x 3.45 x 2.11 cm).
- Weight : 1.7 oz. (48 g).
- Type Decoder: Low power complementary mos.
- Type Front End: Double tuned.

SERVOS

- Case Material: Molded plastic.
- Size: KPS-11: 2.04" x 1.43" x .90"; KPS-12: 1.49" x 1.41" x .73".
- Weight: KPS-11: 1.9 os (54 g); KPS-12: 1.2 oz (34 g).
- Output: KPS-11: .5 seconds for .625" linear travel; KPS-12: 0.5 seconds for 100° rotary travel.
- Output Controls: Rotary wheel, rotary arm, 2 linear racks. (KPS-12): 1 rotary arm or wheel.
- Type Amplifier: Custom I.C. amplifier.
- Motor Size: 10 ohm
- Servos: As standard: KPS-11, -12, -14II, -15II, also available are the optional KPS-15HII, KPS-16, and KPS-18 miniature.

SYSTEM

- Airborne Power: KB-4E 550 mah Nicad battery.
- Type Connector: Standard Kraft connector.
- Type Charger: Wall transformer KBC-B.
- Servo Trays: (2) 1 aileron and 1 "2 side by side, 1 across."
- Shipping Container: Foam box.
- Service Available: Factory or any of the world-wide network of service stations authorized to repair Kraft radios.

Practicing the habit of pointing your transmitter in the direction your ship is flying is the best method to maintain your orientation with the path of flight — the transmitter pointing technique is shown in the photos below.

FLIGHT ASSURANCE TECHNIQUES

By Bill Evans

Take-off, heading away.

Ship traveling to the left.

Ship traveling to the right.

Landing approach, coming at you.

Ship passing pilot just before touch down.

Surely you have noticed that there seems to be certain flyers at your field who practice repeated flying success. From take-off to landing some individuals continually "have it all together." Their kind of ability is not a matter of luck, it's a result of experience and know-how developed over a number years; learned by personal experience and from others.

Though much has been published on the subject of building, flying and maintaining R/C aircraft, certain facts and helpful techniques bear repeating. The purpose of this article is to provide R/C enthusiasts with a list of key pre-flight checks and aids that can help obliviate flight disappointments and crashes and improve your record of flight success.

Flight assurance is dependent on equipment and piloting skills. Though a sharp pilot can overcome some equipment failures, all bets are off when the radio quits or when a part of the ship parts company from the airframe.

Let's first deal with the subject of possible equipment problems (radio and aircraft):

Radio Failure: Since the radio is the part of his equipment that he knows least about, most flyers are quick to claim radio failure as the cause of a crash. I'm sure of this because unofficial statistics show reported radio failures in 137% of crashes.

Let's examine the real possibilities of radio problems: range, battery failure, stripped servo gears, and burned out servo motors, are problems you can most easily identify. A radio that just doesn't work (seemingly dead) or one that operates intermittently must be diagnosed and repaired by a qualified radio technician.

Range: Though short reception distance is many times a result of poor tuning or a bad crystal (resulting from a crash) you can spot this problem before you fly.

Range Check: Range check your radio per manufacturer's instructions. If it doesn't range check have it checked by a serviceman.

Battery Failure: The most common cause of radio difficulty. Though low voltage batteries can cause short reception the first indicator will be a slowing of the servo movement; then they stop usually locked in full or near full control surface limit. Charge **all** your batteries per manufacturer's instructions before each day of flying; and, if at all possible, get and use a battery tester before each flight. A battery tester is a small price to pay to save your ship.

Periodic cycling of fully charged batteries can warn you of weak or bad cells. Shown is the Power Pacer which measures battery capacity in milliamps.

Checking battery voltage under load with a battery tester, S & O shown, can warn you of low battery voltage.

Servo Gears: Stripped servo gears cause a heavy drain on flight batteries. As the battery drains, the voltage will drop to a point where the servo will lock. Stripped gears make a rasping noise that you can detect. If you hear this sound, or suspect it, have **all** gears replaced. Replacing only the bad gear will not solve the problem.

Servo Motor: A servo motor, like any other electric motor, can stop at any time. If the servo motor fails while your ship is on the ground consider yourself fortunate. You can help to avoid a servo motor problem by periodically having your servos serviced. Have your pots cleaned and slow run the servo on a servo checker. Slow running the servo will help spot armature problems.

Radio General: Crashes and mis-handling of equipment can result in; broken crystals, loose connector wires, stretched and broken antenna wires, intermittent battery packs and other component failure. These can best be detected and corrected by your serviceman.

Your chances of avoiding radio failure are greatly improved if you:

- Do range check your radio per manufacturer's instructions prior to flight.
- Do charge your batteries per manufacturer's instructions.
- Do use a battery tester before each flight.
- Periodically cycle your batteries.
- Do check your servos for stripped gear noise and slow movement.
- Do have your equipment serviced periodically and especially after a crash.
- Don't attempt flight unless the above conditions are met.

Your radio is a valuable piece of equipment that will give many years of service if properly maintained.

Interference: This dread is seemingly ever present, a common radio failure complaint. Though real interference most times is difficult to prove. Usually the presence of interference is noticeable by abnormal flight characteristics. Since the receiver is confused by more than one signal, servos jitter and flight becomes erratic. If this happens when flying a glider and you're high enough, try turning off your transmitter and see if the erratic flight conditions stabilize. If it does, you may be experiencing a temporary interference signal that may cease; is so, later turn on and land as soon as possible. Since, at this time, there is no sure way to eliminate problems of interference the best you can hope to do is to detect its presence before you take-off possibly through the use of a frequency monitoring device.

Aircraft Equipment Failure: Most aircraft problems or failures become apparent on the first flight though, some occur as a result of wear and tear. At the top of the list are balance, poorly installed control surfaces, poorly aligned thrust, mis-aligned wing and tail incidence, wing collapse or separation and flutter.

Incorrect Installation: Incorrect installation is a major cause for first flight blues. Inversely installed control surfaces (up for down, left for right) is almost always disasterous. Check and recheck your control surfaces for correct movement. Stand behind your aircraft with transmitter and receiver on and move each control stick and see that the control response is correct. Make sure that pulling on the elevator control stick results with elevator going up, left aileron stick results in the left aileron going up, and that the right aileron goes down!

Applying finger pressure on central surfaces to check for excess play.

Pushrods are very important and **must** be rigid and free of binding. With the radio on, push on the elevator, rudder and ailerons with your fingers to check for excessive play. If you can easily push the surfaces 1/4" in either direction, they're too soft. If so, add bracing or replace the pushrod with a more firm material.

Placement of control horns are important. The clevis holes in the control horns should be on the hinge line. If they are not you will have differential controls - - - that is, more up than down, or more left than right.

Ballance: Check and recheck the C.G. location. Make sure it's per plan (this is most important). If there is any doubt and no experienced help is available, a little nose heavy is much better than tail heavy.

Wing Fastening: If you attach wings using rubber bands make sure they are new. In most cases 6 rubber bands will do though, large ships will take 8 or 10.

If you use wing bolts, check them periodically for tightness. Check the threads and holding blocks for rigidity.

Most wings will not fracture if built per plans. Don't skimp on materials or modify wing structure. Good advice is to build per plans. If you experience a hard landing, check the structure for fractures. Repair as necessary.

Flutter: Control surface flutter is usually caused by excessive slop in linkages or hinges. As above, check for excessive control surface play and, where practical, use at least 4 hinges per surface. Again make hinge installation per plans.

Make certain that servos are screwed down per manufacturer's instructions and that the servo arm screw is snug and in place.

Reccomended Pilot Techniques

Once you become familiar with the function of the controls, piloting is a matter of practice and overcoming the orientation (wondering which way its going) problem. This is solvable. Even the accomplished full sized aircraft pilot has orientation to overcome. I've seen seasoned airline pilots experience orientation difficulty when first making the transition to R/C.

Control Functions

Let's begin with rudder. Rudder control produces yaw which pushes the nose down and to the right or left. Left rudder control pushes the nose down and to the left. Right rudder pushes the nose down and to the right. At this point let it suffice to say that flight control can be maintained (for many aircraft) with only rudder control.

Elevator control produces pitch. Pull back on the elevator stick and the nose comes up, push forward and the nose is pushed down.

Most aircraft can be controlled very smoothly with elevator and rudder controls. Turns are made by pushing the rudder control stick a little to the left (or right) then a bit of pull on the elevator control stick is applied to pull the nose up which flattens out the turn.

Aileron control delivers roll. Roll position is one wing tip up, the other down. Left aileron control pushes the left wing tip down and the right wing up. Right aileron control pushes the right wing tip down and left tip up.

Turns using aileron are made much the same as rudder turns except that a bit more elevator is used. To make a right aileron turn, apply right pressure on the aileron control stick; as the wing comes to a near vertical position pull up elevator; as the ship turns let the stick(s) return to neutral; turn completed.

After some practice and confidence you will not think terms of left, right, up or down, it will become as automatic as driving a car. Your eyes will send the correct pressure message to your thumbs.

Overcoming Orientation

If it were possible to stay behind the aircraft at all times, orientation would not be much of a problem, unfortunately the ship can turn and reverse course. So, sometimes it's moving to your left or right or coming at you as well as going away. You can measurably help overcome the orientation problem by pointing the transmitter in the direction of the aircraft heading. When the ship is going away from you, point the transmitter at the

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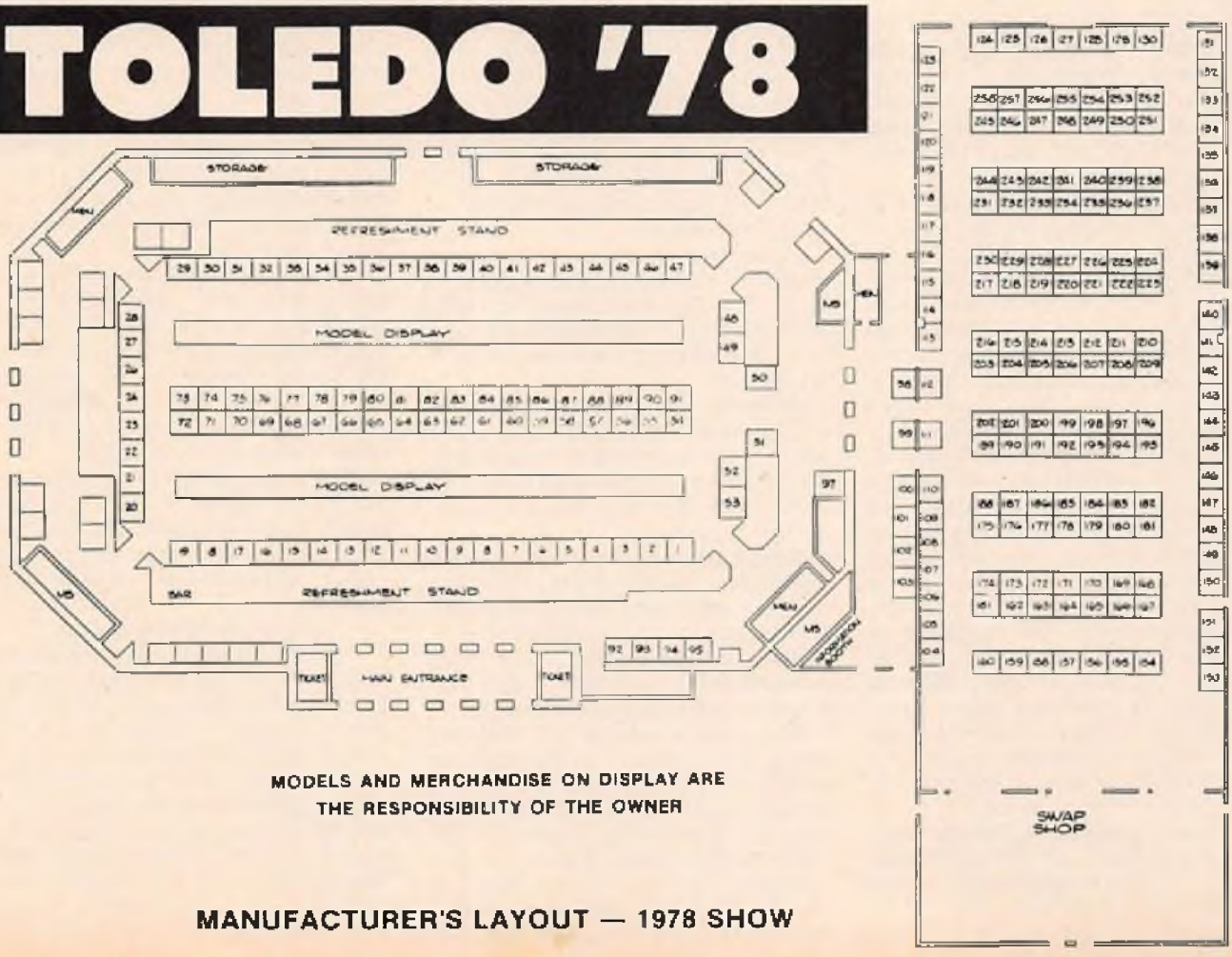
TOLEDO '78



MODELS AND MERCHANDISE ON DISPLAY ARE
THE RESPONSIBILITY OF THE OWNER

MANUFACTURER'S LAYOUT — 1978 SHOW

The 24th Annual R/C Exhibition

By Bernie Murphy

Once more — they've done it again! After twenty four years, it begins to look like the annual R/C shindig in Toledo, Ohio, is becoming a habit with the Toledo Weak Signals R/C Club. This group, spurred on by veteran co-directors Bob Hisey and Don Belote, have once again produced another edition of "The Greatest R/C Show on Earth."

Each year, the Weak Signals produce their annual R/C Exposition. This years event, number twenty four, was held at the Toledo Sports Arena, in downtown Toledo, Ohio, on April 7, 8 and 9. Over 160 exhibits were formally listed in the program, with probably another 30-40 being accommodated at the last minute. Each exhibit is staffed by experts involved with the products displayed. In many cases, the owner, or name behind the product, was on hand.

The Toledo Exposition began as a winter's end get together, involving a few local clubs. The idea was to bring and show the latest creations, born over the cold winter. This facet of the Exposition has remained basically unchanged — except that the display of models has increased to uncountable numbers, and the perfection in workmanship has become so superb that in many cases it is unbelievable. The scale models have become so exacting in detail that they are truly miniatures of the original ship.

The finishes — like gleaming patterned mirrors! This year's display models included a sizable growth in the number of boat entries, many of them beautiful beyond description.

Being turned loose in the Toledo Sports Arena during the R/C Exposition, is about the same as turning a five year old child loose in the World's Largest Toy Store! If it's R/C, you can bet it's here somewhere. There are models and kits of every type and description. Radios, engines and accessories for every purpose. It would be nearly impossible to attend the Toledo Show without becoming intimately involved with it. Toledo is reality, it is imagination, a dream come true. Few RC'ers leave without taking with them new plans and ideas for the future.

The coveted Best of Show Award, which RCM sponsors each year, was won by Bill Basler with a modified Bridi Dirty Birdy which he named "The Wizard". Bill, whose home is in Cedar Rapids, Iowa, used three different acrylic lacquers in finishing his ship, and a combination of over 50 different colors! A spectacular finish, a pleasing combination of unusual colors, combined with an intricate series of hand painted and air-brushed murals created an outstanding effect. Bill's Wizard also took top honors in the Best Finish category. The two trophies were nearly as large as Bill — who, incidentally, is only 17 years old!! Where to from here?

The Toledo Expo is used by some exhibitors as an opportunity to observe public reaction to their new offerings, or possible new products. On more than one occasion, an intended new product has been cancelled after a less than enthusiastic reception. Some items never reach the dealer's shelves as a result. Here, you can talk directly to the manufacturer, face to face. Be it a compliment, or a gripe, most welcome the opportunity to be of assistance. A floor plan, and list of exhibitors, has been included in an effort to convey, to some small degree, the size of the Weak Signals Exposition.

We have not attempted to print a couple hundred tiny photos of each and every display; since they are so numerous, they would of necessity be so small as to serve no purpose. Besides, that space can be better utilized with a "how to" or a construction article anyway.

The fantastic "Wizard" by Bill Basler (age 17) takes Best of Show Award

Listing of Manufacturers Attending and Displaying at the 1978 R/C Exposition

number is corresponding booth in alphabetical order

50	Academy of Model Aeronautics
109-110	Ace Radio Control, Inc.
239	Aero Composites/Master Climb Prod.
166	Aerotrend Products
8-10	Airtronics
108	A-Justo-Jig Co.
257	American Model Yachting Ass'n
26-28	American R/C Helicopters, Inc.
66-67	Andrews Aircraft Model Co., Inc.
16-19	Aristocraft Distinctive Miniatures
114-115	Astro Flight, Inc.
224	Baca Products
230	B & D Enterprises
61	Bavarian Precision Products Co.
159-160	Big Art's Models
178	Bill's Miniature Engines
196-197	Bob Holman Plans
247	BoLink Industries
40-43	Bridi Hobby Enterprises
139	Bryan Aircraft, Inc.
175-176	Bud Nosen Models, Inc.
86-87	Cannon Electronics, Inc.
62-63	Carl Goldberg Models, Inc.
142-143	Carrera Modell Technik
75	Challenge Publications, Inc.
256	Chevron Boat Co.
101-102	Confederate Air Force
140-141	Concept Models, Inc.
66	Coverite
8-10	Cox Hobbies
46-49	Craft-Air
235	Custom Control
138	Custom Model Products
116	CYT-4 Industries
167	DA Enterprises
58	D & B Model Aircraft
85	Dave Platt Models
150	Davis Diesel Development, Inc.
186-188	DuBro Products, Inc.
258	3 D Models
124-125	Dumas Products, Inc.
128	Dial-A-Prop
111	D. I. C. E., Inc.
156	DaCa Model Products
157-158	Eastcraft Specialty Products, Inc.
233	Easybuilt Models
80-81	Edson Enterprises, Inc.
70-72	E. K. Products, Inc
179	Emerson Electric-Fusite Division
213-214	E. W. H. Specialties, Inc.
112	Fliteglas Models
32	Flying Models Magazine
88	Flyline Models, Inc.
76	Fox Mfg. Co.
189-190, 201-202	Futaba Industries, USA
117	Cabletronix - Economy Plus
185	Gas Model Products
122	G and M Models
6	Golden Age Publications
208-209	Gene Thomas/Classic Models
169-170	General Electric Company
52-53	House of Balsa
148	Harry Higley & Sons, Inc.
180-181	Heath Company
153	Herb's Model Motors
144	Hi Flite Model Products
238	High Point Products
168	The Hobby Market
44	Hobbypoxy Products
104-107	Hobby Shack
129	Hughey Boats
206	Idea Development, Inc.
123	I. M. P. B. A.
222-223	Indy R/C Sales Inc.
182	J & Z Products
225	J & M Glascraft Co.
221	J M D Fuel Labs, Inc.
215-216	Johnnie Casburn Mfg. Co.
33-34	K & B Mfg. Co.
226	Karoden Hobby Products
22	K & S Engineering
212	Kelly Products, Inc.
1-4	Kraft Systems, Inc.
161-162	Litco Systems
177	MAC's Products
113	Master Kit
234	Michigan Hobby Hanger
236-237	Micro-X Products
191	Mid-Am Distributors, Inc.
20-21	Midwest Products Co.
218-219	Miniature Aircraft Supply, Inc.
118	Mr. G's Products & Supply
97	Model Aeronautic Ass'n of Canada
29	Model Builder Magazine
54-56, 89-91	Model Rectifier Corporation
23-24	Midwest Model Supply Co.
64	Millcott Corporation
39	Model Aeronautical Press
152	Model Engine Collector's Ass'n
199-200	Model Engineering of Norwalk, Inc.
254	North American Model Boating Ass'n
82	North American Model Enterprises
69	Northeast Engineering
99	NICO Engraving
119-120	Octura Models, Inc.
165	Ohio Superstar Model Products
173-174	Pactra Industries, Inc.
130	Performance Model Parts, Inc.
246	Parma International, Inc.
36	Paerless Corporation
134-135	Pica Products
145	Pierce Arrow Co.
126	Polaris Products, Inc.
194-195	Prather Products
229	Pro-Line Electronics, Inc.
154-155	R/C Kits Mfg.
5	R/C Modeler Magazine
100	R/C Sportsman
137	Radio Control, Inc.
252	Radio Controlled Models
231-232	R & S Hobby Products, Inc.
7	Rev-Up Propellers
243	R. F. Enterprises
57	Rhom Products Mfg. Corp.
245	R. O. A. R.
59-60	Robart Mfg. Co.
183	Robinaire
83-84	Royal Electronics Corp.
73-74	Royal Products Corp.
79	R. Shetler Ent.
146	Sailplane Accessory Co.
121	Shamrock Competition Imports
11-13	Sig Mfg., Inc.
251	Simcoe Model Manufacturers Ltd.
193	Slim Line Mufflers
147	Soaring Products
35	Society of Antique Modelers
136	Sonic Systems
65	Sonic-Tronics, Inc.
203-205	Southern R/C Products, Inc.
149	Space Age Fuels
210-211	Special Edition Plans
244	Special Products
103	Spirit of America Show Team
198	Stenfield Manufacturing
127	Staubitz of Buffalo
37	Sterling Models Inc.
253	Steve Muck's R/C Model Boats
38	Sullivan Products, Inc.
39	Superior Aircraft Materials
172	Sure Flight Products
171	Tarno Aero Engines
6	Tatone Products Corp.
76	Technisales Ltd.
226	Tidewater Hobby Enterprises
30-31	Top Flite Models, Inc.
220	Tower Hobbies
207	Tri R Models, Inc.
227	Utopia Enterprises
163-164	Wes Craft Mfg.
77	Westport International, Inc.
217	Wing Mfg.
250	Workrite R C Hobby
45-47	World Engines, Inc.
192	X-Cell Products

The trends this year seemed to be directed toward larger, and smaller. Quarter Scale was an obvious big thing, in more ways than one. In case you are not aware of it, Quarter Scale is one quarter of actual size. At that scale, a WW II fighter is a mighty impressive piece of machinery! These large minlatures (seems contradictory!), along with larger, more powerful engines, gear reduction units, and miscellaneous accessories, created a lot of interest. They were certainly hard to overlook — if only because of their size!

One of the spectator displays was even larger — a **one half** size Aeronca Champ. This was the largest — this year. We wouldn't be too surprised, if next year, someone wheeled in a full

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RCM PRODUCT TEST

Sky Masters Ind.
LAZY ACE

IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging	●					Pre-Shaped Parts	●				
Plans	●					Parts Match to Plans		●			
Written Instructions		●				Overall Parts Fit		●			
Quality of Hardwood		●				Ease of Assembly	●				
Quality of Fiberglass			NA			Fidelity to Scale			NA		
Other Materials		●				Flight Performance	●				
Accessories		●				Overall Appeal	●				
Die-Cutting			NA								

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

SPECIFICATIONS

Name	LAZY ACE
Aircraft Type	Sport Biplane
Manufactured By	Sky Master Ind. 2440 Colonial Parkway Fort Worth, Texas 76109
Mfg. Suggested Retail Price	$125.00 introductory $99.50
Available From	Direct from Mfg.
Mfg. Recommended Usage	General Sport
Wing Span	76 Inches
Wing Chord	12 Inches
Total Wing Area	1800 Square Inches
Fuselage Length	57 Inches
Radio Compartment Dimensions	(L) 11" x (W) 4½" x (H) 3½"
Wing Location	Biplane
Airfoil	Flat Bottom
Wing Planform	Constant Chord
Dihedral	Top 1/4" — Bottom 2½
Stabilizer Span	32 Inches
Stabilizer Chord (incl. elev.)	11 Inches
Total Stab Area	350 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Top of Fuselage
Vertical Fin Height	10 Inches
Vertical Fin Width (incl. rud.)	8" (Avg.)
Mfg. Rec. Engine Range	.61
Recommended Fuel Tank Size	13-16 Ounces
Landing Gear	Conventional
Rec. Number of Channels	4
Recommended Control Functions	Rud., Elev., Throt., & Ail.

Basic Materials Used In Construction:	
Fuselage	Balsa, Spruce & Ply
Wing	Balsa, Spruce & Ply
Tail Surfaces	Balsa & Spruce
Hardware Included In Kit	See text
Plan Size	40" x 60" & 28" x 40" (2 sheets)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (2 pages)
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	152 Oz.
Wing loading based on rec. flying wt.	12.2 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	160 Ounces
Wing Loading	12.8 oz./sq. ft.
Covering & finishing materials used	See Text
Engine Make and Disp.	O.S. .60FSR
Muffler Used	Closed
Radio Used	Omega
Tank Size Used	13 Ounces

The Lazy Ace, kitted by Sky Master Industries of Fort Worth, Texas, is the first in their line of RC sport aircraft to reach the market. It is a general sport aircraft and was designed to fill the need for really good flying, as well as being a realistic looking super biplane. It is not a scale model of any aircraft. The total wing area is just a bit over 1800 square inches. Both wings span 76" and the fuselage length is 57". It has a lifting stab and this area coupled with the wing area, gives it almost 2150 square inches of lifting surface.

The manufacturer recommends a good strong .61 engine for power (OS .60 FSR or Webra Speed .61) however, the normal .60 engine will fly it well. The prop size recommended is a 12/6 or 13/5. Most .61's on today's market will swing this size prop.

The hardware included in the kit is as follows: Pre-bent landing gear strut (5/32" wire), pre-bent cabane struts (1/8" wire), control horn, Klett hinges, tail wheel bracket, 1/8" brass tubing, 1/16" wire, and miscellaneous screws.

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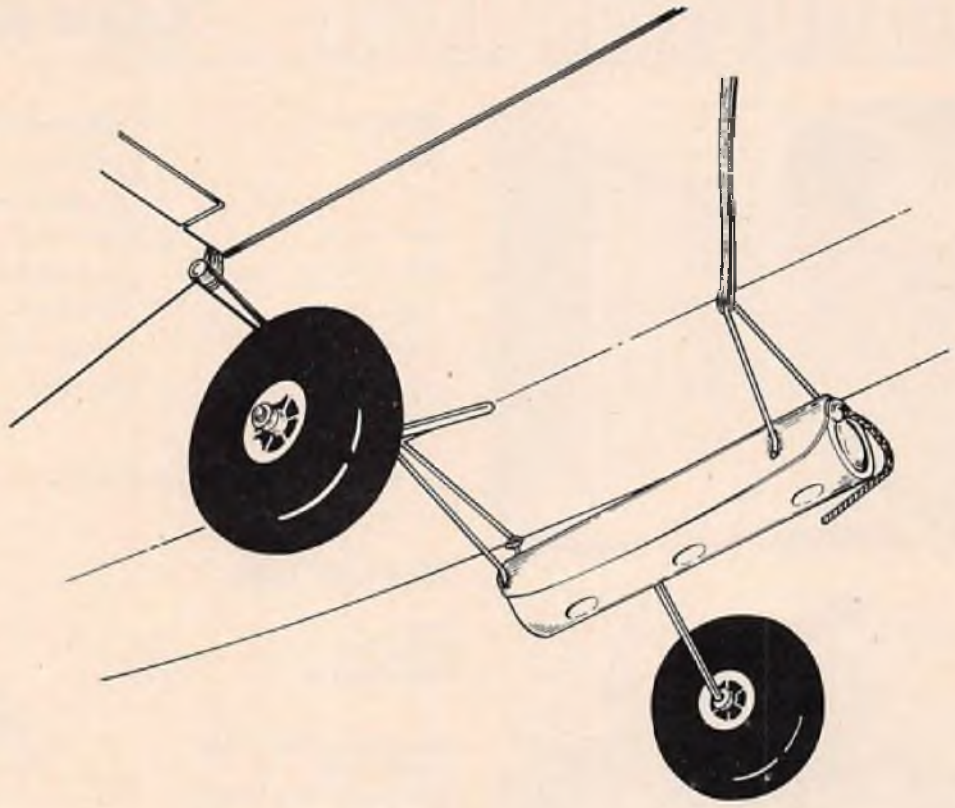
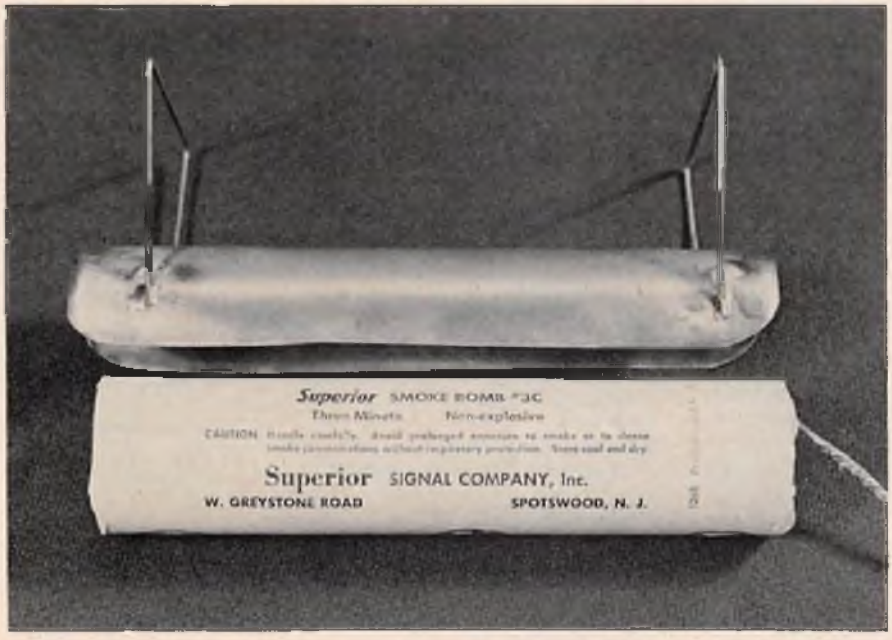
HERE'S HOW



Here's three super ideas passed on to me by Bud Combs of Hazard, Kentucky. Bud seems to be full of little kinks that are bound to interest most of you. Rather than give them to you one at a time, you can have 'em all — right now! I've tried them all and know many of you readers out there will do the same.

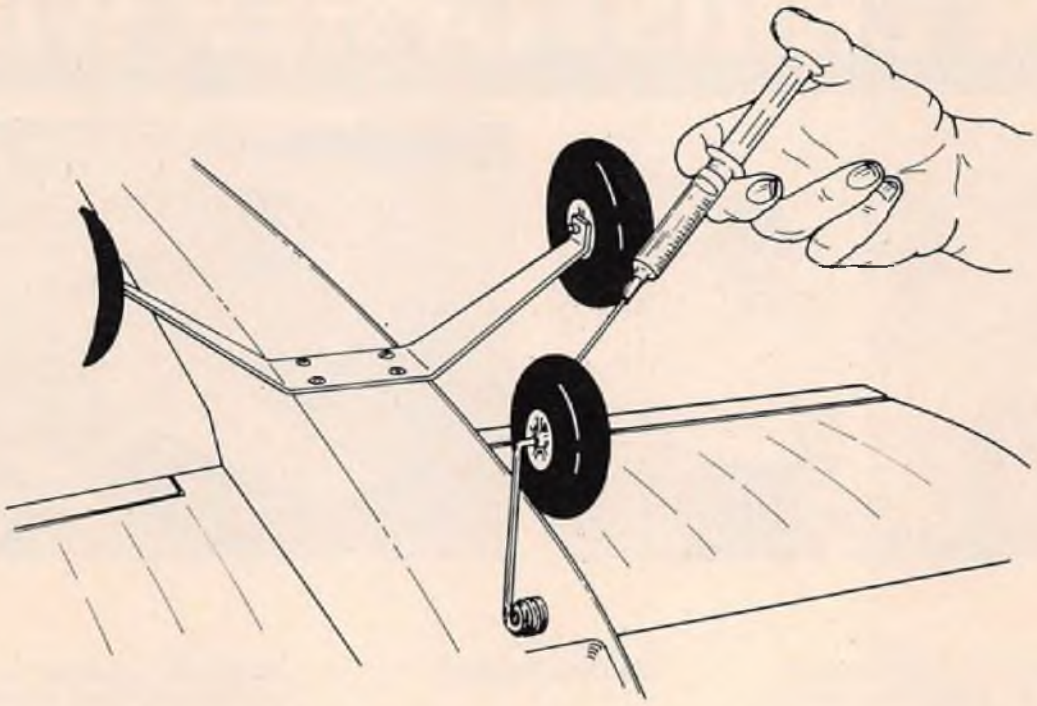
Smoke Trail

Ever thought about doing some aerobatics with a trail of smoke? Bud has been doing it and, in a very simple manner. Smoke without any plumbing to the engine. Start with a piece of 1½" x 6½" 27 gauge brass tube (such as a bathtub overflow or the long end of a sink P trap). Cut the tube 6½" long using a tube cutter. Do not remove the burr that the cutter will make as it will keep the smoke bomb from sliding out. Cut the bottom 1/3 of the tube out as shown in the sketch. With 1/16" music wire, form brackets and solder them to the brass tube to hold the assembly approximately 1½" from the bottom of the plane. Locate the assembly on the Center of Gravity of the airplane and strap in place with rubber bands.



Start the engine, light the fuse and snap in the bomb with its smoke holes in a downward position. Take-off and cut holes in the sky. The bomb will smoke for 3 minutes.

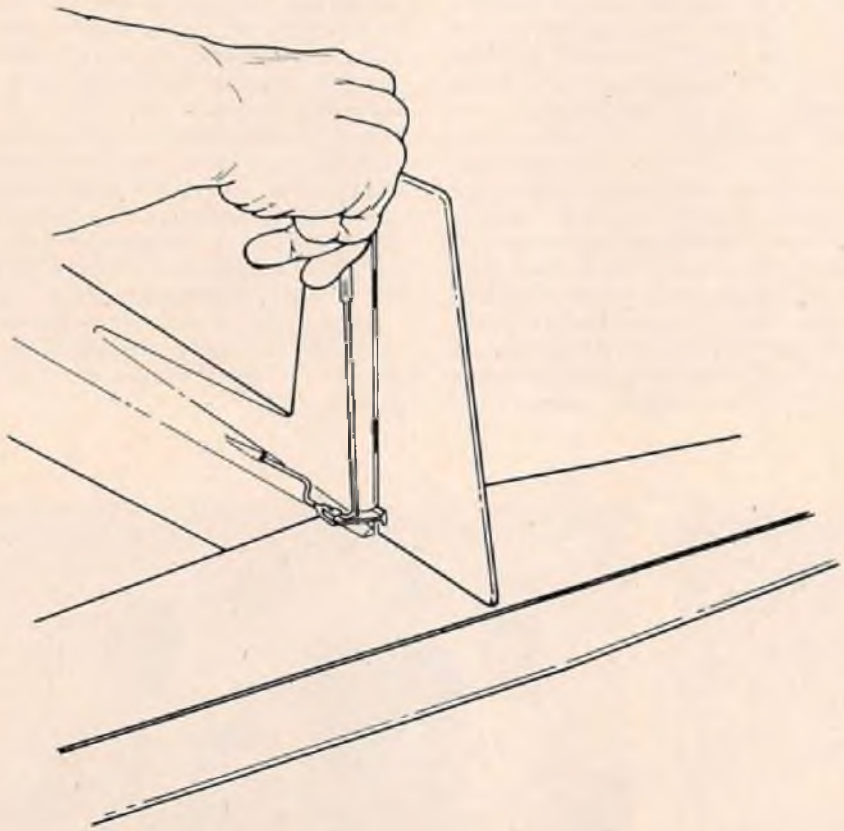
This particular bomb is used to smoke test sewer lines and can be found in most plumbing stores or ordered direct from: Superior Signal



Company, Inc., West Greyhound Road, Spotwood, New Jersey 08884. The smoke bombs are mailable.

A Quick And Easy Way To Add Nose Weight

Fill a hypo syringe with water and insert it into the nosewheel. If you happen to need more than one syringe full of water to get the required weight, leave the needle in the tire, detach and refill the syringe. After getting the required weight, pull out the needle and apply a drop of Hot Stuff. You can easily remove the water by inserting the needle without the syringe and squeezing the tire.



A Super Clevis Opener

Cut a piece of 1/8" music wire approximately 4" long. Heat one end cherry red and flatten for about 1". While still hot, make a 60° bend on a 1/4" radius. When cool, braze it to an old screwdriver handle or whatever you have handy in the junk box.

To open the clevis, place the round end on the control horn and slip the sharp end under one side of the clevis and pull the handle back (like pulling nails with a claw hammer). To close, place tool under clevis and push down on clevis with a screwdriver.

Many thanks to Bud Combs (one of the good ol' boys) for passing along three good ones. □

TOM CHRISTOPHER WINS

By Dick Tichenor

Tom Christopher, from Southern California, captured First Place in the annual Bakersfield, California, Formula I Races, Expert Class. Tom piloted his Terry Tiger powered Polecat neatly around the pylons to win eight of the nine heats (he placed Third with a cut in one heat) for a score of 34 out of a possible 36. Bob Smith and Gary Hover took Second and Third Places respectively.

Speedy Bob Violett drove his K & B powered Polecat to the fastest time trophy and a new Formula I world's speed record of 1 minute 12.0 seconds for the ten lap, 2.5 miles distance. Overhead were comments regarding tachometer readings in excess of 25,000 RPM on the ground and audio tack readings of 28,000 RPM in the air.

A delegation from Canada dominated the winner's circle in Standard Class by capturing five of the first ten places. Doug Rankin won the First Place trophy followed by Len Yuen, Second, and Larry Eckersley in the Third position.

The BARKS Club of Bakersfield, California, once again held their annual Grand Prix of Formula I racing in great style. Led by Contest Director, Glen Spickler, the BARKS members conducted a fabulous set of pylon races. Vickie Boyce and Donna Coffman headed up the bookkeeping staff and are shown in photos with the event winners.

As for the aircraft, Polecat, kitted by Bob Violett, was the racer to beat this year, followed closely by the Prather Toni. The Terry Tiger and K & B front rotor 6.5 cc engines were used by the fast guys. As usual, the Formula I aircraft were finished to perfection. Very noticeable were the snappy phrases immaculately lettered on the rear of the fuselage on quite a few of the racers.

Racing enthusiasts came from 12 states and Canada to do their thing around the pylons. The East Coast folks came from Connecticut, Florida, Georgia, Maryland, North Carolina, and New York. West Coast fliers came from California, Idaho, Utah, and Washington. Illinois was represented by Eric Meyers. Mixing it up with the hot shots in his first big race, was 16 year old Chuck Greenwood from Ponca City, Oklahoma. Keep an eye on this young man, he looks promising.

This reporter had an interesting conversation with Bob Violett concerning his efforts in attaining higher speeds. Bob's concern over control surface flutter has triggered his thoughts toward methods of preventing it at increased air speeds. Some of his remarks involved his interest in both static and dynamic balance of control surfaces. Possible placement of a new sub-miniature servo very close to the elevators could provide a short and stiff linkage to further aid in flutter suppression. As the Indianapolis 500 benefited to commercial automobile industry, Formula I racing continues to contribute technology and equipment to the total radio controlled model activity.

Once again, we commend the BARKS and their co-sponsor, Model Airplane News, for their Annual Formula I Races. □

AT BAKERSFIELD

(1) BARKS Vickie with C & S Team, Tom Christopher and Jim Stafford, Expert Class winners. Jim does the important stuff so Tom can win. (2) Bob Violett took Fast Time Trophy and set new Form 1 world speed record with his beautifully finished K & B powered Polecat. (3) Bob Smith (R), 2nd in Expert; Gary Hovis, 3rd Expert. (4) BARKS Donna Coffman awarded Standard Class Trophies to Doug Rankin, 1st; Len Yuen, 2nd; Larry Eckersley, 3rd. (5) Ron and Nancy Hadaway with scratch built LR 1-A, ST power. (6) 6th Place Expert, Dave Shadel, Prather Toni/Terry Tiger. (7) HOB Don Dombroski holds for Larry Leonard, former National Form 1 and Pattern Champion. Good to see Larry racing again. (8) Chuck Greenwood, 16 yrs., Ponca City, Oklahoma. Prather Toni/Terry Tiger. (9) Gordon Davis, Thunder Chicken/K & B. (10) (L to R) Richard Ferrier, Larry Leonard, Bill Wisniewski, Joe Stream. Joe's first photo in print after years of racing. (11) The victorious Canadians in one big bunch. PPP Jim Maki doing an "RCM at Work" bit in foreground.

VOYAGEUR II

Introduction

One August day I sat down to build a new wing for my primary sailplane which over the past three years had taken a fair number of tree and post landings. I had somehow convinced myself that the rest of the plane was airworthy even though its battle damage was only slightly less than that of the wing. Since this new wing was to be a rather simple project, I decided to make a few modifications to the existing design in hopes of improving the plane's overall performance. Nothing major, since the design of original R/C aircraft was still an area I knew only enough to talk about staying away from.

Then RCM ran an article on sailplane design principles; just what I needed to bring model designing out of the closet. I guess Mother Nature (in cahoots with RCM) was at work here, preparing me for this new dimension in radio control. As the idea of flying an aircraft that was entirely my own creation began to grow, those mentally suppressed dings and dents in my old sailplane began to stand out like gravy stains on a white formal coat. "After all," I told myself, "the plane really didn't fly that well anyway." I collected the plane's salvageable parts, put the rest in the bone yard, and sat down at the drawing board with a large sheet of drafting paper and the RCM article.

ABOUT THE AUTHOR

Terry Alan Blake is 28 years old and has 6 years in R/C with a primary interest in sailplanes, although he maintains a couple of powered trainer types. His bread is buttered by Uncle Sam as a DC-9 instructor pilot in the U.S. Air Force at Scott AFB, Illinois. Alan is currently acting vice-president, instructor, and safety officer in the "Buzzards" R/C club at Scott AFB. His home is Columbus, Ohio where he crashed his first control line plane and later graduated from Ohio State University. He enjoys playing the guitar, stamp collecting, Don McLean's music, Eric Sloane's art, Angie and Scooter (the family cats), his wife Rosalee, and all kinds of flying.

Fourteen months, and four prototypes later, I had a successful flying ship. I must confess that I adopted several proven concepts into this, my first "original" design. Specifically, I incorporated into one airframe many of the construction and performance features I have enjoyed from those sailplanes I have built and flown. I christened her the "Voyageur II" as the final design differed considerably from the original prototype. Actually, 11 major and minor modifications were necessary before the plane, presented here, achieved the stability and thermaling performance I sought.

I chose a V-tail design for four main reasons: They're practical for landings in tall grass, reduce drag, build easy, and usually attract an eye or two at the flying field. (From some of the looks I get, I suspect that some folks doubt their flyability.) Don't let this or the idea of control mixing scare you away from an elevon design. The plane flies beautifully, and the Voyageur's large radio compartment is adaptable to many

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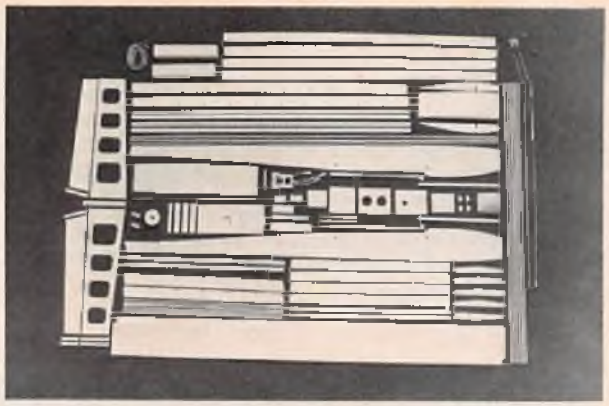
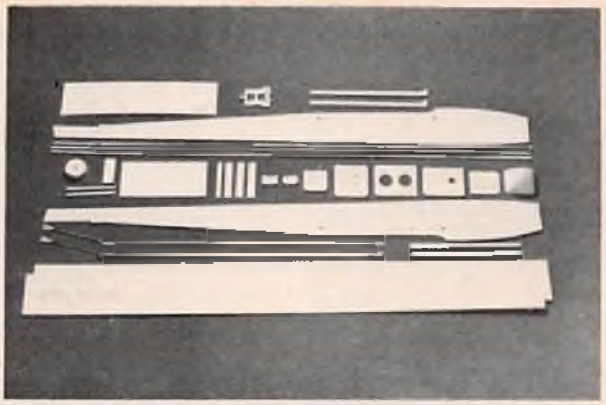


Start with a self-made kit.



The fuselage pieces – notches in the bulkheads are cut after the cross braces have been installed.

MATERIALS LIST FOR THE "VOYAGEUR II"

The $35.00 price tag is based on the purchase of all required materials with nothing on hand.

Balsa:

1 — 1/32" x 2" x 36" . . . Tip panel shear web.
3 — 1/16" x 3" x 36" . . . Fuse. top & bottom sheeting, wing center sheeting.
3 — 3/32" x 4" x 36" . . . Fuse. sides, bulkheads, ribs, gussets, empennage mount, and bulkhead cross braces.
1 — 1/8" x 4" x 36" . . . V-tail, anti-warp strips, and wing tube mounting.
3 — 1/8" sq. x 36" . . . Fuse. longerons.
1 — 1/4" sq. x 36" . . . Fuse. longerons.
1 — 1/4" x 3/4" x 36" . . . Wing saddle.
1 — 1" sq. x 12" . . . Tip blocks.
1 — 2¼" sq. cube . . . Nose block.
3 — 1/2" x 1/2" x 36" L.E. . . . Wing leading edge.
3 — 1/4" x 1" x 36" T.E. . . . Wing trailing edge.
1 — 3/4" x 12" triangular stock . . . V-tail mount.

Spruce:

3 — 1/8" x 3/8" x 36" . . . Wing spars, tow hook mount.
9 — 1/8" sq. x 36" . . . Turbulator spars.

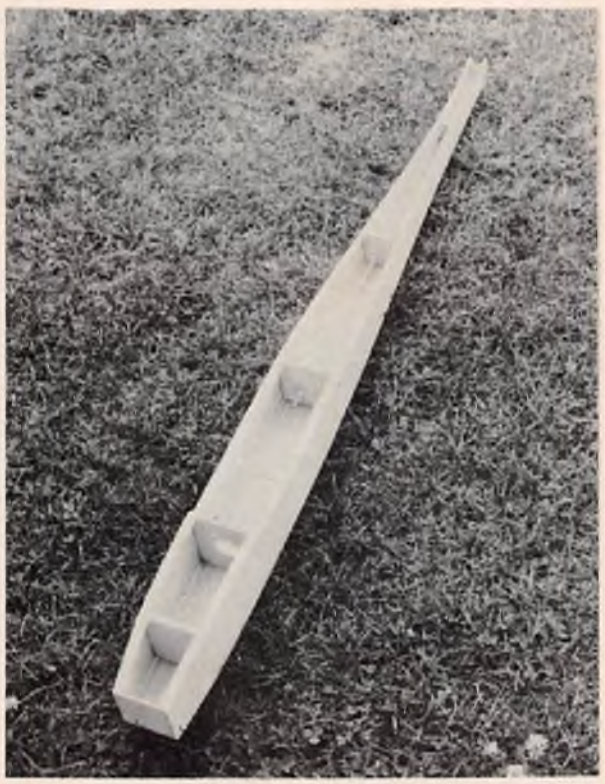
Ply:

1 — 1/32" x 12" x 36" . . . Wing panel shear web.
1 — 1/16" x 6" x 12" . . . Hatch, skid plate, tow plate, and wing & dowel braces.
1 — 3/32" x 6" x 12" . . . Rib templates.

Miscellaneous:

1 — 3/16" diameter x 36" dowel.
2 — NyRods plus 6 extra control clevises.
2 — Small control horns.
1 — Tow hook.
1 — 1/16" diameter x 6" wire.
1 — 3/16" I.D. x 12" tubing.
1 — 3/16" x 12" steel rod.
1 — Control mixer.
2 — Rolls covering film.
1 — Box #64 rubber bands.
1 — Roll glider sup'r skid.
1 — 2-channel radio.
1 — Hi-start or winch.
6 — Nylon hinges (if used).
1 — Trim tape (if needed).

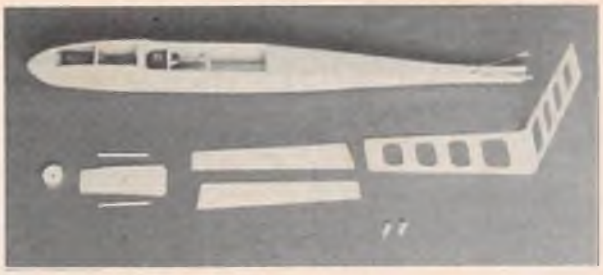
Clothespins and tape align and set the first bulkhead.



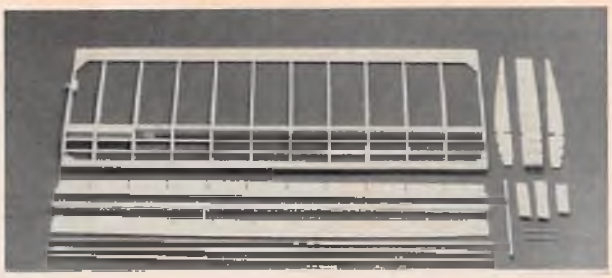
Control rods installed; the fuselage is completed by adding the top sheeting and the nose block.

If you are looking for a first scratch-built thermal sailplane, the Voyageur II is for you. This V-tail conception will please both the beginner and experienced pilot.

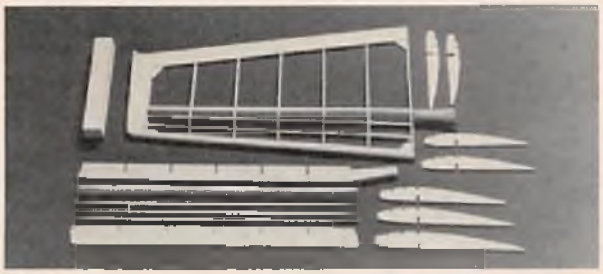
Designed & Built By Terry A. Blake



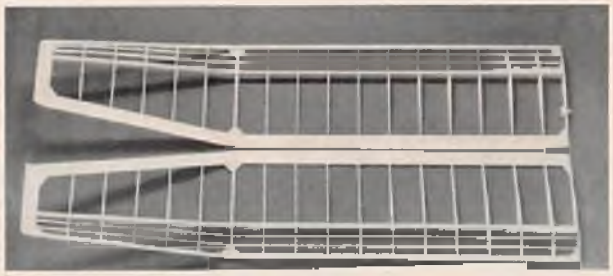
Having built four Voyageurs, I knew my radio would balance as shown here. Don't install yours until final construction. Holes in the elevons are optional.



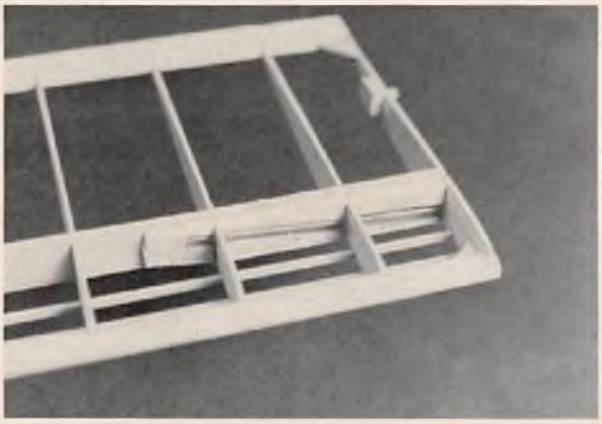
One main wing panel completed and the pieces for the other.



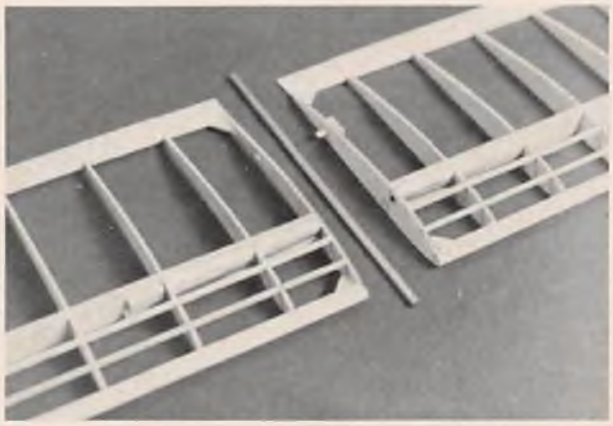
This tip panel shows an early airfoil design which proved unstable due to the upsweeping lower front edge.



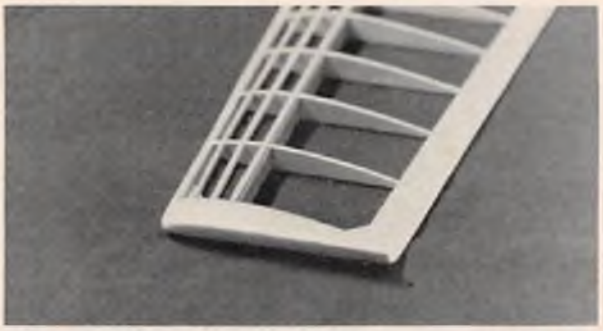
Wing panels ready for covering.



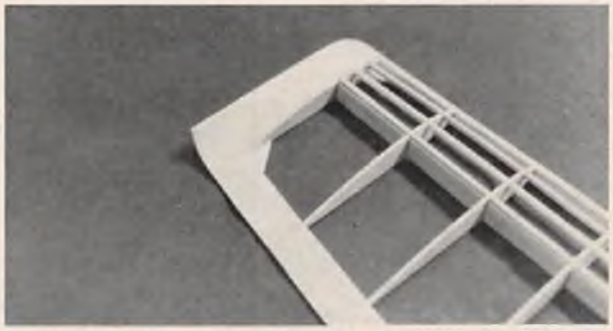
Rough-up the outer surface of the wing brace tubing and use plenty of epoxy to set the tube.



The steel bar aligns the wing mounted tubing for proper main panel dihedral.



The wing tips are easier to build than they seem. These three views will help simplify the details on the plan sheet.

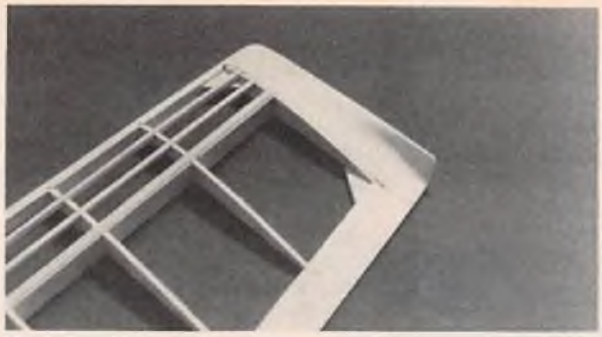


Paint the tips to avoid the problem of covering the concave upper surface.

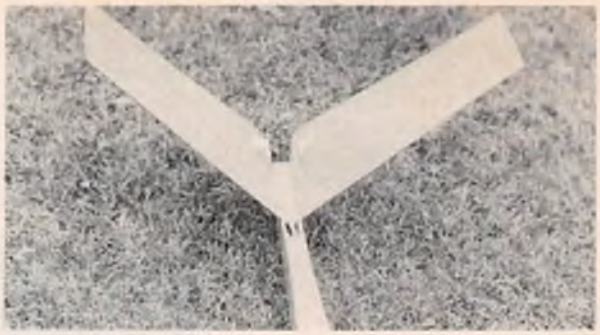
commercially available or homemade control mixers. If this is your first scratch-built project, you will find the plans and construction sequence easy to follow. If this is your tenth project from plans, you'll appreciate the clean design and tight, flat turns inherent to V-tails. Good luck!

Pre-Construction:

Begin by stockpiling your materials in a homemade Voyageur kit. Before starting any unit assembly, your kit should include the following: (1) Cut and matched fuselage sides which have been marked for the bulkhead locations and drilled for the wing dowels. (2) All bulkheads with the cross braces attached (notch the appropriate bulkheads for the 1/8" sq. balsa longerons). (3) A nose block which has been pre-shaped to the top and side



A hobby knife and plenty of sandpaper are all the tools needed for the tips.



Even the control linkage is up out of the grass, but they may be run under the V-tail.

view contours. (4) Both wing dowels and the four 1/16" ply dowel braces. (5) A completed tow hook mounting block (marked, but not drilled, for the tow hook locations). (6) Completed empennage halves (i.e., the fixed and movable portions finished, but unhinged). (7) A complete set of wing ribs (see the special section for construction details). (8) All spars and turbulators cut to length. (9) Wing leading and trailing edges cut to length and notched for the wing ribs. (10) Pre-shaped 1/16" ply tip panel braces (4 required). (11) All other wood and R/C accessories listed in the materials list. You should also pre-form the shear webbing by first cutting the strips to the proper length, observing the angles at each end of all 8 pieces. Mark the rib locations on one piece of the center panel webbing and one piece of tip panel webbing. Stack all 4 of each type webbing, being careful to align the end angles. The marked strip should be on top of each stack. Run each set through a jigsaw to notch the rib locations identically across each shear web. The notches are cut from the top of the webbing and bottom-out 3/8" from the bottom surface of the strips. This continuous strip shear web is considerably stronger than typical construction involving individual pieces of shear webbing inserted between each rib of a completed panel.

Do not pre-cut or pre-shape the following: (1) The five 1/16" ply hatch pieces. (2) The 1/16" ply skid plate. (3) NyRods and 1/16" wire control links. (4) Fuselage top and bottom sheeting. (5) Fuselage longerons. (6) Wing saddle or forward top fuselage longerons (1/4" sq. balsa). (7) Center wing joint tubing or 1/8" balsa tube bracing. (8) Wing tip blocks. Do not join the V-tail halves to the triangular stock or slot the elevon hinge line just yet.

You will need standard modeling tools: pins, clamps, masking tape, electric drill and bits, jigsaw, sandpaper, and some 5-minute epoxy. For the other gluing, I recommend some cyanoacrylate or aliphatic resin. A small amount of contact cement is needed for the skid plate. If you complete the above preparations, your Voyageur should go together in a couple of days, ready for covering and, most importantly, flying.

Making The Wing Ribs:

Making a uniform set of wing ribs for any model may seem difficult at first, but by using the "sandwich" technique described here, you can form an accurate, matched set of ribs for both constant chord and tapered panels. Begin by tracing and cutting two 3/32" ply WP-1 templates. You can insure their similarity by stacking two ply pieces and cutting both templates at the same time. The measurement across the bottom spar gap should be 3/16". You may also drill the 1/4" hole for the brace tubing. Measure and drill **carefully**. Next make a tip rib template in the same manner (1 required).

Using one of the WP-1 templates, rough out 24 rib "blanks" from 3/32" sheet balsa. Do not notch the blanks for any of the spars. (Note: The whole job will be easier if you form each rib "blank" from a piece of balsa that has a perfectly flat bottom surface.) As you cut each rib, mark the bottom at the front corner of the main spar notch. Place all ribs between the two WP-1's, aligning the marks with a square. Insure that all ribs rest flat on the work surface. Place the "sandwich" in a vise and carefully sand the package to the size and shape of the two end templates. Use a sanding block and do not over-sand as you will change the basic rib contour. Since you will have to turn the sandwich many times in the vise, be careful that none of the pieces slip out of alignment. The spars are notched with a small square file, and the main spar may be vertically notched with a zona saw; then filed. You now have a complete set of 22 main panel ribs and two more for the root ribs of the tip panels. Mark, but do not drill, 4 ribs for the approximate location of the 1/4" wing tube to be installed later.

The tip panel ribs are formed in essentially the same manner as the main panel ribs, but since they decrease in size, your "blanks" will be less accurately pre-formed. Use one WP-1 and the tip rib template for the sandwich ends. You will need 6 rib blanks plus one of the two extra main ribs in your sandwich. Once again align the marks at the forward spar notch and sand from template to template. Each set of tip

Plenty of room for even the bulkiest of radios.

Voyageur II: Clean lines, simple construction, and pure flying pleasure.

panel ribs must be made separately, and all 14 ribs will have a slightly greater than necessary cross angle on the rib tops. You may leave the ribs in this manner or sand them lightly after they are firmly cemented in place over the plans. Use a large sanding block for this and accomplish the job prior to installing the tip blocks. Do not enlarge any of the ribs at the joint of the center to tip panel for the 1/16" ply dihedral braces. These are modified during panel construction. Now add the rib sets to your kit.

Empennage:

Start actual assembly of your Voyageur II by completing the V-tail. First hinge the control surfaces as indicated on the plans or utilize the following steps to form a sealed hinge line with the aircraft covering material. By sealing the gap between the fixed and movable portions of the tail surfaces, you eliminate the added weight of the hinges and the unsightly gap and, more importantly, you reduce drag in this area making the control surface 20% more efficient. Start by sanding the hinge line of both pieces of each elevon half as shown in "step one" on the plans. Next, cover one side of both the fixed and movable portions of each elevon half leaving a 3/16" gap at the hinge line between the balsa pieces. Fold the structure at the hinge line and iron the covering onto the beveled surfaces you sanded previously. Open the pieces and cover the other side of the structure, being careful not to shrink the covering directly over the hinge line. Now carefully iron the covering into the hinge working from one side to the other as necessary. As the material shrinks, the two balsa pieces will draw together uniformly and swing freely. The finished product should look like "step two". This method is quite strong.

Whether you use nylon or sealed hinging, I have found it easier to cover each empennage half separately prior to joining them at a right angle with the triangular stock. Study plan section E-E to join these pieces. Don't install the control horns until you're sure of their alignment with the 1/16" wire links from the NyRods.

Fuselage:

Mark the vertical center of each bulkhead. Align and clamp the fuselage sides together at the tail, then cement in F3. To get the proper bond, use some tape at the nose to pull the sides in to the proper fuselage shape — let dry. Next, glue in formers F1, F4, and F5. Position this assembly over the fuselage top view to aid in true alignment. F2 may be positioned to suit your particular radio installation, but remember to keep the bottom of this former flush with the bottom of the fuselage sides. When thoroughly dry, unclamp the tail and add the rearmost F6. Pull the fuselage sides in to secure the other F6 — clamp until dry. Next, install the two bottom full length longerons, gluing them from the tail to former F3. These 1/8" square balsa strips fit into the notches pre-cut into the bottom of each bulkhead. When dry, check that the strips will fit easily through formers F1 and F2, but do not cement them as yet. Sand the fuselage bottom square from the tail to F3.

Now mark the long centerline of a sheet of 1/16" balsa. Cement the fuselage assembly to the sheet from the tail to former F3, matching the centerline marks on the bulkheads with the centerline on the sheet. Allow to dry, then bend and glue the sheet up to F1, trapping the longerons in their respective slots in each bulkhead. Trim the excess bottom sheet away and lightly sand the entire fuselage bottom to shape as shown in section C-C or D-D on the plans.

VOYAGEUR II
Designed By: Terry A. Blake

TYPE AIRCRAFT
R/C Sailplane
WINGSPAN
85 Inches
WING CHORD
Center 8 ⅜" - Tips 5½"
TOTAL WING AREA
710 Square Inches
WING LOCATION
Shoulder Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Tapered Tip Panels
DIHEDRAL, EACH TIP
2" Center panel - 3½" Tip panel
O.A. FUSELAGE LENGTH
40 Inches
RADIO COMPARTMENT AREA
(L) 14⅝" X (W) 2½" X (H) 2⅝"
STABILIZER SPAN (VEE TAIL)
13⅜" (Projected)
STABILIZER CHORD (incl. elev.)
5 Inches (Avg.)
STABILIZER AREA
86½ Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Elevons
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Spruce & Ply
Wing	Balsa, Ply & Spruce
Empennage	Balsa
Wt. Ready-To-Fly	30 Oz.
Wing Loading	6.1 Oz/Sq. Ft.

Control rod placement is next, and the routing of the cables may depend to some extent on the type of control mixer you choose. I utilized a molded plastic unit distributed by North American Model Enterprises, 7639 Grapevine Highway, Ft. Worth, Texas 76118, at a cost of $3.98 plus $1.00 handling. The mixer resembles a small handle switch, and fits nicely just aft of the tow hook mount. (P.S. . . . While you're ordering the mixer, get a captured, releasable tow hook at $4.95. Both items are sold under the brand name of Radio Sailplanes.)

When the outer shell of the control rods are in position, add the aft, top longerons and sand this area square with the fuselage sides. Then add the 1/16" cross grain sheeting — trim and sand as you did the bottom. The small area where the pushrods exit is left open until the wire pushrods are formed and in place.

Next, form the wing saddle from a piece of 1/4" x 1/4" balsa. Trim away the excess wood from the rear of the saddle to a point 1/2" from the front end prior to installing this piece to the inner fuselage side. When the piece is firmly set, remove the remaining scrap balsa carefully with your knife and fine sandpaper. You will need a slight angle across each saddle to match the center wing panel dihedral. While in this area, epoxy the pre-made tow hook mount just aft of former F3. Then add the 1/16" ply dowel braces; drill out when dry.

Using the forward fuselage bottom as a guide, carefully trace the skid plate outline onto a 12" piece of 1/16" ply. Cut and install using contact cement. Then sand the skid plate to blend smoothly with the fuselage bottom as shown in plan view section B-B. Now you may drill the tow hook mounting holes through the fuselage bottom. Next, add the 1/4" square forward, upper longerons.

Begin the forward hatch construction by installing one 1/2" x 2⅛" x 1/16" ply piece at former F1, and one 1/2" x 2¾" x 1/16" ply strip at F3. Now sand the forward, upper fuselage side edges as you did the bottom edges. Contouring the sides prior to actual hatch cutting will result in less overall sanding to the hatch area as the hatch can be more accurately traced and cut to final contour. Cut the hatch from 1/16" ply and epoxy a 1/2" x 1/16" ply strip to each end of the hatch. Make each strip just long enough to fit easily under the ply strips at stations A-A and B-B between the fuselage sides. Each of two ply pieces epoxied to the hatch form a "tongue" which slips under the fuselage mounted ply strips. By flexing the hatch in the middle, it can be quickly installed or removed as needed. When all pieces are dry, install the hatch and sand it

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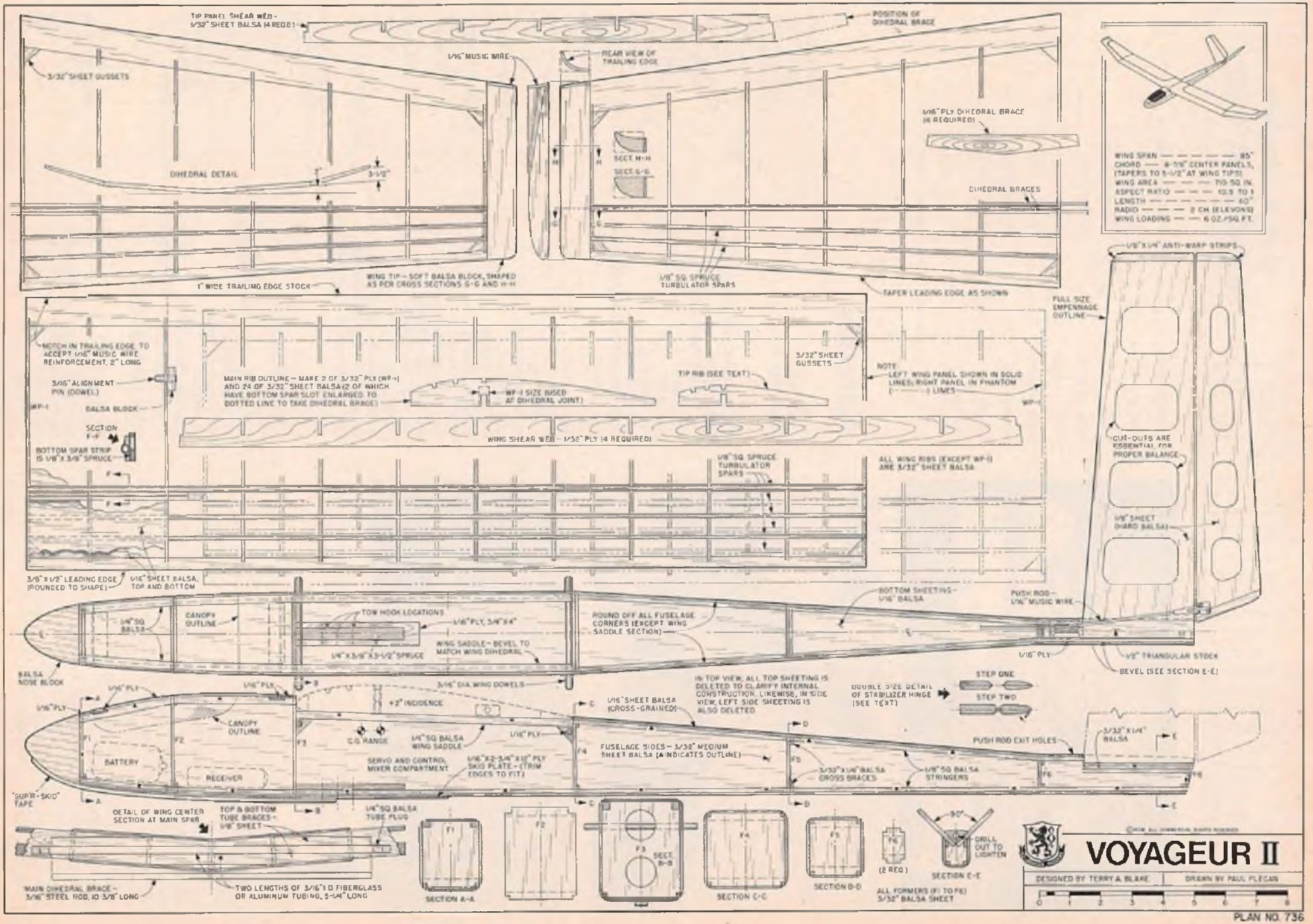
TIP PANEL SHEAR WEB - 1/32" SHEET BALSA (4 REQD.)
POSITION OF DIHEDRAL BRACE
1/16" MUSIC WIRE
REAR VIEW OF TRAILING EDGE
3/32" SHEET GUSSETS
1/16" PLY DIHEDRAL BRACE (4 REQUIRED)
SECT H-H
SECT G-G
DIHEDRAL DETAIL
3-1/2"
DIHEDRAL BRACES
WING SPAN — — — — — — 85"
CHORD — — 8-7/8" CENTER PANELS, (TAPERS TO 5-1/2" AT WING TIPS)
WING AREA — — — — 710 SQ. IN.
ASPECT RATIO — — — 10.5 TO 1
LENGTH — — — — — — 60"
RADIO — — — 2 CH. (ELEVONS)
WING LOADING — — — 6 OZ./SQ. FT.
1/8" X 1/4" ANTI-WARP STRIPS
1" WIDE TRAILING EDGE STOCK
WING TIP — SOFT BALSA BLOCK, SHAPED AS PER CROSS SECTIONS G-G AND H-H
1/8" SQ. SPRUCE TURBULATOR SPARS
TAPER LEADING EDGE AS SHOWN
FULL SIZE EMPENNAGE OUTLINE
NOTCH IN TRAILING EDGE TO ACCEPT 1/16" MUSIC WIRE REINFORCEMENT, 2" LONG
3/16" ALIGNMENT PIN (DOWEL)
WP-1
BALSA BLOCK
SECTION F-F
BOTTOM SPAR STRIP IS 1/8" X 3/8" SPRUCE
MAIN RIB OUTLINE — MAKE 2 OF 3/32" PLY (WP-1) AND 24 OF 3/32" SHEET BALSA (2 OF WHICH HAVE BOTTOM SPAR SLOT ENLARGED TO DOTTED LINE TO TAKE DIHEDRAL BRACE)
WP-1 SIZE (USED AT DIHEDRAL JOINT)
TIP RIB (SEE TEXT)
3/32" SHEET GUSSETS
NOTE: LEFT WING PANEL SHOWN IN SOLID LINES; RIGHT PANEL IN PHANTOM LINES
WING SHEAR WEB — 1/32" PLY (4 REQUIRED)
1/8" SQ. SPRUCE TURBULATOR SPARS
ALL WING RIBS (EXCEPT WP-1) ARE 3/32" SHEET BALSA
CUT-OUTS ARE ESSENTIAL FOR PROPER BALANCE
1/8" SHEET (HARD BALSA)
3/8" X 1/2" LEADING EDGE (ROUNDED TO SHAPE)
1/16" SHEET BALSA, TOP AND BOTTOM
CANOPY OUTLINE
TOW HOOK LOCATIONS
1/16" PLY, 3-1/4" X 4"
1/4" SQ. BALSA
1/4" X 3/8" X 3-1/2" SPRUCE
WING SADDLE — BEVEL TO MATCH WING DIHEDRAL
ROUND OFF ALL FUSELAGE CORNERS (EXCEPT WING SADDLE SECTION)
BOTTOM SHEETING — 1/16" BALSA
PUSH ROD — 1/16" MUSIC WIRE
1/16" PLY
1/2" TRIANGULAR STOCK
BEVEL (SEE SECTION E-E)
BALSA NOSE BLOCK
1/16" PLY
3/16" DIA. WING DOWELS
+2° INCIDENCE
IN TOP VIEW, ALL TOP SHEETING IS DELETED TO CLARIFY INTERNAL CONSTRUCTION. LIKEWISE, IN SIDE VIEW, LEFT SIDE SHEETING IS ALSO DELETED
DOUBLE SIZE DETAIL OF STABILIZER HINGE (SEE TEXT)
STEP ONE
STEP TWO
1/16" SHEET BALSA (CROSS-GRAINED)
CANOPY OUTLINE
BATTERY
RECEIVER
C.G. RANGE
1/4" SQ. BALSA WING SADDLE
SERVO AND CONTROL MIXER COMPARTMENT
1/16" PLY
1/16" X 2-3/4" X 12" PLY SKID PLATE — (TRIM EDGES TO FIT)
FUSELAGE SIDES — 3/32" MEDIUM SHEET BALSA (▲ INDICATES OUTLINE)
PUSH ROD EXIT HOLES
3/32" X 1/4" BALSA
3/32" X 1/4" BALSA CROSS BRACES
1/8" SQ. BALSA STRINGERS
"SUPER-SKID" TAPE
DETAIL OF WING CENTER SECTION AT MAIN SPAR
TOP & BOTTOM TUBE BRACES — 1/16" SHEET
1/4" SQ. BALSA TUBE PLUG
MAIN DIHEDRAL BRACE — 3/16" STEEL ROD, 10-3/8" LONG
TWO LENGTHS OF 3/16" I.D. FIBERGLASS OR ALUMINUM TUBING, 5-1/4" LONG
SECTION A-A
SECT. B-B
SECTION C-C
SECTION D-D
(2 REQ.)
90°
DRILL OUT TO LIGHTEN
SECTION E-E
ALL FORMERS (F1 TO F6) 3/32" BALSA SHEET
VOYAGEUR II
DESIGNED BY TERRY A. BLAKE
DRAWN BY PAUL PLEGAN
0 1 2 3 4 5 6 7 8

PLAN NO. 736

RCM PRODUCT TEST

G.W.R. Models
NEW ERA 440

IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging		•				Pre-Shaped Parts		•			
Plans			NA			Parts Match to Plans			NA		
Written Instructions			•			Overall Parts Fit		•			
Quality of Hardwood			NA			Ease of Assembly		•			
Quality of Fiberglass			NA			Fidelity to Scale			NA		
Other Materials		•				Flight Performance		•			
Accessories		•				Overall Appeal		•			
Die-Cutting			NA								

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

SPECIFICATIONS

Name ..... NEW ERA 440
Aircraft Type ..... Sport Pattern
Manufactured By ..... G.W.R. Models
119 East Avenue
Batavia, New York 14020
Mfg. Suggested Retail Price $74.99
Available From ..... Direct from Mfg.
Mfg. Recommended Usage ..... General Sport
Wing Span ..... 56 Inches
Wing Chord ..... 10.25 Inches
Total Wing Area ..... 550 Square Inches
Fuselage Length ..... 42 Inches
Radio Compartment Dimensions ..... (L) 10¼" x (W) 3¼" x (H) 3"
Wing Location ..... Low Wing
Airfoil ..... Symmetrical
Wing Planform ..... Constant Chord
Dihedral ..... 3/16 - 1¼ each tip
Stabilizer Span ..... 22.5 Inches
Stabilizer Chord (incl. elev.) ..... 5.75 Inches
Total Stab Area ..... 126 Square Inches
Stab Airfoil Section ..... Flat
Stabilizer Location ..... Top of Fuselage
Vertical Fin Height ..... 6.5 Inches
Vertical Fin Width (incl. rud.) ..... 6.25" (Avg.)
Mfg. Rec. Engine Range ..... .36-.46
Mfg. Rec. Fuel Tank Size ..... 8-10 Ounce
Landing Gear ..... Tricycle
Recommended No. Of Channels 4
Recommended Control Functions ..... Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:
Fuselage ..... Balsa and Plywood
Wing ..... Foam and Balsa
Tail Surfaces ..... Balsa
Hardware Included In Kit ..... See Text
Plan Size ..... None
Building Instructions on Plan Sheets ..... No
Instruction Manual ..... Yes (4 pages)
Construction Drawings ..... Yes
Kit Includes ..... Shaped Parts
Mfg. Rec. Flying Weight ..... 80-88 Ounces
Wing loading based on rec. flying wt. ..... 21-23 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly ..... 90 ounces
Wing Loading ..... 23-68 oz./sq. ft.
Covering & finishing materials used ..... See Text
Engine Make & Disp. ..... Fox
Muffler Used ..... Fox
Radio Used ..... R & S
Tank Size Used ..... 8 Ounces

The New Era 440 is a scaled-up version of Don Dewey's New Era III that appeared in the June 1975 issue of RCM. This one is sized for a .36 to .46 engine.

You will find the kit has much of the building already completed for you. Foam wing cores are already sheeted, wing tip blocks are cut to shape and only need to be glued on and carved to final shape. The fuselage is completely assembled and sanded except the bottom planking. After the pushrods are installed, the fuselage can be completed. We were very impressed with the quality of the workmanship done on the entire model. The empennage was completed and sanded to shape. The kit also included shaped aileron stock, aileron horn wire, bearings and pushrod connectors, landing gear wires and mounting blocks, including nose gear wire and steering arm. The firewall has been drilled and blind nuts installed for a Kraft-Hayes .40 engine mount. The mount is drilled for the nose gear, nylon tubing installed for throttle and nose gear steering cables. Our prototype was built with firewall

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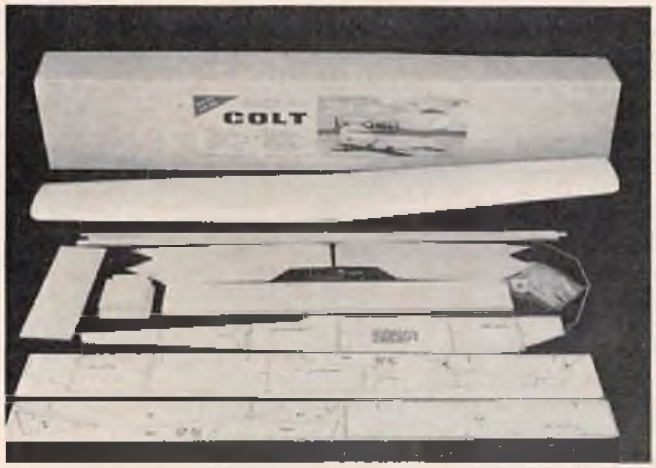
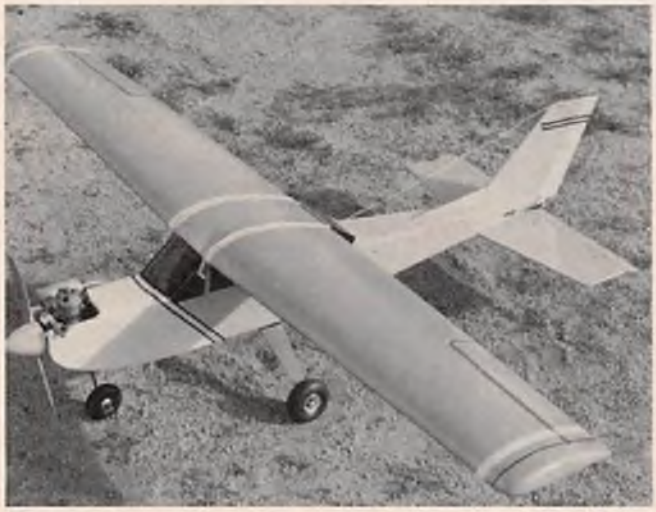
RCM PRODUCT TEST

Sig Mfg. COLT





IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging		●				Pre-Shaped Parts			NA		
Plans			NA			Parts Match to Plans			NA		
Written Instructions		●				Overall Parts Fit		●			
Quality of Hardwood			NA			Ease of Assembly		●			
Quality of Fiberglass			NA			Fidelity to Scale			NA		
Other Materials		●				Flight Performance		●			
Accessories		●				Overall Appeal	●				
Die-Cutting			NA								

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

First impressions are interesting. When you open the kit box, laying there staring you in the face is a one piece foam wing and you immediately think to yourself, "no joining of two halves, no wrong dihedral angles and, what appears to be ailerons, already formed in the trailing edge." This looks great, no time spent covering the wing with sheet balsa or cardboard; just apply some filler, sand, a coat of paint, rub it out, wax, and there you have it — a finished wing. These are things you can be doing while the glue is drying on the fuselage.

The fuselage is easy to build; it is boxy, good looking and roomy enough for any gear. It is strong and by the time you finish building you would feel confident to use it for a softball bat. The ply formers and fuselage doublers are die-cut. Everything is printed on good grade balsa sheet and there is only one curved line in the whole plane. Make things easy for yourself — acquire a 2'-3' metal straight-edge and cut all parts from the balsa sheets using this straight-edge as a guide for your razor blade. When you glue parts of the fuselage and empennage together, sanding or further cutting will be unnecessary.

Most of the necessary hardware is there; about all the extras you will need are wheels and a fuel tank. Extras are listed on the back of the instruction booklet and on the box. Included in the kit are hinges, pushrod hardware, landing gear, nose gear, nylon bearing, steering arm, aluminum engine mounts, control horns and many other goodies which are plastic bagged in the box.

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SPECIFICATIONS

Name	COLT
Aircraft Type	Sport Flyer
Manufactured By	Sig Mfg.
	Rt. 1, Box 1
	Montezuma, Iowa 50171
Mfg. Suggested Retail Price	$20.95
Available From	Both Mfg. & Retail
Mfg. Recommended Usage	General Sport
Wing Span	45 Inches
Wing Chord	6½" (Avg.)
Total Wing Area	290 Square Inches
Fuselage Length	37½ Inches
Radio Compartment Dimensions	(L) 7" x (W) 3" x (H) 4"
Wing Location	High Wing
Airfoil	Flat Bottom
Wing Planform	Swept T.E.
Dihedral	1½ Inches
Polyhedral	NA
Stabilizer Span	16 Inches
Stabilizer Chord (incl. elev.)	5½" (Avg.)
Total Stab Area	88 sq. in.
Stab Airfoil Section	Flat
Stabilizer Location	Bottom Of Fuselage
Vertical Fin Height	6 Inches
Vertical Fin Width (incl. rud.)	7 Inches
Mfg. Rec. Engine Range	.09-.15
Recommended Fuel Tank Size	2-4
Landing Gear	Tricycle
Recommended No. Of Channels	3
Recommended Control Functions	Rudder, Elevator, Throttle
Basic Materials Used In Construction:	
Fuselage	Balsa, Ply
Wing	Foam
Tail Surfaces	Balsa
Hardware Included In Kit	See Text
Plan Size	None
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (16 pages)
Construction Photos	Yes
Kit Includes	Printed Parts
Mfg. Rec. Flying Weight	Not Given
Wing loading based on rec. flying wt.	Not Given

RCM PROTOTYPE

Weight, Ready To Fly	45 Ounces
Wing Loading	22 oz./sq. ft.
Covering & finishing materials used	See Text
Engine Make & Disp.	Enya .15
Muffler Used	Enya
Radio Used	Kraft
Tank Size Used	4 ounce

Balsa Wood Overcast

By Bill Skipper

What else can you call a radio controlled biplane with a wingspan of 8½', a wing area of 20 square feet and a take-off weight of 25 pounds?

Of course, I cannot claim any credit for coining the term. Away back, right after the war, when the Texas skies were reverberating day and night to the peculiar thrumming of the myriads of six engined B-36's, someone termed them the "Aluminum Overcasts". I simply modified it to fit my Quadra powered Gere Sport.

About 30 years ago, an A & E friend of mine by the name of Larry Farnum built a 65 Continental powered Gere Sport in Fort Collins, Colorado.

"Whazzat?" I wanted to know, eyeing the runty critter sitting in the shop, all assembled but with no skin on its bones.

"It's a Jerry Sport," mumbles Larry, "spelt G-E-R-E. Some college kid designed and built it back in the early Thirties. Heh-heh! Powered it with a '26 four-banger Chevy engine, can y'magine? Heard a couple more were built usin' Ford A's."

Well, sir, that was news to me. Me, who was born about 20 years too late because I have never gotten over the excitement of a wind buffeted open cockpit, the shimmering of vibrating flying wires in the sun, the staccato barking of slow revving, big propped engines, or the pleasing thrill of running a hand over hand rubbed fabric drawn taut by nitrate dope. I, who have logged solo time in Jennies, OX-5 Curtiss Robins, a British SE-5 and Bristol Fighter, and would have flown a Hisso Spad if the guy ahead of me had not wound it all the way in and burned. (Gulp!)

Anyhow, that was the first I'd ever heard of a Gere Sport - - - and the last, until Bud Nosen offered it recently in a king size kit. You all know Bud. He's the guy with the six by ten foot drawing board who bought a roll of drawing paper six feet wide and a million yards long at a war surplus store and ain't found out how to trim it yet. So he mounted the whole dang roll on his wall at the end of his drawing board, reels off a chunk and draws airplanes on it to fit.

I guess my love affair with flight began when I was around six, when a transient group of daredevils with two or three Jennies put on their death defying show in Longview, Texas. One intrepid wing walker in a prison striped and skirted bathing suit, derby hat, and black cigar promised to thrill the wide eyed onlookers by diving off the wing of a low flying Jenny into Lake LaMond. Well, he did, but a slight miscalculation caused him to butt heads with a 20 ton boulder — above the waterline.

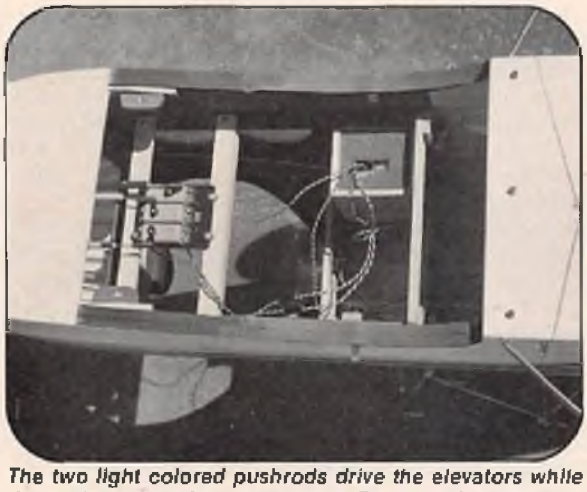
So I went home and gathered up several apple crates and built myself an airplane. It sat flat on the ground but had wings and empennage. All the control surfaces moved, too, man, because I rigged up broom handles for stick and rudder bar and drove the controls with trot line, using bent over nails for fairleads and pulleys. I flew that machine all over the world and never crashed once.

Right after that, I discovered balsa wood and glue, so I turned to modeling until I could realize my dream to fly.

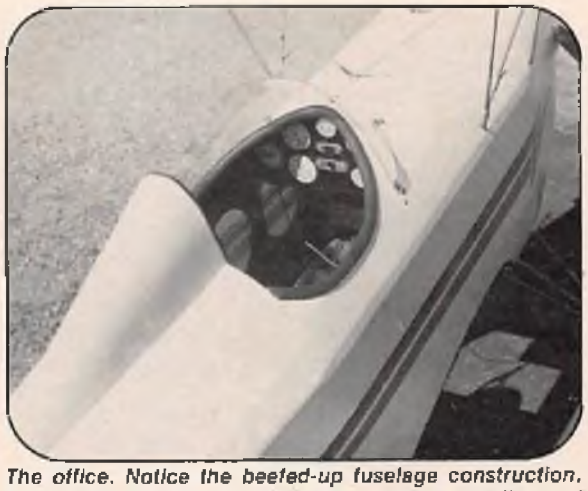
In 1946 I built a Forster .99 powered PA-12 with a 9' span and controlled (?) it by two of Walt and Bill Good's 5 meter rigs on separate frequencies — weighed 17 pounds. That was my first venture into R/C, though I'd been modeling for years - - - rubber, gliders, solid scale,

The Quadra's nest, showing twin 1/2" stacks brazed to muffler, and part of the aluminum anti-ignition interference shield. Probably unnecessary, but why take a chance?

A staunch advocate of conventional gear machines, author has at last found practical use for "milkstool" equipment – nosewheel mounting bracket for the Gere tailwheel. A good view of the empennage bracing and control hookup, also.



The two light colored pushrods drive the elevators while the darker one drives the rudder. The top of the throttle servo can just be seen above the lower wing saddle. A similar box houses the 1 ah battery and is mounted out of sight forward at the top of #1 bulkhead.



The office. Notice the beefed-up fuselage construction. The small forward projecting stubs on the cabane diagonal braces are lifting points on the C.G. Headrest is 3-ply Strathmore Bristol drawing paper. Coaming padding is windshield wiper vacuum hose Hot Stuffed in place.

Crawl right in and take 'er around the patch. The Kraft air filter adapts nicely to the Quadra, but the 18/6 prop looks lost up there.

The balsa wood overcast makes a low pass over the home field. The thrill is well worth the effort involved.

ukies - - - you name it.

Got back into R/C with the advent of lighter stuff in the early Fifties, like McEntee and Lorenz used to invent. Then came reeds, followed by proportional. Airplanes were big, then got smaller, and along came Mr. Nosen.

Always had a fascination with big models, so I grabbed up a Nosen Champ and stuck an OS .80 in it in early 1974 and it's still flying today.

Then suddenly the big engines begin to show up. A nice article by Dick Phillips in the May 1977 issue of RCM, called "Big is Beautiful", caught my eye so I

latched onto a Quadra and had no trouble at all deciding what to build for it.

A biplane, of course. But which one? The biggest biplane kit available was the Nosen Gere Sport. I liked the size and the lines and I remembered the one Larry Farnum had built. I liked the wood in the Gere kit, but knew the plane, as it was designed, would never be able to take the Quadra engine without dissolving into a big bag of shattered balsa about the first time I laid full throttle to the Quadra. You see, I had already test-run the engine and was acquainted with its power.

There were any number of wonderful biplane designs I could scratch-build, and most of them have far more appealing lines than the Gere, but I decided on the Gere as my first big airplane because I'm lazy and tight with a dollar and there was little to be modified on the Gere kit except for the fuselage.

About the only feature of the fuselage that conforms to the kit is the shape and size. The 3/4" plywood firewall is tied to the first bulkhead by full-depth panels of 1/4" ply that form the sides to the fuel tank compartment. The floor of the compartment, slanted and open for exhaust escape, is also 1/4" ply, as seen in the inverted photo. The fuselage sides from front bulkhead to the rear of the cockpit are the 3/16" sheets supplied in the kit, but stiffened with spruce stringers 1/4" x 1/2". The wing saddle is doubled with hard 1/4" sheet balsa as well as with the 3/32" ply in the kit. This results in a strong, stiff wing mount. All the plywood in the forward section is drilled and pinned together by 3/16" dowels or assembled with sheet metal screws and slow setting epoxy. The cheeks between the plywood and balsa fuselage sides are filled with soft balsa blocks to help absorb vibration. The removable one-piece cowl is held on by three dowels and two 6-32 Allen head screws that pass through vertical tunnels on either side and screw into Robart's brass blind nut inserts embedded in the firewall.

The aft fuselage section is of built-up open framework. The four main longerons consist of 48" strips of spruce and hard balsa 1/4" x 1/2", glued together, forming 1/2" x 1/2" longerons. The interbracing is hard 1/4" x 1/2" balsa. Five extra turtleback stringers were added, bringing the total to eleven and strengthening that area considerably. To give the fuselage a pleasing appearance, two balsa stringers 1/4" x 3/8" were glued to each side from front bulkhead to rudder post. 1/32" plywood plates glued across these at the rear provide nice, convenient exits for the elevator and rudder pushrods.

As seen in the photos, the entire empennage is made to remove or install quickly. (Ever try carrying a good sized model around inside the house without jamming the tail into a door casing?) A 1/4" plywood plate glued into the fuselage under the front of the stab mount accepts two 10-32 nylon bolts. The rear end is held on by the lower (flying) wires which snap into a brass fitting on the fuselage by way of Kraft's new steel pinned nylon clevises. Incidentally, these clevises are also used on the flying and landing wires on the wings, for the most part. As the pictures reveal, some of these clevises are those fugitives from typewriters, or the solder on kind offered in hobby shops, but these are not going to remain in service any longer than it takes to get enough of the Kraft clevises. (The local hobby shop did not have enough Kraft clevises in stock at the time.)

The landing gear was made removable by using six 6-32 Allen head screws into blind nuts to hold the 3/16" plywood plate on. The spreader bar is a piece of 3/32" aircraft control cable looped about the axles and held in tension by double coil springs. The 6" Du-Bro tires are nice, but are far too small for scale. Me thinks they should be 8" or 9".

Tailwheel. Hey, fellas, I know the Gere had a skid, but I like tailwheels. As you can see, I lucked out and came up with a marvelous conglomeration that works like it was meant to. I built a small "firewall" from 1/4" ply and mounted a nosewheel bracket there with four 4-40 Allen heads. The strut I bent up from 1/8" wire and shimmed it up to fit the 5/32" hole in the nylon bracket. There is little "rake" in the strut to put undue loads on the rudder servo, but the three-turn coil soaks up the bumps quite well, getting its steering from a short pushrod running from the rudder horn to a nosewheel steering arm. The 2" wheel is scale, and the whole thing does not sway and lean as the plane turns around on the ground.

For the sharp-eyed who quickly noticed three pushrods sticking out back there, I will explain. Look at the shots inside the wing well and you will see three KPS-14 servos, too.

Being one who has experienced servo failure during flight, and one who also knows that large control surfaces require more power to move against an airstream, I decided to use a servo on each elevator independently, not tie the elevators together in the conventional manner, but use a Y-connector into the receiver so that the servos operate in unison. If for some reason I lose one servo in flight, it is hoped that the remaining one will allow a safe landing. (Unless, of course, the dead servo is locked up or down!) The same system is used on the ailerons, and a one amp-hour flight battery supplies the juice to run all this.

There was so much room inside the fuselage that it was difficult to decide just where to put everything. The photos show where things finally came to rest. The switch and charging plug are on the instrument panel. I plan to build a seat and carve a pilot one of these days.

Another change is evident by the rearward raked cabane struts. Due to the extensively beefed-up fuselage, some quick calculations revealed the possibility of tail heaviness in the finished machine. Also, it was felt that there was excessive stagger in the upper wing. Therefore the cabanes were bent rearward 2½", which gave a more practical stagger and moved the C.G. back. Plotting the C.G., I attached a short section of 1/8" wire to the cabane diagonal braces at that point, giving a convenient place with which to lift this big bird to check the C.G. The point is 1.6" aft of the lower wing leading edge and it came out exactly right without any shuffling of gear, a rare thing, indeed!

Before turning to the wings, I'd like to mention the empennage again. There has been a lot written of late concerning lifting stabilizers versus the flat or symmetrical kind. Chuck Cunningham has especially dwelt on this subject in his fine column recently, and to those who warily cast a jaundiced eye toward his teachings, I say "nuts"! Listen to the man because he's right.

When I built my 9' Champ, I incorporated 1.5 degrees of positive incidence in the stabilizer, which helped the usual tendency to porpoise which is inherent in flat bottom wings with slight speed changes. I decided then and there that the next flat bottom wing bird I built would have a lifting stab, then Chuck's writings bolstered my decision and the Gere has a lifting stab. More about that when I come to the flying.

Wings. Oh, my, yes, but wings on a plane are definitely an asset to its performance and should be included, by all means. And those on the Gere required a minimum of modification, being fairly strong as they come. They already have spruce spars with plywood webbing, and about all the changes necessary were to add 1/4" plywood pads where the struts and wires would attach, ailerons on the upper, and some sort of tips to get shut of that chopped-off appearance which square tips always have. They look unfinished, somehow.

One full extra bay was added to the lower wing to make its span the same as the upper and produce a total wing area of 20 square feet. A removable panel under the lower wing at each bellcrank location gives ready access to this little jewel in case adjustments need to be made later on.

The flying and landing wires are 1/16" music wire and attach to .050" brass shimstock tabs which, in turn, are anchored to the wings by Robart blind inserts and 6-32 Allen heads. The clevises screw onto threaded brass sleeves by Du-Bro, which are s
soldered to the wires.

The struts are shaped f

1/4" x 1/2" spruce, gusseted by 1/32" ply and have 3/16" dowels inset in the ends which project about 3/8". These dowels fit into holes in the ply plates in the wings and are held in place by the tension of the wires, with the exception of the lower rear strut fitting. Here a brass fitting resembling a pressure foot on a sewing machine was made and bolted to the strut. Another 6-32 Allen screw into Robart blind inserts holds the strut firmly into the wing. The aileron coupling struts are also spruce, with clevises attaching to pruned small control horns screwed to small plywood plates inset into the ailerons.

All this may seem like a lot of unnecessary trouble just to achieve realism, but let me assure you such is not the case. True, it takes time, but remember we are dealing with a **miniature aircraft**, not a model! In this type of machine, the flying and landing wires are essential because of the weight and flight loads that will be imposed. Forget all the old beliefs that wings should be made to separate from the plane in event of a crash. Besides, who likes rubber bands on a 25 pound plane?

Look at it. A bipe this large needs four ailerons, not two. Two alone constitute only about 5.5% of the total wing area, and almost everyone knows that the aileron area should be around 10%. Okay, so we build four ailerons. The best way to move the uppers is to drive them with push-pull struts from the lowers, unless we want to put a servo in the upper, too. It follows, then, that the wings cannot be unsupported and still have connecting aileron push-pull struts. I tried that once with a four-aileron Aeromaster by leaving the N struts out, and let me tell you that was the hairiest flight I can remember. Sure, the wings were flexing independently in bumpy air, causing the ailerons to jiggle crazily and the Aeromaster to wiggle and waggle all over the place.

All right, so we provide interplane struts to keep the wings aligned and the gap constant and the ailerons tracking. From there it is only one more step to functional wires, and let's face it, there's no substitute for the strength a set of flying and landing wires provides. Ordinarily the wings on a biplane are thinner than those on monoplanes, and to make them full cantilever requires much heavy internal structure. So why not use wires? They look nice and they sure don't hurt a man's peace of mind in case the bird gets inadvertently into a screaming dive from which only a quick (and high-G) pull up will avoid a huge geyser of balsa and plywood.

So I say use wires. Once you go through it a couple of times, it only takes a couple extra minutes to install or remove them. I use one landing and two flying wires in each bay, since, with the Clark Y wing, I do not anticipate many outside loops.

A bit of advice: Acquire two cardboard tubes, such as those in which your hobby shop receives music wire. Label one "Right" and the other "Left" and keep your wires stored in them to prevent getting them mixed up. There is always going to be slight differences in the lengths of right and left wires, and to sort them out or re-adjust them each time you want to fly may result in bitter words.

Studying the photos, you will see that the landing wires attach to the lower wing at the front strut, and to the rear upper cabane fitting. The flying wires attach the upper strut points and at the fuselage. The best way I have found to assemble the plane is as follows:

Set the plane upside down on the cabanes and install the lower wing, remembering to plug in both aileron servos. Then stand it on its nose and wheels to attach the empennage and pushrods. The upper wing is next. Snug the wheel collars down tight, the ones that keep the wing from slipping forward on the cabanes, although I doubt if there would be any way to lose the wing even if all four collars were left off. Incidentally, this is a fantastic method of attaching the upper wing. I've seen none better.

Next come the four flying wires. Snap the clevises to their inboard anchors, then attach the outboard tabs in place with the 6-32 Allen heads. Do not tighten yet. Install the N struts in their shallow holes, then hook up the two landing wires. Now tighten the flying wires. This is where some adjusting must be done when first setting up the rigging, and once accomplished, need not be bothered again.

Adjust the wire lengths with the clevises so that when the flying wires are snug but not extra tight, the outboard landing wire screw is 3/8" out. When seating this screw, all wires will be tightened to sound about like the bass string on a bullfiddle. This is where the steel clevises fall short. Under this kind of tension, even the rubber sleeves will not keep them from vibrating out of their holes, which is why I like the new Kraft steel-pin nylon clevises. They snap into place and resist opening.

Last, add the aileron push-pull struts.

The entire plane is covered in white Permagloss Coverite. This is marvelous stuff, easier to work with than anything yet offered by the modeling industry, and as strong as a bull buffalo after a scared Indian. But as good as Permagloss is, it must be coated with at least three layers of tautening butyrate dope or it will begin to sag after a short time. I have also found that butyrate trim cannot be readily applied over undoped Permagloss, so I have adopted this method on at least six models. Apply at least three brush-on coats of clear C.A.B. (cellulose acetate butyrate) dope, tautening. Six coats if sprayed on. Mask and trim with butyrate, then apply two or three more clear coats, sprayed on. This will give a nice glossy finish that will never sag.

All right, let's fly it.

I spent a lot of time in checking out the radio for possible ignition interference from the magneto on the Quadra, finding none. I use a resistor spark plug and shielded the firewall with aluminum, as did Dick Phillips. However, I am told by experienced chainsaw fliers that the Quadra with a resistor plug does not bother radios. The receiver antenna is stuffed into a plastic tube built in along the upper right longeron, and so is out of sight.

Everything worked perfectly, though the high speed needle valve on the Quadra required some leaning down to get good two-cycle operation, a hair on the rich side at full throttle.

Tail-high taxi tests showed little tendency to wander, a point that bothered me, since the landing gear was placed where the plans indicated, even though I had moved the upper wing rearward 2.5". I thought I might be forced to move the axles rearward to compensate, but there was no need, I saw. The Gere responded easily and faithfully to rudder steerage.

Finally I was ready. It was the first decent flying day we'd had all winter - - March 5 - - and it was gorgeous. The wind was light and variable and the temperature around 70, and a bunch of club members were shuffling their feet impatiently while glancing covertly in my direction, meaning "Chicken! Whatcha waitin' for?"

The Gere lifted off smoothly after a run of fifty feet or so. I had all trims neutral and was ready to make any adjustments called for, but none were. The climb, while not spectacular due to the Quadra still being too rich, was very satisfactory and I found 200 feet under the wheels quickly.

I was not certain of the fuel supply because I'd done a lot of taxiing and adjusting, and the 12 ounce tank was one I'd grabbed at random, intending to replace it with one twice as large in the future. Anyway, it would be only a short flight.

It was apparent immediately that this was no aileron plane. The first turn was hesitant and sluggish until I remembered the thing had a rudder. Coordinated, the turns were smooth and natural going in and coming out, and any over — or under — controlling was obvious.

The elevator was a bit goosey, but I'd set it up with 2" either way from neutral on the theory that too much travel on a test flight is better than too little.

There was little tendency to porpoise as it leveled off and gained speed, thanks to that lifting stab. And with the 18/6 prop it was faster than expected.

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SHARING

By Bob Thompson

Many years have passed since I shaped and glued my first piece of balsa in the form of an aircraft. They have been years of want and plenty.

In retrospect, the years of want were not when one lacked the price of the glue or balsa but rather when you lived in an area where other modelers were in short supply. Years of plenty have been short of the price of balsa at times but have been rich in the people whose ideas have made the whole modeling scene so exciting.

One usually enters the modeling field because of a newly awakened interest in the object in question, i.e., aircraft, boats, cars, etc. Were this to be the total of the attraction, the individual would probably move on to other interests. Why this does not happen is normally due to the meeting of a fellow modeler and the sharing of experiences, ideas, etc. While the newcomer may not recognize this under the specific heading of "sharing", he will be aware of the feeling of warmth that emanates from another modeler when this experienced modeler takes the trouble to show his modeling "know-how".

From this I can only conclude the sharing of ideas is a fundamental reason for the never ending interest in modeling.

The ideas shared in this article are not necessarily new and some probably originated with idividuals far from this area. They are printed here for any who will benefit, with the additional hope they might spur another modeler to pick up camera and pen and continue the "sharing theory".

The powered sander leads off as it far out-shadows any other single tool in the modeler's workshop. You can remove a part from a sheet of plywood with a broadaxe and after a few deft swipes of your sander one could not separate it from the part removed with the finest jigsaw.

This sander is a few pieces of scrap plywood, a surplus switch, an old lamp cord and an adaptor for your plywood disc. The adaptor consists of a 1" piece of brass bar stock drilled out to accept your motor shaft. The piece is, in turn, braised to the center of a 1½" square of 1/8" brass. To insure accuracy, have a friend chuck this unit in his lathe and face it off. Any electric motor of 1/10 HP or better will be sufficient.

Sanding blocks are always mentioned in articles on building but for some reason no one mentions sanding sticks. A sanding stick is to wood, what a file is to metal. Make them from anything that fills the bill and when the job is finished save the ones you liked. Second from the right is a poorly cut spar joiner. The fourth is a piece of broom handle. In the lower center are wing struts which have served as sanding sticks for 10 years. When you come to a difficult sanding job, build one to fill the bill. Your work will show the difference.

This idea arrived after becoming totally disenchanted with trying to pour a quarter ounce of resin from a full can. I slopped more than I used. With this method the precise measuring required was a snap. Use eye protection when handling the catalyst.

The two larger glue containers represent the way we normally acquire our adhesives. The Elmer unit is an improvement in that it has a fairly pointed spout although it is an expensive way to buy glue. Once it is empty you can refill it with the cheaper stuff from the big bottles. The needle is a standard disposable unit with a 21 guage needle. I acquired this one from the family doctor. Grind off the point before using . . . really a joy for getting glue where you want it. A piece of fine wire should be kept handy as the glue will set up in the needle after a considerable period of time.

"Cheapness keeps me in." The unit of Micro Balloons on the right was

purchased for $2.15 and that was some time ago. The bag on the left was purchased a short time ago for 50¢ at our local boat repair yard. Different color, yes, but they do the same job.

A cap from a can of spot remover keeps the sharp part under control.

This photo is included to show how items from other areas can be adapted to our hobby.

From the top: K2r— After a hard landing or a crash, wipe off the worst of the oil. Spray immediately. Once the sprayed-on material is dry, you can brush it off and have no problem with oil causing your glue not to stick. This is also where you get the blade holders.

Next down is a fabric tracing wheel. With carbon paper it makes a very simple, but effective, method of transfering former shapes, etc.

Dri-Wick makes it possible to remove those small electronic components without ruining them by overheating.

Dental picks — available from your local dentist on a throw away bases, have uses too numerous to mention. They last forever.

A Grumbacher pallet knife is next and used for placing and smoothing micro-balloons. The 870 model is the one I use.

Last, but ever handy, is a large pair of biology tweezers for recovering those small pieces dropped into fuselages, etc.

A scrap piece of 2" x 3" fir ends the frustration of pawing through a tool tray. Yes, the sign does seem to help.

Owners of Trexler Wheels awake! The problem of getting air into these units after they have become a bit aged is an experience. Not so any more. Grind and polish **round**, the end of a bicycle spoke or similar sized wire, coat with silicone, and carefully insert. Once the wire is all the way home, your troubles are over. I keep a spare wire in my kit just in case.

Power tools are a problem to get and, once you do, it becomes a problem of what to do with them. Answer — place them on reasonable sized bases using rubber feet where required to absorb vibration. Store on a shelf till required then bring them to your work bench. It does work.

This one removes the problem of how to hold the thing and use it too. The parts are from a Heath 3 channel transmitter and are available from your local Heath dealer. Required are 2 strap tips, 2 strap clamps, 2 strap brackets, 1 strap, 4-4/40 nuts and lock washers, 4-4/40 x 1/4" screws. Some difficulty may be experienced while drilling holes to mount the strap bracket. I found my Series 71, shown in photo 11A to be no problem. My Series 76 (shown in 11 and 11B) was, however, too tightly packed to drill bolt holes so I placed the strap brackets with Hot Stuff.

Clean the case with methyl hydrate and let dry. Now wipe it with a clean damp cloth to insure the moisture required for the Hot Stuff to do its thing.

This is a fast, cheap method of supporting the parts to my T-28 while I spray.

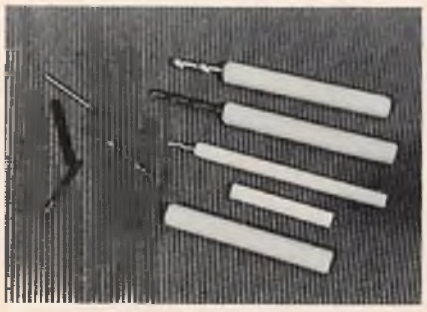
Fit all parts for wing, stab, and rudder with the required hinges **without** glue. Remove the hinges and you will have all the slots necessary to fit these little stands.

When spraying, place a finger on one of the support feet as you spray that component.

The large units support the wing when the metal tips are inserted into the aileron hinge slots as shown in Photo 12A.

The ubiquitous tissue roll. A couple of dabs of glue and you have a pencil holder, scissor holder or what have you.

Bread wrap closures can be made into a variety of very useful objects. Here an antenna holder.



Who doesn't break them? Don't cuss! With short lengths of dowel and epoxy use the broken ends and you'll in time have a fine set of drills for those hard to get at places. If you're in a bind in a tight area, break one on purpose.

Needle valve extentions can be a pain. The center needle valve indicates where the unit should be cut. Solder a piece of brass tube of the required size and length using the noted bearing solder. I have used ordinary solder and found they failed at the needle end.

For a modest outlay, you can avoid those self-tapping screws they include in kits and which always end up ratted-out by the time you have the threading job done.

A point worth mentioning is that when you buy the taps be sure to buy a bottle of cutting fluid for the metal you're tapping.

This unit makes spraying possible in my basement without divorce lawyers, etc. Size the plywood to fit an opened basement window. When you're finished and the odor is gone, remove, close the window, and bask in the warmth of the smiles from upstairs.

This exhaust fan was recovered from a domestic room cooler which had seen better days. A possible source would be your local air conditioning firm. The fans vary in size but are more impressive in the quantity of air they can move. This one has 8" inlets and the spec sheet rates its output at 1200 CFM.

This is for the fellow who can't afford fluorescent lights here, there and everywhere. Drape track will move the lights where you want them. The three sets of rollers ensure your light doesn't do a number on your model by falling on it.

When you are faced with the difficult fuselage shape, a stand is the only answer. A piece of scrap foam cut out to the shape of your particular problem and glued up into a stand saves your ship from the ever present dings, etc., caused by rolling around on your work bench.

This is for the fellow who, I hope, will pick up his camera and carry on. Instead of going out and buying all sorts of fancy back drops, etc., walk around the house picking up table cloths, bedspreads, towels, etc. Lay them all out with printed notes so you'll know which is which. Pick the articles that you'll probably be working with, lay them out and snap away. Once you see the results, you can then make a value judgment and be reasonably sure of the results.

Cheers! □

If you have any ideas like Bob's that would be of interest to fellow modelers, send them to RCM and we will share them with our readers.

WHEEL DOOR OPERATION FROM YOUR MULTICON RETRACTS

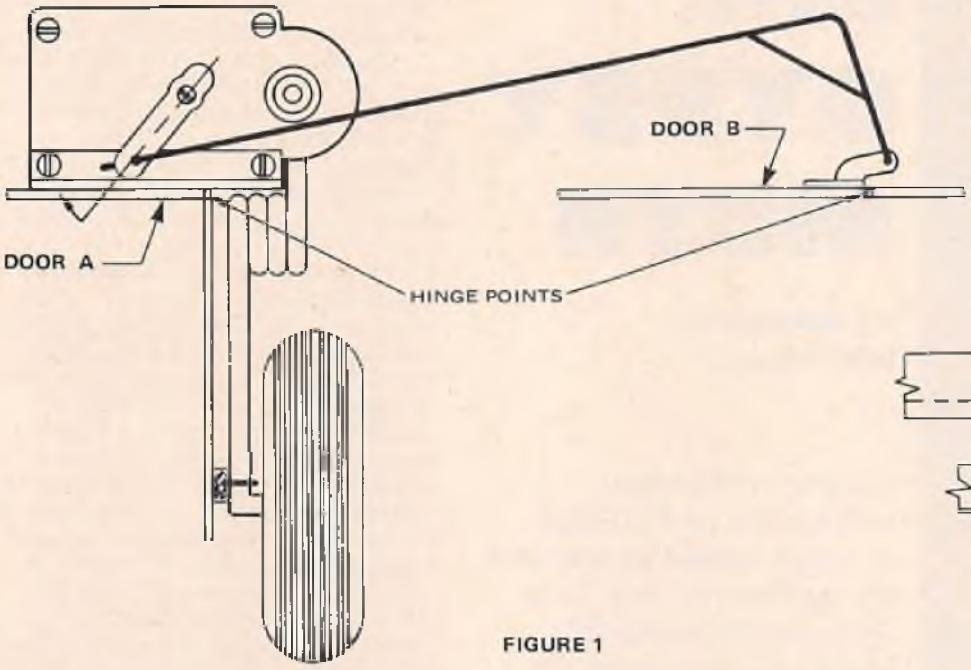
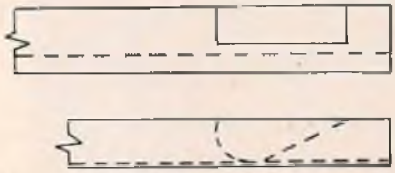


FIGURE 1



MOUNTING RAIL

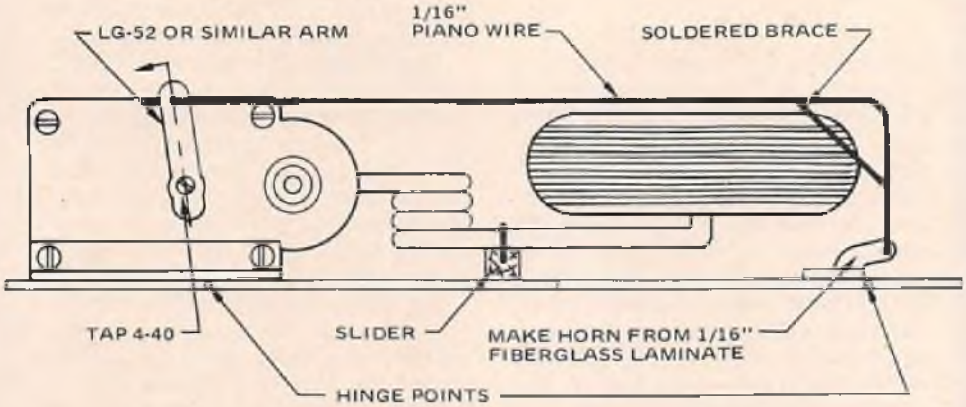
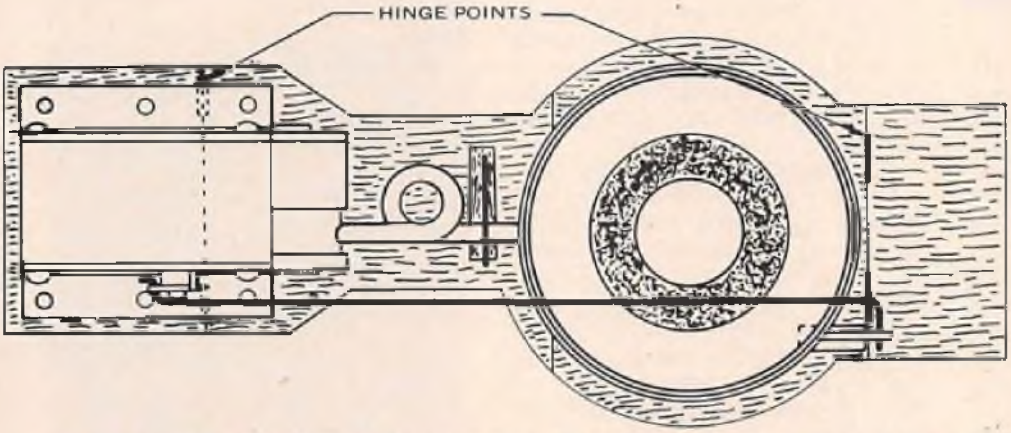
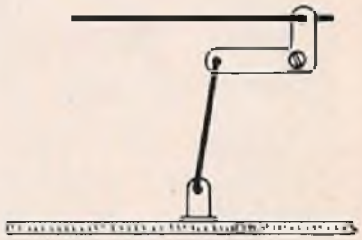


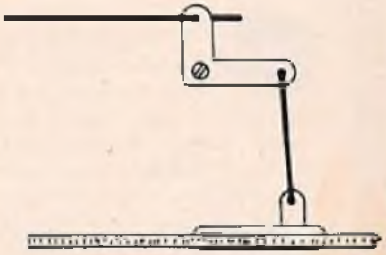
FIGURE 2





BELL CRANK

OPTIONAL METHODS



BELL CRANK (OFF SET HINGE)

In operation (Figure 1) Door 'A' is open and Door 'B' closed. When the gear begins to retract, Door 'B' begins to open while the wheel and Door 'A' go inside. Then Door 'B' closes again (Figure 2). The trick of all of this is the angle of the door pushrod to the output arm. The arm pulls on the pushrod for half of the cycle and then pushes on it for the other half.

D.H. GYPSY MOTH

By Gordon E. Whitehead

Gordon Whitehead, well-known for his Scale designs, comes up with one more of his winning .15 to .20 powered Stand-Off Scale ships which we are proud to present to our readers.

D.H. GYPSY MOTH
Designed By: Gordon E. Whitehead

TYPE AIRCRAFT
Stand-Off Scale
WINGSPAN
45 Inches
WING CHORD
6½ Inches
TOTAL WING AREA
540 Square Inches
WING LOCATION
Biplane
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
1 Inch
OVERALL FUSELAGE LENGTH
36 Inches
RADIO COMPARTMENT AREA
(L) 5¾" x (W) 2⅝" x (H) 2¼"
STABILIZER SPAN
14½ Inches
STABILIZER CHORD (incl. elev.)
4½ Inches (Avg.)
STABILIZER AREA
55 Sq. In.
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
5 Inches
VERTICAL FIN WIDTH (incl. rudder)
6 Inches
REC. ENGINE SIZE
.15 — .20 Cu. In.
FUEL TANK SIZE
2 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa, Ply & Spruce
Empennage	Balsa
Wt. Ready-To-Fly	55 Oz.
Wing Loading	14.5 Oz/Sq. Ft.

Of the many thousands of D.H. 60 Gypsy Moths which were made between 1925 and the mid-1930's, only about 36 examples ramain, 7 of which are in the U.S.A. So if you want a Gypsy, you'll either have a long wait, or will have to make do with a model! The first scale model I ever saw performing was a big, light 5' span, single channel Gypsy Moth back in 1958, and I've had a soft spot for the ship ever since. One day, the urge became unbearable, the drawing paper came out . . . and there she was!

The model is not far from scale. The engine compartment is slightly wider than scale in order to accommodate the HB .20; the wing section is 12% Clark Y instead of 6% RAF 15; and the wings are banded on. All this emphasizes that the ship is a sport model. A glance at the plans will show that she is quite lightly built. So if you're a lousy flier, get in some practice, and if you're between average and ace, please don't add excess weight by beefing her up, as you'll ruin the performance. She's strong enough to stand up to anything in the air, and flexible enough to survive many a rough landing. Mine has had hundreds of flights, and even more landings as I like doing 'touch and go's', but I'll say a word or two about flying technique later.

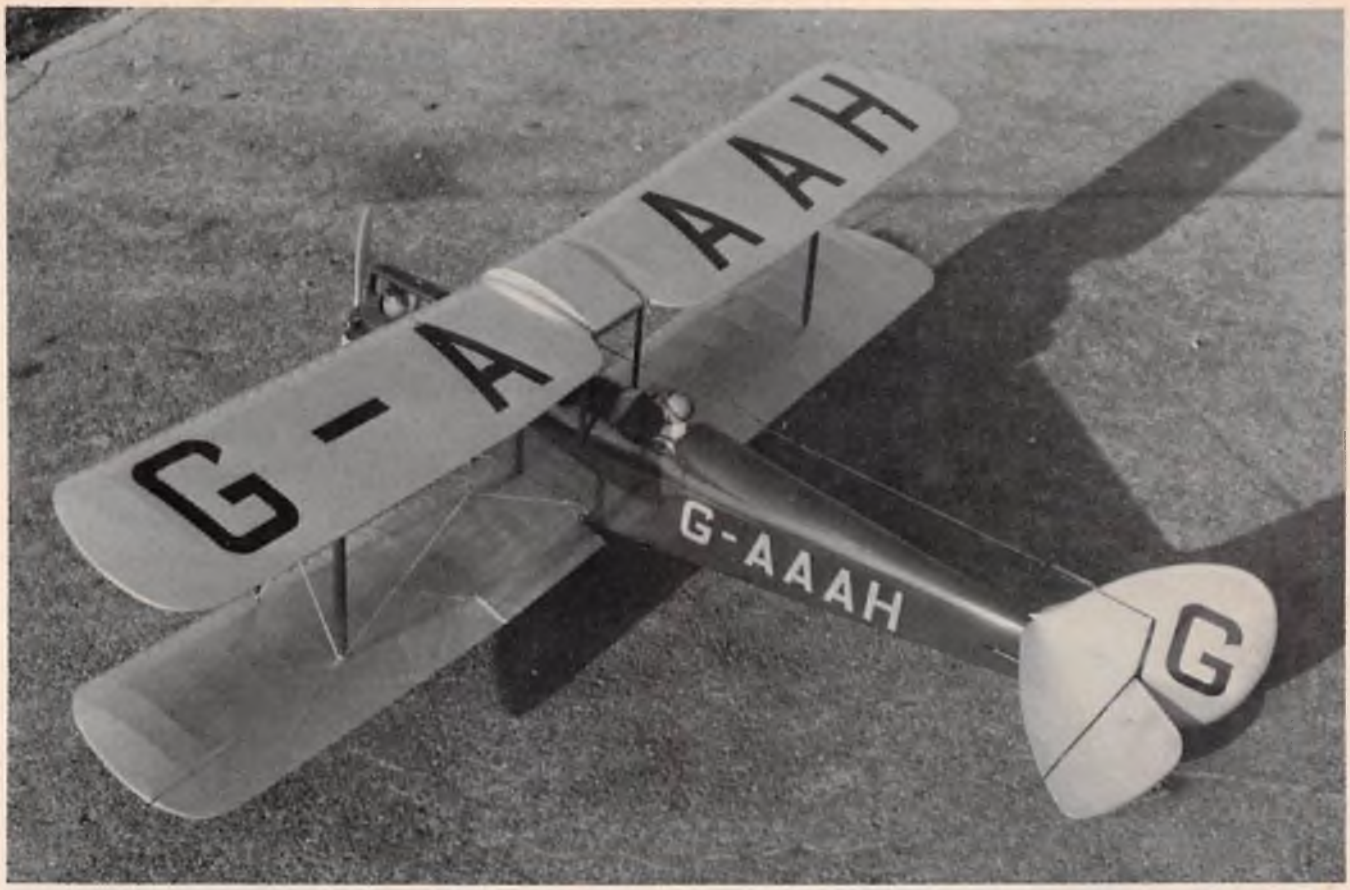
My Gypsy's color scheme is that of Amy Johnson, and you shouldn't have too much difficulty finding an attractive scheme. In fact, I never let the absence of a good scheme prejudice my choice of subject. If diligent research is fruitless, then I merely paint the ship the scheme I'd have put on the real one!

CONSTRUCTION NOTES

The fuselage is a simple box structure, with all sheet sides just like the full size ship, and the only complicated part is the engine cowl. The empennage employs an interesting structure, which is light and strong. The wings are cantilevers, but the interplane struts usefully share out lifting loads, even though the elastic wing bracing is only decorative.

Fuselage: Choose light balsa, but not brittle stock. The diagonal joint between the cowl sides and fuselage, and the narrowing of the cowling towards the nose, mean that the ply cowl sides need to be pre-twisted as shown on the plan — a simple task, but best done first so that the jigged sides can be drying out while you do something else. Contact glue F1A to F1, and doublers D1, and D2 to the fuselage sides. Cement 1/8" square and 1/8" x 3/16" balsa longerons and uprights to the sides. Glue P1 in place. Join the fuselage sides with F1/1A and F2A, ensuring squareness, also gluing in place the cabane supports S1, and the 1/2" x 1/8" balsa cross braces at front and rear of lower wing seat. When set, join the tail end with the 1/4" square tail post, epoxying the tail skid in place. Fit all formers and 1/8" square bottom cross braces. Bind the cabane struts in place, carefully incorporating the slight forward slope of the main 'verticals' then solder the top joints, epoxy the binding and, finally, add the top decking. Glue the ply cowl sides, M1 and C3 together, butt-joining the lot in place on F1. First check the twist in the cowl sides by dry pre-assembly. If wrong, re-soak with more or less twist as needed. Make the top cowling referring to the photos (but not to the paint finish!). Fit the ply bottom piece, bottom 1/16" sheet and check the tank fitting. Add the 1/2" sheet stab seat.

Empennage: The sandwich method used is really strong, but my model needed 1 ounce of tail weight to optimize the C.G. position. Therefore, very light 1/4" sheet may be in order, provided you don't nylon cover or tar it. Remember the tail moment is long — however, I like built-up tailplanes, so have no difficulty in selecting my method! Butt-join 1/32" sheet to the full width of the stab or fin/rudder and cut out the complete outline in one piece. Build the outline, spars, and 'ribs' on one side, pinning down flat until dry, then turn the job over



and repeat the process. Sand to section, then marvel at how light, yet stiff, the surfaces are. Separate the moving surfaces.

Wings: I once read that wood is a poor building material when used in compression, but good in tension. Shortly afterwards, I had 3 out of 4 top spars on one side of a small bipe collapse in compression after a particularly hairy snap maneuver. Luckily, the bottom spars didn't collapse, so I was able to have another 3 flights before going home! However, I now make the top spars of my bipes of spruce, instead of balsa, and of bigger section than the bottom spars. Other people solve the strength problem by using I-beams, D-boxes, or veneered foam! Sand smooth the exposed face of each spar. Then lay down the bottom spars, and trailing edge for each wing panel, add all ribs, followed by top spars, leading edge and tips. I built the bottom wing as per top wing, and ran each panel through the Dremel with the table tilted to cut off the ailerons. Join the bottom wing panels with the center section, not forgetting the 1/8" ply doubler to support the landing gear. Fit the servo and links. The top center section tank parts are fitted after joining the top wing panels. The secret of building a light, strong, yet warp-free, wing is to leave the wing pinned down as long as possible — easy when the plan shows all 4 panels! Don't forget the riblets. The method shown isn't as tedious as you would think, and the final effect is most rewarding.

Finishing: My model's fuselage was tissued, and had 3 coats of sanding sealer well rubbed down under 2 sprayed coats of colored butyrate dope. I sprayed the sides silver in the region of the registration letters, masked off the letters and sprayed the green top coat. I hand painted the cowl lettering.

I Solarfilmed the flying surfaces. The edges are rather narrow, so one has to be careful with the heat gun, otherwise the adhesive will soften, and the material will shrink away from the leading edge, etc. Wing letters were knife cut from black film and ironed on at low temperature.

Radio Installation: My old mini Futaba gear went in with 3 linear servos abreast. The flat pack nicad went under the receiver, after a bit of gouge work on F1A. The switch and charging socket are in the pilot's cockpit. Control throws are on the plan.

Flying: Don't go to the flying field until you have the engine really behaving. Flying pleasure is immeasurably enhanced by a good throttling engine, and you won't want to merely fly this ship about the sky on one throttle setting. My first flight with this model was made in a 15 kt wind on, believe it or not, a slope soaring ridge! Naturally I didn't learn an awful lot about her behavior, except that she is easy to land. However, I've designed, built, and flown about 35 successful RC models to date (plus some failures), so I have more than average confidence. A few days later in a more appropriate location, I was able to verify her viceless nature, but the 10" long 1/4" I.D. exhaust pipe seen in the photos was appreciably lowering the power. I installed a 5" long 3/8" I.D. copper tube bent to direct exhaust goop down below the cockpits, and power was regained. When taxiing on grass, you'll have to 'blip' the motor to raise the tail for steering. A steerable tail skid fixed to the rudder would be a boon. For take-offs, use full power — she'll float into the air as gracefully as the full size. I needed about 1/8" down at the elevator trailing edge for normal cruise trim, but no rudder or aileron offset.

The Gypsy will climb quite steeply and quickly, and rolls quite quickly too. She loops very gracefully, and if you throttle back the engine when she reaches about '10 o'clock', she'll slow down and coast over the top at an acceptably slow speed. Don't gun the engine until she's level, or you'll spoil the illusion. She cruises very prettily and with a nice 'sit' at between 1/4 and 1/2 throttle (9/4 Tornado, 5% nitro). A good .15 should provide enough urge, but a .20 is ideal. You, and any onlookers, will really enjoy watching her chug around at just above head height. Once you've trimmed her to fly hands off, a touch of aileron, 'on-off', is all that is needed to guide her one way

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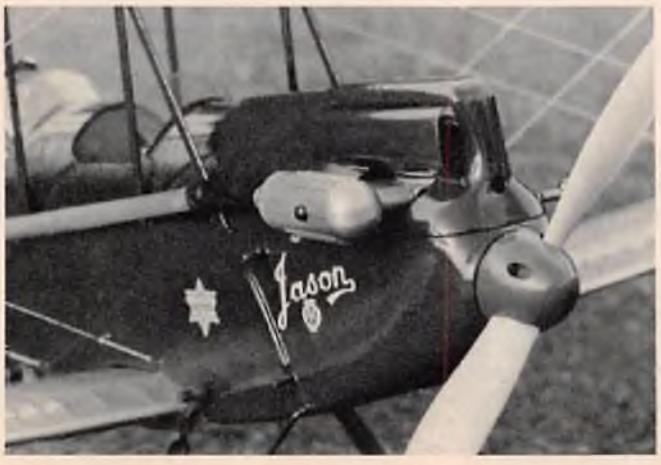
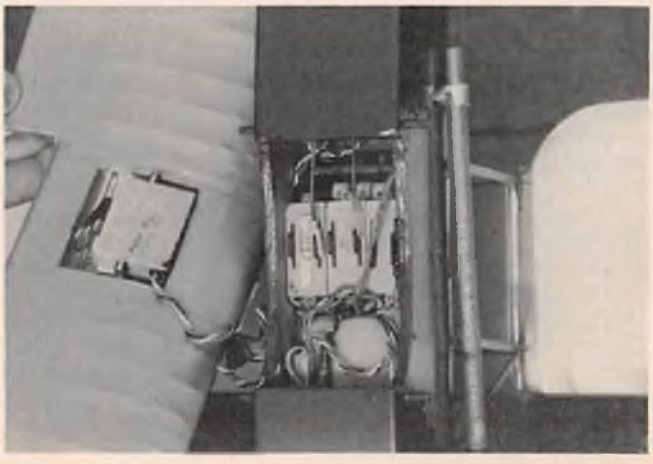
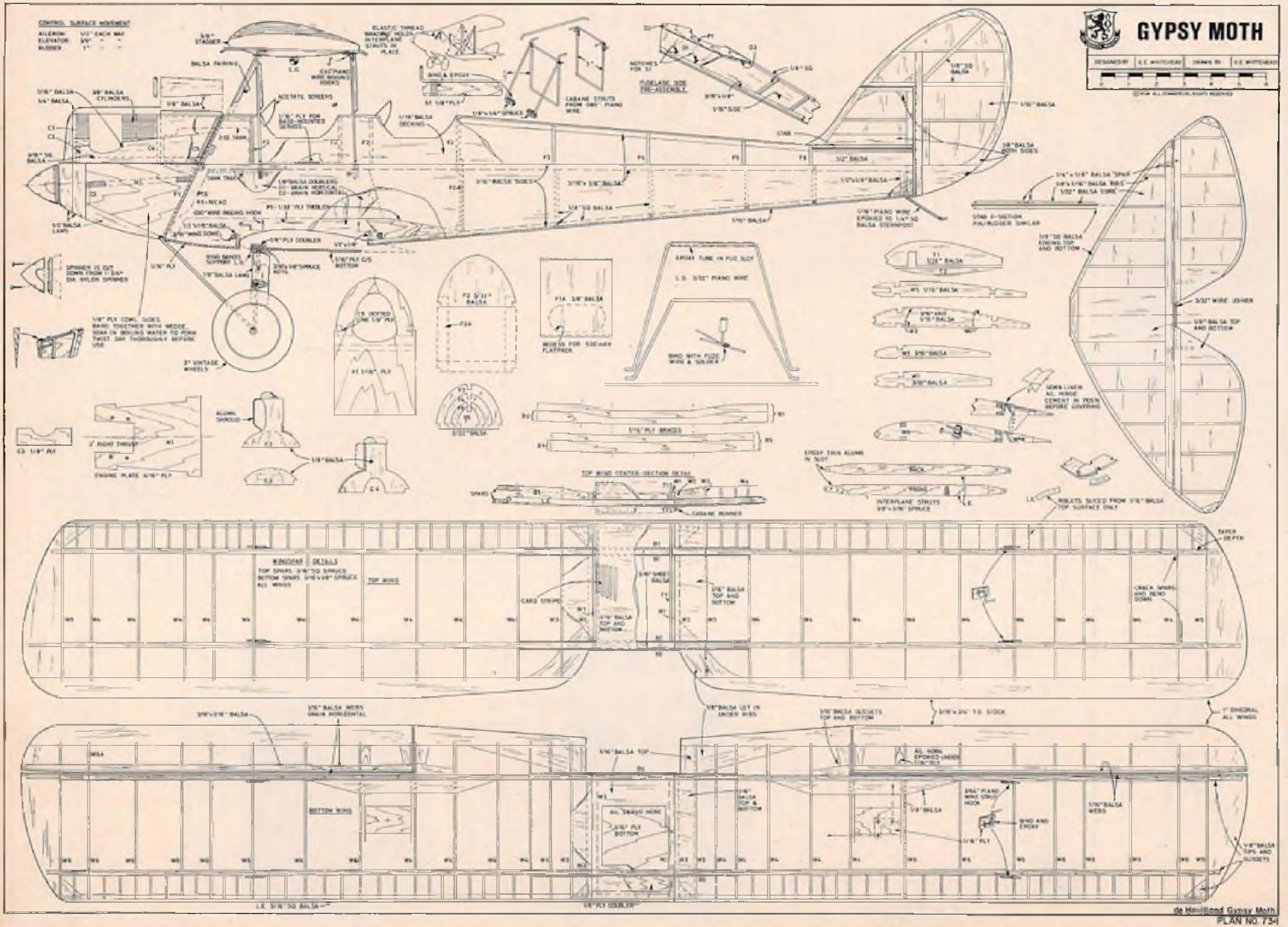
TOP ROW, LEFT: Bottom view of tail showing control linkage hook-up to rudder and elevator. TOP ROW, RIGHT: Aileron horn and rod on bottom of lower wing. ABOVE RIGHT: Left side view of top engine cowl. ABOVE LEFT: Right rear view of cowl. Made from balsa and aluminum sheet. LEFT: Cowl removed. Note bracket for hold-down screw also tank filler and vent lines routed out side of fuselage for easy access. BELOW LEFT: K & B .19 is well hidden but with good ventilation. Note muffler extension to keep oil residue away from lower wing and fuselage. BELOW RIGHT: Lower wing removed showing 4 servos installed. Again note muffler extension.

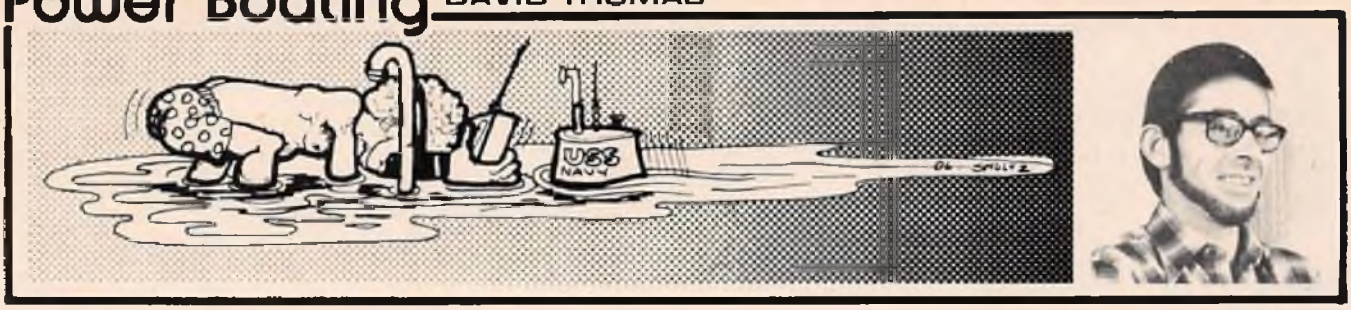





GYPSY MOTH
de Havilland Gypsy Moth
PLAN NO. 734

Power Boating

DAVID THOMAS



Some time ago I mentioned in this column the fact that I had received the new Rossi .65 Marine glo engine, and that tests were underway. This is a ringed engine, and not an ABS set-up, so the longevity of the internal parts should be quite good. The first thing I did was to break the engine in, on a rig, using a plane prop. This is by far the easiest way of doing the job; all that is needed is an adapter for the prop, and a pump, such as an old windshield washer pump from a car, to provide the cooling water. This can conveniently be run off the 12 volt electric starter battery, if you run such a thing. I do, I'm really lazy.

Rossi 65 installed in Super Jumbo. Note the special long-range tank, and the extra cooling circuit loop between the cylinder head and the water cooled exhaust manifold.

The Super Jumbo at speed – but not its top speed, since the engine was not particularly well tuned on this run.

When I got it nice and free running, after about an hour, I broke with my usual practice and, instead of putting it straight in a boat, I sent it off to a friend of mine who has a pretty accurate test rig, to find out just what the performance figures are. The manufacturer states that this engine will develop 3.25 b.h.p., and on the test rig, with a fuel mixture of 75% methanol, 20% castor oil, and 5% nitro. It produced 3.20 b.h.p., using the tuned pipe and silencer that came with the motor. Well, who's going to complain about 0.05 b.h.p.? And, anyway, there is bound to be a range of different figures for any given batch of engines, just like you get a good or a moderate G.M. automobile; it's mostly a question of luck.

I then put the engine in a boat — a deep V Jumbo Jaguar Mk. II, because I figured that, with this sort of power, I was going to need all the stability I could get. And I wasn't wrong. At a recent demonstration, just to impress the spectators, I knelt on the launching pontoon and held the model in the water and then opened the taps wide. An absolutely enormous jet of water was thrown up (I had a job to hold on to the boat) and someone told me afterwards that it looked very much like the pontoon was about to take off across the lake! Come to think of it, that would be a good stunt for amusing the spectators - - - must try it sometime.

The .65 starts remarkably easy, especially on the Sullivan starter. If anyone has troubles, because of the compression, then remember that it is a good idea, once the starter is in place in the belt, to back-off the egnine to the far end of the cycle so that the starter has a chance to work up some speed and inertia, before actually hitting the compression. That way, you'll have no trouble. But if the starter begins working directly against the compression, with no run-up, then it sometimes won't make it, and this doesn't do the starter any good.

It is a very easy engine to start, and very reliable at low speeds once the carb is properly adjusted. Talking about the carb, they have fitted an in-flight mixture control system so that with the use of a third servo, the engine can be adjusted for maximum power while the model is actually running. The system is very simple: the needle, with its usual fairly fine thread, runs inside a brass barrel which, in turn, runs on a very coarse thread on the carb itself. This barrel has an arm which is attached to the third servo in the usual way. Initial adjustment of the engine is made at the bank with the fine needle; the servo being set so that the brass barrel gives the richest setting. Once the model is running at full speed, the engine can then be progressively leaned-out with the third servo, until the absolute top speed is achieved. A pretty useful device, and one which is becoming quite common on both boats and planes these days.

Needless to say, the boat went very fast! The throttling on the water is good, with the provision that one has to expect a fairly brutal reaction when the engine comes onto the pipe — the revs go up about 2,000-3,000 practically instantaneously, and the boat heads out like a horse on its way home to the stable. I ran without any form of tank pressure, and due to the very brutal turning reaction of the big Jumbo — I consider that any boat that will not turn at full speed on reasonable water in about 3 metres or less is no boat! The engine did come off the pipe momentarily during the last part of the turn, but came back on as soon as it straightened up. This wasn't helped by the fact that I favor very big-bore fuel tubing, and large filters with an extremely fine mesh. But there is no real problem, since tank pressure from the exhaust system will cure this tiny fault — a fault that would be common to practically any engine under the same conditions.

Now to sum-up. I like the finish of the engine, both inside and out. I like the novel exhaust fixing, despite some doubts at the beginning about its staying in place. In fact, if the tail-end of the pipe is fixed correctly, there is no way it can come adrift. I also particularly like the way the pipe can be slid up and down on the manifold, in order to get the best position. The carb behaves well, good mid-range throttling, and a very stable slow running. All in all, the engine does exactly what it was designed to do, does it well, and I predict that this new Rossi is going to be a very, very good racing engine, and that we are going to see a lot of them around, both in the .65 and the .60 sizes. One last point, for the serious and technically minded among you, the 3.2 b.h.p. was developed at 21,000 rpm but the engine had a whole load of torque right down to about 14,500, so there is a very useful power range.

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It must be Rossi's birthday today because the other thing I have to talk about is that outboard motor which I

The AMP Tiger-Shark and Rossi 61 F outboard. More testing to be done on this outfit, but it looks very promising already, and it sure looks nice!

mentioned last time, and which I have since received and tried out briefly. As can be seen from the photos, this is based on the Rossi F.61, and is a special. I have fitted it to the new Tiger-Shark, also manufactured by A.M.P.S., and have tried the outfit out very briefly. I don't want to say too much about it at this point in time, becuase I really haven't had the chance to investigate the thing properly, and I don't like going off half-cocked, but I can say that the model looks very pretty, and the noise level of the outboard, even at full revs, is incredibly low, thanks mainly to the underwater exhaust system. The boat really moves out, on the two brief runs I have made, so things look promising. We'll come back to this one later.

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Now some letters. One comes from Mr. T.J. Maxey of Maxey Enterprises in Los Angeles, California. This is a firm specializing in sonar devices, and Mr. Maxey is an R/C plane enthusiast, but says he reads my column too! Gee, it's nice to know someone does! Anyway, going back to the problem of gluing ABS, he says that while my correspondent is correct in saying that Methyl Ethyl Keytone will do the job, it is difficult to use. His explanation is logical and easy to follow: MEK is not a real glue, it is a solvent. Taking the case of two pieces of ABS to be stuck together, what happnes is that the MEK dissolves the surface layer of each piece, and these mingle. When the MEK, which is very volatile, evaporates, we are left with a nice joint, we hope! The snag is that, like some other glues, it will not fill gaps, so that there has to be an almost perfect fit between the two parts in the first place.

In addition, Mr. Maxey says that the stuff is very inflammable, and pretty corrosive if it gets onto some synthetic materials. So if anyone uses it, keep the stuff off that shirt, or you'll have wife trouble!

The solution is apparently to have a thickened mixture of some sort, that will fill gaps and avoid this problem. Mr. Maxey, himself, uses a thickened solution of Tetrahydrofuran and Cyclohexanone (I wonder which of those two is the fall guy!), and this makes an excellent glue for ABS. And as the man says, he makes ABS protective devises for sonar gear, and his glue is no good, at about 1,000 ft. of depth, where the pressure is 440 psi, some awfully expensive gear is going to be ruined, and he will not be thought of very kindly in certain quarters. So it seems fair to assume that, since he is still in business, his glue is pretty good.

Now, Mr. Maxey is one real nice fellow, because while he says that he is not in this business, if there is sufficient demand he is prepared to let modelers have 4 oz. cans of this very special glue at around $4.00 a can — which compares with the price of epoxies at this time. So if anyone is interested, his address is 5824 Halm Avenue, Los Angeles, California 90056.

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On now to a letter from Ed Liddycoat of Burlington, Canada, who wrote at some length on the subject of balloon bursting - - - thanks Ed. The letter included a full-size plan for a boat, and color transparency (which unfortunately we can't reproduce here), plus a whole lot of information. Ed makes the boats from 1/8" mahogany door skins from the local lumber yard for about $3.00, which has got to be cheap. The hull uses the warped bottom method, which I know is a very quick way of building, but does need a good eye to make sure that it isn't warped. The motors used are taken from a Black and Decker cordless lawn clipper, and are 4½ volts nominal, run on a 6 volt battery. Ed doesn't say whether these batteries are 6 volt nominal or load. That means that they could be 5 or 6 nicads. A 5-cell nicad power pak will have a nominal voltage of 6 volts, but will drop off to 5 volts when running. A 6-cell pak will be 7.2 volts nominal, dropping to about 6 volts on load. The usual prop is the Octura 1240 on a drive shaft made of 3/16" brazing rod (no flux!) and the Octura drive dog and Dumas universal between motor and drive shaft. How's that for some real useful, practical information? I could do with more letters like that! Ed goes on to say that they run 6 boats at a time, and I think they do it in swimming pools, because the starting procedure is one in each corner and two in the middle, back to back. Each boat has a balloon, and I gather anything goes, because, to qote the letter; "You talk about a demolition derby for cars; this is the same with boats ramming one another trying to get at the other fellow's balloon. I have had three boats halfway up on top of mine at one time . . . it was white with black striping, but is now marked with red, green, blue paint, plus scrapes and bruises and three holes right through the 1/8" sides." Sounds like they play pretty rought up there in Canada.

There is no mention of speed control just a servo actuated on-off switch from Radio Shack. One very good idea is to fill the radio compartment with a block of expanded foam, and then cut out individual compartments for the radio, servos and radio battery. Not only does this protect all the fragile gear from shock, but it also fills the compartment, so that in the event of someone making a hole in the boat, no water gets at all that precious radio equipment. Ed also says that the antenna should be mounted on the centerline of the hull, because if it is too near the edge of the boat, someone is going to wipe it off.

Apparently there are quite a few people into balloon bursting up there, and Ed quotes Rochester, Buffalo, Toronto Metro-Marine among the clubs who take part in this form of activity. As you can see, a letter full of really useful stuff — thanks again Ed, for letting everyone out there benefit from your experience.

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One of the many preoccupations among boat modelers is propellers - - - what to use, what size, and so on. A name I haven't mentioned before is Jim Gale, who manufactures the Gale range of copper beryllium racing props. Jim sent me some samples to try out on my endurance boats for the World Champs, and they are very nice jobs indeed. The

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Typical power props; from left to right, a J. Gale C-20 in beryllium bronze; an Octura 1457 in metal, and an Octura 1460 in plastic. All three use a dog-drive system.

A J. Gale three-bladed prop on the K & B 21 outboard. It has been found that the performance of this motor can be increased by judicious use of props, and tuning them.

This group will not set speed records, but oh boy, do they have fun. (L to R) Paul Kenny, Ron Sheldon, Ron Gilman, Mike Helzel and Bob Seigelkoff.

Have You Seen . . .

1/4 Scale Formula I Racers?

By Dick Tichenor

About 10 years ago, Jerry Nelson, along with a group of his friends, dreamed up an R/C racing event that became the current Formula I races. Among these friends was Bob Seigelkoff. After years of Formula I racing, Bob became tired of the effort required to be competitive: it had become more work than enjoyment. Last year Bob submitted a proposal for a new racing event to RCM to put the fun back in pylon racing. We printed his proposal in the "From the Shop" column in our August 1977 issue.

We recently had the pleasure of seeing a demonstration of this activity. Seigelkoff had made plugs and molds for producing fiberglass lay-ups of the major components. The model is the Cosmic Wind Little Toni with a wing span of 61", wing area 809 square inches, weight 10 pounds (give or take a pound), and powered by a .60 engine. That adds up to fairly low key performance similar to your average .60 powered sport ship.

Four of these ships going around the pylons was an unusual sight indeed, like Formula I racers that were not in a hurry. Somehow, Ron Gilman was about half a lap ahead (or maybe behind, who knows) so he pulled up into a loop between #1 and #2 pylon and came out back with the others. One of the guys did a slow roll between #3 and #1 pylons just to liven things up a bit.

Gilman has flown his Toni in both Pattern and Stand-Off Scale contests. He had no spectacular victories but he competed and had lots of fun. The Toni has full aerobatic capabilities with straight and gentle take-offs and landings.

Bob would like to hear from anyone interested in this 1/4 Scale Formula I event. He and some of his associates are cranking out drawings for other Formula I aircraft using conventional wooden construction methods. Write to Bob Seigelkoff at 21658 Cloud Way, Hayward, California 94545.

The demand for Bob's fiberglass Toni quickly exceeded his production capabilities. Bridi Hobby Enterprises has acquired Bob's tooling and is in production on the Little Toni kit. Kits are

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Ron Gilman's Little Toni is off and away.

And around she goes.

Mike Helzel touches down ever so easy.

Bob Seigelkoff detailed his Little Toni with good stuff like rivets and corrugations. Would you believe a C & S tailwheel assembly?

These all represent various versions of the Cosmic Wind that were raced over the years.

Scale Views

CLAUDE McCULLOUGH

SCALE SPOTLIGHT

In this regular department, we'll feature unusually beautiful or ingenious scale models submitted by RCM readers to Scale Views. No problem picking one this month. Mark Frankel of Gladwyne, Pennsylvania, really knocked us out with his 1/4 scale Wing Derringer. The full

scale Derringer was an unsuccessful attempt to produce a fast, compact two-seater twin after market surveys showed that twin engine aircraft only carried two people most of the time. It was a classy looking aircraft, as is Mark's model. His version weighs 25 lbs. at a 50 ounce per square foot wing loading. No exotic power plants, just two Enya .60-III's - - - which proves that large models are more efficient than small ones and don't need a huge amount of power to fly well. Rhom retracts with 3/16" legs seem to hold up, but he feels that 7/32" diameter might be better. Does anyone know a source for this size music wire? Most 1/4 scale builders would be interested. Mark has heard that Rhom is considering production of a 1/4 scale retract unit and this sound like something that would find a ready market.

Photos of Wing Derringer courtesy of Jim Lipshutz

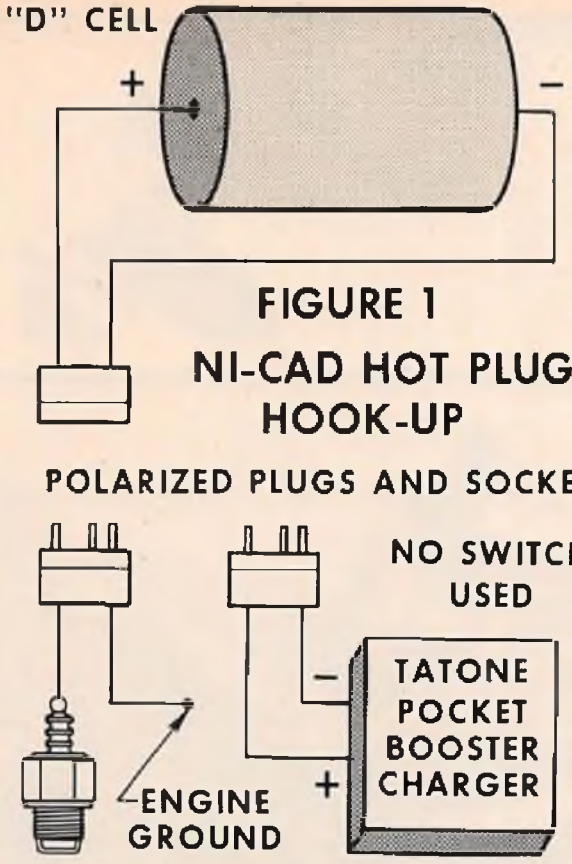
STAY COOL WITH A HOT PLUG

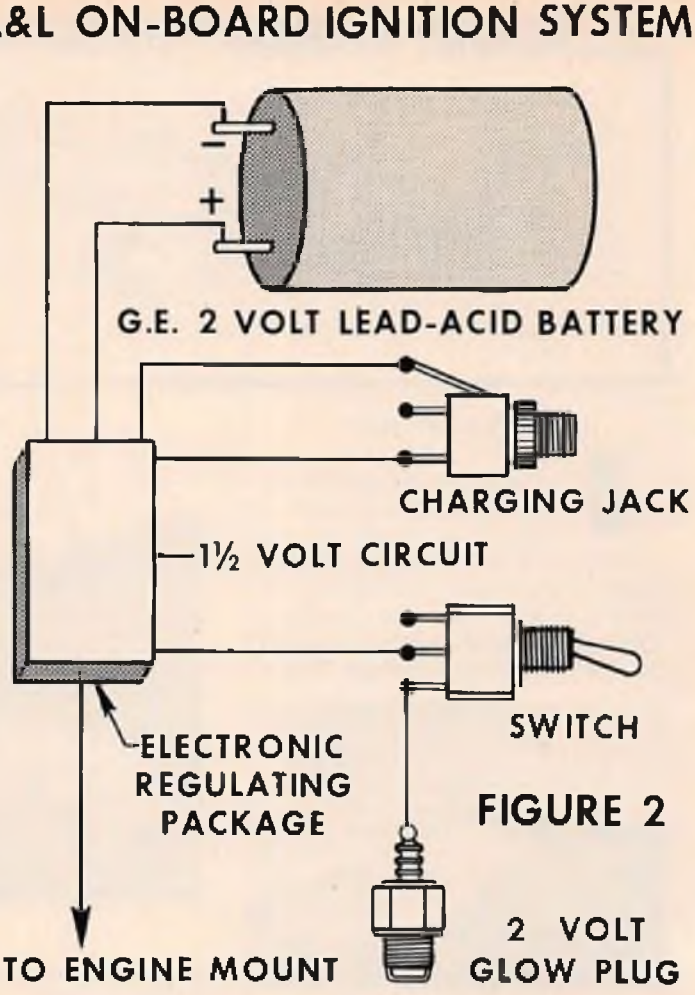
Scale models spend a lot of time with the engine idling or the power cut down from high speed. This is necessary to perform maneuvers like proto taxi, return to the hangar, and making slow fly-bys. To do a pattern at scale speed, long periods of medium speed running are required - - - so there are many opportunities for a scale engine to load up or surge and quit when changing the throttle position. Even a well tuned engine may stop after a prolonged period of slow speed running — bad news anytime. Under the pressure of a contest, a conked-out engine can be a disaster.

One way to improve the chances of consistent engine operation at every speed is to keep a battery hooked to the glow plug. The difference in reliability is so marked that I think every scale model that is able to carry the extra weight, should have a hot plug installation. Most scale designs are inclined to be tail heavy and have to carry lead in the nose for correct C.G. location — better some useful ballast like a battery instead of dead weight. Anyway, too many scale models are flying around on the edge of a snap roll. So, even if no extra weight for balance seems required, you may be better off with the C.G. moved forward a bit. The model will be more stable at low speed and less sensitive to control movements. Of course, if you already have it so located, the hot plug installation can be put farther back in the fuselage near the C.G.

I've been using a very simple system for some years that is shown in Figure 1. The plug and socket are left hanging out the back of the cowl. When ready to start the engine on the runway, they are plugged together and pushed into the cowl out of sight. With an electric starter, the engine will start just about as easily on the internal battery as it will from a booster battery. So right off we've dispensed with dragging around a booster on the runway and having to unhook it and get it out of the way before take-off. Another advantage follows quickly when, after taxiing 50 feet, the model has to stop before take-off. The idle can be set lower with a hot plug so I've been able to dispense with brakes and come to a stop, even on an asphalt runway, by going to full low idle trim. Next, the transition to high speed from idle goes better. In fact, all during the flight the hot plug pays off.

The "D" size nicad used in Figure 1 weighs 6 ounces. I just checked a cell I've used for 5 years. It ran the glow plug at full brilliance for over 35 minutes non-stop before showing signs of slowing down. This is plenty for two or three flights, as much as anyone ever gets at a contest. If more flights are required in a day, an extra charged cell can be put aboard. For really long flying





The On-Board installed on Shinn 2150-A. The square duct over the engine helps prevent over-heating when the cowl is on. All of the air entering the cowl is directed through the head fins of the Webra .61.

The complete L & L On-Board Ignition System. Includes black box, heat shrink tubing, switch, charging jack, charging plug, extra hook-up wire and a special glow plug connector.

time, a micro switch could be added to the engine throttle servo or pushrod to turn the battery on only when the engine is running in the lower speed ranges where the extra boost is most needed.

The best answer to flying all day seems to be the new On-Board Ignition System made by L & L Electronics (Box 13434, Albuquerque, N.M. 871 12). They have adapted the electronic regulation idea that has become so popular in field kit "power panels" to a size and weight that is practical to carry in flight. The complete system, which weighs about 8 ounces, is shown in Figure 2 and an accompanying photo. The circuit in the "black box" senses the temperature of the glow plug. In high speed, with the plug hot, a minimum of current is added to the glow plug. As the engine goes to lower speeds and the plug cools down, more current is fed to the plug. And, as the power panels do, the maximum amount is fed to the plug during starting. L & L says that even a twin engine model, putting a double drain on the unit, can be operated all day with power to spare.

Although the circuit can be wired for 1½ volt glow plugs, 2 volt plugs are recommended to take advantage of the extra power provided by the 2 volt sealed lead acid battery. Tests showed that starting is easier with the 2 volt plugs and the flight time between charging was increased nearly 50%. An L & L evaluation report says, "Engine speeds increased an average of 200 rpm at idle and 750-800 rpm at full throttle. Needle valve adjustments were not as critical with the system on. This was especially evident when moving the airplane from horizontal to vertical prior to take-off. When the system was on during the entire flight, fuel consumption was

reduced 4%-7%."

My experiences with hot plug flying tends to confirm their statements. I expect everyone has noticed the drop in rpm when the glow plug clip is taken off a motor. The increase in idle speed stated may seem to be at variance with my previous comments, but it really is not. The idle does increase a bit over the un-boosted idle at the same carburetor setting, but the main point here is that a lower idle point — one that would never keep running very long unassisted — can be selected with the hot plug system running.

A photo shows the On-Board Ignition System installed in my Shinn 2150-A. The hook-up is not difficult and heat shrink tubing is provided to cover all the joints. The tabs on the G.E. battery seemed a little hard to solder to, so I drilled a small hole in each and inserted the wire in the hole before soldering. The G.E. battery fit neatly into the same space under the cowling that had held the nicad "D" cell. Along with the nicad, I had been carrying a piece of lead in the nose. The slightly higher weight of the L & L system made it possible to dispense with the lead. So the bolt used to hold the lead in place was taken for a strap retaining the "black box". Since doing this, I've re-thought the matter and I'm going to take off the strap, which shows signs of cutting into the box. L & L recommends epoxying the box to the model. This seems a little too permanent to me so I'm going to try another approach and stick it down with G.E. Silicone Bathtub Seal or Devcon Seal-It. This stuff sticks fine and is flexible, yet can be cut off fairly easily when required. Be sure that it is applied to a clean and non-oily surface.

Also, after the picture was taken, the battery was carefully oil proofed by covering it with 3-M Multi-Purpose Colored Plastic Tape. More bathtub seal was used where the wires came out of the package. Actually, I used the Clear tape from the 3-M colored series — it stretches more than the colors. The switch was concealed for the sake of scale appearance and the charging jack located under the pilot's seat where it can be pulled out and the charger hooked up without having to remove the cowl or the wing.

Richard Loggins, of L & L, told me on the phone that they were advising users to watch the horizontal C.G. on their models. This amount of concentrated weight put off to one side can goof you up on some airplanes, so it is best to put the batttery in the center of the fuselage. In the case of the Shinn, which has tandem seating in the full size version, the fuselage is fairly narrow for the amount of wing, so this was no problem. In fact, the battery was offset to one side on purpose, to counter the weight on the other side of the side mounted engine, cooling duct, and exhaust manifold.

During development of the On-Board Ignition System, L & L experienced troubles with the glow plug connectors being used and worked up a better one that stayed on from a 1/8" wheel collar with the ignition wire soldered to it. For the production version, a special gadget (which can be seen in the system picture on a glow plug) was developed. It doesn't require any soldering since the set screw holds the wire and grips the plug at the same time. This little gimmick works fine but posed a problem in the Shinn. The cowling fits so tightly against the engine head that there wasn't quite room enough for the L & L connector. So I went back to what I'd used before without any trouble — a sub-miniature Alligator clip. As can be seen in the photo, it grips the ball on the glow plug

A sub-miniature alligator clip really latches on to the top of a glow plug.

terminal and holds itself just clear of the engine head. If you can't locate a sub-miniature clip with a vinyl sleeve insulator as shown, then it can be insulated with a couple of wrappings of the aforementioned Scotch Multi-Purpose Tape. Check for heat damage from time to time, since the plug may short out if the insulator melted away. The fact that there is a slight airspace between the head and the clip seems to be enough, as I've never had trouble with this type of connector.

While I was working on the column, Paul Johnson from Des Moines, Iowa, came by to show me his new Damo 4-cycle twin in operation. Paul is an off-beat engine enthusiast, particularly twins. Since Clarence Lee is doing a full report on the Damo and its incredible need for very little oil, suffice to say here that the Swedish engine really starts and runs in impressive fashion. Paul had no desire to run any "look ma no oil" tests with his new pride and joy and was going the cautious route with a 5% oil mixture. (Incidentally, I hear that Bob Karlsson also has a Damo and it has inspired Bob Lopshire to start designing a new scale model especially for twin-cylinder engines. Considering the standards he set with his Fairchild 24 featured on the cover and in the April 1978 issue of RCM, the new ship should be something to watch for.)

But to get back to what we were talking about — glow plug connectors. Paul had an ingenious version on his

Paul Johnson runs up his Damo. Paul doesn't like to crawl around on the ground when checking out engines so he carries this folding leg collapsible table test stand. On the lower level are an OPS twin in-line and a Gannett 4 cycle.

Johnson's spring clip for glow plugs.

Johnson's spring clip installed on the Damo 4 cycle twin.

Damo that is shown in the accompanying photos. The piece of spring is cut off the end of a common radio dial cord spring, obtainable at radio supply houses or radio-TV repair shops. A section of heat shrink tubing is used as an insulator, slipped up on the spring section and shrunk in place. Seen on the Damo, it is flexible, grips the ball adequately, yet comes off easily when required. □

SERVO BUFFER AMPLIFIER

OLD RC SYSTEMS LIVE AGAIN

By George Steiner

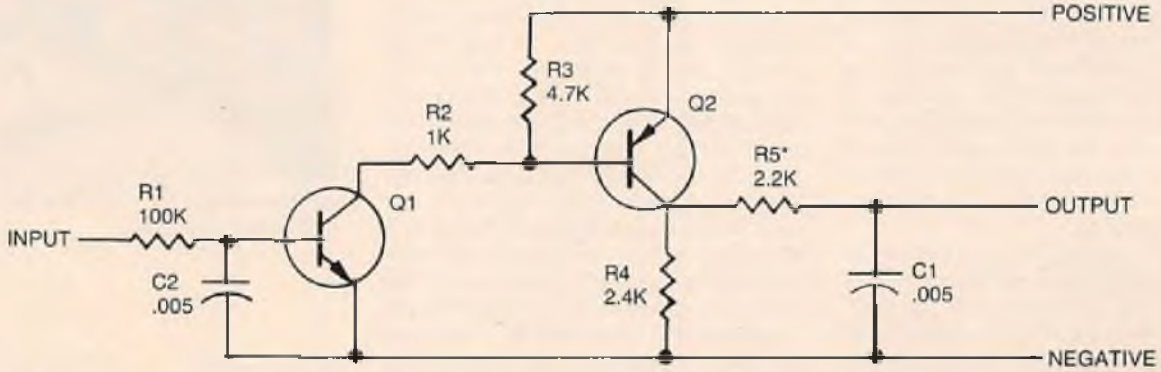
Did you ever give any thought to why two different types of servos have a difficult time working together in a single RC system? For instance, say you have two similar RC systems and servos from one system work with both systems and the other servos don't. Did you ever wonder why 3 wire servos cannot tolerate 4 wire servos operating with the same receiver?

Not too long ago, while rummaging through my electronic RC gear, I came across an old RC receiver. I remembered back when it was given to me that it had failed to operate the servos I had on hand. It didn't make any difference what type they were. My curiosity got the better of me this time --- why didn't that receiver drive a typical positive pulse servo? I soon found out when I hooked the receiver up on the bench. Looking at the pulse out of the receiver with an oscilloscope, it became obvious that the pulse collapsed when a servo was plugged in. The servo had overloaded the receiver output to the point where the pulse was so low in amplitude that it would not operate the servo.

This brought to mind that one time I had hooked up two servos in parallel to couple rudder and aileron. One servo loaded the circuit enough to keep the other servo from operating. Now we have defined the problem and it remains to be seen what can be done about it.

Buffer Amp Components layout.

Before we get into a solution, let's look at different types of servos and the load impedance they present to the receiver. The old 4 wire servo like KPS9, KPS10, KPS11, etc., with discrete components, generally have a very low load impedance (about 1000 Ohms). As the years went by, the impedance started rising to the point of the modern day IC servo. Nowadays some servos take on a load impedance of over 100K Ohm. The advancement in the receiver and servo load impedance has given us more efficient RC gear and allowed the RC equipment to become smaller and smaller. Response time became faster and faster. Along with this efficiency becoming better, battery drain has become less and less. In a nutshell, the state of the art has caused a lot of good old RC systems to be left on the shelf. Well, let's dust them off and get them



* NOTE:OMIT R5 AND REPLACE WITH A JUMPER WIRE FOR MAX. OUTPUT. SEE TEXT.

FIGURE 1
SCHEMATIC

back in service again. How about the old transmitter and receiver systems that are still in good shape, but the old servos are shot? Let's re-outfit them with the new 3 wire servos. How to go about doing this becomes the solution to the preceding problem. By building an interface device between the servo and receiver, a small Buffer Amplifier, we can solve numerous problems.

To solve these problems, we need to devise an electronic gadget that will serve in the following capacities:

(1) An amplifier designed to isolate a preceding circuit from the effects of a following circuit.

(2) A plug-in device between servo and receiver to isolate two servos working in parallel.

(3) Something that would guarantee complete isolation and have an input impedance of more than 100K Ohms.

(4) Be able to deliver a load to any old servo or match any old receiver to a new 3 wire servo.

(5) Be small enough in weight and half the size of a postage stamp.

Some other requirements for this Buffer Amplifier is it could clean up any type of signal that was passed through it. Some of the older decoders kicked out a pretty dirty signal (refer to Figure 5 at the trailing edge of X signal). This really raised heck with the 3 wire IC servos. They are super fast in response and that little pip at the end of the pulse caused most of them to turn on again (servo jitters). We also want the device to give a solid gain of 1.5 volt PP input with a constant 4.8 volts PP out.

The device must also eliminate any jitters in servos caused by noise riding on the pulse out of the decoder. Well, the device presented here just does all that!

Using 9 discrete components, a PC board and servo end connectors to plug in-between receiver and servo, this device will let that old RC system live again.

I ended up taking my old stuff and making another receiver system that I presently have installed in my power boat. It works so good I even use the Buffer Amps in one of my larger slow flying power planes. I have coupled ailerons and rudder along with mixed 3 and 4 wire servos. It works great.

In one case I have taken an old Bonner Digimite RC system and updated it using the Buffer Amps. This lets the old RC gear make use of any one of the new 3 wire servos that are now on the market. One of the biggest assets to this Buffer Amp device is that the new 3

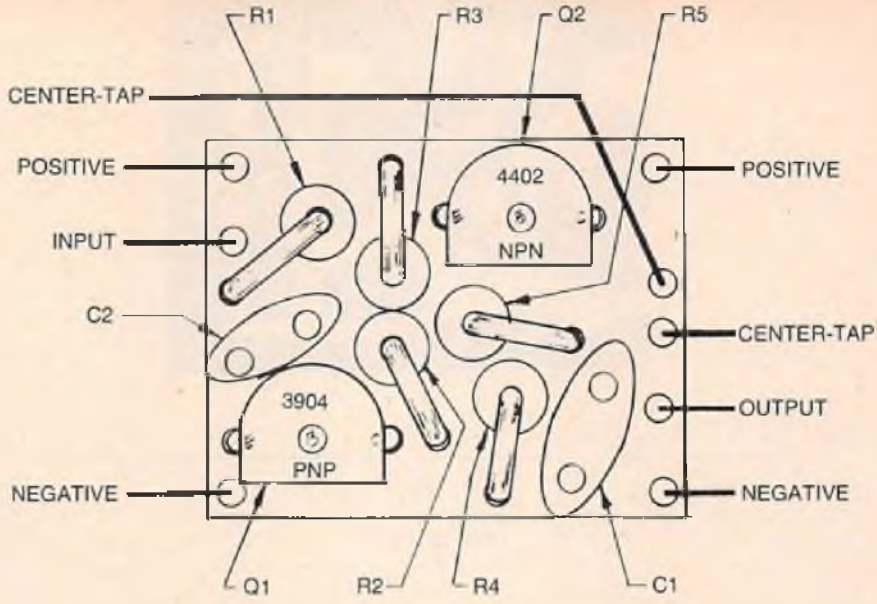


FIGURE 2
COMPONENT SIDE

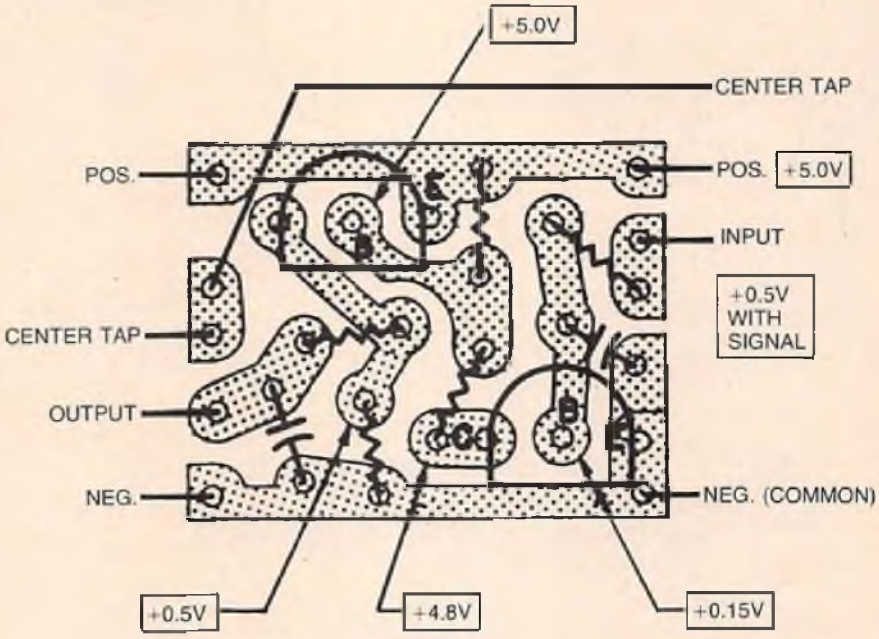


FIGURE 3
COMPONENTS FROM FOIL SIDE
WITH VOLTAGE MEASUREMENTS

SPECIFICATIONS

(1) Voltage: 4 volts to 6 volts.
(2) Minimum input pulse: 1.5 volts P.P.
(3) With minimum input pulse output pulse: 4.8 volts P.P. across a 10K load. (Battery voltage 5).
(4) Weight: 1/10 oz. less connectors.
(5) Size: 1/2" x 5/8".
(6) Current drain: 500 microamps.
(7) Cost less servo plugs: Approx. $5.00.
(8) Input impedance: 100K Ohms.
(9) Pulse lag time: 50 microseconds.

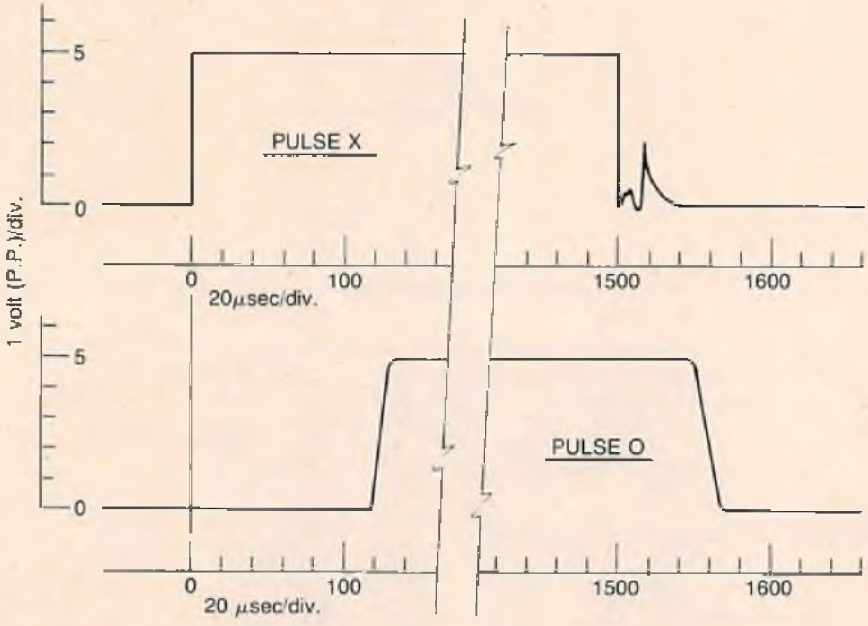
PARTS LIST FROM ACE R/C

Resistors all 5% 1/4 watt: ... Price Each

R1, 100K ohm ..... $.25
R3, 4.7K ohm ..... .25
R4, 2.4K ohm ..... .25
R5, 2.2K ohm ..... .25
R2, 1000 ohm ..... .25
Capacitors Disc 50 volt:
C1, .005 mf ..... .25
C2, .005 mf ..... .25
Transistors:
Q1, NPN 2N3904 - HEP S0015 ..... .50
Q2, PNP 2N3906 - HEP S0019 ..... .50
Miscellaneous:
1, PC Board ..... N/A
1, Male connector (Deans) ..... .60
1, Female connector (Deans) ..... .60
1, Piece of heat shrink tubing, 3/4" x 1¼" ..... N/A
TOTAL $3.95

ONE INCH

FIGURE 4



PULSE X: PULSE OUT OF SCS DECODER AND INTO BUFFER AMP.

PULSE O: PULSE OUT OF BUFFER AMP — NOTE THE LAG IN TIME BETWEEN PULSES AND THE CLEAN-UP OF TRAILING EDGE OF PULSE O.

FIGURE 5
A SINGLE-CHANNEL PULSE ANALYSIS USING BUFFER AMP

wire IC servos can be used with any one of the old silicon controlled switch (scs) receiver decoders. The use of the Buffer Amp is a must if you are trying to use an old Kraft Gold Medal with the Christy Mixer. The old RC systems cannot match CMOS technology. You must remember, though, that this device is not a cure all for all servo glitches.

Many factors can cause a servo to act funny. A battery pack with poor capacity is one. By this, I mean the battery pack has poor voltage control letting your whole RC receiver system bounce up and down every time a servo is operated. This voltage fluctuation, in turn, causes the receiver sensitivity to go up and down and soon thereafter your whole RC receiver flight pack does the shake, rattle and roll.

This device also will not repair or take care of a system that has noisy motors or dirty feedback potentiometers. They, in turn, can cause poor centering or shakey servos also.

What it will do for you is let you mix different servos between each other in the same mode in parallel without overloading the receiver decoder. It will let you pump up the decoded pulse to operate any positive pulse servo from year one. Many servos through the years have been a little short when it came to the amplitude of pulse it took to drive them. I have seen that a 4.4 volt peak to peak pulse may not be adequate to drive some servos in the past.

This Buffer Amp will clean up the dirtiest decoder pulse caused by the old SCS decoders. It will suppress any servo jitter caused by transmitter overload within reason.

Referring to Figure 1, operation of the Buffer Amp is quite simple. You use a two stage NPN to PNP transistor switching amplifier. How does it work? It takes the positive going pulse of the receiver fed through R1 and ties it to the base of Q1. The positive pulse signal turns Q1 on. This raises Q2 base that is biased off through R3 causing Q2 base to look for negative. Q2 turns on making the R4 and R5 point become positive. This point remains positive as long as the input remains positive. C1 and C2

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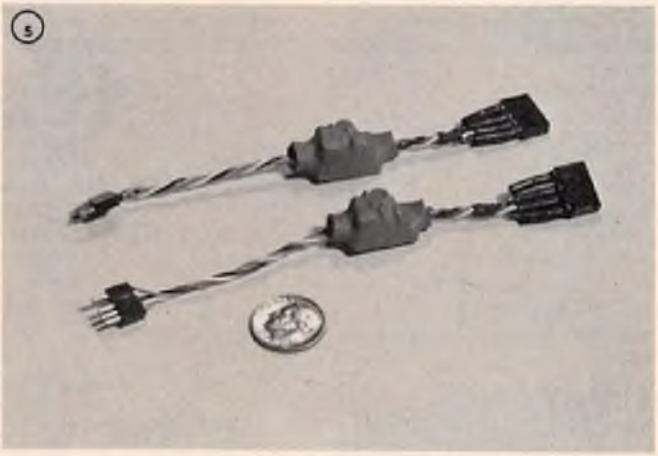
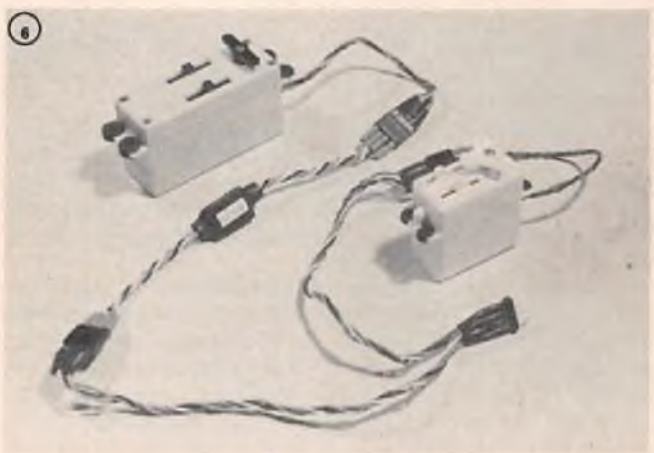
Q1 and Q2 in place.

C1 and C2 in place.





(1) R1, R2, R3, R4 and R5. (2) PC board with nine discrete components. (3) One half the size of a postage stamp. (4) Completed Buffer Amps. (5) Completed Buffer Amps ready to be placed between receiver and servo. (6) Buffer Amp in use with two different types of servos in parallel, a 3 wire with a 4 wire. (7) System hook-up showing Buffer Amps in use with an older receiver and 3 wire as well as 4 wire servo in use.

RCM PRODUCT TEST

Ace R/C ALPHA

IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging	•					Pre-Shaped Parts			NA		
Plans		•				Parts Match to Plans			NA		
Written Instructions		•				Overall Parts Fit		•			
Quality of Hardwood	•					Ease of Assembly		•			
Quality of Fiberglass			NA			Fidelity to Scale			NA		
Other Materials		•				Flight Performance		•			
Accessories	•					Overall Appeal	•				
Die-Cutting	•										

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

The Alpha is a .049 to .09 powered trainer designed by Tom Runge and kitted by Ace R/C Inc., Box 511, 116 W. 19th St., Higginsville, Missouri 64037. When used with a TD .049 and rudder and elevator controls, it would be an ideal airplane for a beginner. It is docile, stable, and easy to fly and, because of its construction, would be less prone to injury than others. With a TD .09, it would be a good second airplane for the beginner and would also provide a pleasant change of pace for the more experienced flier.

This kit is rather unique in many ways. It is one of the few models on the market where the same airplane can be used with a larger engine to match increasing piloting skills. It is a happy combination of plywood, balsa, and foam, which not only reduces construction time and effort to a minimum, while still looking like a real airplane. It is complete with all hardware except for wheels and motor mount, at a price that is well within the lowest RC budget.

The fuselage is constructed of die-cut plywood sides with die-cut plywood bulkheads. The top hatch, windshield, rear deck, front bottom and belly, are also cleanly die-cut from 1/8" Pop-Ply as well. The top rear of the fuselage is planked with cross grained 1/8" balsa, while the bottom is handled similarly with 3/32" balsa sheet.

The three piece foam wing has a one piece 1/8" square by 36" spar top and bottom, with a 1/4" x 3/4" shaped trailing edge and a reinforced leading and trailing edge at the center section. Plywood wing tips should also help to prevent damage to the tips in case of a cartwheel landing. The tail surfaces are sheet balsa with 1/4" triangular stock reinforcement at the joints, a feature we feel should be incorporated in more trainers. The nose wheel is fixed and the formed sheet aluminum main gear is rubber band mounted to the bottom of the fuselage.

The plans, even though not full scale, are clear and explicit with photo illustrated instructions to help keep the novice straight.

All wood parts are cleanly die-cut with a high degree of accuracy and fit together with a minimum of sanding. We would suggest, for the benefit of the beginner or the non-reader, that when mounting the servo rail doublers and the 3/8" square spruce servo rails, the doublers be slid in place over the rails and the unglued assembly then slid in place in the fuselage. The servo rail doublers can then be glued to the fuselage sides and, when dry, the servo rails slid into the proper position to fit your servos and fastened in place.

We used 5-minute epoxy on all plywood joints with aliphatic resin to hold the wing spars and tail surfaces in place, being careful to wipe off all excess while still wet. The test model was

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SPECIFICATIONS

Name	ALPHA
Aircraft Type	Sport Trainer
Manufactured By	Ace R/C Inc. Box 511, 116 W. 19th Street Higginsville, Missouri 64037
Mfg. Suggested Retail Price	$19.95
Available From	Both Mfg. & Retail Outlets
Mfg. Recommended Usage	General Sport
Wing Span	40 Inches
Wing Chord	6 Inches
Total Wing Area	240 Square Inches
Fuselage Length	30 Inches
Radio Compartment Dimensions	(L) 6⅞" x (W) 2" x (H) 3⅜"
Wing Location	High Wing
Airfoil	Flat Bottom
Wing Planform	Constant Chord
Dihedral	1¾ Inches
Stabilizer Span	15 Inches
Stabilizer Chord (incl. elev.)	4 Inches
Total Stab Area	60 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Top of Fuselage
Vertical Fin Height	4 Inches
Vertical Fin Width (incl. rud.)	4⅜" (Avg.)
Mfg. Rec. Engine Range	.049-.09
Recommended Fuel Tank Size	1-2 Ounces
Landing Gear	Tricycle
Rec. Number of Channels	2-3
Recommended Control Functions	Rud., Elev., Opt. Throt.,
Basic Materials Used In Construction:	
Fuselage	Plywood & Balsa
Wing	Foam, Plywood & Spruce
Tail Surfaces	Balsa
Hardware Included In Kit	See text
Plan Size	20½" x 28" (1 sheet)
Building Instructions on Plan Sheets	Yes
Instruction Manual	No
Construction Photos	Yes
Kit Includes	Die-Cut Parts
Mfg. Rec. Flying Weight	25 Oz.
Wing loading based on rec. flying wt.	15 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	30 Ounces
Wing Loading	17.6 oz./sq. ft.
Covering & finishing materials used	See Text
Engine Make and Disp.	T.D. .049
Muffler Used	No
Radio Used	Ace Digital Commander
Tank Size Used	2 Ounces

RCM PRODUCT TEST

Stressed Skin Design DELTA SKYHAWK

IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging	●					Pre-Shaped Parts		●			
Plans			●			Parts Match In Plans		●			
Written Instructions			●			Overall Parts Fit		●			
Quality of Hardwood			NA			Ease of Assembly			●		
Quality of Fiberglass			NA			Fidelity to Scale			NA		
Other Materials	●					Flight Performance	●				
Accessories			●			Overall Appeal			●		
Die-Cutting			NA								

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

Our general feeling is that the Delta/Heathkit Skyhawk is a fine kit. There are, however, some items which need to be discussed. The kit is suggested for beginners, but we feel that the written instructions supplied with the kit need some help in order to optomize the results for the beginning builder. The manual supplied with the kit does a good job and contains some fine drawings to aid in assembly, but the following additions and changes will help in building.

The instructions suggest securing the engine mounts to the firewall with self-tapping screws or 4-40 bolts. We prefer the 4-40 bolts with nylon locking nuts behind the firewall. We also recommend laying out and drilling the firewall for the engine mount, fuel lines, and pushrod penetrations prior to mounting the firewall to the fuselage.

There is a discussion in the assembly manual concerning reinforcement of the joints around the wing saddle. There are some additional areas which we feel should be reinforced for the beginning flyer. These areas of maximum stress can be reinforced using scrap ABS material in the kit.

(1) Use 1/2" squares of ABS inside the fuselage around the wing alignment dowel holes, wing hold-down holes and landing gear 5/32" holes. Use glues recommended in the kit.

(2) Use 1/4" strips of scrap inside the fuselage to reinforce the joints in the nose as far back as the windshield and on all the joints in the cowl.

The method described in the instruction manual for attaching the horizontal stabilizer does not assure holding the wing, fuselage, and empennage tightly in alignment during assembly. The following revised procedure will allow correct alignment of the three.

First, install the wing alignment dowels in the wing per the manufacturer's instructions. Next, drill for the wing hold-down dowels in the two fuselage halves. Put the fuselage halves together in correct alignment and secure using rubber bands

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SPECIFICATIONS

Name ..... DELTA SKYHAWK
Aircraft Type ..... Trainer
Manufactured By ..... Stressed Skin Design
P.O. Box 3447
Grand Junction, Colorado 81501
Mfg. Suggested Retail Price $59.95
Available From ..... Both Mfg. & Retail (& Heathkit)
Mfg. Recommended Usage ..... Basic Powered Trainer
Wing Span ..... 48 Inches
Wing Chord ..... 8 Inches (Avg.)
Total Wing Area ..... 436 Square Inches
Fuselage Length ..... 34 Inches
Radio Compartment Dimensions ..... (L) 8" x (W) 3" x (H) 4½"
Wing Location ..... High Wing
Airfoil ..... Semi-Symmetrical
Wing Planform ..... Double Taper
Dihedral ..... 7½ Degrees
Polyhedral ..... NA
Stabilizer Span ..... 18½ Inches
Stabilizer Chord (incl. elev.) ..... 5" (Avg.)
Total Stab Area ..... 92 Square Inches
Stab Airfoil Section ..... Symmetrical
Stabilizer Location ..... Mid-Fuselage
Vertical Fin Height ..... 7¾ Inches
Vertical Fin Width (incl. rud.) ..... 4" (Avg.)
Mfg. Rec. Engine Range ..... .15-.25
Recommended Fuel Tank Size 4-6
Landing Gear ..... Tricycle Gear
Recommended No. Of Channels 3
Recommended Control Functions ..... Rudder, Elevator, Throttle
Basic Materials Used In Construction:
Fuselage ..... Plastic — ABS
Wing ..... Foam, Plastic covered
Tail Surfaces ..... Foam, Plastic covered
Hardware Included In Kit ..... See text
Plan Size ..... None
Building Instructions on Plan Sheets ..... No
Instruction Manual ..... Yes (21 pages)
Construction Drawings ..... Yes
Kit Includes ..... Pre-molded parts
Mfg. Rec. Flying Weight ..... 48 Ounces
Wing loading based on rec. flying wt. ..... 15.8 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly ..... 50 Ounces
Wing Loading ..... 16.5 oz./sq. ft.
Covering & finishing materials used ..... MonoKote & D.J.'s
Engine Make & Disp. ..... Fox .15 Schneurle
Muffler Used ..... Fox
Radio Used ..... World Las Vegas
Tank Size Used 2

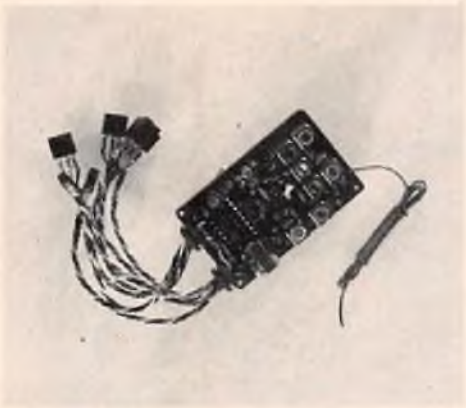
If You Want A Safe Return On Your Investment ....

Lean Towards Cirrus You Can Depend On It!

CIRRUS Hobby Shack 700 Series

Dependable, Beautifully Styled, Quality Craftsmanship Economical.

Everyone makes investment decisions as they go through life: some are major ones, and a few are less important. Just the fact that you are looking at and reading about Cirrus says that you're ready to make a decision on a new radio control system. We feel that, for your overall enjoyment in the years to come, the investment in a radio system is an important one.



The Cirrus Radio Systems' new features are: new triple tuned front end receiver; the RF amp is controlled by AGC (Automatic Gain Control), and the three and four systems have a new BA-633 decoder chip. The six channel alone features a double sided, copper clad, fiberglass PC board with the same decoder as our previously successful Cirrus radios, which in fact does have a special Custom Made chip. It's the only system we know of having a single conversion receiver with triple tuning, which causes high image rejection plus high rejection of intermodulation distortion.

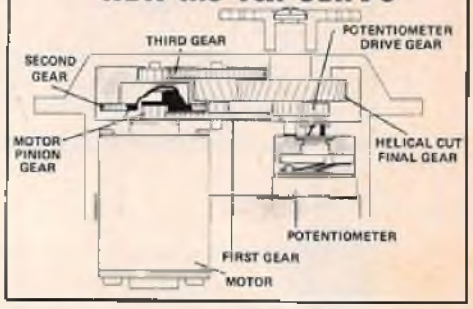
You Deserve A Safe Return On Your Investment.

When you select a radio system you want quality, dependability, up to date engineering design, back up service and warranty, and that's why we know that Cirrus is your best investment. You get innovative design features. You get a triple tuned front end receiver for high image rejection. You get a handsome appearing system that you'll be proud to own and show off to your friends. In owning a Cirrus System you'll have one of the finest radio systems offered in America that will insure you safe flights for more fun over many years.

Make The Smart Investment.

If you're not the gambling type, we can assure you that buying a Cirrus is one of your safest and smartest moves. Cirrus Systems have been one of the biggest sellers in America this last year. We have climbed to the top because we have taken the gamble away from the new radio investor in offering these outstanding Cirrus Systems at economical prices. We can sell them to you at sensible prices because they come directly to you from our warehouse, and thus we have eliminated the so-called 'middle men' who force prices up. Notice that we said economical, not cheap, for Cirrus are as good as and in some cases better than our competition. It's just a smart investment to want a Cirrus, as modelers all over America have found out.

NEW MS-ICR SERVO



Featuring the new innovative design utilizing "Helical Cut" final gear in a servo allowing more bearing surface for smoother mesh, less noise, better wear for ultimate reliability. This is a compact three wire servo that is still rugged and lightweight providing high power output with high resolution and low power consumption. It has two monolithic IC's, 74 transistors, 13 diodes, and 79 resistors for a total of 165 parts. Size - L: 41.5 mm, H: 35.5 mm, W: 19.5 mm.

Invest Some Time.

It's natural that you may want to shop around, and we think you should. We suggest that you invest some time in comparing Cirrus with other radio systems. Ask a modeler who owns a Cirrus and find out if he feels he made the right investment. After investing your time we know you'll make the best choice for the most return.

CIRRUS SPORT THREE RADIO SYSTEMS INCLUDE: 3 channel receiver, 3 channel transmitter (dry), 2 servos, airborne battery pack (dry), switch harness, servo trays, frequency flag, instruction booklet, and FULL 180 day warranty. 27 or 72 MHz.

CIRRUS THREE CHANNEL SYSTEM (DRY) WITH 2 SERVOS $109.99	CIRRUS THREE CHANNEL SYSTEM (DRY) WITH 3 SERVOS $129.99	CIRRUS THREE CHANNEL SYSTEM (DRY TRANS., AIRBORNE NI-CAD & CHGR.) W/ 2 SERVOS. $129.99

CIRRUS SUPER SPORT FOUR RADIO SYSTEMS INCLUDE: 4 channel transmitter with Ni-Cads, 4 channel receiver, 2 mini servos, Ni-Cad airborne battery pack with charger for both transmitter and receiver, servo trays, switch harness, frequency flag, instruction booklet, and FULL 180 day warranty. 27 or 72 MHz.

CIRRUS FOUR CHANNEL ALL NI-CAD SYSTEM WITH 2 SERVOS. $159.99	CIRRUS FOUR CHANNEL ALL NI-CAD SYSTEM WITH 4 SERVOS. $189.99

CIRRUS SUPER SPORT SIX RADIO SYSTEMS INCLUDE: 6 channel receiver, 6 channel transmitter, all Ni-Cads in the transmitter, and a Ni-Cad airborne battery pack, seperate charger for the batteries, 4 Cirrus Mini-Servos, servo trays, instruction booklet, frequency flag, and a FULL 180 day warranty. 27 or 72 MHz.

CIRRUS SIX CHANNEL ALL NI-CAD SYSTEM WITH 4 SERVOS $209.99

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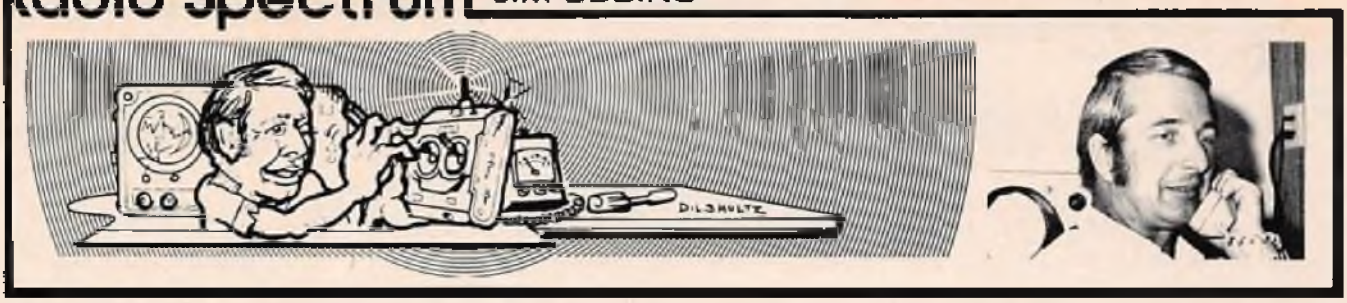
Radio Spectrum

JIM ODDINO



FOG INDEX

One of my fans (?) recently sent me a paper describing the Gunning Fog Index. R. Gunning is the author of *New Guide To More Effective Writing*. His Fog Index is based on research in the field of education and is a handy tool to determine how difficult a piece of material will be to read.

Here is the way you compute the Fog Index:

(1) Find the average number of words per sentence. Use a sample of at least 100 words. Divide total number of words by number of sentences. This gives you average sentence length.

(2) Count the number of words of three syllables or more per 100 words. Don't count: (a) words that are capitalized; (b) Combinations of short easy words like "bookkeeper"; (c) verbs that are made three syllables by adding "ed" or "es" — like "created" or "trespasses."

(3) Add the two factors above and multiply by 0.4. This will give you the Fog Index. It corresponds roughly with the number of years of schooling a person would require to read a passage with ease and understanding.

I tested one of my previous columns and found I had a Fog Index of 12.8. Most best selling books including the classics, test 7th and 8th grade reading level. Gunning suggests that anything over 12, places a handicap on trying to get ideas across. People just don't like to extend themselves. I always thought my stuff was pretty easy to read because I really didn't use many big words (don't know many). An analysis of my Fog Index indicates that it is not the big words that are killing me, but the length of the sentences. So if all of a sudden my sentences seem short and choppy, primer style, you'll know what I am trying to do.

Any other suggestions to improve the column are always welcome. **Enough of this nonsense!**

•

RF CIRCUITS

In the May 1977 issue, we went off the deep end and went through a typical design of an RF oscillator, similar to those used in RC transmitters. The response was quite good, though I'm sure very few modelers are interested in how their equipment works. Many asked for more of the same, specifically covering RF amplifiers. We've held off, hoping not to lose the majority of our readers, but now comes the time I try to hang on to the minority.

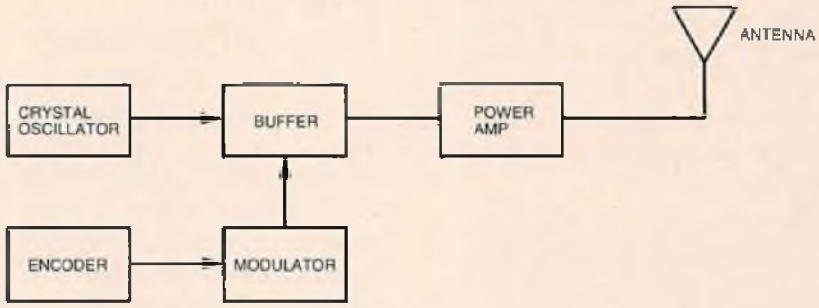


FIGURE 1
TYPICAL RC TRANSMITTER

Crystal oscillators must work at low power levels if they are to have good frequency stability. We need good frequency stability because the FCC says so, and because we have fixed tuning in our receivers. This means we will need one or two amplifier stages in our transmitter in order to put out sufficient power. Generally, the oscillator is followed by a buffer which is modulated by the encoder and its output is fed to the final power amplifier which feeds the antenna. A block diagram is shown in Figure 1.

Generally, both the buffer and power amp are Class C amplifiers in RC systems to get high efficiency. High efficiency means a high ratio of RF power to the antenna for a given DC power out of the batteries. We'll get around to Class C amplifiers eventually, but let's assume we're going to use a Class A buffer, and to start with, it will be untuned. The circuit is shown in Figure 2. Class A means that collector current flows during the entire cycle. The transistor is never turned off and it is never saturated.

Let's look at the biasing. The base is at a voltage of 3.33 volts.

$$\frac{5K}{5K + 10K} \times 10V = 3.33 \text{ volts}$$

Since the base emitter drop on a silicone transistor is .6 volts, the emitter will be at 2.73 volts. The emitter current is then:

$$I = \frac{2.73}{500} = .0054 \text{ or } 5.4 \text{ milliamps}$$

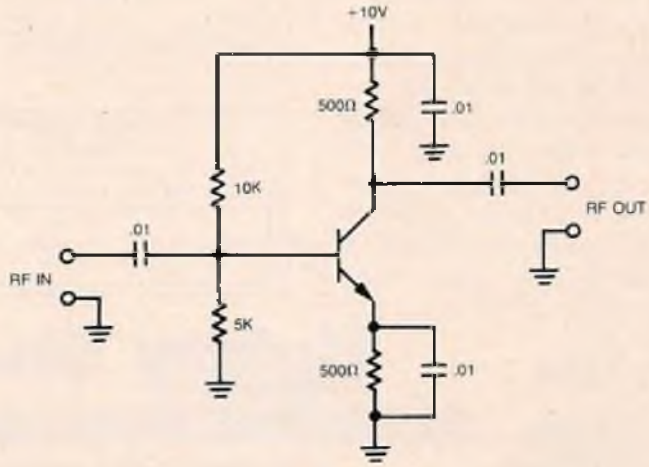


FIGURE 2

Since the collector current is essentially the same as the emitter current, the collector voltage is:

$$10 - I_c R_c = 10 - .0054 \times 500 = 7.2 \text{ volts}$$

This assumes the base is biased from a voltage source. The current through the divider (5K and 10K resistors) must be ten times the base current. If the Beta is 100, the base current is:

$$I_b = I_c \div \beta = \frac{5.4ma}{100} = 54\mu a$$

The current in the divider is:

$$\frac{10V}{15000\Omega} = 666 \text{ microamps}$$

This says our base divider is "stiff" enough. That takes care of the DC calculations.

At RF frequencies, all the .01μf capacitors look like short circuits, so our amplifier is a grounded emitter amplifier. The input resistance is approximately:

$$Rin = 25\beta ac \div Ic$$

This β is the AC current gain which is approximately $= f_t \div f_o$ where f_o is the operating frequency and f_t is the gain bandwidth product. If the transistor (2N2369) f_t is 500 MHz and we are operating at 50 MHz, then βac is ten.

$$Rin = 25 \times 10 \div 5.4 = 46.3\Omega$$

If we assume the amplifier is driven with an AC signal of .01 volts (ten millivolts), the RF input current will be:

$$I_b = Ein \div Rin = .01 \div 46.3 = .215ma$$

The collector current will be:

$$I_c = \beta I_b = 10 \times .215 = 2.15ma$$

This current flows through the 500Ω collector resistor, so the collector voltage swing will be:

$$V = I R = .00215 \times 500 = 1.075$$

The voltage gain or amplification is:

$$\frac{1.075}{.01} = 107.5$$

Now let's put a tuned circuit in place of the 500Ω collector load. See Figure 3. First let's review the nature of tuned circuits. If energy is injected into a tuned LC circuit, it will remain stored for a time. The voltage across the capacitor will cause current to flow in the inductor. A current flowing in the inductor will cause a voltage across the capacitor. If there were no losses, it would be stored forever. The circuit does have losses which are primarily in the resistance of the inductor when operating at RC frequencies. This brings us to the term Q or Quality Factor which is defined as the total energy stored divided by the energy lost in one cycle. It also turns out that Q is related to the frequency and 3 db bandwidth as follows:

$$Q = \frac{\text{Freq.}}{\Delta f} \quad \text{(3db BW)}$$

The losses can be represented by either a series or parallel resistance as shown in Figure 4.

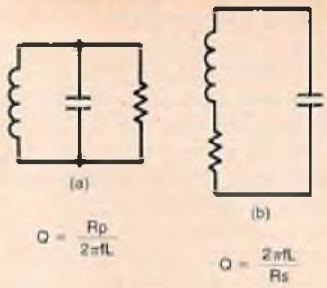


FIGURE 4

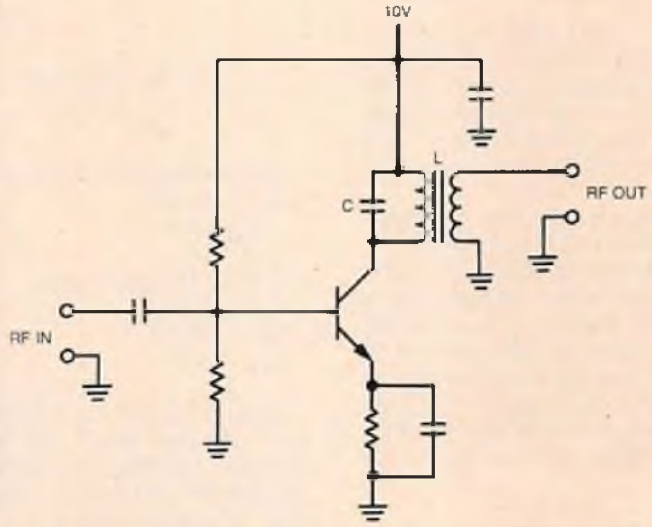


FIGURE 3
TUNED BUFFER

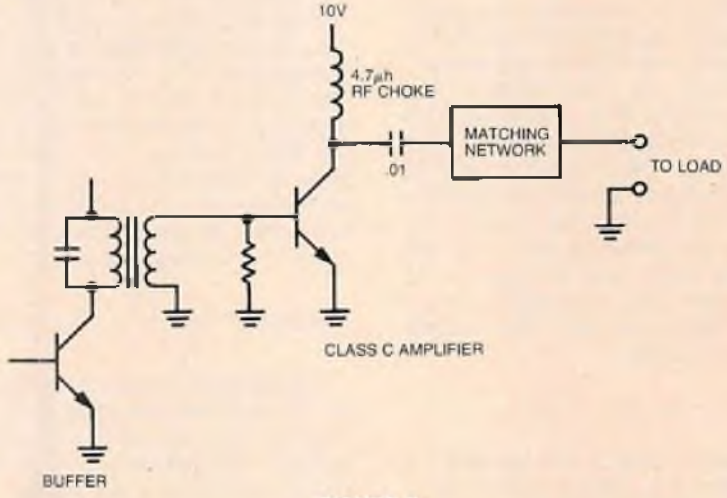


FIGURE 5

If there is no other load the Q is called unloaded Q or Qu. If there is energy taken from the circuit, and we will, to drive our power amp, then it is called the loaded Q. Unloaded Q's of 150 are easily obtainable with toroid inductors. By the way toroids have lots of nice features for experimenters. Data sheets tell you how many turns you need to get a certain inductance. Another thing is that the magnetic energy stays in the core and is not coupled into nearby circuits. Let's assume we have a .25μh inductor with a Q of 150. The parallel resistance is:

$$Rp = Q2\pi fL = 150 \times 2 \times 3.14 \times 50 \times 10^6 \times .25 \times 10^{-6}$$
$$Rp = 11{,}780 \text{ ohms}$$

If we put a 5000Ω load on the circuit, the net parallel resistance would be 3500 ohms. The loaded Q would be:

$$Q = \frac{3500}{2 \times 3.14 \times 50 \times 10^6 \times .25 \times 10^{-6}} = 44$$

The loaded Q is always less than the unloaded Q. Okay, back to the circuit. At resonance, the tuned circuit appears to be a 11,780Ω resistor, instead of the 500Ω we had. If you calculate the gain it will be unreasonable, but don't panic. In order to take some energy out, we will load the circuit and this load appears in parallel with the tuned circuit. So, if we had an external load of 5000Ω the total load will be 3500Ω and the gain will be about seven times that of our untuned amplifer. Still too high. If we were going to use this Class A amplifier, we would need some type of negative feedback to stabilize it.

Now, let's talk about Class C amplifiers. See Figure 5. Class C is defined as one where collector current is flowing less than half of a drive cycle. This is easy with a transistor since there is a built-in bias of .6 volts before current flows.

The gain is still a function of the high frequency Beta which is a function of the gain-bandwidth product. The power will be a function of the load just as it was in the Class A amplifier because the RF choke has a very high impedance at 50 MHz compared to the load we will put on it. Let's jump into that right now. Let's say we want a one watt transmitter. We must present the following load (R_L) to the amplifier:

$R_L = Vcc^2 \div 2Po = 10V^2 \div 2 \times 1 = 50$ ohms

This means we could hang a 50Ω antenna right on our Class C amp which is supplied by 10 volts and we wouldn't even need a matching network. In fact, I believe there was a transmitter on the market in the old days that did just that. But please don't do it, if you want to get along with your neighbors, because the matching network will also act as a filter and get rid of unwanted frequencies. Besides, our antennas don't look like pure 50Ω loads. Just so what we do doesn't seem silly, let's design a circuit for a half watt transmitter which means we want a load of:

$R_L = 10^2 \div 2 \times 1/2 = 100\Omega$

We want a network that will look like 100Ω when it is hung on our Class C amplifier and terminated in our antenna which we will assume is 50Ω for now. The network might look like Figure 6.

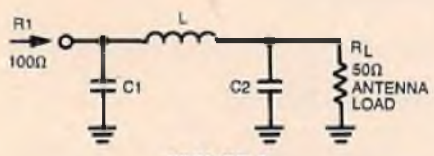


FIGURE 6

We are transforming a 50Ω antenna to a 100Ω load on our amplifier. We can transform 50Ω to 50Ω or 100Ω to 50Ω etc., just as easily. This is the familiar PI network which is a low pass filter which will reduce harmonics in the load. The equations for the reactances of C_1, L, and C_2 are as follows:

$$Xc_1 = \frac{R1}{Q_L}$$

$$Xc_2 = R_L \sqrt{\frac{R1/R_L}{(Q_L^2+1)-(R1/R_L)}}$$

$$X_L = \frac{Q_L R1 + (R_L/Xc_2)}{Q_L^2 + 1}$$

If we choose a loaded Q of 3, we get
$Xc_1 = 33.3\Omega$
$Xc_2 = 25\Omega$
$X_L = 50\Omega$
And at 50 MHz this equals:
$C_1 = 90$ PF
$C_2 = 100$ PF
$L = .15\mu h$

I wound 7 turns on a T-50-2 toroid and put in trimmers for C_1 and C_2 and got pretty good results. The trimmers let you adjust for the fact that the antenna isn't a pure resistance and that the transistor has some parallel capacitance.

Getting back to Figure 5, the resistor on the base serves to load the buffer so that negative excursions don't cause reverse breakdown and to lower stage gain, thereby stabilizing the amplifier. A resistance of 50 to 100 ohms is typical. The rule of thumb on the link or secondary of the transformer is one to two turns for every ten turns in the primary. The 50Ω base resistor load will be transformed by the square of the turns ratio, as far as the load on the buffer, if you use toroid cores.

$$R_L \text{ (buffer)} = \left(\frac{10}{1}\right)^2 \times 50 = 5000\Omega$$

The 2N 4427 is specifically designed for RF amplifiers operating at 10 to 12 volts and you should have no trouble getting a half watt output. You'll need a power meter to know how you are doing. This can be constructed quite easily. See Figure 7.

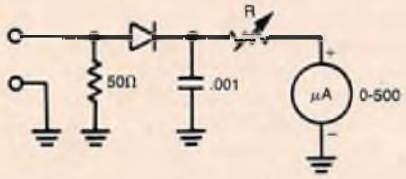


FIGURE 7
RF POWER METER

I built one with approximately a one watt full scale range. The 50Ω resistor should be non-inductive so I used five, ten ohm, one watt carbon resistors wired in series. You'd like to have a perfect diode, that is, no voltage drop, but it is not necessary as you will see when we calibrate the meter. Use a hot carrier diode if you can find one. The resistance R should be set for a full scale reading with one watt applied. I used a 180K resistor with a 1K pot in series. The capacitor makes this a peak reading meter so we may calibrate it with DC. One watt corresponds to 7.07 volts across 50 ohms.

$$P = \frac{E^2}{R}$$

$$E = \sqrt{PR} = \sqrt{50} = 7.07 \text{ volts}$$

So set the input voltage to 7.07 volts and adjust the pot until you get full scale. You can then generate a calibration curve for inputs from zero to seven volts (zero to one watt) or you can make a new scale for the meter as I did. Many commercial RC transmitters will tune into a 50 ohm load so you can use this meter to check your transmitter output. Remember to retune to the antenna when you finish and, for goodness sakes, don't mess with this stuff if you've never tuned your transmitter before.

If you were designing a new transmitter, you would also want to look at its output on a spectrum analyzer. This allows you to look at all the harmonics and spurius signals. You might find that you are not attenuating the second harmonic enough. This can be handled by putting in a trap, another circuit tuned to the harmonic, that has the equivalent reactance at the fundamental. The circuit might look like Figure 8.

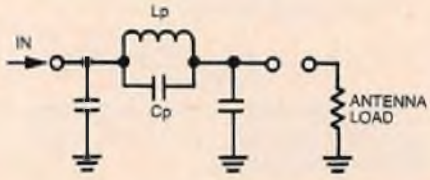


FIGURE 8

The parallel combination of Lp and Cp would be tuned to 100 MHz for a six meter transmitter.

Some other problems that are peculiar to RC transmitters, is that they must work with fairly large changes in input voltage and temperature and with the antenna collapsed and even removed. These are all significant factors.

I have left many things dangling, but I hope this spurs questions. I would welcome any comments and like to hear if any of you have any success using the principles outlined here.

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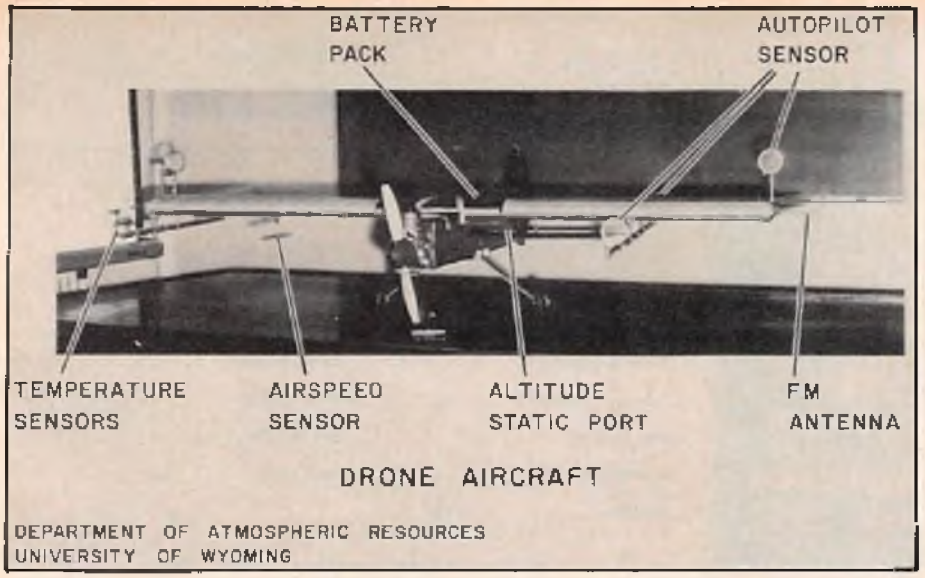

RC AIRCRAFT USED IN ATMOSPHERIC RESEARCH

By
Dennis
Knowlton

Outside picture of equipment.

Trainer used as such as well as back-up aircraft.

● As the quality and reliability of equipment improves, radio controlled aircraft (RC) are being used more and more as practical research tools. The Department of Atmospheric Resources of the University of Wyoming, in Laramie, has been engaged in atmospheric research for the past decade using, among other things, a fully instrumented Beechcraft B-80 Queen Air. In support of this research, an RC aircraft capability has been recently added to our facilities. This instrument allows detailed study of the lowest layer of the atmosphere (up to 3 kft) and this report explains how our group, as an example, is utilizing this new research capability.

In partial fulfillment of an environmental impact study for Atlantic Richfield Company, it was necessary to do a detailed study of the atmosphere in the locality where a strip mine is proposed. One of the reasons for studying the atmosphere in this instance is to determine the horizontal airflow and the vertical stability near the site and to predict from that how pollutants will disperse into the air. Also, there is a possibility of inadvertent modification of the weather caused by large strip mining operations and their attendant energy conversion plants. To aid in this study, several sophisticated instruments are used (both airborne and ground based). One of these instruments is an R/C "Ugly Stick."

As you can see from the accompanying photographs this is no ordinary Sunday Flyer's airplane. The total cost of this system is in excess of $5,000.00. The parameters measured with the aid of the drone are altitude (within 12 ft. resolution), dry bulb temperature (within 0.1C resolution) and wet bulb temperature (within 0.5C resolution). To enhance the accuracies of the measurements, some other parameters are also measured. These include air speed, temperature of the pressure transducer and reference voltage.

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Electronics and controls installation in fuselage.

Author making approach on gravel road. Instrumentation in van in background.

RCM PRODUCT TEST

TrueLine CORSAIR

IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging		•				Pre-Shaped Parts		•			
Plans		•				Parts Match to Plans		•			
Written Instructions			•			Overall Parts Fit		•			
Quality of Hardwood		•				Ease of Assembly		•			
Quality of Fiberglass			NA			Fidelity to Scale			NA		
Other Materials		•				Flight Performance		•			
Accessories		•				Overall Appeal		•			
Die-Cutting			NA								

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

The TrueLine Corsair is a trainer type aircraft that is kitted by TrueLine Model Aircraft Ltd., of England. It is being distributed in the U.S. by Mid-Am Distributors, 348 Murray Drive, Lexington, Kentucky 40505, (606) 252-4102. It is distributed in Canada by, Model Craft Hobbies Ltd., 1660 Matheson Blvd., Mississauga, Ontario Canada L4W 2K6, (416) 625-4410. It is designed for use with a 2 or 3 channel radio system and an engine in the .10 cubic inch class.

The Corsair is a shoulder wing design of conventional construction methods. The wing is foam and comes pre-sheeted with a hardwood veneer (we believe it's called obechi wood), which is wrapped around the leading edge. The quality of workmanship of this pre-sheeted wing is excellent. The airfoil is flat bottomed and the proper dihedral angle is pre-cut by the manufacturer. The wing is completed by simply gluing the balsa trailing edge caps and wing tip plates in place and then joining the two wing halves together. Total time spent in assembling the wing was about 4 or 5 minutes, discounting glue drying time. The tail surfaces are of all balsa sheet construction. The fuselage is a conventional box type design with internal diagonal doublers from the nose to the trailing edge of the wing. The fuselage assembly is well detailed on the plan and all kit parts are numbered. Wood quality is quite good and the fuselage parts go together in an easy and rapid fashion. The only changes that we made were of a personal preference nature. We elected to use the nylon bolt and front dowel method to mount the wing to the fuselage. The plans show the wing being held in place via the dowel/rubber band method and we would urge any beginner (who is building a Corsair) to use the method shown on the plans, as it is far more forgiving in the event of a "hard landing", even though it is not as pretty. We also mounted our engine directly to the firewall using its radial mounting lugs, (a Helmut Bernhardt HB .12 engine with Perry carburetor, this engine has both beam and radial mounting lugs). We also reinforced the firewall with 1/4" triangular stock.

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SPECIFICATIONS

Name	CORSAIR JUNIOR TRAINER
Aircraft Type	Sport Trainer
Manufactured By	See text
Mfg. Suggested Retail Price	$32.95
Available From	Retail Outlets
Mfg. Recommended Usage	General Sport
Wing Span	44 Inches
Wing Chord	7 Inches
Total Wing Area	305 Square Inches
Fuselage Length	30 Inches
Radio Compartment Dimensions	(L) 7" x (W) 2⅜" x (H) 2¼"
Wing Location	Shoulder Wing
Airfoil	Flat Bottom
Wing Planform	Constant Chord
Dihedral	1½ Inches
Stabilizer Span	16 Inches
Stabilizer Chord (incl. elev.)	4¾" (Avg.)
Total Stab Area	75 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Top of Fuselage
Vertical Fin Height	4 Inches
Vertical Fin Width (incl. rud.)	4" (Avg.)
Mfg. Rec. Engine Range	.10
Mfg. Rec. Fuel Tank Size	1-2 Ounce
Landing Gear	Not Given
Recommended No. Of Channels	2-3
Recommended Control Functions	Rud., Elev., Opt. Throt.
Basic Materials Used In Construction:	
Fuselage	Balsa & Plywood
Wing	Foam, Hardwood Veneer, Balsa
Tail Surfaces	Balsa
Hardware Included In Kit	See Text
Plan Size	39" x 25" (1 sheet)
Building Instructions on Plan Sheets	Yes
Instruction Manual	No
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	Not Given
Wing loading based on rec. flying wt.	Not Given

RCM PROTOTYPE

Weight, Ready To Fly	29 ounces
Wing Loading	13.7 oz./sq. ft.
Covering & finishing materials used	See Text
Engine Make & Disp.	Helmut Bernhardt
Muffler Used	Helmut Bernhardt
Radio Used	Westport Variant
Tank Size Used	2 Ounces

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TOLL FREE PHONES - Tower Hobbies was the first to offer Toll Free " 800 " phone service to its customers. With the Toll Free lines you can call Tower at no charge to yourself to place orders, check on availabilities, check current prices, obtain professional advice, or whatever. Your telephone is a straight connection to the largest and finest R/C inventory in the United States - it's fast, easy, and free of charge.

COMPUTER POWER - Tower was the first and as far as we know still the only mail order company in the hobby to keep track of inventory, remember backorders, and process all orders with a computer. This enables us to keep errors to an absolute minimum which means that you don't have the headache of receiving wrong merchandise, being billed incorrectly, or having your backorders forgotten or misplaced. Tower processes your order quickly and correctly this time, next time, and everytime!

EXTENSIVE INVENTORY - Tower Hobbies has the largest and most complete inventory of radio controlled model airplane supplies and related accessories in the United States. Tower carries over 150 manufacturers lines including: Airborne, Ace, A.F.I., Airtronics, A.H.M., A-Justo-Jig, Allied Hobbies, Ambroid, Andrews, American Helicopters, Austin Craft, Badger, Banner, Bauer, Bolectra, Bridi, B.W.T., C.B. Associates, Custom Model Prod., Concept, Coverite, Cox, Craft Air, D&B, DAE, Devcon, Dodgson, Dremel, DuBro, Dumas, Economy Plus, Edson, Enya, Eveready, Exhib'air, Fliteglas, Fox, Fuseite, Futaba, Gas Model Prod., Goldberg, G.M.C., Graupner, Grish, Hallco, Hobbypoxy, Hot Stuff, House of Balsa, Jemco, Jensen, K&B, Kavan, Kraft, Kwik-Cote, Lanier, Legionair, Leisure, Lenco, Long Island, Maco, Mark's Models, M.E.N., Microflame, Mich. Hobby, Mile High Models, Midwest, Milman, Miller, Model Dynamics, Monokote, M.R.C., Neal's, Bud Nosen, Octura, O.S. Max, Pactra Aerogloss, Panavise, Pacer, Perry, Platt, Powr-mite, Prather, Proctor, Power Pacer, R&S, R/C Guide, Rocket City, Rev-up, Robart, Rhom, Royal, 60 to Go, Sanwa, Scozzi, Sealector, Semco, Sherline, Sig, Simmons, Skyglas, Slimline, Bob Smith, Solarfilm, Soarcraft, Sonic Systems, Southwestern, Spickler, Su-Pr-Line, Southern R/C, Sta-Brite, Stafford, Sterling, Supertigre, SonicTronics, Sullivan, Superpoxy, SureFlite, Tatone, Titebond, Tonico, Top Flite, Tower, Trexler, Universal, V.K., Williams Bros., Webra, Wing Mfg., Wilhold, World Engines, Westcraft, X-Acto, Zinger, Zap and more!

The front office file area is a busy place! Over 35,000 active customer files fill up 70 file cabinets. Can we make a file for you?

The warehouse final checking and packing area processes over 350 packages each day. You'll enjoy receiving packages from Tower!

Good afternoon - Tower Hobbies! Part of our phone staff answering our Toll Free lines. We went to take your orders, answer questions etc.

Our computer operators enter your order on the terminals. The computer quickly and accurately generates an errorless invoice just for you.

Now where did those rear valve ABC schneurles with Perry pumpers go? Tower has the largest and finest R/C inventory selection available.

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P.O. BOX 778 CHAMPAIGN,

TOWER HOBBIES SIX & THREE CHANNELS

Tower Hobbies digital proportional radio control systems are absolutely the finest value radios on the market today. Take a close comparitive look at the Tower systems against *any* other brand and you will quickly see that you get unquestionably the most radio for your money with Tower!

QUALITY : Tower radios are made for us by Kraft Systems in California. They are manufactured to our exacting specifications which include the latest technology of design, the finest components, precision assembly, and outstanding quality control. Kraft is the World's finest R/C systems manufacturer and Tower Hobbies is the most reputable R/C distributor in the industry - the combination of the two guarantees you the finest possible product and service all at the lowest possible price.

WARRANTY : Tower radios are warrantied for 180 days from the date of first purchase. Five convenient warranty service centers are located accross the Country for fast, dependable, and precise service.

COMPATIBILITY : The Tower 6 and Tower 3 components are fully compatible with the previous Tower 5 model as well as the entire line of Kraft Systems radios (except for the "A" series). This gives you the greatest accessory and feature availability in the industry — interchange flight packs, servos, chargers, trays, output arms, or anything from the Kraft lineup of outstanding products.

COMPONENTS : The Tower 3 channel comes standard with two KPS-14 servos and a lightweight 450 MAH ni-cad receiver battery pack, giving an airborne pack weight of only 7.9 ounces. The Tower 6 channel comes with your choice of four KPS-14 or KPS-15 servos and a powerful 550 MAH receiver battery pack, giving an airborne pack weight of only 11.9 ounces with 14's and 13.5 ounces with 15's. Both systems come with lightweight slimline receivers that make for very convenient installations. Both switch harnesses have external recepticles for charging convenience.

FEATURES : Both Tower systems feature a dual function meter that allows you to check RF and absolute battery voltage. This allows you to monitor your flying time in addition to being able to check for possible cell malfunction. This deluxe feature is usually only found on systems in the $500.00 price range.

POPULARITY : Tower radios enjoy a high degree of popularity at flying fields all across the country. When you show up at the field with a Tower radio your flying buddies will know that you are a no-nonsense flyer that demands top quality equipment but at down to earth prices. Your choice of a Tower radio says a lot about your astute ability to recognize true value — it shows you're a smart shopper!

APPEARANCE : Tower Hobbies radios are attractive. There is just something very elegant about that rich ivory color accented with black trim pieces. But that's in keeping with the total quality feel of Tower radios — that first class feeling. We just don't think that a radio should look weird or strange — because we feel that the radio you fly is a reflection of your own personality. With Tower Hobbies radio control systems you go first class in quality, performance, and appearance.

PRICE : Tower Hobbies radios give you absolutely the maximum amount of radio for the least amount of money — and that's value! There is nothing cheap about a Tower radio. The design is the latest, the manufacturer is the finest, the quality is peerless, and the service is second to none. So how then can the price be the lowest in the industry? Simple. Tower's tremendous buying power allows us to create economies due to volume — and there are no middlemen between us and the manufacturer to artificially jack up the price. You're paying the bottom dollar price for the top of the line product. We can't think of any reasons why you should pay more to get less.

ORDER NOW ! ! Both systems are in stock for immediate delivery on the 72 mHz frequency of your choice. Call Toll Free right now for immediate COD delevery or send your order in the mail along with purchase amount plus $2.00 for postage. If you are not 100% satisfied with your Tower radio after receiving it then simply send it back in original condition within 10 days for a full purchase price refund.

TOWER SIX

The Tower 6 channel transmitter comes in the popular 2 stick closed gimbal configuration. Standard equipment includes a fully proportional fifth channel, toggle switch sixth channel, choice of four KPS14 or KPS-15 servos, slimline high range receiver, ni-cad batteries in both transmitter and receiver, charger, switch harness, servo trays, full servo accessories, and a dual function meter that indicates both RF and absolute battery voltage.

This is a top of the line complete radio system that is perfect for all radio control applications. From ½A to pattern ships, it offers all the performance you could ever ask for.

Six channels, top performance, high quality, and outstanding service after the sale — all at the lowest price in the hobby. Can you think of any reason why this shouldn't be your next radio?

Retail $350.00 Stock #TOW88462

ONLY $199.95

TOWER THREE

The Tower 3 channel transmitter comes in the popular single stick closed gimbal configuration. Standard equipment includes a fully proportional third channel, two KPS-14 servos, slimline high range receiver, ni-cad receiver battery, charger, switch harness, servo accessories, and a dual function meter that indicates both RF and absolute battery voltage. The dry cell transmitter (battery not included) can easily be converted to ni-cad operation by adding ni-cad pack.

This is a top of the line complete radio system that is perfect for small aircraft, gliders, boats, and cars. It's lightweight, yet very rugged.

Same outstanding performance, quality, and service as in our 6 channel and again all at the lowest price in the industry. This is the system that makes sense for the beginner that needs three or fewer channels.

Retail $210.00 Stock #TOW88231

ONLY $119.95

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SPECIALS GOOD UNTIL AUGUST 15th, 1978 ONLY

BE A SMART SHOPPER; COMPARE OUR PRICES. HERE IS JUST A SAMPLE OF OUR LOW PRICES. WE HAVE THOUSANDS MORE JUST AS GOOD!

Radio Sale!

	Retail Price	Tower Price
KRAFT		
KP-2AS	129.95	88.98
KP-4A	299.95	189.98
KP-5C&CS	375.43	269.98
KP-6A	329.95	214.98
KP-7C&7CS	515.43	369.98
SANWA		
2 CH	109.95	69.98
FUTABA		
2GA	109.95	74.98
2E	139.95	94.98
2F	139.95	94.98
3F	179.95	119.98
3FN	199.95	132.98
4FN4 S-17	269.95	179.98
4FN4 S-16	299.95	194.98
5FN	349.95	224.98
6FN S-17	319.95	209.98
6FN S-16	359.95	234.98
7GN	579.95	389.98

	Retail Price	Tower Price
Airtronics Sportavia RTF-NEW!	69.95	48.98
Airtronics Q-Tee	21.95	15.38
A-Justo-Jig wing & fuse jig	54.95	36.98
American RC Helicopters--Call for Prices		
Bridi---ALL WOOD KITS---34% OFF RETAIL		
Bridi---ALL GLASS KITS---33% OFF RETAIL		
S & O Battery Tester	24.95	16.18
Coverite Balsarite	2.95	1.98
Cox Tee Dee .051	20.95	13.68
Craft-Air Butterfly--NEW!	49.95	32.48
Craft-Air VM-2 Voltmeter	24.95	13.98
Dubro Prop Drive Unit	100.00	66.98
Dumas Big Swamp Buggy	28.95	18.58
Dumas Hot Shot 21--Glass NEW	67.95	44.18
D&B F-86 Sabre Jet	179.95	125.98
Fox---ALL RC ENGINES---40% OFF RETAIL		
Futaba S-7 & S-16 Servos	39.95	29.98
Futaba S-17 Servo	29.95	22.48
Goldberg Senior Falcon	59.95	35.98
Goldberg Skylane 62	59.95	35.98
House of Balsa---ALL KITS---30% OFF RETAIL		
Jemco Corsair	68.50	54.78
Jemco P-51	58.50	46.78
Jensen Ugly Stick	62.50	39.98
K&B .35 RC	34.95	22.78
K&B .40 RC Pressurized	95.00	56.98
K&B .19 RC	50.00	29.98
K&B .61 RC Pressurized	115.00	68.98
K&B .21 Outboard	99.50	59.98
K&B .21 RC Inboard Marine	69.50	41.68
K&B .21 RC Schneurle w/muff	67.50	40.48
K&B .40 RC Sport Marine	75.00	44.98
Kraft .61 RC w/muffler	99.95	71.98
Kraft KPS-14II&15II Servos	44.95	34.95
Kwikcote---ONLY $2.98 per roll!		
Lanier Jester II	73.50	45.58
Lanier Comet 35	52.50	33.58
Mark's Wanderer	19.95	12.98
Mark's Bushwacher w/access.	52.95	31.78
MEN Trainer (.15 to .25)	31.95	20.48
Midwest Cardinal ARF	29.95	19.48
Midwest Sweet Stik	39.95	24.78
Midwest Attacker	39.95	25.98
Monokote-Reg. & Trans. Colors	9.00	4.98
MRC Radios--- CALL FOR LOW PRICES!!		
Dave Platt---ALL KITS---33% OFF RETAIL!!		
Quadra 2 cubic inch engine	139.95	109.95
Robart Super Pumper Mk II	17.95	10.78
Solarfilm---ALL REGULAR COLORS---3.98/roll		
Slimline Muffler for K&B 35&40	8.95	6.28
Sterling Fledging	41.95	26.48
Sterling Puddle Jumper MK II	39.95	25.98
Sullivan Deluxe Starter	39.95	25.98
Sureflite Foam J-3 & Spitfire	34.95	22.78
Stafford Twin Commanche	139.95	94.98
Top Flite Freshman Trainer	49.95	29.18
Top Flite Super-M 10X6(12)	13.80	8.98
Tower 12 volt gel/cell battery	26.95	18.98
Webra .61 RC Schneurle	166.90	89.98
OPS Engines--CALL FOR LOW PRICES!!		

BUD NOSEN TRAINER 28% OFF

This 8.5 ft. wingspan all wood, fast building trainer is designed for a .60 size engine & 3 or 4 channel radio.

RETAIL $79.95 NOW ONLY $57.58 Stock #NOS74008

BRIDI RCM TRAINER 60 34% OFF

This popular all balsa trainer has a 58" span and takes a .40 - .60 engine. High quality, flies great.

RETAIL $62.95 NOW ONLY $41.58 Stock #BRI74002

LANIER COMET II 36% OFF

This popular almost-ready-to-fly features a 63" span and takes a .50 - .61 engine. Great trainer.

RETAIL $58.50 NOW ONLY $37.48 Stock #LAN74105

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*CLOSED FRIDAY EVENING AND SUNDAY

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Write down all the items you want along with their stock numbers and prices. Add $2.00 to the merchandise total to cover postage, handling, and full insurance. Send payment in Money Order or Check only (Personal Checks may be delayed to allow for clearance). Foreign orders add $10.00 (excess will be refunded with order). Satisfaction always guaranteed.

1978 R/C CATALOG

The all new 1978 Tower R/C catalog features over 3000 products from over 150 manufacturers. All at super discounts. Send for your copy now!

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DA ENTERPRISES SERIES IV POWER PANEL — 36% OFF

The all-in-one power panel !

Supply power to starter, plug, pump, etc., as well as fast charge your radio at the field!

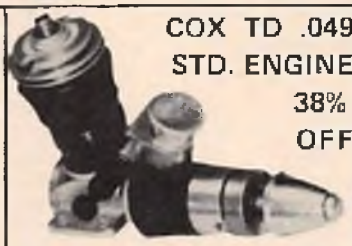
RETAIL $34.95 — NOW ONLY $22.48 — Stock #DAE90000

BRIDI RCM TRAINER 40 — 34% OFF

This popular all balsa trainer has a 52" span and takes a .35 - .49 engine. A high quality kit.

RETAIL $54.95 — NOW ONLY $36.28 — Stock #BRI73007

COX TD .049 STD. ENGINE — 38% OFF



A super hot ⅛A engine ideal for free flight, control line, ½A R/C, and more. Limit of 2 per order.

RETAIL $20.95 — NOW ONLY $ 12.98 — Stock #COX01049

FUN BUGGY — 22% OFF

This is the Siguma-Ace .19 size dune buggy distributed by Leisure Electronics. See the Dec. RCM article for more details.

RETAIL $179.95 — NOW ONLY $139.98 — Stock #LEI90000

BOLINK ELECTRIC CAR — 20% OFF

This 2 channel 1/12 scale electric car comes already assembled with 05 motor, nicads, & charger & goes over 25 mph.

RETAIL $99.95 — NOW ONLY $79.98 — Stock #BOL90094

CRAFT-AIR FIELD BOX NEW — 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 — Stock #CRA90100

CRAFT-AIR HI - START HEAVY DUTY — 35% OFF

Features reel, tubing, towline, parachute, stake, tow ring, and strong construction. For sailplanes of 100" wingspan and larger. Limit 1.

RETAIL $39.95 — NOW ONLY $25.98 — Stock #CRA20020

AIRTRONICS OLYMPIC II — 30% OFF

This 99.9" span trainer is capable of contest competition. All balsa with pre-cut parts. An excellent quality sailplane.

RETAIL $49.95 — NOW ONLY $34.98 — Stock #AIR71208

ZINGER WOOD PROPS — 35% OFF

Two popular sizes--Stock up now on these high quality props!

10X6 WOOD PROPS(6)

RETAIL $8.40 — NOW ONLY $5.48 — Stock #ZIN17663

11X7 WOOD PROPS(6)

RETAIL $9.60 — NOW ONLY $6.28 — Stock #ZIN17675

POWER PACER BATTERY TESTER — 20% OFF

A new ni-cad battery tester, cycler, and charger. Works great!

RETAIL $59.95

9.6 volt — Stock #PWR80096

6 volt — Stock #PWR80060

KRAFT KP-6A 6 CHANNEL NEW — 37% OFF

6 channels, open gimbals, 4 servos, nicads, trays, harness, charger & 1 yr. warranty make this all new Kraft radio a super value.

RETAIL $339.95 — NOW ONLY $214.98 — Stock #KRA88262

SONICTRONICS ELECTRIC FUEL PUMP MODEL No. 1250 — 36% OFF

This outstanding fuel pump operates on 12 volts. High quality.

RETAIL $13.95 — NOW ONLY $8.98 — Stock #STR54249

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ZAP ZAP ZAP ZAP 50% OFF

Zap is a Super Cyanoacrylate adhesive that is super fast setting. Large size comes with extra applicators. Limit of 6 per order.

RETAIL $3.50 — NOW ONLY $1.78 — Stock #SOR32050

PACER X–30 ADHESIVE 50% OFF

X-30 is super glue like Hot Stuff,Zap,etc except that it has a 30 second set time that allows for last minute fittings & adjustments. Also, its higher viscosity enables it to make fillets. Limit 6 per order.

RETAIL $3.50 — NOW ONLY $1.78 — Stock #PCR32030

GOLDBERG HANDI TOTE 34% OFF

This flight box is compact yet has room for everything you need. Limit of 1 per order.

RETAIL $14.95 — NOW ONLY $9.98 — Stock #GBG90000

HOT STUFF HOT STUFF 44% OFF

Hot Stuff is an instant bonding cyanoacrylate super adhesive that is a must for modelers. Stock up now at this super price.

RETAIL $3.50 — NOW ONLY $1.98 — Stock #HOT32001

K & B .40 RC ENGINE 40% OFF

The most popular .40 ever made! Features a Perry carb.

Quantities are limited. Limit of 1 engine per order until sold out.

RETAIL $67.50 — NOW ONLY $39.98 — Stock #K&B01040

DU-BRO KWIK FILL FUEL PUMP 36% OFF

RETAIL $10.95
NOW ONLY $6.98
Stock #DUB20191

HOUSE OF BALSA P-51D (.29-.40) 30% OFF

This all-balsa sport, stand-off scale ship is absolutely outstanding. The hottest new seller of the year.

RETAIL $54.95 — NOW ONLY $38.48 — Stock #HOU73000

K & B .61 R/C ENGINE 40% OFF

Limit of 1 engine per order.

This outstanding engine features a Perry carb and muffler.

RETAIL $90.00 — NOW ONLY $53.98 — Stock #K&B01161

TOWER HOBBIES R/C LONG GLOW PLUGS 50% OFF

These excellent glow plugs feature an idle bar. Made by the world's finest plug manufacturer especially for Tower. 6 plugs per package. Limit of 2 packages per order.

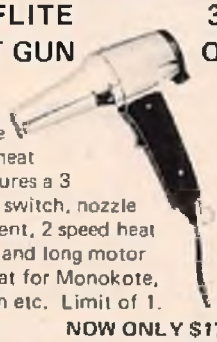
RETAIL $7.20 — NOW ONLY $3.58 — Stock #TOW15006

STERLING 1/2 A CORSAIR 40% OFF

This all balsa 36" span kit features special hardware and decal sheet. .049-.10 engine and 2 Ch. radio.

RETAIL $29.95 — NOW ONLY $17.98 — Stock #STE72036

TOP FLITE HEAT GUN 36% OFF



This fine quality heat gun features a 3 position switch, nozzle attachment, 2 speed heat control, and long motor life. Great for Monokote, Solarfilm etc. Limit of 1.

RETAIL $27.95 — NOW ONLY $17.98 — Stock #TOP45301

DUMAS 24" HOT SHOT TUNNEL HULL 35% OFF

This die-cut mahogany and birch plywood kit is designed for a 3.5 cc outboard like K&B's.

RETAIL $30.00 — NOW ONLY $19.48 — Stock #DUM70400

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12 VOLT MOTORCYCLE BATTERY — 50% OFF

These are high quality, heavy duty motorcycle batteries that are perfect for all electric starters. Brand new. Limit 1/order.

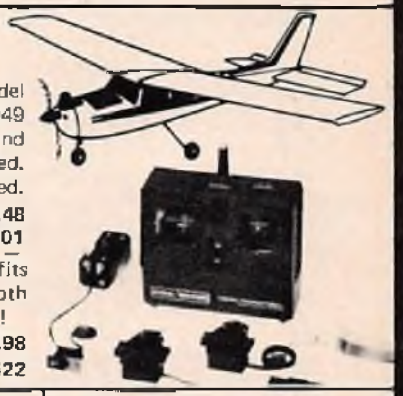
RETAIL $26.95 — NOW ONLY $13.48 — Stock #TOW19000

12 VOLT BATTERY CHARGER

To go with your 12 volt motorcycle battery, or any other 12 volt battery, we now have this high quality charger that does a perfect job. Safe and easy to use. Works great with battery at left. UL approved. Limit 1 per order.

RETAIL $13.95 — NOW ONLY $6.98 — Stock #TOW19100

COX READY TO FLY CESSNA CENTURION



This all molded foam scale model comes complete with a Cox .049 engine, prop, push rods, horns, and all other fittings already installed. 36" span. Cox 2 Ch. recommended.

RETAIL $54.95 — NOW ONLY $38.48 — Stock #COX72401

The Cox/Sanwa 2 channel radio fits perfectly into this model. Buy both and be in the air within one hour!

RETAIL $109.95 — NOW ONLY $69.98 — Stock #SAN88522

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. Limit 1 per order.

RETAIL $69.95 — NOW ONLY $43.98 — Stock #DRE34381

SEALECTOR CUSTOM MODEL SEALING IRON — 33% OFF

This custom model is great for covering with Monokote, Solarfilm, etc. It features adjustable temperature, teflon shoe, and a handy stand. Excellent quality.

RETAIL $22.40 — NOW ONLY $14.98 — Stock #SEA45202

MILLER No. 2017 SPRAY SET — 40% OFF

Complete set includes a 12 foot air hose, compressor, spray gun, air brush, and nozzles.

RETAIL $73.95 — NOW ONLY $44.38 — Stock #MLL62017

SULLIVAN ELECTRIC STARTER — 35% OFF

The Sullivan electric starter is a high torque, high R.P.M., 12 volt starter. Limit of 1 per order.

RETAIL $36.95 — NOW ONLY $23.98 — Stock #SUL12200

KRAFT KP-4A 4 CHANNEL — 37% OFF

4 Channels, open gimbals, 4 servos, ni-cads, trays, harness, charger, and 1 yr. warranty make this all new Kraft radio a super value.

RETAIL $299.95 — NOW ONLY $189.98 — Stock #KRA88242

DEVCON 5 MINUTE EPOXY IN ECONOMY 9 OZ. SIZE — 40% OFF

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

RETAIL $5.80 — NOW ONLY $3.48 — Stock #DEV32209

DREMEL 572 MOTO SHOP — 35% OFF

This deluxe saw features a complete accessory set of blades, discs, etc. and flexible shaft. Limit of 1.

RETAIL $89.95 — NOW ONLY $58.88 — Stock #DRE34572

GOLDBERG FALCON 56 — 40% OFF

This all time best seller is now re designed with ailerons. 56" span, 15 - 35 engine, all balsa construction. An excellent trainer.

RETAIL $39.95 — NOW ONLY $23.98 — Stock #GBG72015

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By Dr. Gerry Casey

Photos By John Kokes

BIG MOTHER

Palos Verdes Estates, facing the Pacific Ocean in S. Calif. It's a perfectly beautiful day cliff-side at Bluff Cove. Up on the strong seabreeze lift, are numerous lovely R/C sailplanes soaring like birds.

Truly, it is a glorious sight. But except for those holding transmitters, no one is watching!

Adjacent to the RC'ers, stands a crowd of some fifty people oh'ing and ah'ing as they watch huge pieces of Solarfilm-covered balsa being assembled. The tension is unbearable for "Big Mother" will soon try the air . . .

Over-dramatic? Not really. I've given you an accurate picture of what happens *every time* I take this monster glider out to fly. It's amazing. People just cannot believe their eyes when they watch me struggle with two wing panels, each five foot by twenty chord inches. My monster has 2450 square inches of wing area. It weighs exactly eight pounds and is able to get a watching crowd all turned on waiting for it to fly. Ham that I am, I love it.

"Is this the first time?" one will ask.

"Yes, and I sure hope it'll fly!" I always lie.

Then all get involved in a dramatic game of speculation. Adults and children wager "it will" or "it won't." Other pilots — in on the act — come by and sadly shake their heads during my assembly efforts. Finally my moment of truth is at hand. Big Mother is ready to fly.

It takes three of us to get it launched over the cliffs: I at the transmitter, one man on the wing, and the other launching by holding tightly to the fuselage and being careful to keep the nose pointed well down to avoid being blown over backwards. Usually, I sob a little and look pleadingly at the spectators.

Shouting, they urge, "Go! Go! It *might* fly!"

I let them see my hands shaking, then signal. The two crewmen let go.

Wow! Like a euphoric turkey buzzard, Big Mother spreads her wings, sails easily out into the lift and begins to turn and wheel in the air as easily and far more spectacularly than the garden-variety soarers alongside.

The crowd roars and claps their hands. Some even thump me on the back. (Hard to fly that way.) Once, a lovely young girl with tears in her eyes came up and kissed me on the cheek. (Down Dewey!)

I know. You cannot believe it.

It is difficult imagining today's bored public getting all involved in one man's trial getting a huge beast to fly. But as I said, it happens regularly. To me, flying the big ones is the icing on the cake for some forty years of modeling.

As if all that isn't enough, I wheel Big Mother around her turn and belt it back downhill across the cliffs — eye level — and move the left transmitter stick. A horn begins to blow — a banshee squeel emanates from the gizzard of the bird and the kids watching and hearing scream with abandon. Dogs bark wildly and nearby seagulls skitter nervously out of the way of that "big mother!"

So, what's this Big Mother thing all about and how did it get that way?

Ah! You thought it looked familiar? Indeed. If you remember Dec. '76 issue of RCM, you might recall the story on the Zoegling Primary glider. That, in time, became "Little Brother" as I began to put together Big Mother.

Right. The big bird was an abnormal outgrowth of the smaller one. I had so much fun flying the little one and having fun with spectators that I reasoned irrationally: If a six foot span is that much fun, I ought to go bananas with one having a ten foot span. And I did.

I discovered that building and flying a two-thirds greater sized model of a proven design gives you ten times the fun. Also, I discovered an entirely new set of problems that increase proportionately as you begin to stretch the design to its bigger and heavier configurations.

Other than minor changes, the big job is identical to the Zoegling Primary. Building it, I simply multiplied everything by two-thirds. I did fudge on the wing section by substituting the original NACA 7410 with the NACA 6409. This thinned the cross section and gave a better flat plate resistance overall.

While it's simple to scale up sizes, the structure presented challenges. We'll get into that later, but I do want you to know the bonuses you'll enjoy with the larger models.

One is that the Reynolds number improves as size increases. Thus, Big Mother was able to soar on lift much too light for the Zoegling primary.

Interior space is a blessing.

Looking into the great abyss inside Big Mother's cockpit, I first thought of putting a Capuchin monkey therein as pilot. But have you priced a monkey

lately? They don't people around! Also, my friends called me names like "sadist" and "enemy of the animal world," and things like that. Funny. Wasn't the first American space passenger a chimp?

Big Mother, when tested for ballast showed a need for over a full pound of nose-weight. So instead of lead, etc., think of what you can substitute! Cameras — water-dropping things — parachutes — and horns and sirens, any can be accommodated. For example, a used Kodak Super & Instamatic M14 movie camera can be picked up for about $25.00 and weighs only 13 ounces! I chose to use the horn-alarm that is supposed to prevent purse-snatchers from getting our ladies handbags. Most hardware stores carry these little battery operated screamers. Add a small megaphone and they'll scare anyone.

No scale pilot was available for this size, so I carved one out of balsa that, when completed by my inept hands, looked like a cross between "Sasquatch" and a demented grizzly. On the cockpit was his name that I found in an old phone book: Halkin Kochenlocher. (Odd, no one's commented on it.)

So you are tempted to build a big one? Might as well for they are coming — mark this word of prophesy. Before you start though, you'd better hear a bit of this new ball-game called "big."

If you value your home, build outside or in a large garage. Usually, I build sitting at the dining room table in my *bachelor* apartment (eat your hearts out, husbands!). But after accidentally stuffing a huge wing through the window, I moved the monster pieces onto the living room floor.

Bigger, to me, means easier. I thought Big Mother took a little less time to build than the little brother.

The first thing you do, is to measure the interior of your auto, or whatever you drive to carry your model in. In most Detroit sized cars, you'll start running out of space with wing panels over five feet long. For greater spans, I'd suggest dividing the wings into three sections, joining them with pin and tube and locking with ply tongues through which 3/16" nylon bolts secure.

Weight goes up like you wouldn't believe on these giant models, although they seem to handle it well. Both my small primary and Big Mother were about the same wing loading. Except where absolute strength is critical, use mostly model cement. My little bird weighed three pounds. If the weight had grown proportionate to the scaling up, Big Mother would have come out at some five pounds. Instead, she weighed out at eight pounds.

While flight loads on the structure might require a proportionately smaller size item, the handling loads dictated heavier materials. A 6" span between longeron braces might be great for the

flight loads but would distort badly from even the lightest pull of any type covering. So it was not too surprising to find that many of the balsa pieces gave way to hardwoods, pines, spruces, and plywoods.

Metal fittings that required soldering on the smaller model had to be silver soldered on the larger one.

Rigging the big birds takes care. No longer can the modeler "eyeball" the thing and hope to come out right. With all the wires and turnbuckles on Big Mother, I had to devise a traveling bubble-level to make the required alignments of wing and tail.

For your giant, I urge you consider Lou Proctor's nuts, bolts, wires, turnbuckles and metal fittings.

The greatest challenge in big models is the proper wedding between radio control and the huge control surface areas.

Control "slop" with great air pressures on these large surfaces can cause flight oscillations that spell disaster. Even counter balancing to lessen the loads is very tricky. On the small Zoegling, a fully counter balanced rudder gave no trouble. The same type counter balance on Big Mother caused it to oscillate in level flight so badly it nearly flew off in the air.

Aileron differential is a vital "must". I have seen eight or nine foot span power models literally stop in flight when turns were attempted due to the serious yaw of undifferentiated ailerons. Consider that Big Mother's ailerons totalled 280 square inches of area and you'll realize what you are up against. Any of the recently appearing giant-sized kits may be super in design and flawless in kit quality, but can end up an abysmal failure if the builder does not approach the giant-sizes as different from the small models.

You can save a lot of agony if you don't try to move those huge control surfaces with anything but the extra powerful servos. Trying to test Big Mother with ordinary servos resulted in such ulcer producing maneuvers as: turns which, once started, would not stop — not enough elevator to recover from a dive — and aimless wanderings at the will of the wind regardless of radio signals sent.

If you have any doubt, at least do your test flights with one servo per aileron. Most manufacturers can supply special duty servos. In my experiments, I ended up using Proline's 15 II servos. I found their strength to be such that, ultimately,

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Experts Little Brother - World 4 ch. $239.00

World Engines announced the production of the above pictured World 4 channel radio quite some time ago, thinking that we were on the threshold of production. By the time the print dries on this advertisement we certainly hope to have some of these systems into the hands of our dealers.

We produced this system with the thought in mind that radios with mechanical trim cost less to produce than those with electronic trim, and that by going this route we could be competitive with some of the lower priced systems that are on the market today.

Actually, our friends at the OS factory made it possible for us to buy some of their metal bale type mechanical stick assemblies at a very attractive price and we are passing the advantages of this design on to the customer.

This system is being sold with a dry transmitter battery arrangement – 8 pen cells which can be replaced with nicads. Pen cell nicads can be popped into the cavities where the dry batteries would normally go and the transmitter will operate.

For the curious, we have placed some of the components that go into the system in front of the transmitter, like the stick assembly, transmitter printed circuit board, receiver and the servo.

The receiver that is with this system comes with a new decoder which is a definite improvement over anything that we have offered in any radio. The S-11 servos that are going out with these systems have very high torque motor and are much more efficient.

Our philosophy in building radios is to keep them simple but high in quality. For this reason we stayed away from changing crystals from one frequency to another or trim panels; but on the other side of the coin, we have always tried to use the best components that we could get and the best nickel cadmium batteries.

We think we have set our systems up as tight if not tighter than many other manufacturers in regard to the amount of dead band in the servos, return to center capabilities and other things that actually relate to precise control from transmitter to control surface.

These systems are using the new Mitsumi 3 pin connector which is not readily interchangeable with our other systems; however, the connectors can be changed and then the servos would be compatible.

Price of the 4 channel system with receiver, 3 servos, transmitter, battery charger, nickel cadmium battery for the receiver (transmitter is dry.) $239.95

A coupon will be packed in this system making the fourth servo available to the customer (mail in to World Engines) for $18.00.

World Engines

8960 ROSSASH AVE., CINCINNATI, OHIO 45236 • TELEPHONE (513) 793-5900 • INTERNATIONAL TELEX 214 557

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WORLD'S CATALOG $1.00 POSTPAID

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World Engines of Germany
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Lincoln, NB. 68508

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Pompton Plains, NJ 07444

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Bronx, NY 10471

Mardel Hobbies
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Schenectady, NY. 12303

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Hendersonville, NC. 28739

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Toledo, OH. 43609

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Cleveland, OH 44129

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32094 Detroit Rd.
Avon, OH 44011

W-K Hobbies
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Centerville, OH 45459

Wife's Hobby Shop
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Quarryville, PA. 17566

J. C. R/C Hobbies
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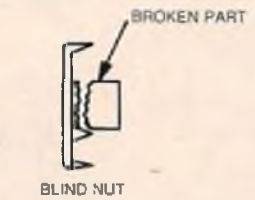
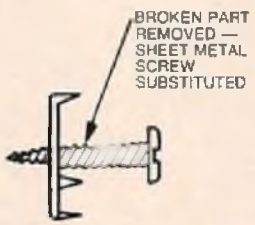
FOR WHAT IT'S WORTH

Ever had a problem with trying to get pins into spruce framing for fuselage sides on something like the VK Nieuport or one of Lou Proctor's Antics? Using a small hammer is a help, such as the older metal ones that come in childrens carpenter sets, but driving them into spruce, the pins bend so easily that you can go through a box of pins in an evening. My solution to the problem was to cut a short length of brass tubing (1/16" fits the pins that I use) just the thickness of the wood shorter than the pins being used. Place the pin inside the tubing, aim it at the right spot and drive it home. The pins seldom bend. Admittedly you then have to pull the pin out, remove the tubing and replace the pin. However, with the hole already made, it goes in quite easily — sure saves on the pins and the frustration. Submitted by Dick Phillips of Prince George, B.C., Canada.

After building a Kadet and flying it a few times, Elmer McKay of Norfolk, Virginia, found that he had broken a blind nut. It would be impossible to get to it without removing a section of the bottom area aft of the firewall. To solve the problem, Elmer held that part of the engine mount (see sketch) on the aircraft by using a sheet metal screw instead of the 6-32 screw that came with it. To date, many flights have been put on the aircraft with no problems.

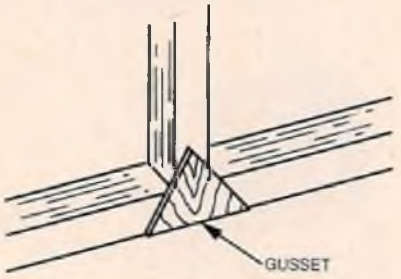


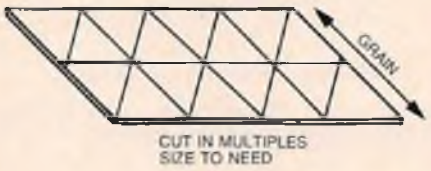


Harris Barron of Brookline, Massachusetts, submitted the following ideas which he has found to be very helpful in his modeling activity.

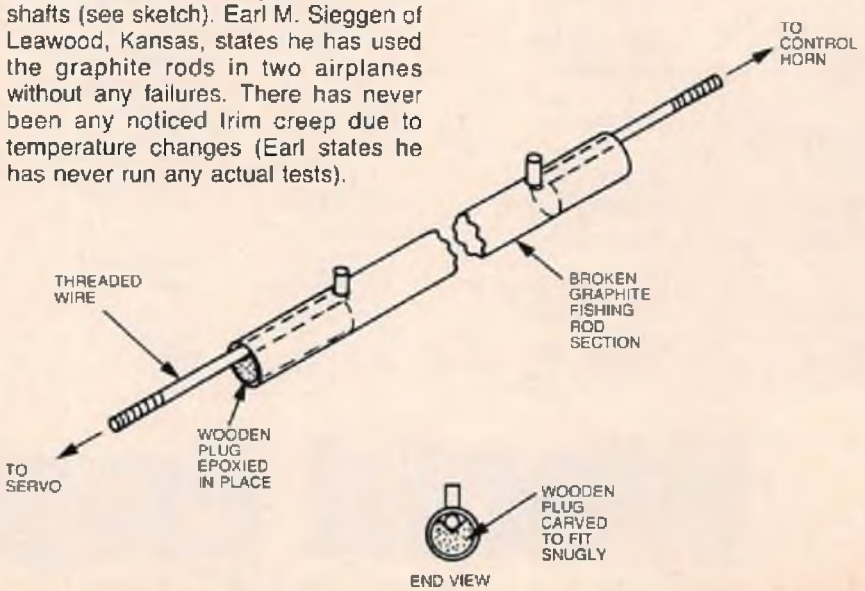
(1) Molded nylon fittings (control horn, clevises, wing hold-down bolts, props, etc.) can be color related to the aircraft finish by simply boiling the trimmed parts in an aniline dye solution suitable for synthetic textile dyeing. First, degrease with a detergent bath; then boil for about 5 minutes in the desired color dye bath. Rinse and dry. Increasing dye quantity results in deeper color.

(2) 1/64" three ply plywood makes excellent gussets for sturdy, mainframe open stick, old timer type construction (a-la full-size wood rib technique). Keep grain vertical (as in sketch) use aliphatic resin, cyanoacrylate, or epoxy and apply to inside face of structure.

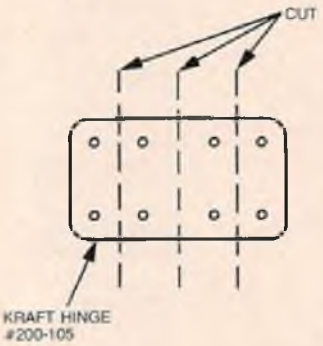




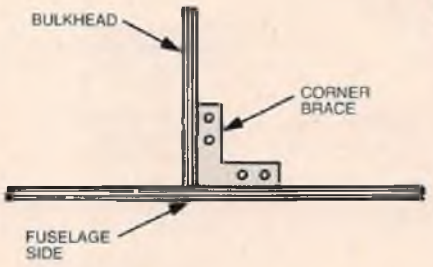
Check around in your area for a sporting goods store that sells and repairs graphite fishing rods. The center sections from a broken rod are unusable for repair and therefore should be free for the asking. The graphite sections are hollow and can be used as pushrods the same as arrow shafts. The advantages (besides being free) are that the graphite rod sections are lighter and stronger than arrow shafts of balsa squares. Use the graphite sections just like arrow shafts (see sketch). Earl M. Sieggen of Leawood, Kansas, states he has used the graphite rods in two airplanes without any failures. There has never been any noticed trim creep due to temperature changes (Earl states he has never run any actual tests).



Max G. Hurst of Collinsville, Illinois, submitted the following suggestion to share with other modelers. One Kraft hinge (part #200-105) cut into 4 pieces as shown will make the right number of landing gear hold-downs for the normal size pattern ship. The hole size and spacing are exactly the right dimensions.

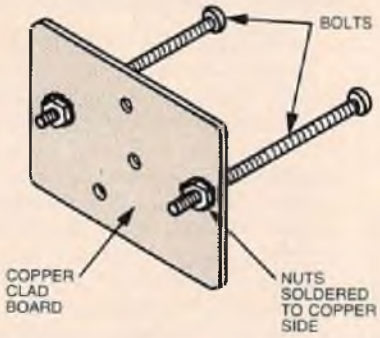


Being a beginner in R/C, Paul M. Hopkins III of Yuba City, California, had trouble keeping bulkheads and ribs square. By using a 2" corner brace, you have an inexpensive square. These can be purchased in any hardware store and in many sizes to suit the situation. See the diagram.

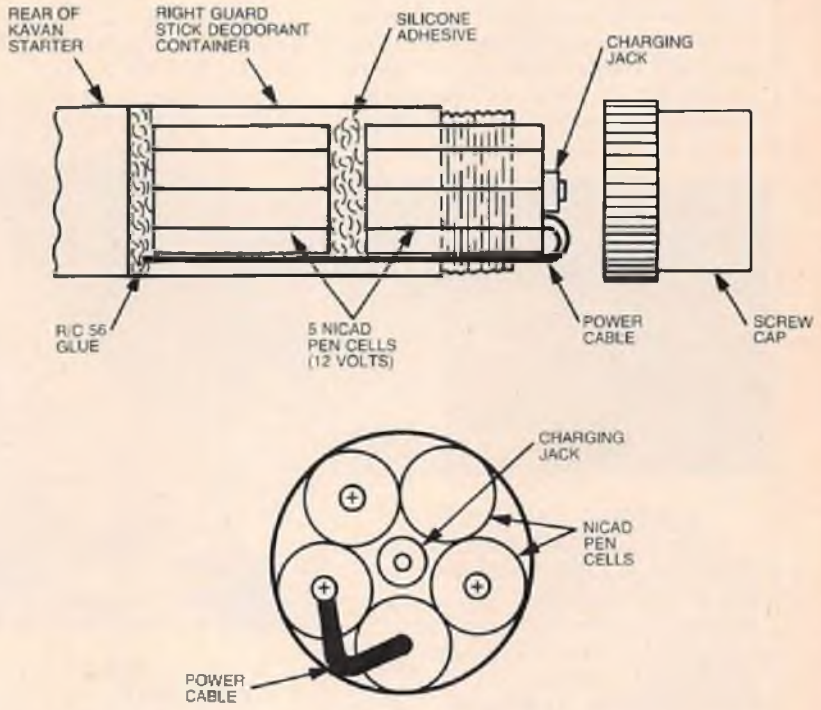


FOR WHAT IT'S WORTH

A very successful engine nut plate has been used by D.A. Michael of Lykens, Pennsylvania. It has been used on .020 up to .051 size engines. The plate consists of surplus copper clad board used to make etched circuits. The copper clad board can be purchased from Radio Shack and most likely any radio parts store. It is very inexpensive for a nice size piece which will make many nut plates. Cut out the size plate required for your installation and drill your mounting holes along with several other extra holes at different locations in plate. Install mounting plate on engine with bolts and nuts. Solder nuts on copper side and then remove. Scratch the un-copper side of the board (for better adhesive holding) and epoxy to back side of firewall. Extra holes in board are for holding strength for the epoxy. It will fill in holes and make a better bond. Take some silicone grease or petroleum jelly and spread on screws. Tighten screws through firewall and this will insure a good tight bond for the epoxy and the lubricant will keep the epoxy from binding up the mounting screws. When ready to mount the engine, put a small dab of silicone seal on screws to keep fuel out of the fuselage. Use 2-56 hardware on .020 engines and 4-40 on .049-.051 engines.



For those owning a Kavan starter and who also like to operate with minimum ground support equipment, Gene Hughes of Sacramento, California, suggests packaging your 12 volt power source on the rear of your starter. (See sketch.) Total length 11¼" — weight 33 oz. Modification is simple and requires minimum effort and tools with cost running approximately $22.00. Then ten pencell nicads (Radio Shack) fit perfectly into the new Right Guard plastic stick deodorant container. Plastic container is held to starter with R/C 56 glue and won't come loose with the normal R/C knockabouts. Screw top is mounted aft to allow easy access for any maintenance or charging (aux. power in emergency) and is mounted in center/aft of end grouping of 5 cells with silicone adhesive. Both groups of 5 cells are held together with silicone adhesive to provide insulation and the flexibility for sliding power package into container. Power supply provides torque equal to your 10 pound lead acid battery with more than enough starts for an active weekend of flying. It's great for racing where you want minimum support equipment about.



Ethyl (rubbing) alcohol has many uses in the modeler's workshop. A few of these uses have been submitted by Capt. T.D. Hudson of Homestead AFB, Florida. (1) To dilute epoxy (use a 50/50 mixture) for fuel proofing tank compartments, firewalls, etc. Simply thin down and brush on to desired thickness. This thinned mixture penetrates the wood much better and cuts down on the weight since the alcohol completely evaporates. Use alcohol to clean the brush when finished.

(2) When repairs to your plastic film covered model are necessary after a few flights, use alcohol full strength to clean off all traces of exhaust residue surrounding the repair area for a much better bond of the new covering material.

(3) Use full strength on a cleaning rag to remove those ugly epoxy finger prints or smears on plastic film covering materials when finishing up a model.

(4) Spray on full strength and wipe off with paper towels for a sparkling clean-up job on your model after flying sessions. Removes all traces of residue on your airplane and really shines up the finish.

Rebecca Phelps of Wilmington, Delaware, states that she is that rarity, a woman in the hobby. The first time Rebecca tried to put down fiberglass cloth with epoxy she found it to be a nightmare. The problem of getting the cloth to stay put and to absorb the epoxy is nicely solved by directing a hair dryer or heat gun at your epoxy brush as you strike it on. The heat makes the epoxy penetrate the cloth instantly and makes it flow easily enough that you can put on a coat thin enough that it won't fill 3/4 oz. cloth in one application. It doesn't work to heat your epoxy mixture, it just sets up too fast. But heating the area you are painting works just great. One word of caution: Work in a well-ventilated room because of the fumes released by heating the epoxy.

E. Scott Hinckley of Provo, Utah, has had a problem with losing the insert out of his Cox Conquest .15 RC muffler. Even with tightening the muffler insert as much as possible and balancing the propeller, it still came out in flight. To fix this, he assembled the muffler and drilled a #50 hole (1/16" is fine) through the back of the muffler body and the thick flange of the insert. The hole was then tapped with a 2-56 self-tapping screw. Scott has not had any problems since and the fix is not visible as the hole was drilled on the bottom of the muffler. □

showcase '78

All items appearing in Showcase '78 are press releases supplied by the manufacturer of the product and/or their advertising agency unless otherwise specified. The appearance of an item in Showcase '78 does not necessarily constitute an endorsement of that product by R/C Modeler Magazine.

ELECTRIC CAR CHASSIS

A new 1/12 scale electric car chassis designated E-45 has been introduced by Electro Craft Systems. This chassis is made from laminated fiberglass and can be used to build a very strong and competitive electric race car. The advantages over metal chassis are that it does not bend or deform permanently and that electrical (RF) interference with the receiver is minimized. The chassis is easily assembled and is pre-drilled for standard MRP 1/12 scale components. It easily adapts to other front and rear end parts such as Marker. A built-in battery pan simplifies installation of 4 or 6 cell battery packs. The electric car chassis retails for $11.95 and is manufactured by Electro Craft Systems as part of a complete line of 1/12 scale electric conversion parts as well as complete electric cars and sub-assemblies, including the famous competition speed control PSC-9FR, winner of numerous Class D electric car races, including West Coast and National Championships. For further information, send 25¢ to Electro Craft Systems, 924 Ferngrove Dr., San Jose, California 95129. Dealer inquiries are invited.

QUALITY WORLD OF BOLINK

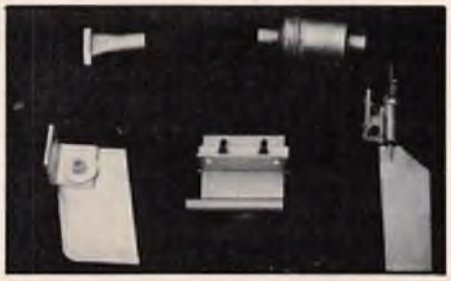
BoLINK takes you back to the good old days! Remember the '32 Ford Tudor? BoLINK has it in 12th scale. 1978's most unique body style! Made from Tuffak — available clear or painted. Interior also available. Also available is a '77 Ford pickup truck - - - be the first in your club. Send $1.00 for a complete catalog and discover the "quality world of BoLINK." $2.00 credit with first purchase over $10.00 when you order catalog from BoLINK, P.O. Box 80653, Atlanta, Georgia 30341.

HUSON 36

Dumas Products, Inc., 901 East 17th St., Tucson, Arizona 85719, presents a new RC model sailboat kit, the Huson 36. Built to the AMYA 36/600 class rules, the Huson 36 kit contains a white fiberglass hull and deck to be joined by the modeler, keel weight, rudder, hatch, wood to shape mast, boom and jib club, dacron sails and hardware. A realistic model of a typical 28'-34' full size cruising sailboat, the Huson 36 can be the center of many hours of fun or competition for anyone. Kit uses any 2 channel proportional radio and Dumas Sail Control Unit #3701 (not included).

THE HYDRALOCK

Idea Development has announced their latest "think tank" product for R/C enthusiasts — The Hydralock — a device that converts air driven retracts to hydraulic operation. Containing a tough neoprene bladder and weighing one quarter ounce, the Hydrolock is installed in place of the "T" fitting in the pressure line(s). The Hydralock is filled with oil, as are the pressure lines to the gear, and the air side of the system is then used as a force to move the oil, accomplishing the hydraulic function. Hydralocks stop gear sag-out in high G maneuvers, end landing collapse, and offer the added feature of lubricating the system and prolonging the life of the O rings. Bonus for the scale modeler is that Hydralocks are adjustable for any speed of retraction (and extension) from two seconds to one full minute travel time in either direction. While one Hydralock will handle the gear in a trike airplane, Idea Development suggests the use of two because of wing removal. The ultimate installation on any ship would be the use of two Hydralocks for each gear leg. Serious scale modelers, and others interested in precision flight, will find the Hydralocks useful for flap application to obtain realistic transition from take-off to flight speed, and vice versa, and apply them to such uses as retracting the turret on the Stafford B-24, closing and opening the canopies on Navy aircraft, etc. Priced at $8.00 each, two for $14.00 (postpaid), Hydralocks are available direct only from Idea Development, Inc., P.O. Box 7399, Newark, Delaware 19711.



MODEL BOAT HARDWARE

Metal Concepts, Inc., P.O. Box 25596, Seattle, Washington 98125, is now offering the serious competition model boater a line of high quality hardware for .40 and .60 size racing models. Among the items available are: a heat treated rudder and shaft from stainless, a strut with mounting featuring needle bearings and aluminum and stainless construction, skid fin and bracket from stainless, exhaust couplers for the OPS .60, OPS .40 and K & B .40, and mufflers for the end of tuned pipes. Special items will be quoted if a sketch is provided. You must be satisfied with the material you receive or a full refund will be provided if the items are returned within 10 days. A complete list of items and prices will be sent upon request.

FIGHTER ACES OF THE LUFTWAFFE"

All the great Luftwaffe aces are recorded in *Fighter Aces of the Luftwaffe* by Col. R.F. Toliver and T.J. Constable. From Hartman and Barkhorn (352 and 301 confirmed victories) to those with the qualifying requisite of 5 'downings' — many of the aces are reviewed at length with fascinating detail while others can only be spared

relatively brief 'thumbnails.' The authors have skillfully grouped their characters into the various war-fronts and battle time-frames so that while they are presenting personal biographies, they are simultaneously recording the historical progress of the air-war over the entire Europe / Asia / Africa theaters of WW II. Their orderly presentation of their massive research is outstanding. The book contains 432 pages and 283 photos. The price is $17.95 and is available from Aero Publishers Inc., 329 West Aviation Rd., Fallbrook, CA 92028.

SIG COLT

Sig Manufacturing Co., Montezuma, Iowa 50171, introduces their Sig Colt. For .09 to .15 engines, it has a 45" wing span and 290 square inch wing area. It features a flat-bottomed molded foam wing, built-up fuselage, sheet balsa tail surfaces, and room for standard size radios. A scale-like (sorta-Cessna) sporster for Sunday fliers that combines the convenience of ready-to-use foam wing with the strength and durability of a balsa fuselage and tail. Can be used with 2 or 3 channel radio. Available from Sig Manufacturing for $20.95.

HOBBY LITE

Take the strain out of electronic assembly. Use the new tool, Hobby Lite, to light up circuits, transistors, or any other detailed area you are working on. Once you use it, you'll wonder how you ever got along without it. The individually ground, precision tips allow you to see and handle the most intricate jobs. Hobby Lite is made of finest surgical grade, stainless steel. A twist of the handle provides pinpoint illumination. The barrel and knurl are made from solid brass, then chrome nickel-plated. It is finely balanced to fit the hand perfectly and is guaranteed never to rust, corrode, or tarnish. Hobby Lite is the product of the A.E.N. Enterprises, 558 E. Lambert Rd., Brea, California 92621.

NORTH AMERICAN F-86

Air-Forms, Inc., 201 W. Yucca, Clovis, N.M. 88101, presents to you the exciting North American F-86 in ducted fan form. This kit is designed for the Sunday flyer and serious scale modeler alike. It can be built and flown on a modest budget, or given the full treatment, be a winner in any Stand-Off Scale contest. Their concept, with this first offering, is to bring the realm of jet aircraft to the average modeler without destroying his pocketbook. Other jet aircraft will follow as they are developed, always keeping in mind the needs of the sport modeler. The kits are designed to be light, easy to build, and have a minimum number of parts. All balsa parts are machine-cut and selected for lightness and strength as required. The fuselage is lightweight epoxy-glass and the wing cores are foam. Tail surfaces are sheet balsa. Decals and proof of scale are furnished in the kits. Landing gears are pre-bent and a scale canopy is provided. Along with the usual plans and building instructions, they take you through the installation and flying aspect of ducted fans. There is a special section on increasing the performance of your aircraft at minimal cost, other engines and their performance ranges, flying techniques unique to ducted fan aircraft, and other practical ideas. A fan unit is not included in each kit. A 4 channel radio is required. The F-86 flight performance is as a jet fighter should be! The light wing loading and low overall weight combined with a non-critical airfoil result in flight response that is excellent. Depending on your resources and desires, you can power the aircraft with a regular front rotor .40 or move into the newer ABC type racing engines. Available through your dealer or order direct. Price $134.95.

SCALE SAILPLANES

Have you heard what is happening in scale sailplanes? This year, Windspiel Models, Route 3, Box 457, Coeur D'Alene, Idaho 83814, will be importing several king size sailplanes 1/4 and 1/5 scale. These are the finest models made in the world. Completely finished ready to cover and paint and install your radio. These planes have epoxy glass fuselage with carbon glass reinforcement, completely finished foam core balsa sheeted wing with carbon fiber spars, ailerons and spoilers and, in some cases, flaps are completely installed. All tail feathers completely finished and ready for installation. These planes also feature fully retractable landing gears. They consist of 1/3 scale DG-100 limited standard class sailplane exactly like the prototype, wing span 5 meters. DG-200 unlimited standard class with flap, wing span 5 meters. The ASW-17, wing span 6.70 meters, and the SB-10, wing span 7.50 meters. Some other 1/4 scale planes are as follows: H-101 Salto, SB-10, DG-100, Kestrel, 604, Mosquito, Libelle, FS-25, HP-18, Pirat, ASW-17, to name a few. Also available will be several 1/5 scale sailplanes which will be semi-finished planes and several kits. They also will be stocking fuselage, plans, canopies, etc. Planes that are currently available are: ASW-19, ASW-20, Nimbus, Janus, Blanik, LS-2, Standard Cirrus, Slingsby Vega, SB-10, Orinth, LS-1C, Mosquito, and ASW-17. Windspiel will also be carrying retractable landing gears which are well suited for the 1/6, 1/5, 1/4, and 1/3 scale sailplanes; also spoilers, linkage and electronic mixers. For further information, contact Windspiel Models.

EXCALIBER II

R/C Glass, 1628 Corona, Medford, Oregon 97501, is now offering a fiberglass version of Jerry Dunlap's 1977 N.A.M.B.A. National Outboard Champion, the Excaliber II. The Excaliber II is a 25½" pickleforк tunnel design incorporating a special tunnel section developed by Dave Knowlen, designer of record holding limited hydroplanes. In addition to its national victory, the prototype Excaliber II was N.A.M.B.A. District 8 Outboard High Point Champion, established an oval competition record and became the first outboard to be officially timed at over 40 mph. The fiberglass Excaliber II from

R/C Glass incorporates the proven design concepts developed in the wooden prototype plus destinctive cowling styling made possible through fiberglass molding. Completely assembled with a removable cowling, the Excaliber II is available in white gel coat or metal flake finishes. Hull construction is from glass cloth using quality hand lay-up throughout. Plywood reinforcement for the transom and turn fin is glassed into the hull. Plywood for building a radio compartment and plexiglass for the radio compartment lid is also included. Radio installation can be accomplished through the use of a removable waterproof radio box or a built-in radio compartment. The new Auto Trim engine adjustment kit from K & B Manufacturing is easily installed in the Excaliber II. The gel coated Excaliber II retails for $70.00. A metal flake deck, white gel coated bottom version is $75.00 and an all metal flake version is available for $80.00. Please add 5% to cover cost of handling and shipping. Dealer inquiries are welcomed.

NEW ELECTRONIC SWITCH

This new all electronic switch is a Pro Line exclusive. Modern CMOS logic and quad comparator IC's drive power transistors in each of four channels; it eliminates a lot of mechanical problems. Integrated fail-safe circuit switches all channels "Off" should transmitter or receiver signals stop. Can switch 10 amps per channel, total of 25 amps for all four channels. Minimal receiver battery drain of less than 30 ma. For complete details and price, write to: Pro Line Electronics, 10632 N. 21st Ave., Suite 11, Phoenix, Arizona 85029.

DU-BRO MUFFLER STRAPS

These non-breakable steel muffler straps are adjustable to fit most mufflers and engines from .29 to .80. The kit contains 2 straps and a 1", 4-40 socket head bolt, nut and lock washer. They are $1.50 (1 per bag) and are available from Du-Bro Products, 480 Bonner Road, Wauconda, Illinois 60084.

6" MUFFLER EXHAUST EXTENSION STOCK

This is a much needed item that can be used for planes, boats and even cars. This is the same aluminum stock that the Du-Bro Muff-L-Aire is made from and will fit any engine from .29 to .80. The modeler can cut to length, bolt, tap and weld this stock to either adapt it to his own muffler or use the universal Du-Bro Muff-L-Aire. Du-Bro baffle plate sets and muffler straps are new items that are also available and compatible with the 6" extension stock. Priced at $3.95 (1 per bag), they are available from Du-Bro Products, Inc., 480 Bonner Road, Wauconda, Illinois 60084.

THE CALIFORNIAN

The Californian introduced by Astro Flight Inc., 13377 Beach Ave., Venice, California 90291, is a high performance sailplane designed for 2 or 3 channel radios. A long 113" polyhedral wing gives positive spiral stability, quick roll response and a floating glide. Spoilers provide pilot control of descent rate and approach glide angle. The large elliptical stab gives hands off pitch stability and powerful pitch control making The Californian equally at home with expert and novice alike. The beautiful, completely finished plastic fuselage, is very rugged to shrug off a beginner's mistakes. Wing span 113", wing area 850 square inches, total surface area 1000 square inches, weight 40 ounces, price $69.95 from your hobby shop or direct from Astro Flight.

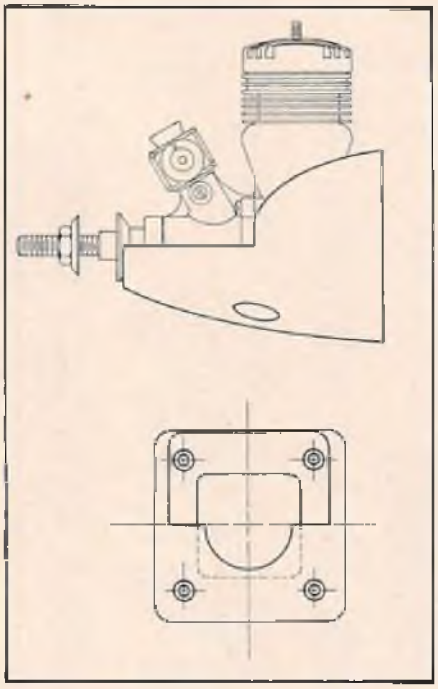
SAIL CONTROL ARMS

Sail Engineering supplies sail control arms for all classes of model yachts. Arm #1 is our standard arm as supplied with the SE-1S and SE-2S type sail controls. It is suitable for 12 meter, 50/800 yachts and others of similar size and sail area. Arm #2 is suitable for the same class of yacht as Arm #1, but is utilized when a traveler rig is used. Arms #3 and #4 are used for 36/600 size yachts — #4 being used when a traveler rig is employed. Arm #5 is an all-metal arm which is used on J boat and A boat class yachts. It is also suitable for the Santa Barbara class. The following are the current prices on the arms: Arm #1 sells for $5.95; Arms #2-3-4 each sell for $4.95; and Arm #5 sells for $6.75. Available from Sail Engineering, P.O. Box 8439, Richmond, Virginia 23226.

NEW ELECTRIC DRIVE KITS

Dumas Products, Inc., 901 East 17th St., Tucson, Arizona 85719, have come out with two new Electric Drive Kits to power many of their 12" to 22" model boats. Electric Drive Kit #2330 is for 12" to 16" models and contains a 3 volt D.C. motor, coupling, shaft, shaft tube, propeller and rudder and sells for $4.50. This kit is perfectly suited to the Dumas 12" Harbor Patrol boat, Cabin Cruiser and Speedboat kits which sell for $3.85 each. Electric Drive Kit #2331 is for 16" to 22" models such as the Dumas 18" Cabin Cruiser, Deep Vee 10 and Ske Vee 10. The kit, which sells for $12.50, contains a 4.8 volt D.C. motor, coupling, shaft, stuffing box, rudder, rudder arm and propeller. A 4.8 or 6 volt battery is required (not included). Performance is surprisingly good, and modelers of all

ages will certainly get more enjoyment from these small models when the power is applied. The Electric Drive Kits are available at your hobby shop.



.40 SIZE ENGINE MOUNT

A new .40 size Engine Mount is announced by Fourmost Racing Products, 4040 24th Avenue, Forest Grove, Oregon 97116. This mount is a continuation of the successful wrap-around design of the .049 Airflo Mount. This design, combined with a super rigid glass filled nylon compound created the strongest, vibration free, molded airplane front end available. Aerodynamic efficiency is also improved through reduced drag around the engine. The Airflo .40 Engine Mount is ideal for Quicky Type Aircraft as the firewall face is 2½" square. Price is $5.25.

KAVALIER KIT

Designed by Claude McCullough the Kavalier has a 56" wing span for .29-.40 engines. A special wing gives superior stability and control. Built-up balsa construction has built-in washout. Easy to assemble as usual on a flat surface. The precise amount of incidence change required to help eliminate tip stall is automatically incorporated. Differential aileron control horns. Provided pre-formed, ready-to-use for less down, more up aileron movement. Thick, semi-symmetrical airfoil for strength and high lift. Find out what smooth flying really is with the Kavalier. Make coordinated, in-the-groove turns. Flare out for slowed down landings on the main gear with no tendency to stall or snap roll. Best of all, this extra reserve of stability does not reduce maneuverability. So the Kavalier makes an excellent stunter and all round sport flier also. From Sig Manufacturing Co., Inc., Montezuma, Iowa 50171. Price $39.95.

12 VOLT 4 AMP GELL CELL

Astro Flight, Inc., 13377 Beach Ave., Venice, California 90291, now has available their 12 volt 4 amp Gell Cell. Designed for your field box, it is lightweight and sealed so you don't have to worry about spills and can rely on having years of trouble free service. Six volt, 4 amp and 7 amp batteries also available from your dealer or order direct. Price $24.95.

AERO-POXY

Pactra Industries, Inc., 7060 Hollywood Blvd., Los Angeles, California 90028, offers a new line of specially formulated, 2-component system finishes that are designed to handle the special problems of gas powered model builders. Aero-Poxy's super tough, totally fuel proof, mar-resistant, one-coat "armour finish" is designed to endure the punishment of rough handling, wear and fuel spillage, without affecting its durability or good looks. Pactra points out that their unique formulation utilizes a non-irritating and non-sensitizing curing agents, that eliminates dermatitic or respiratory problems, and that Aero-Poxy is free of lead hazards and non-toxic when dry. Aero-Poxy consists of a Color Base, available in Phantom Black, Radar White, Rocket Blue, Solar Orange, Fighter Green, Trainer Yellow, Marauder Red, Sabre Aluminum, Gloss Clear, and Primer (8 ounces only), and a choice of a Super Hi-Gloss Catalyst or a Flat Catalyst, to give modelers versatility of finish and color mixing capabilities. Suitable for brush or spray application. Available in 4 oz. cans, 8 oz. cans, plus thinners for brushing and spray in 16 oz. and 32 oz. cans.

NEW REVERSIBLE SPEED CONTROLLER

Minimal power needed to vary speed and direction of D.C. motors with Pro Line Electronic's new electronic speed controller. A linear proportional controller with modern CMOS logic and quad comparator IC's gives proportional and bidirectional control with no mechanical linkages, servos or contacts to service. Fail-safe circuit insures zero speed should transmitter or receiver signals stop. Electrical ratings are dependent on the cooling technique . . . with water cooled heat sinks: maximum 25 amps, 15 amps continuous. Without heat sinks 10 amps continuous. Maximum switchable voltage is 30V. DC. Receiver battery drain is less than 20 ma. For complete details, write Pro Line Electronics, 10632 N. 21st Ave., Suite 11, Phoenix, Arizona 85029.

CORSAIR

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The kit includes a 1/8" thick fibre plate and hardwood beams for mounting an engine in the conventional beam mount manner. Other hardware included were hinge material, formed wire L/G and mounting fittings, L/G spreader cable, control horns, decals, molded canopy and engine mounting nuts, bolts and washers.

Our Corsair was finished with Hobby Lobby's Superkote covering material on the wings and horizontal tail surfaces. The fuselage and vertical fin were finished with K & B Superpoxy enamel.

The radio equipment installed was Westport International's Variant system. We used a new 300 MAH Variant battery pack which is only fractionally larger than a conventional 225 MAH battery pack. The ready to fly weight, with 3 servos was 29 ounces.

Our test flying was done from a grass field, which necessitated hand launching our Corsair. If you are blessed with a paved or hard surface runway, the Corsair should take-off just fine. However, hand launching is no problem — all that is required is a casual flip. There is no need for a "half back" sprint followed by a mighty heave as the Corsair will practically fly right out of your hand. The Corsair is stable and possesses all the desirable traits normally associated with trainer type aircraft. Being a clean design, it is slightly faster than some other trainer types; however, its slow speed flight characteristics are good to the point that by throttling the engine back to about 2/3 throttle, an ideal beginner flight speed may be attained.

The Corsair has an unusually wide stance landing gear. A flexible cable is soldered between the gear legs to prevent the landing gear from spreading and producing "bounce" type landings. However, this lateral cable is guaranteed to "catch" on grass fields and put the Corsair up on its nose on

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Fastest, best handling cars in R/C today!

New Pro-Series Racers from Cox. Ferrari 5.12 BB. BMW 3.5 CSL.

Our new two-channel racers have the speed— up to 30 mph—to match their names. And the handling to match their speed.

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THE HOBBY MARKET

CORSAIR

from page 104/86

most landing attempts. This is only a problem on grass fields, and a minor one at that, as the landing speed is quite slow.

In summary, the TrueLine Corsair is a fine trainer type kit, that is equally good in the air. If you are searching for a .10 powered (an engine size that has been strangely neglected), trainer or sport aircraft, the Corsair from "across the big pond" might be just the aircraft you've been looking for. □

BIG MOTHER

from page 95/94

I joined Big Mother's rudder and ailerons together with power from only one servo. It worked great and no trouble since.

Cost-wise, you'll be the hit of your friendly loan company. Imagine six rolls of film covering and over $125.00 in raw balsa! However, if you build three or more of these leviathans, your hobby shop owner will give you theatre tickets or invite you to dinner.

So, as an example, let's fly Big Mother.

Think ahead like you've never done before. With all that weight and surface, it takes time to move it where you want it. Rolling into turns is slow and rolling out of them takes a certain amount of leading. Last minute large corrections on landings or approaches are a "no-no". *Take your time too!* Use full scale flying rules. Example: "Good approach, good landing. Bad approach, goodbye!" With eight or more pounds moving along at good speed, sudden stops will crunch. Big bird structures are meant for flying, not crashing. If you dig a ten to fifteen foot massive wingtip into the sod, something is going to give!

I am urging, not discouraging, though the tone of caution is evident. The flying takes no more skill, it does take a little more thought.

The bonuses are great. Big models simply *look* more graceful and scale-like while flying. *Big* means no problem with orientation. But the biggest kick you'll get is the response from the public, whether uninitiated or model fraternity. All watching you masterfully fly your giant will *assume* you are an eagle even if your skill is more of the barnyard variety.

My own enthusiasm for the big ones is secure. My next project will be a 15 foot span secondary sailplane with a three piece wing. (Goppingen Wolf.) When I told this to my friendly model supplier, he gave me an abrazo bear hug and shouted, "Ole!"

Another fun thing with Big Mother was aero-tows.

A Glendale, California hobby shop owner, Dick Chronister, agreed to fly my tow plane as long as he could be my prime supplier of materials.

We tried two tow planes: the Kaos and an Aeromaster Bipe. Each worked well but the engine smoked more with the biplane. First Law of towing: climb shallow! On the Kaos, we attached a "Y" shaped yoke of nylon cord to hooks on each side of the fuselage just above the wing saddle and Center of Gravity. Six foot aft of the model, we began a single line totaling 35 feet in all. This permitted the elevator and rudder of the Kaos to move without restriction.

to page 110

Mac's *FANTASTIC* 5-CHANNEL RADIO

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DEFINITELY NOT A FOREIGN IMPORT!

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- Case Material: Hi-Impact ABS plastic.
- Type Gimbals: Dunham open-gimbals.
- Type Pots: CTS 5K ceramic.
- Power Supply: 9.6v nicad.
- Type Meter: RF and battery condition indicator.
- Modes Available: Two stick, Mode 1, Mode 2, and single stick — also special order stick arrangements.
- Frequencies Available: 27, 53, 72 MHz
- Weight: 19 oz. with antenna & nicads.
- Size: 1-23/32" x 4-27/32" x 5-11/32" (43.5 x 123 x 136mm).
- Unique Features: RF section provides nominal 750 mw output. One of the smallest transmitters on the market.

RECEIVER Model 520R (5) (4)

- Case Material: Nylon.
- Size: 23/32" x 1-19/32" x 1-27/32" (18 x 40.5 x 47 mm).
- Weight: 1.24 oz. (35.1 gr.) for 5-channel.
- Type Decoder: C-MOS 8-bit shift register.
- Type Front End: Double tuned, dual FETS. FET RF AMP. Feeding a FET Mixer.

SERVOS Model CE-4

- Case Material: Nylon.
- Size: 3/4" x 1½" x 1⅞" (19 x 38 x 38 mm).
- Weight: 1.25 oz. (35.4 grams).
- Output: Rotary type.
- Output Controls: Arms.
- Type Amplifier I.C. amplifier, utilizing T.I. 28604 I.C. chip.
- Motor Size: 8 ohm, 16 mm.
- Servos: CE-4 (Dunham Mechanics)

SYSTEM

- Airborne Power: 500 mah (Nicads).
- Type Connector: Deans 3-pin.
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BIG MOTHER

from page 108/94

With our knees rattling, we went for broke. Dick opened the throttle on the 60 powered Kaos and it began to struggle forward. Big Mother took to the air in less than ten feet. I eased her down to permit the Kaos to take-off. It did and we were away. The first thing we discovered was that the tow plane pilot must give loud verbal information as to which way he intended to turn. Once, he turned sharp left while I was fat, dumb and you-know-what!

Ooooops! . . .

Cut loose with the servo controlled hook — both models doing funny things — land — talk about it — try it again. Whee! This time we all worked together and Big Mother climbed high into the blue.

There's nothing spooky about aero-towing once the novelty is gone. Any RC'er with ordinary skill can fly the tow plane or the glider. Just slow everything down so turns are long and lazy and the flying is smooth.

For hi-starts, I had to use two lengths of heavy duty surgical tubing and still Big Mother was sluggish on the climb. But climbing in a thermal, she out-classed all the other sleek sailplanes. And, you can go as high as you will — she can still be seen.

Perhaps you feel I'm unduly turned on about these giant sized creatures? Sure, I agree. But in this day when everything we have is shrinking due to costs, it's a psychological happiness to unfurl a bird with 2500 square inches of wing area and watch the eyes bug out. Let 'em shrink my loaf of bread — even my steak — but leave me my supermonster model!

"BIG" spells pleasure. So be a man (or woman) of distinction. Join the elite before its too late. For soon, very soon, all the fraternity will be gung-ho about the super models.

Amen. □

RC IN ATMOSPHERIC RESEARCH

from page 85

To measure both wet and dry bulb temperatures, thermolinear thermistors built by Yellow Springs Instrument Company are used. To measure altitude, a pressure transducer produced by National Semiconductors (LX1600A) is used. The air speed is measured using a heated thermistor probe developed (I believe) by J.R. Rowland of Applied Physics Laboratory at John Hopkins University. The signals from

to page 114

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RC IN ATMOSPHERIC RESEARCH

from page 110/85

these transducers are brought to a multiplexer and analog-to-digital converter and serially transmitted via an FM link to a mobile ground station. On the ground the signals are recorded and displayed.

To aid in daytime flying and to also extend operations into the night, the aircraft has been equipped with a remotely trimmed "Hill" electrostatic autopilot. This unit was developed by Maynard Hill and uses the earth's electrostatic field to control the airplane's attitude. With an unstable aircraft like ours, the autopilot is necessary for flights above 2000 feet. By making the unit remotely trimmable, changes in power setting and atmospheric conditions can be compensated for.

Some of the system's characteristics include:

Control, Heathkit 8 channel radio; Aircraft, Jensen's Ugly Stick; Engine, ST .60 Bluehead; Weight, 8½lbs wet; Rate of Climb, >1000 ft./min.; Max Cruise, 70 mph; Reliable Ceiling, 3000 ft.; Max. Surface Winds, 20 mph.; Number of Data Channels, seven; Channel Accuracy, 0.1%; Flight Duration, 15 min.; Flight Restrictions, FAA approval necessary above 500 feet.

Most of the problems encountered in our research have to do with the fact that it is a field oriented program. Consequently, no improved runways are available so the aircraft was converted to conventional landing gear, the nose wheel is removed and the plane is hand launched. Also, in a field project, all spare parts and repair materials must be carried along (in Wyoming the nearest RC hobby shop may be several hundred miles away). Future plans for our aircraft project include adding heading, range and azimuth information for complete IFR capability. The system will then be coupled to one of our Hewlett Packard computers for real-time display of the atmospheric data in engineering units. Also, with computer survelance the flight path profile can be controlled. □

RADIO SPECTRUM

from page 84/82

Radio Control Equipment Rating

Many of the letters I receive, ask for opinions on various brands of RC equipment. I don't normally reply because I don't have a good way of really determining what is good and what is bad about the various kinds of systems being used. Usually I just hear about the complaints. I thought what I would do to remedy the situation is to conduct a poll and, hopefully, get a good statistical sample of how individuals rate their own equipment, good or bad. It will still be difficult to get an absolute rating because everyone's standards are different, but I think we might get some useful information. Tell us the following:

1) How long you've been in RC.
2) What your main interests are — sport flying, pattern, pylon, etc.
3) How you rate each one of your systems (by brand) with regards to the following categories. Use a zero to ten scale, with ten being perfect.
   a) Performance — when your set is working, how good is it? Are the servos smooth? Very little deadband? Centering perfect with no drift? Are the transmitter sticks smooth with no slop? Does the receiver glitch once in awhile? Think about how good it works when you are satisfied it doesn't need repair.
   b) Reliability — How often does something go bad that keeps you from flying? Servo motors quit? Connectors fail? Wires break? Think about failures that require corrective action.

to page 116

VIKING

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Tom Williams

Wingspan	meters (118 in.)
Wing area	120 in.²
Flying Weight	Mark I, 52 oz.
	Mark II, 54 oz.
Wing Loading	Mark I 6¼ oz./ft.²
	Mark II 6½ oz./ft²
	w/Ballast 17 oz./ft²
Mark I Airfoil	11½ % Flat Bottom (Craft-Air Windrifter)
Mark II Airfoil	New 12% Semi-symmetrical

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Recommended Radio	3 channel
Flying Weight	50 oz.
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Up until the time of the introduction of the BUTTERFLY II, the most popular kit trainers on the market have required flying skills far beyond those expected of one just entering the sport. In fact, the vast majority of these "trainers" were never successfully flown. Typically, their take-off and landing speeds are 35 to 40 mph. Of course some of the "trainers" were never completed, yet many, which were beautifully built, were reduced to rubble on their first day out.

The BUTTERFLY II is not only rugged and crash resistant, but it takes off and lands at only 18 mph; time to observe, time to think, time to correct. This slow flight also gives it a true-to-scale flight appearance, i.e., more like an eagle in flight than a housefly.

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RADIO SPECTRUM

from page 114/82

c) Maintainability — How much work does it take to keep your system flying? How often must you clean feedback pots? Do you send the system in for repair or retuning quite often? How fast is the service and how long does this maintenance keep you from flying? Think about the time fixing versus the time flying.

d) Cost to own — add up the original cost, the cost to service the equipment, and subtract what you think you might be able to sell it for. How does this compare with other systems?

We may not be able to tell you what system to go out and buy, but we should be able to tell you how owners feel about their own equipment. It should be very interesting when one guy has more than one brand of equipment. Now is your chance to tell the manufacturers what you think of their products.

•

Antennas

I received a letter a few months ago that I've been meaning to answer. Now when I've finally gotten around to it, I can't find it. However, the question asked went something like this:

Can we send more power in one direction by putting a reflector on our transmitter antennas?

The answer, which may surprise some of you, is yes. The best example is the familiar radar dish we've all seen. It is actually a reflector just like we have in an optical system. We know that a flashlight beam is much brighter than the light we would get if we removed the reflector and let the bulb radiate in all directions. Radio frequency waves can be beamed in the same way. The reflectors don't always look like optical reflectors, however, a good example is the standard VHF TV antennas on everyone's house. Some of those rods are the actual receiving antenna, while other rods are reflectors and directors. This makes the antenna directional and is why many people have rotors to point the receiving antenna at the TV transmitting antenna.

You can probably guess why we don't use directional antenna's in most RC systems. It would put another load on the pilot to remember to keep pointing at the airplane. However, if you had some special application such as an altitude record or some long distance mission in one direction, it is a way of increasing range just as if you increased transmitter power. If you had a way of pointing the receiving antenna at your transmitter

you could gain on that end too. However, present day systems work without directive antennas, and we're really better off with one less thing to worry about. □

DELTA SKYHAWK

from page 79

. . . or masking tape. Spot glue the fuselage halves together at the top of the windshield only. Now, using the wing as an alignment guide, drill the holes for the wing alignment dowels in the top of the fuselage. Install the wing in the saddle and use rubber bands around the hold-down dowels to secure in place. Turn the joined fuselage and wing upside down and lay across the narrow dimension of the box top of the shipping carton. Now, install the horizontal stab and get good alignment with the wing by shifting the fuselage halves up and down relative to each other until alignment is assured. You can assure alignment by raising the stab off the carton slightly and assuring that the position of the two flying surfaces remain in alignment. Now glue the bottom of the fuselage together and then glue the horizontal stab to the fuselage. When complete, turn the unit over and do the top in the same manner. When installing the vertical stabilizer, use some epoxy on the bottom of it, where it sits on the horizontal stab, so as to assure rigidity and alignment.

Here are some other comments worthy of note:

(1) Don't use the wheel pants. They'll just break or get in the way.

(2) Use great care in cutting the cowl to fit the engine/muffler combination. Some of the lip of the upper and lower fuselage joint must be cut away to allow the cowl to fit.

(3) The use of brass 1/16" pushrods is **not** recommended for the control surfaces. Use 1/4" square hard balsa and fit with pushrod ends. They will be more rigid and will not add weight.

(4) If you are a new flyer, don't use the flight instructions in the manual — get an instructor. It's not that simple.

Assembly using the hints provided above is quick, but don't look for a finished product in a weekend.

Flying the Skyhawk was a real pleasure. It flew right off the boards with no trim changes required beyond the zero trim initial setting. We did find that the flight characteristics were quite comfortable for training at the front of the C.G. range listed and toward the rear; the machine was quite agile.

With reference to the size engine required to fly the Skyhawk, we felt that it would be good to check the kit with the minimum engine size recommended by the manufacturer. Our choice of Duke

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for further information, contact: Larry Bolich, Special Events Director, Washington, D.C. (202) 347-2751.

DELTA SKYHAWK

from page 117/79

Fox's new .15 cu. in. Schnuerle was the correct one. The engine pulled the craft smartly through the air and allowed us to do a large range of acrobatic maneuvers. If a Schnuerle engine is not used, a .20 cu. in. engine would be the better choice to provide sufficient extra power for the beginner. □

ALPHA

from page 78

. . . . covered with white Econokote on the wings and stab and red Flite Kote on the fuselage and rudder, trimmed with DJ's tape. It was powered by a TD .049, fueled with 25% Go-Pop to swing a 6/3 Cox grey prop and directed by an Ace Digital Commander 1-8 with bantam servos and a 500ma battery pack. With this combination, the similarity to a Cessna 150 was quite pronounced. Like the song of the same name, "Slow and Easy Was The Game". Although it would loop, roll and spin, it was definitely not a pattern airplane. It is forgiving and gives you time to think. If we can find a way to throttle a muffled TD .09 without a severe weight penalty, we plan to add the third channel and believe that this little bird will be a real ball.

Total construction time, ready for covering and radio installation, was about 6 hours, including a couple of phone calls. Although we haven't had an undesired opportunity to test its strength when smitten by Mother Earth, the brick outhouse aspects of this model should make it quite durable. With the wing and hatch off, full access to everything is gained. The engine is out in the open so there are no problems in getting to it.

This is the sixth Ace kit we have built and, although the first one that was designed as a trainer, we feel that it is their best all around effort to date.

We commend Ace for their efforts and recommend this kit to anyone not completely dedicated to gas guzzlers, either as a first airplane or, with the larger engine, a pleasant change of pace. □

SERVO BUFFER AMP

from page 76/74

add enough time constant to the circuit to make the Buffer Amp act as a low pass filter. Any noise burst of approximately 100 microseconds or less is completely eliminated due to the response cut off. This cut off or response plays an important function of this device. The other thing that takes place

to page 122

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SERVO BUFFER AMP

from page 120/74

is that the pulse has a delay time through the Buffer Amp also. This delay time re-positions the pulse which, in turn, eliminates noise bursts that are entrapped in the saturation part of the positive mode pulse. The device is very effective when noise bursts ride on the trailing edge of the pulse. Figure 5 shows this. R2 is in the circuit to restrict current flow in Q1 and Q2. Without R2 there would be an instant short during the positive pulse through Q2 emitter to Q1 collector. Output load is restricted through R5. If an older servo that uses discrete components like the KPS9, 10, or 11, is going to be used with the Buffer Amp, R5 should be of some lower value resistor of say 1000 Ohms than that of 2.2K Ohms as shown. In a real stubborn case of heavy loading, R5 can be jumpered out. Indication for the need to do this is when the servo locks over into the end or fails to move at all. If you are going to use a 4 wire servo with one of the new 3 wire decoder receivers, a center tap wire will be necessary to make the 4 wire servo operate. The Buffer Amp doesn't need the use of a center tap to operate.

to page 124

BIG SAVINGS at ORANGE COAST HOBBIES

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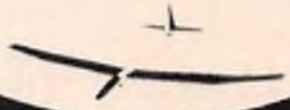

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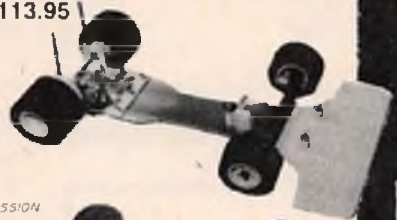

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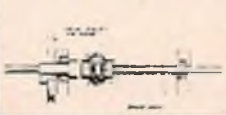

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from page 122/74

Construction is not critical. Use Figure 2 for parts location and use the parts list to identify the parts used. Figure 3 shows parts location from the foil side. Figure 4 is the PC board layout in the positive form for those of you who want to make your own. A 1/32" drill is used to drill the holes for the components in the PC board. Parts should be placed as close as possible to the PC board. The usual caution goes with being careful while soldering the components. Try not to overheat them.

A good component supplier for this project is Ace R/C. Their address is Box 511, Higginsville, Missouri 64037. The resistors, capacitors and a substitute transistor can be ordered from Ace. Refer to part #27K20A for the resistors at 25¢ each. For the capacitors, use part #18K7 at 25¢ each and state what value needed. For the transistors, any general purpose type can be used, such as HEP S0019 and HEP S0015. From Ace R/C, the 2N4400 can replace the 2N3904 and the 2N5355 will replace the 2N3906. Price of these transistors will run about 50¢ each.

The step-by-step photos should resolve any question on the placement of parts. They are truly straightforward. A piece of heat shrink tubing makes a nice way to protect the PC board after completion of the Buffer Amp. The MonoKote heat gun does the shrink job.

In closing, I have a concluding comment. In field testing this device, it became a little difficult sometimes looking for a guinea pig. It took some real talking to persuade a fellow RC'er that the glitch problem he had could be helped with my Buffer Amp. You just don't dream up something like this, and just because it worked on your equipment expect it to work on everybody elses. It took many tries to make sure I was taking out the glitches and not causing a lot more.

If by chance, after building your unit, you have some trouble in acquiring the desired results, feel free to contact me with your problem. I will do my best to give an answer. Maybe not the solution to your problem, but a helpful answer.

Any of you who are not up to making your own PC boards, I have a few at $2.50 each. I also have a kit of parts with everything but the servo plugs at $6.00 if you are really lazy. The kit also includes the PC board. Please enclose a self-addressed stamped envelope with your request. My address is as follows: George Steiner, 2238 Rogue River Drive, Sacramento, California 95826.

Remember, "Old RC systems don't die — they just fly away." □

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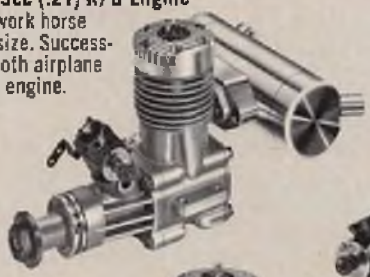

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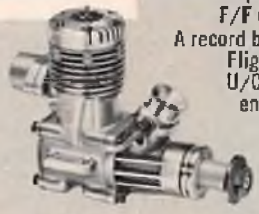

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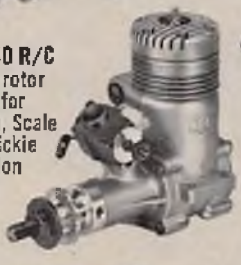
K&B .40 R/C
A front rotor engine for Pattern, Scale and Quickie 500 Pylon Racing.



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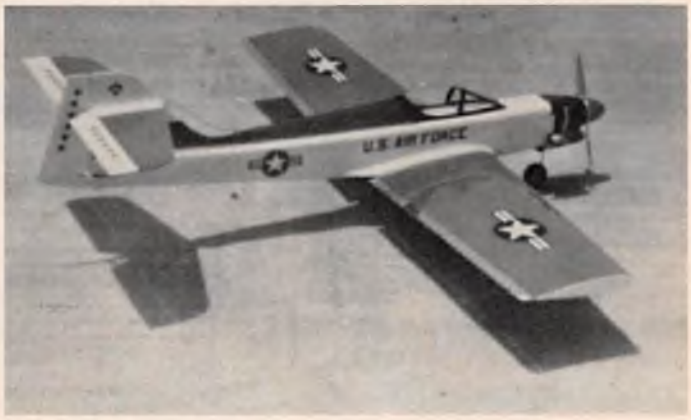

Top Left: The Hobby Huset (Uppsala, Sweden) sent us this picture of a beautiful Sig Skybolt built by one of their local fliers. It features the Hale Wallace paint scheme and scale flying wires.

Top Right: Leroy Rogers (Tulsa, OK) took the Sig Kougar kit and redesigned it to this T-tail configuration. He reports that it flies real well.

Left: Arthur Allen (Midvale, UT) built this stock Kougar and he reports; "I am only in my 2nd year at flying R/C and I am far from an expert, but I am able to fly the Kougar without any difficulty. One of the expert members of our club flew my Kougar and stated it was the smoothest and most responsive plane he had ever flown. Six of our club members are now building Kougars after seeing how well mine flies."

Lower Left: Anthony Maynard (B'dos, West Indies) has over 200 flights on his Kougar since completing it in 1976. He told us that he is so pleased with its flight performance that he has decided to build another one. At the same time, his daughter is learning to fly on a Sig Kadet.

Bottom Left: Monroe Larson (Burnsville, MN) wanted to fly RC and, as he relates in his letter, "I chose a Sig Kadet powered by an OS40 for my first plane. The combination was fantastic! The plane is a knockout and it gets lots of comments for its appeal on the ground and its good manners in the air." Monroe told us his reasons for buying a Kadet - "(1) Excellent reputation as a trainer. (2) The best instructions and plans of all kits I looked at. And (3) Great appearance - a handsome plane and I like that."

Bottom Right: When a model designer designs a kit, that's not news. But when a model designer builds a kit - now that is news! Noted kit designer Dan Santich (Pinnacle, NC) sent us a picture of a Kougar he recently built. Dan said in his letter; "It was a very nice kit and really went together easily. As you can see, I modified the wing and installed CG retracts. It just flies super! Thanks for a fine kit."

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1/4 SCALE FORMULA I RACERS

from page 70

available through your local hobby dealer or direct from Bridi Hobby Enterprises, 1611 East Sandison St., Wilmington, California 90744.

The kit can be assembled over a weekend as it is fairly simple and doesn't have a whole lot of parts. In fact it will take longer to put a good finish on it than it will take to build it. Regardless of how you use Little Toni (racing, scale, aerobatic, or sport) it is a model that you can enjoy with pride. □

POWER BOATING

from page 69/68

props I have are all for 3.5cc engines — or 19-21 c.i., if you prefer it that way — but there is a whole range for any size of engine. The props are nicely made, and, being metallic, can be tuned for racing by the real experts, or left as they are for the not so expert, and still are very efficient.

A lot of modelers are a little confused by this business of what prop to use on what boat, and the field is so large that it is difficult to give advice without going into a very long article on this one aspect alone. However, here are some ideas, or rather thoughts on the subject.

In the first place, when you buy a boat and engine, ask at the shop what prop you should use. Generally you will get a farily good idea from this. If you don't and I've said it before, it's time you changed shops! Okay, now supposing the guy says that for your mono-hulled boat, with a K & B .21 engine, you need a Gale C-7 or a Dumas 1240 prop. Right, you take the recommended prop, and you build your boat, and you try it out with that prop. One of three things will happen; either it is too small, the right size, or too big. How can you tell? This is the difficult part. The best bet is to lay your hands on the local expert — if you are a member of a club this is not difficult — and get him to take a look, or rather, to listen and look. In the first place, he will have a lot of experience, and may well know just the right prop for your combination. Alternately he will listen to the boat running. If the engine is turning at top revs, and the boat is slow, this means that the prop is too small. If, on the other hand, the boat is going at a reasonable speed and the revs are well up without being too high, the prop is about right. If it is slow, with the revs well down, then the prop is too big.

From here, you have to make a decision. If you want the boat for sport, to run round the lake on Sundays, and the prop is about right, then there is no real need to change it. If, however, you want to race, then you need the right one. Now, a C-7 is the middle range prop in

to page 131

we've earned the name champion

Sport flyers around the world have discovered the quality and dependability that the EK Champion offers. The confidence that you are flying with the best equipment available and knowing that your radio is backed by the most experienced digital R/C company in the world, makes this radio the all-time Champion.

The Champion transmitter provides 5-channels for control with two 2-axis sticks, plus one lever for non-centering auxiliary control. The transmitter has a voltmeter for quick reference and a light-emitting diode (LED) charging indicator.

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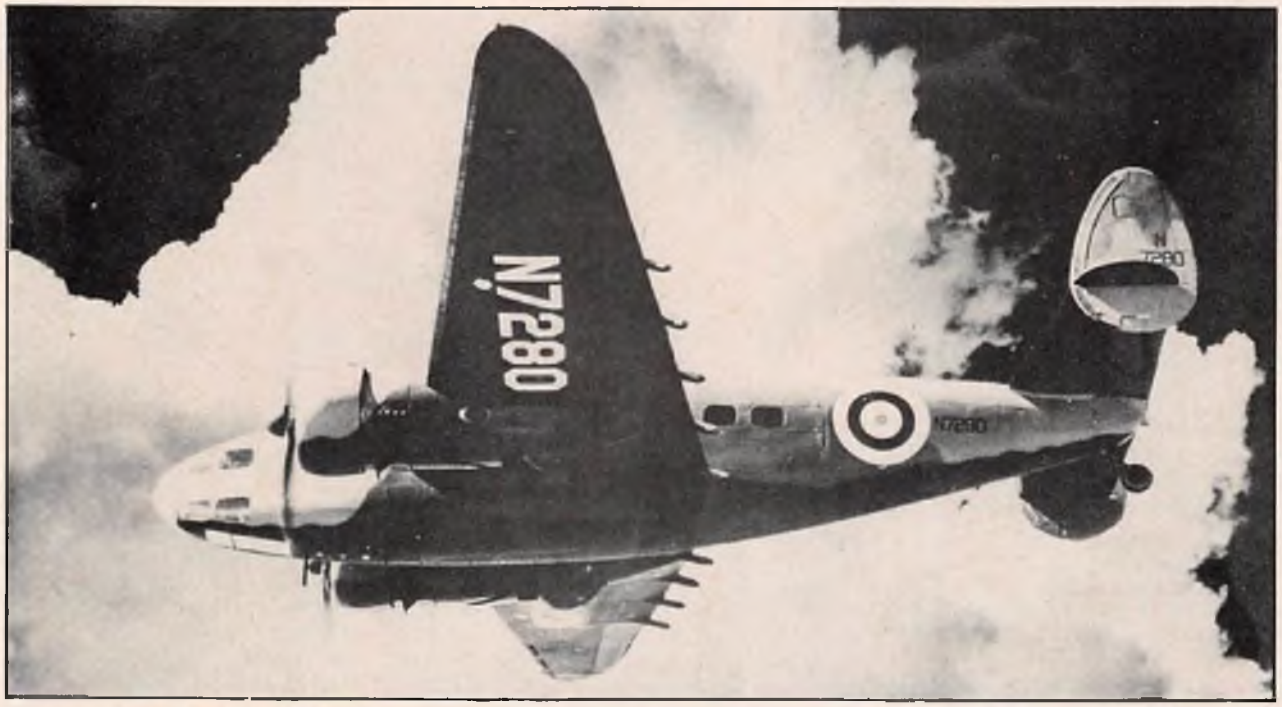

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from page 128/68

the Gale line for a .19 engine in a mono hull. If the engine was screaming its head off and getting nowhere, you need a bigger prop, so you look on the back of the packet and see that the next size up is the C-20. So you buy yourself a C-20 and try it. If, on the other hand, the revs were very low, then a change down in size is indicated and you go to an A-7.

A word of warning here: I have stated a purely hypothetical case, so don't quote me. The most important thing to do is to get some expert advice — and be careful who you pick to advise you; the guy with the big mouth is not the expert, as a rule. Every club has a loud mouth but, if you observe carefully, you won't see him running many boats — he spends too much time talking! Go rather for the guy who says little but does a lot of running; he is the one who generally knows.

I have only quoted two brands, Gale and Octura, but there are others around. Some props are plastic, some are metal. It is quite feasible, if you use plastic ones, to cut down the diameter so that the prop is tailored to your requirements. The same thing is true of the metal ones, but in this case the best tool is a Dremel grinder. Again, some metal props are malleable, and here you can adjust the pitch by bending the blades with a pair of grips padded with material between the jaws. And at this stage you are moving into the expert class. Personally, I use an electronic audio tachometer which tells me accurately the revs of the engine at any time while the boat is running. Then, by playing with both the pitch and the diameter, I can tailor the prop to get just the size I need for that engine. I haven't actually tried one, but I know that Glo-Bee (see ads) make a small audio-tach that works on the comparative system. It may not be too accurate — I don't know that — but it would be very useful for comparing the performance of a prop before and after modification.

Another very useful tool is the Hughey Prop Pitch Gauge, which not only allows you to set pitch for theoretical speeds, but also allows you to check accurately that both blades have identical pitch — something that is practically impossible to do by eye.

It is just not possible to tell by eye or ear whether a mod has improved performance or not. If you haven't got a tach of some sort, and don't want to buy one, then there is a very simple method of checking. Put two buoys in the water, about 60-70 yards apart — the exact distance just doesn't matter — and time the model, at full speed, twice each way. Write these times down, and calculate the average time. Keep this record

The Hughey prop measuring gauge – a most useful device for any modeler who wants to get the maximum out of a prop. Hughey also offers prop-makers kits and materials.

carefully. Now modify the prop, or change it, and go through the same thing again. This way, you can tell very simply whether the performance is the same, up or down. It's efficient, and cheap!

When you have the prop just right, and if it is a metal one, then very carefully sharpen the edges, and polish the whole thing. I use a jeweler's paste and a mop in the Dremel, but this firm, in fact, makes a buffing compound which works just fine. Sharpening and buffing, or polishing, is one of the secrets of the really fast boater, and can make a big difference, but only if the prop is the right one in the first place. I hope this will give you some idea of how to go about that selection.

In case you have any trouble getting supplies, here are couple of addresses, but do try your local model shop first, they usually stock these things, and it's not fair to them to jump the circuit. J. Gale Products, 8030 Fordham Road, Los Angeles, California 90045: Octura Models, P.O. Box 536, Park Ridge, Illinois 60068: Hughey Boats, 840 East 64th St., Indianapolis, Indiana 46220.

◆

And that's it for this month, see you all next time round. □

D.H. GYPSY MOTH

from page 65/64

or the other. To perform loops, stall turns, and Split S's, you'll need full throttle on entry, but closed throttle from half way. Rolls, and flick rolls need full power all the way. In a spin, she rotates quickly, but descends slowly and exits quickly on neutralizing the controls. She needs full up, full rudder/aileron, and only enters a true spin about 1 in every 4 attempts.

Stalls are fairly abrupt, with no wing drop. However, because of the abrupt stall, 3-pointers are not possible. I've

to page 134

WE'RE TAKING OFF IN NEW DIRECTIONS.

First off, we've changed our name. Dave Platt Models is now called Pica Products. That in itself is significant, but the big news here at Pica is the excitement of all the new ideas and products we're introducing.

Pica is improving and updating our existing line of kits. The Waco, the T-28, Spitfire and FW-190, all proven flyers and consistent contest winners, are undergoing renewal to keep them on top of advancing R/C technology.

We're expanding our line. Pictured above is the flagship of our new fleet of kits, the Duellist 2/40. The Rapier, an exciting new pattern ship, is just now coming off the drawing boards. Plus a whole series of new medium-sized kits is planned.

We've added a superior new fast drying glue and a revolutionary new type of filler. And we're going to introduce a group of custom R/C accessories in the near future.

We've got a new name and fresh new ideas. Now we're Pica Products, and we're taking off with innovations in modeling.

Duellist 2/40

Wing span: 67"
Wing chord: 14"
Total wing area: 795 sq."
Fuselage length: 54"
Stabilizer span: 27"
Verticle fin: 10-1/4"

Rec. engine: .23-.40
Rec. fuel tank: 8 oz.
Gear: Fixed or retract.
Channels: 4 (5 w/ret.)

Control functions: Ailerons, Elevator, Throttle, Rudder.

Construction: Balsa.
Plan sizes: 35"x 67"
Instruction manual and construction photos included.

Kit includes: Die cut balsa, shaped parts, hardwood, plywood, aileron torque rods, hardware and sample fillit.

Flying weight: 6-8 lbs.

The Duellist 2/40 has been designed as an easy-to-fly and safe handling twin engined R.C. model. Combining elegant appearance with simple structure, it's ideal for the modeler who has progressed through the usual trainers and pattern or low wing sport ships. As such, it offers a further level of enjoyment in the R.C. hobby, and a new accomplishment in flying skills to the builder.

pica

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innovations in modeling
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D.H. GYPSY MOTH

from page 132/64

found that compared with monoplanes, small bipes like this suffer from a larger drag rise at high angles of attack. A tail low wheeler is the best landing tactic, to keep above stalling speed. A double area tail might remove this characteristic, but I'm not worried by it.

Well, I've enthused about her for long enough. She's a picture in the air, whether doing aerobatics or just chugging. I think you would enjoy owning a Gypsy Moth. □

BALSA WOOD OVERCAST

from page 59/56

Reducing power to cruise still required no trim adjustment.

As mentioned, the Quadra was running a bit rich yet and the fuel tank was down, so a pass around the field followed by the first landing was accomplished without incident. The glide was steady and fairly steep due to the drag, and a bit of power added on the flare gave a slow-motion landing at an estimated fifteen miles an hour.

A close inspection was made of the entire airplane to see if anything was

coming unglued or loosened. The elevator travel was reduced, fuel added and the needle valve leaned.

The second flight lasted twenty minutes, giving me a chance to study the Gere's flight characteristics and to practice coordinating aileron and rudder on the single stick Kraft KP-7CS. Flying the smaller sport and pattern ships spoils one because the rudder is seldom used except for snaps and spins and knife edge in flight, but these big jobs require the use of coordinated rudder in the turns to keep down the wallowing. Also, rudder alone just skids the Gere. It can be turned eventually by rudder alone, but in a wide, flat circle.

On the third flight I took off, climbed to a hundred feet and came back overhead. The Quadra quit abruptly, giving me a chance to investigate the Gere's dead stick performance. There was no wind, so a keyhole turn was made, the plane gliding nicely and taking a surprising amount of time to descend to a beautiful three point landing. The wing loading is only 20 ounces per square fool, but the thing has a built-in headwind and I somehow expected a steeper glide angle in a dead stick approach.

I could find no reason why the Quadra quit as it did, so I richened it a bit and flew again with no problem, making numerous low passes while my buddy, P.O. Davis, burned up film in the

Omega.

Loops are a study in a slow motion flight and rolls are sluggish, even with the four ailerons, necessitating top rudder and down elevator in the appropriate sequence to get smooth straight and level slow rolls. In other words, the Gere probably handles just about the same as its full size counterpart. You have to fly it through every maneuver, but it is stable enough to make long passes hands-off.

Okay, so I'm hooked. But both you and I know people who are hooked on much worse things, eh? You bet.

And, contrary to what it may seem, this article is not a testimonial for Bud Nosen, Kraft Systems, Quadra or anyone else. Rather, it is a testimonial for Big Airplanes. It just so happened that I used materials, equipment and accessories so wonderfully available to all of us in this fantastically fascinating hobby, and the manufacturers I mention, along with all the rest, deserve a plug now and then for their efforts and ingenuity and skill.

As for Big Airplanes, I hope this has been the added push some of you have needed to get you started. If you've been on the fence as to whether you should take the jump and build one of these big beauties, do it. Don't wait. More and more Big Airplane plans and kits are coming over the horizon, now that we have bigger engines and prop drive units to power them. Big Airplanes is a rapidly growing trend that will hopefully be with us for years to come, so don't pass up all the fun.

Just because they are big, does not necessarily mean it will take longer to build one. Actually, the time required to build the Gere, even with all the changes, was no more than the time it takes to build a nice looking Aeromaster, and less time than it takes to build a Dave Platt Waco. More material, sure, but no more time because they are handier to work on. They crowd a man's work bench, and until you learn to handle them in a confined space, the ceiling is liable to get marked up some, but it's worth it.

Transporting is more of a problem, of course, but many is the time I've seen a modeler show up at the field in a runt car with the plane tied on top and the wings inside.

Besides, look at all the extra ground support equipment you don't need to take, like glow plug battery, extra glow plugs, starter, fuel pump, field cradle and the like. Shucks, all you really need besides the plane, transmitter and a gallon of **cheap** fuel are a prop wrench in case the engine backfires and loosens the prop, a 6-32 Allen wrench for the wires, a common screwdriver to snap the clevises open, and your ESV. A pessimist might carry an extra prop.

to page 138

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BALSA WOOD OVERCAST

from page 136/56

Since the Southern Products' Six Shooter fuel pump and Du-Bro's rotary pump are both susceptible to petroleum base fuels, I use the Oklahoma credit card method of fueling and defueling — siphoning. Works great.

Okay, tigers, that's it, so sic 'em! Don't choke on dust whilst ridin' drag, but get up there in front and build yourself a Big Airplane. □

SIG COLT

from page 55

Sig recommended using paint on the foam wing, since it was in one piece and relatively different to most kits, it was felt advisable to follow the instructions. The wing was sanded lightly with 240 dry sandpaper then was given a coat of filler which also seemed to harden the surface. Syncloid™, a spackling paste, is thinned with water to the consistency of cream and a coat of this was painted on the foam wing, it was allowed to dry 24 hours and re-sanded. This new surface sanded just like balsa and filled well. It apparently had no derogatory effect on the foam. If you plan to use this product as is or thinned, please test where it won't show. The Syncloid spackling paste is one of the best fillers for holes, dings, and cracks, in balsa wood construction that we have used for a long time. It is available in most home repair centers and is great as is or thinned.

After filling, sanding, and wiping clean of all dust. We coated the whole wing with light blue Sig Plastenamel.When dry, sand with 400 wet sandpaper. Give it a second coat followed by sanding with 600 wet sandpaper. Then apply trim colors or use low heat plastic iron-on film. Rub the wing down with white rubbing compound, it will take on a dull overall sheen, but don't worry, a good auto wax will bring back the gloss.

The RCM prototype fuselage and tail was covered with cream and light blue SuperKote plastic film, which is not only of excellent quality, but may be ironed on over the aforementioned Plastenamel — as a trim. Just don't iron too long in one place or let the iron slip and hit the paint. Be sure to keep the iron on low heat.

Only one caution: be careful, the elevator pushrod exits on top of the stab placing the horn on top of the elevator. This makes it move just reverse to the normal hook-up.

Flight testing was done at El Mirage dry lake just south of Edwards AFB Test Center. If this type of terrain is good enough for the Air Force, it is good enough for us. Nothing but a dry, flat, smooth surface between you and the

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R/C MODELER MAGAZINE'S

MODEL OF THE MONTH CONTEST

The Model of the Month Award Program is designed to encourage the sport and novice competition flier to submit details of his most recent kit or scratch-built model to RCM in order to encourage general model craftsmanship and the overall promotion of R/C flying.

Each month R/C Modeler Magazine will award a 371 Variable Speed Moto-Tool as illustrated in the photograph. The second and third place winners each month will receive a one year subscription to R/C Modeler Magazine or, if they are a subscriber, an extension of their current subscription.

AUGUST WINNERS

FIRST PLACE

W.J. Kyncy
Oroville, California

Scale 1938 PBY was scratch built from Sid Morgan Plans. Wing span 9 feet with a total weight of 18 pounds. Powered by two Super Tigre .60's and controlled by a Futaba 5 channel. Finished with Coverite and K & B products. Markings are copied from brother-in-law's PBY of 1938.

SECOND PLACE

Eugene Martin
Felton, California

A Curtiss Hawk F6C-1 is scratch built from drawing presented by Wylam in Model Airplane News. The Hawk was done in 2"-1' scale including all ribs, spars and stringers. A Cirrus 700 series radio and H.B. .61 P.D.P. complete the package. Covered with flat aluminum Super MonoKote sprayed with clear Satin Hobbypoxy. 122 ounces with a span of 63 inches. 700 hours involved total.

THIRD PLACE

James M. Carter
Pittsburgh, Pennsylvania

Focke-Achgelis Type 61 — German, circa 1937 scratch built semi-scale twin rotor autogyro. Rotor span 70 inches, fuselage length 42½ inches, and weighs out at 68 ounces. Uses an O.S. Max .35 and a 3 channel Cirrus radio. Original design by Skip Ruff appeared in Model Builder Magazine. Flew successfully on first attempt.

RULES

A. Model Aircraft Origin
   1. Any kit — wood, fiberglass, foam, or ARF kit is eligible. Any scratch-built aircraft built from magazine or original plans is also eligible.
B. Category
   1. All types of radio controlled airplane models.
      a. Scale
      b. Pattern
      c. Racing
      d. Fun-To-Fly
      e. Original Design
C. Entrants to submit:
   1. Color photo or slide, size 35 millimeter or larger.
   2. Black and white glossy photos (any size) of both sides, top, rear, front, and bottom views.
   3. Close-up photos may be submitted on detail work if desired.
   4. A short write-up giving dimensions, weight, power, radio, etc.
   5. A statement that:
      a. The submitter was the sole builder of the model.
      b. Parts and/or accessories used were part of the kit or available to all modelers at retail outlets.
      c. All non-available or special parts were built by the hands of the submitter.
D. Judging will be on:
   1. Workmanship
   2. Quality of finish.
   3. Attention to detail
   4. Subject of model or difficulty of the project will count in judging.
E. Judging will be done by RCM Editors Don Dewey and Pat Crews.
F. Persons not eligible:
   1. Members and employees of RCM or any other model airplane publication.
   2. Members and direct or indirect employees of Dremel Manufacturing Co.
   3. Members and employees of any manufacturer of hobby kits, hardware or supplies.
   4. Anyone engaged in the wholesale or retail distribution of hobby kits, hardware or supplies as a major source of income.
G. Models not eligible for submittal are:
   1. Models that have been submitted for judging of workmanship at any major AMA sanctioned contest and have placed 1st, 2nd, or 3rd in that judging. Flying points as a final standing do not apply.
   2. Models that have been built for display purposes only.
   3. Models that have been built for manufacturers demonstration purposes.
   4. Models that have won a similar award in another publication.
H. Entrants who have models that qualify under these conditions are eligible to enter. Included with the entry should be the entrant's AMA and FCC numbers, and also, the name of his club, if any.
I. Prize Information:
   1. A Dremel 371 Variable Speed Moto-Tool will be awarded to the monthly winner. An illustration and description of the kit will be included each month along with the winner's name, address, club, etc. The second and third place runners-up will be awarded a one year subscription to R/C Modeler Magazine.
   2. Dremel Manufacturing Co., of Racine, Wisconsin will be notified of the monthly winner immediately after a decision is reached by the judges so that the kit award can be received by the winner prior to the issue of that months RCM.
J. General:
   1. All contest entries must be addressed to RCM Model of the Month Award Program, R/C Modeler Magazine P.O. Box 487, Sierra Madre, California 91024.
   2. All photographs and materials submitted by the contestant will become the property of R/C Modeler Magazine and none will be acknowledged or returned.

This contest will be null and void in any state or locality where specifically prohibited by law.

SIG COLT

from page 138/55

horizon. With that much run on take-off, you can run till lift-off occurs. This wasn't necessary with the Colt — the .15 up front lifted it off after a short run and was throttled back as soon as sufficient altitude was acquired. Most of the flying was done throttled back, only when climbing for a loop or gaining speed for a roll was full throttle used. Remember you do not have the expansive wing area of a trainer. When doing maneuvers, maintain your altitude lest the ground rise up and smite thee. The Colt is responsive so take care when pushing around the stick until you have had time enough to feel it out. □

NEW ERA 440

from page 54

....set at zero degrees. The production models now have a two degree right thrust built into the firewall.

Assembly of our prototype was straightforward and no difficulties were encountered. The instructions are brief, but adequate for the average builder with some building experience behind him.

We had received, from Duke Fox, a new Fox .45BB engine and tuned pipe. This was an excellent opportunity to try out the engine. The engine was too large for the K/H mount so we machined a custom mount from aluminum. The mount had to be kept narrow on the outside, yet large enough inside to handle the engine along with drilling for the nose gear. After installing the mount and engine, we found the fuselage had to have 1/4" added to the nose with some filling required with resin and micro-balloons. We achieved a good blend with a 2½" Midwest spinner. The

aft end of the tuned pipe was supported by two 1/16" x 1/2" aluminum struts. At this point we were trying to decide why we hadn't just used the furnished mount and installed a smaller engine. The Fox .45 with pipe was just too intriguing to pass up.

In making the fuel tank installation, we found that while the 8 ounce Sullivan tank could be squeezed through the F-2 bulkhead, it was impossible to remove. We ended up with a pull tab on the tank made from reinforced glass strapping tape. Just wrap tape around the tank length-wise with an added length to get hold of. There is room for a sleeve of 1/2" foam around the tank. A little talcum powder helps insert the tank into place.

The entire model was covered with white Super MonoKote and trimmed with blue and orange.

Our prototype tracked well during taxi tests, but seemed light on the nose wheel. Possibly the main gear could be angled back slightly. On the take-off roll, the New Era 440 was very sensitive to steering and can be easily over-controlled. The first take-off was normal with only slight aileron trim needed. Under power, the elevator was very sensitive with the recommended throws. We moved out one hole on the horn which made it just right.

We had used the minimum dihedral called out and found the aircraft performed very well. On the flat wing version, the rudder was tried for directional control by itself and was useless; when used in conjunction with ailerons, the performance was great. We tried "tail slides and hammerheads" and it did its job well. The New Era 440 will do all of the maneuvers that the pilot's skill will allow.

Under low power, or dead engine, the aircraft penetrates very well and all but rudder controls were functional. Power on landings are super — it settles down and stays put with no bounce.

During the preliminary flights, some engine and fuel problems were encountered. After the pressure tap on the tuned pipe was relocated and our Fox .45 had some running time, everything came together. The engine started hitting its peak and the idle came down where we wanted it. The more time we run the engine, the better the performance gets. Duke has a good product here, if you just give it an hour or so of break-in time before expecting the top performance. We were using 10% fuel by George Aldrich and a Top Flite prop. We had a slight evidence of fish tailing on one high speed pass but feel it was the severe wind conditions we were flying in that day. It only happened once.

For those who don't have a lot of time to build, or even if you do, we highly recommend the New Era 440 as an excellent aircraft and at the price of $74.99, it's a real bargain. A tapered

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OUR BRAND NEW RC12E LOOKS LIKE A WINNER.

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NEW ERA 440

from page 142/54

wing is available to fit without modifications. It may be ordered as standard or in addition to the constant chord wing. The tapered wing price is $20.00 if it is ordered separately. □

VOYAGEUR II

from page 52/48

smooth with the curving fuselage edges.

The fuselage is now completed by attaching and contouring the nose block; then complete the empennage attachment. This last step starts with addition of the 3/32" x 1/4" balsa tail mounts just forward of the rearmost F6. Epoxy your completed V-tail assembly to the fuselage by first notching the last F6 with a 90° "V" cut of the proper size. Run a square sanding block on edge in the mounting area to "square up" the mounting surfaces. Trial fit the empennage often during this process to assure that each tail fin is equal height above the work surface. (See plan section E-E during this entire process.) Form and install (temporarily) the pushrods, and then add the two mini-horns to the elevons. The fuselage top sheeting around the pushrods may now be formed from a scrap of 1/16" ply or balsa, but do not cement it in place until the pushrods are permanently in place. Now take a break.

Wings:

Study the wing plans carefully and you'll probably **not** build two left wings or end up with one wing longer than the other. And remember that your wing panels will be only as straight as the surface they are built on.

Begin wing panel construction by forming the lower wing spar assembly. First, re-check your spar lengths, shear webbing end angle accuracy and alignment and, above all, insure that you lay out all pieces correctly to form one each left and right center panel spar. Next, firmly cement the webbing to both sides of the 1/8" x 3/8" main (bottom) spruce spars. The small cross section drawing on the plans will aid you in this step. Clamp with plenty of spring type clothespins, and sight along the spars to insure they are not setting up with a span-wise warp. When dry, you can position the left main spar over wax paper covered plans. Then pin down the left main panel trailing edge. Before installing the wing ribs, mark and drill both WP-1's for the 3/16" alignment pin. Slide the 11 main panel balsa ribs into position, and add one WP-1 to the center root. Note how the pre-cut angles on each end of the spar supply the proper slant to the end ribs for the dihedral breaks. Cement all ribs in place and

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Hobby Shack — pilot

RADIO-CONTROL

ALMOST READY TO FLY

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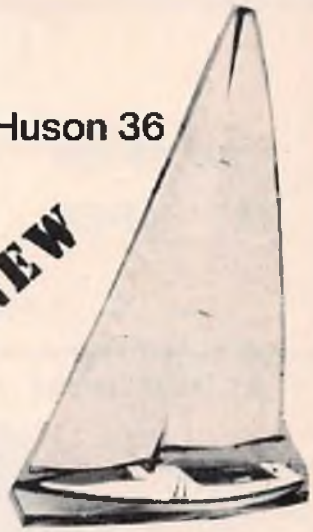

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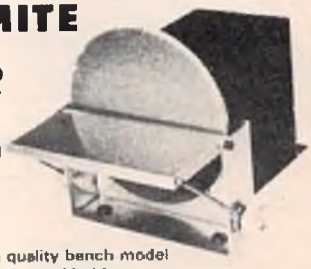

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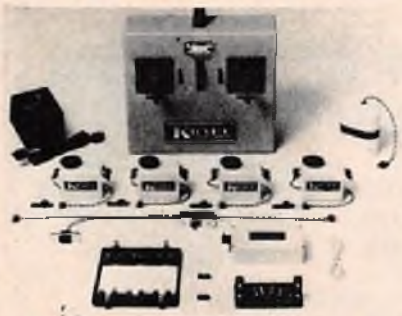

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VOYAGEUR II

from page 144/48

allow to thoroughly dry before continuing. Position and install the left main panel leading edge stock, followed by the three turbulator spars. Use plenty of cement and clamp securely the turbulator which fits between the shear webbing. When the unit is thoroughly dry, remove the excess material from each end of the left center panel and install the four 3/32" gussets. Complete the right center wing panel in the same manner.

The tip panels are completed in a similar pattern as that used for the main panels. Study the plans and photos for completion of the wing tip blocks. (Note: The 1/16" wire at the trailing edge of the tip block is optional.) You will have to enlarge the root rib of each tip panel to accommodate the two 1/16" ply tip dihedral braces.

When all four wing panels are completed as described above, you may attach the tip panels to their respective center panel section. Once again, enlarge the dihedral joint rib at the main spar to clear the tip ply braces. You should have 3½" under the tip with the main wing panel resting on the work surface. When both wings have been joined, sand the leading edge, if needed, to the blunt contour shown on the plans. You may also notch the center panel trailing edge of both wings for the 1/16" wire. This 2" wire protects the trailing edge from crushing when the wing is rubber banded to the fuselage. Epoxy the wires into the notches. Next, add a 3/16" pin and block to the left center panel WP-1.

The wings are joined with a 3/16" diameter steel or music wire rod which is inserted into 3/16" I.D. tubing mounted in each wing half. Study the wing center section spar detail on the plans before proceeding. Sharpen the end of the

aluminum/brass tubing with a file, and use it to bore through the two wing ribs in each panel where the tubing will eventually rest. Be as accurate as you can; it is better to have a greater angle on the tube than less than that indicated on the plans. This will result in slightly more than 2" of main panel dihedral which is considerably better than having less than 2". When both wings have been drilled for the tubing, cut the tubing to length and position each piece in a wing section. Add the 1/8" balsa tube bracing and the 1/4" square tube plugs. Trial fit the wing panels with the rod in place to insure that the proper dihedral is achieved. When you are satisfied, rough-up the outer surface of the tubing with sandpaper, and epoxy the tubes in place. **Use plenty of epoxy**, but do not allow any adhesive to get inside the tubing. When dry, add the 1/16" balsa cross grain sheeting to the two center bays of each wing half; top and bottom.

Finish & Covering:

Cover using your favorite material. Warps in the wing panels can be manipulated during the shrinking process, but remember that they can be put into the wing just as easily. Be sure to take your sealing iron over each rib and spar, as the covering material is an integral part of the wing structure. Take a little extra time during the covering process, as the effort will be rewarded many times over at the flying field. The colored trimming tape available at most hobby stores adds a nice accent to most finishes and is very easy to apply. Be sure to include the canopy outline for a finishing touch. After covering the fuselage, punch in the tow hook holes from the bottom. Add the glider super skid, and install the wing dowels.

Next comes your radio gear. Balancing is no problem, but start with your battery in the forward compartment. Pack the battery and your receiver in foam for protection, and route the antenna through the leading edge of

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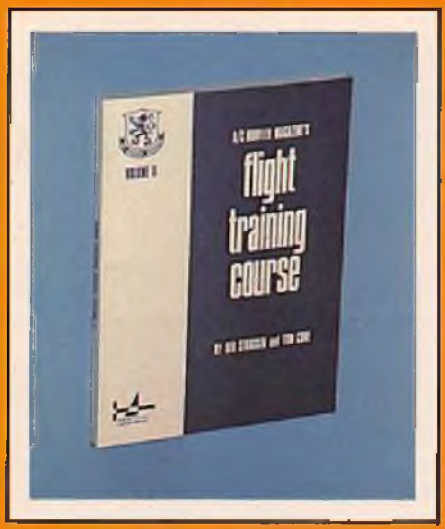

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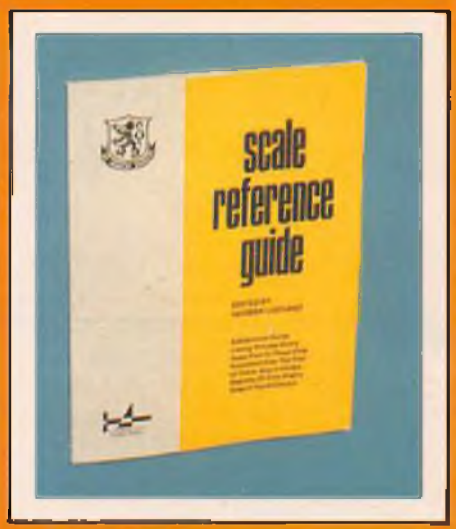

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VOYAGEUR II

from page 151/48

the hatch. Secure the other end with a rubber band between the empennage halves. Set your control throws for 1/4" on the elevator travel each way and 3/8" to 1/2" on the rudder each way. If this is your first V-tail, remember that for a right turn, the **right** elevon goes down and left one goes up. Up is up and down is down as usual.

Flying:

If you've built your Voyageur carefully, it will fly right off the building board. Try a few hand launches in deep grass to gain a feel for the craft's speed and control response. Do not launch it like a spear, but rather, let it glide gently from your hand from an easy, nose low release. Go easy on the elevator, as it is better to land a little hot than to plant the nose from a stall.

On the first hi-start launch, you'll find that she tracks fast and true all the way up with only minor corrections for the wind. If the launch is a good one, the transition from tow to glide is automatic, and you're soaring without touching the sticks. Normal glide is medium slow with the nose about level with the horizon. The first flight will give you some idea of the sharp control responsiveness to both pitch and trim. I have yet to observe any fishtailing, even at slow speed. Loops are tight, stall turns are quick if started with plenty of airspeed, and rolls are possible, though somewhat dished-out. Since you're bound to have a stall or two, you can rely on them being straight ahead and easily recoverable. Landings are routine, hand catches are easy.

The Voyageur II is no twelve foot monster, but she will thermal on light to moderate lift. A little weight is nice on the windier days, and it is here that she is really "at home". I have had longer flights on days when the wind hit 15 knots than I have experienced with my other kitted sailplanes.

I hope you'll enjoy your Voyageur, and can some day experience the thrill of launching your own sailplane design.□

LAZY ACE

from page 43

The Lazy Ace tips the scales at 9½ pounds which gives it a wing loading of just over 12 ounces per square foot. This means the aircraft is flying on the wing rather than just on the engine and puts it in the class of a slow, gentle, predictable, have fun, Sunday flier.

The structure of the Lazy Ace is strong

and very light and goes together reasonably fast. It is not complicated and the well fitting parts are large enough to make for easy handling. The fuselage sides are built up with spruce longerons and vertical and diagonal balsa braces. The primary fuselage longeron is 1/4" x 1/2" to give extra beef to the structure. The built up sides are joined with balsa cross braces to form a box structure. 1/4" sheet balsa formers are added to the top of the box. The forward turtle deck is covered with 1/32" ply (one piece) from the 1/4" firewall to aft end of the rear cockpit. The rear turtle deck is 1/4" balsa stringer with the main center stringer being spruce.

The cabane struts, supporting the upper wing, are made of 1/8" piano wire with 1/16" wire cross bracing. It is very important to build these true without adding positive or negative incidence to the wing. We built a simple jig to insure identical cabane sides. Lay out the cabane configuration on a piece of 1/4" ply approximately 12" x 12". Drill two 1/8" holes in the ply where the struts will normally mount in the fuselage. Install the pre-bent 1/8" wire into these holes. Drive in small brads along cabane layout to position the 1/8" wires at the proper angle. Next, align the 1/16" wire cross bracing using weights to hold it in place. Apply Stay Clean soldering flux to each joint and solder with a heavy duty soldering iron. Remove, carefully, from the jig and wrap each joint evenly with thin copper wire. Set back in jig and re-solder all joints. This method guarantees accuracy, neatness and complete success. It can really mean the difference in a good flying model.

Because this is a super large biplane, you must build two large wings. When you break them up into panels, they become easy to handle and build up fast — especially with the simplified wing tip design chosen by the designer. Typically, a wing panel is built as follows: The 3/32" leading edge and trailing edge sheeting are pinned to the plans. The 1/4" square spruce main lower spar and 1/4" x 1/2" spruce lower trailing spar are pinned down next. Starting with the tip, set in a rib, over the sheeting spars. A piece of pre-cut 3/16" balsa vertical webbing is set in next, then a rib, then vertical webbing, etc. When all the ribs and webbing are in place, the 1/4" square spruce top main spar is set in place. Next the leading edge, top leading edge and trailing edge sheeting are installed. All the pre-cut pieces fit well allowing for good ease of assembly. The wing panels are joined with 3/16" aircraft ply dihedral braces making the center joint extra strong.

The stab and vertical fin are pretty straightforward, however, some care should be taken in covering the stab. It is easy to warp because of the type of construction. You will end up with a slight twist if not careful. Allow the glue to

dry thoroughly before removing it from the building board.

Our model was covered entirely with Coverite Permagloss requiring close to 5 yards. With careful management you might be able to cut that down some. R/S Perfect Paint was chosen for the trim color because of its ease of application. The entire trim was masked off and the edge of the masking tape was sealed with R/S Perfect flat satin P-15 in the spray can. This method will give a much cleaner edge. Two light coats of color were sprayed on - - - just enough to cover, with the idea of keeping the sheen in the trim color as close as possible to the basic permagloss color. A DJ Trim Tape accent stripe was set, one tape width, back from the color trim to complete the model trim.

We powered our model with an OS .60 FSR swinging a 12/6 prop. A Kraft 13 ounce tank was installed to insure adequate air time. Our radio was the new Royal Omega transmitter which allowed us, quite easily, to mix rudder with the ailerons, for coordinated turns. Ailerons were set to maximum throw with differential added in the travel to help decrease the yaw in the rolls. Our model weighed 10 pounds and was balanced according to plan.

The initial test flight was performed in calm air. After a few taxi turns to check out ground handling (really to settle nerves) the throttle was advanced slowly. The tail came up immediately and the Lazy Ace was airborne in less than 75'. A slight amount of down trim was required to hold level flight after which a gentle right turn was executed to bring it back. A few stalls at a safe height to get the "feel" and the Ace was wheel landed as smooth as silk. The next flight was the true test. We really rung it out. Loops, inverted flight, stalled turns, rolls, spins — just about anything we could think of, short of total destruction. The Lazy Ace did them all. And, as you might have guessed, with a smiggen of throttle

to page 158

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- Fast, precise, high resolution
- Gold plated Deans connectors

REGULAR Size: 1.5x1.45x.73 Wt. 1.2 oz.
MICRO Size: 1.28x1.3x.6 Wt. 0.7 oz.

RECEIVER
- Double sided PC boards
- Double tuned front end
- 1.5 μV. AGC on 4 stages
- Gold plated Deans connectors
- High selectivity and rejection
- 5 channels, 8 available

FREQUENCY: 72.08, 72.16, 72.24, 72.32, 72.40, 72.96, 75.640
REGULAR Size: 1.9x1.7x.8 Wt. 1.5 oz.
MICRO Size: 1.75x1.14x1.0 Wt. 1.5 oz.

BATTERY
REGULAR
- 500 mAH, vibration resistant
- Nylon D&R case
- Gold plated Deans connectors

Size: 2.2x1.25x1.25 Wt. 4 oz.
MICRO
- 225 mAH, vibration resistant
- Nylon D&R case
- Gold plated Deans connectors

Size: .85x1.45x1.45 Wt. 2 oz.

SWITCH HARNESS
- Noble high quality switch
- Deans gold plated connectors
- Nylon protective cover
- Wt. 0.4 oz. (charging connector to be supplied by user)

WRITE: We answer inquiries immediately. We ship rapidly when paid by money order or cash.

GIFT CERTIFICATES $25.00 EACH

NEW 544 SERVOS! NEW LOW PRICES!

After one year of research we are introducing the best servos ever produced regardless of price — the 544 Servo Line. Also in addition to our regular kits a new microservo kit (S5443K) is now available.

These new servos and kits use a new highly advanced 544 AA IC offering internally regulated power supply, dynamic braking, linear ramp timing and the need for very few external components. This revolutionary new IC is complemented by the most sophisticated PC board in the industry — double sided, plated inside holes, reflowed in hot oil and manufactured of epoxy glass. This inherent reliability and vibration resistance is further enhanced by CTS metered deposition pots and the best motors available. D&R mechanix production is now electronically controlled for increased precision. Finally a burn-in procedure further assures the highest reliability.

We have purchased a large volume of parts at low prices and we are passing the savings on to you. The prices will hold as long as this supply of parts lasts.

Our flite pak approach has been immensely popular and many modelers have purchased their 4th or 5th flite pak. If you have not yet tried our approach now is the best time to do it and save. Flite pak prices are the sum of component prices and all parts can be mixed.

NAME

ADDRESS ZIP CODE

QUANTITY	CAT. NO.	DESCRIPTION		PRICE	TOTAL
	S5441	Rotary D&R servo, assembled	544 IC	20.00	
	S5442	Rotary Dunham servo, assembled	544 IC	22.00	
	S5443	Rotary Dunham micro servo, assembled	544 IC	29.00	
	R2000	Receiver regular, assembled	Frequency_____	36.00	
	R2001	Receiver micro, assembled	Frequency_____	39.00	
	B1000	Battery regular, assembled		13.00	
	B1002	Battery micro, assembled		13.00	
	H1001	Switch harness, assembled		5.00	
	S5441K	Kit of S5441 servo	544 IC	17.00	
	S5442K	Kit of S5442 servo	544 IC	19.00	
	S5443K	Kit of S5443 servo	544 IC	25.00	
	R2000K	Kit of R2000 receiver	Frequency_____	30.00	
	H2010	5 male & 5 female Deans 3 pin connectors & assortment of wire		8.00	
	S2000	Trays for all regular servos 5 pcs.		4.00	
	S2000A	Single snap on tray for all micro servos		1.25	
☐ COD, Shipping, handling & insurance				2.50	
☐ Cash, money order, bank draft, certified check, shipping, handling & insurance				1.50	
On personal checks delay of up to 3 weeks. N.J. res. add 5% sales tax. Foreign orders add 10% of the total.				TOTAL	

Litco Systems BOX 90, EAST HANOVER, NEW JERSEY 07936

R/C boats and cars both showed an increase in numbers and interest this year. The boat craftsmen in particular showed outstanding craftsmanship in their scale and hydro ships. The display turnout here was far beyond expectations, and display space was at a premium.

For those interested in helicopters, a trip to the Perrysburg Holiday Inn for the flight demonstrations was a must. Both American R/C Helicopters (John Simone Jr.) and Dieter Schluter provided spectacular flights. Simone with the new flybarless Revolution II and Schluter with the Heli-Boy. Both made amazing flights under very gusty 30 mph+ conditions. Loops, rolls, split S's, Immelman turns, along with a few maneuvers yet to be named! Really spectacular!

If you missed the Weak Signals Twenty Fourth Exposition, you missed meeting a lot of new friends, seeing a lot of old friends, and, generally, just a great time. The Weak Signals Club deserves the thanks and appreciation of the entire R/C sport/hobby and industry for the task that they have undertaken and so very successfully accomplished. We, at RCM, take our hats off to the entire group in a salute of thanks for one more "Super Show".

Next year's Exposition will be the Silver Anniversary Edition — We hope to see you there!! □

FLIGHT ASSURANCE TECHNIQUES

from page 39/38

ship. If the ship is moving to the left, turn the transmitter to the left (you should move your body a little to the left as well). When the ship is going to the right, turn the transmitter and body to the right. Now the hard one, when the ship is coming at you, look at the ship over your shoulder and point the transmitter away from the ship.

If you follow the practice of pointing the transmitter in the direction of the aircraft heading you will help yourself stay oriented and manage to "stay in the pilot's seat." After practice, you will find that only slight transmitter deflection will be necessary. You may notice that even the experienced R/C pilot will use some transmitter and body english when he's in a tight spot. Remembering and applying transmitter pointing may well save your aircraft.

Take-Off And Landing

Take-offs and landings are the most critical parts of flying. Both require practice. For rough fields, a hand launch

to page 160

LAZY ACE

from page 156/43

she'll float around the sky with ease.

If you want a big, fun, easy-to-fly biplane, you won't go wrong with the Lazy Ace. It isn't Stand-Off Scale so, tell 'em it's a home-built. A 1" = 1" model of the original — built by Chuck Cunningham. □

TOLEDO '78

from page 42/40

scale 1:1 model of a P51D or B-17.

With it all, the radio manufacturers are building still smaller and lighter systems. Kraft handed out quite a number of their sub-miniature servo cases with lapel/tic tac pins attached, promoting more than a few joking comments about them getting into the jewelry business! For a price, it is possible to install a complete full house system, including retracts in an .049 powered Half-A ship, without overloading it!

The smaller Half-A ships were also very prominent — though it sure takes a lot of them to cover the space of a Quarter Scale! The popularity of these little birds is due to no small degree to their convenient size. They are easy to build, comparatively inexpensive, readily stored and transported and, best of all, a ball to fly.

Pattern and Standoff Scale Flyers

You are cordially invited to the Third Annual 1978

HITACHI
R/C CLASSIC

AMA-Sanctioned

Radio Control Aerobatic Competition
to be held in California City, California, October 7 & 8

Sponsored by:

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Hosted by:
Antelope Valley Tailwinds, Inc., Lancaster, California

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Silver Trophies 1st through 5th Place courtesy of A&L Distributors, Great Western Cities, K&B Manufacturing, Lakeshore Inn, Pactra Industries.

■ Gifts for all contestants ■ AMA & FCC licenses required
■ Entries limited to 25 per class ■ Fantastic banquet Saturday night
■ Camping OK—no facilities ■ USPJA judges
■ Pre-registration required ■ Party Friday night at Lakeshore Inn
■ Free RC Cola for contestants and families (courtesy of Royal Crown)

Located in beautiful California City,
just 45 minutes north of Lancaster, California on the high desert.

Hitachi R/C Classic

Enclose $20.00 per event

C/O Dick Russ, C.D., P.O. Box 32852, Oklahoma City, Oklahoma 73132

NAME _____ AMA NO. _____ FCC NO. _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

CIRCLE EVENT: Novice Advanced Expert Masters S/O Scale

Frequency: Pattern: _____ MHz Scale _____ MHz

IMPORTANT:

Pre-entry—No entries will be accepted after September 15, 1978. When classes are full, earliest postmark determines acceptance.

Due to limited accommodations, be sure to make motel reservations early for
Hitachi R/C Classic at Lakeshore Inn,* 21330 Lakeshore Drive, California City, California, (714) 373-4861

*Tell them it's for the Hitachi R/C Classic, or you won't get in. Insist on Reservation Guarantee.

FLIGHT ASSURANCE TECHNIQUES

from page 158/38

done properly has the advantage. If you hand launch, do not throw the ship into the air, merely hold the ship parallel to the ground and run into the wind. Let the ship rise out of your hand. It's that simple. Always take-off and land into the wind. Check the wind direction before you land or take-off.

With regard to landing, position yourself pretty much facing the landing direction into the wind also point the transmitter in the direction of landing. Look over your shoulder at the aircraft on approach; while easing back on the throttle keep the wing level with the ground. Go easy on the elevator, plan to land about one foot above the runway, the ship will settle these last few inches by itself. For the first few landings, do not shoot for a specific spot, just keep the wing level and let it settle the last foot, later you can work on spot landings.

In addition to practicing those techniques identified above, the following list when remembered and followed will add to your Flight Assurance.

Check List For Flight Assurance

(1) Fully charge all batteries the night before flying.

(2) Make certain your frequency is clear.

(3) Range check your radio before each flying session.

(4) Use a battery tester to check your batteries before each flight.

(5) Cycle your batteries periodically.

(6) Check all control surface movement prior to take-off (a hard landing can strip a servo gear or loosen a servo's mount).

(7) Balance and use engine manufacturer's recommended prop.

(8) Have your radio serviced

periodically (at least once a year).

(9) Have your radio serviced after a crash (there may be a damaged crystal or wire connection).

(10) Take-off and land into the wind (check for wind shift prior to landing).

(11) Stay in the pilot's seat by following the aircraft heading with the transmitter.

(12) Make it a point to learn and follow the rules for your field, club, AMA, FCC, and those for sportsman-like conduct.

(13) Avoid being in a hurry, take your time. It only takes a few seconds to recheck for a clear frequency and all those necessary items that make for flying safely, often and with success. □

RCM TRAINER 5

from page 35/32

what to do when you get out to the field.

And that's it. If this is your first R/C model aircraft, we urge you to find the help of an experienced R/C pilot to help you out in your first flights. If you find that the aircraft needs right trim to fly straight under power, then needs to be re-trimmed to neutral when the engine quits, add some right thrust — a little at a time — by putting a slightly wedge shaped piece of plywood behind the engine mount, increasing the right thrust until you correct this condition.

For detailed information about your first flights, see RCM's Flight Training Course, Volume One. Good flying. □

CAP'N DICKS COCKPIT

from page 30/29

introduce a spark model in the future." (Wouldn't that Damo be a beautiful mill for a 9' Cub? The ol' Cap'n may have to start whittl'n.)

Anyhow, Dave sent a photo of the engine, and invited me over to Midwest on one of my layovers, to test run one. Incidentally, the Damo uses not more than 5% oil in the fuel mixture — and has been run, without damage, with no oil at all — the methanol providing all the lubrication!

Al finished the props, and at midnight we broke up. Al graciously presented me with one of the 10/6's just out of the mold. I'm going to test it on my H.P. .40 powered Attacker.

Time for some ZZZZ's, as I had an early morning departure for Seattle. On one of my layovers in Seattle I'm going to call 'Dirty Dan', and see if he's taken up R/C! Ha! . . .

R/C Bradford, from Cap'n Dick's Cockpit. □

HOVER

from page 27

engine up to operating temperature. Now grit your teeth and open the throttle wide open and let it scream for 10 to 15 seconds, then richen it till you hear it slow down, then start going in slowly, a click at a time. Now once each click starts to increase rpm, keep going until the next click doesn't do anything to change the rpm. Now back the needle out one click at a time until the engine just slows down slightly. Stop right there, pull the throttle back to the idle position, and immediately set the low speed needle for the desired idle. Do the low speed needle as soon as the high speed needle has been adjusted while the engine is at operating temperature. Once you have adjusted the engine this way you can just more or less forget the engine as far as needle valve adjustments are concerned. If your engine, after being properly adjusted, acts like it's too lean or seems to need adjusting, you probably have developed a dirt problem and that's what you should start looking for and not adjusting the needle. And, if you run good clean fuel that is filtered coming out of the can and filtered again going into the engine, you probably won't have any dirt problems.

I practice what I preach and to prove it the engine in my Jet Ranger hasn't had a needle valve adjustment since last July and I fly all year round. This year I even flew the bird in Germany and never have I adjusted the needle valve nor have I felt the need to.

This above adjustment method is applicable to any carb except the Perry carb which I've commented on before.

Well that's about all for this month. Hope to see you at one of the contests this summer. Until then, keep the stick forward. □

from page 18

section of wing is flat, no dihedral.

★

Mike Reagon and his Mirage. Note elevator is hinged on right side only.

Head on of Mirage showing offset vertical fin and flat wing center section.

Scott Correa of Reedley College, dropped me a note to let me know that at times we forget the student who lives away from home and the modeling problems that they are confronted with.

"School itself can, at times, be more than one can stand, coupled with the fact that you live in a small town and the outlook gets pretty morbid. Sometimes I ask myself how I stay sane here. Very simply, my conscience answers as I edge my way to the workbench. You take the scraps of wood pinned to your desk and work minor miracles with them. If you live in a dorm, you'll soon find out what I mean. Between homework and class, who has time to hack and slash the balsa bits? We do. The poor kid who lives with our gliders. We really live with them! I have a Windrifter under the bed,

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HARDWARE & ACCESSORIES

AIRTRONICS
504 standard launch pail 24.50
505 heavy duty launch pail ... 25.75

D.J.'S TAPE
1/16" 1.60
3/32" 2.15
1/8" 2.15
1/4" 2.95
yellow,red,white,black,gold,blue, green,orange,silver

DU BRO
157 friction brake linkage ... 2.65
160 prop balancer 2.65
161 tank filter 1.04
165 flex cable (20") 1.20
191 kwik-fill fuel pump 7.69
216 kwik hinge slotter 1.75
234 ½A steerable nose gear .. 1.80

CARL GOLDBERG
HT-1 Handi tote 11.75
RG-2 Twin gear retracts 10.45
RG-3 Tri-gear retracts 17.45
RP5-1 Retract power system.. 20.99

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eng. tank mount 049/051 #2440 3.90

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Super pumper (1/2A-.15) 11.99
Super pumper (.15-.45) 14.99
Super pumper (.60-.78) 17.99
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SONIC TRONICS
220 fuel line-surgical sm. 24" .58
221 fuel line-surgical lg. 24" .63
225 fuel line-silicon sm. 24" .72
226 fuel line-silicon lg. 24" .81
231 seating tape 1/8"x3/8x36" .76
236 mounting tape 1/8"x½x36" .85
250 Mark V elect pump(2-6v) 9.35
1250 Mark V elect pump(6-12v) 9.35
251 Silicon line-pump to tank 1.50
253 Filtered fuel can pick-up 1.55
--- Power panel-solid state 19.50

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2 oz. bulb pump ..... .99
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¼" ..... .50 ½" ..... .70
¾" ..... 1.10 1" 1.40

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R/C Short or Long	8.99	.92

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"T" pins - #20 (1 oz.) 1.29
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4 oz. ..... .98
8 oz. 1.45
16 oz. (pint) 2.45
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Formula 2-45 min. work time . 2.80
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170 Tweedy Bird-19 ..... 26.80
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8	4,5,6,7	5.62	1.04
8-½	4,5,6,7	5.62	1.04
9	4,5,6,7	5.62	1.04
10	4,5,6,7	5.99	1.12
11	5,6,6W,7,7W,7½,8	6.91	1.28

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Super Maple	/doz	ea.
9 x 6	8.82	.84
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See our catalog listing for additional Zinger and Top Flite props.

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APPLICATION—1978 A.M.A. MEMBERSHIP
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Reduced Rate for Partial Year Members. AMA membership ends each year on December 31, regardless of the date a membership application is received. Late-year membership policy is as follows: those who apply between August 1 and September 30 pay the full current rate, but will receive half-year credit of the dues paid for the current year toward the next year's membership—they must, however, use this credit by July 1 of the next year; those who apply between October 1 and December 31 pay full next year's rate and receive full membership for the following year, plus whatever days of membership remain in the year of application.

SOARING

from page 163/18

a Kestral and an 11' Waco cargo glider on the ceiling, not to mention sawdust and an irate roommate.

"It does have its good points. Sometimes you build a weird looking Turkey and it flies. That gives you a real warm feeling, until you get waxed at a contest. But waxed or not we keep on building. Why? Because we love every minute of it!"

★

Good Lift. □

SUNDAY FLIER

from page 17/16

tied for Second, and Mike won the fly-off, giving him Second Place and Jerry Third.

Rich Spicer, whose beautiful new racer got my vote for best new design --- tried too hard, over-controlled, and went into the hill. But he wasn't the only one. Several others had done it previously in some of the earlier races. You have no idea how much the excitement affects your flying until you get into a slope race.

Last year, if you recall, I said that the real story of the races was in the high degree of sophistication of the designs --- Ken Kilbourne and Jerry Krainock with their high aspect ratio untapered wings; Blaine Rawdon and his variable incidence wings; Jon Lowe's design, flown by Fred Weaver to win, with the "button press" flaps for tight pylon turns. And, the fact that four out of the first five places had V-tails. (I was the only one with stab and vertical fin.)

Not so this year. Four out of the five first places had conventional stab and elevator, or flying stab and fin. Rick Walters went to the "conventional" empennage. Only Mike Mitchell stayed with the V-tail.

to page 168

NEW JUNIOR SIZE!

.35-51 SIZE F4U 1D CORSAIR

Although the size has been reduced from our popular .60 series, the quality hasn't! The addition of a .20 and .40 size series marks Royal's entrance into new dimensions in quality. For the modeler, this simply means an added convenience and dollar-savings advantage of a smaller size without compromising hand-crafted workmanship or flyability. See the JUNIOR (.40 size) and MIDI (.20 size) series at your local dealer today.

FEATURES

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SPECIFICATIONS

Engine Size	.35-.51
Wing Span	54¼ In.
Wing Area	480 Sq. In.
Fuselage Length	41¾ In.
Scale Ratio	1¾"=1'
Price	74.95

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FEATURES

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About the Product:
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- 44"x15' $32.95

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The one step instant finish
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2" spinner	1.49
2¼" spinner	1.69
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from page 166/16

So what does that tell you? Only this; low drag is important, but the parasite drag of the fuselage and empennage is secondary to the induced drag of the wing. Jerry Arana's "Grand Boss" won the prize for the best design. The airfoil is a flat bottom section, and the top curve is the same as the top of the Eppler 374. The flat bottom is curved up in the front in what is called a Phillip's entry. So what section is it, really? Who cares? It's fast --- and that's what counts. Jerry did 19.2 seconds for an average lap — the fastest recorded, for a course speed of 45 mph, which means that on the straightaway he had to be doing over 60 mph, and when added to the downwind component of the wind, he was coming in on the downwind turn at over 80 mph. But, in the fly-off with Mike, the wind was light, and Mike's wing, using the straight Eppler 274 airfoil, stayed in the "drag bucket," while Jerry had to go to a higher angle of attack, with the resulting higher drag, and couldn't quite keep up. And that's where the versatility of Mike's design paid off.

Even so, the real story of this year's races was in the quality of the flying. For instance, in one race between Jerry Arana and Rick Walters, the lead changed hands three times. Only one slight bobble by Jerry, near the end of the race, made the difference. You can't blow a single turn against Rick and win, because he just doesn't blow any!

On Saturday, the wind was up and good for racing even before the first scheduled race. It got even better as the day went on until the last few heats of the fifth round. Then, the wind was blowing 25 to 30, with gusts to 35, but parallel to the hill. Very turbulent, with very little lift to depend on. I happened to be in the last heat, and really blew the start badly --- had to go back and re-start. As I cussed myself for the lousy start, Bob Andris, who was pitting me, said, "Keep on going, they're having trouble too!" So I did. And what happened? They got caught in the turbulence and thrown into the hill. All I had to do was stay up and finish the course, and I would win. And believe me, it was a real struggle. But again, the Eppler 374 section proved itself in light lift.

On Sunday, the wind was again perfect for flying at the start, and some great races were run. Then, during the last round, the wind became very light, and everyone was taking out lead ballast so they could stay up. It almost became a survival contest — who could finish the course? But that's slope racing.

Finally, as the last heats were being flown, a light rain began to fall. When it became necessary to have a fly-off for Fourth Place, between Bill Watson, Cliff Tanaka, and me, it looked like we'd have

to toss for it. But we went ahead and flew anyway. Bob Andris, who had pitted me in all my previous races, turned the job over to Rick Walters, for the simple reason that Bob wears glasses and the rain would interfere with his vision. I had the same problem (I jokingly told one of the guys that I'd wear my goggles over my glasses so the rain wouldn't smear my glasses; you should have seen the double take). In fact, during the fly-off, I couldn't see my plane at the far end of the course, and Rick had to tell me what to do. He was my "instrument panel." And a good one; I won the fly-off.

We were all disappointed that Tony Baker, England's premier designer of slope racers, was unable to make the contest. We had his entry, and hoped to compete against him. For personal reasons he had to back out. However, his design, the "Ridge Racer" was in evidence, flown by Pat Page. But Pat ran into bad luck, with a couple of mid-airs, so the plane never really had a chance to show its potential. Maybe Tony can make it next year. But be ready for a tough contest, Tony. These guys give no quarter - - - and that includes me.

And that's the story of the greatest RCM Trophy Races that have been held in the twelve years of their existence. Everyone present agreed to that - - - and they all said - - - just like I did, "Wait until next year!"

That is except for Rick Walters.

The champ doesn't have to wait.

And he earned it. □

ENGINE CLINIC

from page 15/10

12,400 (the highest rpm I ran the engine). The sharp drop off was more than likely due to valve float commencing at the high rpm. The surprising thing was the high rpm at which the engine developed its maximum horsepower. I had expected it to be considerably lower in the 8,000-10,000 range.

With an excess of three hours of running time now on the engine, it was re-checked for rpm with the break-in prop (14/6 Top Flite) to see if there had been any further gain in rpm over the first and second hour checks. The rpm was the same.

With all of the power tests out of the way, the engine was checked for fuel economy. Three 4 ounce tanks of fuel were run through the engine for an average time of 6 minutes on 4 ounces using the 16/6 propeller. The engine was peaked and then backed off on the rich side until there was no audible spark knock and allowed to run the tank out with no further change in the needle setting.

It would have been quite interesting to have been able to run the engine with spark ignition rather than glow, where the ignition timing could be controlled. I would almost bet that even more power could have been had from the engine due to the elimination of spark knock at lean settings. Mr. Wahl says that a magneto ignition will be available for the engine and I imagine the four tapped screw holes directly behind the propeller drive washer are for mounting the magneto.

As my final test, I decided to see how the engine would perform on **no oil** fuel. One 16 ounce tank of straight methanol with 5% nitromethane was run through the engine. Although power was down a few hundred rpm, no adverse results occurred - - - frankly, much to my surprise. I was expecting the engine to seize any minute. During previous tests I had checked the cylinder head temperature and found this to be running in the 340°-360° range, depending on propeller size. Using the **no oil** fuel, the cylinder head temperature rose slightly to 380°. Normal cylinder head temperature for a .60 size two stroke engine is in the 360°-390° range so everything was perfectly normal. However, the slight drop in rpm and rise in temperature would indicate that some oil in the fuel is desirable — maybe our methanol isn't as "oily" as Swedish methanol. Even so, to run 16 ounces of fuel through an engine with no oil is something you wouldn't dare do with any of your two stroke model engines. I think one of the reasons the Damo can do this is due to a certain amount of fuel leakage past the rings into the crankcase. With no bypass action between the crankcase and combustion chamber, as in a two stroke engine, this fuel remains in the crankcase lubricating the internal parts. In fact, one of the reasons for the manufacturers recommending the use of no more than 5% oil in the fuel is to prevent excessive oil from accumulating in the crankcase causing erratic running and poor performance. The manufacturers are very emphatic about this point.

Many of you are certainly going to realize that the maximum horsepower of 1.2 developed by the Damo is not exactly earth shattering with many present day .60's exceeding this figure. However, it must be remembered that your .60's develop higher horsepower at considerably higher rpm turning a much smaller propeller - - - a prop too small to use on an aircraft of any size. Four stroke engines favor larger propellers at slower rpm.

To see how the Damo would compare with a strong running .60 on the same prop sizes, my final test was to run my own Custom K & B .61 with Perry pump and PDP modification. This is the same set-up that Peter Chinn tested some

months back in his engine reviews and found to equal or exceed many Schnuerle ported engines.

The Custom K & B .61 turned the 14/6 Top Flite 9,500 and the 16/6 Y & O 8,000 - - - almost the same as the Damo turned them. However, the 18/6 Zinger was another story. The .61 would only turn this 4,900 — 1000 slower than the Damo.

Now, although a good .60 will turn the same rpm in the 14/6 and 16/6 propeller sizes as the Damo, there is one factor that must not be overlooked. Two stroke engines inherently develop their power at higher rpm and do not like to be lugged down much below 10,000. A two stroke single cylinder engine is working its guts out trying to turn a 14/6 or 16/6 prop. The Damo four stroke is doing so with a minimum of effort. This is indicated by the low cylinder head operating temperature and its ability to run with very low oil content fuel.

With all of our running tests out of the way, the engine was disassembled for photographs. I would like to give credit to my youngest daughter Karen who handled all of the photography, developing, and printing of the pictures used with this article. Karen is a high school senior and teacher's aid for the photography class. All the pictures you see were taken after over three hours of

running time including almost 25 minutes of running time on **no oil** fuel. You will note there is hardly any detectable evidence of the engine having even been run. The shiny cylinder walls which probably will not show up in the magazine print being the only indication of running.

As mentioned at the beginning of this article the Damo 218 is of quality construction throughout and built with the precision of a Swiss watch. There are not shortcomings or substitutions for quality to cut production cost that you commonly find in many engines today.

Design-wise the engine has many unusual design features. The crankshaft, in particular, is very unique. When manufacturing a twin cylinder engine, there are several approaches that manufacturers have taken over the years. Many have used a one piece crankshaft and split the rods the same as in automotive engines. Others have

used a center disc and pressed the ends of the crank pins into this. This means slipping the rods on the pins prior to pressing the unit together. Once assembled, the rods cannot be replaced (without great difficulty). Sten Dal chose a method I have not seen in a model engine before. A center disc is used into which the ends of the crank pins slip. The ends of the crank pins have "flats" milled on them. The disc is, in turn, drilled for two pieces of round and hardened drill rod with wedge shaped ends. These wedges are retained by Allen head set screws. With the rods on the crank pins and the crank pins, in turn, slipped into the disc, the set screws are tightened creating a one piece unit. Extreme precision is used milling the flats, etc., so that tightening the set screws aligns the bearing journals and crank pins perfectly. The crankshaft, itself, is supported by no less than four ball bearings — the front portion in the conventional manner with a ball bearing at each end, and the short rear portion by two ball bearings back to back. A small gear attaches to the end of the rear section to, in turn, drive the larger cam shaft gear (see photo). The gear is "pinned" in place and retained by a large screw with left hand threads.

The crankshaft directly drives the cam shaft which is supported at both ends by caged needle bearings. For those not familiar with the term caged, there are two types of needle bearings — caged and uncaged. Caged bearings use a spacer to separate the individual needles. Uncaged bearings do not use a spacer and the individual needles rub against each other. This means that the front side of one needle is rubbing against the back side of another which is actually doubling the surface speed of the bearing needles. Needless to say, this increases friction, lubrication requirements, and hinders high speed operation. So, a caged needle bearing is far superior to one that is uncaged - - -

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from page 172/10

the main application for uncaged needle bearings being low speed applications. However, many model manufacturers have used uncaged bearings for con-rods, etc., over the years. One of the most notable being the famous Dooling .61 of the late 40's.

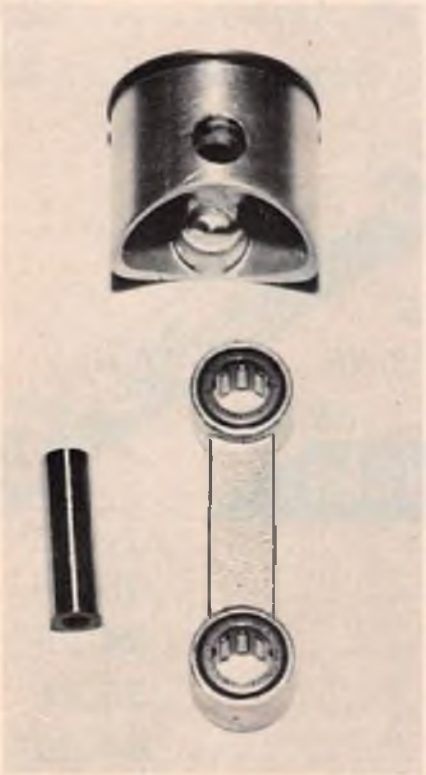
The cam shaft itself is enclosed in what might be considered a plenium chamber, or intake area, that feeds the two tubes leading to the engines intake valves. This means that the incoming fuel mixture passes over the cam shaft on its way from the carburetor to the intake valves and combustion chamber lubricating the cam bearings and lobes. One of the highest points of wear in any four stroke engine is the cam lobes and followers. Sten Dal chose another unique method of assuring ample lubrication at this high wear point.

Hardened steel cam followers ride on the cam shaft lobes actuating the hardened steel pushrods that, in turn, operate the valves. This is one point where lubrication is recommended - - - a small bit of grease at both ends of the pushrods every 30 minutes of running time. I doubt very much if fellows purchasing the engine will remember to do this at the recommended frequency as it amounts to about every two or three flights. I ran the engine three hours plus during testing with only the initial grease applied by the factory and at the end of this time there was still ample grease in the small pushrod sockets.

The valves are hardened steel and the valve guides and seats are bronze. The rocker arms are hardened steel. The rocker arms attach to the head by means of a hardened steel shaft that slips through a machined post that is part of the head. As will be noted from the photograph of the heads, there is a considerable amount of work involved in

the manufacture of just this part alone. In fact, the head alone with its valve mechanism has more work involved than many of your complete small bore engines.

The engine pistons and rings are quite conventional being machined from aluminum and cast iron respectively; the piston being what appears to be a permanent mold casting. No bushings are used in the piston as the wrist pin is a press fit and retained by snap rings at each end. The connecting rod is also a permanent mold casting and uses caged needle bearings at both ends.



The cylinder liners are made of hardened steel and slip into machined aluminum fin muffs. Rather than being retained by long screws that have a bad tendency to stretch, steel studs are used (this copying full size competition engine practice). The heads on your automobile engine are retained by bolts, however, high performance engines used for drag racing, Indianapolis, etc., use the stud method. Again, Sten Lars chose the best method. Threaded steel collars, in turn, screw over the ends of the cylinder studs securing the heads and cylinders to the crankcase.

I think that pretty much wraps up construction features of the engine. The accompanying photographs should pretty well cover any points that I have missed.

Now all of this quality does not come cheap. The suggested retail price is $650.00 which may price it out of the hands of the everyday sport flier. However, for those dedicated scale enthusiasts, this is an engine built

to page 178

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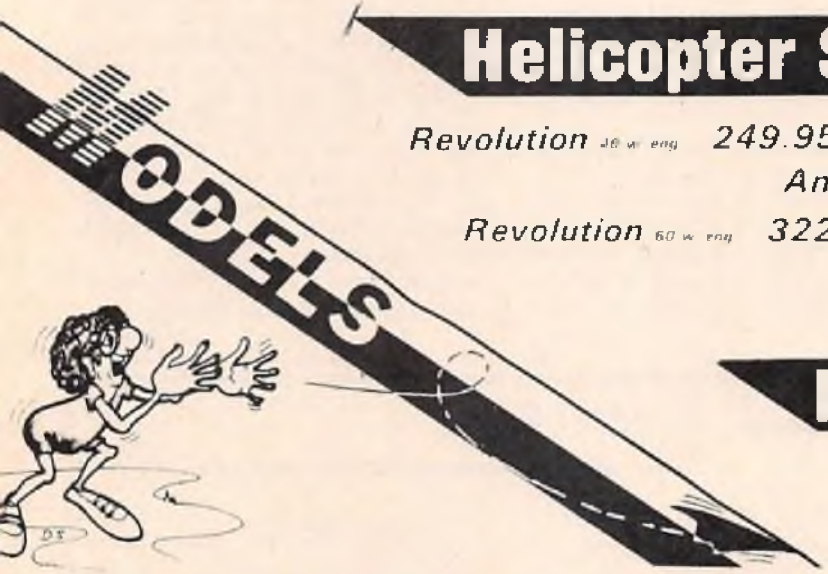

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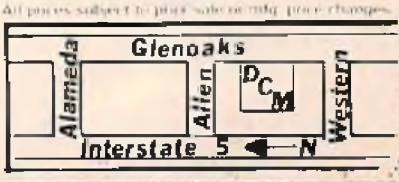

ENGINE CLINIC

from page 175/10

exactly for your needs. Over the years, I have received hundreds of letters from scale enthusiasts wanting to know when some manufacturer was going to stop catering to the pattern crowd, racing crowd, etc., and market an engine strictly for those interested in scale models. Few manufacturers could afford to do this as the market potential is pretty limited.

Engine manufacturers have to think in terms of tens of thousands in order to justify initial tooling costs, etc. The manufacturers of the Damo 218 are producing the engine on a limited run basis — hence the selling price. According to Mr. Wahl the Damo 218 is only the first in a line of specialized engines. A marine version will be available and development is underway on an inline 4.

Although the Damo 218 in intended for the 1/4-1/3 scale models, it is not in the same power category as some of the larger converted utility engines such as the Quadra, Roper, etc. So, don't expect to stick the engine in a Bud Nosen P-51 and tear around the sky. The engine lends itself more to the J-3 Cub type aircraft where both scale appearance and sound are desirable.

At a weight of 24.5 ounces (erroneously listed at 19 ounces by the manufacturer) the engine is not too heavy to be used in many .60 size scale models. Being of four stroke design, the engine makes more of a muffled roar than the high pitch whine of a single cylinder two stroke engine. With mufflers it would be almost inaudible. Mufflers are available for the Damo, although I did not receive them with the engine. To further quiet the engine during the initial break-in, I fabricated a 5/8" diameter manifold connecting the two exhaust pipes. From the manifold, I used a single 1/2" diameter exit pipe. The idea was that I could, in turn, then connect a single muffler. However, the muffler was not necessary as the manifold itself further quieted the engine to the point where it was barely audible 50 feet from the engine. In fact, propeller noise with an 18/6 was louder than the exhaust noise. An interesting fact was that the manifold was good for an increase in rpm of 300-400. I checked engine rpm to see how much loss would be incurred with the manifold and was surprised to find it gave an increase. Whether this was due to a slight tuning effect, or the engine found slight back pressure beneficial, I do not know. All power checks, however, were made without the manifold.

to page 180

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ENGINE CLINIC

from page 178/10

So, to wrap it up guys, the main selling features of the Damo 218 are extremely quiet operation, scale appearance and sound, a minimum amount of oil in the fuel required which means no more mess on the airplane, very low vibration, and a high quality piece of machinery.

I understand that Jerry Nelson at Nelson Model Products, 6929 West 59th Street, Chicago, Illinois 60638, will be the U.S. importer of the engine, so replacement parts and repair service will be available in this country. □

CUNNINGHAM ON RC

from page 7

making the logical location of the control horn on the bottom of the elevator. Good pushrod building generally prevents the bowing problem, but the Biggies present quite a larger load.

There are several ways to compensate for this. First, you can use a normal pushrod set-up, but install a bracing system throughout the fuselage. This still may allow the rod assembly to flex - - - and, you must build this in while the bird is under construction. Second, you can locate the servos toward the rear of the aircraft, using "extension" cords to connect the servos to the receiver. This will allow you to use much shorter pushrods and this, in itself, will eliminate a great amount of bowing. Next, you can mount the control horn on the top of the elevator so that the pushrod is angled down through the horizontal stab and fuselage. Always avoid right angle bends in the pushrod. This gives you the positive "pull" on the elevator which then has no bowing problem. The fourth method is to use cables just as are used on full scale aircraft. This method can be a bit more difficult to hook up, and more difficult to adjust than the single pushrod, but may, in the long run, give you a more positive control of the elevator. Perhaps a combination of cables and short pushrods would be the simple answer.

The elevator is the biggest problem because it can get you into or out of trouble so quickly. Aileron connections, using two servos, can pretty well solve the problem; Jerry Smith showed a simple and neat installation in his Here's How column a couple of months ago. (Even though you don't need two aileron servos on the Lazy Ace, Jerry.) I'm going to use Jerry's method on my new bird.

Another place to consider control questions and problems is in the tail wheel connection to the rudder. On most R/C aircraft, this is a pretty simple hook up, but as the aircraft become larger it is

more necessary to protect the rudder servo from hard landing shocks, as well as having the tail wheel swing in a much smaller arc than the rudder swings. This can be accomplished by studying full scale tail wheel fittings, noticing the springs used both to dampen the rudder swings, and to dampen the landing loads. One servo is certainly enough muscle for the rudder, but protect this servo from tail wheel problems. And, if you swing the tail wheel in a much smaller arc, the take-off problems will be much less, due to this smaller off set. As I have said so many times before, the secret to making successful take-offs, with a tail dragger, is to get the horizontal stab up to flying attitude as quickly as possible.

There is no better way to gain an introduction into Big R/C aircraft than by building and flying a seven or eight foot antique cabin model. Not only is it fun to fly, but also gets you thinking big!

And, speaking of thinking big, this is the last chance that I will have to remind you to come to Fort Worth, Texas, for the First Annual Southwestern Jumbo RC Fly In. This great "Happening" will be held July 22-23, at Thunderbird Field, on the shores of Lake Benbrook, just west of Fort Worth. Any big aircraft is eligible to participate. No competition, just a get together to see what the other guy has built, how he has done it, and what his next project will be. You can bring a Quarter Scale, a Semi-scale Biggie, an Antique, a large glider, a half finished, or a fully completed model. The only requirements are that a monoplane must have a wing span greater than 80" and a bipe must span greater than 66". After that, you're on your own. Strict frequency control will be maintained. This Fly In is hosted by the Fort Worth Thunderbirds and sponsored by Skymaster Industries. So, mark your calendar and be at the T-bird Field July 22-23. Write to me at 2440 Colonial Parkway for a map and any other further details.

As I said previously, control systems are the secret to long and happy hours of flying from 1/2A aircraft to 1/4 or 1/2 size aircraft. Make sure that you do a good job here, and you'll go a long way towards having many happy hours in the air. □

FROM THE SHOP

from page 2

The other variation of the turn is one in which the airplane yaws through 540 degrees instead of the usual 180 degrees. It's somewhat on the order of the Lomchevak in that once the airplane is correctly entered into the maneuver the pilot need only stand and watch.

to page 183

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from page 181/2

My current aircraft is a German model called a Mini-Flipper. It's a low winged, 54" span, fiberglass and foam, 7 pound craft powered by one of Clarence's finest .61's. I discovered it would perform the 540 degree stall turn quite by accident but since then have been able to repeat the maneuver on a sometime basis. The best entry seems to be similar to the regular stall turn entry except that the rudder is used during the last slow part of the climb on a left-right-left basis (for a left turn) timed to coincide with the natural yaw oscillation frequency of the aircraft. The aircraft will yaw to the left, more strongly to the right, and very strongly to the left and, if the final left hand yaw is done just before the aircraft stops, power is kept full on, and you cross your fingers. The ship can be made to yaw the full 540 degrees, the plane of the yaw remaining in the plane of the turn, just as the usual 180 degree yaw is supposed too. The maneuver is very pretty if performed correctly. Hope some of your readers will give this maneuver a try. I'd like to know of an aircraft and a technique that will work every time.

Sincerely,
Darrell

•

Walter Nutini, president of The Aeromodeling Brasilian Association, sends us the following letter and photos telling about their RC demonstrations in front of 140,000 spectators!

Dear Mr. Dewey,

The Aeromodeling Brasilian Association have presented some aeromodelism shows during the recesses of the plays of the Foot-ball Brazilian Championships.

The team that participates in these shows is called "Esquadrilha Senta Pua". They dress in black and orange uniforms and perform exhibitions in U-Control, R/C Acrobacy, and R/C Helicopters.

Enclosed are some photos which were taken during the aeromodelism exhibit at the foot-ball match day between "Corinthians Athletic Club" and "Ponte Preta Athletic Association"

when there were about 140,000 spectators in Morumby Stadium, in S. Paulo.

Thank you for letting me tell about some of the news of the "Esquadriha Senta Pua".

Sincerely,
Walter Nutini
President

•

The following letter tells about a reader who read one of our feature articles and went on to experiment and enjoy the results.

I am enclosing two photographs which are self-explanatory. The idea was obtained from your February 1976 RCM and both the aeroplane and the parachutist were made by my son Rego Burger, age 15 years. He is seen on the left of the photo and the friend is Mr. Sidny Endenman, also of the Port

Elizabeth Radio Flyers. The plane nicknamed the "Coffin" is powered by a Webra .61 Speed and weighs 9½ lbs., with the parachutist. We have had successful jumps and all that remains is practice in judging wind and height for successful controlling. We have tried both types of chutes and have given preference to the old circular type. We

will, however, continue to practice with both types of chutes. If there are any other young lads who would wish to write to us, please print our address. We promise to reply to any letter received.

Yours faithfully,
G. Burger
10 Gladstone St.
Port Elizabeth
South Africa

•

Wolfang Jung of Pforzheim,

Germany, sends us these photos and specifications of two interesting models — the Caravelle (Air France) and an Airbus (prototype).

The specs for the Caravelle are: Wing span: 3,55 m; Fuselage length: 3,31 m; Height: 0,83 m; Weight: 11,5 kg; Motor: Hirtenberger 10 ccm, 2 pcs, HP .61; Working hours: Approximately 500 hours. He uses a Multiplex Royal with 8 pcs servos.

The Airbus specs are: Wing span: 3,20 m; Fuselage length: 3,31 m; Height; 0,90 m; Weight: 14 kg; Motor: Hirtenberger 10 ccm, 2 pcs, HP .61; Working hours: Approximately 700 hours. It has retract landing gear and a Multiplex Professional radio control with 10 pcs servos.

Our thanks to Mr. Jung for sharing these interesting and exciting models with us.

•

We are aware that many of our subscribers have been receiving their copies of RCM in less than ideal conditions. Several months ago our mailer notified us that their wrapping machine was no longer working and they could not replace it — since RCM was their only customer willing to pay the extra costs involved in having their subscription copies wrapped.

Therefore, we have now made arrangements with our mailer and envelope supplier to have all subscriber's copies put in an envelope. We will be able to do this starting with the September issue for all subscribers who desire this service.

Since we feel it would be unfair to increase the subscription rate to all subscribers, whether they want their copy of RCM in an envelope or not — we have decided, instead, to let each subscriber choose for himself.

If you want your copy in an envelope the cost will be $3.00 per year or .25¢ per issue.

Simply send .25¢ multiplied by the number of issues you currently have left on your subscription. You will find your expiration date on your mailing label. Example: John Doe 7-79 — expiration date is July 1979. Therefore, .25¢ x 11 (September 1978 issue to July 1979 issue) would equal $2.75. Mr. Doe has only to remit $2.75 and the coupon on page 187 of this issue and he will start receiving RCM in an envelope.

We hope this will help alleviate the difficulties so many of you have been experiencing in regards to torn and mangled issues. This is our actual cost on envelopes, postage, and handling charges. Just let us know as soon as possible so we will be able to put your RCM in a sturdy envelope.

(. . . Okay, all you guys in Toledo – I told you I was listening! – Pat Crews.)

•

See you next month. Good flying. □

RCM PRODUCTS

RCM WING JIG II — PRICE: $34.50

The original RCM Wing Jig, first published in the August 1967 issue of this magazine made it possible for many modelers to build their airplane wings warp-free and in far less time than it had previously taken. The RCM Wing Jig II offers many design improvements on the original version that greatly extends both its versatility and the accuracy of the wings produced. It is now used exclusively in the RCM shop for all building projects.

Since the accuracy of the jig depends almost completely on precise fabrication and fit of the parts, RCM has made arrangements to have a limited quantity of these Wing Jigs manufactured which are now available through the RCM Product Division.

The RCM Wing Jig II consists of two sections hinged in the middle. Each section consists of a front and back "L" shaped base piece. A jig rod support is located at either end of each wing jig section to mount the rods that support the wing ribs.

The switch to a double length jig that's hinged in the middle makes it possible to build an entire wing, complete with the dihedral called for in the plans, in one operation. Or, the Wing Jig II can be set up flat to use both sections to build up a wing panel for one of those big powered or glider jobs. Or, with the dihedral set, a polyhedral wing can be accurately built. It can even be used to join foam wing halves to get the dihedral as it should be.

A uniquely designed rod and support makes it possible to true the wing jig rods to order. A simple protractor device makes it possible to set the dihedral even when it is given in degrees. The addition of adjustable end legs make it possible to set the dihedral accurately for each wing panel. New "L" shaped base pieces assure a warp free jig to start with. A yardstick attached to the front of the base pieces helps in spacing the ribs when the wing is set up on the jig. A bubble leveling arrangement assures both wing panels will be true to each other. A new design rod support makes it possible to move the two wing jig rods from as close as you'd want them to 6½" apart. And, a new technique makes it possible to build those small cord wings with ribs too narrow for two wing jig rod holes.

To use the Wing Jig, holes are drilled in the wing ribs, the proper dihedral is set on the jig, and, the ribs are slid onto the wing jig rods. The rods are aligned and clamped down, the ribs are properly spaced, and, the spars, leading and trailing edge and top sheeting is glued in place. The wing is removed from the jig and the bottom sheeting is glued in place. Finally, glass cloth and resin is applied to the center section, and, the wing tips are installed.

That's it, the RCM Wing Jig II — the most versatile, easy to use and convenient wing jig ever designed. Assembly time is approximately one hour and you'll be ready to build your next wing faster and with more accuracy than you ever dreamed possible. **This is the only Wing Jig endorsed and manufactured by RCM.**

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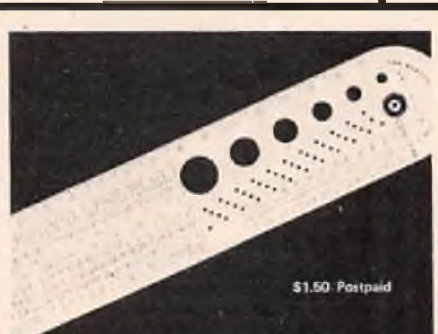

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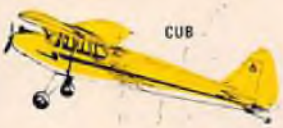

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20-S (shoulder wing)	29.95	21.95
15-H (high wing)	22.95	16.00
Box Fly-19-25	34.95	27.00
Box Fly Jr.	24.95	18.95
Miss World	49.95	36.00
Mr. Mulligan	47.95	35.95
WE Cub	39.95	29.00
WE Champ	39.95	29.00
Lil John (low wing)	59.95	47.00

KITS

Indy's Special Low Prices

MK

Spirit St. Louis	98.50	73.50
Zero	54.95	42.95
Mattlas 40	54.95	42.95
Mottlas 20	43.98	34.99
Curare 40	79.95	63.00
Curare 60	98.50	79.00
Blue Angel Jr.	54.95	42.95
Happy 20 S	29.95	23.95
Astro 20	45.00	35.50

MIDWEST

MIDWEST MODELS

Lil T. Glider	26.95	21.00
Tri Squire	29.95	23.50
Lil T. Squire	22.95	17.90
Pitts Spec.	94.95	74.00
Cardinal Squire	84.95	66.00
Strikemaster	69.95	54.50
Cessna Cardinal	29.95	23.50
Mach I	94.95	74.00
Das Lil Stick	32.95	25.70
Sweet Stik	39.95	29.00
Chipmunk	29.95	23.50
Attacker	39.95	29.00
New Hawk Glider	139.95	104.00
Silent Squire	39.95	29.00

SUD NOSEN MODELS

¼A Aeronca Champ	99.95	84.00
Cessna 310	169.95	135.96
Citabria	99.95	84.00
Gere Sport	129.95	110.00
Jenny	129.95	110.00
Mr. Mulligan	139.95	112.00
J-3 Cub	119.95	95.99
Trainer	79.95	65.00

SIG

Super Sport	19.96	15.95
Klipper	20.95	16.75
S. Chipmunk	59.95	46.00
Sig P-51	57.95	45.00
Kadet	34.95	27.95
Komsander	39.95	31.00
Kougar	44.95	35.75
Smith Mini plane	49.95	39.95
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Yak 18	73.50	59.00
Citabria	57.95	45.00
Liberty Sport	64.95	51.50
Ryan STA	73.50	59.00
Clipd Wing Cub	39.95	31.00
Skybolt	62.50	49.95
Piper J-3	39.95	31.00
Doubler II	24.95	19.95
Cessna 150	69.95	55.00
Minnow	27.95	22.25

INDY ENGINES

CIPALLO

.09 R/C	18.95	14.93
.09 Throttle	3.50	2.98

MILLS

0.75 Diesel	19.95	15.95
1.3 Diesel	28.95	19.95

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COMO

COMO 40 R/C w/muffler & S.T. Carb 59.95 43.50

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OS 10 Sch	37.95	29.00
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OS 60 RSR	139.95	108.
OS 65 RSR	142.95	110.
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60 RSR	136.50	105.00
65 RSR	142.95	110.00
40 SR RV	82.95	64.00
10 FSR-S	23.95	18.00
10 FSR RC	30.95	23.50
15 STD	31.95	24.50
15 RC	37.95	29.00
20 STD	32.95	25.00
20 RC	39.95	30.50
25 STD	34.95	26.90
25 RC	41.95	32.00
25 FSR STD.	51.95	40.00
25 FSR RC	57.95	44.50
30 STD	42.95	33.00
30 RC	47.95	37.00
35 STD	43.95	33.50
35 RC	49.95	38.50
40 STD	59.95	46.00
40 RC	72.50	55.97
45-H	94.95	73.00
45 FSR RC	99.95	77.00
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60 FSR RC	119.95	92.00
60 FSR RC W/Petry Pump & Carb	149.95	115.00
WANKEL	109.95	84.50
60 FS	199.95	139.95
OS 36	117.50	90.00

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X-15 RC	59.95	48.00
X-21 RC Sch.	69.95	54.00
X-21 FI RC Car.	74.95	57.
23 STD	36.95	28.00
*35 STD	39.95	30.50
*35 RC	47.95	37.00
G21/35 STD.	53.50	41.30
G21/35 RC	59.95	46.00
X-40 ABC Sch. W/Rear Valve	81.95	63.00
G60 FI PP	90.95	70.00
G60 ABC RC	99.95	77.00
X-45 FI RC W/Rear Exhaust	83.00	64.00
G60 BH W/Pump & Carb	112.95	87.00
G60 ABC W/Pump & Carb	121.95	94.00
X-60 FI SP.	125.00	99.95

* Denotes Combat with PP

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G71 RC	105.95	81.00
60 FI BB RC	74.95	57.00
23 RC	53.95	41.50
46 RC	68.95	53.00

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	List	Indy
Veco 19 std	40.	29.00
Veco 19 R/C	47.	33.00
K&B 35 pln. br.	30.	21.00
K&B 40 R/C	62.	44.00
K&B 3.5 R/C w/muffler	67.	47.00
K&B 3.5 inboard marine	69.	49.00
K&B 4.9 FR std	95.	66.00
K&B 5.8 FR std	95.	66.00
K&B 6.5 RSH	92.	64.00
K&B 3.5 Quibrd	99.	69.00
K&B 61 R/C	85.	59.00

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	List	Indy
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Square Soar	24.95	19.00
Cadet	36.95	28.00
Questor	34.95	26.50
Grand Espirit	129.95	95.00
Super Questor	39.95	30.50
Aquila	69.95	54.00
Olympic 11	49.95	36.95

ACE

Pacer	19.95	15.50
Dicks Dream	11.95	9.95
Ace High	19.95	15.50
Up Start	17.95	13.75
All Star	24.95	19.95
Whizard	18.95	14.75
Mach None	19.95	15.95

TRAINMASTER

ANDREWS

S-Ray	34.95	27.95
A-Ray	44.95	35.95
H-Ray	39.95	31.95
Sportmaster	69.95	55.95
Mini Mester	44.95	35.95
Trainmaster	52.95	42.95
Aeromaster Too	74.95	59.95

ASTRO FLIGHT

Electra Fly	24.95	17.96
Bushmaster	44.95	33.75
Fournier RF/A	44.95	33.75
Malibu	29.95	22.50
Monterey	39.95	29.95

DIRTY BIRDY

BRIDI

	List	Indy
Shrike	184.95	129.99
Brown Racer	134.95	102.00
Chipmunk	124.95	93.00
Dirty Birdy (balsa)	84.95	63.95
Dirty Birdy 40	59.95	45.99
Tweedy Birdy	43.95	34.50
Sportster	39.95	31.00
Trainer 10	27.95	21.50
Trainer 20	34.95	27.00
Trainer 40	54.95	42.00
Trainer 60	62.95	49.00
Basic Trainer	39.95	31.00
15-600	39.95	31.00
Sun Fli 4-20	29.95	23.00
Quickest 200	24.95	19.00
Quickest 500	42.95	33.00
Super Kaos 40	55.95	43.00
Super Kaos 60	69.96	54.00
Kaos	66.95	52.00
Sirius Lockheed	134.95	102.00

KITS
Indy's Special Low Prices

CASS ENGINEERING

	List	Indy
Pulsar Bige	95.00	79.95

CRAFT AIR

Windrifter	44.95	33.75
Sadaire	129.95	97.50
SD-100	59.95	44.95
Buehl Pup	34.95	25.50

GMC MODELS

½A Corsair	31.95	23.95
½A Zero	31.95	23.95

SR' FALCON

GOLDBERG MODELS

Ranger ARF	23.95	19.00
Sr. Falcon	59.95	47.95
Falcon 56 MKII	39.95	28.50
Skylane 62	59.95	47.95
Jr. Falcon R/C	13.95	11.00
½ A Skylane	15.95	12.95
Jr. Skylark	14.95	11.95

HOUSE OF BALSA

Miss Data	39.95	27.09
Pietenpol	49.95	39.95
¾A Pietenpol	22.95	17.99
P-51	27.95	21.95
ME-109	27.95	21.95
P-39	27.95	21.95
Chipmunk	27.95	21.95
P-47	29.95	23.99
FW-190A	29.95	23.99

LANIER MODELS

Jester II	73.50	51.50
Invader	84.50	59.00
Scamp	52.50	36.75
Comet II	58.50	40.95
Cessna	46.50	32.75
Pinto	46.50	32.75

MARKS MODELS

Sunny (Bipe)	32.95	24.75
Windward	32.95	24.75
Windfree	44.95	35.00
Wanderer	19.95	15.95
Buschwacker	44.95	35.00

MILE HIGH MODELS

Joy Stick	18.95	14.99
Super Joy Stick	36.95	25.95

GLUE & FILM

ADHESIVES

	List	Indy
Willhold R/C 56	1.50	1.25
GMP Styro Stik	2.30	2.00
Hobby Poxy II	4.00	2.99
Hobby Poxy IV	2.00	1.75
Willhold Aliphatic	1.80	1.50
GMP 6 mn. Epoxy	5.95	4.75
GMP ½ fast	5.50	3.75
Devcon 5 mn. lg.	2.50	1.85
Devcon 5 mn. sm.	1.35	1.00
Devcon 5 mn. 9oz.	5.80	3.99
Devcon slo cure	5.80	3.99
Hot stuff	3.50	2.40
Blue Line H.S.	4.95	3.50
Giant Zap	3.50	2.40
X-30 Adhesive	3.25	2.40
Ambroid 4 oz.	1.25	1.10
Ambroid ¼ oz.	.65	.55
Super Cement	.75	.65
Blue Goo	2.95	2.59
Glaskote ½pt	2.95	2.75
Glaskote Thinner	2.55	2.25

COVERING MATERIAL
INDY SILK

1 yd. pkg.	3.25	2.75
2 yd. pkg.	6.50	5.00

COVERITE

Super 38 x 47	7.75	6.20
Silkspan	7.75	6.20
Permagloss	9.10	7.25
Day-glo permagloss orange, yellow, olive drab & aluminum	9.95	7.95
Camouflage 1½ and 2" scale	9.95	7.25
Balsarite ½ pt	2.95	2.75

MONOKOTE

Opaque	9.00	5.50
Transparents	9.00	5.50
Metallic	10.50	7.00
plain trim sheets	1.19	1.10
Checkerboard trim	1.59	1.50

SOLARFILM

Opaque	7.80	5.00
Transparent	9.00	6.50
Metallic	10.00	7.00

MIDWEST

MicroLon	1.95	1.75

BUTY - FLEX DOPE
22 Colors

Quarts - colors	5.95
Quarts - clear	4.95
Gallons - clear	10.95
Gallons - thinner	6.75

GLIDER ACCESSORIES
AIRTRONICS

Std. launch pail	34.95	27.99
HD launch pail	36.95	28.00

CRAFT AIR

Del. Hi Start	39.95	31.00
Std Hi Start	34.95	25.00
Super HD Hi	59.95	42.00
Para Pod	09.95	07.00

ASTRO-FLITE

HD Hi-Start (real heavy duty)	41.95	31.95
Astro-start	39.95	31.00

BOATS & CARS

JEROBEE CARS

CARS WITH RADIOS

MK-8B	177.50	142.00
Challenger	187.50	150.00
Alfa	226.95	181.00
Vette	215.95	172.00

CARS LESS RADIO

MK-8B	55.00	44.00
Challenger	65.00	52.00
Alfa	87.50	70.00
Vette	87.50	67.00

CARS LESS RADIO AND ENGINE

MK-8B	27.00	21.50
Challenger	32.00	25.50
Vette	50.00	40.00

JEROBEE – BODIES

MK-8B Body	7.95	6.50
Porsche	4.95	4.00
VW Bug Body	12.95	10.50
Vette Body	12.95	10.50

ACCESSORIES

Tank heat sink	2.50
wing with decals	2.95
brake kit	1.95
remote tank kit	2.95
Aluminum flywheel	2.95
mount for Tee Dee	6.95
Bumper	2.49
Chassis Frame	3.95
Lexan Chassis frame	7.95
Starter Rebuild kit	1.69
Eng. rebuild kit	7.55
Rear Axle kit	1.49
Clutch shoes	.98
drive shaft w/ret	.89

HUGHEY

	List	Indy
20 Rigger	100.00	85.00
40 Rigger	110.00	93.50
19 Hydro	77.00	67.00

SAIL BOATS

Blue Sonic 900	129.95
Indy special	$99.95

PUMPS STARTERS

STARTERS

Std. Sullivan	36.95	26.99
Del. Sullivan	39.95	28.99
Sonic Tronic	38.50	27.00
Kavan	45.00	32.00
Astro-¾A	16.95	13.50

FUEL PUMPS

Sonic Tronics MK II Electric	14.95	11.75

HAND PUMPS

Du-Bro	10.95	8.50
Six Shooter	10.95	8.50

HELICOPTERS

DUBRO	List	Indy
Shark 60	325.00	275.00
Tri-Star	229.95	189.00

ACCESSORIES

Conversion kit	75.00
Update Kit	34.95
Blade Set	15.00
Tri-Star Blades	12.00
Alum. paddles	10.00
Flybar	6.00

KAVAN

Bell Jet	400.00	320.00
Alouette II	200.00	175.00

ACCESSORIES

Instrument panel	12.00
T.R. blades	3.00
Reg. main blades	18.00
Expert main blades	19.95
Nylon tail cone	5.95
Comp. window set	20.00
window channel	2.95

RETRACTS
ROM – AIR

2 gear mains	85.00	57.75
3 gr. firewall	114.00	79.95
3 gr. belly	114.00	79.95
pressure gauge		13.50
Fremo		2.75
1¼ oz. Oil		1.65
line coupler		1.90
quick disconnect		2.00

GOLDBERG

2 Gear	14.95	10.50
3 gear	24.95	17.50

POWER PANELS
DAE

Dual range	24.95	18.00
Mini panel	15.95	11.00
Series IV	34.95	24.95
Std. panel	18.95	14.95

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Colorado Springs, Co. 80907
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Maitland, Fl. 32751
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6125 Roswell Road, N.E.
Atlanta, Ga. 30328
ph. 404-255-9033

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Rt 4, Teamon Road
Griffin, Ga. 30223
ph. 404-227-8015

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ph. 712-276-7085

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Oberlin, Ks. 67749
ph. 913-475-2624

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Wichita, Ks. 67211
ph. 316-681-2941

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ph. 313-982-1237

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Howell, MI 48843
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John's Radio & T'V Ctr.
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Bayshore, Mi. 49711

The Hobby Shop
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Niles, Mi. 49120

U.P. Model Air
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Iron River, Mi. 49935

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Portage, MI 49082
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MINNESOTA
Mac's Models, Inc.
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ph. 612-489-6060

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Route 1
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ph. 601-234-2475

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Tupelo, Ms. 38801
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Fairfield, N.J. 07006
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ph. 315-393-2580

King Arthur Ceramics & Hobbies, Co. Bridge Rd.
Hudson Falls, NY 12839
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Ray's Hobby Supplies
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Uniondale, NY 11553
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Raleigh, NC 27606
ph. 919-851-4492

Thornton's Hobbies
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Four Oaks, NC 27524

Edros Hobbies
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Northport Shopping Ctr.
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Grand Forks, ND 58201
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Dickinson, ND 58601
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ph. 216-826-3088

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Columbus, Oh. 43229

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ph. 419-385-8739

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507 E. North Street
Prospect, Oh. 43342
ph. 614-494-2110

Lima Radio Control Spls.
307 N. Cole Street
Lima, Oh. 45805
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Paul's Hobbies
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Lucasville, Oh. 45648
ph. 614-259-5298

S & M Print Shop
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Amsterdam, Oh. 43903
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The Model Hanger
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Mansfield, Oh 44902
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Xenia, Oh. 45385
ph. 513-376-9928

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Crabtree, Or. 97335

Chazem's Enterprises
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Salem, Or. 97303
ph. 503-581-5276

The Hobby Shack
1008 S. Main
Milton-Freewater, OR 97862
Ph: 938-7229

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Portland, Or. 97219
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Great Sthrn. Shopping Ctr.
Bridgeville, Pa. 15017
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H & S Sales & Service
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Indiana, Pa. 15701
ph. 412-463-8191

Laurel Shop
175 Main Street
Brockville, Pa. 15825

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Washington, Pa. 15301
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Walterboro, SC 29488
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Plainview, Tx. 79072
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San Antonio, Tx. 78228
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Borger, Tx. 79007
ph. 273-7037

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Kilowatt Kage, Inc.
Waterlick Plaza
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Bill's Hobby Town
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Kitsap Hobby Supply
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Poulsbo, Wa. 98370
ph. 206-779-7676

Hobby World, Inc.
70 Front St.
Issaquah, WA 98027

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Wenatchee, Wa. 98801
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Smithville, WV 26178

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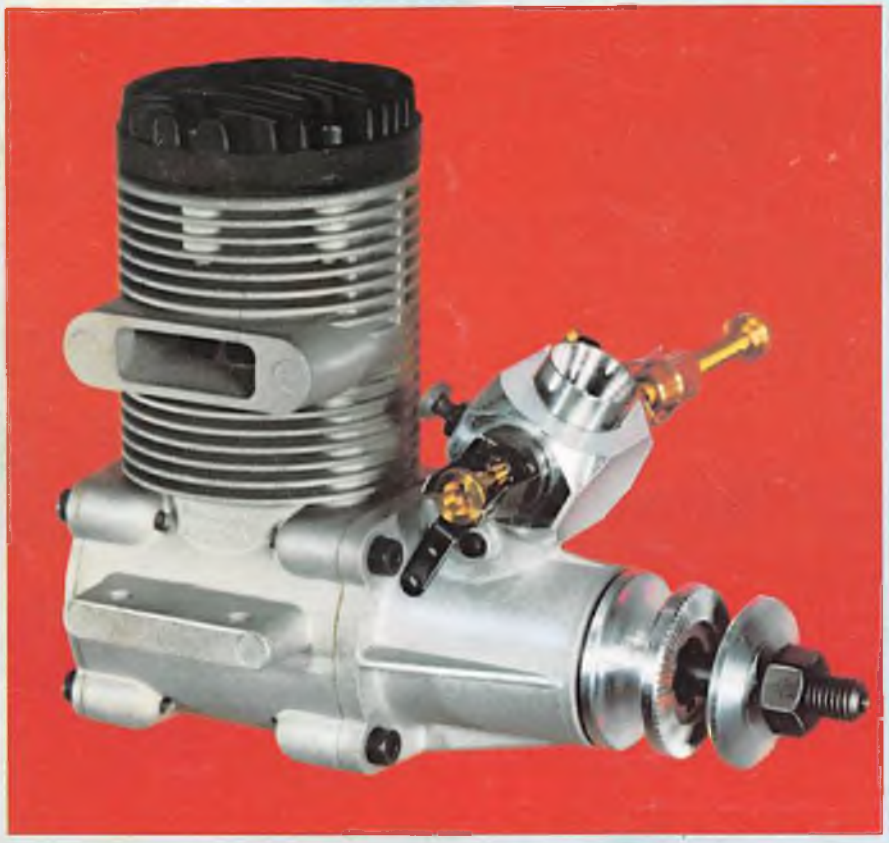

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