49115 APRIL 1978 $1.50

RCM radio control MODELER

THE WORLDS LEADING PUBLICATION FOR THE RADIO CONTROL ENTHUSIAST

Featured This Month:
ALMOST A FAIRCHILD

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When the elite of the radio control car racing fraternity gathered at Thorp Raceway for the first World Championships, Butch Kroells rolled to a convincing win with his works Associated RC100. Butch had the hot combination that day with his steady driving, his trusty Futaba FP-2F and his rocket-fast, 1:8 scale 917/30KL.

It came as no surprise that Butch teamed up with Futaba for his biggest ever win...Futaba systems have been in the winner's circle on the RC car circuit for years.

The reason? Simple, the traditional blend of reliability and craftsmanship of the 2F has made it the favorite of racers the world over. And, of course, our rugged S7 servos are built to take even the abuse of competition driving.

The Kroells Worldbeater.

The FP-2F system includes two S7 servos and a double-tuned, RF amplified receiver.

Congratulations, Butch! And thanks for keeping Futaba first.

Futaba

Butch Kroells: World RC Car Champion.

Futaba Industries, U.S.A./630 W. Carob Street/Compton, CA/90220

VOLUME 15 1978 NUMBER 4

RCM MODELER

FEATURES

This Month's Cover
features Bob Lobshire's framed up Fairchild-24 with almost an 8' wing span and the completed version being toasted by Miss Wendy Birnbaum. A complete construction article on the Fairchild-24 is included in this issue beginning on page 50. Ektachrome transparencies by Bob Lopshire.

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APRIL

From The SHOP

DON DEWEY

From W.H. Sears of the Denver R/C Eagles, comes the following letter. (It also bore the signatures of the entire membership of the R/C Eagles Club):

Dear Mr. Dewey,

We members of the Denver R/C Eagles, and fans of the AFC Champion Denver Broncos, would like to remind you of the content of your "From The Shop" column of July 1977.

The Broncos made it to the Super Bowl, even though we lost, while the Rams stayed home and watched on TV.

Therefore, we shall read with great interest the story of how Jack Youngblood learned how to fly that Squirrely whirlybird, while you were wearing out numerous pencils writing "I am a hacker" 100 times to appear in your column.

Smugly,
W.H. Sears, Jr.

I always (most always) keep my promises. Since the Super Bowl is over and Ken Willard has agreed to become the Rams tackling dummy, I'll hold up my end of the bargain: "I am a Hacker . . . " (100 times).

●

Our thanks to MSGT Richard Mills who is with the U.S. Air Force stationed on Guam. Dick sent us the following article from the "Tropic Topics", the Anderson Air Force Base newspaper. It is on the subject of possible eye damage caused by the hardener used in fiberglass resin and should be of interest to all modelers.

HARDENING AGENTS IN FIBERGLASS CAUSE PERMANENT EYE DAMAGE

By Eddie Gamble
Chief, Ground Safety

At a Safety Conference held in Vancouver, B.C., an eye specialist described a hazard that could affect each of you and your families. That hazard is the catalyst or hardener that is added to fiberglass resin before the resin is applied.

The eye specialist stated that a drop of this catalyst in the eye will progressively destroy the tissue of the eye and result in blindness, unless immediate action is taken (within four seconds) to wash the catalyst from the eye.

Furthermore, once the chemical has started to destroy the eye, there is no known way of stopping the destruction or repairing the damage. The specific toxic agent involved is Methyl Ethyl Ketone Peroxide (MEKP).

Catalyst users should wear protective glasses and have immediately available a source of bland fluid (such as water) for thorough washing of ocular tissues.

The hazard associated with fiberglass resin was previously unknown to those attending the conference. Although many had used fiberglass resin at home or work, the hazard may be unknown to you also, and to your spouse and children who may use a similar kind of resin and catalyst when working with fiberglass or hardener used in liquid casting plastic.

Before using any of these catalysts, check their chemical composition and take appropriate measures. The cost of a pair of safety goggles is a very small price to pay for the protection of eyesight.

●

The next letter will be of interest to you "scale buffs".

Dear Don:

As a long time fan and mutual lover of flying machines, I thought I would pass on a thought that may help some of our fellow builders. I am a member of the Jepsen Book Club and I believe the most recent selection to be rather special. It covers every U.S. Fighter from 1925 through 1980 (Curtis P-16 through the YF-17), and most have a complete 3-view with scale and one or more actual photos. Admittedly they, in some cases, may be difficult to build from, but I think it depends on the skill and dedication of the builder.

The book is titled "U.S. Fighters", by Lloyd S. Jones, 1975, and is available from Aero Publishers, Inc., 329 West Aviation Road, Fallbrook, California 92028.

Sincerely,
Donald G. Plummer
San Antonio, Texas

●

In regard to the article "The Stow'n Go", by Mike Corbett, which was published in the January 1978 issue, please note the following additional information sent to us by the author:

(1) The text says "cut the required thickness off the bottom of Part A". Nothing should be cut from the bottom of this part. It should read " . . . Parts B & C".

(2) As a matter of safety, modelers should regularly inspect and replace rubber bands holding the fuel can, or use cord or wire as insurance against the can letting go and tipping over at some inopportune time.

●

Chuck Moses and Don McCarthy (formerly Moses R/C Electronics and McCarthy's R.C. Service) have opened a new radio control repair facility called "Authorized Radio Control Service" located at 915 N. Main St., Orange, California 92667. (714) 639-8886.

Chuck and Don are factory trained technicians with many years of service in the R/C industry. Their new company provides factory authorized service for Ace, Cannon, Cirrus, D & D kits, EK-logictrol, Mathes, Micro Avionics, Orbit, Pro Line, Royal, RS, and World Engines radio control equipment. They also repair most other brands.

●

Dear Don,

The following deals with an area of R/C modeling that, to my knowledge, has not been dealt with before: people too young to enter R/C. It is possible that this thought will generate strong feelings, both pro and con; but RCM has never been afraid of controversy.

My purpose in writing this is to make people think before helping the very young child – 8 to 11 years old. We need to keep our sport/hobby safe!

I have written this especially for RCM. No other magazine covers the R/C area adequately. Keep up the good work.

Yours truly,
Wally Laich
Houston, Texas

R/C AND THE PRE-TEEN

We must discourage people from flying R/C! Sound like treason, blasphemy, stupidity? Well, I feel that there are times when the above statement is very true. After reading this article, consider this statement again.

The major way our hobby increases is by word of mouth. A person will go to an R/C field, watch, ask questions; and, we have a new member. R/C flyers are quite vocal when it comes to the advantages, benefits and comradeship that can be found within the R/C fraternity. This at-

to page 183

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.

NEW! BUILD YOUR OWN CRUISE MISSILE!

Hobby Lobby/Wik-Modelle DELTA 40 ..... **$47.00**

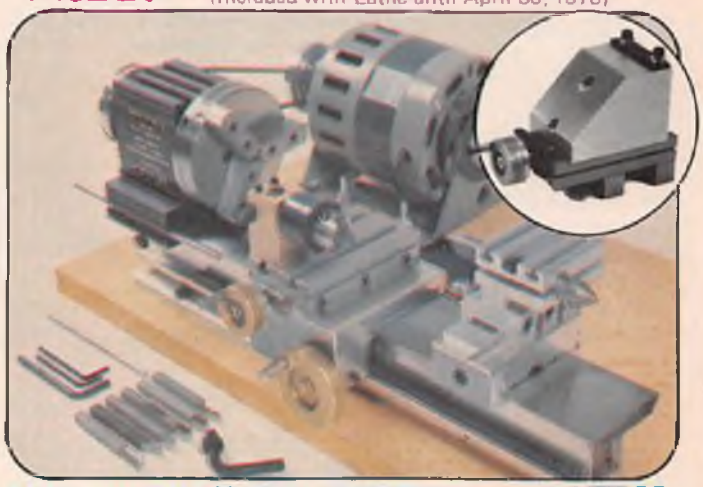
List price $62.50

DELTA 40 is a double-delta RC plane for 3 channels (Aileron, Elevator, Throttle) and .29 to .45 size engines. It's big (53" long, 744 sq. inch wing area) and lightweight (only 3 pounds, 6 oz. with radio) so . . . **It gets up and goes!** Delta 40 flight characteristics are remarkable: Slow flight and landings are normally at a 20% nose up attitude with excellent handling characteristics. And high speed performance is about what you'd expect-**WILD!** Delta 40 will do axial rolls that'll blow your mind.

The kit is unusual in that most of the wing is built of precisely cut pieces of Rohacell foam, with balsa and hardwood outer framing. The control mixer for the elevons is included. Delta 40 is certainly not for a beginning flyer. But, if you're up to it you're in for a very rare treat with this supersonic replica from West Germany.

FREE! $34.85 Milling Attachment

(Included with Lathe until April 30, 1978)



Hobby Lobby/TAIG MICRO LATHE II **$189.00**

About half the price of competitive precision metal-working lathes! The Taig lathe is a heavily overbuilt machine that was originally designed for light industrial use. 4½" turning diameter, 7¾" length capacity. Cross slide travel 1¾". Accuracy 5/10,000". Included are: Taig 15" bed lathe, 1/10 HP Dayton motor, mounting board, 3 jaw chuck, ¼" Jacobs drill chuck, 7 piece tool set, new lever-operated tailstock, stepped pulley & belt set, self-adjusting motor bracket **AND if you'll order before April 30, 1978, a MILLING ATTACHMENT worth nearly $35!**

Hobby Lobby's 4 Channel Beginner's Plane

Hobby Lobby JUNIOR TELEMASTER **$33.44**

List price $42.95

FREE! Buy a **JUNIOR TELEMASTER** before April 30, 1978, and get 2 rolls of SUPERMONOKOTE **FREE!**

TIGER'S PRICE WILL INCREASE SOON: Buy one NOW and SAVE $!!

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List price $66.00

With a K&B 40 and (of all things) a Grish 3 bladed 9-6 nylon prop, our TIGER does victory rolls straight up and out of sight, holds a knife edge attitude as long as you want it to, and then slows down like a trainer for landings. In the air it's the best looking plane we've seen. All this for a kit that includes a fully obechi-sheeted wing and the simplest balsa fuselage construction imaginable.

HOBBY LOBBY

SAVE UP TO 68% ON HARDWARE!

BULK BALSA WOOD

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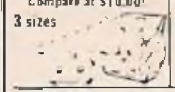
10–1/8x4x36 **$8.88**
10–3/16x4x36 **$9.99**
10–1/4x3x36 **$7.77**

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 anybody's name stamped on it.

BULK PACKAGE Control Horns

75 Control Horns *only* **$3.35**
Compare at $10.00!
3 sizes



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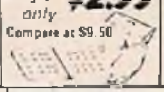

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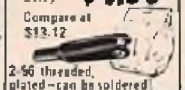
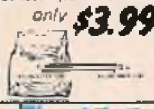
35 Clevises *only* **$4.99**
Compare at $13.12
2-56 threaded, plated—can be soldered!



BULK PACKAGE Nylon Tube Pushrod

25 feet Nylon Outer Tube
25 feet Nylon Inner Tube
only **$3.99**



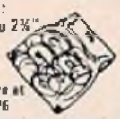
BULK PACKAGE Brass Threaded Couplers

35 Couplers *only* **$3.99**

BULK PACKAGE 8 Wheels

NEW!

only **$5.99**
4 Pairs:
2" thru 2¾"
Compare at $10.76



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 Mini Nylon Pop Clevises

NEW!

35 Clevises *only* **$3.99**
Compare at $7.25

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 $6.50
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Larger Quantity!

7 Fuel Filters

only **$3.99**

NEW!

BULK PACKAGE 70 FEET Surgical Fuel Line Tubing

only **$1.99**

BULK PACKAGE Mini Nylon Pop Clevises with 10" Rods

NEW!

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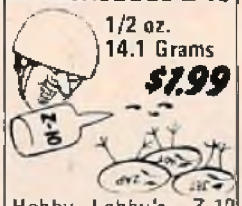
If you EVER wanted a **SUPERCYCLE** *buy one NOW!*

SUPERCYCLE $49.00
list price $89.95

The supply is somewhat limited, but until we run out you can buy all of these you want for this ridiculous $49 price. Call now!

NO ONE UNDERSELLS Z-10



1/2 oz.
14.1 Grams
$1.99

Hobby Lobby's Z-10 cyanoacrylate adhesive will glue balsa wood, plastics, your fingers—anything— together in about 5 seconds. Z-10 is as good or better than any other cyano adhesive, but it costs you less.

"... (you are) the most helpful (supplier) I've found."
As a new modeler I've been looking at several of the major suppliers and yours is by far the most professional and helpful I've found. You can expect all of my business in the future.
G. L. D., Ft. Rucker

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.

SURE-FLITE A-R-F FOAM KITS

SURE-FLITE A-R-F FOAM KIT
SPITFIRE MK I **$26.56**
List price $34.95

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.

BABY BIRDIE ALMOST READY-TO-FLY **$34.16**
List price $44.95

PIPER J-3 CUB FOAM ARF **$26.56**
List price $34.95

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.

CESSNA SKYLANE 182 FOAM A-R-F **$25.56**
List price $34.95

For .15-.19 engine. 53" span, 420 sq. inch area. 2 to 4 channels. Steerable nose gear, 2 hour assembly.

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 defuel 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".

SAVE $9.55 *Order a Sr. Telemaster before the April 30 price increase!*

BIGGER DISCOUNTS ON SIG KITS!

Piper J-3 Cub ..... ($39.95) **$34.38**

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Kougar	($44.95)	$38.68
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Ryan STA	($73.50)	$63.27
Citabria	($57.95)	$49.88
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Kwik Bilt P-51	($57.95)	$49.80
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Kwik Bilt ¼ Midget Mimmow	($27.95)	$24.06
Skybolt Biplane	($62.50)	$53.75
Super Sport	($59.95)	$51.57
Kwik Bilt Cessna 150	($69.95)	$60.20
Smith Miniplane	($49.95)	$42.99

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.

KIT SALE!

(Prices in effect until April 30, 1978)

We have complete accessory packs available for all airplane kits. Call us!

(Accessory packs contain everything you need to complete each kit except for radio and engine!)

Bridi

RCM Basic Trainer	$24.99
RCM Trainer 60	$37.99
RCM Trainer 40	$33.99
Trainer 20	$27.99
Super Kaos 40	$36.99
Super Kaos 60	$47.99
RCM Sportster	$27.99
Trainer 10	$17.99
Sun Fli 4-20	$17.99
Dirty Birdy 40 (balsa)	$39.99

Jensen

Das Ugly Stick	$44.99

M.E.N.

Buzzard Bombshell	$39.99
M.E.N. Trainer	$23.99

Midwest

Tri-Squire	$16.99
Cessna Cardinal Foam ARF	$16.99
Sweet Stick	$24.99
Super Chipmunk Foam ARF	$16.99
Mach I	$65.99
Strikemaster	$48.99
Pitts Special	$65.99
Silent Squire	$24.99
Attacker Foam ARF	$24.99

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Hobby Lobby's

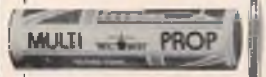
SUPERKOTE

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

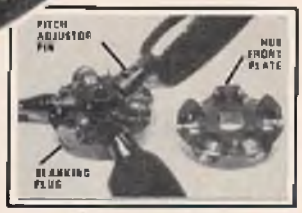
NEW! Revolutionary! Variable Pitch Prop!

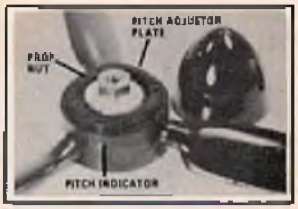


Hobby Lobby/S.L.E.C. 10" MULTI-PROP Introductory Price **$9.99**
List price $14.50

This is the most **revolutionary model airplane prop** we've ever seen. It is 10 inch 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:





BRAND NEW! Now available in 12" diameter!

Hobby Lobby/S.L.E.C. 12" "MULTI-PROP" . . . . . Introductory Price **$11.99**
Spare 12" Blade for S.L.E.C. Prop . . . $1.49 List price $15.95

Hobby Lobby PAPILLON 1/2A R/C Motor Glider

only **$15.96** List Price $23.95

45½" wing span, 278 sq. in. wing area.

•Precisely cut, easy-to-build, all balsa kit from Japan.

•2-channel powered glider—great trainer slope soarer and sport plane!

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.

NEW! HARPOON Flying Boat

a.r.f. **$88.00**

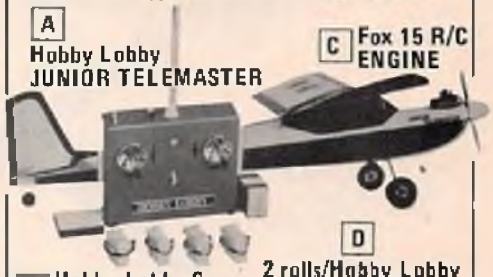
Here's the easiest way for you to start flying off the water. Harpoon is an **A.R.F.**—the fuselage is ready-formed Polyflite—similar to epoxy glass in appearance. And the wings are foam cores that come **ALREADY SHEETED** with balsa. Harpoon is 57" span, 540 sq. in. wing area, for .35-.40 engines and 4 channels. Hardware includes: Formed wire parts, hinges, control horns, pushrods.

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

Combination price in effect until April 30, '78

Here's a plane for .09-.10 engines!

Hobby Lobby
09 CESSNA TRAINER
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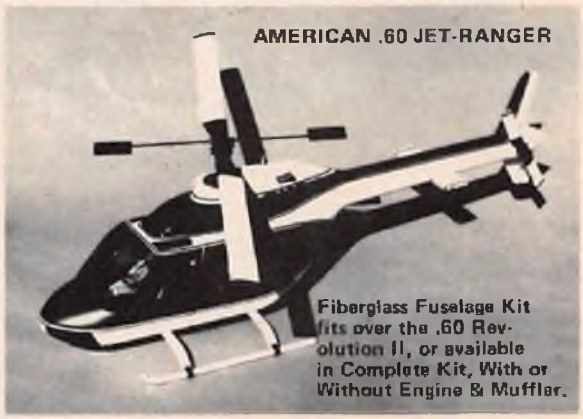

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Cunningham On RC

CHUCK CUNNINGHAM

Have you ever taken a good look at the sponge that your wife uses to wipe up the kitchen counter? If you have, chances are that it is a cellular type foam sponge that, when damp, is very absorbent. When it is dry, it really won't soak up anything at all. It must be damp to be receptive to the job at hand. I got to thinking about this the other day while doing a bit of enforced KP in the kitchen. I grabbed the dried out sponge and tried to wipe up a spot, and no luck. Suddenly, I realized that the sponge is just like people. When you're all primed and ready, you're receptive to ideas and thoughts, and when you're just sitting around, then the mental sponge turns off. And, this is just what the problem seems to be with a lot of people who turn to radio controlled miniature aircraft for a hobby. They are there, but not really receptive. I believe that, over the many years that I have been pushing control sticks, I've seen hundreds of would-be fliers come out to the field, not really seeking advice, but "knowing it all". Almost everytime you can spot this type and be pretty sure that he won't stick with it. It's a tough hobby to get started in, and if you want to get into it, and really get with it, then by all means be receptive. Be receptive to help, advice, suggestions, and flying instructions. It really is refreshing when you do find a beginner who really wants to learn how, and will take the advice that is offered in the right spirit. Nuff' of this rambling, but if you're a beginner, heed one more little bit of advice.

Think about a pilot who flies a 747 for a living. Chances are that he has been pushing big birds around the sky for one heck of a long time, and can fly pretty darn well. He could ease himself into the seat of a Piper Cub and be right at home. Okay, now, think about the pilot of a Piper Cub. Getting pretty good at landings and take-off, and even plots a reasonable cross country course. How about slipping him into the front seat of a 747? No way! Couldn't even begin to figure out the instruments, could he? So, how come a fledgling pilot in R/C thinks that just because he has mastered an easy going trainer aircraft, he is qualified to fly anything? Beats me, but it happens all of the time. A new pilot just gets feeling a little at ease making left hand turns and can get the aircraft down on the ground again with a salvaged prop every now and then, and wham!, he wants to start building a hot pattern bird or a Formula I racer. How come? You tell me, I'm really at a loss. Most of the time, this flier will waste a bunch of time and money on a too fast bird and, then, after the crash go around bad mouthing the design of the airplane. I get letters like this, and see the same thing at the flying field. Rarely is it the pilot's fault; always the radio or the airplane.

What we really need is some form to measure progress as a pilot - - - perhaps a series of tests, or skills. I hope by this time that the letter from Mike Corbett that was printed in the February 1978 issue will have drawn some comment, and that some form of measuring pilot skill may yet be in the near future. Would save a lot of pocketbooks.

•

I have been receiving a lot of mail about large models since I have kinda' been on the soap box about them for the past six or seven months. Most modelers seem interested in the larger aircraft, and I belive that this is a natural outgrowth of the reliable radio. Most of us like to fly aircraft that look like full scale and, once bitten by the "big airplane" bug, find it hard to get back again to smaller models. But, we do have a problem with the large models, and that is power.

I have been flying my Lazy Ace on a Speed Webra .61, and my Miss Texas on an HP .61. Both super engines, with all of the power needed to fly these larger than normal birds. But, they do burn a lot of fuel. I've got a Speed Webra .91 on order and right now I am wondering just how large of a tank that it will require. I'm still deciding just what kind of an aircraft to design for this big horse of an engine, but, again, how much fuel will it digest? I haven't as yet had an opportunity to see a Quadra engine at work, or the new imported Saito gas engine (though it is only a .61 and really wouldn't qualify for flying the larger airplanes). Wouldn't it be nice if someone came up with an adaptation of the Speed Webra .91, or the MRC Suevia (1.5 cu. in.) to make them burn gas and oil rather than model fuel? How about a large engine designed for model work rather than an adaptation of an engine designed for running a chain saw or some other piece of equipment? A gas and oil mixture costing about 75¢ a gallon would make a big aircraft that much more enjoyable to fly.

•

This month, I'd like to get in a few thoughts on installing radio equipment in your favorite aircraft. Seems to me that I have passed along some ideas on this subject several times, but today's mail brought a few more requests for something about this problem, so here goes.

The reason for the radio receiver being hooked up to the servos, and the servos, in turn, being hooked up to the control surfaces is so that your brain can command the surface to move in such a way that the aircraft goes where you want it to go (at least we like to think that we told it to go where it went). In order to accomplish this with the least amount of problems, it is necessary for the radio to be installed in the aircraft so that it is not easily damaged, is resistant to engine vibration, and that it does not get in the way of the pushrods running from the servos to the movable surfaces. Not too large an order unless this is the first time that you have ever laid eyes on a radio control aircraft of your own, then it becomes a really big problem.

Let's start off with the battery. The battery needs to be protected both from vibration and from damage due to a crash, or from a leaking fuel tank. The easiest method to protect the battery is to wrap it in foam rubber. Get a piece about 3/8" to 1/2" thick. Wrap this lightly around the battery pack and hold it in place with strips of masking tape. Make sure that the battery is completely covered by the foam rubber. Next, wrap the foam encased battery pack in an over wrapping of Saran Wrap, or any type of plastic kitchen wrapping material. Seal this package with tape. Make sure that the wires are coming out of the pack, or else you will have to take it apart and start over again. The battery normally finds its home to be in the nose of the aircraft, resting under the fuel tank, so the reason for the plastic wrap is to keep spilled fuel from the pack. Make sure that the foam wrapping is not too tight.

Now, let's move to the receiver. You can protect it in the same way as the battery. Be sure and do not wrap the foam too tightly around the receiver so

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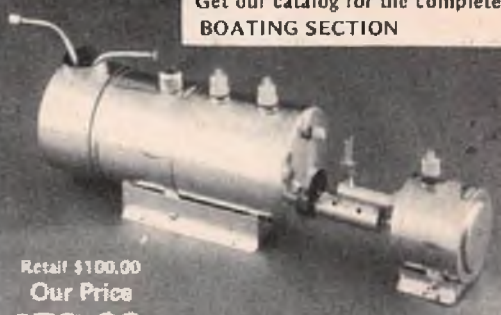

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Burn time	20 min.	20 min.	20 min.
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Endurable boiler pressure	45 kg/cm	45 kg/cm	45 kg/cm
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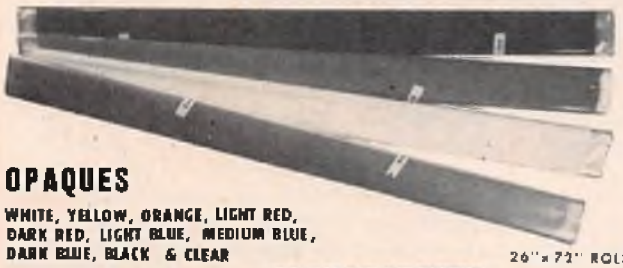

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Engine Clinic

CLARENCE LEE

Dear Mr. Lee:

Last summer, I purchased an OS .40 FSR RC. Gave it a good break-in – 45 minutes rich on the bench with a 9/6 Super M prop and Power Blast fuel manufactured in Chelmsford, Mass. – 12% nitro, 22% castor and (Ucon) synthetic. I know this because I talked to the manufacturer at last year's RC WRAM Show. The problem is, after the engine is stored away, for even a week, it begins to rust in the big end Crankshaft BB area. After my last flight, I have been running every last drop of fuel out of it and oiling – now with a rust cutting type oil. Upon starting it, say a week later at the next flying session, a lot of orange rust comes out the exhaust for about 15 seconds. It's very easily seen since the plane is an all white Kouger. I replaced the rear BB with an OS original from World Engines. At this time, I also noticed the inside bottom and sides of the main casting were all orange stained. I could not get it off even using lacquer thinner or carb cleaner. The ball bearing I removed was really dirty and rusty. The new bearing started to do the same thing. I just kept running the engine. Then one day, upon starting, it popped and - - - no compression. Upon taking it apart, the ring was frozen to the piston due to build-up of rust deposit under it. The engine had about 6 hours running on it at this time. I soaked the piston in ST 56 penetrating oil for a half-hour, freed it, and gave it a little up and down slop, with Fox garnet, by lapping. The ring seemed to have an extremely tight fit when compared to other ring engines such as my Fox BB McCoy .60, etc. Next, I checked Peter Chinn's engine reports on some bearing sizes of other .40 size engines. The OS has 15mm x 28mm x 7mm – same as in my Fox Hawk 60 and Fox 40BB. The only difference being the Fox uses a Fafnir manufactured in the USA. I replaced the second OS rear bearing with a Fox-Fafnir and hope this cures the problem. I have not run the engine since, due to snow and cold weather, etc.

Since my Fox 40BB and Hawk .60 are super clean inside and run on the same fuels, namely Power Blast and sometimes Dukes or K & B 500; stored in the same basement, there must be a problem with the metals in the OS. Possibly the crankshaft and BB or BB and casting material or a combination of all three fighting or corroding each other. I am going to bring this to the attention of World Engines at this year's RC WRAM Show in White Plains, New York, February 27th. I have been in modeling with glo-engines since I was 7 years old (December 1947) and have never experienced this with any previous ball bearing engine in the BB crankshaft area. In my opinion, the OS .40 FSR is a really fine engine. It starts extremely easy by hand; runs very smooth with plenty of power; very good fuel economy (although I am using a Perry carb which has a slightly smaller diameter than the OS original); and seems to have very good wear characteristics. My question is, have you heard of anyone else having this problem – ever, with any model engine? Is there such a thing as metals corroding each other even when oil is present? Also, perhaps you would want to bring this to the attention of other OS 40 FSR engine owners.

One other question – this engine (OS 40 FSR) is not sold with Perry pump and carb. I have a K & B 40 pumper and checked the carb throat diameters. All I would have to do is purchase another K & B 40 size Perry pumper carb and turn down the throat about 1/64" to adapt. Since there is no pump yet available, would a Robart Super Pumper work with the Perry pressure carb on the OS 40 FSR?

Thanking you very kindly,
Michael C. Jablonski
Bethlehem, Pennsylvania

Rust in model engines is a pretty common occurrence — especially with the use of synthetic oils and mufflers. This is why I have repeatedly mentioned in the Engine Clinic column to always run an engine out dry by pulling the fuel line when through flying for the day and then loading the engine with 3-In-1 or equivalent (both in the exhaust and down the intake to be sure plenty of oil does reach the rear bearing). The rear bearing always seems to be the part most susceptible to rust formation.

Nothing in your engine could be causing the problem other than it is natural for iron to rust. Some grades of steel naturally have more of a tendency to rust than others due to the iron, carbon, etc., content. However, most bearing manufacturers use a high carbon chrome type steel and I doubt if changing the original OS bearing to a Fafnir will solve the problem. Fafnir is a high quality bearing and, in my opinion, one of the best production bearings made in this country, and I have tried them all. However, they will rust just like any of the others, if exposed to moisture, model fuels, etc. About the only way you could get completely away from the rusting would be to use a stainless steel bearing that contains no iron.

As far as electrolysis — this can take place between certain materials of different composition, such as magnesium, brass, etc.; however, they would have to be emersed in salt water, or similar vehicle, to act as a conductor. It is very doubtful this is occurring in your engine.

Because of the ring sticking problem, I would suspect water in your fuel. This, in turn, forms the varnish causing the rings to stick. It might also be caused by the rust cutting agent you are using. You do not want to ever use a rust cutting agent in the engine. It would be better to have the rust on the bearing then cut loose, so that it can pass through the engine. Rust is nothing more than iron oxide which is often used as a commercial lapping compound. Every time you see the orange rust coming out the exhaust, you can be sure there has been some lapping action in your engine as well. This is why I do not recommend the use of WD-40, LPS and other rust inhibitors. They are excellent products when used for their intended purpose, but they were never intended to be burned in the combustion chamber of an engine. They hold water in suspension and loosen rust. However, the first time you fire the motor up, this goop goes through the engine doing more harm than good — especially if used in an older engine that has seen quite a bit of running and is full of rust, varnish, etc. So always use a good penetrating oil — and lots of it, not just one or two drops.

I cannot say why your OS is being affected and not your other engines other than you are doing something different — using a muffler on the OS and not on the others, running the engine in winter and the others in summer, etc.

to page 12

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Brand C fuel	*11,600 RPM*	*440°*
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MAGNUM POWER	*12,200 RPM*	*400°*

OS60 FSR

Brand A fuel	*11,800 RPM*	*425°*
Brand B fuel	*11,800 RPM*	*445°*
Brand C fuel	*11,800 RPM*	*420°*
Brand D fuel	*11,600 RPM*	*450°*
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I am sending 35¢ for 12 pg illustrated Catalog with Basic Explanation of R/C Equipment and Radio Control Definitions

Name _____
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ENGINE CLINIC

from page 10

Change your fuel and, because you are having the rust problem, I would recommend one that is all castor oil with no synthetic oil. Run the engine out dry as you have been doing and load with 3-in-1. I am sure your rust problem will be helped considerably.

Regarding the use of the K & B .40 pump carburetor in conjuction with the Robart Super Pumper — the K & B .40 pump carburetor is the same venturi size as the pump carburetor used on the .61. This means it is getting pretty big for a .40. The K & B .40 pump engine was intended for Quickie 500 racing. This also works out okay as a pattern engine as long as it's used with the Perry pump. However, the venturi size is getting marginal for use with the Robart pump as it does not have the capacity or regulation that the Perry pump has. Your engine (OS) will work with the Robart pump and Perry pump carburetor, but you can expect leaning of the engine during hard maneuvers and towards the end of the tank. You would be better off with a smaller venturi size when using the Robart pump. A standard .61 size Perry carburetor in conjunction with the Robart pump would be a good combo on your .40.

Dear Clarence,

Some time ago, you advised someone that the Tarno Carb would not perform with the Perry pumper. For some reason, this really got my blood to rush, as at the time it seemed that you had answered the query without trying out the combination (you were speculating).

So I ordered a pumper for my Veco Lee .61. When it came, I hurriedly installed it and proceeded to start the engine. At first, I was about to agree with you, but I probably did like many who have bought the pump; I was using too much pressure, and the engine was flooded to the point that I almost had a hydraulic lock in the cylinder.

So I unscrewed the pressure adjusting screw all the way out, to its max, and tried again. This time, at half speed on the carb, the engine started and ran well at that speed and at full open after the main needle valve was re-adjusted to a smaller calibration for the fuel passage. The idle was not good at all until the low speed adjustment was closed to approximately 1/8 turn, then all went well and I could proceed to fly.

The Veco Lee did not rev any differently than before but the different attitudes of the model did not make any changes in the engine performance, and that is what the pump is supposed to do. Then I started to alter the spray

to page 169

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Sunday Flier

KEN WILLARD

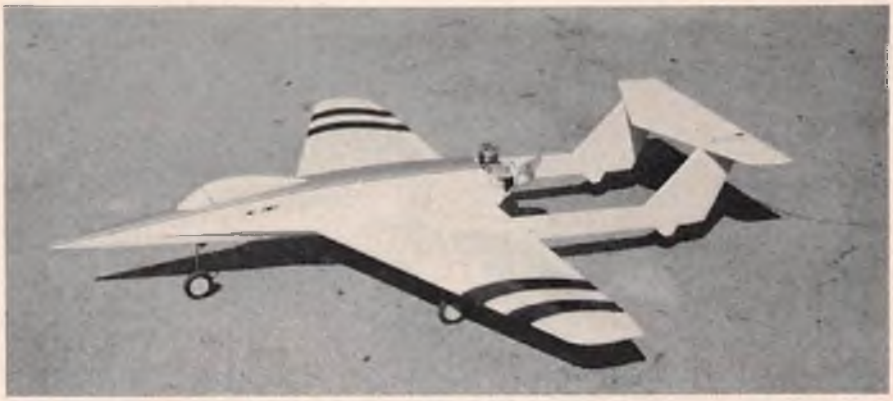
Hey! Whatever happened to Mr. Dum-Dum? A few issues ago I announced the second bi-annual Dum-Dum contest, with the winner to get a one year subscription to RCM. Here it is (as I write this) a few months later, and only two modelers have been willing to admit that they did something dumb. Is the sophistication of the sport so great now that you modelers just don't make any mistakes? Or did you just decide that, what with Don Dewey picking the Rams, and me picking the Raiders for the Super Bowl, it would be useless to try to top us? Come on — you can do it. Just stick with modeling — like we should have in the first place! Leave football to the jocks - - - it made Don and me look like jerks! But get those letters in if you want that free subscription. I'm sure Mr. Dum-Dum is alive.

Lots of letters on other subjects this month, though. Jack Scarborough of Austin, Texas, writes, in part:

Dear Ken,

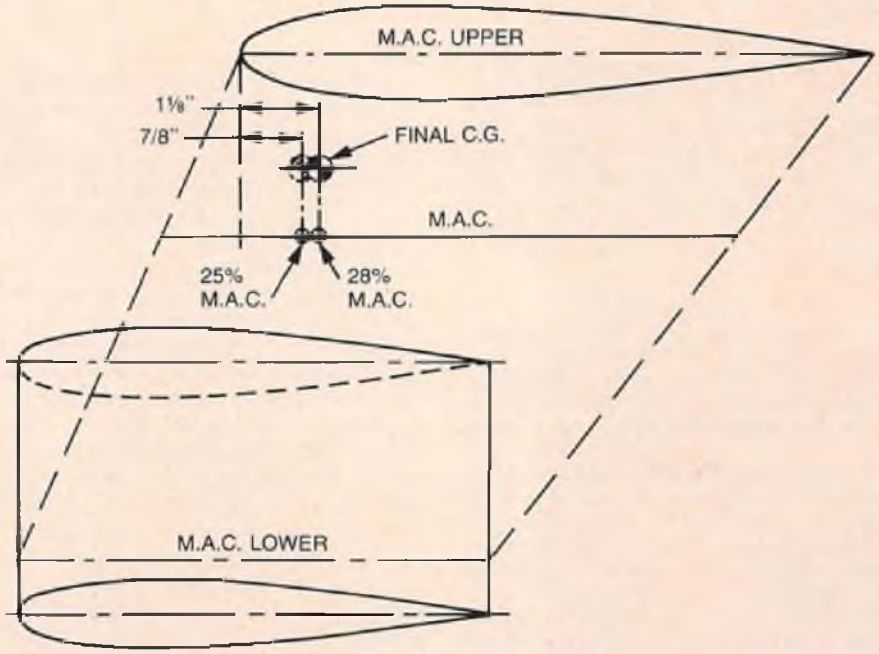
I have enjoyed reading your articles containing many ideas on design, building and flying. Your discussion in the December 1977 RCM on the position of the balance point for biplanes came close to home, since I went through just such calculations as you suggest, during the design of my negatively staggered "Sun Ray", article and plans published in RCM March 1975. I knew I had to make some kind of calculation to find that balance point before flying, and not just "eye balling" for the location, especially in view of the unusual wing positions.

A couple of possible references I have here were inadequate to do the job, and I had been recently using an old "Aviation Handbook" by Warner and Johnston – 1931 (I've had it since 1938). There are some handy formulas for finding the mean chord and its position, based on the planform and relative position of the wings. (I don't have NACA reports #445 and #458 which you mentioned, but do have a bunch in 1937-38-39.) However, the equations should not be difficult for many people. RCM's Cunningham has shown this same thing graphically for monoplanes in his column.



Jack Scarborough's "Delta Pusher." She's long, but easy to carry in the car with the fuselage detached from wing.

Using these formulas, and figuring balance at the 25% mean chord point, the calculated position for the "Sun Ray" was found to be only about 1" aft the upper wing leading edge. Figure 1 shows the balance diagram. (e) was assumed to be 1.00, admittedly a "guesstimate". Warner has presented a lot of evidence that (e) is less than 1.00 for negative staggers, but looking at the lower wing shape, I did not want to credit it with having more effective lift than the upper wing. In any case, I don't think a 15% change in assuming (e) either way would be critical on the final result for this purpose. A minor complication was in taking account of the bent (inverted gull) section of the lower wing. Here I just took 3 sections separately (center, gull and flat outer panel),



SUN RAY BALANCE DIAGRAM

..eighted the vertical position of each section's chord by those areas (taking vertical moments); using the projected area of gull section, and 1/2 of center area enclosed by the fuselage. Having thus found the mean chord position of the lower wing –then the formulas were applied as shown in the handbook. The balance diagram was made later as a check. One thing I'm sure of, it's a lot easier to just do it, rather than trying to write how it was done!

We flew the plane at the approximate 1" calculated position (anywhere from 7/8" to 1⅛") aft of the upper wing leading edge, and it balanced just fine. Maybe we were a bit lucky with some of those assumptions, but the point is, a logical attempt was made to calculate it first.

This plane has shown that it has low overall drag by comparative flight tests with similar sized (fixed gear) monoplanes. (It's faster than some of them.) A claim could be made that induced drag, due to wing interference, is low also, especially as demonstrated in high G maneuvers of various kinds, where the performance is very agile and responsive.

In the few 5½ years I've been in R/C, having started flying on a .60 Kaos which seemed very satisfactory for me for sport flying and basic aerobatics, I've stuck with that general size, trying to design and build for the best aerodynamics and reasonably light weight for best flying ability.

Now that I've stated that noble purpose, my wife said last night (after seeing years of hectic scenes at *the field and in the shop), "I think you fellas have crazy mixed-up brains." Could she have meant R/C flyers? Or do I need to ask?*

Enclosed is a picture of one of my planes.

Sincerely,
Jack Scarbrough, Jr.

Of the photos that Jack sent, I thought the "Delta Pusher" was the most intriguing. It isn't really a delta, as you can see. It's what some of us call a "chicken delta" with tail feathers; it certainly is sleek — and Jack sent the following data on it:

Delta Pusher

A spectacular flyer. Jet-like appearance. Flights so far show good stalling, aerobatics and speed range. Emphasis on good aerodynamics, and light weight for best performance with this type R/C plane.

Characteristics

Power: HP 60 (reversed, operates okay); Weight: 7¾ lb., 124 oz. (includes 8 oz. nose wt.); Span: 54 in.; Area: 700 sq. in.; W/S: 25.5 oz./sq. ft.; Wing Section: Root - 64A014 (Ref. "Theory of Wing Sections" — Abbot and Van Doenhoff 1959 — Appendices I, III, IV — NACA Airfoil section tests and ordinates); Tip - 64A215 (with 2° washout); Length: 63½ in. (43⅜ in. disassembled).

Elevator, rudder, and aileron servos mounted in center wing. Motor servo in fuselage. Nose wheel operates off extra (5th) servo mounted in fuselage — runs on splitter wire from receiver rudder outlet. This allows easy wing attachment to fuselage at the field. This whole servo set-up operates fine.

Incidentally, using the graphical method for finding mean chord, she balanced safely, and slightly nose heavy on the first flight. Then a small nose weight decrease of 2½ oz. brought the CG back to 30% mac, the correct balance.

I would especially appreciate any comments and suggestions that you or your associates may have on this job.

If any of you would like to get in touch with Jack, his address is 2307 Windsor Road, Austin, Texas 78703. I'm sure he'd like to have your comments.

☆

Another letter I received was from Steve Crowe, 13069 Harding St., Sylmar, California 91342. Many of you wrote in for info on his GeeBee racer which was on display at the MACS show last spring. Steve tells me that the GeeBee flies as well as it looks - - - even better perhaps, and that any good sport flyer could handle it. So, write Steve at the above address if you want any info. Oh yes - - - he did say that Bob Holman's Plans Service, P.O. Box 741S, San Bernardino, California 92402, can provide plans, a canopy, gear fairings, and a cowl.

☆

Here's a letter from a modeler who might well qualify for the Mr. Dum-Dum award — not because of what he wrote — but he forgot to sign the letter! And, since the letters go to RCM, get opened, and then forwarded to me, I didn't see the envelope. Anyway, what he writes is worth printing. I know. I busted up a model once for the same reason. He says:

Dear Ken;

I am recently married and newly acquainted with R/C and have come to appreciate both institutions very much. My wife doesn't think she is as fond of R/C though because she feels that a new dress is far more practical than a "dumb little airplane."

What I'm leading up to is this: I've been flying for a year now and have just purchased a new Futaba 6 channel outfit installed in the Midwest Cardinal. I have had great success with this combination and have had many fine flights.

Now, confident of my ability, I invite my somewhat reluctant wife to witness my flying proficiency and share in the joys of R/C in hopes of raising her respect for this sport. Wouldn't you know it, my usually stable Cardinal (you have to try to crash it), while flying nice and easy on a calm day, suddenly banked hard to the right and all I could do was watch it nose in and see my wife nodding confidently that her reservations were well grounded.

I was left with my mouth open trying to explain what had happened and that this was a freak happenstance.

I've been in the air long enough to know when it's my fault and when I have had interference of some sort. I'd be content to take responsibility under the pilot error category, but I feel it was something else.

My radio is brand new and works great, and the batteries were freshly charged but I did notice my antenna was loose on the transmitter base and vibrated as I walked to the crash sight. I had forgotten to screw it down tightly. Could this have been the reason for the sudden unpredictable and uncontrollable behavior of my plane? This is the excuse I gave to my beautiful wife and I was just wondering if it might be true.

Print this if you think it's worth it. Your reply will be appreciated.

Yes, Mr. no-name, a loose antenna connection could very easily have been the cause of your embarassment. It's a good idea to check your antenna every time you go flying - - - especially if you've been making range checks with the antenna removed and then replaced it.

☆

This last letter, with its enclosure, almost amounts to a guest editorial. As I read the "open letter", I couldn't help but think of the many times I've visited club meetings and, in one way or another, heard essentially the same words, but put in a different way. R/C clubs are so universally beset by the same problems that it was refreshing to read a really good, tongue-in-cheek description of the thought processes of many of the various club members throughout the U.S. — correction — throughout the world. I remember getting some similar type remarks from a reader in England, whose club was having problems.

Anyway, Jack Goodrich (one of the "other guys" with no blimp!) wrote the following letter and enclosure. He's from Troy, Michigan. Looks like the Skymasters are a good, solid club that can take a bit of ribbing:

Dear Ken,

I have enclosed an article I recently wrote for our club newsletter. I believe the basic message applies to most clubs, in one degree or another.

If this article is of interest to you, please feel free to use it, or parts of it in one of your future columns.

I know I am not alone in saying your portion of the magazine is a heavy favorite to us sport flyers.

Thank you,
Jack Goodrich
Troy, Michigan
Skymasters R/C Club

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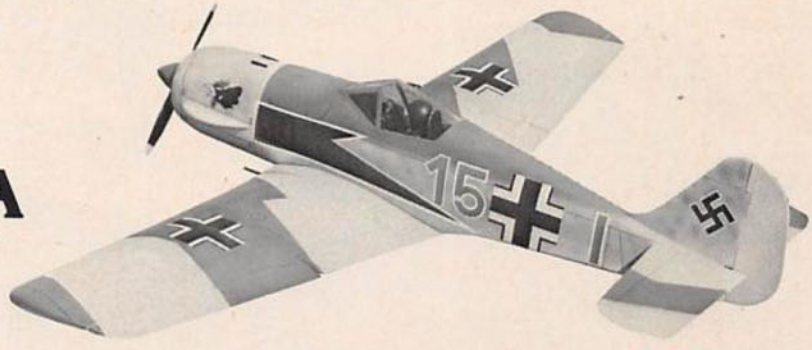

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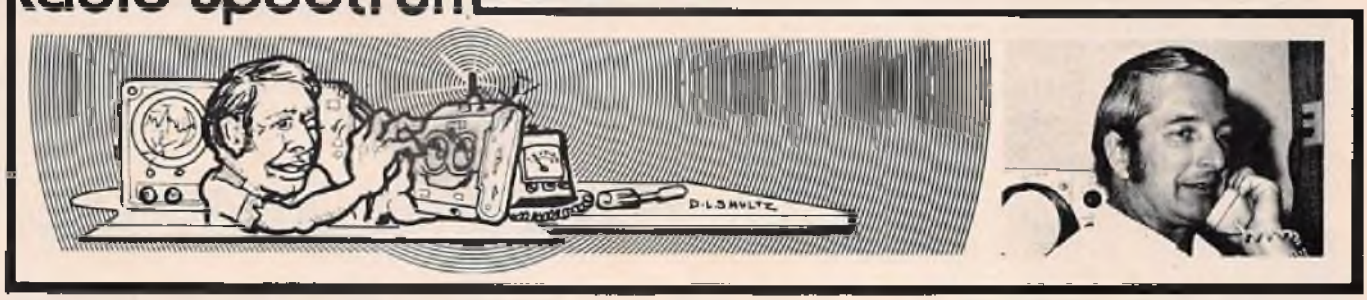
Radio Spectrum

JIM ODDINO



Anyone out there know why there is no channel one on your television set? If you know the answer to that one, you probably know all about Major Armstrong. Back in 1918, he developed the superheterodyne receiver while serving in the Signal Corps in France. The concept was the same as the superhets we use today. Another of Armstrong's contributions to radio was the super regenerative receiver which surprisingly was invented after the superhet. It is hard to say what his greatest invention was; he had a lot to do with developing the basic vacuum tube too, but I'm kind of partial to his development of Frequency Modulation or FM as we call it. That's because he did it against such great odds. In the early days of radio, people were knocking on his door trying to buy his ideas. It was a result of his invention of the superregen that he signed a contract with RCA that made him quite wealthy. But, in the 1930's, when Armstrong demonstrated the superiority of FM, RCA and the rest of the industry had so much money tied up in AM radio, they weren't interested in FM. World War II came along and also retarded the growth of FM.

However, the real challenge was the technical one. FM had been considered, even tried, and then discarded.

Armstrong was trying to overcome static which is interference produced by waves varying in amplitude just like the modulated waves of AM radio. Any radio that passed amplitude variations, passed static. Early experimenters had treated FM like AM which propagated most efficiently when held to a narrow band of fixed frequencies. They tried the same thing with FM, but got nothing but distorted tones. Then Armstrong proceeded in exactly the opposite direction that theory said one ought to go to reduce interference. He widened, instead of narrowing the band. He soon demonstrated signal to noise ratios of 1000 to 1 compared to 30 to 1 for AM, and he did it on a frequency of 110 MHz which was considered phenomenal.

Right about now you're probably saying, if FM is so good, why aren't we using it in R/C? Well you don't get something for nothing. The basic concept that makes FM attractive is to trade frequency space for signal to noise. In fact, this has become the basis for a whole new field of communications called "spread spectrum" systems, which we'll talk about later. If we look at commercial broadcasting, AM stations with a bandwidth of 10 KHz give pretty good fidelity, but FM, to get an improvement, deviates the frequency plus and minus 75 KHz. If you live in a section of the country that has a lot of thunder storm activity, you can really tell the difference. However, you can see that in a given band, you can have a lot more AM stations than FM. In the crowded citizen bands, which include "our" 27 and 72 MHz frequencies, the FCC has specified the allowable bandwidth in order that many channels or frequencies might be available to the public.

It is interesting to note that in the R/C press, it has been suggested that narrow band FM offers a solution to the crowded conditions. I guess this is a result of what has happened in Germany. They recently revised their rules and now specify certain R/C frequencies 10 KHz apart. They also made a change to allow narrow band FM. This does not mean NBFM is the only thing that will allow operation with 10 KHz separation. In fact, Simprop has chosen to stick with AM, although they have incorporated what they call SSM to reduce the bandwidth. The SSM stands for "sinus-small band-modulation" and is just the opposite of spread spectrum modulation. My guess is that they probably filter the pulse train more, prior to modulating the carrier. In normal amplitude modulation you should be able to transmit in an RF bandwidth that is about twice the information bandwidth. You should be able to do the same thing with narrow band FM but you will not get any signal to noise improvement. So, you can see why the R/C industry hasn't charged out and pushed harder for NBFM. I think it will eventually come in this country and I think it might offer some other advantages as I've suggested in previous columns, but don't think that it will offer any improvement as far as the crowded conditions, or signal to noise improvement.

What about wideband FM? Does it have a place in R/C? If you've got an amateur license, you probably know that wideband FM is allowed on frequencies above 52.5 MHz. The 6 meter R/C frequencies are 100 KHz apart and, as long as we don't get carried away and interfere with each other, I think there is a great potential there. Theoretically, the signal to noise increases as the square of the bandwidth increases. So, even with modest deviation radios, we can get significant signal to noise improvements. Do we need it? I don't know. However, I do know the airways are getting more polluted every day and some day we might need everything we can get. Will it ever be allowed on the standard R/C frequencies? It is doubtful — but who knows? Another giant in communications, J.P. Costas, said that "for congested-band operation, broadband systems appear to offer a more orderly approach to the problem and a potentially higher average traffic volume than narrow-band systems."

With today's components, spread spectrum systems are a reality in the military and space communication systems. Systems are being built to operate in a link in which the interfering noise is 100 times greater than the signal (this would take about a 400 KHz bandwidth and would take up our complete 72 MHz band for all practical purposes). However, soon it might be possible to put a complete spread spectrum encoding system in one chip making it practical for R/C. A system could be built where we all use the same "frequency" simultaneously without interfering with each other because we all would have our own private code.

So — stay tuned in, because the patent office hasn't closed down yet. By the way - - - in 1934, Armstrong set up an FM modulator in the Empire State Building with a 44 MHz transmitter that had been installed for TV experiments as a power source. You guessed it — the original FM broadcasting was done on what would have been channel one. During the war, the FCC ordered the FM broadcasters to vacate the 44 to 50 MHz band and move to 88 to 108 MHz, but never reinstated channel one as a TV channel.

★

Dear Sir,

I use a 12 volt, 1 amp charger on my 12 volt, 10 amp motorcycle battery. I have tried to figure charging time mathematically with a timer to turn it off, but still have overcharged and gassed the battery. Now I know that this will ruin

to page 22

Presenting . . .

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R/C Air Boat/Amphibian for .15-.35's

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Run it on land Or in the water

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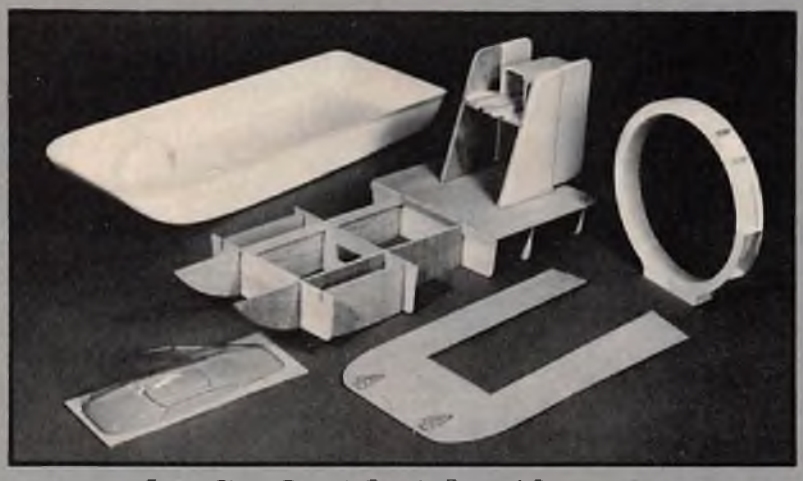

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Dry Kit. Rubber power material supplied. Other equipment not included.

The Beautiful Cherokee is manufactured by one of the greatest names in American Aviation, Piper Aircraft Corporation.

The Cherokee, a basic 2-seater with optional two family seats, is powered by a 150 hp. Lycoming engine and equipped with wheel speed fairings. Top speed is 142 mph.

P-61 Black Widow

Kit E-15

Wingspan: 37 1/2"

$19.95

Sterling MODELS INC.

PHILA. PA 19134 U.S.A.

from page 19

the battery in time, and you cannot leave the leads on the battery when off as this will drain it. A 1/2 wave unit, which I think mine is, is the worst one.

My brother uses an 8 amp charger that he leaves connected to his boat battery. It reads the battery and puts a charge in when it needs it; you don't overcharge or need to disconnect the charger. I can't use this on my battery though it is used on the boat battery.

Perhaps you can tell and show me a simple circuit that I can add to my 1 amp charger, so that it can do what the large 8 amp unit does. I generally charge the cell once a month, usually an overnight charge. But, as I have said, this seems to be too long. I can tell when it gasses as the plates have bubbles caught in them and when I tilt the battery they rise out.

Thank you,
W. Hansen
Brooklyn, N.Y.

I suspect many others are having similar problems with motorcycle batteries and gel cells. If you are only getting a year or so life from your 12 volt batteries, you ought to try something different. I think the culprit is the constant current chargers, which keep charging at the same rate even though the battery is fully charged. This results in boiling off the electrolyte. Another potential cause is running the batteries down too low and/or storing them in a discharged state. I talked to Bob Boucher of Astro Flight who has lots of experience with both the motorcycle and gel cell batteries (guys who fly electric airplanes really put their 12v batteries to a lot of use). He said that gel cells seem to be better than the motorcycle batteries but they have some of their own problems. They apparently self-discharge such that if you let it sit for six months, you might as well throw it away. Bob charges his battery after every flying session, but I'm sure he runs it down a lot further than someone who is only using it for starting and fuel pump operation. His charger starts out at 450ma and then drops off to 200ma or so. It would be better if you had a constant voltage charger that dropped off to 50ma and then you could leave it connected all the time just like the boat battery Mr. Hansen described. Globe Industries who pioneered the gel cells in this country has a number of battery charger circuits available and I believe all are of the constant voltage type. If there is enough interest we will work something up and publish it in this column. So let us know if you, too, are having trouble making your 12 volt batteries last.

★

Dear Mr. Oddino,

Your January column included a letter from Ed Gerhardt recommending the Ace CMOS decoder to update an early Heathkit receiver. I would caution the prospective users of the CMOS decoder that it is not totally compatible with all servos. An example are the Heathkit servos and probably the Kraft servos that are direct coupled to the decoder output. While they will work okay –don't turn off your transmitter first.

I don't understand why, but the decoder doesn't reset with loss of signal.

Whatever channel the transmitter encoder was on when turned off, the decoder output on that channel stays high and thus drives the servo with full power against the stop. This can buckle or break pushrods, tear loose control surface hinges, etc. Normal recommended operation is to always turn the transmitter on first and off last. I personally prefer to turn my receiver on first as a final check to see if my frequency is clear.

The solution offered by Ace was to put 2.2 MFD tantalum capacitors in series with decoder outputs. I have done this and it works but does add to the parts count and poses mounting problems. My installation was to install the caps standing up on the board with the + end down and wire the servo signal leads from connectors to the negative end.

To help support the caps, I coated the caps, leads, and decoder chip liberally with Wilhold's RC 56 — a clear drying, rubbery cement. G.E. RTV silicone caulk (bathtub caulk) would also work.

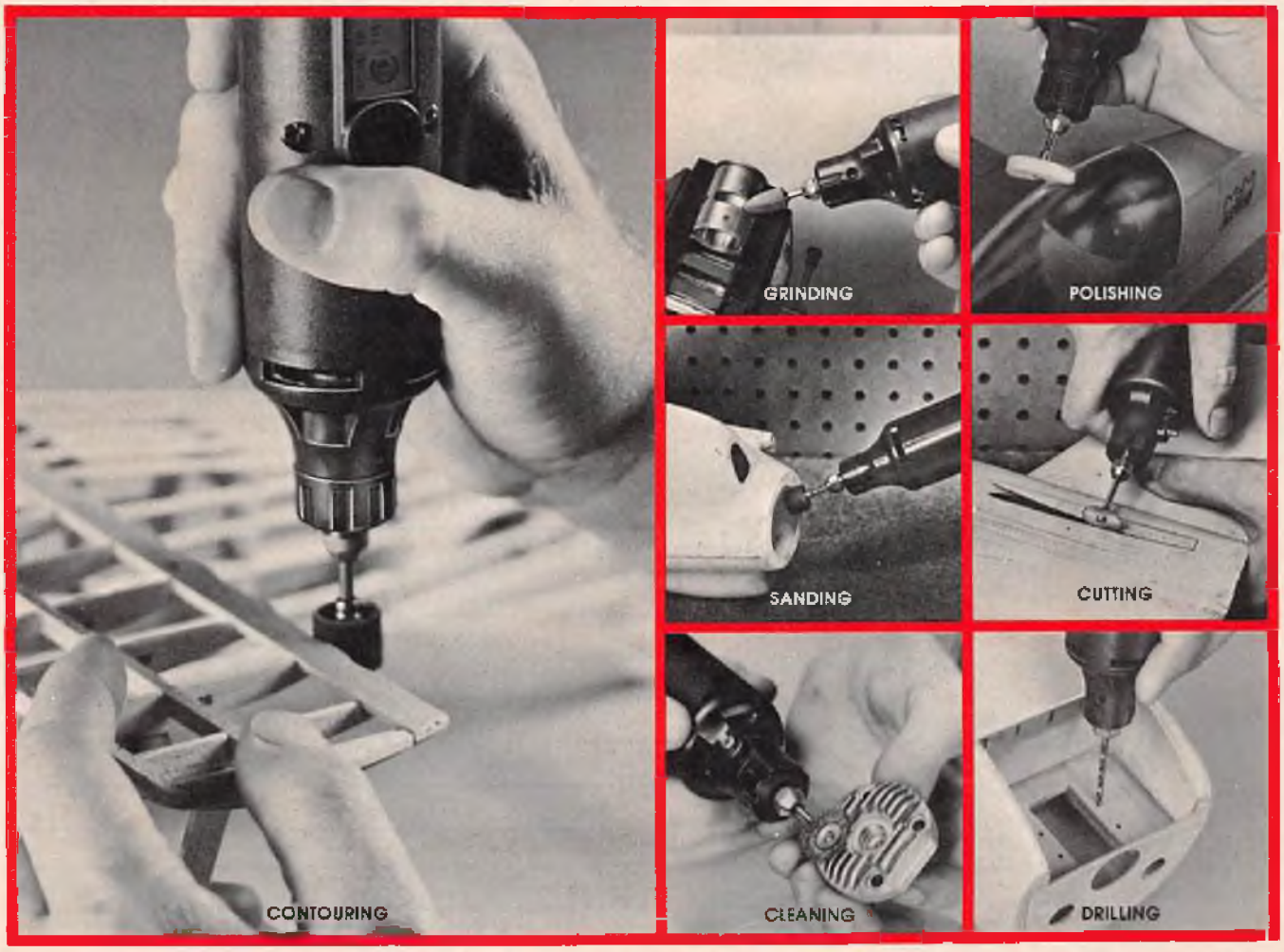
With the shoe on the other foot, so to speak, an Ace servo (old W.E. I.C. or new 544 I.C.) which has a capacitor coupled input will not work with a Heathkit receiver I.C. decoder unless a 10K ohm loading resistor is added between the signal input and ground. The Ace kit instructions now include this information. The Heathkit I.C. decoder outputs are evidentally ungrounded collectors (TTL type) and thus stay high once the servo input capacitor is charged.

I've followed all your columns to date but have not seen anything on receiver-decoders and how they work. I'm sure many others would like to see a discussion on this subject.

Very truly yours,
Warren C. Hrach
Cleveland Heights, Ohio

Thanks for the comments, Warren. There are probably some other serious compatibility problems between various decoders and servos. Even equipment offered by the same manufacturer is not always compatible. This can end up costing you money when you're trying to save it by updating an old receiver or building new servos. The transmitter on-first/off-last is not too hard to get used to and can be tolerated. Most manufacturers take care of this by either providing a reset to the decoder (Kraft and RS) or AC coupling with a capacitor in the

Gets good ideas into the air fast.



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input to the servo.

I guess we haven't talked about decoders in the past, so let's start now. We will define a decoder as everything after the receiver detector, as many systems actually make a physical split in the circuit at this point with two separate printed circuit boards. Figure 1 is a block diagram of a typical decoder as we have defined it.

You might find various filter circuits between the receiver detector and threshold circuit in some systems, depending on how quiet or noisy the receiver is. However, the first thing that needs to be done is to establish some minimum level of signal that you want to work at. I set the threshold on my receivers at about 40 millivolts. This means if the pulse train out of the receiver is over 40mv, I will get an output out of the threshold circuit; if it is below 40, there is no output and all servos will stop where they are. Obviously, if the noise was greater than 40mv, the system would trigger on noise and be useless. Therefore, the threshold must be set slightly above the highest noise you might ever expect to get. Figure 2 illustrates this principle.

It can be seen that if you turn the transmitter off, the pulses would disappear but the noise would still be below the threshold and would not trigger the decoder pulse amplifier. It should be noted that Figure 2 illustrates a condition where the receiver is at maximum gain which results at low or no signal conditions causing the AGC voltage to go to its maximum. With strong signals, the signal amplitude doesn't increase as much as the noise decreases due to the AGC action causing the receiver gain to drop, thereby amplifying both the signal and noise less. I'm going to have to read that again and see if I understand it. Anyway, if the input is over some threshold, you will get an output. Usually some filtering is done at this point with something as simple as one capacitor or as complicated as circuits which ensure that the pulse is within certain expected limits. In other words, it would reject short spikes and pulses that were longer than those transmitted. The pulse amplifier simply squares up the pulse train and provides a nice, clean signal to drive the other circuits.

The shift register is usually an integrated circuit in modern R/C systems, but could be built with discreet transistors or other devices. To illustrate the operation of a shift register, let's picture 8 baskets sitting in a row with an apple next to the first one on our left. When we give the sign, our helper is going to take the apple and put it in the first basket. He will leave it there until we give him the signal again at which time he moves it to the second basket and so on until he finally takes it out of the last basket. He does not put it back next to the first basket. It is the sync

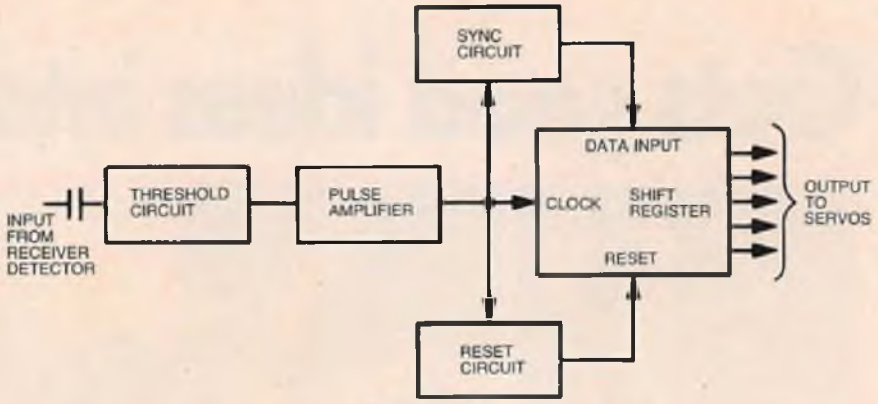

FIGURE 1

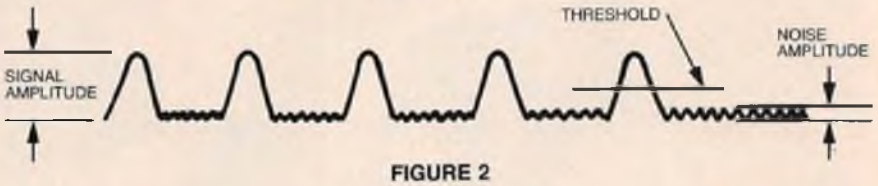

FIGURE 2

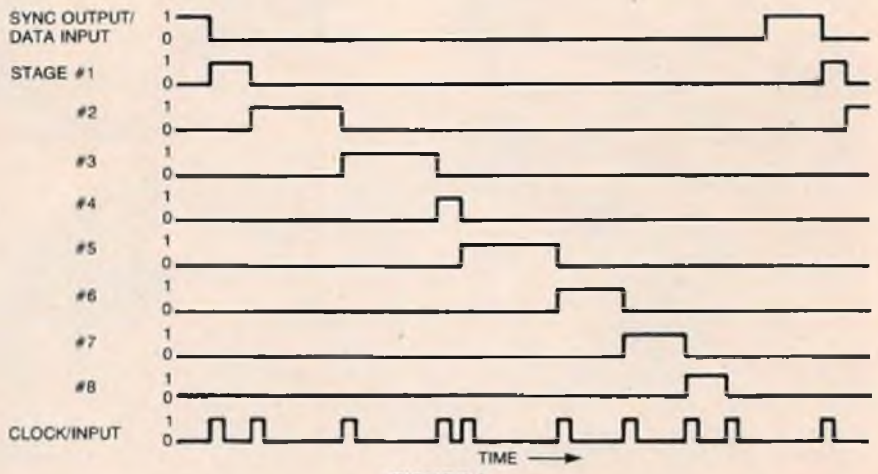

FIGURE 3

circuit that is going to do that for us. Okay, let's transfer that thought to electronic hardware. Instead of baskets, the register is made up of stages, usually flip-flops, which can store either "one's" or "zero's". A one would signify that there was something in the stage and a zero, that the basket was empty. In most systems, the one is represented by a voltage close to 5.0 volts and the zero by a voltage close to zero.

Let's assume our sync circuit has put a "one" next to stage one. When the first pulse from the pulse amplifier comes along, the one is transferred into stage one. When the second pulse comes out of the amplifier, the one is moved from stage one to stage two and so on down the line. It is important that no other "one" is put next to stage one (or into what is called the data input) or it will be loaded into stage one whenever the next pulse comes out of the receiver. Figure 3 illustrates this operation.

It can be seen that the shift register takes our serial information, a series of pulses with the servo commands equal to the time between them, and converts it to eight parallel outputs with the information in pulse width format. Each time we shift a pulse through the register, we complete one frame.

The usual R/C system is designed so there is an interval between the time the last channel's information is sent and the time the next frame is started. This is detected with a pulse omission detector which is the sync circuit in our block diagram. If the sync circuit doesn't see any pulses for, say, 7 milliseconds, it sends a "one" to the data input that says the next time I receive a pulse, I want the one at the output of stage #1.

Some receiver decoders include reset circuits which are similar to the sync circuit. If the reset circuit doesn't receive any pulses for, say, 15 milliseconds, it makes the output of all stages reset to zero. This would happen in the case mentioned - - - that is, turning the transmitter off first. The reset circuit wouldn't get any pulses and all outputs would go to zero resulting in no further servo movement. Those are the basics. Maybe next time we can get into the circuits themselves. □

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Soaring AL KINDRICK

Lost and Found Department

Lost: Where are all of the two meter sailplanes, flyers, builders, kits, and contests that were starting to appear one year ago? The two meter sailplane has its place in our soaring ranks. Easy to build, great to fly, simple to transport, and competitive in competition. Let's hear more on these fine little sailplanes.

Found: A new exciting line of scale sailplanes available to the scale buff in the United States. Pete Bechtel of Windspiel Models, Cour D'Alene, Idaho, is bringing into the U.S., from England, the exclusive line from Viking Models. The list of scale sailplanes is too long to list here, but they are great. Superb epoxy glass fuselages, built-up construction on some models, foam on the others, and carbon fiber wing construction. If you are interested in quality scale kits, drop Pete a line and ask about the available models. Write Pete Bechtel, c/o Windspiel Models, Rt. 3, Box 457, Coeur D'Alene, Idaho 83814.

★

Many of us, at one time or another, have built or are about to build a sailplane with a one piece wing, or center section one piece with plug-in tips. After you have covered the new bird, you sit back and say, "Boy, the center section glass job didn't turn out too keen".

Tom Obringer, of Chesapeake Bay R.C., has come up with a very neat, clean, and strong center section.

A very important part of a model sailplane is the center of the wing or the area where the two wing halves join. Many builders overlook this area or, as in my case, have problems strengthening this area. I've tried using glass cloth and epoxy, but it always turned out uneven and left areas where the glass had lifted. When I then tried to sand these high spots and feather the edges, as soon as I sanded through the epoxy to the glass cloth, it would turn to fuzz. I then tried celastic over the center section. This method was a lot easier since all that is required is to cut the celastic to size, soak it in dope thinner, and apply it over the center section. The edges can be feathered out with your fingertips, while still damp, then it can be lightly sanded. Again, if sanded too much, the fuzz will appear. Even though this method is much easier, I had my doubts as to its strength when compared with the fiberglass method.

After reading several tips from model magazines, I think I've developed a method for using glass cloth and epoxy

glue which has the benefits of both methods. I start by covering the top half of the wing first. The width of the cloth used depends on the size of the sailplane and the stress you will put on the wings. I use 6 oz. cloth, which ranges from 2" to 4" wide. Cut a piece of cloth long enough to cover the entire top section and wrap around the leading edge about 1½". Starting at the trailing edge (I do not wrap the trailing edge with cloth), tack the cloth down with Zap or Hot Stuff. Run a line of Zap across the entire width. This has two advantages: One is to allow you to stretch the cloth tight; the second is to allow you to trim the end of the cloth flush with the trailing edge without causing the edge to fray. Pull the cloth tight at the leading edge and again apply a line of Zap across the full width of the cloth at the leading edge. Pull the cloth around the leading edge to the underside of the wing and run another line of Zap across the width at the end. Now, go over the covered area and, using Zap, tack the cloth down to prevent it from moving when the epoxy is applied. Pay particular attention to any high spots or lifted edges; when found, tack them down.

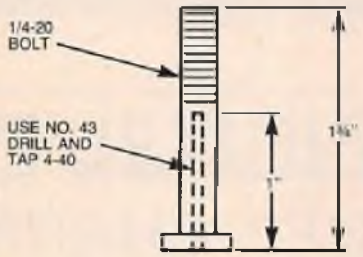
In the next step, I have only used Hobbypoxy Formula 2 and cannot comment on any other types of epoxies or resins. Mix up a batch of epoxy which you feel will cover more than the area you have. When I mix Hobbypoxy Formula 2 and want a hard finish when cured, I mix 55% Part A with 45% Part B. This will also speed up the curing time slightly.

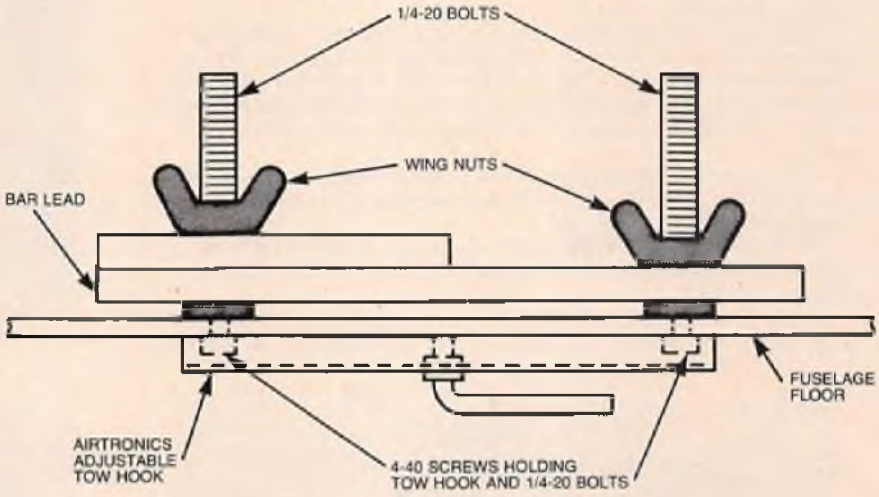
When mixing, be sure to mix the 2 parts very thoroughly. Do not take any short cuts here. Next, place the container of mixed epoxy (I use small baby food jars) in a pan of hot water until the mixture is very thin. This takes about 3 to 5 minutes. Next, apply the epoxy to the glass cloth with a paint brush, extending beyond the edge about 1/2" to 3/4". When brushing it on, take time to work the epoxy into the cloth. The object is to get the glass cloth to soak up the glue. After working in the glue, use the brush to smooth the surface. Set the wing up horizontally with the covered area up and allow to cure overnight. If done right, when you sand, you can sand down through the cloth without the appearance of fuzz. Sand the entire area and feather the edges until flush with the balsa. Repeat the above steps to cover the bottom of the wing. I feel this method gives me the strongest center section possible, and it's not all that difficult to do.

★

James Durrell, Jr., of Columbus, Ohio, has a clever way of attaching ballast in your sailplane.

"I have been flying sailplanes for two years and have had trouble attaching ballast in those planes using an Airtronics adjustable tow hook. After looking at the two screws used to attach the tow hook protruding inside from the bottom of a recently built Olympic II, I decided to use those two screws to attach the ballast. To do so, I purchased two 1/4-20 machine screws 1¾" long and drilled the center of the bolt with a #43 drill (.089 dia.) to a depth of 1". Using a 4-40 tap, tap the hole just drilled so the 1/4-20 screw will thread on to the 4-40 screws securing the tow hook to the fuselage. Bar lead may then be cut and drilled to fit over the 1/4-20 screws and secured to them with wing nuts."





NOTE: BAR LEAD MAY BE DIVIDED BETWEEN BOLTS TO ADJUST C.G.

★

In last month's column, we talked about the importance of a timer and his responsibilities. This time, we want to talk about the winch master or winch assistant. Either term you wish to use boils down to the same thing. After the sailplane is off the hook, get that winch line down fast — especially if your contest is man-on-man with four or five winch lines all up at once. If you don't think it is important to get that line down fast where two or more winches are in use, plan on spending your flying time untangling winch lines.

The picture shows Bob Lear in the proper position to bring the line down properly when the tow hook is free from the sailplane. His right hand is on the winch button, his eyes on the sailplane all the way up, ready to bring the line down quickly to turn around the roller without having to say anything to the

to page 162

Ollie Van Houten launches while Bob Lear has hand on foot pedal over-ride button to bring launch line down quickly.

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Racing At Random

FRED REESE

In my last column, I talked about building lighter Quarter Midgets to meet the minimum weight of 2½ pounds. Since then, I followed my own instructions and built a Prather Quarter Midget "Little Toni" to evaluate each step of the building process with regard to weight. First, I want to say that the "Little Toni" is exceptionally well engineered and of such high quality, that I felt no need to change any parts or method of construction to improve the kit. I built the kit as per the plan and the instructions and did not leave out or change any parts. I used as little epoxy as possible while still considering strength, and then used Hot Stuff for wood-to-wood balsa joints in the wing to further reduce weight. The results are impressive for a stock glass and foam kit. In the last Racing at Random column, I said that a 16 ounce, or less, airplane would be the weight to strive for. The weight of the motor mount would be considered, in addition to the weight of the airplane. My Prather "Little Toni" Quarter Midget weighs only 16¼ ounces and that includes the cowl and the wheel pants. In order to give you a reference, I weighed everything, as it was added, to make the following table. You can use these figures to check your construction against these weights to better predict the finished weight of your racer.

One of the reasons for the light weight is the wing built from this kit. At 6.75 oz. complete, it was 1.75 oz. lighter than my goal of 8 oz. The Prather landing gear is a little heavy but it is stronger so, when combined with the light wing, the combined weight is 8 oz. My goal for the finished fuselage and tail, but less the motor mount, was also 8 oz. The Prather QM "Little Toni" fuselage, tail and cowl, less the motor mount, also weighs exactly 8 oz.

The radio system I use is a Kraft Gold

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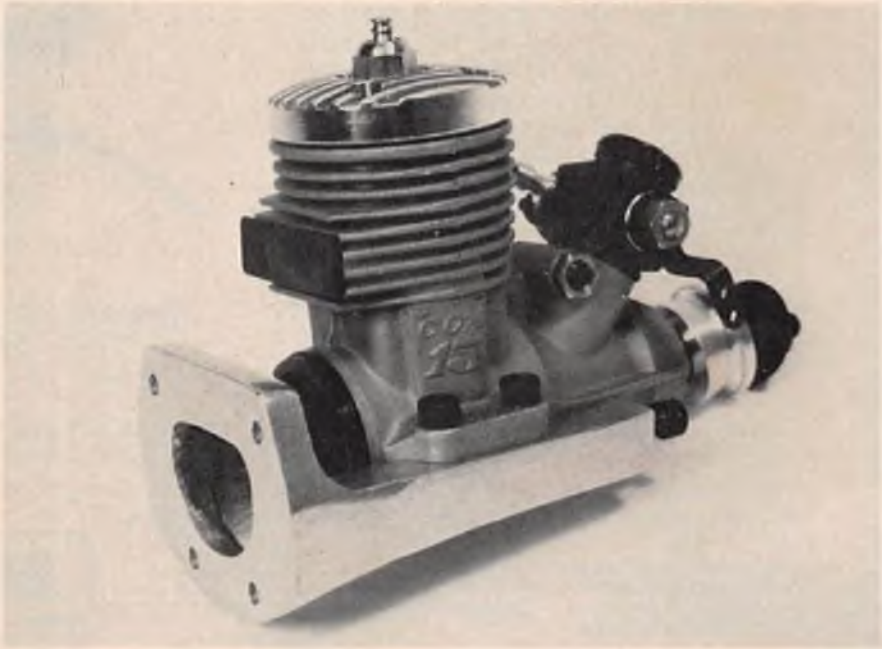
QUARTER MIDGET CONSTRUCTION WEIGHT CHART
Minimum Allowable Weight is 40 Oz.

Item	Item Weight	Item Total	Total
Fuselage			
Epoxy Glass Fuselage	4.5	4.5	
Tatone #2311 Engine Mount	1.75	6.25	
Firewalls	.75	7.0	
Epoxy and Cloth	.75	7.75	
Paint — one coat	.25	8.0	8.0 oz.
Tail Group			
Before Sanding	1.25	1.25	
After Sanding	.75	.75	
After Covering	1.0	1.0	9.0 oz.
Wing			
Foam Cores	1.0	1.0	
Balsa Sheeting and Glue	2.25	3.25	
L.E., T.E., Tips, Joined and Sanded	.75	4.0	
Aileron Linkage Installed	.5	4.5	
Gear Mount Installed	.25	4.75	
Glass Cloth and Resin (Before Sanding)	.5	5.25	
Glass Cloth and Resin (After Sanding)	.25	5.0	
Super MonoKote Covering	1.5	6.5	
Hinges and Servo Mount	.25	6.75	15.75 oz.
Landing Gear	1.25	1.25	17.0 oz.
Engine Cheek Cowl	.75	.75	17.75 oz.
Glass Wheel Pants	.25	.25	18.0 oz.
*Actual weight of the airplane less the weight of the mount			16.25 oz.
Engine (Cox .15)	6.5	6.5	24.5 oz.
Accessories and Hardware	6.0	6.0	30.5 oz.
Radio	10.25	10.25	40.75 oz.

*This is .75 ounce overweight.



New Tatone engine mount # 2311 for Cox Conquest .15. The mount is undrilled and will also fit the Rossi or Super Tigre .15 racing engines and is long enough for rear intake .15's as well. As shown, the mount has been drilled and tapped in the ends of the beams for a forward firewall mount. The mount is also low in the rear to clear the exhaust extractor.

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RCM TWIN TRAINER

The RCM Twin Trainer by Brendan K. Wong is designed as a twin engine trainer for two .40's. You'll find this design takes the trouble out of twin engine flying.

How many of you have wanted a twin but couldn't afford the cost of "practicing" on a Stand-off Scale B-25? This is a problem many would-be multi flyers face. I don't know of any company that kits a true twin engine trainer. This plane will fill that void.

About a year ago, I decided to get into radio control. I knew absolutely nothing about R/C, but had done some control-line flying, so I didn't exactly start from the bottom. A friend was already into R/C, so we met at the flying field a number of times. After a month of data gathering, I set down my plan.

Due to the cost of balsa, gas and engines, I stayed with .40 powered aircraft. Step One called for a .40 powered trainer. I also needed a radio set and an engine. A Bridi RCM 40 with a K & B .40 and a 5 channel Futaba set turned out to be a great combination. A Sig Kougar was my second trainer (Step Two). Both planes are great, and I'd recommend this combo to any newcomer. Step Three would be a twin trainer. Because there weren't any kits or plans available, I decided to modify my RCM 40 for twin power. Borrowing two .25's, I built two engine nacelles and tacked them on the wing, covered up the old engine compartment and tried it. After one flight, I decided to do it right and start from scratch. Because this would be a trainer, a second twin would most likely follow. For this reason, this trainer would use engines in the range of what most of us can afford — .25 to .40. Prototype II used extended engine nacelles to get the weight up front and reduce the possibility of building tail heavy as in Prototype I. Another modification was an extension of the wing to 62". You'll notice some other minor changes in the plans but, other than that, it's really an RCM trainer. Model I of Prototype II weighed 5.75 lbs. with two K & B .40's. Since I wasn't exactly sure how this thing would fly, finish was minimum. I used Fas-Cal plastic iron-on covering with basic black overall.

Since I had made the trim flights on my Kougar, I decided to trim out my twin myself. I had no trouble with my Kougar and hoped this twin would be as easy. After adjusting the throttles, I finally got the engines to run about the same. By the way, I don't use counter-rotating engines. I made some high speed taxi runs to adjust the nose gear, then topped off the tanks to prepare for my first flight.

Both engines were adjusted for a strong four cycle at wide open throttle (W.O.T.). With both engines W.O.T., this thing goes like hell, so make sure it goes straight without much steering. There

isn't much time to practice your steering skills. With both engines humming, it took just a bit of up and it was flying. There was no tendency to roll to the left and, in fact, was so easy to take-off, it felt like it was already trimmed. I took it up high and trimmed for straight and level flight. It needed a bit of aileron trim and some down trim. Turns in either direction using aileron-elevator or rudder-elevator were done without any trouble. The flight to this point was great, so I decided to try a landing approach to feel it out before I ran out of gas and had to make a landing without any idea of how it would handle. As it turned out, I didn't have to make more than one approach! Everything felt so good, I brought it in the first time around.

Flight One was a complete success! In other flights, it has shown me that it could do just about anything. Loops can be as big as you want them to be, inverted flight is just as easy as right-side-up, and it'll fly straight up for as long as you like. In other words, I really think it's a great plane! There is one thing I would not do and that is spins. I'm worried about the wing falling off. Those rubber bands aren't the greatest way of attaching the wing, but you have to show the troops that it is a trainer, right?

I've had a number of flights where one engine has died, but haven't tried to continue the flight on one engine. If one engine does die, do not continue to fly with the other engine in W.O.T. I'm sure it will not fly. Cut back on the throttle first. One of these days, I'll take it way up and let one engine die and give it a try.

The plans shown here, Prototype III, have some improvements over Model I of Prototype II. These improvements were to strengthen the nacelles and wing saddle section, and to move the main landing gear to the nacelles.

I hope this article proves that not only experts can try something different. If you are a decent builder and flyer, there is no reason why you cannot build and fly this twin. It's a cheap way to learn the basics. If someone tells you you're crazy, ask him if he has tried one. If he hasn't, play deaf. If he has, get as much information out of him as possible, and try not to duplicate his mistakes. Please feel free to contact me about any problems. My address is 3504 Garnet Street, Torrance, California 90503. I would like to thank Bridi Hobby Enterprises for allowing me to use the RCM 40 Trainer plans as a basis for my twin.

Let's get to the construction.

CONSTRUCTION NOTES

Most builders will agree, making a kit before starting actual construction is the best way of scratch-building. I like to identify each part with removable labels. Please read over each section before starting, and be certain you understand what you will be doing before you actually do it!

Horizontal Stab and Elevator: Cut the rear section of the horizontal stab and elevator from the 1/4" x 4" x 36" balsa sheet. The front stab portion should be cut from one of the 1/4" x 3" x 36" sheet. Join the stab pieces together using Zap. Install the plywood elevator horn plate. Sand the stab and elevator to shape.

Vertical Stab, Dorsal Fin and Rudder: Cut the vertical stab and rudder from the remaining piece of 1/4" x 4" x 36" balsa sheet. The dorsal fin can be cut from any piece of 1/4" sheet remaining. Glue the plywood rudder horn plate in place. Don't glue the dorsal fin to the vertical stab.

Fuselage: Cut all fuselage parts out. Cut the fuselage top block from the 3/16" x 4" x 36" balsa sheet. Also cut B-2 and B-3 from this sheet. The fuselage sides are cut from the 1/8" x 4" x 36" balsa sheet, one sheet per side. The aft section will have to be joined.

Draw a centerline down B-1, B-2, B-3, the top fuselage block, and the horizontal stab. Place the top fuselage block, with the centerline showing, on your building board. Glue the 1/4" x 3/16" stringers in place (allowing a 1/8" recess to accept the fuselage sides) on the fuselage block. Glue the 3/16" x 1/4" x 2" cross brace in place as shown in the plans. Glue B-3 in place. Also use a triangle or square to make certain B-3 is perpendicular to the fuselage block.

Using the completed fuselage top block, mark the positions of B-3 and the vertical brace on each fuselage side, making certain your marks are perpendicular to the top fuselage block. Lay both fuselage sides down on your building board with the innerside up. Place the 1/32" ply wing saddle-fuselage doubler in position and mark the position of B-2; also mark the position of B-1. Glue the 1/32" plywood doublers and the vertical braces to each fuselage side. Using one fuselage side, Zap B-2 in place using a triangle or square to make certain it is 90° to the fuselage side. Place this fuselage side upside down on your building board and Zap the other fuselage side to B-2. Pull the rear portion of the fuselage together and pin using a 3/8" piece of balsa as a spacer. Remove the fuselage assembly temporarily to place the fuselage top block in position over your plans. Put glue on the stringers and B-3. Place the fuselage side assembly on the fuselage top block. Make certain the fuselage sides are perpendicular to your building board by shimming the fuselage sides apart where necessary. Use Zap to "pin" in position. Zap B-1 in position while holding the fuselage sides tightly against its edges. Allow to dry.

Use the 1/16" ply and balsa, cross

text to page 150

ABOUT THE AUTHOR

Brendan K.M. Wong is 26 years old and holds a Bachelor of Science in Mechanical Engineering from Northrop Institute of Technology. He is employed at Aerojet Ordnance and Manufacturing as a Mechanical Engineer. Born in Hawaii, Mr. Wong has had recent experience in design and development of carburetor calibrations for 1976/77 vehicles; design and development of advanced single venturi staged carburetor; cold weather and high altitude emissions and driveability studies; hot fuel handling study and fuel system integrity designs to meet Federal docket; emissions calibrations, fuel economy, driveability, etc.

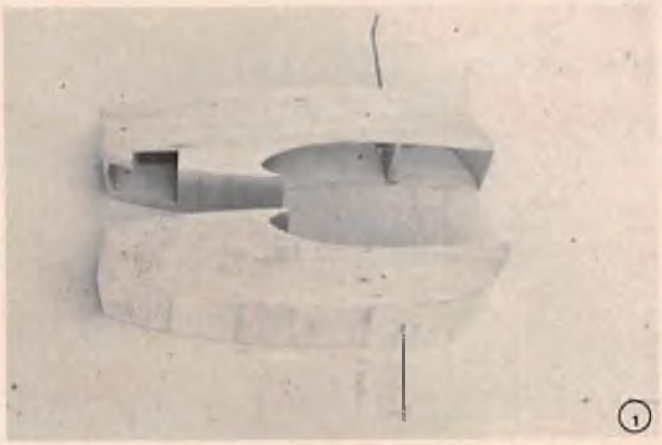
RCM TWIN TRAINER

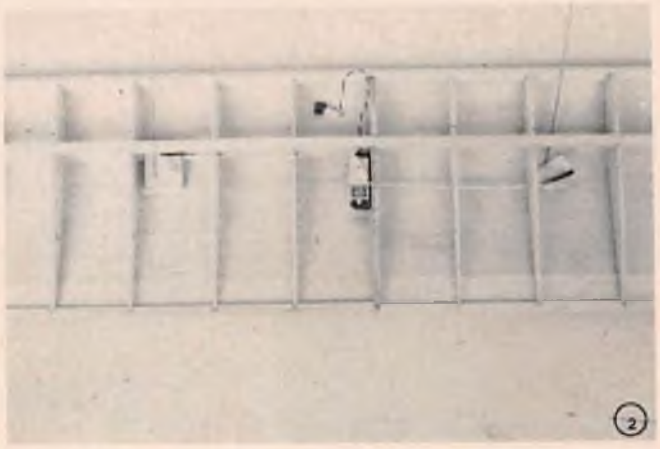
Designed By: Brendon Wong

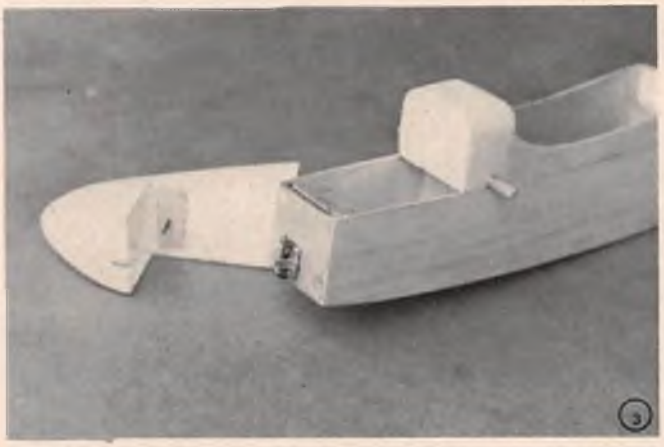
TYPE AIRCRAFT
Twin Engine Sport Trainer
WINGSPAN
62 Inches
WING CHORD
10¾ Inches
TOTAL WING AREA
666 Square Inches
WING LOCATION
High Wing
AIRFOIL
Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
(Flat Wing)
O.A. FUSELAGE LENGTH
45 Inches
RADIO COMPARTMENT AREA
(L) 15" X (W) 3" X (H) 3"
STABILIZER SPAN
22½ Inches
STABILIZER CHORD (incl. elev.)
5⅛" (Avg.)
STABILIZER AREA
107 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
6½ Inches
VERTICAL FIN WIDTH (incl. rudder)
5¾" (Avg.)
REC. ENGINE SIZE
.25-.40 Cu. In.
FUEL TANK SIZE
4-8 Ounces
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail. & Throt.

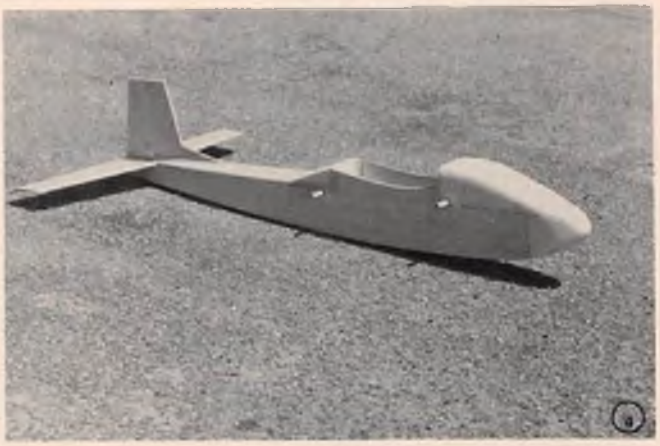
BASIC MATERIALS USED IN CONSTRUCTION

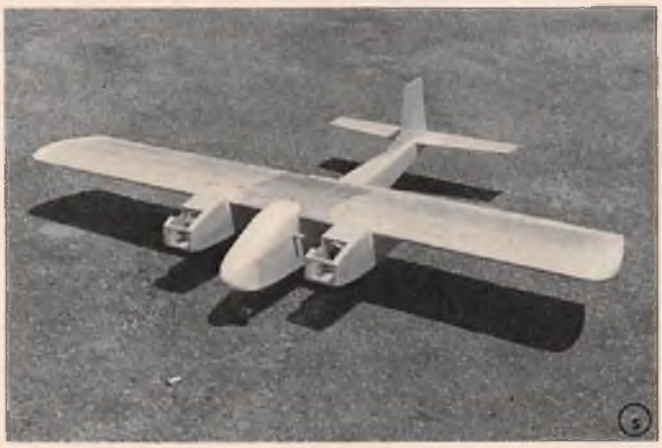
Fuselage	Balsa, & Ply
Wing	Balsa & Ply
Empennage	Balsa
Wt. Ready-To-Fly	92-104 Oz.
Wing Loading	19.9-22.5 Oz/Sq. Ft.

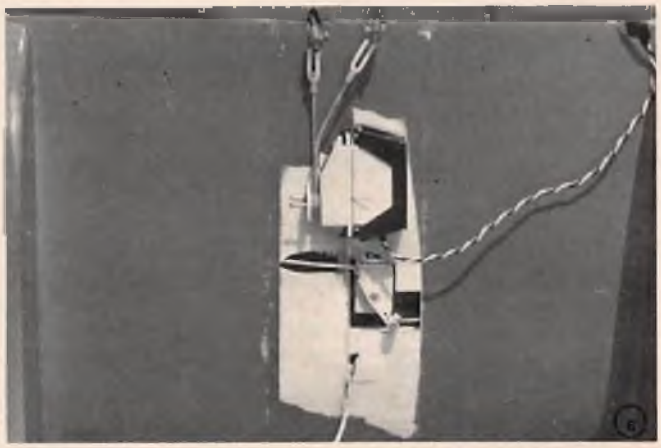


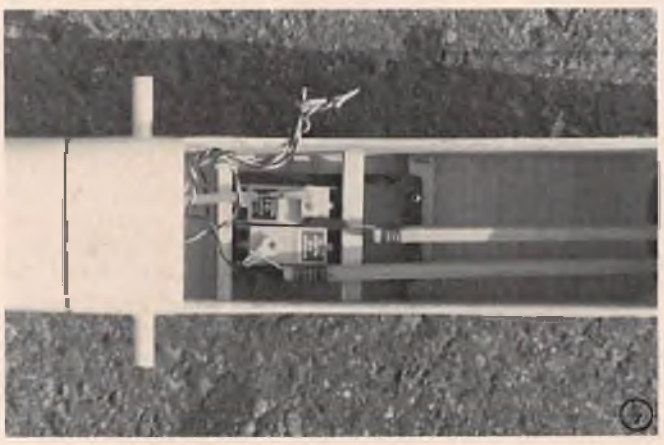






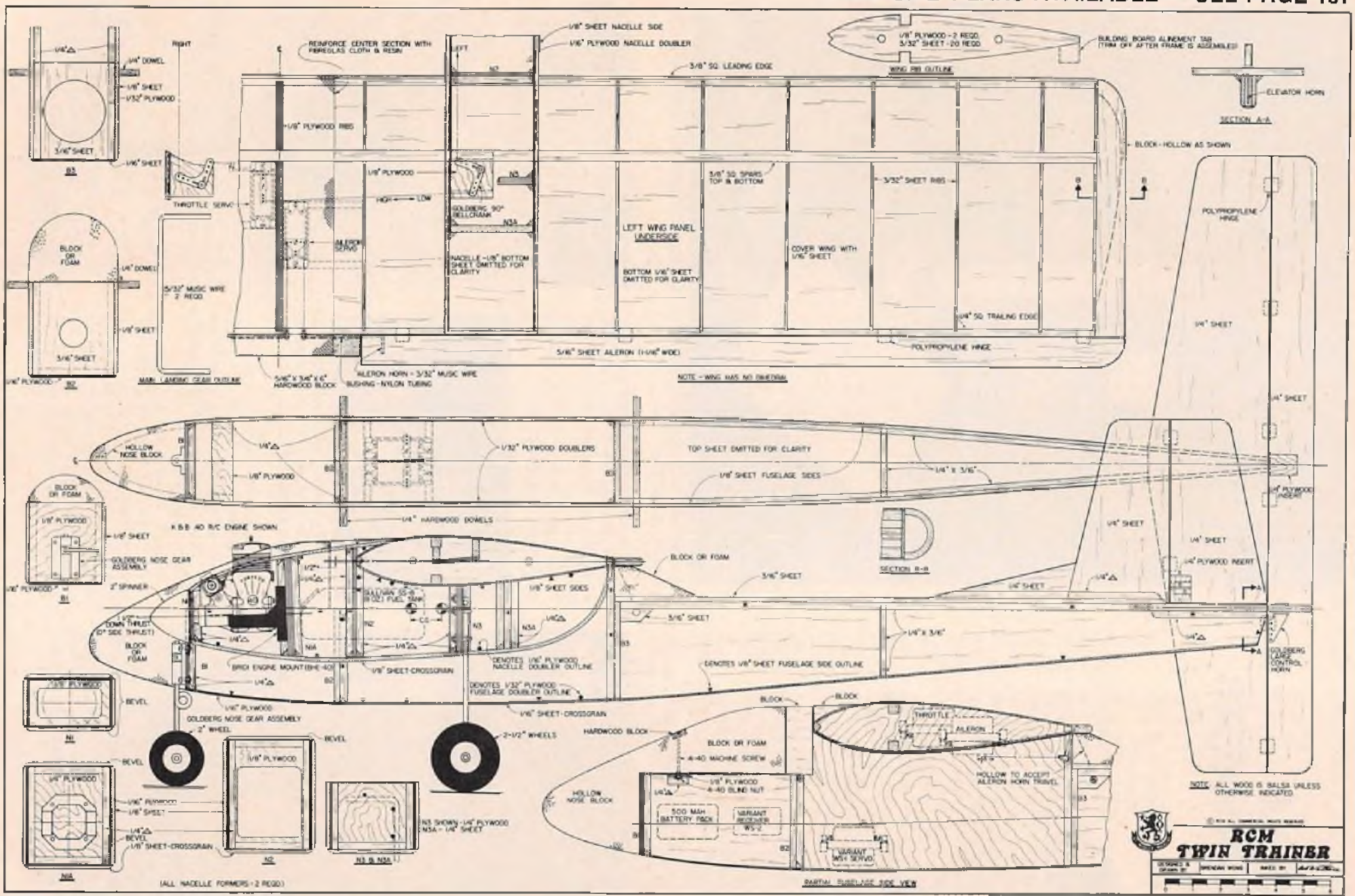






(1) Framed up engine nacelles ready for installation on wing. (2) Bottom view of wing center section showing throttle servo & linkage. (3) Forward fuselage section showing removable foam nose block. (4) Completed fuselage ready for covering. (5) Completed twin ready for final covering & equipment installation. (6) Completed wing with throttle & aileron servos installed. (7) Rudder & elevator servos installed showing ample room for even the largest of equipment. (8) Nose block removed giving good access to receiver & battery pack. This allows easy adjustment to nose wheel tiller arm.

FULL SIZE PLANS AVAILABLE — SEE PAGE 187



A SIMPLE ANEMOMETER

By Ferd Chappa

The heat of competition has bred many strange and wonderful devices - - power fliers use everything from electric starters to retracts and they're still looking.

Over on the silent front, while they don't make much noise, competition is as fierce as pattern, pylon racing, or you-name-it — maybe not as spectacular, but fierce.

While time and precision are the plagues of one front, weather is the glider pilot's worst enemy or best friend — depending on how he reads Mother Nature and humors her moods.

This simple anemometer is a device bred purely from competition. Rae Fritz, like any true competitor, is always looking for an edge — and, logically, when you depend on weather, knowing wind speed is a definite advantage.

Anemometers have been around forever — even in model airplanes they are not a new device.

The difference in this one is its utter simplicity and reliability. Not only does it work, but it's easy to build and it's cheap - - you don't hear that much - - it's cheap. Less than $15 if you have to buy **everything**.

Anemometer with original drawing and Orlando LSF Soaring Nats trophy. Unit is sheer simplicity.

Anemometer stuck on a pole ready to go to work. Most any type mounting will work as long as it's sturdy and you can read meter.

The authors aren't the only ones to think this is a worthy project.

Here's the motor. You can probably scrounge one from an old cassette recorder. Details in text.

The League of Silent Flight awarded Fritz the Best Technical Achievement Award for his anemometer at the June 1977 Soaring Nats in Orlando, Florida.

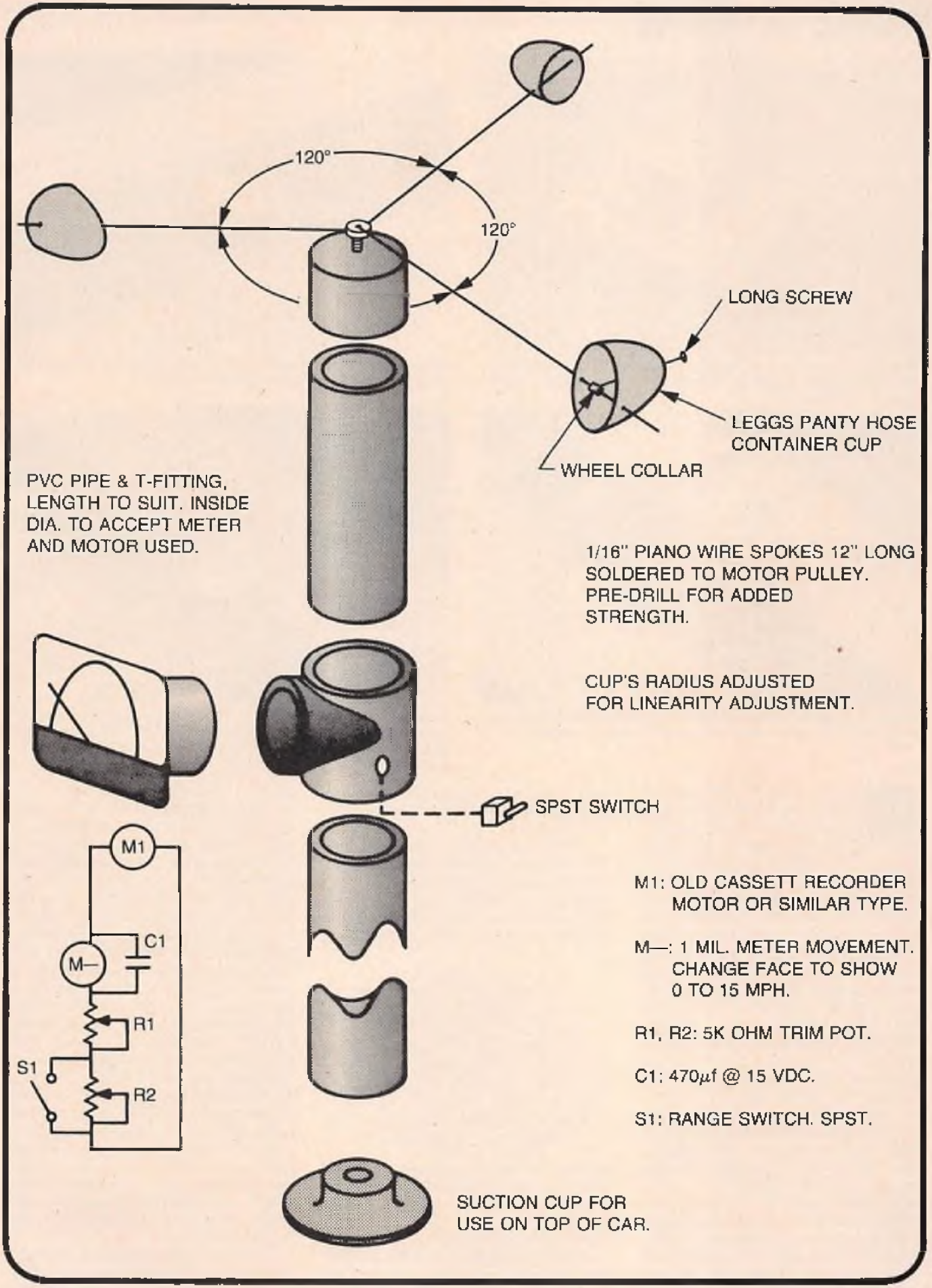
So, let's build one.

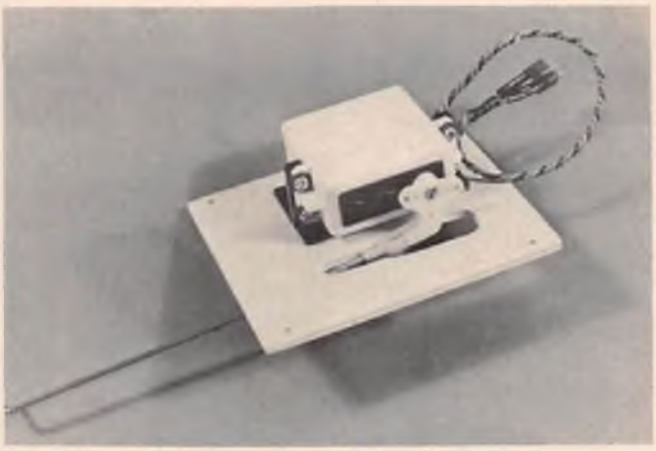
All parts are available at most electronic stores and plumbing shops. The cost of all parts would run about $14.00, but a little shopping at your local repair shop for the motor and meter would cut the cost to less than half.

Most of the cassette recorders use the

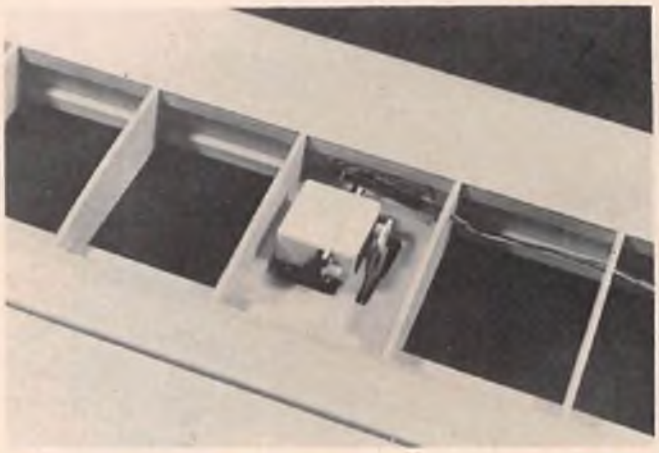
to page 144

This is the meter. Switch is for low speed/high speed. If conditions are super windy, just flip switch and double numbers.

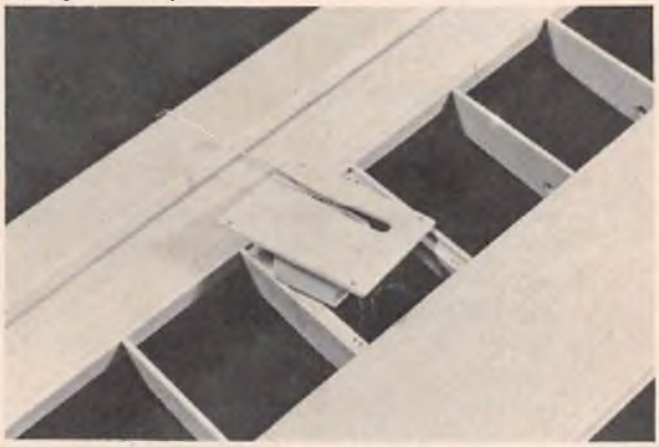

120°
120°
LONG SCREW
LEGGS PANTY HOSE
CONTAINER CUP
WHEEL COLLAR
PVC PIPE & T-FITTING,
LENGTH TO SUIT. INSIDE
DIA. TO ACCEPT METER
AND MOTOR USED.
1/16" PIANO WIRE SPOKES 12" LONG
SOLDERED TO MOTOR PULLEY.
PRE-DRILL FOR ADDED
STRENGTH.
CUP'S RADIUS ADJUSTED
FOR LINEARITY ADJUSTMENT.
SPST SWITCH
M1
M—
C1
R1
S1
R2
M1: OLD CASSETT RECORDER
MOTOR OR SIMILAR TYPE.
M—: 1 MIL. METER MOVEMENT.
CHANGE FACE TO SHOW
0 TO 15 MPH.
R1, R2: 5K OHM TRIM POT.
C1: 470μf @ 15 VDC.
S1: RANGE SWITCH. SPST.
SUCTION CUP FOR
USE ON TOP OF CAR.



Aileron servo mounted on lite-ply plate using Kraft side mounting tray (part number 200-004). Allow room for installation of clevis through hole in plate.



Servo mounted in wing panel. Note servo connector and special cable. Installation is neat, clean and simple.



Servo mounted on plate is screwed to rails located on each rib. Removal of servo is a must in case of trouble or service.

Installation as viewed from bottom. Aileron adjustment is easily accomplished by removing keeper from control horn and rotating wire. Threads in clevis can readily be seen at all times with nothing hidden.

Have you thought about building one of the large R/C models now available on the market? More and more are beginning to show up. One manufacturer of large models, Bud Nosen, must have foreseen this latest trend since Bud has many 8' to 10' aircraft kits available, including his latest, a spectacular 102" P-51D. Other kit manufacturers are entering the large airplane market. Concept Models will soon kit a 1/4 size Fleet bipe. Midwest Models will kit a large version of their old and trusty Tri-Squire as a trainer. Skymaster Industries has just released the Lazy Ace with more to come. There is no doubt that large planes have found a place in the market. But the industry is not geared up for this latest trend and some of the hardware necessary to outfit these large aircraft will come painfully slow. The need for larger hardware (hinges, clevises, control horns, etc.), more powerful engines to turn big props, and power servos to move large control surfaces, are now becoming a reality. Some of these items are beginning to appear, however, it will take time until they are plentiful. How soon this will happen depends largely on how much of an impact this latest trend has on the R/C industry.

Having seen some of these large aircraft fly, I was completely enthralled with the majestic way they took to the air. They fly very realistic and smooth, although most are lightly wing loaded. I heard one pilot say, "It's almost like owning a full sized homebuilt."

Special "Y" cable required to hook up servos mounted outboard in wing. Take extra care to observe polarity.

Recently, I became involved in building Chuck Cunningham's Lazy Ace. As the airframe on the Ace began to take shape, I suddenly realized that maybe my particular servos would not have enough power to operate the control surfaces against the air loads, especially the ailerons which are quite large (each being 3" x 33"). I could see the Ace coming out of a loop with a big head of steam and then full aileron for a super roll. At this point, it seemed to me my aileron servo would be straining its gears out. Rather than impose the extra load on my poor servo, I decided to use a servo for each aileron. Well, why not! The servos are small and light and can be easily mounted outboard in the wing. The servo aileron hook-up is quite simple, as opposed to the usual bellcrank hook-up, allowing for less chance of pushrod binding. Because of the possibility that the servo will have to be serviced after a period of time, it must be removable from the wing. In this case, the servo was mounted on a piece of lite-ply and held into the wing panel with four small wood screws. In case of servo problems, it is easily accessible.

About the only problem you might encounter with this set-up is that a "Y"

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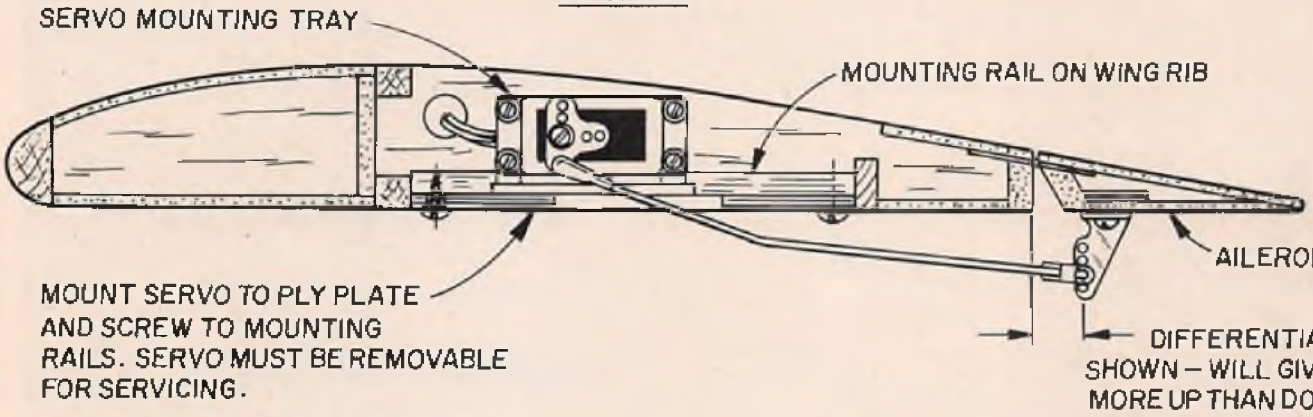
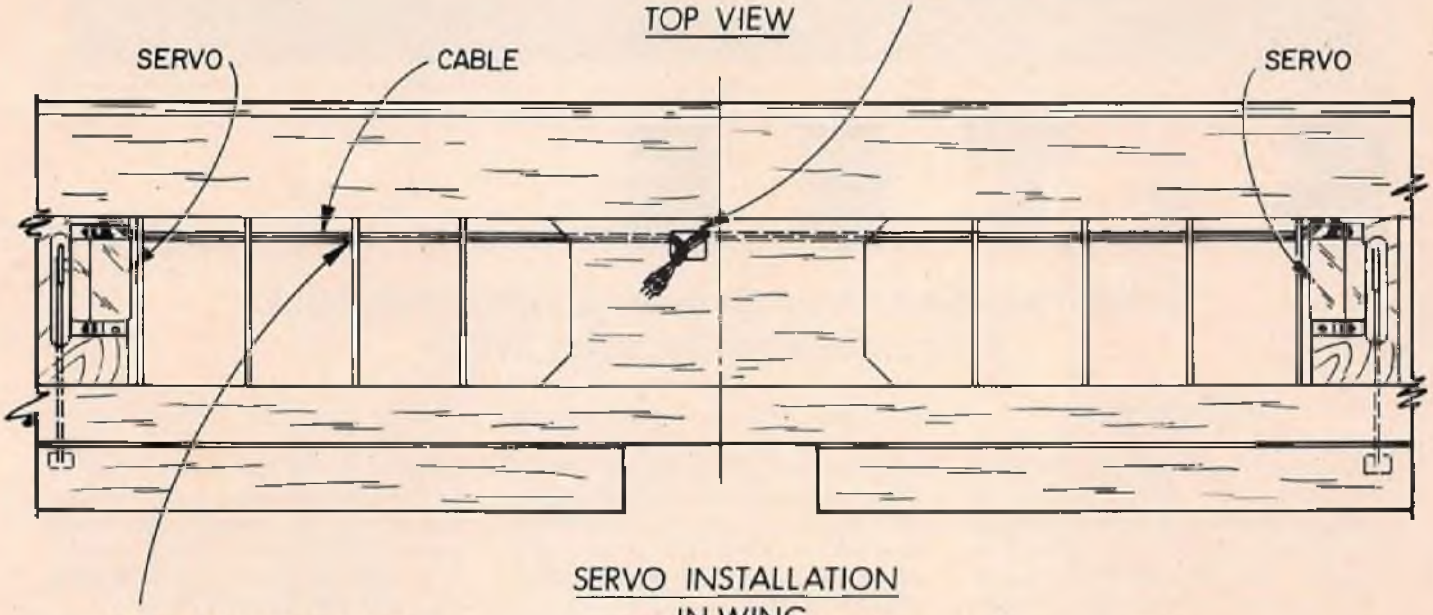
TYPICAL CROSS SECTION OF SERVO MOUNTED OUTBOARD IN WING

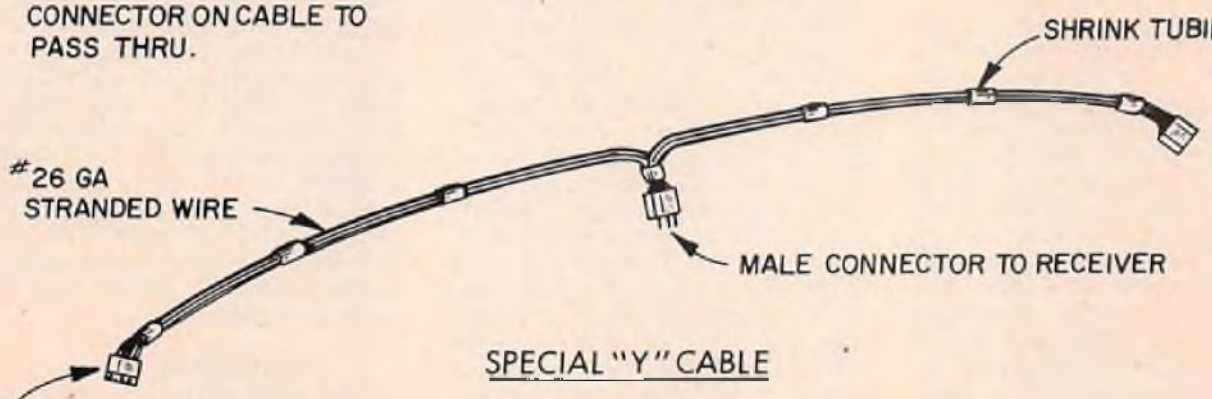


SMALL HOLE IS REQUIRED IN CENTER FOR CONNECTOR OUTLET. CENTER SECTION IS MUCH STRONGER.

TOP VIEW



SERVO INSTALLATION IN WING



SPECIAL "Y" CABLE

NOTE:

WHEN SOLDERING WIRES TO CONNECTORS MAKE SURE OF CORRECT POLARITY. CHECK SERVO CONNECTOR TO BE SURE.

Prototype By Geoff Watkinson

S-TEE

By Lee Renaud

A Half-A powered, shoulder wing version of the popular Q-Tee, designed for sport flying.

INTRODUCTION

The S-Tee is a shoulder wing version of the popular Q-Tee design published in the January 1976 issue of RCM. The general airframe is almost identical to that of the Q-Tee which means that construction is very simple and rugged. The shoulder wing layout provides a larger equipment compartment, making 3-channel operation feasible.

The S-Tee is an intermediate model which offers a step-up in performance over the Q-Tee. The Cox Medallion .049 with throttle plus a one or two ounce tank permits easy "touch and go's" as well as providing extended engine runs. The model is so simple that we encourage you to try modifying the design if you want more aerobatic performance. We have built models with the dihedral reduced to 50% of that on the plans, using rudder control as well as straight wing versions with 5/8" wide strip ailerons cut from the trailing edge. Both flew well, but are not recommended for the beginner.

If you have read this far and think that the S-Tee is the model to introduce you to the sport of R/C, send to RCM for a copy of the full size plans of the S-Tee (see page 187 for plan ordering instructions). Then visit your local friendly hobby shop with a copy of the materials list and select everything you need. While you are waiting for the full size plans, study the photos, instructions, and magazine plan to completely familiarize yourself with the building sequence. This will pay off later when you start to build.

Note that in addition to the materials required to build the S-Tee, you will need a few tools, supply items and a work surface. For this size airplane we recommend an inexpensive 24" x 36" wood drafting board as an ideal work surface. It is flat and true, easy to push pins into, and can be easily picked up and stored if you are working with limited space. Alternately a sheet of Celotex or similar material makes a good surface.

You should have a model knife and/or single edge razor blades, a razor saw, metal straight-edge, pliers, small hammer, and a hand drill available. A few hardwood sanding blocks, assorted grades of sandpaper, straight or tee-pins and masking tape will also be required. The type of adhesives used are largely a matter of personal choice. Wilhold Aliphatic, Titebond, and similar glues are excellent for general construction. Hobbypoxy Formula 4 or Devcon 5-Minute Epoxy are recommended for the fuselage former/side joints, and the wing center joint. We used Hot Stuff entirely to build our own prototypes as we feel the time and weight saved is well worth the additional expense. Just be sure to follow the warnings on the bottle and make sure all joints fit tightly.

When the plans arrive, we suggest that you cut out all parts required to build the airframe. Bend the landing gear to the pattern shown on the plan. To cut the wing ribs, we suggest making two templates of 1/16" ply and pinning eighteen 3/32" x 7/8" x 7⅛" balsa rectangles between the ply templates. The resultant sandwich can be shaped to contour, notched, then separated to provide the ribs. We find that preparing a personalized kit in this manner reduces overall assembly time and gets the model completed quickly.

CONSTRUCTION

The construction sequence described, progresses from the most simple steps through more complex building requirements. If this is your first model, we suggest you follow the sequence shown. The advanced modeler will, of course, ignore all instructions anyway.

To reduce overall building time, we suggest that you skip forward to the next step while the glue is drying. Just work carefully and be sure you understand all construction steps before cutting. Cut the plans apart if this is more convenient. Cover the plans with Handiwrap, or similar wrap, to prevent gluing the wood parts to the plan.

Tail Surfaces:

(1) The rudder is cut from a strip of 1/8" x 1⅜" x 17⅞" balsa. Lay the strip against the plan and mark the correct length. Check carefully, then cut. (The balance of this strip is used for the elevator.) Now, lay the rudder over the plan and cut or file a notch in the leading edge, to clear the elevator tie. Round off the corners then round all edges and sand smooth.

(2) The fin is made from a piece of 1/8" x 3" x 3⅞" balsa. Sand both edges square and straight, align over plan and cut off the top front corner, using the cut line to line up your straight-edge. The triangle which you cut off is now butt glued to the front of the fin. When the glue is thoroughly dry, sand the outline smooth, and round the leading edge and top. Be careful not to round the bottom edge, where it fits between the stab center ribs.

(3) Use the plan to locate the holes in the rudder for the control horn. Mark the holes and use a 3/32" diameter drill, checking carefully that the holes in the rudder line up with the holes which are molded in the horn base and nut plate. Locate the hinge positions from the plans and use a #11 X-Acto knife blade (or similar) to cut a 1/2" long slot in the front edge of the rudder. Work very carefully and be sure the slot is exactly on the center of the wood. Run the blade back and forth in the slot and trial fit the hinges until the tab is fully inserted in the rudder and the crease is lined up with the edge of the rudder. Align the fin and rudder and mark the hinge positions on the fin. Cut slits in the fin trailing edge and fit the hinges. With the surfaces pushed together, check that the rudder swings freely and moves at least 30° each side of center. Check that all edges line up and final sand all over. Lay these parts aside until later.

(4) Lay the elevator stock in place over the plans and trim to final length. Cut a 1/8" deep notch in the leading edge, so that the 1/8" diameter dowel tie fits snugly. Be sure the edge of the dowel is aligned with the front of the elevator and glue the dowel in place. Pin the elevator in place over the plans and mark the cut-out which provides rudder clearance. **Don't** cut this section out yet.

(5) Cut the trailing edge to exact length from a strip of 3/16" x 1/4" x 36" balsa and pin in position tightly against the elevator. Cut one tip and center rib from 3/16" x 11/16" x 11⅞" strip, and use these as patterns to cut a second set. Be careful that all edges are straight and square for tight glue joints. If you are using aliphatic or similar glues, we suggest that you pre-glue the end grain of these parts. This is easily accomplished by applying a coat of glue and letting it dry for 10-15 minutes before applying the final coat of glue. It is also wise to trial fit the parts before using any glue and to correct any mistakes before continuing. Pin the end ribs in place, gluing them to the stab trailing edge. Also pin and glue the center ribs in position, using the fin as a gauge to space the ribs apart. Cut the leading edge pieces from the 3/16" x 1/4" strip, and fit the center joints so that both pieces butt tightly together, then pre-glue this joint. Apply glue and pin the leading edges in place.

(6) Cut the truss ribs from a 3/32" x 3/16" x 36" strip. Fit these snugly in place, working from the center toward the tip, and being careful not to force the leading or trailing edges out of position. Pre-glue all joints, then glue in place. This completes the elevator assembly and we suggest that you leave this pinned in place at least 8 hours before removing from the work surface.

(7) Install the hinges following the same procedure used on the fin and rudder. Remove the hinges and sand the elevator, rounding all edges. Now carefully cut out the Vee shaped section being careful not to cut into the elevator tie. Round the leading edge and tips then use a sanding block to sand the top and bottom surfaces smooth. Be sure that all ribs are flush with the leading and trailing edges as any high or low parts will show up as flaws when you cover the model. Check the fit of the fin in the space between the center ribs and that the elevator tie does not hit the rudder in full throw positions. Correct any problems now, before covering. This completes the construction of the tail surfaces and now you are ready to tackle the wing.

Wing Assembly:

(1) Separate the stacked ribs and trim 1/16" from the top surface of the six center section ribs (W-1 and W-2) to allow for the top surface sheeting. Pre-glue the leading and trailing edge of all ribs.

(2) Use a small square or straight-edge to cut four pieces 1-5/16" wide and four pieces 3⅛" wide from the 1/16" x 3" x 18" sheet. Be sure that the 1-5/16" wide pieces are all exactly the same width. Cut four gussets from the 1/8" x 1/2" x 3" strip following the method shown on the plan, so that the grain runs diagonally to provide maximum strength.

(3) Smooth the plans out flat and tape them tightly to your work surface, then cover wing area with a piece of Handiwrap. Note that the wing is built flat in one piece then cut apart at the center joint after assembly is completed. Now pin the trailing edge in place over the plans, using enough pins to hold it flat and secure. Slip the tip W-3 ribs over the spar and pin the tip ribs in final position gluing them to the trailing edge and spar. Be sure the tip ribs are square with the work surface. Next, install the (2) W-2 ribs butting tightly against the trailing edge. Be sure the lower surface of all ribs are tight against the work surface and that the spar is properly aligned.

(4) Install the two W-1 ribs at the center of the wing being very careful that they are properly aligned. Be sure to leave a 1/16" to 3/32" space between these ribs so that there is clearance for your knife or saw blade when you cut the wing apart. You may now proceed to install all the W-3 ribs in both panels, gluing them to the spar and trailing edge. Place a drop of glue on the leading edge

S-TEE

Designed By: Lee Renaud

TYPE AIRCRAFT
1/2A Sport
WINGSPAN
36 Inches
WING CHORD
7 Inches
TOTAL WING AREA
250 Square Inches
WING LOCATION
Shoulder Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
1¾ Inches
O.A. FUSELAGE LENGTH
27 Inches
RADIO COMPARTMENT AREA
(L) 9½" X (W) 1¾" X (H) 2"
STABILIZER SPAN
12¾ Inches
STABILIZER CHORD (incl. elev.)
4½" (Avg.)
STABILIZER AREA
56 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
3⅝ Inches
VERTICAL FIN WIDTH (incl. rudder)
4¼" (Avg.)
REC. ENGINE SIZE
Cox .049-.051
FUEL TANK SIZE
Cox Engine Tank
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
2 - (3)
CONTROL FUNCTIONS
Rud., Elev., & (Throt.)
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Ply & Hardwood
Wing	Balsa & Hardwood
Empennage	Balsa
Weight Ready-To-Fly	16-20 Ozs.
Wing Loading	9.24-11.56 Oz/Sq. Ft.

Completed fuselage sides ready to be joined.

Formers installed to right fuselage side – use small triangle or square to align properly.

of all ribs and press the pre-shaped leading edge against the ribs. Use pins to force the leading edge tightly against the ribs and to hold it firmly against the plans. Try not to pin through the wood unless absolutely necessary as this may weaken the structure or split the leading edge. Check once more that the leading and trailing edges, spar, and all ribs are tightly against the work surface.

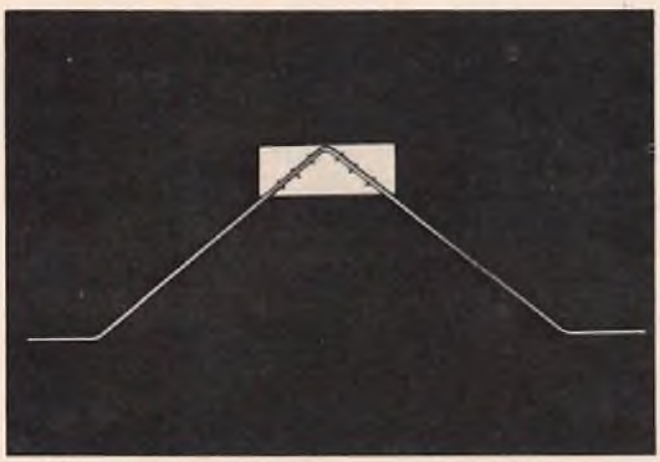
(5) Trim two pieces of the 1-5/16" wide sheet to fit snugly between the leading edge and spar (save the cut-offs). Glue these to the center W-1 rib leading edge and spar, pinning the sheet tightly to the work surface. Next, glue the 1-5/16" x 3" pieces in place behind the spar and trim the cut-offs to fit between these pieces and the trailing edge. Now glue the W-1 rib against the edge of the bottom sheet and to the L.E. spar and T.E.

(6) Install the tip rib gussets, trimming to fit if necessary, so that the gussets are tight against the ribs and leading and trailing edges. Install the top center sheet starting at the trailing edge working toward the leading edge. Be sure the joint is centered over the gap between the W-1 ribs. Trim sheet for a good tight joint, and use pins and/or masking tape to hold in place. If the wood is hard to hold down, dampen the outer surface with a rag or sponge moistened with water before bending downward. This completes the basic wing assembly and the wing should remain pinned to the board at least 8 hours to avoid possible warps. (You can begin working on the fuselage while the wing is drying.)

(7) Remove the wing from the work surface, carefully removing all pins or tape. If the pins are hard to remove, grasp with pliers and rotate the pin slightly to break loose any glue, then pull straight out. Use a flat sanding block at least 3" wide by 9" long, made of pine or plywood stock, with #180 or #220 sandpaper glued in place to sand the wing lower surface from tip to tip. Be careful to keep the airfoil section flat and not to change the rib shape. Cut away any excess blobs of glue as you progress. Cut the tips from 1/8" x 1⅜" x 7⅛" balsa as shown on the plan. Trim any excess material which protrudes beyond the tip rib and glue the tips in place aligning the bottom edge with the lower wing surface. When dry, cut off the excess material to match the top rib contour.

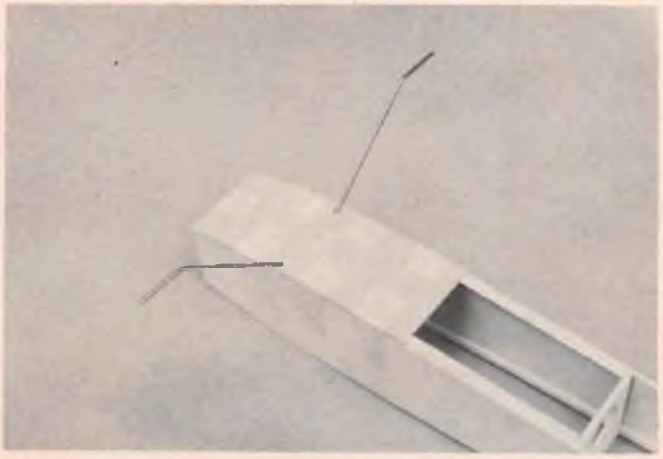
(8) Use a small razor plane or your knife to carve the leading edge to the shape shown on the side view. Work slowly with the grain of the wood and reverse the direction of cut if the wood tends to splinter. Remove material from the corners and carve and sand the leading edge to a nicely rounded shape. Be very careful to maintain the shape along the whole span of the wing and avoid shaping to a point. This is very important as the wrong shape, or different shapes on the right and left panel will cause serious problems when you fly the model. Now you can sand the top surface of the wing, using extra care not to change the contour of the ribs. Just blend the leading and trailing edge joints, and the tips and center sheet.

(9) Cut the wing apart at the center, working from both upper and lower surfaces. Be careful not to cut into the center W-1 ribs. A razor saw or hacksaw with a fine tooth blade is the easiest way. But you can do it with a knife. When the cut is complete, trim and block sand the excess spar, L.E. and T.E. material flush with the ribs. Check that the joint is square and that the ribs meet tightly. Trim the trailing edge on one panel to the contour shown on the plans, back to the 3/16" strip. Use this as a pattern to trim the second panel so that both panels



Landing gear wired to F-2. Epoxy securely.

Using model clamps to hold securely, join two sides.



Ply bottom in place and secured with masking tape. Notch ply for landing gear.

Rear of fuselage completed with formers F-5A, 5B & 6 in place and stringers installed.

match.

(10) Epoxy the 3/16" x 3/4" tapered stock to the end of one panel carefully aligning the lower edge. When dry, carve the wedge to match the end of the panel. Place this panel flat on your work surface (use Handiwrap underneath the joint) and butt the second panel against it. Block up the second panel so that the tip is raised 3½" above the work surface and check the fit of the joint. If a gap exists, sand the face of the wedge until the gap is eliminated. Weight the first panel with magazines or similar so it won't shift around and apply epoxy to the end of the second panel. Join the panels, using pins, tape and/or weights to hold securely; check that the tip rib is 3½" above the surface and let dry thoroughly. Don't move the wing until you are sure that the epoxy is completely cured!

(11) Sand the joint smooth and use Duco or similar cement to secure one end of a strip of 3/4" wide by 14" long nylon tape to the bottom trailing edge. Then raise the tape out of the way and apply a heavy bead of cement to the bottom joint. Pull the tape tight and squeeze down onto the cement. Use your fingers to rub the tape down firmly in place, allowing the cement to ooze through the pores of the tape. Add more glue, if necessary, to cover any dry spots and let dry a few minutes. Now apply cement to the top surface and pull the tape tightly around the leading edge, across the top and down around the trailing edge, rubbing down as you go. When dry, trim off excess tape and rub in 2-3 additional coats to further strengthen the joint, rubbing the cement into the tape and adjacent balsa. Don't omit this step as the wing's strength depends on the tape and cement reinforcement! Sand the wing all over and it is ready to cover.

Fuselage Assembly:

(1) Pin the right fuselage side to the plan. Mark the location of formers F-2, F-5 and the aft cross pieces. Glue the nose doubler in place using the firewall (F-1) as a spacer at the front. Cut the tail post from T.E. stock and glue to the side. Cut a longeron (3/32" x 3/16" balsa) to length and glue in place between the doubler and the tail post. Cut the stiffener and glue to the side. Cut the 3/32" gear brace, glue in place using F-2 as a spacer. Cut and glue the 3/16" triangle stock between the gear brace and location for F-5.

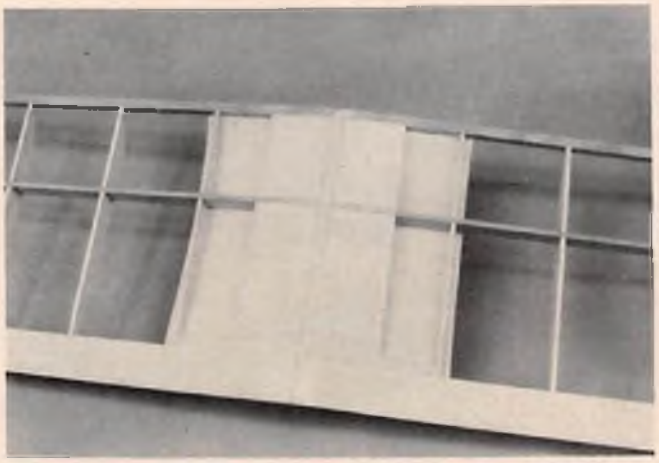
(2) After the glue has dried, remove the right side from the plan. Pin or tape the left fuselage side piece to the **outside** of this assembly. Now build up the left side, making sure that all the parts fit in exactly the same place as the right side.

(3) Using the plan as a template, mark the location of the 12 wire binding holes in former F-2. Drill the holes with a 1/32" diameter drill. Align the former and the gear over the plan and tack glue the gear in place with epoxy. Be careful not to plug any holes. Cut six pieces of soft wire about 1" long and bend to hairpin shape. Push a wire through 2 holes and twist together on the back side of the former. Twist the wire until it is firmly snugged down around the gear. After all six tie wires are in place, trim off the excess wire. Apply epoxy liberally around the landing gear and over the twisted wire on the back of the former. Check the gear alignment again and let the epoxy cure thoroughly. Mark and drill the firewall (F-1) for the engine mounting screws. A No. 55 drill is best, but a 1/16" diameter drill will do as a substitute.

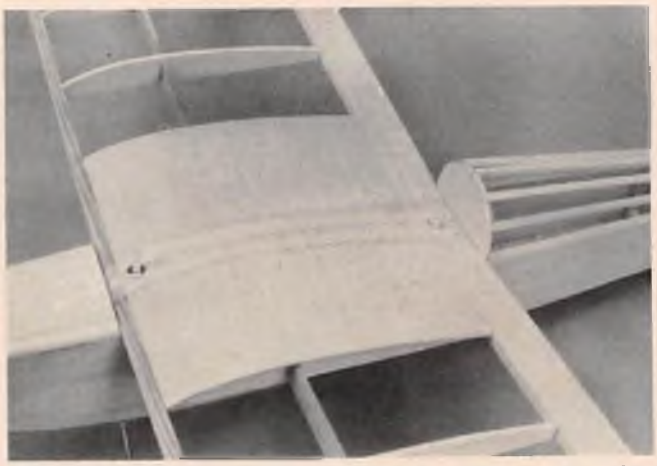
(4) Apply a bead of epoxy to one edge of F-1 and position on the right side assembly so the face of the former is flush

Engine installed and nose blocks glued in place and sanded to shape.

Tail group completed and pinned in place to check alignment.



Bottom view of wing center section after two panels are joined. Center wrapped with 3/4" nylon tape.



Completed wing mated to fuselage. Holes drilled for grommets and nylon screws.

with the edge of the side and that the bottom edge is aligned (make sure you don't glue it in upside down — check mounting holes). Use a square or triangle to insure perpendicularity. Hold in place till epoxy dries. Next epoxy F-2 in place. Note that you may have to notch the doubler to clear the landing gear wire. After F-2 has set, attach F-5. Check the location of the pushrod holes to make sure you don't glue former backwards. Check perpendicular alignment of all three formers as the epoxy cures.

(5) Lay the left side over the assembly and check the alignment of the parts. Correct any misalignment before proceeding. Apply epoxy to the edge of the formers and attach the left side. Weight the assembly until the glue sets.

(6) Using the plan as a template, cut 4 cross pieces from 3/16" x 1/4" stock (one forward, two aft and one stab cross piece). Place Handiwrap over the top view of the plan. Pin the front, top aft and stab cross pieces to the plan. Apply epoxy to the ends of these pieces and to the side of the fuselage tail post. Lay the fuselage, upside down, over the plan. Pin the fuselage so it rests against the cross pieces. Tape the tail together and pin the fuselage to the plan. Make sure the fuselage conforms to shape on the plan. Epoxy the bottom aft cross piece in place.

(7) Notch the plywood floor to clear the landing gear. Epoxy the floor in place using weights or masking tape to hold it in position. Complete the bottom sheeting with pieces cut from the 1/16" x 3" x 12" sheet. Note that the grain of the bottom sheets runs across the fuselage. Allow the assembly to dry thoroughly.

(8) Remove the pins and lift the assembly from the plan. The pushrods shown are telescoping nylon tubes, which transfer the motion of the servo output arms to the control surface. This type of pushrod is lightweight, very easy to install, operates smoothly, and we highly recommend their use. Note that the outer tube is firmly fixed at former F-5 and the side exit point. The inner tube slides back and forth inside this outer tube. Cut or file the slots under the stab for the outer pushrod tubing. Before installing the pushrods, place your radio equipment in the fuselage and make sure that the servo rotation will result in proper control surface movement. The elevator pushrod is pulled forward for down, and pushed back for up elevator. The rudder pushrod is pulled forward for right and pushed back for left rudder. Now remove the outer tube and use coarse sandpaper to scuff the surface which contacts F-5 and the sides for better glue adhesion. Reinstall the tubes in the fuselage and use Hot Stuff or epoxy to glue the tubes in place.

(9) Check that you can insert and remove the battery pack through the space between former F-2 and the top cross piece, correcting any problems before continuing. We suggest that you line the sides, front, and bottom of the battery compartment with soft 1/4" thick foam or equivalent. Contact cement works well to secure these pads in place and this should be done before adding the top forward sheet. Install the 3/16" x 5/16" spruce servo rails across the fuselage. Make sure your servos will line up properly with the pushrods.

(10) Glue formers F-5A and F-5B together as indicated on the plan. Glue this assembly to the top of former F-5. Check perpendicular alignment as the glue dries. Glue former F-6 on top of the aft cross piece and cut and glue a 1/8" square piece of balsa atop the stab cross piece. Now attach the 1/8" square

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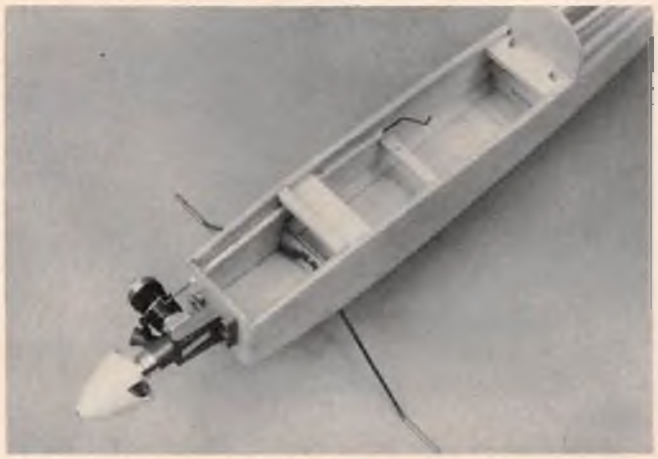
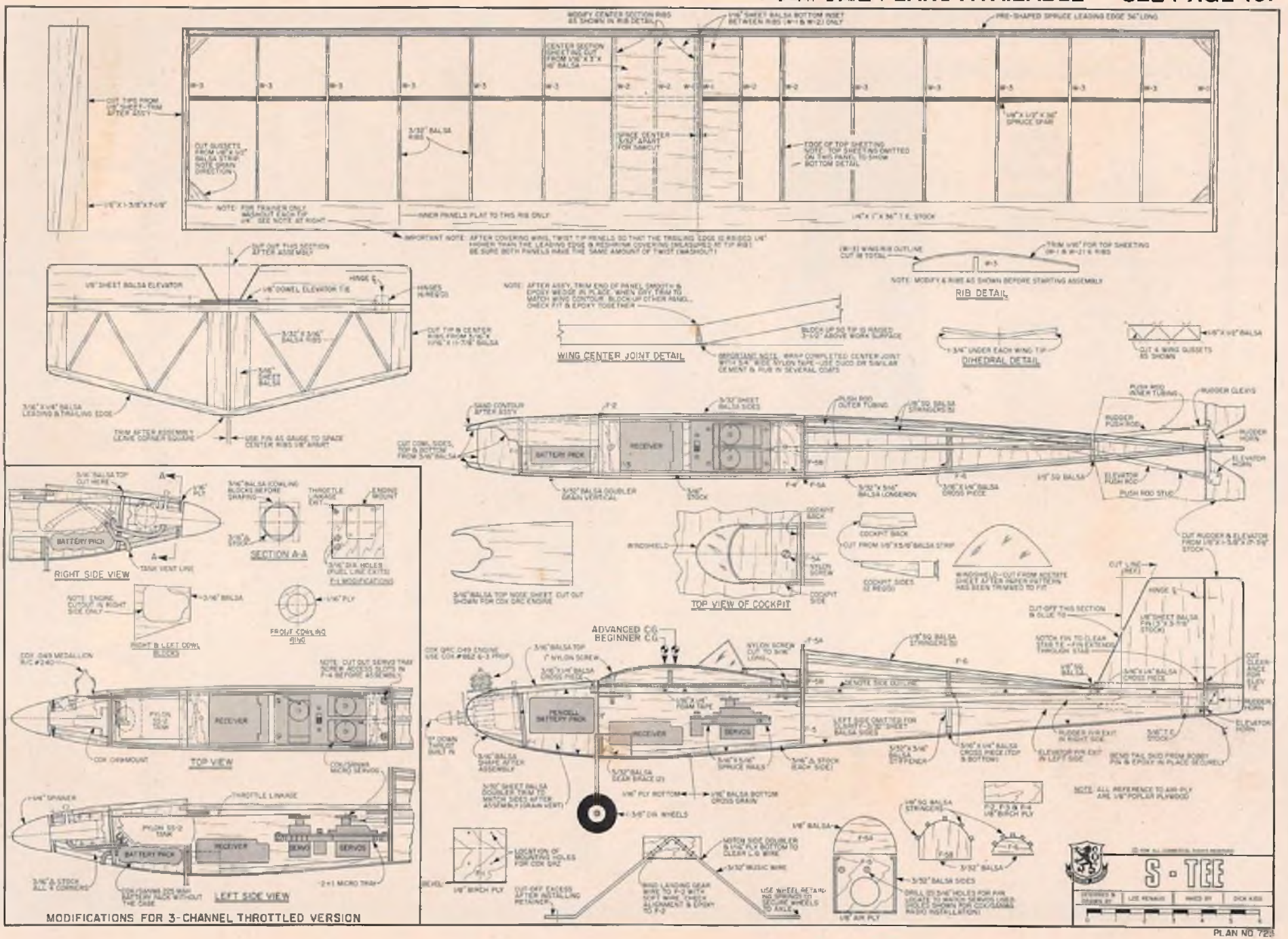


3 channel version showing throttled Tee Dee installation. Note cut-outs in rear wing mount for access to servo tray screws.

Completed fuselage for 3 channel version.


RIB DETAIL
WING CENTER JOINT DETAIL
DIHEDRAL DETAIL
TOP VIEW OF COCKPIT
RIGHT SIDE VIEW
SECTION A-A
TOP VIEW
LEFT SIDE VIEW
MODIFICATIONS FOR 3-CHANNEL THROTTLED VERSION
ADVANCED C.G.
BEGINNER C.G.
S·TEE

PLAN NO 723

Photo courtesy of Cessna Aircraft Co.

TRANSITIONING

R/C Piloting To Full Scale Flying

Part I

By Arthur J. Sabin

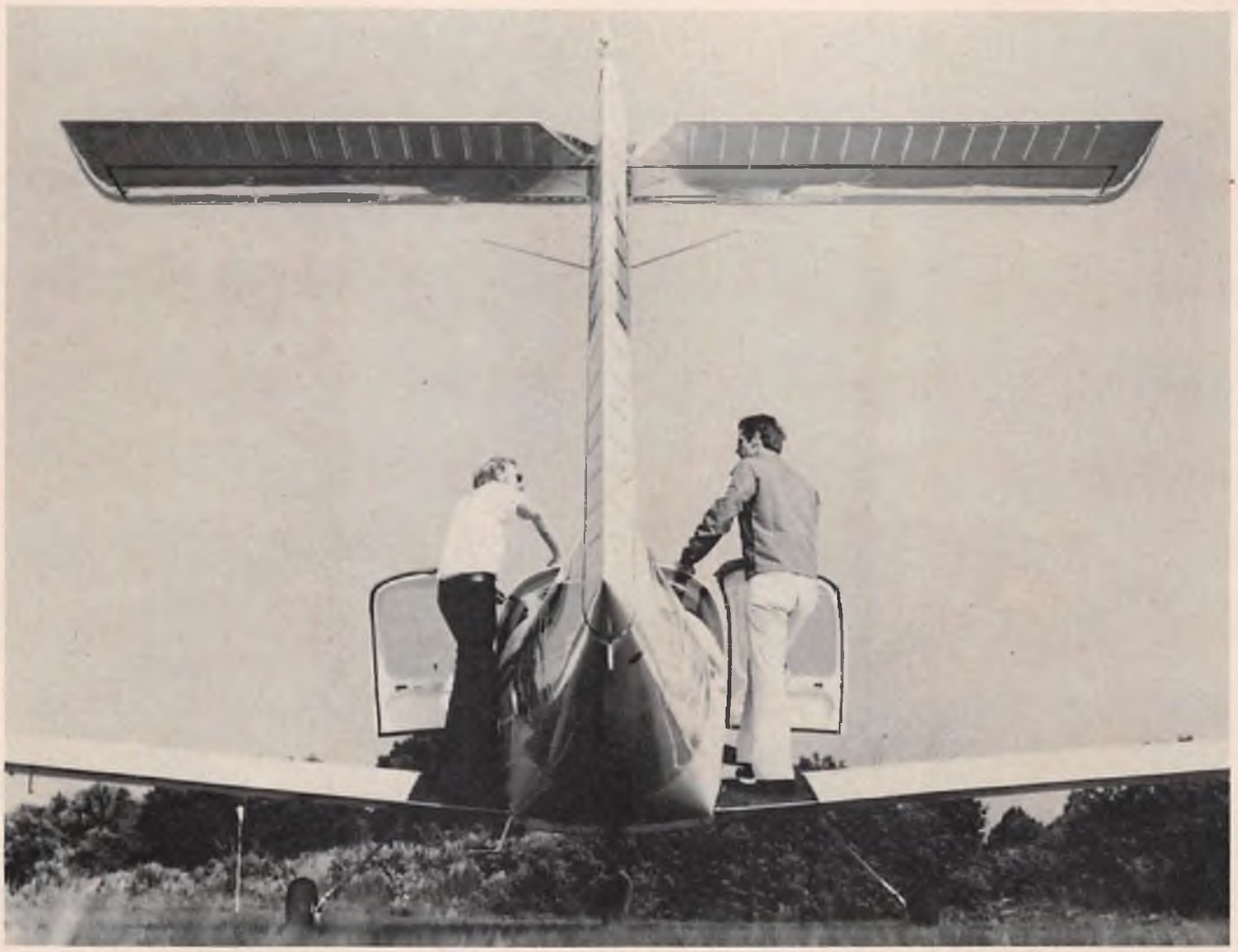


Photo courtesy of Piper Aircraft Co.

How many times have you had to explain that when you say you are going **flying** Sunday morning, it is an R/C aircraft and not a full scale airplane? Or, perhaps, that you had just crashed your plane and the listener stares in bewilderment because you're in one piece? Whatever variations it might take, we've all had to explain in some fashion or another that our piloting was of R/C models, not full scale airplanes. But let's face it, aircraft of any type in the mind of the general public means only something that **carries you**, not that you control in flight.

But just how far off is the average person in their perceptions? We are **modelers**, which by simple definition means we create small representations of some larger object; if we model trains, tanks or anything perhaps but aircraft, the public would not be confused because it is **only** aircraft that have been extensively modeled as functioning devices and are also potentially operated by non-professional people as a sport. The closest to this unique situation would be the modeling of cars or boats and, while there are some similarities, a few moment's thought will convince us that it otherwise just doesn't fit.

The point is that if we are perceived as pilots of full scale aircraft by others, essentially **because it is possible that we are**, is that so far off from how we **truly perceive ourselves**? I would reject out of hand the whole business of R/C modeling explained as simply sublimation - - - the process of substituting one thing when we really intend another - - - any more than (as the cliche runs) driving a convertible automobile is a substitute for a mistress. No person who is into radio control modeling would really accept that permise; we know the pleasures, the thrills and satisfactions we encounter from modeling itself, including the construction as well as the piloting of our craft. We know that these endeavors are worthy, worthwhile and self-fulfilling in and of themselves, just as there are self-fulfilling pleasures in owning and driving a convertible. But to deny the close affinity and attachment between R/C piloting and the world of piloting full scale craft is to deny reality.

We must acknowledge (and it's certainly no sin) that we love aircraft, we love the concept of flight and that by flying any form of craft we learn something about basic aeronautics. As we advance from the trainer stage, we get deeper and deeper into more subtle relationship with the world of flying; perhaps it's scale modeling, competitive pattern flying, the speed thrill of pylon racing, or the mastery of piloting helicopters. Furthermore, our relationship with airplanes and flying extends to reading magazines devoted to full scale aircraft, visiting air shows, air museums and even to such simple things as explaining airplanes to our friends. Can anyone really question that to the R/C modeler of aircraft in any of its varieties, there is a real involvement with the world of full scale craft and flight?

This close relationship is also evidenced by the many hundreds (yes, perhaps thousands!) of licensed full scale pilots who are into R/C modeling. The love of airplanes and flight is pervasive, so much so that it is almost rare to speak to a pilot of a full scale craft who is not at least familiar with R/C flying if, in fact, he is not in some phase of R/C modeling. It is apparently just as natural for those who fly full scale aircraft to love to model and meet the challenges of R/C piloting as it is for R/C flyers to be involved with full scale aircraft whether it be modeling same or in some related activity (magazines, air shows, etc.)

Photo courtesy of Cessna Aircraft Co.

being involved beyond R/C piloting.

Sometimes the crossover or transition from full scale craft to R/C piloting doesn't work. I so well remember one vivid instance where a newcomer showed at our local flying field; he had a beautiful model and as he put it down and looked over the scene, it was evident to the "old timers" that this was a novice as well as a stranger. When one of the more experienced R/C pilots offered assistance, he pooh-poohed same explaining that he flew "the big ones — you know, the really big ones; I'm a 747 pilot." I think that the reader can probably fill in the rest of the details of this little scene; the script did not run longer than 90 seconds into take-off. He was never seen again at the field. Most full scale pilots do, however, appreciate the fact that there is a very definite skill involved in piloting R/C craft and accept with more graciousness and less ego the necessity of going through a learning process.

From what has been said thus far, should it be surprising that most, if not all, R/C modelers of aircraft have at one time or another — perhaps right now — considered the crossover or transition in the other direction, moving from R/C modeling to full scale flight? Because this is a relevant and, in fact, constant theme, this series of articles will explore aspects of that transition. But let it be said immediately that this is one person's views and experience, thus clearly open to question and challenge. It is believed, however, that what is discussed and reported is valid.

Using a question and answer approach, we begin as follows:

Photo courtesy of Piper Aircraft Co.

Q. Because I fly R/C models, will that help or hinder me in undertaking learning how to fly full scale aircraft?

A. The answer must be both. In one respect, the transition will certainly be easier for you as an R/C pilot than for the person who simply reads an ad in the paper advertising a $10.00 trial flight (it used to be $5.00, but inflation has hit). We know about airplanes; how can it be denied that it's helpful to know the difference between an aileron and the rudder. We know how the controls work and in what direction. We also know something of what it takes to do the maneuvers necessary in flight because we have done them with our hands on the ground. Furthermore, we are aware of the influence of the environment, wind, heat, and humidity because they affect our models as they affect full scale airplanes. We know about coordinated turns and what it takes to get the plane off the ground. We practice a pre-flight inspection and we know that the "make or break" of piloting is the ability to land. I believe there are even more subtle assists; we're used to the noise of an engine and to **learn** from the sound; we know the frustrations involved in the learning process of flying as well. We're used to talking and thinking airplanes and that makes a difference too. In a word, the world of airplanes and flight is a world that we have familiarity with and in which world we express ourselves through our models and our flying.

We don't fear the world of flight; to us it is an hospitable ambience that beckons us to leave the earth, move swiftly into that third dimension, the dimension of flight . . . it beckons us and we love it.

On the other hand, there are some negatives which make the answer "both". The hard and honest truth is that just because you can, with reasonable proficiency, fly radio controlled models, does not insure your success in the world of full scale flight. The challenges, the skills, the perceptions, the judgments that must be made and the psychological stresses are different, different enough so that there can be no assurance of success in the one because you have reasonable proficiency in the other. Put another way, just because that 747 pilot has the skills and all the other qualities necessary to pilot that huge craft, does not, incredible though it seems on one level, necessarily mean that he is going to have the preceptions necessary to control a model in flight including that crucial aspect of landing. In a word, if we are willing to accept that the competent pilot of full scale aircraft is not guaranteed easy access to, nor success in, flying R/C models, how can we accept that the reverse will not be the same. In fact it is; though there are no statistics available, you can believe that there are plenty of R/C pilots who have tried full scale flying and have washed out.

Let me give you a specific example from my own experience. It was only after trying quite a few "touch-and-goes" that I realized that what I was doing

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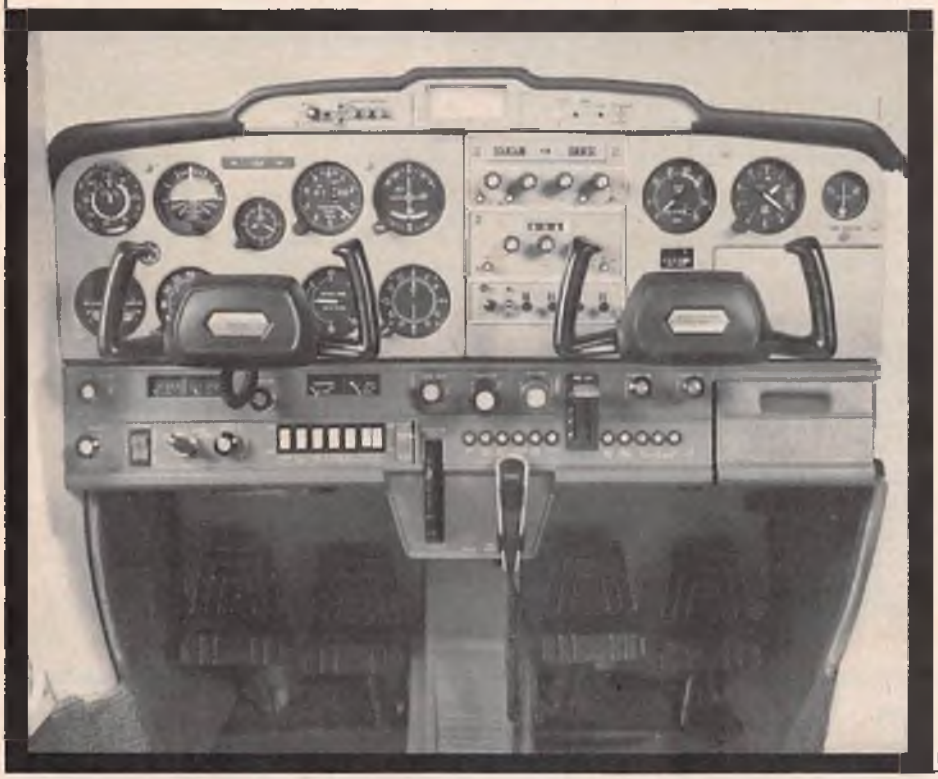

Photo courtesy of Cessna Aircraft Co.

They don't make 'em like they used to . . . men, that is. Graham Lomax looks like a midget sitting at the wing tip. Wing covers hang over fence. When on wings, pizza and beer is served. Wing seats six with ease.

ALMOST A FAIRCHILD

One of the finest aircraft construction articles ever presented by RCM, Robert Lopshire's Fairchild F-24-H is an .80 powered Stand-Off Scale model that you won't be able to resist.

What you see on the cover, and in these pages, began life as "Mr. Mulligan" at a luncheon over a year ago. If you read my article last month of the business of starting an "Innovator's Class" of competition, you'll remember that a modeling drop-out and I got to letting our minds drift back to the "good old days" and that we yakked about the business of building a big plane that would fly at scale speeds. The MDO, Carl Cantera, and I agreed on the basics . . . but not his suggestion of Mr. Mulligan, Benny Howard's magnificent classic of 1934. Like Carl, I'd always loved the plane, but to build a model of it didn't grab me. We'd decided on at least an 8' span, and the cowl on Mr. Mulligan scaled up to the size of a washtub.

My all time favorite for being a great flying machine as a model was DeHavilland Puss Moth. I built one at the age of 8 and had instant success with it. I pushed my point and Carl grudgingly agreed to let me have my way since I said I'd scale it up and build it and he could fly it. (As mentioned in my previous article, I could care less about flying the things, but, oh, that drawing board and building!) Now the plane was a Puss Moth.

Then letters to the Smithsonian and God's gift to scale modelers, Claude McCullough, along with several letters to England, proved something important —no one had any real good plans for the Puss. Some itty-bitty three-views did come back, but nothing good enough to make and 8-footer out of. Too, Carl saw the photos and three-views and went back to mumbling about the idea of a Mr. Mulligan.

Then I thought of a plane that had to have been influenced by the Puss . . . the Fairchild Ranger, or more correctly, the Fairchild 24. The name "Ranger" came only from the fact that the planes built with an in-line engine used the Ranger engine. The other version of the plane used a Warner "Super Scarab" radial engine . . . which, if built, would put us back at the Mulligan configuration of a whopping big cowl, and all that prop effort going for naught.

Back to Claude McCullough, and a letter to Bob and Dollie Wischer, and I had a surfeit of info on the Fairchild, along with some info from Steve Sauger

who was building a Fairchild for his entry on the U.S. Scale Team. Carl allowed as how this looked more like his idea of a neat airplane and, since I agreed, I sat down at the mighty drawing console and began to doodle. Lou Proctor stood over me as though transposed from San Diego, and repeated his hallowed words . . . "Every model should be builteth as though a home-built that one might flyeth himselfeth . . .", or something like that.

Carl and I had agreed that to build and fly a **true** scale ship for **fun** would be something akin to rolling a marble down the center stripe of 42nd Street in New York at rush hour, pushing it with your nose. In that moment of truth, coupled with a desire to build something that looked like a real plane and flew like one, the "Innovator's Class" idea was born. The longer I sat at my drawing board, the more the idea became valid . . . and the Fairchild began to get redesigned in a number of places.

First place of changing the factory scheme came when I took a look at the top view of the original. Looked like a pregnant guppy. A bit of a shock to the design senses since the Fairchild had always looked so slim and sleek in photos. The scaled-up fuselage width of 10½" was chopped down to 8½". After all, esthetics had to be considered here, and besides, no people were going to sit in the silly thing anyway. So the seating became a tad squashed, who cared?

The next major change was to get rid of the original idea of welding a mounting up from the axle to fit the main oleo onto so it would exit the wheel pant at the scale position. Most modeler's don't have welding outfits, nor do they work with materials readily weldable in the small scale worked with. I went for a more direct approach of mounting the oleos; I used portions of two hinges made by the Stanley Company. I **could** have used longer versions of the hinges to obtain a scale effect, but my personal opinion was that they would have been a bit flakey for strength, and besides, I wasn't after scale so much as I was after a realistic looking plane. I opted for the short hinges. Only a Fairchild fanatic, or a scale judge armed with plans would know the difference in the finished product.

Another design feature bothered me . . . a portion of the color scheme that Fairchild put on the original ships. This concerned the area around the cabin. Fairchild had all this painted the same color as the large trim panel, and the result was that it all pretty well blended in with the dark cabin. As an artist, I took the liberty of changing all this by using white around the cabin and windshield to set these parts out. As inventor of my own little contest, I'm allowed. . .

In actuality, although I departed from scale, I stuck closer to it than I would see for those who might become interested in a "Innovator's Class", where one would be free to mix airplanes to obtain a final result. My approach was fairly mundane, much more the way a kit maker might approach a project, but I did discover some things along the way that hadn't, to my knowledge, been used before.

The original plans for the ship were made by working from all the three-views obtained. All that was needed for what I had in mind when setting out to design the ship, and what I foresee as the way for the group who might get interested in my proposal for the "Innovator's Class". However, I did take the time to trot to a local airfield and make a few dozen shots of a full scale Fairchild F24HR . . . which proved the plans that I'd been working with were absolute liars. Not shown on any of the American plans was an item at the rear of the fuselage that I've dubbed, for lack of any mention anywhere, a "fishtail". This gizmo flares out to fill the gap between the elevator sections and carries the rudder cables. Funny thing here was that only an English plan sheet showed the thing until I saw the real ship. Since I'd planned cable controls to the rudder, the sight of how it all worked solved a number of design problems at this end of the fuse.

The American plans showed a metal tail wheel housing. Not so on the real McCoy. The item is a canvas boot fitted over heavy curved rods, top and bottom . . . a snap to duplicate with Indian Head cloth stitched over soft wire frames. To keep these fuelproof, I coated the finished product with polyurethane varnish. Not to be "scaley", but to add a touch of realism.

The flaps on the full scale ship show a three point mounting which wasn't in keeping with the materials we work with. Fine with steel and aircraft bolts, but not with plywood and funny little hinge methods. I changed the hinging to four from three and, while making the hinges somewhat realistic, I shot for strength and reality of function, rather than true scale. More on the hinges later.

On the original Fairchilds with Ranger engines, the exhaust stacks, two of them, protruded from a slot on the right side of the engine cowling at the very bottom. Modelers don't have many options where engines are concerned, and

Brand spanking new Fairchild-24 just flown from factory to California by Pappy Beale (on left) for his flying school. Dick Kidd (on right) had the pleasure of flying this while working on his commercial license. Photo taken at El Monte Airport, Calif. in the late 40's.

FAIRCHILD F-24-H
(Army-UC-61-K)
Designed By: Bob Lopshire

TYPE AIRCRAFT
Stand-Off Scale (2½" = 1')
WINGSPAN
91¼" (Scale 93¼")
WING CHORD
14 Inches
TOTAL WING AREA
1165.5 Square Inches
WING LOCATION
High Wing
AIRFOIL
Clark Y
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
2 Degrees
OVERALL FUSELAGE LENGTH
63¾" (Prop nut to Rud.)
RADIO COMPARTMENT AREA
Size Dependent on Scale
Interior (Ample Room)
STABILIZER SPAN
30⅛ Inches
STABILIZER CHORD (incl. elev.)
7¼" (Avg.)
STABILIZER AREA
195 Sq. In. (Approx.)
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
7 Inches
VERTICAL FIN WIDTH (incl. rudder)
10" (Avg.)
REC. ENGINE SIZE
.80 or larger
FUEL TANK SIZE
14 Ounce
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
5
CONTROL FUNCTIONS
Rud., Elev., Flaps, & Throt.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Ply & Hardwood
Wing	Balsa, Ply & Spruce
Empennage	Balsa, Ply & Spruce
Wt. Ready-To-Fly	258.4 Oz.
Wing Loading	30.15-31.9 Oz/Sq. Ft.

There are 5 full size plan sheets available for the construction of the Fairchild. Due to space, only 1 sheet of the 5 sheets has been shown. Plans are highly detailed and show both civilian & army version. All areas that deviate from scale have been referred to on the plans. This was also done in order to show all of the detailed construction photos.

"That pylon should be around here somewhere . . " Shown here on the maiden flight, the Fairchild proved very solid in the air, even had full aileron control with flaps at full down. Rudder was only used for ground handling.

since I'd decided on an O.S. Max .80, I had no options whatsoever. In the inverted mode, the Max blows its waste out but one side . . . the left one. So, I reversed the exhaust location, and turned it into a double function . . . an exhaust/cooling tunnel. The exhaust fires straight down from the Max through a Tatone manifold, but cooling air from the front cowl openings is drawn over the engine to flow down and out through that tunnel. The Tatone manifold is **loosely** stuffed with "Chore Girl", scouring pad, to serve as muffling material. A Lou Proctor idea. The touch of realism is the two exhaust pipes that protrude down out of the slot . . . both a pair of absolute phonies. By the way, the pencil shown in the photo of the pipes and their fittings, is a "Stabilo-8008". Available at art stores, they will write on anything but grease. To clean off, wipe with water, alcohol, or lighter fluid.

Because I'd formed the original AMA Show Team as a PR device for the Academy, and modeling in general, I'd also pitched in and helped them a bit by building planes for them. One of the ships was a Span Aero Piper J-3 with an 8' span. Started by one of the members of the Team, I took it over and finished it, installing drop bay, tow hooks and releases, etc. To put all this extra weight on the ship, I gutted the plane, taking vast liberties with structural members. How clever of me, I thought, until we took the thing to a show and Austin Gutman, the drop-pilot, tried to land the beast. It simply wouldn't come down! Lesson learned, build the biggies **heavy**. Later talks with Bob Karlsson and Graham Lomax, both experienced with large planes, bore out this lesson. Shoot for a wing loading of 32 ounces per square foot. The "Almost A Fairchild" hits this weight loading precisely. Because of the Show Team, mention of a bay area is made on the plans, although none was included in the model built.

I said that the ship started out as Mr. Mulligan, then became the Puss Moth, then the Fairchild. I had my private pet names for it too as the project progressed. In the doodling and drawing stages, I referred to it as the "Paper Monster". In the building stages it became the "Spruce Moose", and I confess that all during the building, I kept an anxious eye on the door, with feelings that maybe the thing would get so big it would never leave the room. In hefting it around to work on it, I gave it another name — "Hernia Helper".

About here, I should mention that the beast was built in an apartment, which called for certain ground rules. No dope for one thing. Sawing, banging, and the like had to be done when I knew that the librarian who lived below was gone. It was frustrating at times, especially late at night when I wanted to get out an anvil and a hammer to form a part, or when I had a few acres of plywood to whack into formers on my jigsaw. The entire apartment has wall to wall **shag** carpeting . . . and you've never lived until you go looking for a dropped screw in a shag carpet. The shag had me running a vacuum cleaner almost constantly, and painting became a nightmare: shag has a habit of somehow putting a constant supply of fuzz in the air, and every last hair of it goes straight to fresh paint.

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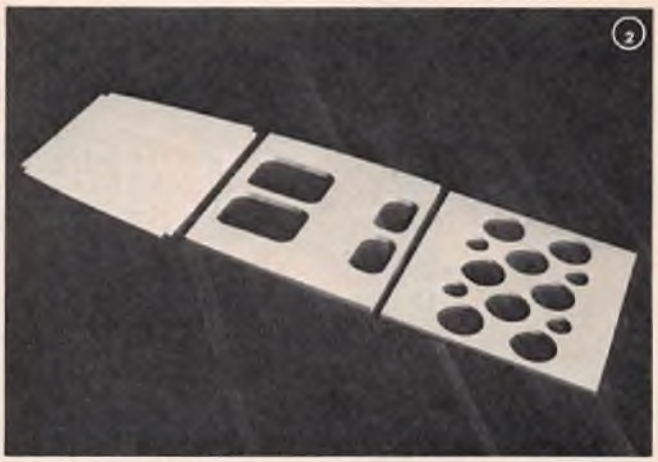
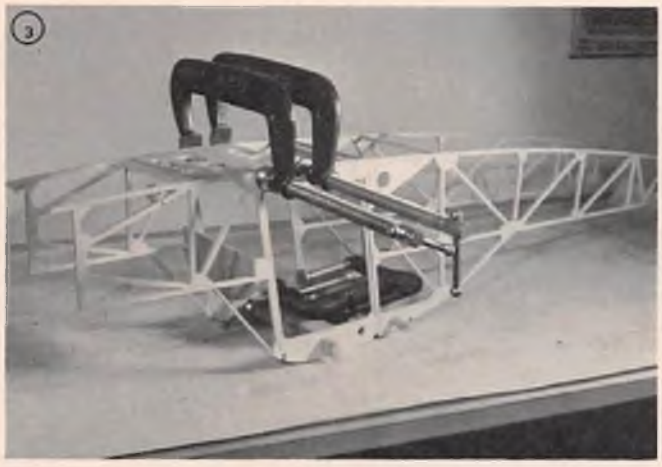
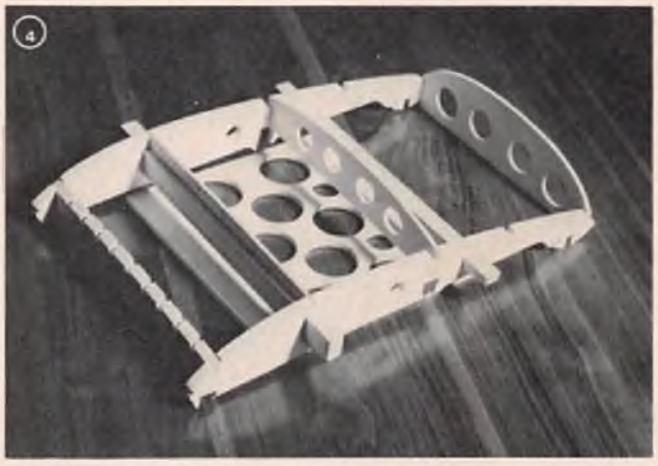
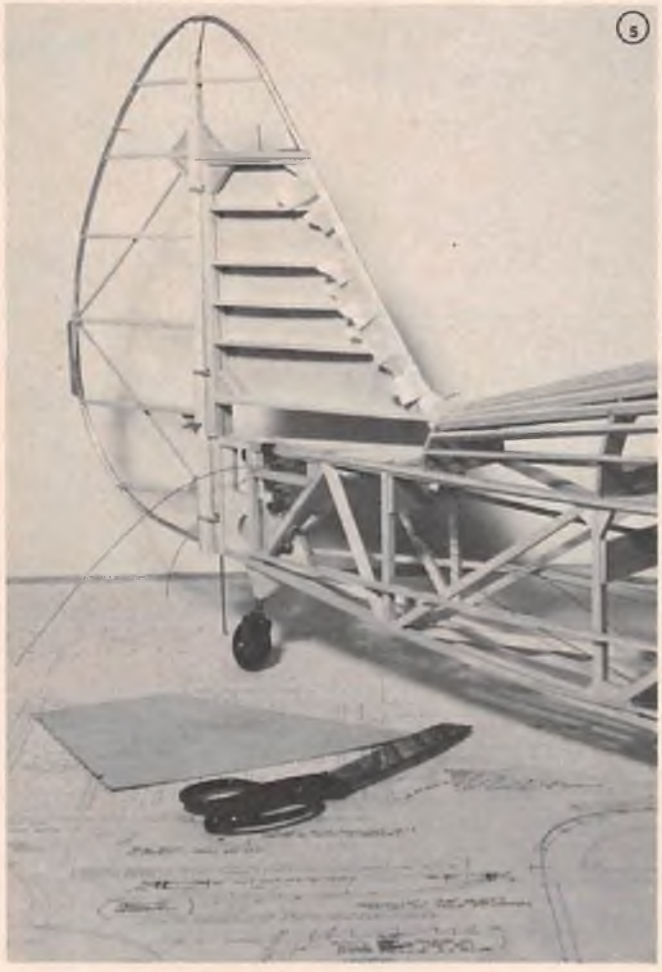
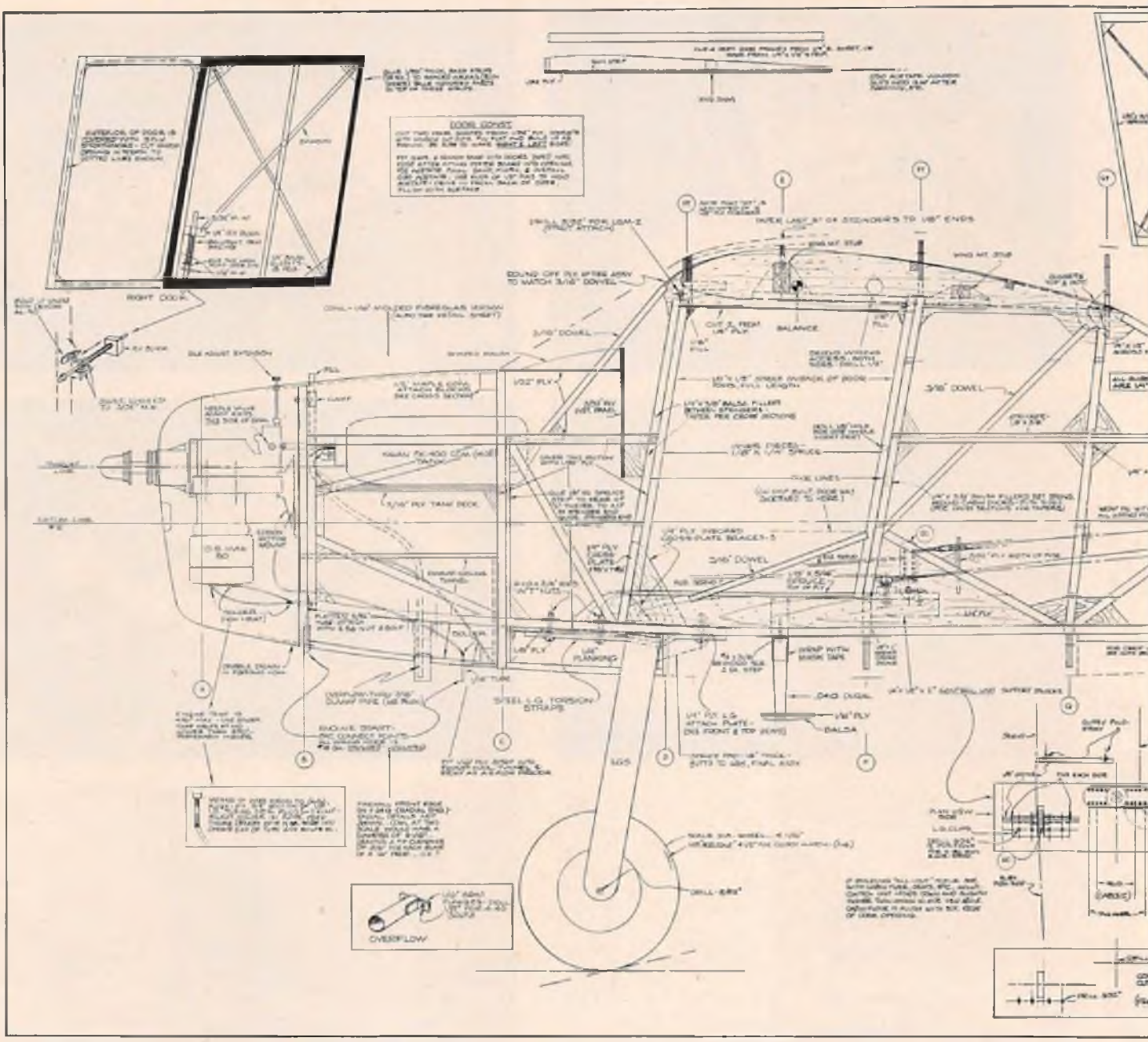








(1) Entire plane "kitted" prior to any assembly. Most of the fuselage parts shown here. All ply, no balsa used. (2) Right to left — upper cabin plate, 1st cross member installed in fuse; landing gear mount plate, 2nd cross member installed. Fuse now auto-aligned. Tank deck goes in next and gives correct curve to sides at nose. (3) 10" C clamps used to clamp landing gear plate in place, other clamps used as weights. Former at instrument panel not glued in yet — just in to check that whole mass is square. Wing mount stubs also in just for alignment. All structure is 1/4" sq. spruce, all gussets are of 1/4" ply. (4) Top of cabin parts fitted together for photo only. Rib-like sections are part of fuse sides. Large ply plate at bottom of assembly fits between rib sections and auto-aligns entire fuse. Plate is first cross member installed when joining the two fuse sides. (5) Rudder mounted to fuse and fin half covered with 1/32" ply. Large shears used to cut ply. Trim tab is .015 ABS mounted into slot cut with Dremel Moto-Tool and Dremel rotary saw blade. (6) Fairing skirt fitted to rudder and fuse. Epoxolite used to complete the fairing. Masking tape was later used to achieve fairing ends on rudder and elevator. Double thickness of tape gives right effect.



Rather than get into that business of "glue stick A to stick B" sort of construction article which I don't think anyone ever reads anyway, I'll mention some of the highlights, and some of the discoveries I made in the building. The plans were drawn and enough notes made on them to serve as a **visual** construction article. (Five sheets, roughly 3' x 6' each).

A few other Lou Proctor ideas were incorporated in the construction. Bamboo was used as internal structure bracing, much the way the Antic uses it to gain strength. Per Lou's suggestion, Duco cement was used to fasten the bamboo braces in place. Duco seems to have a pulling effect on bamboo, stretching the pieces taut. The combination was used in the outer sections of the wing as anti-twist braces, just as the full scale ship had at those points. Same in the rudder.

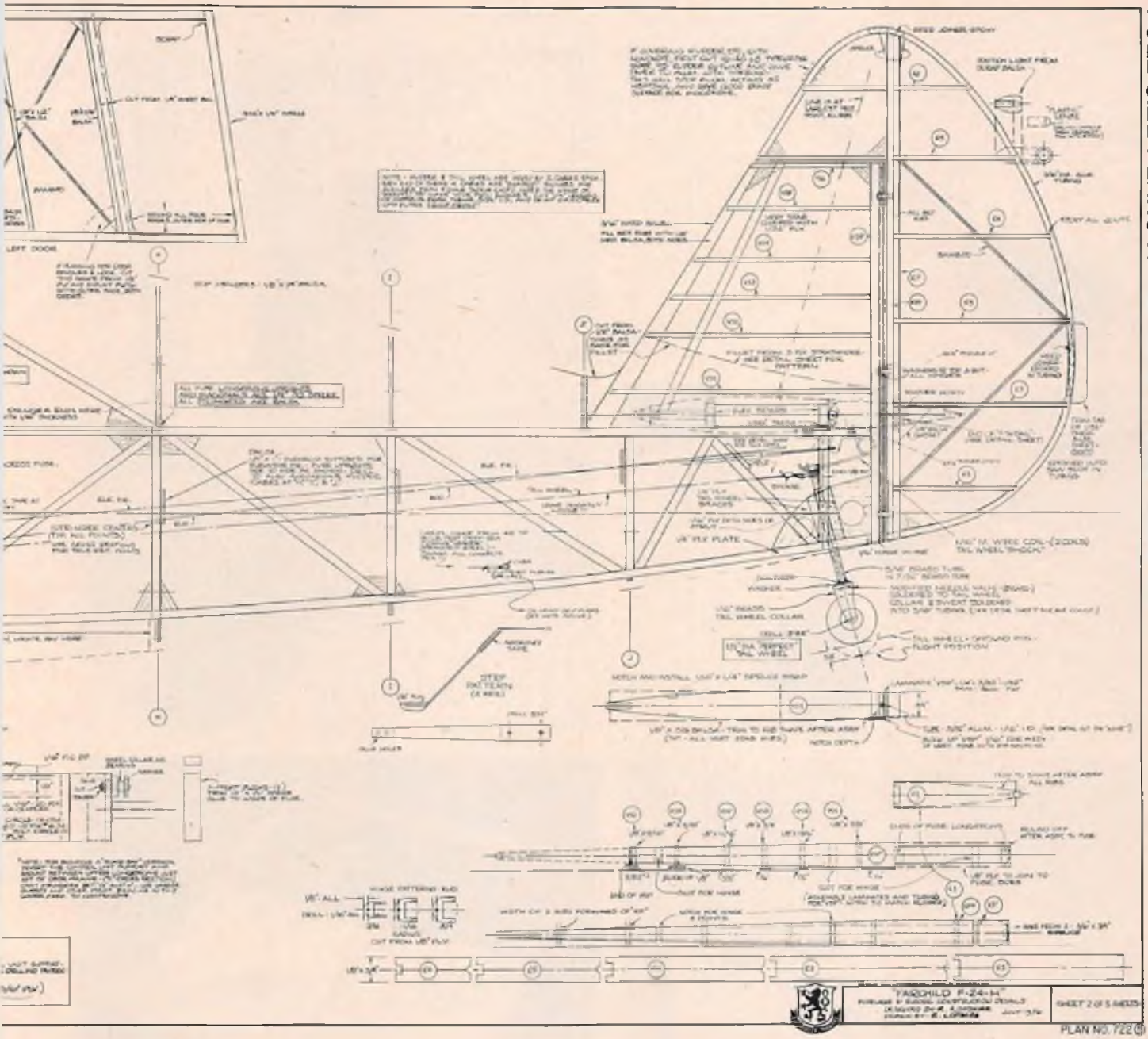
Note of interest to anyone who wishes to use aluminum tubing such as I did for the rudder outline . . . if you try to cover it with MonoKote or a similar product, forget it. The aluminum acts as a big heat sink and the material will not stick. I overcame that little obstacle by cutting the rudder outline slightly oversize from typewriter paper and gluing the paper to the aluminum with Titebond. Instant stick for the MonoKote.

In the photos, and on the plans, I make frequent mention of "3 ply Strathmore". Strathmore is a high quality drawing "board" used by artists, mainly for pen and ink work. Mistakes can be scraped off with a razor blade, and electric erasers don't faze it at all. It is also stable to a high degree, with moisture having little effect on it, and, bonus extra, paint and MonoKote love it.

I introduced the Show Team to Strathmore as a covering for foam wings, and while Jack Salmon, Team Manager, fought me on it, he grudgingly tried it on some foam wings and fell in love with it. It's tough, and it won't split like balsa. I've used it on the Fairchild in a number of places: to cover the main landing gear struts, cover the doors, make the simulated steel fairing plates on the landing gear, etc. You'll find it in art stores under the name mentioned, and once in a blue moon under the name "Bristol Board", but I prefer to avoid the latter since art store people haven't too clear an idea of what constitutes a true Bristol Board. At this writing, Strathmore goes for around $2.40 for a 30" x 40" sheet. It also comes in one and two ply as well as three ply, and in two surfaces — kid and plate. I used the kid finish.

Not many models have silver-plated door handles, but the Fairchild does. The handles, like the tail wheel yoke, were built up over metal forms using De-

FULL SIZE PLANS AVAILABLE — SEE PAGE 187



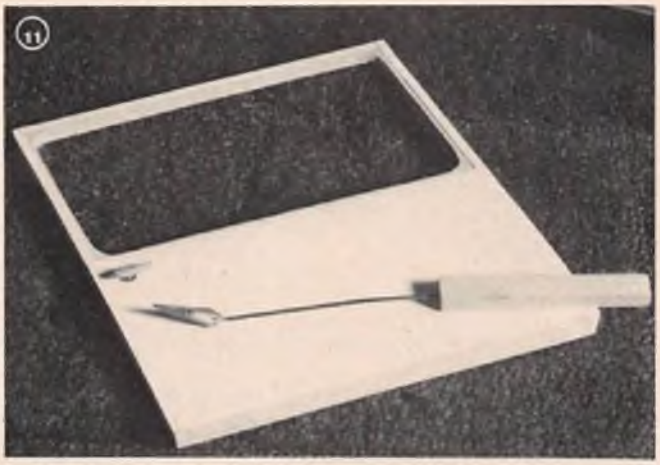
vcon AL-40, a metal in paste form that dries a flat grey, but buffs up to a metallic sheen. The silver plating was done by applying silver foil over the built up handles. This foil is also available in art stores or large hobby shops and is very simple to use. A coat of Adhesive Size is brushed on the surface to be "plated" and let dry for about 15 minutes, then the foil is applied by dangling a sheet of foil in place and using a dry, soft brush to pat it into the adhesive. A coat of clear dope or lacquer should be put over the finished job because it **will** tarnish. Because the ship is white, with blue and gold trim, I was tempted to gold-plate the handles . . . but I kept it pure.

While I decided to give Fairchild credit, in spite of what I did to their airplane, I was about to make the company ident decals for the tail when Bob Karlsson (the Corsair nut) dropped in and asked how he might put the name on his latest creation, a Curtiss Robin, or whatever. Rather than going into the business of making decals, try buying some Windsor & Newton opaque water colors and mixing them on a white plate (only way to get true colors) with some soap. The soap should be the bar type, and the addition of it makes the paint adhere to slick surfaces. Make a mistake and all you have to do is wash it off and try again. Once dry, put a coat of clear over it and it will match your plane and be waterproof. Note that I said **any** slick surface — that includes MonoKote. In this case, top coat it with polyurethane varnish.

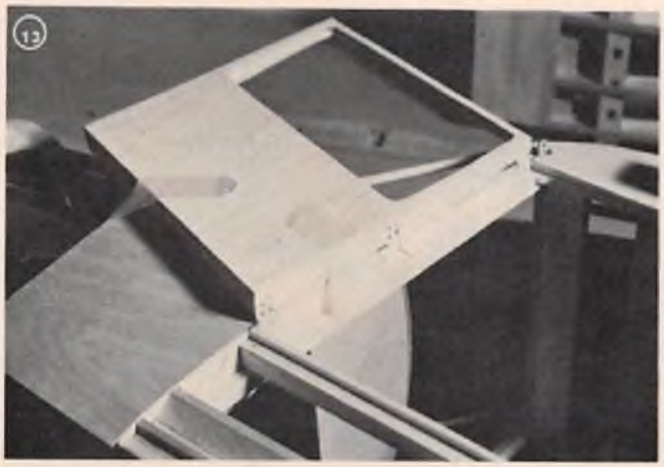
The running and position lights were made by filling gelatin capsules with epoxy and cutting them down to the required size — something I regarded as an old trick, but one the fellows around here hadn't seen. It takes some snooping in a drugstore to find the right colors and sizes, but they're there if you look. I used one half of a "Contac" capsule for the white position light, and the other half for the red port wing light. A Vitamin B complex capsule yielded the green starboard wing light. All are coated with polyurethane varnish to make them waterproof.

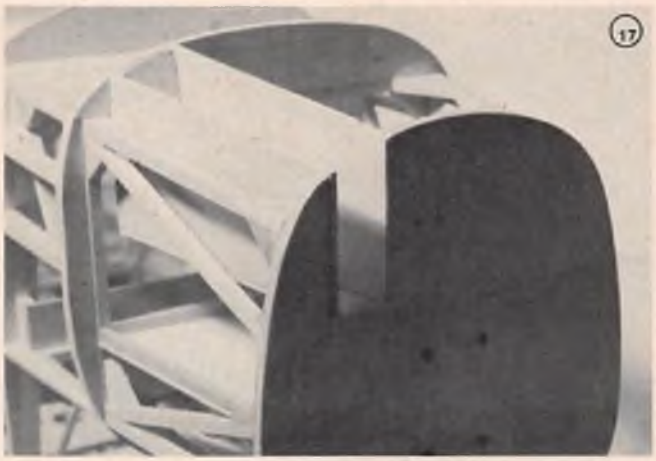
In that I've never really been in love with music wire landing gears, I decided from the outset that this ship wouldn't have one. The big main gear was first drawn up to work as hinged legs ala the real plane, but the limitation of our sizes ruled it out, so I went for the one piece spring steel jobbie. While the oleos work, the spring steel carries the weight and does most of the work. Later, it dawned on me that something else I'd stumbled on would have worked for the legs I had in mind originally — cotter pins. I was in a hardware store looking for the thumb screws used to hold the

photos follow — text to page 62

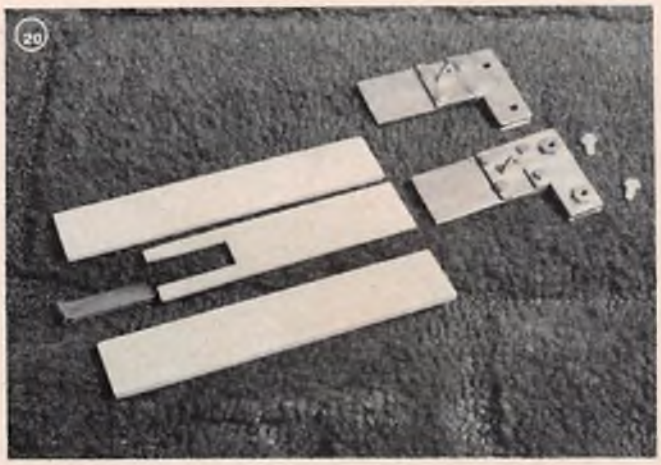


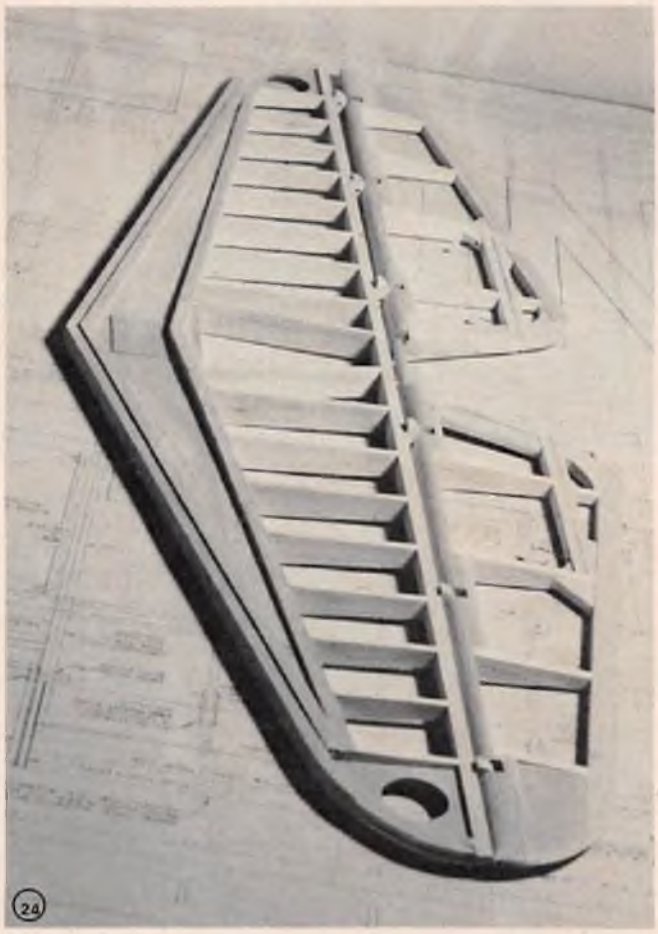
(7) Tail wheel "oleo" assembly. Tube at center is epoxied into a ply sandwich, rest of unit free to move up, down, right, left. Spring mounts thru fitting at top. Cables affixed to both sides of horn at top. (8) Tail wheel collar built up to shape using "Devcon AL-40". Balsa cuff on oleo tube is covered by cloth stitched to wire frames, top & bottom. Rudder hinge wire buries into balsa. (9) Tail wheel assembly mounted in place w/spring. Length of plastic tube over spring end to insure no metal to metal "noise". Cable guides & cables installed. Cables to tail wheel must be slightly slack due to angular travel of tail wheel on the vertical. (10) Interior of door — both made the same in right & left versions. 1/16" wire sticking up thru plate is bent at rt. angle on end covered. End fits into washer soldered parallel with 3/32" wire that serves as spring loaded door catch. Spring from ball point pen. Smaller wire protrudes up thru eyelet guide & has wire handle soldered after door is covered. Handle finished w/AL-40, then silver plated. (11) Door covered w/3-ply Strathmore drawing board. Funny thing on door is artist's painting knife — home made by soldering thin brass shim stock to 1/16" m.w., ramming wire into length of 1/2" x 5/8" spruce. Used to cover door handle w/AL-40. (12) Door hinges made by cutting standard hinge half in two. Model used 00 90 bolts and nuts with ends clipped off. Alternate method is to use straight pin in place of bolt, clip to length & smack end of pin lengthwise with a punch such as the finish nail set shown.



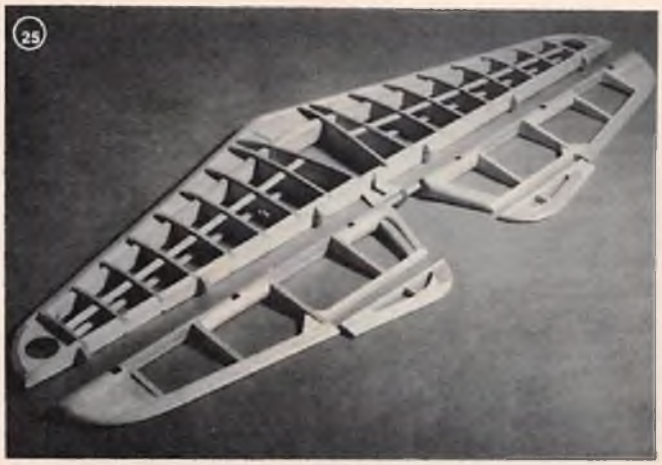


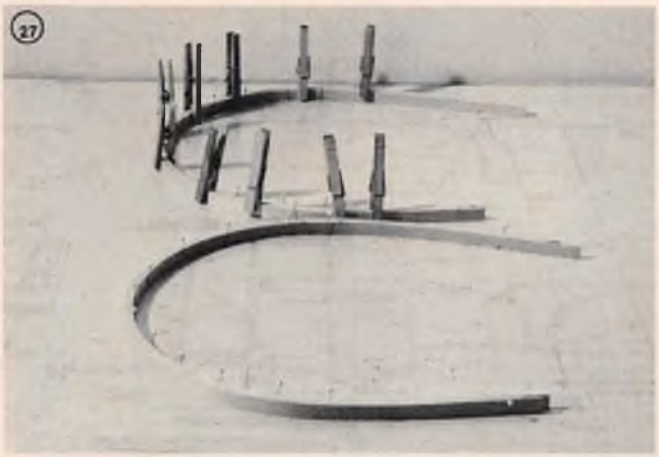
(13) Door is taped firmly, hinge positions marked, & frame & door notched to receive hinges. 1/2" pins forced in w/epoxy. Curvature of door & frame leave gap at this position, but door fits snugly when closed. Note raised door sill over scale position at lower level. This to clear all controls, radio, etc. (14) Top cowling installed around the 2 windshield braces. Braces are 3/16" dowels, Titebonded top, epoxied bottom. Tank held in by aluminum strap. Vinyl seating tape on underside of strap for non-skid performance. (15) 6 oz. bottle of Titebond can get lost in a place like this. Brass strip on upright to left of bottle is screwed & epoxied in. Top is drilled to receive LG mount bolt & nut seen at far upper left. White strip on upright is half-round plastostruct. Antenna runs thru to top of fuse & back. Antenna plug on opposite side. Radio has 3½" wire to plug. (16) Control center mounted in bottom of fuse. Upright piece hooked to pushrod to elev. L.G. clips serve as hinge point. Horizontal bar made from printed circuit board for rudder & tail wheel cables. Wheel collar acts as bearing. Duro "Magic Black Rubber" used on all nuts for vibration. Servos connected w/short lengths of 1/16" m.w. Behind control center is the elev. pushrod supports — ply unit in center holds tube rigid near control center. At all pass-thru points, tube is wrapped w/masking tape & epoxied. Epoxy alone on tube does not hold. (17) Exhaust/cooling tunnel made of "Liteply" (Sig). On full size ship, cowling slotted & exhaust stacks exit. Moved from rt. side to accommodate Max .80, this unit pulls air from front cowl over engine & out. Exhaust from Max fires straight down. Non-restrictive dummy pipes mounted to add touch of realism. (18) Balsa pieces glued to areas where windshield would fit, & the length directly above door; eases windshield fit. Note that wing mount stubs are still not in.

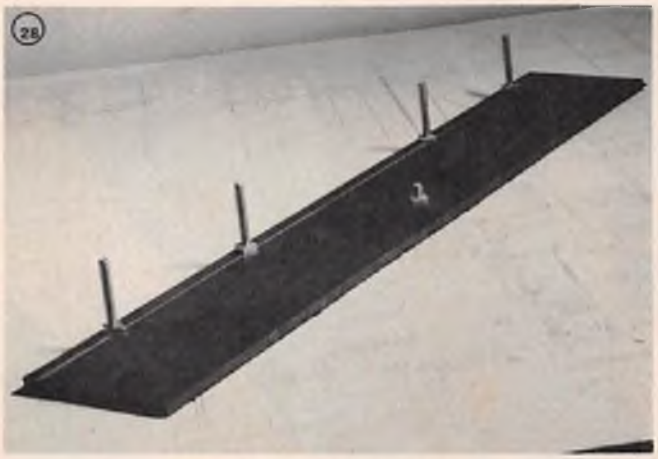


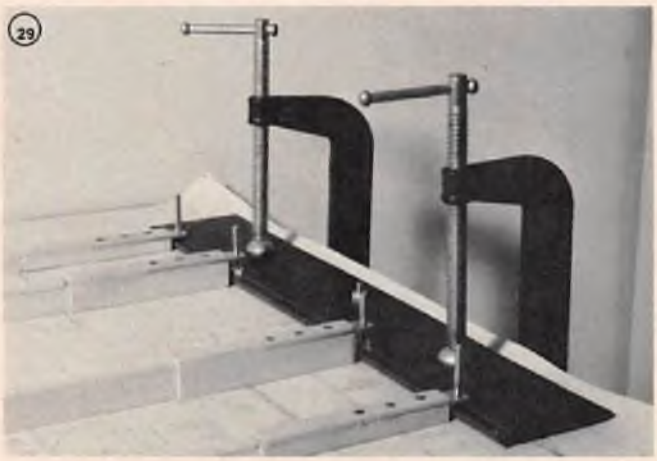


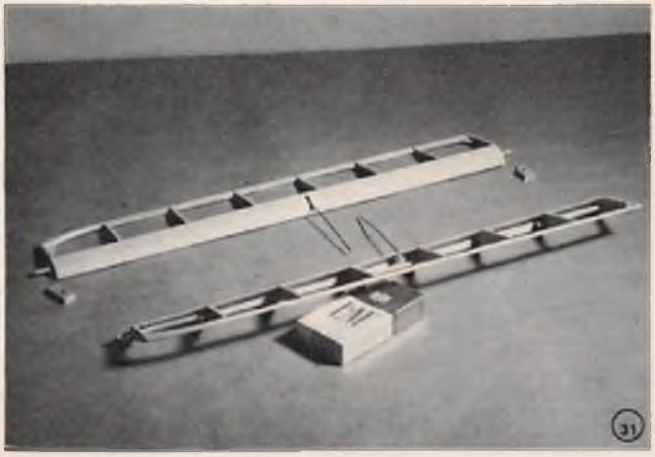
(19) L.G. mounted w/torsion straps. Just aft of the straps are 2 mounts for steps. Pipe at lower left of center is fuel overflow. (20) L.G. strut components; these make up the unit that extends outward to connect to the 2 wing struts. They may appear difficult on plans, but are simple to make. Brass end plates are sandwiched into ply pieces shown. Both brass L end plates are shown to illustrate top & bottom views of a part. (21) Wing mount stubs glued in place, top stringers on. Note that stringers are laminated of spruce below, balsa on top, both 1/8" sq. Wing mount bolts are 1/4 x 20 nylon w/lower ends slotted for easy removal. Note eyelet mounted in rear door frame — serves as catch for door lock. All window frames are recessed to receive plastic windows. (22) Rudder spars & elev. hinges. Rudder built on plans w/tapered spar, section with hinges glued on after removal from board; assures precise alignment of surfaces. (23) Rudder is built flat of strip stock. Razor plane & sanding blocks used to shape rib sections. Simple & accurate. Hinge wire runs up through alum. tube buried in balsa sandwich of fin post. Lower end of wire curved & tucked into tail wheel housing — simulates position light wiring on true Fairchild. (24) Elevator — all rib blanks cut to match spars front & rear, capstrips run over front spar & into meet L.E. Perfect alignment on tapered sections — & no rotten ribs to cut out! Trim tabs mounted w/two pieces of 1/16" thick alum. & are usable if needed for permanent trim.



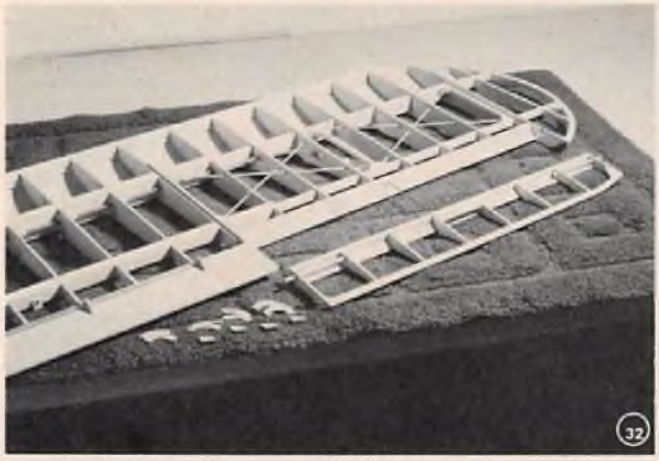


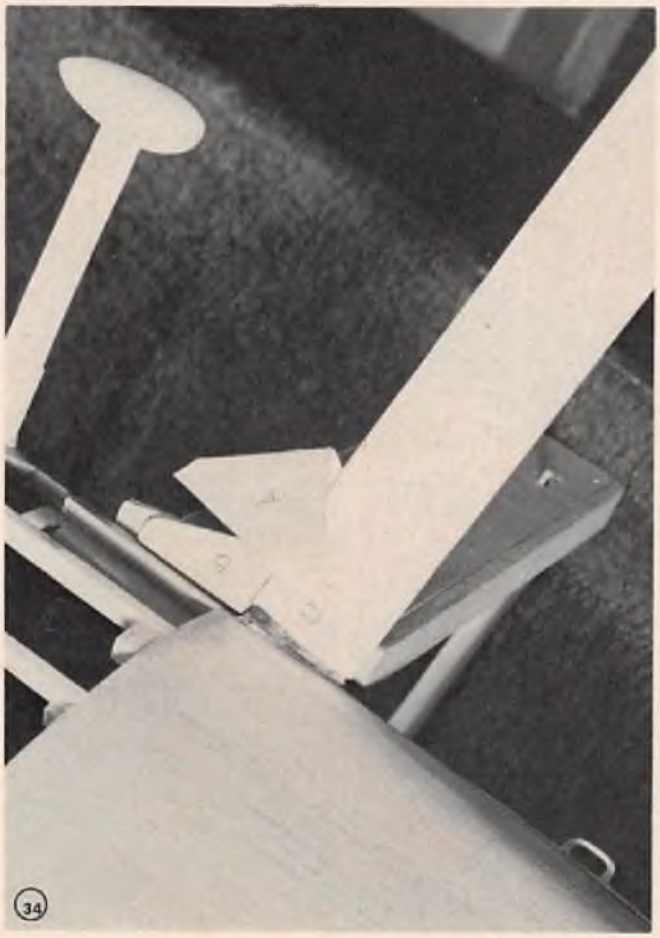




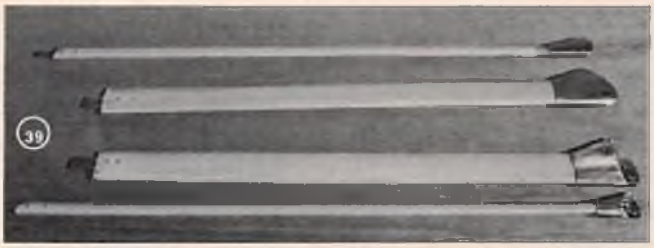


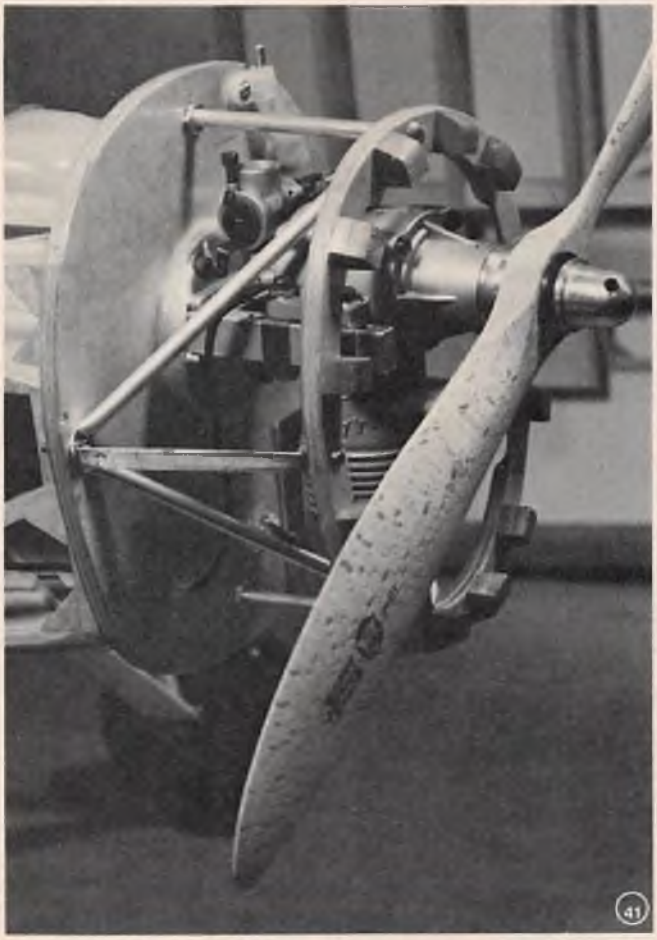
(25) Flat center top & bottom spars have been added to elev. & 1/8" sq. caps run over to form a perfect tapered unit. Bottom of fishtail installed & elev. is ready to be glued into slot at rear of fuse. (26) Assembled spars. Spars are made up from laminates of spruce & maple. Alum. bar is sandwiched in at large end. Screws run down thru spruce, alum. & end in maple — strong! Wing bolts to plane ala the full scale ship. (27) Wing tips built up from 36" long strips of 1/16" balsa joined w/Titebond; wrapped around pins over plan with clothespins while glue dries. For stronger than cut balsa tips, the units are cut down to fit after 24 hours of drying. (28) Wing building alignment jig made from scrap of 1/4" masonite and 1/4 x 20 bolts. Center lines of spars & attach holes drawn on masonite to be drilled and fitted w/bolts. Spars dropped on bolts & wings built over plans. Small bolt serves as leveler for jig. (29) Wing building jig clamped to building board w/assembled spars in place over alignment bolts. (30) Wing at flap area showing the off-center hinges installed. Flap is sitting on edge. Installed, flaps rotate downward 80°, although scale throw of 60° maximum is used. Box section carries 2 servos (each wing) for flap & aileron. Rear wing strut attach is at lower left. (31) Ailerons, showing internal horns. If using this method, run alum. tube full length to avoid buckling tendency. Slight bend in aileron obliterates pushrod action. Model finished with small external horns. Blocks shown hold aileron in place in wing — aileron must be covered prior to installation.





(32) Wing, showing aileron, mounting tubes, & components that go to make up the off-center flap hinges. These made from modified bellcranks, fit on each side of wing ribs & have small 1/8" ply spacers between on the exterior lower wing surface. Flap w/hinge plates is sitting in position. Bent tube aileron drive was torn out after tubing proved to have slop. (33) Dash parts were made of a combination of available instrument faces mounted in a Structo-Plast housing panel cemented to a ply instrument panel. Whole ensem, as well as "dome" forward of panel & area under windshield, finished w/Pactra flat black enamel . . . also used for entire cabin interior. Dash knobs were turned out of artists push pins. (34) Main gear covered w/Strathmore, and gear fairing parts ready to be glued. Plane on its back, shot taken from above, between gear legs. Step unit is to left. (35) Ala the real plane, these 2 units fit at upper end of L.G. to form a fairing. Small part is from spruce, large bent piece is 3 ply Strathmore — it paints beautifully, loves ManoKote. (36) Float attachment — unit is in the ship built, just in case an urge to go to sea arises. Floats scale up at 49½" long, so urge may die. 1/16" cotter pins are soldered into brass tubes, tubes bound together & soldered with 1/16" m.w. spacers. (37) Stab is glued into position & sheeted. Elevator must go into slot at this time too . . . no way to get it in later. Hinge wire is not installed until later, after sheeting and "fishtail" are completed.





(38) Dummy exhaust pipes made from 7/16" brass tube, painted a flat grey, & drops of red to simulate real pipes. Butyrate wiring harness clip cut in half and fastened to tube w/sheet metal screw. 2/56 bolt w/washer thru clip & block shown hold each to wall of exhaust/cooling tunnel. Stabilo pencil used to mark. (39) Wing struts ready to prime & paint. Ends to the right have alum. fairings installed — double "dots" showing at left ends are 1/8" dowels that hold end fittings in place. Units made of spruce sandwiched w/Titebond & epoxy. (40) Step assemblies in early stage. Dural struts epoxied to ply step & form built up with Epoxolite. Top of step is made from 1/8" thick alum., grooved to partially imitate full scale plane which had grooves and Fairchild logo. Wet or Dry paper cemented in place would duplicate most steps on planes of this era. (41) The engine room — all starting wiring is internal. Ground wire can be seen here attached to Edson motor mount. Bracing adds a lot of strength to cowl ring. Maple blocks around cowl ring protect and seat front cowling — not shown on plans. All nuts used in this area have nylon inserts for vibration. (42) Ground service access — door made of .040 alum., contoured to shape of fuse. Steel plate epoxied to inside, grips magnet at lower right of opening to stay closed. Scissors spring holds door open for charging, top plug; switch, middle; battery plug-in to engine, lower. (43) Ground service access door closed — rivets are obvious. Sig rivets used thru holes in printer's offset plate wrapped around 1/16" m.w. imbedded in fuse. Hinge sections made by slicing w/X-Acto knife. Handle made of 1/16" m.w. wire w/solder build-up around washers outside, solder blobs inside. (44) Landing gear components at the fitting stage. Cabin interior has been painted black, along with area in front of windshield. Baggie on to keep the Max .80 clean.

(45) Detail of wing strut fitting, w/upper strut fitted in place. Spring & top of main oleo yet to be installed. "Rubber" cuff at fuse end of wing strut fitting is actually bell wire epoxied in place around strut. (46) Engine area supports painted black to avoid "peek thru" around cowling sections. Phony exhaust pipes have been painted and mounted. Butyrate clips make them immune to breaking off. Tatone manifold on Max .80 is loosely stuffed with Chore Girl to become highly effective muffler. Pins in windshield help hold ABS over butyrate, with R/C 56 as main adhesive. Tube at top of firewall is fuel fill to tank. (47) Ship was placed in sun on 80° day with doors closed and cowling on — temp inside went to 117°. Hole shown was made & ship again placed in same temp setting — thermometer went to 97°. Outlet fairing used to cover hole ala the full size ship. Cowling shown was made in 5 sections. (48) Wheelpant is made of fiberglass. Closure panel & strut fairings made of .030 ABS, oven molded over forms carved from balsa. DJ Multi-stripe was used to simulate the rubber cuffs on the real plane. Fairings are not scale, but only a Fairchild fanatic would know for sure.

upper landing gear strut to the fuselage at the front of the cabin, when the cotter pins leaped out at me. I used them at the float attach point in case I get daft enough to build a set of floats for the monster. (Floats for this ship scale-up to be 49½" long!) Cotter pins match the inside diameter of the brass tubing we use, and they are tough enough to act as mount points for almost anything, if used in the right size. Mounting two side by side gives an almost exact copy of full size attach points. Space them right and a third will fit between them exactly to carry a strut, or whatever.

If you decide to build the plane, remember to put the tailwheel cables in with a slight bit of slack in them. Make the cables tight and the wheel will not turn. I put them in tight and found out; I also put them in as spring loaded units, and while I could turn the control bar up front, the tail wheel didn't move a fraction of an inch. The reason, of course, is the slant of the tubes — tension on the inner one locks it against the outer. And, no, lubricant doesn't solve it. I used silicone and it stuck fast with the cables tight.

Should you consider lightening the tail by reducing any of the structure, don't. The Fairchild hangs slightly nose down on a balance test, just the way it should. No weight was added to the nose to achieve this, and it's one of the reasons the ship was considered in the hassle over what would make a good, big, fun ship. That long nose works for you.

While on the subject of the nose, the photos show braces not shown on the plans. These are the diagonals that run around to catch the cowl ring where the standoff bolts are anchored. I considered adding them to the plans, but they are each a slightly different length, and I suspect that each plane built would require differing lengths. I used 1/4" aluminum tubing to make them, flattening both ends and drilling them to accept the bolts. The entire airplane can be picked up by the cowl ring, and no amount of trying will see it twist. While aircraft type nuts with nylon inserts were used on all bolts in the nose area, they were safetied with Duro Plastic Black rubber, as were nuts in the landing gear system, the control center, and anywhere else the nut was out of view when

the ship was completed. Only a wrench will work to undo a nut safetied with this product.

Another item not shown on the plans is a gillhooley added during the writing of this article. This is the ram-air carburetion and, while all that sounds like speed shop talk, the ram-air was achieved very simply. The original Fairchilds had all sorts of air openings in the front of the cowl and, on the models, I used the upper oval opening to fit in a funnel made of brass shim stock. The front of the funnel fits the oval exactly, while the back end is perfectly round. Into this rear opening I fit a length of 1/2" diameter vinyl tubing which, in turn, curves up and back to pass over the carburetor opening. A square slot was cut in the portion over the carb, and the remaining length past the carb was plugged with 1/2" length of 3/8" dowel, held in with Duro Plastic Rubber. There is no way that carb can sit back and complain that it's starved for air.

I promised a word about the flap hinges. These were made from aileron bellcranks — 16 of them. The elbow was cut off at the mounting hole and each was sanded round at this point. Two are used at each hinge point, one on each side of a wing rib, with a bolt through, and plenty of epoxy over bolt, hinge, rib, and nut. Just as with the engine having been installed, and all worked to fit around it, and the announcement made about the wealth of new engine reduction units, so it was that after cutting these 16 bellcranks to shape, someone put off-center hinges on the market. Story of my life. However, the cranks aren't all that hard to alter, and you might try what I did — sand them on a Black and Decker rubber sanding cone fitted onto my Dremel jig saw. A great product, it consists of grit of some sort imbedded in rubber. It cuts at the right rate of knots for modelers, and gives a very smooth finish at the same time. Do the nylon cranks in light touches to avoid the melting that occurs when nylon gets hot.

The wings are, admittedly, built up in a rather strange manner, and appear pretty weak if one studies the plans. They are weak . . . until the cap strips go on . . . then they become tremendously strong. In designing the structure, I decided that the balsa ribs should be nothing more than what they actually are — pulp to form a shape. The spruce cap strips inboard convert the pulp to brute strength, just as the balsa caps at the outer section do enough to the ribs out there to make them more than adequately strong.

If you look carefully at all the funny pictures, you'll notice a shot of the simple jig made to lock the spars into position for building. This worked like a charm. When the wings came up from the building board, I nervously approached the fuselage and tried them out for fit. Viola! (Nuts to the French — I prefer Viola.) I admit that I had to touch up one of the holes with a needle file to achieve a perfect fit, but this was nothing like some of the nightmares encountered with kits that use wires fitted into tubes, such as a glider normally uses. I'm a fairly careful builder, but I've yet to build a sailplane kit where the wires exactly matched the plug-in points.

This brings up the business of accurate transfer of part shape from plan to wood. Another artist's trick, aside from cutting the part out of the plan and rubber cementing it to the wood and cutting around the line, is to blacken the back of the plan with a #1 or #2 broad or flat lead pencil. Art stores have them, and carpenters use a variation to mark lumber for cutting. Next, take a cotton ball or a wadded facial tissue, and soak it with rubbing alcohol. Rub this over the pencil markings and you have instant, non-smear "carbon paper", like the original carbon paper of years ago. Some experimentation with a scrap of paper and a standard lead pencil will show you how simple and easy this is. Using commercial carbon paper is a worthless pursuit — the results are never accurate. On the same thought train, should you wish to trace something onto a dark surface, use white chalk, or better, a pastel stick on the back of the drawing to be traced. Rub the chalk or pastel out to a smooth finish with your fingers, blow off the excess dust, turn over and trace it down. In the case of the pencil technique, should you wish to remove the traced down line, do it with alcohol. With the chalk or pastel, use your finger, or a dampened facial tissue. Both of these methods work in marking Mono-Kote for cutting out design shapes.

On the first flight, test pilot, Bob Karlsson, decided that the ship was so sure footed that he began a series of low passes to wahoo the field. Only correction made was a slight bit of aileron trim.

The plans show one method of installing the internal wiring, while I used yet another, as shown in the pictures. You will notice variances in the plans and the finished product, and even places on the plans where two alternatives are often shown for a specific bit of construction. Either way works; I simply note the varying methods on my plans and often choose yet another way in the final construction.

The idea of using the various pipes that hang down out of the full scale ship as connections for the starting wiring is valid, but another idea popped up during the construction: put all the electrical gizmos in one place and cover them with a door to keep them clean. Since I'd puzzled out the manner of fast loading on the Show Team's drop ship, which had to take-off, drop, land, reload, etc., 4 times in 10 minutes, I used the same fastening on this door as on the J-3 built for the Team . . . parts from a magnetic cabinet door catch. The magnet is mounted in a corner of the door frame, and the metal "grab plate" is epoxied to the aluminum door. The only disadvantage I see to this whole scheme is that, if the plane lands far away and the usual eager little kid runs out to retrieve it, he'll never find the switch. It's under that door, too, but then no little kid would ever be able to lug jumbo back either.

Something else not shown on the plans is a tube, made of rolled three ply Strathmore, that runs from the servo box in the wing, out through the root rib. This allows the servo wires to be fed in and out without hanging up on a rib. Extension wires were made up for the servos for the distance from box to root rib, and extension "Y" harnesses were made by Kraft to get the wiring long enough to run down the door frames and forward to the radio. The Y's were required to split the commands up to handle the two servos in each wing.

Two methods of elevator construction are shown, but the easiest is to cut the spars and leading edge parts to exact shape, pin to the plan with the ends blocked to level, then glue over-size strips between in the rib positions. After

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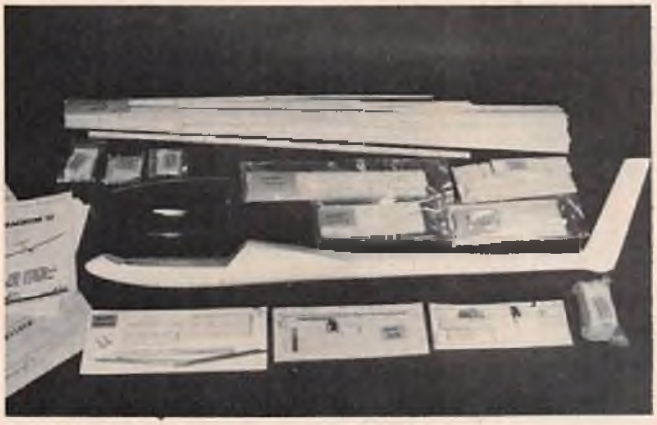
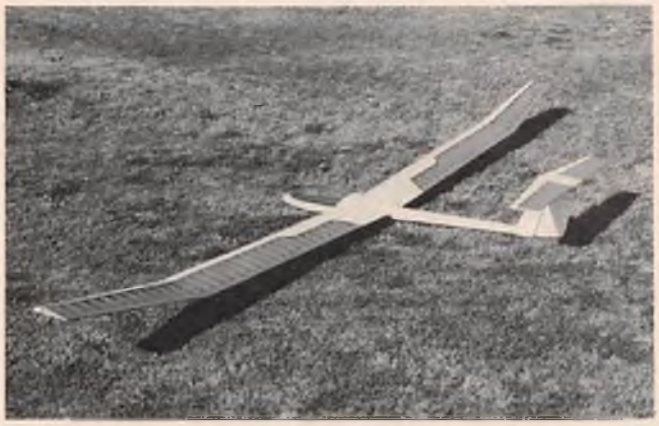
RCM PRODUCT TEST

Soarcraft Products' MAGNUM 12





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		●				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 Magnum 12 is a competition sailplane, manufactured by Soarcraft Products and is available direct from the manufacturer as well as retail dealers. The kit comes complete with a fiberglass fuselage, all necessary balsa, ply, and hardwood to build the wings and tail section. Hardware is very detailed and includes pre-bent wing wires, pre-formed canopy, packaged cut and sanded ribs. A complete spoiler assembly (vented gate design), clevises, pushrods, tow hook, and all miscellaneous screws, tubing, etc., to do the job. All that is missing is the radio, the glue, the covering material - - - and you.

The kit contains good plans and written instructions, and benefits from really outstanding packaging. All separate components are, where feasible, in individual clear plastic sealed bags.

As you might suspect, this big bird is definitely not for the beginner . . . builder or flyer. But don't let that scare you off if you've built and flown a few of the larger sailplanes in the past. For fear we might be doing it an injustice, we hasten to point out that construction is straightforward, with no unusual or difficult steps to follow. It's just that when building big, any small error or early misalignment has a way of compounding itself later on. So, ordinary care and attention will get you there all okay . . . and experience in building will assure getting there more painlessly.

Flying is a treat, but like building, you will be ahead of the game with some background in handling birds of similar size. With over twelve feet of wing, this sailplane really excells. We've rated it excellent in the flying department, and you have to see it to fully appreciate the magnificent sight it gives, once it gets into the sky where it belongs. In 1975, John Baxter, LSF 24 of Santa Clara, California, became the first person to com-

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SPECIFICATIONS

Name	Magnum 12
Aircraft Type	Sailplane
Manufactured By	Soarcraft Products 1550 Dell Ave. Suite K Campbell, California 95008
Mfg. Suggested Retail Price	$129.95
Available From	Both Mfg. and Retail Outlets
Mfg. Recommended Usage	Competition Sailplane
Wing Span	148 Inches
Wing Chord	8 Inches
Total Wing Area	1112 Square Inches
Fuselage Length	50 Inches
Radio Compartment Dimensions	(L) 11" x (W) 4" x (H) 2"
Wing Location	High Wing
Airfoil	Flat Bottom
Wing Planform	Constant Chord
Dihedral	2 Inches
Polyhedral	3½ Inches
Stabilizer Span	32½ Inches
Stabilizer Chord (incl. elev.)	5 Inches
Total Stab Area	163 Square Inches
Stab Airfoil Section	Symmetrical
Stabilizer Location	T-Tail
Vertical Fin Height	9 Inches
Vertical Fin Width (incl. rud.)	6¾ Inches
Mfg. Rec. Engine Range	NA
Recommended Fuel Tank Size	NA
Landing Gear	NA
Rec. Number of Channels	3
Recommended Control Functions	Rud., Elev., Throt., Spoilers
Basic Materials Used In Construction:	
Fuselage	Fiberglass
Wing	Balsa & Spruce
Tail Surfaces	Balsa
Hardware Included In Kit	See Text
Plan Size	30" x 84" (1 sheet)
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (23 pages)
Construction Photos	Yes
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	76 ozs.
Wing loading based on rec. flying wt.	9.06 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	72 ounces
Wing Loading	9.3 oz./sq. ft.
Covering & finishing materials used	MonoKote
Engine Make and Disp.	NA
Muffler Used	NA
Radio Used	RS 2 Channel
Tank Size Used	NA

A BETTER WAY

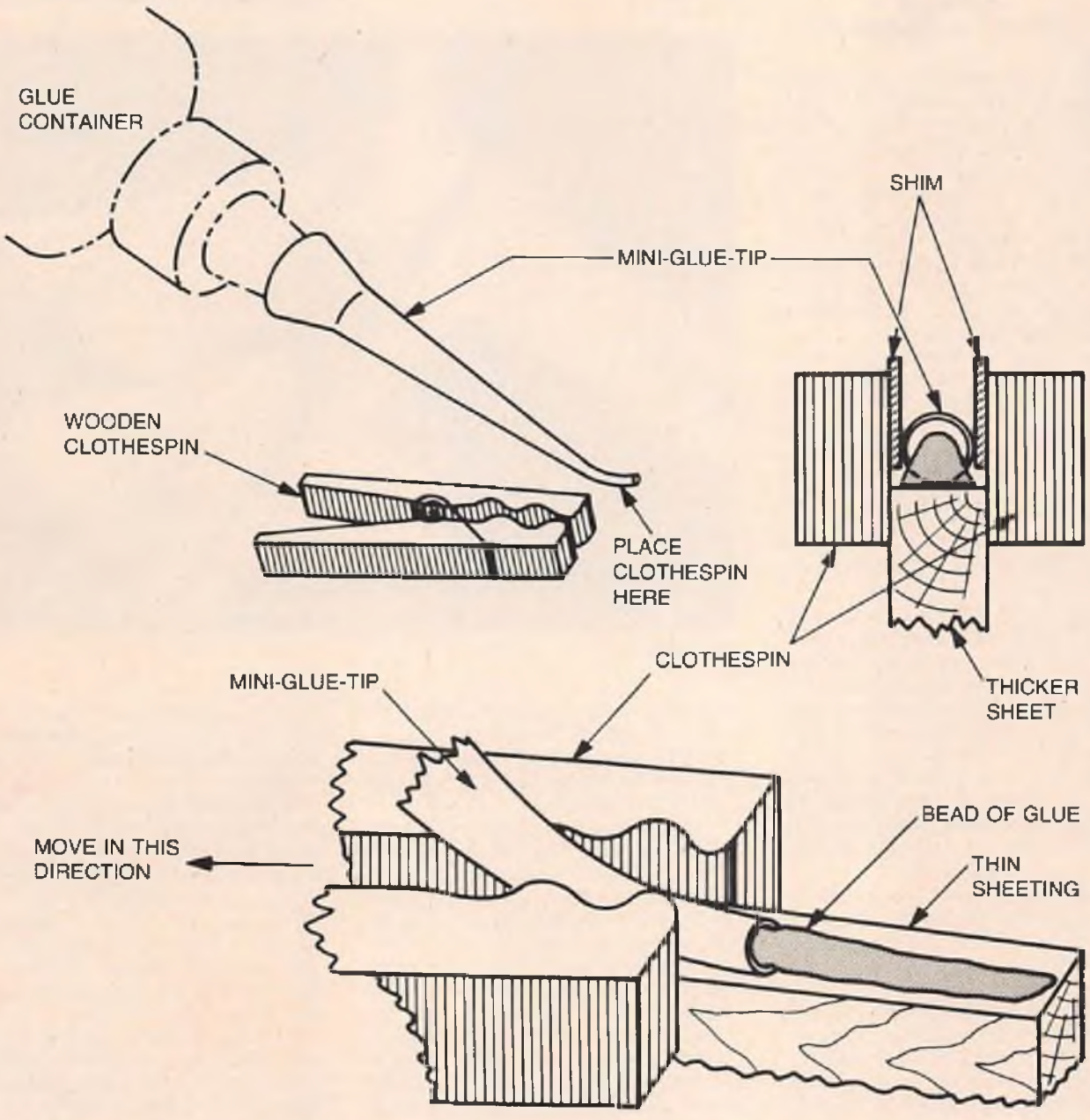
By David L Peltz

One of the most difficult gluing tasks that a modeler often faces is the application of a bead of glue along the edge of a thin sheet of balsa or plywood. Using the technique described below, this job is made infinitely easier.

The use of a "Mini Glue Tip" is enhanced by the temporary application of a normal wooden spring type clothespin. When placed on the "Mini Glue Tip", it acts as a guide allowing the bead of glue to be accurately placed on the edge of the wood sheet. It works well on 1/16" and 3/32" sheets.

This procedure is very useful when preparing the sheeting usually found in D-Type wing construction, as well as certain types of butt joints.

If the sheeting is thicker than 3/32", the modeler may wish to either trim the end of the "Mini Glue Tip", or place shims between the glue tip and the clothespin. □



DUCTED FAN DESIGN

By R.W. Kress

PART III

FIGURE 1

Photos courtesy of Grumman Aerospace Corp.

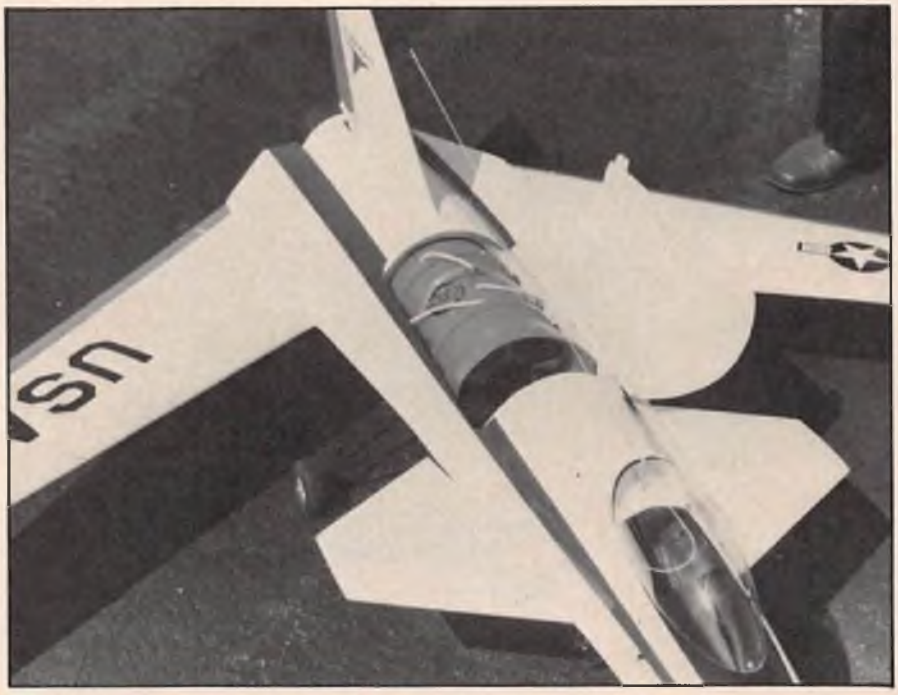


FIGURE 2

INLETS OR "MOTHER NATURE'S REVENGE"

In my previous articles, I briefly reviewed some rules of good practice in inlet design. I really had no intention of writing this article until a recent experience convinced me that such was necessary. My fear, of course, is that improper inlets in scratch-built designs or, worse, in production kits, could have disastrous impact on the future of ducted fan modeling. My reaction is this comprehensive (I hope) article on inlet design.

The experience cited relates to the photo of Figure 1. This is the inlet of a new Grumman forward swept wing fighter design. The model is built up using a F-16 fiberglass fuselage housing one of my .60 class ducted fans. It has been flown with both an OS .60 FSR and an OPS .60 with pipe (not much improvement since the fan overloaded the engine and prevented its getting "on the pipe" — more to be said later).

The inlet of Figure 1 looks pretty slinky. Unfortunately, that's about all you can say for it because it turned out to be really crumby. We ran installed static thrust tests on the model with the rather large hatch off, as shown in Figure 2, and measured a 7.5 lb. pull with a force gauge. This was close to predictions. **With the hatch on, the thrust was about 5.5 lb. at very nearly the same rpm!** Obviously, the blame had to rest entirely upon the inlet.

Some might contend that the inlet static thrust deficiency would clear up in flight as forward speed is increased. As will be explained later, this speed factor will result in only a small improvement.

To explain what happened will provide the guidance to avoid the situation in later designs. I have decided on sort of a build up approach showing how a near-perfect inlet works and then, gradually degrading it to show the pitfalls. All sketches to follow are drawn fairly accurately to scale and are based on my Midwest RK-40 fan which has a duct inside diameter of 5.1".

Figure 3 shows a near-perfect inlet for producing static thrust — a so-called "bellmouth" inlet frequently used in the development tests of full scale jet or fan engines. This inlet is hung on the RK-40 fan with a short tailpipe having a constant diameter equal to the 5.1" fan inside diameter. Since the fuel tank protrudes out of the tailpipe, the effective diameter of the tailpipe, in this case, is .906 times the fan diameter. This is a so-called "zero contraction" tailpipe where the exit area is equal to the fan swept area. Had the tailpipe extended beyond the tank, the exit diameter required would have been .906 x 5.1" = 4.6".

As you can readily imagine, the airflow smoothly converges into the Figure 3 fan from all directions around the inlet, some of the air even coming from behind the inlet and flowing around the inlet lip and into the fan. The inlet lip is generously thick like a wing leading edge and, similarly, smoothly shaped to allow the near-180° flow direction change without flow "breakaway" at the lip.

One could logically ask how the Figure 3 inlet would work at normal flight speed. Figure 4 has been prepared to explain why it, in fact, would not work so

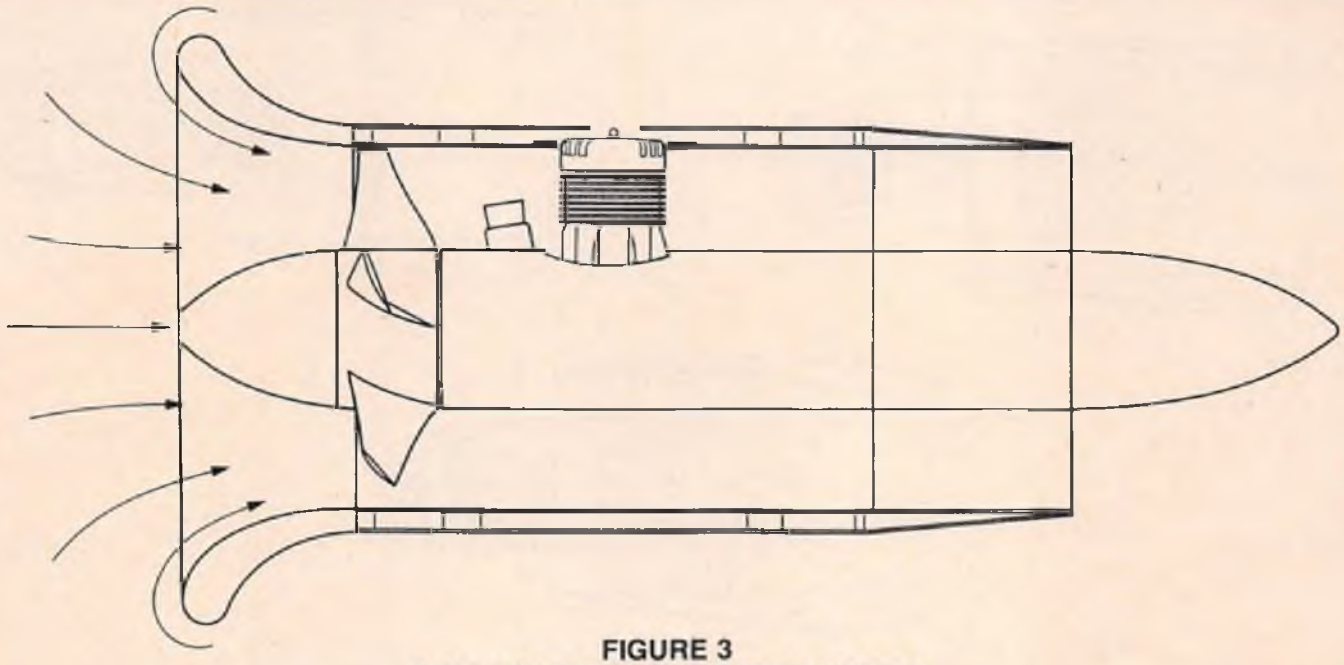


FIGURE 3
BELLMOUTH INLET AT ZERO SPEED

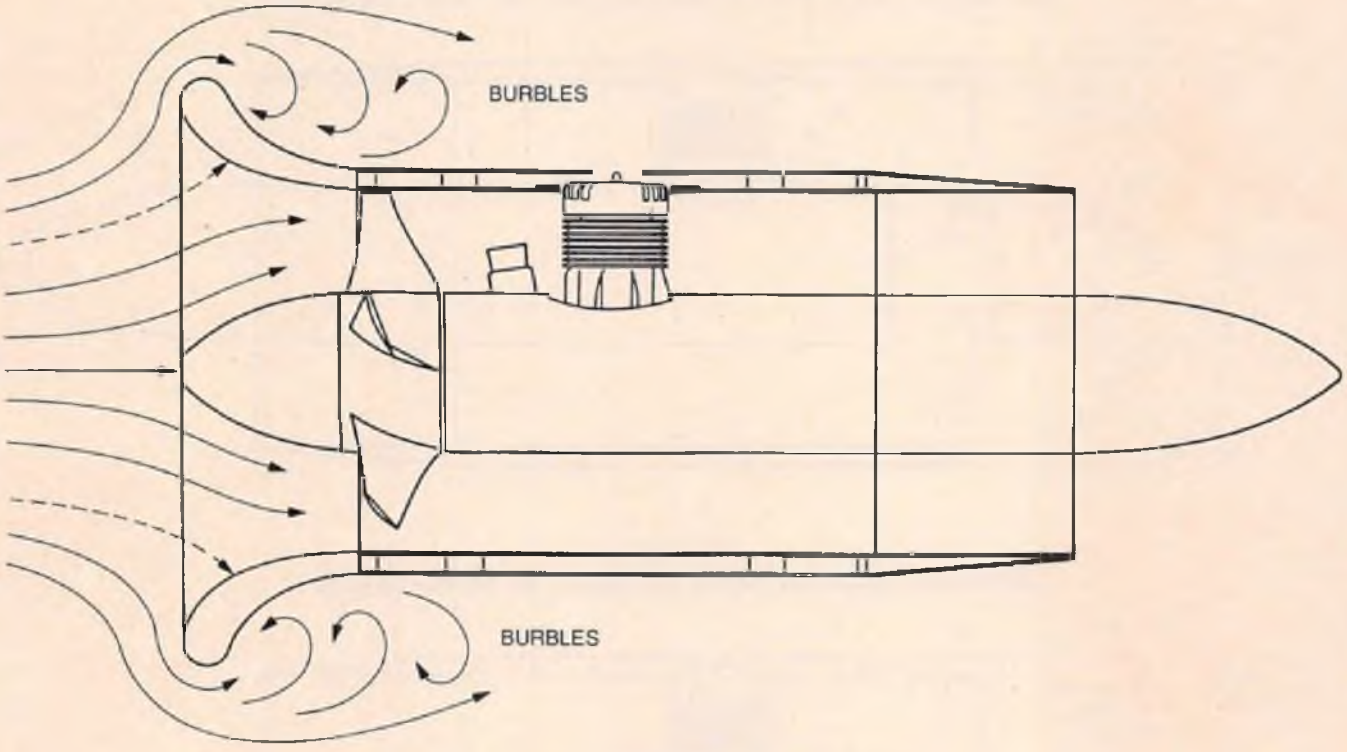


FIGURE 4
BELLMOUTH INLET AT HIGH SPEED

well. On this Figure are shown dashed streamlines originating well upstream of the inlet. These are the so-called "stagnation" streamlines which "dead end" as shown at the "stagnation point" on the inlet lips. Within these streamlines is contained all of the air which flows through the fan interior, or, in other words, the stagnation streamlines bound the inlet "capture area". As the speed increases, the stagnation streamlines come closer together since the fan wants to swallow more or less a constant quantity of air per second which can, in effect, flow through a smaller "pipe" (capture area) at the higher speeds. Likewise, in the limiting zero speed case, the capture area opens up to envelop the entire zone external to the fan. At the higher speed the inner flow is well behaved as shown in Figure 4. But the exterior flow gets into difficulty, having to try and flow around the bulbous inlet lips. The inevitable flow breakaway (call it separation or burbles if you wish) will occur at some speed, greatly increasing the drag. This drag is called "spillage drag".

From the foregoing, one might leap to the conclusion that there is no inlet which is good both statically and at forward speed. This is obviously not the case since full scale aircraft have been facing the same problems for many years. Although, surprisingly to some, the consequences of a poor inlet design in model scale are much more severe. This is because model fans operate at very low pressure ratios compared to full

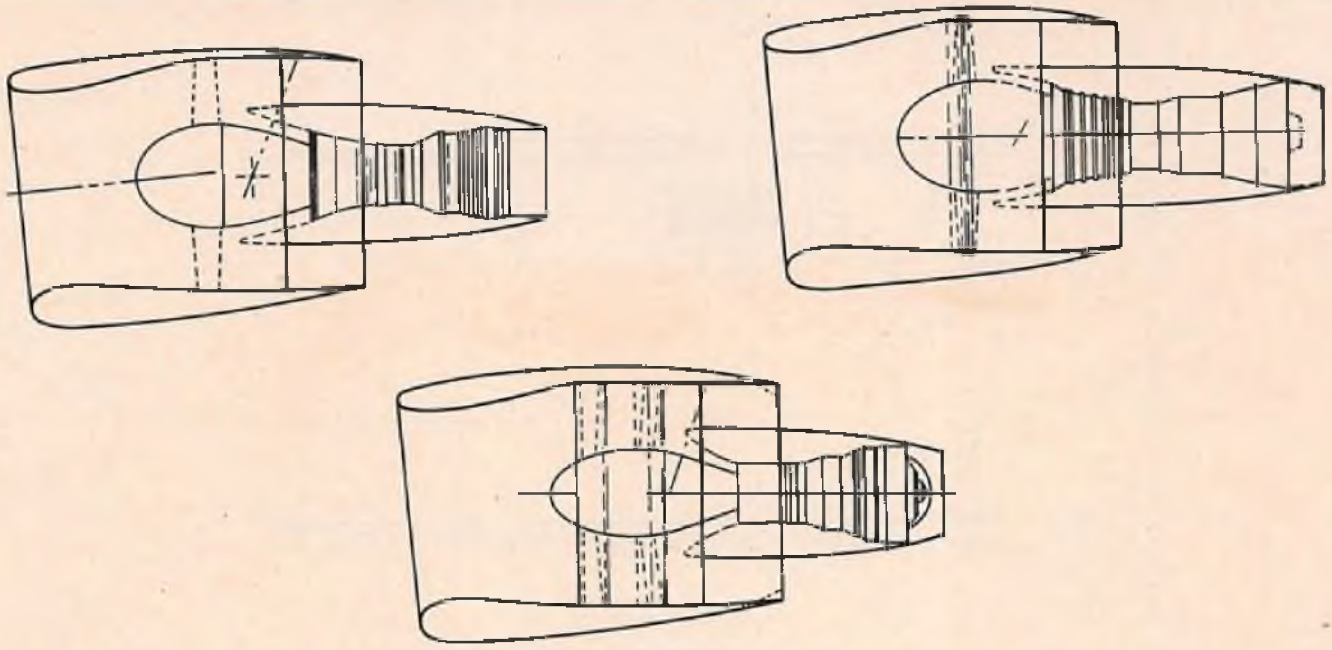


FIGURE 5
SEVERAL MODERN FULL-SCALE TURBOFAN INLET DESIGNS

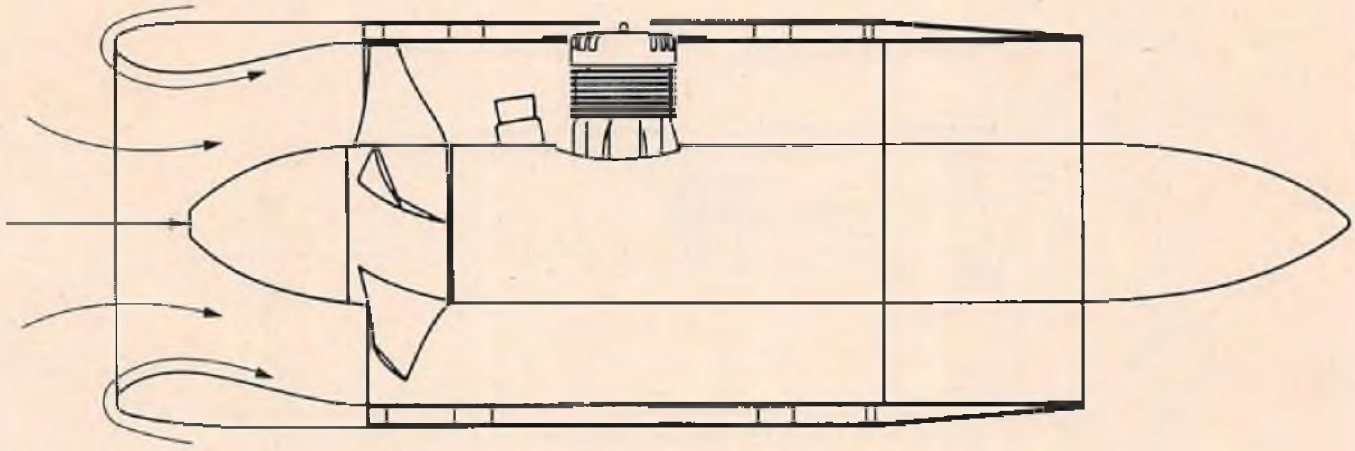


FIGURE 6
NEAR-OPTIMUM MODEL FAN INLET AT ZERO SPEED

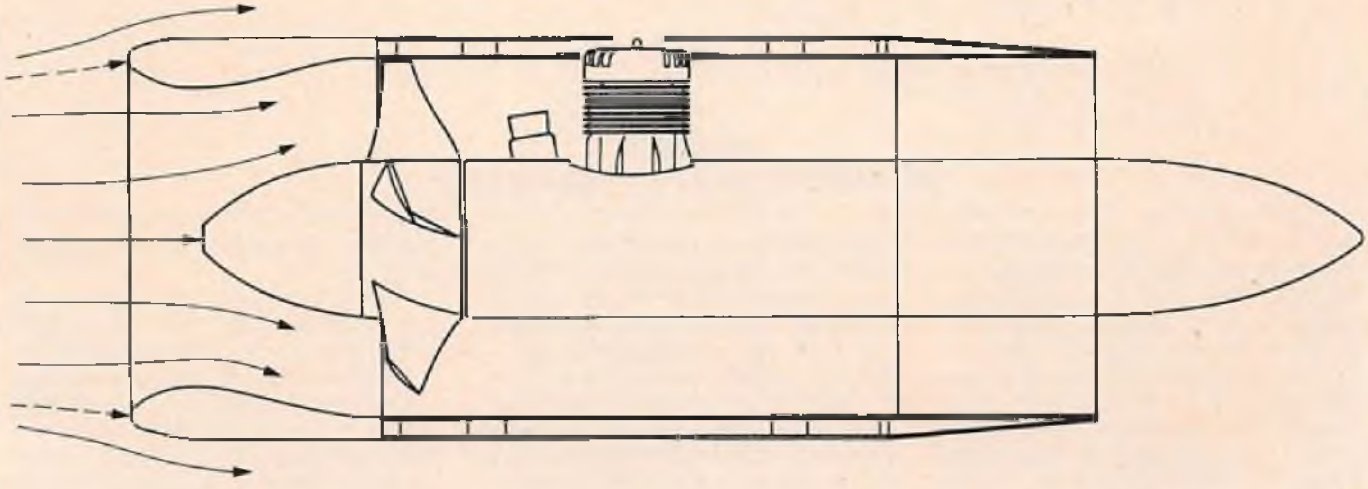


FIGURE 7
NEAR-OPTIMUM MODEL FAN INLET AT HIGH SPEED

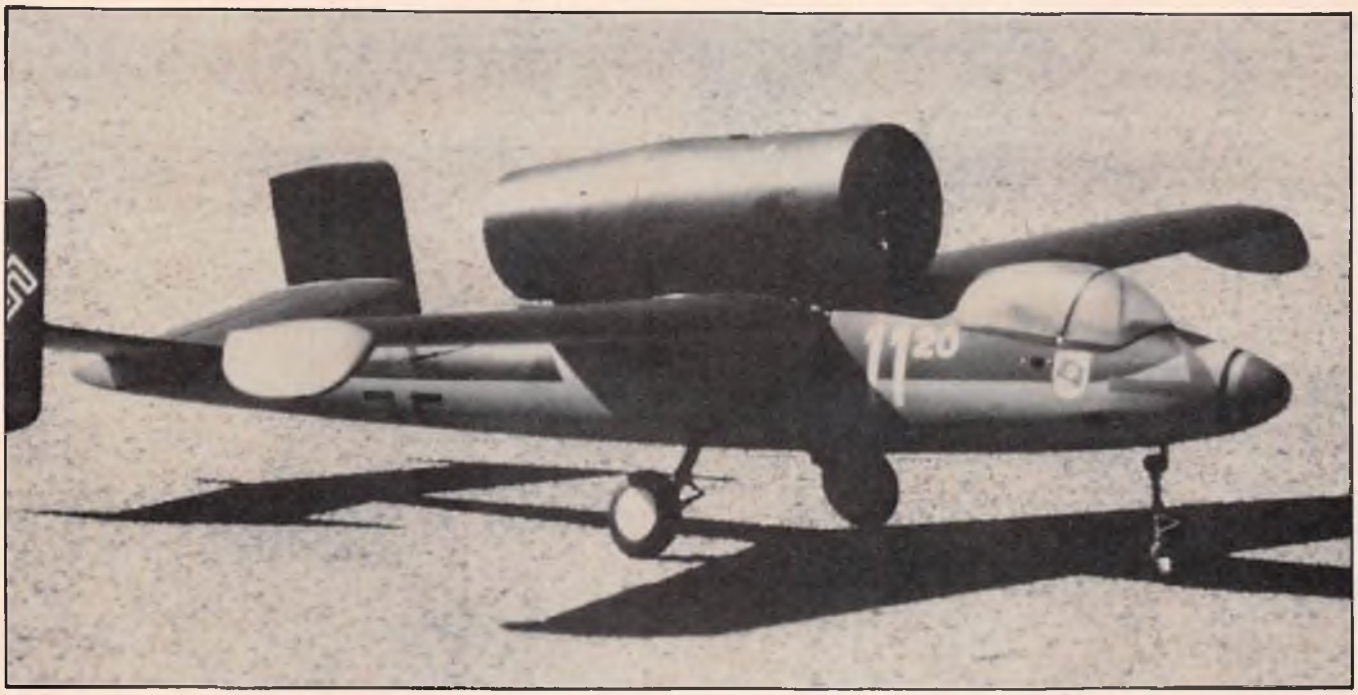


FIGURE 8

scale. More later.

Figure 5 shows several modern full scale turbofan inlet designs. Using virtually identical procedures as those used full scale for fan engine cowl design, the near-optimum inlet design for ducted fan models shown in Figure 6 has been prepared. Credit goes to Mr. Homer Potonides of the Grumman Preliminary Design Propulsion Group, one of the nation's leading inlet experts. Figure 6 shows the inlet in the static condition. The drawing can be scaled if you wish. The trick, once again, is to provide airfoil-like inlet lips allowing the streamlines closest to the surface to flow smoothly around the lip. But also, the interior inlet flow passage contains an expanding or diffusor section which must be very carefully designed in conjunction with the spinner (or bullet) to avoid flow breakaway in that passage. The throat (or minimum) diameter is 83% of the fan diameter or 84% of the fan swept area. What we see then is an inlet flow which first converges through the throat and then expands again slightly into the fan.

Figure 7 provides the basis for examining the same inlet at forward speed. The interior flow within the stagnation streamlines is, if anything, even smoother than was the case for the bellmouth of Figure 4. And as you can see the exterior flow is now near perfect resembling that over an airfoil upper surface. The inlet and fan is conceptually very similar to jet transport podded-type fuselage or wing-mounted nacelles. At its design speed, the capture area roughly equals the high point (most forward) diameter area.

The inlet of Figures 6 and 7 has been used on Nick Ziroli's Heinkel-162 of Figure 8 and will be included, in polyurethane foam construction, in Midwest kits of that aircraft. These same inlets will be made available and sold separately for all fan sizes to allow the modeler to scratch-build authentic transport-like engine nacelles. They will also be made available to other kit manufacturers. To construct a nacelle, one merely wraps the fan with anything from 1/64" ply on up (if a fatter shape is desired) and forms a tailpipe of the desired shape from some thin material, finally gluing the foam inlet into place. Incidentally, Nick's He-162 weighing 7½ lbs. with 6+ lbs. of thrust, will do almost any maneuver in the book as demonstrated at "Chicago Expo '77".

The inlet of Figures 6 and 7 is a conservatively designed unit that I know will work. It is also a reasonably good approximation to the outside shape of modern full scale turbofans as shown in Figure 5. The shape can be further improved as shown in Figure 9. The Midwest Axiflo foam inlets will be made to the shape of the dashed line in Figure 9 and will actually have to be sanded slightly (about 1/16") to fit the cylindrical nacelle shape of Figures 6 and 7. However, for more pleasing external lines, at a slight expense of cross-sectional area, one can generate the external shape of Figure 9 by wrapping the fan with heavier balsa and sanding it down, rather than wrapping it with thin plywood. The cut-back aft end shape of the engine shown in Figure 9 can also be used if scaling is required.

From a styling viewpoint, the nacelle of Figure 9 does not fit well with the older jet inlets of the 707 type. To do this would require closing down the throat and risking inlet separation. I intend to run some experiments on this by slitting a foam inlet in 8 or 10 spots and gradually closing it down, running thrust measurements at each stage. By this means I will determine the minimum allowable throat area for the model scale and flow rate. Until these experiments are concluded, it would be best to not work with throat diameters less than 83% of the fan diameter. This also goes for any type forward-facing inlet, and don't forget the rounded lips! When the minimum allowable throat diameter is found from the experiments, I intend to produce a new line of foam inlets, if they are of significantly smaller throat size.

You may wonder, why the uncertainty about the allowable throat size if we are so smart? The answer lies in available test data, which are virtually nonexistent for model scales and flow rates, although much exist for full scale, high flow inlets.

For those with a technical bent, I am including the discussion to follow, which explains something about the aerodynamics of good model inlets in terms of pressures. Static pressure and dynamic pressure vary as the air passes through a fan. Static pressure can be thought of as the "driving" pressure quality of an airflow which causes the flow to accelerate or decelerate in speed. Dynamic pressure is akin to the momentum of the flow motion or that pressure which would be felt if the flow were suddenly arrested. Taken together they form a quantity called total pressure, which is the common measure used to describe the increase in flow energy imparted by the fan (mostly a static pressure increase) or the flow energy lost when the flow breaks away (mostly a dynamic pressure loss).

Inlet losses, due to design defects, are generally quantified by talking about total pressure losses. The losses mainly

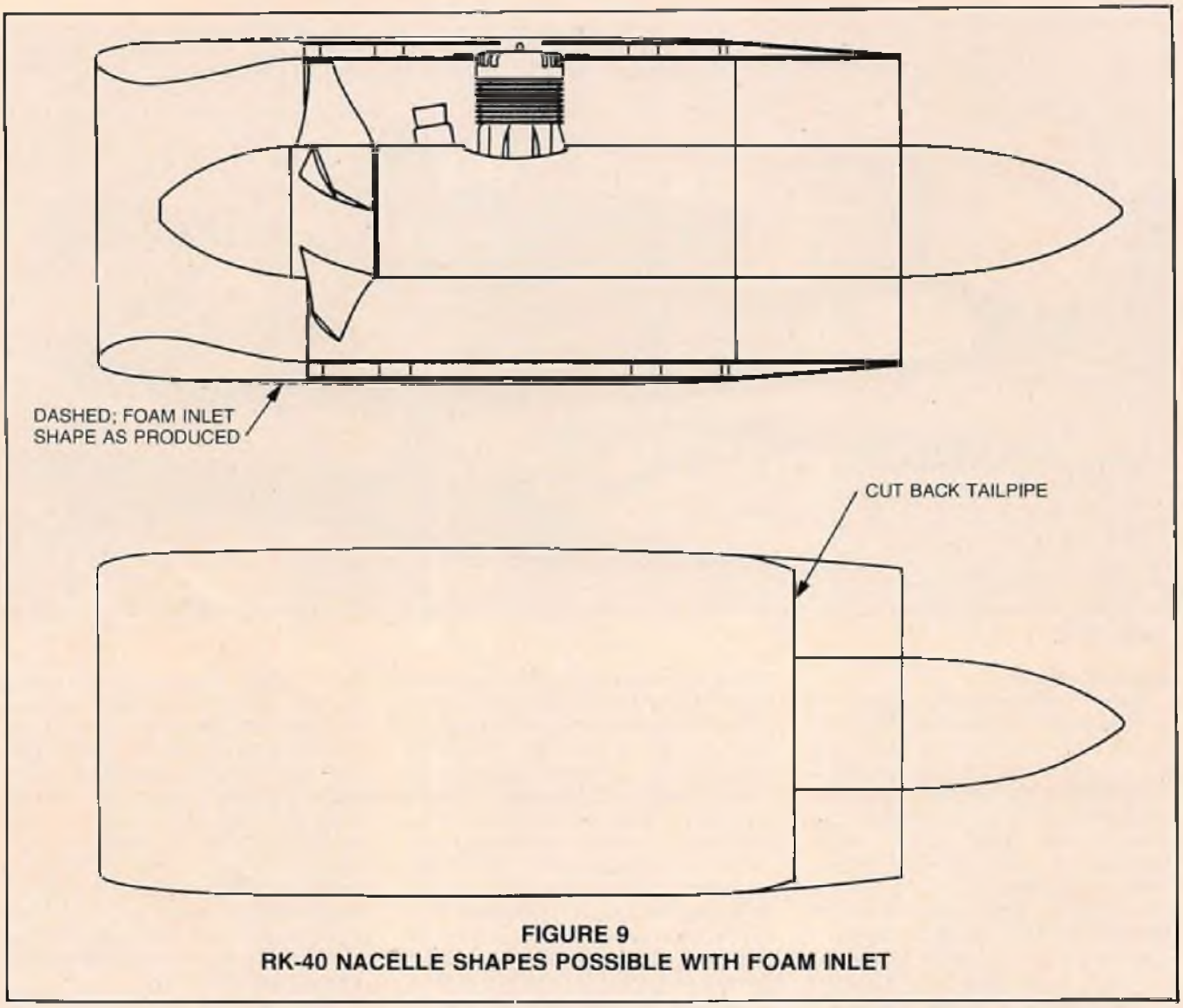


FIGURE 9
RK-40 NACELLE SHAPES POSSIBLE WITH FOAM INLET

stem from flow breakaway (burbling, separation) reflecting itself largely in dynamic pressure or flow velocity reductions. The flow breakaway comes from two major sources: (1) Sharp inlet lips where the flow can't make the turn into the inlet or, (2) Excessive divergence angle of the internal flow passage within the inlet (or "diffusor trouble"). The flow is trying to proceed against what is called adverse driving static pressure gradient, that is, static pressure increasing in the flow direction. It may break away from the diffusor walls if the conical divergence half-angle is greater than about 7 degrees.

The flow breakaway causes a dramatic loss in average dynamic pressure and, hence, total pressure, since the orderly velocity field turns into a bunch of meandering burbles. The dynamic pressure loss indicates a loss in flow through the fan. The tailpipe exit velocity also drops. Hence, the thrust, which is the product of the mass flow and the exit velocity, is dramatically lowered.

I have performed a rather interesting set of calculations which are explained in Figure 10. This Figure shows percentage of maximum thrust as inlet total pressure losses are gradually increased from zero. The calculations were performed for the RK-40 fan with a K & B .40S on 25% Nitro. However, the results would be similar for any engine or fan size. Figure 10 takes some studying, but it reveals some very important facts:

(1) Very large thrust losses 20-30%, or even more, can result from what are very slight (based on full scale experience) total pressure losses. A 1% total pressure loss (equivalent to .299" of mercury or 4.06" of water), expressed as a percentage of ambient static pressure, causes a 40% thrust loss!

(2) Using the alternate scale of the bottom of Figure 10, this 1% total pressure loss, expressed instead as a percentage of the dynamic pressure entering the fan, amounts to roughly 110%. The losses, which appear small as a percentage of ambient pressure, appear large when expressed as a percentage of the flow energy entering the fan. The reason for losses exceeding 100%, lest you technicians get upset, is that static pressure losses at the fan inlet also occur.

(3) The crux of the matter is revealed by studying the two circled points on the Figure 10 curve. The zero loss point showed a thrust of 6.69 lbs. at an rpm of 18,420. The loss-free fan pressure rise is 1.44% of ambient, or in other terms, the fan pressure ratio is 1.0144. Anyone who is used to full scale fan pressure ratios of 1.3 or more will realize that small pressure losses, which don't hurt a 1.3 pressure ratio fan too much percentage-wise, can kill a model fan which is inherently a low pressure ratio device (due to old man Froude's scaling laws).

(4) The second point on the Figure 10 curve is a point involving a 26.7% thrust loss. Thrust has fallen to 4.90 lbs. with the rpm dropping **only slightly** to 17,070. Actually, this point corresponds to the measured experience of the Grumman forward swept wing fighter model discussed previously. The fan pressure rise has increased to 1.68% and the pressure ratio to 1.0168. This may sound strange, but what is happening is that the flow through the fan has decreased, reflecting the loss in thrust. This increases the aerodynamic blade angle, increasing the fan pressure rise. The fan is actually trying harder to pump the air in the face of the inlet losses.

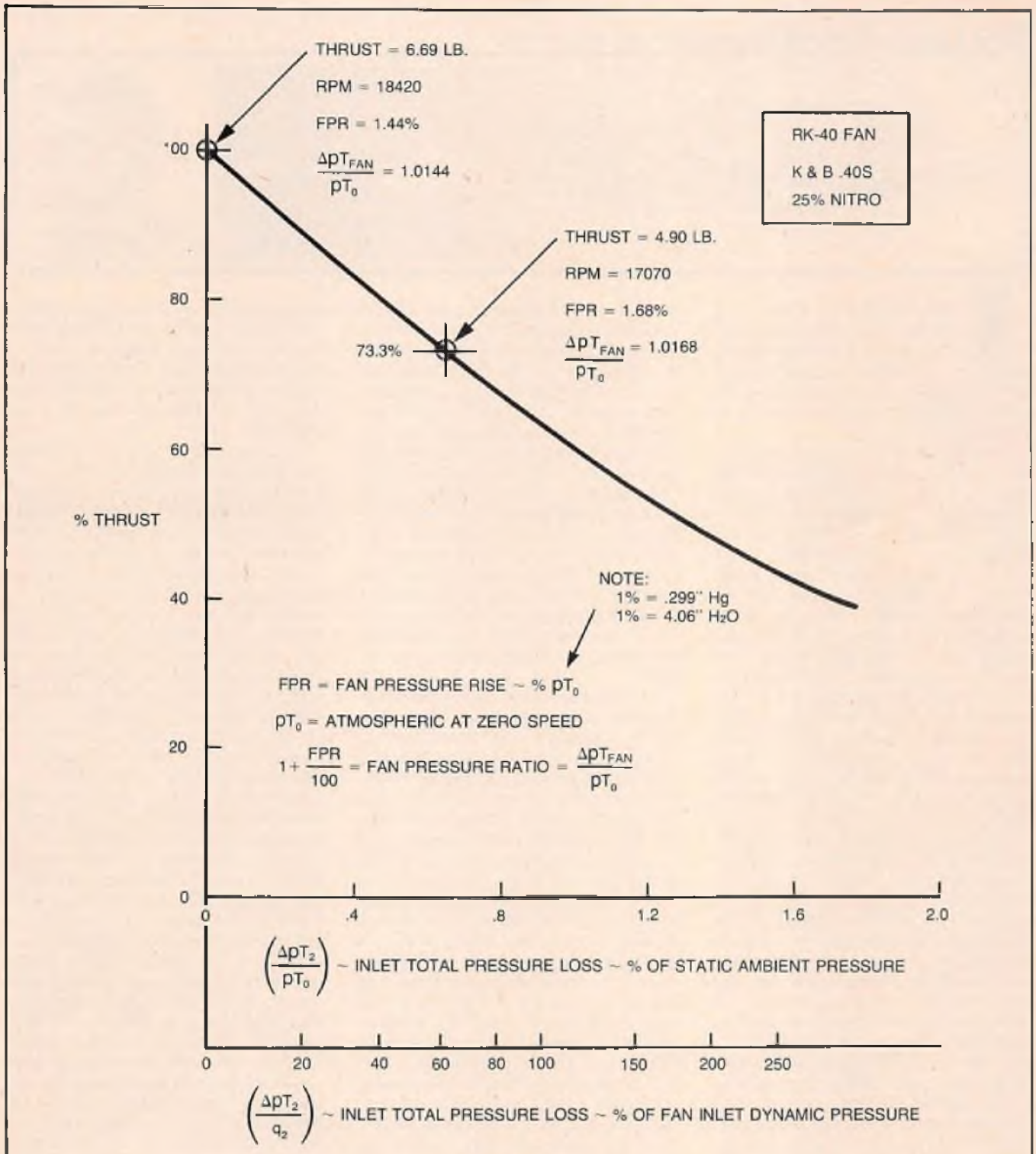


FIGURE 10
DUCTED FAN INLET — INDUCED THRUST LOSSES

For those readers who may have purchased one of my RK-40 fans or who may be planning to do so, I have encountered a problem in the construction of these units, which can be a nuisance if it happens, but which can easily be corrected.

The two pre-drilled 3/32" holes in the front of the motor mount are too shallow. Also, the #4 x 5/8" sheet metal screws in the kit are 1/16" longer than used on the prototypes. These two factors, when combined with a more brittle than normal mount, can cause the end of the mount to crack on inserting the screws.

The foregoing can be corrected by two steps:

(1) Drill the two motor mount end holes 1/2" deep with a #39 drill.

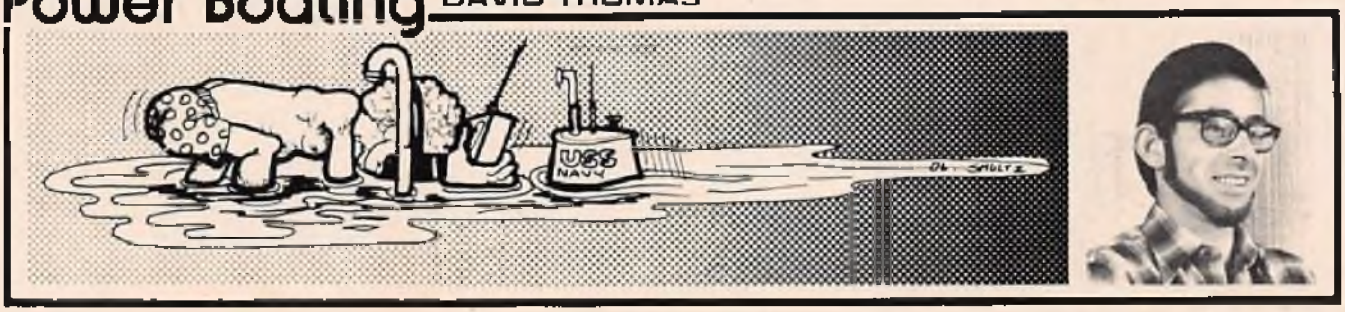
(2) Also, drill out the four motor mount holes with a #39 drill. A #39 drill is six thousandths larger than the 3/32" called for. It will still be tight enough to secure the engine, but will not stress the mounts as much upon insertion.

If you have suffered a cracked mount, my sincere apologies. You can order a new one from Midwest or you can use a Kraft Hayes 40 R mount as a replacement. Future fan production runs will incorporate the deeper #39 mount end holes plus a less brittle nylon material where normal 3/32" engine mount holes can be used without fear of cracking.

□

Power Boating

DAVID THOMAS



I have decided to start backwards this month by answering a letter. There are several reasons for this. First, I don't have any new products to write about and, second, the letter in question has a direct bearing on the subject in hand.

It comes from Jim Pomeroy of Calgary, Alberta, and I'd like to quote the first few lines: "I am a beginner to R/C modeling and have been flying (breaking?) fixed wing and helicopters for about a year . . . Like yourself, I would like to get into boating to give me something to do between paydays when the helicopter is broken!" Welcome to the club, Jim! I often wonder just how many guys there are out there who got into model boats for about the same reason? I can't say it is true in my case — I just naturally love any kind of boat. In fact, over the past couple of years, I have been going the other way. The story goes something like this: I win a few races, and also a few precision steering contests, and I get to thinking, "Hey, I'm pretty good with these boats. What else is there to do? Helicopters (I already fly fixed wing) might be fun. Shouldn't be too difficult, after all, I'm a pretty hot boater, aren't I?" Ha! How wrong can one man be? Some two years later, there is a growing pile of wreckage in one corner of my workshop, made up of chopper parts that don't work any more. I sat down one day and figured out just how much that pile cost me — I won't give you the figure because my wife sometimes reads these articles (she must be mad!). Let's just say it was enough. And I still can't fly one. A lot of men would have given up by now, but not me. It's not that I have more will power, it's just that I am more stupid — I still don't believe that overgrown apology for an egg-beater is going to beat me! Finally, I have gotten wise. I'm building a Du-Bro Shark with the special training gear, which is supposed to be unbreakable. Anyway, all that has nothing to do with boats, so back to the subject.

Jim has a Fletcher Arrowshaft 25 offshore racing model with an OS 60 RSR engine in it. His first question is: Are fiberglass boats significantly stronger than wooden ones? The answer to this is an unequivocable "yes". However, it would be better to take a closer look at the subject. Manufacturers use fiberglass for many reasons. It is easier to get accurate reproductions for one thing. A fiberglass hull suits many modelers who haven't the time to build a hull up from wood. It is stronger, and also completely fuel resistant, and can't get waterlogged. It is very easy to repair, and very complex shapes, such as tug and submarine hulls, can be produced easily once the mold has been made. However, the story doesn't end there. A fiberglass hull is quite expensive, it will sink unless fitted with some form of floatability, and is usually heavier than the equivalent hull in wood. In addition, it makes a lot more noise than a wood hull due to resonance. Plus, if you like building, there's just nothing much for you to do!

The big advantage of fiberglass is in European style multi racing, where anywhere between 8 and 12 boats are all hammering around the same 350-yard circuit at about 40 mph, crashes are inevitable, and sometimes very spectacular. With the large amount of energy stocked in the hull, even fiberglass hulls can suffer. Personally, I always bury a 4 mm diameter music wire rod all the way round the hull when I bond the deck to the hull, to avoid damage. At the beginning of this year, I hit another guy's fiberglass boat — built very light, it has to be said — and literally smashed it to pieces. This is one of the risks of this kind of racing. As you can imagine, wooden hulls would last no time, and are hardly ever seen in competition.

Jim goes on to ask if there is a power difference between the front and rear induction OS .60's. Well, this is more in Clarence Lee's line than mine, and I hope he doesn't get mad at me for answering the question! The short answer is that, in the majority of cases, the rear induction model is somewhat more powerful than the front — and I know from experience that this is the case with the OS.

Then Jim wants to know if there is any power to be gained from fitting a straight venturi on an engine, and using a throttle exhaust? Well, I am waiting to hear from The Other Pottols Throttle Shop, so I wouldn't like to give a definitive answer at this time, but it certainly does seem to me that there is some power to be found in this manner. I have reservations about the functioning of the exhaust throttle on really powerful .60 size engines due to the heat generated, but I don't want to say to much on the subject until I have found out for myself. I am hoping to fit one on the Rossi .65 and, if it holds up on that, then it should be okay for about anything.

And there you are, Jim, that's it sorted out. However, I will add that I, too, have a Fletcher Arrowshaft 25, and with a Webra Speed 60 in it, it is already going some, so don't worry. That OS 60 RSR with a pipe will give you plenty of push.

Last time, we took a look at the different engine options open to the boat modeler and their uses. This time, we'll take a look at the different sorts of hulls, and the materials that can be used for construction. In fact, we've already dealt with one, thanks to Jim Pomeroy's letter. However, it would not be fair to think that the fiberglass hull is only good for racing models; this is just not so. It is a material that lends itself well to any sort of hull and, more particularly, those with complex forms. But while this is true, it must be pointed out that fiberglass is not a very good material for the individual builder to use when making a boat to his own design. Not because it is very difficult to use — in fact, it is quite easy — but because it represents quite a lot of extra work. The reason is that a mold is required and, to make a mold, a master pattern is necessary, and it takes about as long to make that pattern as to build a wooden hull, so there isn't much future in it. Where fiberglass can be put to good use is where several members of a club get together and decide to run a one-design boat. Once the mold is made, it is quite easy to turn out any number of identical hulls quite quickly, and at a fairly low cost.

Most modelers who get into fiberglass hulls will do so through buying one ready-made, either as a bare hull or as part of a kit. There are very few problems attached to working with them, but there is one point that will bear repeating. When polyester resin sets in contact with the air, a very thin film of a greasy substance is left on the surface of the material. This is the case with the inside of a hull molded in a female mold (the outside won't have it, since it was in contact with the mold, and not the air). This is important since most of the fitting-out concerns the inside of the hull. In order

to be sure of getting a really good bond, it is advisable to either run a small sanding disc over the area to be used, or to clean it well with a degreasing agent such as acetone. If you don't, things could come unstuck under pressure, and here I am thinking of engine mounts, for instance, in a .60 powered model.

One material that is becoming very popular these days is ABS plastic and, again, this is a material that is very useful where the hull shape is difficult. I am currently building a review model of a German high speed Air-Sea Rescue Launch, the hull of which comes molded in ABS. Well, you have to believe that, if I had had to build that hull myself, I'd still be at it! As it is, a couple of evenings work was sufficient to fit the motors, rudders, and drive shafts in place, install the radio, put the deck on, and it was already to be tried out. (With two Decaperm Special engines and a set of 4 a/h nicads, it goes like smoke and, with the Astro Flite speed controller, it runs for about an hour.) Here again, there is a point to be considered. Okay, so you want a nice scale model — but you have to ask yourself why you want it. Do you want it because you like going out to the lake and running it, or do you fancy the idea of all those evenings of work that are involved? In the first case, ABS is for you; in the second, you'd be better off with an all-wooden construction kit.

Which brings us nicely to wooden kits. If you like handling and working wood, then this is for you. I do — but I just don't have the time. To compensate, I have a scale non-sailing kit, by Art am Fusta of Spain, of an American brig hidden in the cupboard of my office and, when I have a spare hour between lectures, I lock myself in, get that kit out, and do a bit of building. I have it figured that the model will be finished around Fall 1983!

Seriously though, some modelers really prefer building to running their boats and, after all, why not? The idea of the hobby is doing what you like best. If the model you want to build is at all complex, then you will have to use either the plank-on-frame method of construction, or double-diagonal planking with very thin ply or veneer strips. Alternately, for hard chine cruiser type models, the traditional method of a keel and formers, skinned with four sheets of plywood, is the usual way, and I must say that the majority of wooden kits around fall into this variety. This leaves the other old and well-tried system called the "bread and butter" method. Here, the hull is made of layers of hardwood planks laid horizontally, and carved to shape. Once the outside is finished, using templates to check for accuracy, the planks are unglued, the center of each cut out to leave room for all the gear, and the planks then finally glued back together. If you are going to try this one, you need a good eye for line and a bit of practice with wood chisels, but it is a very acceptable way, once again, of producing a difficult hull form. In addition, it is very cheap because an old plank of well-seasoned wood that you might find just about anywhere is all the basic material you need.

Of course, this is a very simplistic run-down of the various materials and methods; there are others. There are combinations of different building systems, and also of different materials. The whole thing comes down to deciding just what you want to do, and then choosing your kit as a function of this choice.

Now, I have to be honest and tell you that I had intended to continue this article by starting a step-by-step explanation of how to build a wooden hard chine kit but, unfortunately, the only unopened kit I have handy seems to be missing one of the hull formers, so until I can get a replacement, we'll have to put that to one side.

Of course, this left me wondering just how I could finish the article when I received a very short card from Charles M. Geiger of Daytona Beach, Florida. I'd like to quote what he says: "I noticed in the December 1977 issue of RCM, your Deep V Cougar Special looked like it was an angle/straight prop drive. How do you set up such a prop drive which is equal to a parallel drive?" Ha! Now I've got troubles because I am not too sure just what Charles wants to know. Anyway, I guess a bit of explication all around wouldn't do anyone any harm, so here goes.

In the first place, let's consider the parallel drive. This is quite simple; instead of a single rigid prop shaft, there are two. One leads from the engine down to just in front of the skeg. Here it is linked by a universal coupling to a second, much shorter shaft, running in bearings in the skeg housing, and parallel to the hull bottom — hence, the name parallel drive. This is the point where all my troubles begin, because I am going to declare, openly and publicly, that I don't like this drive set-up. No way. Now I shall probably get a lot of rude letters, half of them from people manufacturing this type of drive, and the other half from people who have used them to set up umpteen records, all asking me what the heck I know about it! Gentlemen, I apologize in advance, please don't bother to write. I'll take it as read, but the fact remains that I still don't like it. Why not? Because, in the first place, two very experienced engineers spent a couple of hours and a lot of beer explaining to me that any coupling used at speed to produce a change of direction automatically causes power losses. And since they were more clever than I, like a fool I just believed them — and still do. For instance, when a parallel drive works, you can hear it. So what produces the noise? We all know the answer to that one, and so did Newton, so there's one power loss straight away. Second, the

The break-down of all the parts in a parallel drive system: engine coupling, main shaft, underwater coupling, parallel shaft, skeg and rudder strut.

The parallel drive with all the parts in place, as they would be in a boat.

angle change; and third, no one is going to convince me that the underwater coupling, turning at goodness knows how many thousands of rpm, is not going to create drag. Plus, the whole thing is complicated and fragile. Okay, so I've said it. But it would be stupid to leave it there. The idea was to get the final drive parallel to the hull bottom, and this type of drive does just that, and does it quite well. The fact that I personally don't like it is not that important. What is important is that there is another way of getting that parallel drive, and that's what I used in the boat in the photo Charles is referring to.

It is what is commonly known as a flexible drive, and there are quite a few of them around nowadays, but they still seem to be regarded as a very specialized piece of equipment. This is not so; they are easy to use, efficient, and price-wise, they compare with a traditional rigid shaft set-up, and are cheaper than a parallel drive.

In the first place, the flexible drive is just like the cable that goes to the speedometer in your car. There is an inner, flexible, cable that transmits the power, and an outer tube which protects it, and also stops it from whipping. But before you dash out and start taking the car to pieces, hang on a minute. The inner cable is a special one; it's not possible to use any old cable to transmit the power from a hot .60 engine. The ones I use are triple-wound, 5 mm in diameter for the big engines, and 3.5 mm for smaller engines and electrics. The last couple of inches is a steel shaft, bored to

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FLUTTER

PART I

by Herk Stokely

Model engine power is increasing; model speeds are increasing; structural methods are changing; new, denser materials are in use; larger, more flexible models are being built and flown through a much wider speed range. On top of it all, many new modelers are entering the sport with tremendously creative ideas, but with very little practical experience or technical knowledge. Result: wing flutter, tail flutter, aileron flutter, rudder flutter, rotor blade flutter, weak or complete loss of aileron control, stripped servo gears, broken models, damaged property, and unhappy people. What is flutter? Where does it come from? How can I get my model back if it happens? How can I design and build to prevent it with any assurance of success?

Flutter seems like an impenetrable mystery to some, but be assured that it can be stopped — on any model — using simple, easy to install methods, and with complete assurance of success. But you can also be sure that every model that you can buy today, or build from plans available today, will flutter at some speed, and under some conditions. Hopefully, the conditions under which **your** model will flutter are outside the flight envelope in which you operate it. Push it too far, though, and I guarantee you that it will. When it does happen, if you are fortunate and if you have built carefully and well, you may get your model back. At high speeds, however, the on-set of flutter can be so sudden, and its force so destructive that, in an instant, the control surfaces are gone and the model is now a missile.

Modelers now are facing the same problems that the aviation industry went through in the 1920's with this mysterious, destructive, and unpredictable problem. There is a difference, though, because its causes and solutions are now known and available. Their application to our current RC models are both simple and effective. This is as true of a 6 oz./sq. ft. glider diving to get out of a killer thermal as it is with a Formula One racer, a 100 mph pattern model, a speed record attempt helicopter model, or a 2" to the foot scale B-17. What I'll try to show as I develop these articles is broken down into several sections. First, where does it come from, and what lets it start? Second, how to help your model survive it when it happens. Third, how to delay the on-set of flutter, hopefully to speeds and conditions outside the flight envelope of your model. Fourth, how to prevent it absolutely under any conditions in which models are capable of operating. Fifth, practical applications of these concepts to the variety of models flying today (including gliders, helicopters, racers, pattern, sport, and scale). Sixth, a short explanation on aileron reversal, a condition which we're not encountering much yet, but which we definitely have in our future.

Flutter — where does it come from? What lets it start? How can I get my model back when it happens?

Early in his career, Dr. Theodore Von Karman (one of the founders of modern aeronautical science) did a study on the flow of fluids behind a cylindrical object. He thought that there were two possibilities for the pattern that the flow might take. These are illustrated in Figures 1 and 2.

FIGURE 1

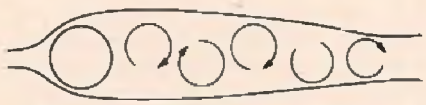

FIGURE 2

He proved mathematically that the symmetrical pattern of Figure 1 is unstable, and that the alternating pattern of Figure 2 is stable, making it the only one of the two that is possible. Later, he demonstrated experimentally that the flow behind an object does follow the Figure 2 pattern. You can do the same thing by watching a lightweight flag fluttering behind its flag pole. As each alternating vortex is shed from the pole, and moves downwind, the flag takes up a shape that lies between them as shown in Figure 3.

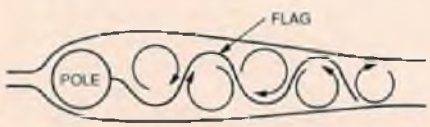

FIGURE 3

After Dr. Von Karman published his analysis, this undulating curve taken up by the flag, was called a "Karman vortex street". An individual vortex, as it is "shed" by the flagpole takes the form of a rotating cylinder of air moving downwind in the "wake" of the pole. They travel along in a column with each one rotating in the opposite direction from its two neighbors.

Now I'm going to tell you a few facts quickly without trying to explain them, and then we'll go on to how this relates to flutter in an RC model. As wind speed increases, these vortex columns come off the pole at a higher rate, they contain more rotational energy, and they are smaller and more compact.

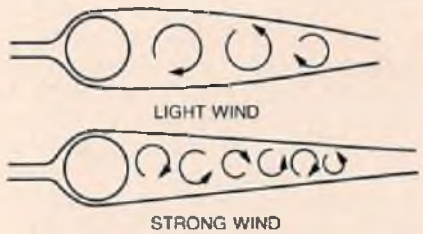

FIGURE 4

By becoming a flag watcher, you can observe all of these things for yourself.

Now instead of a flag, suppose we hinge a narrow sheet of thin rigid material to the downwind side of the pole, thus:

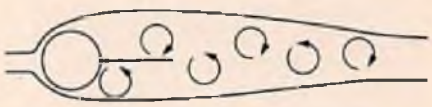

FIGURE 5

As you can see, the vortices trying to move into column are exerting forces on the sheet material. This is an alternating force which will cause the sheet to move back and forth as the alternating vortex columns exert their force on first one side, and then the other. To make this look more like an article on models, and less on flagpoles, let's streamline the pole a bit, and taper the hinged sheet.

FIGURE 6

This gives us something that looks like a pattern plane wing with aileron flying at a low angle of attack, but nothing that I've mentioned before is really changed.

Now let's go, for a minute, from aerodynamics to vibratory phenomenon. The hinged sheet mounted on the

streamlined flagpole has a thing called natural frequency. Most of us who are modelers also have a "thing" but this is different. If you turned the wing so that the hinge line is horizontal and the aileron hanging vertically, we could swing the aileron out and release it to observe the rate at which it swings back and forth. Let's say that we notice that it swings a complete cycle (both directions) three times in one second. This means that its natural frequency is three cycles per second. Now let's go a step further toward model technique. Let's put on a control horn and pushrod. Instead of a servo, we'll install a spring, thus:

FIGURE 7

Some of my servos are pretty springy, so this really gets us close to a real model. Now, if we "twang" the aileron with a finger, it will vibrate. Notice, though, that the frequency of the vibration will be much higher than when it was hanging free (maybe 50 or 100 cycles per second). The stiffer the spring is, the higher the rate of vibration (natural frequency) of the installation. (This is only true if you keep everything else the same, of course.) Actually, this is the model that I'll use for the rest of my control surface flutter discussion. Pushrods, servo output arms, torque rods, and control arms all act like springs, with each one contributing to the overall springiness of the system. There is one other factor that affects the vibration of the control surface. It has to do with the weight of the control surface and the distance that the C.G. of that weight is from the hinge line. It's called polar moment of inertia, but the way it works is that the heavier a control surface is, and the farther its C.G. is back from the hinge line, the lower its natural frequency (in cycles per second) will be. (That is, of course, if you keep the spring values the same.)

Now we've got two ingredients: an oscillating force on the control surface that increases in frequency and intensity with speed, and a natural tendency of the control installation to vibrate at a certain frequency that gets lower as the weight of the surface is increased, moved aft from the hinge line; or the rigidity of the control system installation is reduced. For any model, this latter factor is pretty well fixed and set when the model was built. Each control surface (aileron rudder, elevated, flap, etc.) installation has its own natural frequency. When all of the building and radio installation is completed, the vibratory characteristics of each control could be measured. At this point, the conditions under which each control surface will flutter are fixed and, when the model is flown into those conditions, flutter will start. I'm oversimplifying a bit but, as aircraft speed increases, the increasing frequency of the oscillating airflow can reach the natural frequency of the control installation, the flutter will begin.

Now there **are** other things that affect flutter. I'll mention them without much explanation at this point. First, flutter can occur at harmonics of the natural frequency of the installation. For instance, flutter can start when the oscillations of the airflow reach one-half of the natural frequency of the control installation (or 1/4, or 1/3, etc.). The driving force at these harmonic points is usually quite low, and probably doesn't have much affect on our models. Second is a factor called **damping**. Most vibrating systems have some friction built in which can absorb some or most of the vibrational energy. Rusty or misaligned hinges, rubbing pushrods, etc., can provide some damping which reduces the severity of flutter vibrations when they start. Unfortunately, frictional forces decrease as the vibratory speeds increase, and this kind of frictional damping doesn't help much with really destructive flutter. Some full scale aircraft and helicopters do use damping to control vibration problems very effectively. These systems usually use viscous dampers (like the shocks on a car) where the damping forces actually increase as the speed of the vibration increases. A damper of this type will let normal control movements pass with little opposition, but it will oppose high speed vibrations as if the damper were a solid shaft. There is probably not much that is useful for our models in this area, but the development of helicopters without flybar (Hiller) control systems will probably require viscous dampers to prevent vibratory rotor forces from reducing the servos to junk in a very short time. Third is the shape of the control surface itself. Some shapes are much more affected by the oscillating airflow than others. This is an area where much needs to be said about model design, and I'll cover it thoroughly in a succeeding article.

At this point, my friend, the glider pilot says, "Hey! That's great for ailerons and rudders, but my glider had a terrible experience with flutter. Diving out of a thermal, the wings shook so hard I could hear them half a mile away, and the flying stab actually bent its pivot wires from the force of its vibration. Ribs were broken, the elevator servo gears were stripped, the covering was split, and it was in such bad shape that I'm not sure that I was lucky to get it back. There isn't even a control surface on my wing or stab." Likewise, the helicopter freak says, "I spent six hours balancing and tracking the blades on my machine and it was so smooth in a hover that you could have set a glass of water in the cabin without spilling it. Later when it was in forward flight, it vibrated like I thought it would come apart. I made a low pass and saw that the main blades were 2" out of track, and the tail rotor proportionately worse. There are no ailerons on my rotor blades!" Glad you mentioned those things, guys. Actually, the same thing that drives the aileron can drive the wing, thus:

FIGURE 8

Even when no control surface is installed, the alternating vortices in the airflow apply their forces to the trailing edge of the wing, flying stab, or rotor blade. The same oscillating force is present whether there is a control surface or not. In this case, it's not the springiness of a control installation that sets natural frequency, but the inherent torsional stiffness of the wing, stab installation, or rotor blade. All of the same ingredients are there, however, and all you have to do is press the model into the right conditions and you **will** get it. Have I oversimplified? Yes — I have tried to make it practical and visual, something that really requires math that few of us can handle; theory that would be very dull to most of us; and measurements that none of us can make accurately. If this part of the article is something less than scholarly, I'm satisfied.

Next, I'd like to get into how to recognize flutter when it occurs in flight, and getting it under control so that you have a chance of getting the plane back on the ground in one piece. Next month, I'll get into some things you can do at the field or back in the shop that will let you keep flying and, hopefully, eliminate the problem. I'll also talk about some things to beware of that can make flutter occur in a model that didn't have the problem before.

Those of us who have spent much time at an RC flying site can remember cases of flutter that we've seen. A big 9' span twin engine model humming around, huge ailerons blurred, control response okay, if a bit sluggish, and no apparent damage, flight after flight. The owner said that he knew it was fluttering, but it didn't hurt anything so why worry. A couple of weeks later, the aileron servo quit and he landed it with a rudder. No damage to the plane but the aileron servo was a mess. A really fast pattern plane swooping down in one of those big beautiful arcing dives; there is a sound like a piece of 1 x 12 shelving being ripped lengthwise; something drops off of the plane and the beautiful arc turns into an ugly line that intersects the plowed field next to the runway. My glider coming downhill after 9½ minutes of a 10

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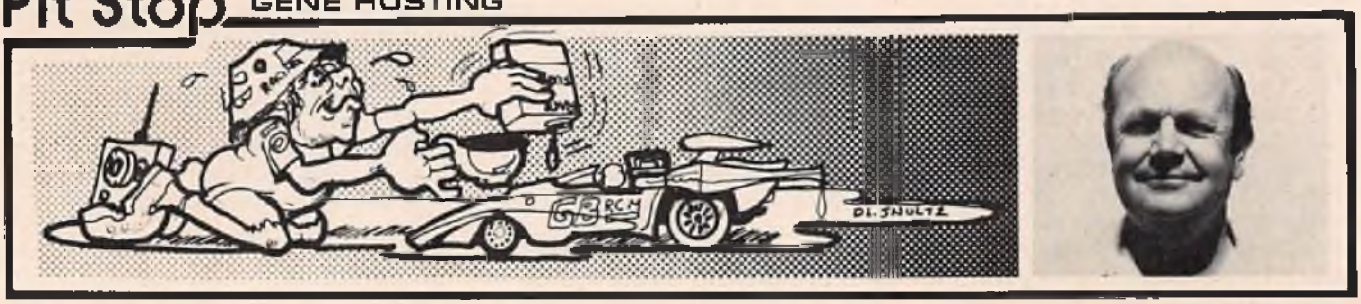
Pit Stop GENE HUSTING



The "Mini Car Grand Prix" was held inside the Long Beach Sports Arena and was sponsored by the Lions Club of Long Beach, Calif.

The sport of R/C cars has grown so fast in the last two years that most of you have probably not heard of the greatest R/C car event ever held. I'm not speaking of the greatest race, which I would call the World Championship Race in Pomona, but of the most fantastic R/C car **happening** imaginable. For our airplane friends, try to imagine having Eddie Rickenbacker, Baron Manfred Von Richthofen, Charles Lindberg, Amelia Earhart, Col. Roscoe Turner, Howard Hughes, and your own personal hero, competing at a local R/C Formula One race or pattern event! If you can imagine what excitement this would create among the R/C airplane fliers, then you'll appreciate the same excitement among R/C car racers at this event. I want to thank Jim Sunday and RC Sportsman Magazine for giving us permission to reprint this article.

The following article appeared in the Los Angeles Times by the most-read sports columnist in the West — John Hall.

PRIXPOSTERIOUS

The dazzling Grand Prix machines took the starter's flag and roared into the first turn. Car No. 4, brilliant blue and white, got the jump through the double esses.

Behind No. 4, the flaming red Ferrari 312-T, Niki Lauda's car, caught the side of the track and went into a spin. In a bunch, the McLaren M-23, Alfa Romeo Flat-12, and Brabham BT-44B plowed into the Ferrari, and they all went into the wall in a sickening smash.

Coming off the turn, No. 4 brushed the wall, lost control, flipped end over end three times, and came to rest with its wheels in the sky.

"No. 4 is upside down and four cars are in a tangle behind," Sandy Reed, voice of Ascot Park and Riverside Raceway, screamed through his public address mike to the groaning crowd. It was disaster.

Then an attendant stepped out on the track, lifted No. 4 with one hand and put it back on its wheels. Another attendant separated the other tangle. Instantly, off they all roared again, whining and buzzing like irate hornets down the track — two straightaways, hairpin curve, esses — that covered nearly the entire floor of Long Beach Arena.

"If we have this kind of action in our race, none of us will last through it," Chris Pook laughed as he stood by the wall near the hairpin curve. The plywood wall was only a foot high. But Pook, ringmaster of the 12 or 15 ring circus formally known as the United States Grand Prix West of Long Beach, was kidding on the square.

There was action, and these were the radio-controlled miniatures in Tuesday night's "Mini Grand Prix" — one of several sideshows before Sunday's main event, when the world's foremost Formula I aces "do it in the streets" along the ocean front of downtown Long Beach.

A few of the "real" Grand Prix stars dropped in to try their luck during intermission — Jody Scheckter, Hans Stuck, John Weston, Bob Evans — borrowing the remote control boxes with the dials and buttons and operating from the "driver stand" above the start/finish line. It was embarrassing. They couldn't get their cars around the track. The drivers blushed. The crowd giggled. All in fun, but these RC cars, one-eighth scales of the real things, are not toys. The 3-foot trophies for the winners are bigger than the cars.

"Would you let this man drive your R/C car?" Bill Steele let Emerson Fittipaldi drive his R/C car. But then Emerson Fittipaldi was twice World Champion, 1972 Lotus and 1974 McLaren. Emerson drove the R/C car very well for his first time out.

Carlos Pace, Martini Formula One driver being interviewed for TV. The R/C car TV segment was shown in many cities across the country.

The fabled names of the game were hard at it — Irvine's Chuck Hallum, 1975 ROAR Oval National Champion; Pomona's John Thorp, 1975 Texas 600 Champion; Anaheim's Gene Husting, 1975 So-Cal Series Champion. "Easy to see why this sport has been growing so fast," Pook said. This "growth" now includes weekly race meetings in San Fernando Valley, Pomona, and Orange County among other R/C hot spots.

What was John Hall talking about? Something so unbelievable you had to be there to understand. Try to dream up the most fantastic R/C car race that you can, and I doubt that you'll come up with anything that would be half as good as the "Mini Car Grand Prix".

Let me start at the beginning because the whole story sounds like a fairy tale — but it actually happened!

P.H. "Moe" Loura, a member of the Orange County R/C Car Club in Southern California, thought it would be a great idea if we could run our R/C cars in a demonstration type race in conjunction with the Formula 5000 cars which were to race in the streets of Long Beach in September, 1975. So Moe went to Long Beach, to the office of Christopher Pook, who is the President of the Long Beach Grand Prix Association. Now, if you can imagine how many millions of problems that Mr. Pook was involved with in just getting the Formula 5000 race going,

Chuck Phelps (in the middle) receives his trophy from Emmet Corn of the Lions Club (on the right). Moe Loura (on the left) who deserves all the thanks for making this event happen.

and at this moment Moe walks up with his R/C car, just as Mr. Pook was walking into his office. Mr. Pook sees Moe with his R/C car, looks interested and asks Moe for details. That's how it all started. We ran a demonstration race on a parking lot 50' from the Long Beach course and got great response, so Mr. Pook told Moe to contact him before the Formula I race in April, 1976.

In March, Moe contacted Mr. Pook who set up a demonstration race for the R/C cars at the parking lot next to the Queen Mary, which was anchored within sight of the Grand Prix course. The race was supposed to be in conjunction with an antique car show, but the people putting on the car show objected. They probably felt we would steal all the spectators away from them, and they would have been right. When Mr. Pook heard of this, he asked Mr. John Queen, Sr., Vice President of the Long Beach Grand Prix Association, for suggestions on where we could race. Mr. Queen, who is a member of the Lions Club, contacted the Long Beach Lions Club and, together with the Lions Club and Mr. Vito Romans, suggested the Long Beach Arena! A date was set for March 23, 1976, 7:30 p.m., which was the Tuesday before the Formula I Grand Prix race.

With only 3 weeks lead-in time before the race, Moe worked almost 24 hours a day working out all the details. Moe, Jim Cade, Bill Steele, and Bill Jianas also went to dinners to show the R/C cars and movies to Lions members and also ran

A very happy Gene Husting, on the left, receives his 2nd place trophy from Mr. Emmet Corn.

their cars in demonstrations.

What happened next was a fairy tale come true. On Tuesday afternoon at 2:00 p.m., I went to the Long Beach Sports Arena, which is inside the Grand Prix circuit. I walked into the building and heard the familiar sound of a bunch of wild hornets, but the exhaust wasn't any louder than outside. Three or four drivers were already running on "the track". "The track" was actually roofing paper, the type that looks like rough sandpaper, which was glued and taped to the polished concrete floor. I unpacked my car and took my turn to drive on the track. It wasn't bad! In fact, it was better than a lot of tracks that I've run on. It wasn't perfect, but it was more than adequate to stage a demonstration race. Some of the butted seams moved the cars around a little but it was fair for everyone. I was quite surprised in a later practice session to hear that I had the fastest lap. It must have been because I took my Taipan engine out, which had too much power for this track and put my Veco-McCoy engine in, which made it easier to drive.

About this time, which was about 5:00 p.m., in walked Emerson Fittipaldi, who was twice World Formula I Champion (1972 Lotus and 1974 McLaren). Emerson watched the cars practicing for about half-hour when Bill Steele volunteered his R/C car for Emerson to drive. Emerson drove for about 15 minutes and showed why he's a World Champion! He didn't go as fast as our novices, but he sure did do a lot better than I did the first time I drove.

The next thing I'm going to tell you, I know you're not going to believe but, so help me, it's true! Running on this sandpaper type roofing paper, our tires did not wear! And on top of this, the more we ran, the better the traction got! Nobody could believe it.

About 6:00 p.m., 12 of the Formula I cars were pushed into the Arena and parked right behind our pits with their spare engines, tires, etc. Talk about atmosphere! And then two different TV companies came in and set up their cameras.

At 7:30 p.m. our Mini Grand Prix race got started with the first qualifying heat of the Novice Class. I looked up in the grandstands and couldn't believe my eyes. I thought if we got 50 paid spectators we'd be lucky. We ended up with over 3,000 spectators who paid $1.50 to $2.50 each to see the action! Just then, in walked Niki Lauda, World Champion Formula I (1975 Ferrari); Jody Scheckter, Elf Team Tyrrell; Gunnar Nilsson and Bob Evans, Lotus; Ronnie Peterson, March; Carlos Pace, Martini Racing; and John Watson, Penske! These drivers were here to compete for — or is it against — "The World's Worst Driver Trophy". The R/C car racers volunteered the use of their cars and the Formula I drivers got on the drivers' stand,

Joe Zimmerman won Concours with this beautiful scratch-built McLaren Formula I car.

were handed the transmitters, and given about 10 minutes practice before the start of the 7-lap race. Niki Lauda, champion that he is, took off in the lead in John Thorp's car. Carlos Pace was driving my car. I tried to help Carlos all I could, but he seemed to be getting further behind. Being a racer, he wanted to go fast and he sure didn't want to win "The World's Worst Driver Trophy". I thought I shook a lot, but his transmitter was shaking so much, it looked like a vibrator — it was just asking too much for them to master it all in one easy lesson. I finally told Carlos to just hold the speed steady, at about 10 mph, and just concentrate on driving. He tried that and began passing cars which were crashing everywhere! He did work his way back up to third. While all this was going on, about 20 of the drivers' mechanics, who were standing around the track, were laughing themselves sick at how bad their drivers looked.

Carlos was standing on my right, and on my left was Jody Scheckter, driving Bill Jianas' car. Jody was punched out of his mind, but most of it ended up in the boards. He finally ended up in the middle of the floor area, which was polished concrete and about as slick as ice. He tried for 2 minutes straight to get the car back on the track, but he couldn't do it. Bill finally drove it back on the track for him. That must have been the longest 7-lap R/C car race in history. After the race, the announcer asked the audience

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Bill Newlin took 2nd place in Concours with his Ferrari Formula I.

RCM PRODUCT TEST

Bud Nosen's GERE SPORT BIPLANE

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

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

Sitting on the flight line on its 6" Du-Bro balloons, or in flight, Bud Nosen's 1933 8' (5.42" = 1') Gere Sport Biplane is a show stopper. It was uniquely tailored just for you if: F-4's and F-86's are flying things, but biplanes are flying machines - - real airplanes.

The Gere's flight performance is scale-like, and so is the visual impact of this almost 'half-size' airplane. Start thinking in terms of large, awesome, cavernous, outsize, etc., and get ready to understand what it's like to build and handle a 'half-size' airplane. We built cradles out of 2" thick foam to hold the fuselage for work on radio installation, covering, etc. And if you cover your current project with what's left from the last one — plus one new roll — forget it. We did an analysis to decide how much MonoKote was needed, didn't believe it, re-did it - - and then bought 9 (nine) rolls.

The kit is excellent - - a real pleasure to build - - but not for beginners. An instruction sheet (printed on both sides) is more than adequate for the experienced builder — with one top wing exception to be covered later. An accurate bill of materials is also provided. If the instructions and bill of materials are followed carefully, there is no need to add any materials. Although, when you first open the box, you will think there is enough wood to build a squadron of planes.

The Gere was built as kitted except for the addition of Interplane N struts, upper wing ailerons (same size as lower wing ailerons), and provisions for attaching the lower wing with leading edge dowels and trailing edge nylon 1/4-20 bolts, instead of the kit provided rubberband hold-down. And, since bipes have short nose moments and the fuselage is voluminous, the radio installation was made immediately aft of the plywood firewall (1/4" x 6" x 9") and the forward bottom section of the fuselage was converted to a removable hatch for access to the radio system and fuel tank.

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SPECIFICATIONS

Name	Gere Sport Biplane
Aircraft Type	Stand-Off Scale
Manufactured By	Bud Nosen Models Box 105-C Two Harbors, Minnesota 55616
Mfg. Suggested Retail Price	$129.95
Available From	Both Mfg. and Retail Outlets
Mfg. Recommended Usage	Sport or Stand-Off Scale
Wing Span	96¼ Inches
Wing Chord	14⅞ Inches
Total Wing Area	2790 Square Inches
Fuselage Length	71¾ Inches
Radio Compartment Dimensions	(L) 18" x (W) 9.5" x (H) 8"
Wing Location	Biplane
Airfoil	Flat Bottom
Wing Planform	Constant Chord
Dihedral	1.75" (lower wing)
Stabilizer Span	32¼ Inches
Stabilizer Chord (incl. elev.)	13⅞ Inches
Total Stab Area	412 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Top of Fuselage
Vertical Fin Height	14½ Inches
Vertical Fin Width (incl. rud.)	13¾ Inches
Mfg. Rec. Engine Range	.60 & larger
Recommended Fuel Tank Size	Depends on engine size
Landing Gear	Conventional
Rec. Number of Channels	4
Recommended Control Functions	Rud., Elev., Throt., & Ail.
Basic Materials Used In Construction:	
Fuselage	Balsa and Ply
Wing	Balsa, Ply & Spruce
Tail Surfaces	Balsa
Hardware Included In Kit	Very complete
Plan Size	81" x 36" (2 sheets)
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (2 pages)
Construction Photos	No
Kit Includes	Die-Cut Parts
Mfg. Rec. Flying Weight	232 (14.5) ozs.
Wing loading based on rec. flying wt.	12 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	264 Ounces
Wing Loading	10.6 oz./sq. ft.
Covering & finishing materials used	Super MonoKote
Engine Make and Disp.	Max. 80 & Roper 1.4
Muffler Used	Max & Roper
Radio Used	Kraft Series '73
Tank Size Used	16 Ounce

RCM PRODUCT TEST

Hobby Shack's LAMBORGHINI

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	●				
Other Materials	●					Flight Performance			NA		
Accessories	●					Overall Appeal	●				
Die-Cutting			NA								

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

SPECIFICATIONS

Name ..... Lamborghini
Type ..... 1/12 Scale racing/sport car
Manufactured By ..... Hobby Shack
18480 Bandilier Circle
Fountain Valley, California 92708
Mfg. Suggested Retail Price $79.99
Length ..... 14.4 Inches
Width ..... 7.1 Inches
Height ..... 3.5 Inches
Wheel Base ..... 8.1 Inches
Track ..... Front 5.6" — Rear 6.0"
Weight ..... 4.5 Pounds
Suspension ..... 4 wheel independent coil spring
Gear Ratio ..... Forward 7.00/1 — Reverse 18.70/1
Fuel Tank ..... 2 Ounces integral casting
Mfg. Rec. Engine Range ..... .09-.10 Cu. In.
Recommended No. Of Channels 2
Recommended Control Functions Steering & combined throt. gearshift
Basic Materials Used In Construction:
Chassis ..... Die-cast Alloy
Gears ..... Brass & Nylon
Shafts ..... Hardened Steel
Wheels ..... Die-cast & Machined Alloy
Tires ..... Semi-pneumatic Ribbed-Racing
Fan/Pulley ..... Die-cast Alloy
Body & Fan Shroud ..... ABS Plastic
Front Bumper ..... Hard Black Rubber
Plans ..... None
Instructions ..... Yes (12 page manual)
Photos ..... Yes
Kit Includes ..... Everything Required

RCM PROTOTYPE

Covering & finishing materials used ..... See Text
Engine Make & Disp. ..... Fuji .099 SR RC
Muffler Used ..... Stock with manifold
Radio Used ..... Futaba FPT 2F

To steal a phrase from Mazda, the Lamborghini Countach is a "great little car". In appearance, it is a cross between a Dino, a Maserati, and a Pantera. It can be finished up to a point where it would grace any mantel or sideboard. This is quite an achievement in a car kit for under $80.00 which can also be steered, throttled and shifted from neutral to forward or reverse after adding only a two-channel radio, an engine and 4" of fuel line (everything else required is supplied in the kit).

As received, the kit is in an attractive and functional master carton and the components are in three more fitted, strong boxes inside. There is a very clear 12-page instruction book with 39 high-quality construction photographs, some drawings and copious text. You get a die-cast alloy chassis into which the factory has already installed the transmission, drive shafts with U-joints, rear springing, shifting clutches and shifting control mechanism. All that is left for the new owner to do is to install the front-end steering and suspension, the bumper, the wheels, the radio equipment, the engine, the fan-shroud and the body. This is very straightforward, as the instruction book details seven separate sections for construction and finishing, and the necessary parts for each step are packaged in individually numbered bags to match each operation.

We followed the instructions exactly and it was a romp. After assembling the front-end, we found the steering and springing were tight and had to disassemble and do just a "leetle" clearing in the top king-pin bushings in the chassis. After re-assembly, it was perfect and the front wheels automatically have toe-in and camber imparted by the component locations and dimensions. Two brass gears and a die-cast fan/pulley are mounted to the engine shaft. A 90° exhaust manifold is included in the kit which rotates the muffler mounting to direct

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

8' 1933 GERE SPORT

9' "MR. MULLIGAN"

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

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WESTCHESTER RC SOCIETY WINS Bermuda Fun Fly

Larry Durner and Steve Richman of Westchester Radio Control Society, White Plains, N.Y. and a spectator, look over the model planes assembled prior to the start of the Fun Fly against the Mid-Atlantic Radio Control Society in Bermuda, Sept. 3.

By Tom Kelsch

Hamilton, Bermuda — Go to Bermuda for a Fun Fly? Why not?

The Westchester Radio Control Society of White Plains, New York, did just that over Labor Day weekend, and they are talking about a return engagement.

Their hosts in Bermuda were the members of the Mid-Atlantic Radio Control Society, a club with approximately 20 members and the first such organization on the Mid-Atlantic island. The Bermuda club was formed in April, 1977.

This was Bermuda's first attempt at a Fun Fly, but any weakness by the Bermudians in the flying department was made up for in the fun.

"Best Fun Fly I have ever attended," enthused Larry Durner, leader of the visiting Westchester group. "The members down there are very enthusiastic and they went all out to make sure we enjoyed ourselves."

For the new Bermudian club, it was definitely a learning experience. The agenda was limited to five events, chosen with a view both to providing accurate competition and to maneuvers that the untested Bermudians could handle. Even so, some of the Bermudian participants had never done some of the maneuvers before the competition. The events were loops, spins, touch and go, balloon burst and limbo.

"Flyers down there are aggressive," stated Durner. "They try to win; they give it their all. There is none of the conservatism and hesitancy you sometimes find in more skillful competitions. The Bermudian flyers are willing to, in their words, 'have a go' at any maneuver."

The results were often predictable, occasionally surprising. In the second event of the day, for instance, Bermudian Humphrey deMoura took his plane up as high as it would go, closed his eyes and threw it into a spin. By the time he pulled it out, the plane had completed 12 circuits — not spectacular, but not bad for a first effort.

Mid-Atlantic Club President Arthur Morris opened the proceedings by winning the loop-the-loop competition with 102 points. He was able to score only 30 more points the rest of the afternoon.

In the end, the superior skill and experience of the Westchester flyers became clear. The four-man Westchester team defeated the eight-man Bermudian team 856 to 714 points over the five events. Overall winner was Durner, followed by Dick Wolstoncroft and Denny Schleef, all of Westchester.

Site of the Fun Fly was an unused air installation on the grounds of the United States Navy facility in Bermuda. Through special arrangement with the Navy, the Bermuda club uses the landing field three times a week for radio control activities.

"Those huge paved areas make an ideal flying ground," said Durner. "So many clubs in the States have to land on dirt or grass or have just a small strip they built themselves. Here you have acres of pavement to come in on."

"That can be a disadvantage in train-

to page 105

Bermudian Humphrey deMoura works on his plane between events at Bermuda's first Fun Fly. deMoura finished fourth in the contest. He was the top Bermudian flyer behind three flyers from the visiting Westchester Radio Control Society.

Denny Schleef of Westchester Radio Control Society, White Plains, N.Y., works on this Midwest Attacker between flights during the Bermuda Fun Fly.

RADIO SPECS

WORLD ENGINES
EXPERT II
5-CHANNEL

MARKETED BY
WORLD ENGINES INC.
8960 ROSSASH AVE.
CINCINNATI, OHIO 45236

FEATURES

TRANSMITTER

- Number of Channels: 4 proportional channels, 5th channel toggle switch on top of case.
- Case Material: Vinyl laminated aluminum.
- Type Gimbals: Open gimbal.
- Type Pots: All pots sealed C-P.
- Power Supply: 9.6 volt nickel cadmium battery.
- Meter: Expanded scale voltmeter.
- Mode: Mode II standard. Mode I on special order.
- Frequencies: 53 MHz, 72 MHz.
- Weight: 2 lb., 3 oz.
- Size: 7" x 6.4" x 2".
- Unique Features: Built-in stand/handle, electronic trims, adjustable stick length, special proprietary integrated circuit encoder fully voltage regulated, built-in trainer system, dual rate and adjustable pre-set buttons optional.

RECEIVER

- Case Material: Nylon.
- Weight 2 oz.
- Size: 1.25" x 1.45" x 1.85".
- Type Decoder: LS-TTL integrated circuit, special noise masking circuitry.
- Front End: Double tuned, integrated circuit symmetrical mixer oscillator.

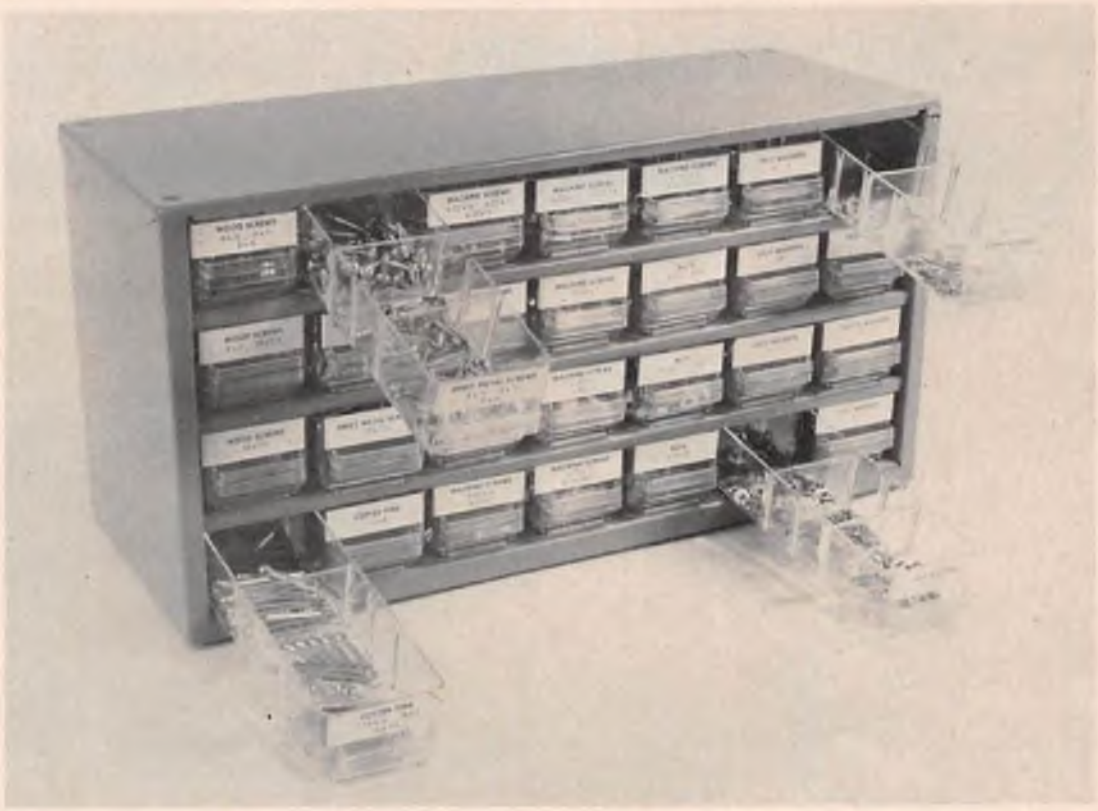
SERVOS

- Case Material: Nylon.
- Size: S-10 .74" x 1.38" x 1.52"; S-11 .92" x 1.67" x 1.69".
- Weight: S-10 1.2 oz.; S-11 2 oz.
- Output: ±45°
- Output Torque: S-10 23 oz./in.; S-11 40 oz./in.
- Motor: S-10 16mm; S-11 20mm.

SYSTEM

- Airborne Power: 4.8v 550 mah nickel cadmium battery.
- Connectors: Proprietary design.
- Servo Trays: 2+1+SW, w/mounting hardware.
- Warranty: One year.

THE FASTENER ORGANIZER



By Geoff Watkinson

Finally, we did it! We got organized and at what we consider to be an amazingly low cost. We can now immediately find screws, nuts, washers, etc., for our varied hobby and home-handyman projects and avoid those frustrating delays and filthy hands that always go with searching through boxes and cans in dark corners of the garage at 10:00 at night.

We are talking about the "Whitney Fastener Organizer". The picture is a better general description than a bunch of words and the specifications tell you what the contents are. However, they still do not tell you the complete story of what you get, and what you will have, about 45 minutes after you first open the carton. There is a steel cabinet with 28 drawers and 51 sealed and labeled bags, each containing a quantity of a particular fastener. There is a sheet of die-cut pre-printed labels (pressure-sensitive) and 40 drawer dividers. All you have to do is put the labels on the drawers in the same sequence as they are printed on the sheet; slide one or two dividers into each drawer (as indicated on the labels) then open the labeled bags one at a time and dump the contents into the appropriate compartment of each drawer. Hey, Presto! You can now sit back and grin at the world in general and your hobby-bench in particular. We got all anxious to start building something right away just so we could have the pleasure of finding something the moment we needed it (a new experience that is long overdue).

The kit is available two ways with either S.A.E. or metric-sized fasteners. The catalog numbers for each are given in the table of specifications and quantities are identical in both kits. The strong steel cabinet has a glossy gray baked enamel finish and stands on no-mar rubber feet; or it can be screwed to a wall through the pre-drilled holes in the back. Drawers are heavy clear plastic with molded handles and rear drawer-stops to prevent up-skittling the contents all over the floor; or the drawers may be lifted and removed completely. They are grooved to take up to three of the supplied dividers. After you have set up the drawers and contents, you will find you still have 17 drawer-dividers left over so you can make further divisions to store and identify your own particular pet bits and pieces where you will never have to search high and low for them again.

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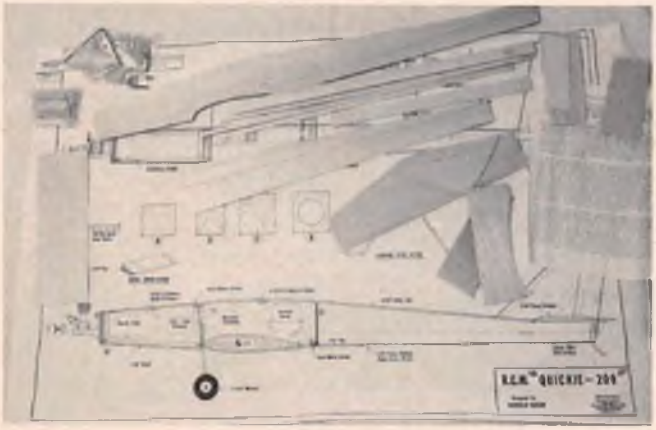
SPECIFICATIONS

Manufacturer:
J.C. Whitney & Co., 1917-1919 Archer Ave., P.O. Box 8410, Chicago, Ill. 60680.
Manufacturer's Suggested Retail Price:
$19.95.
Catalog Number:
88-7937A (S.A.E. Kit); 88-7938R (Metric Kit).
Kit Contents:
1 — steel cabinet, 15"W x 5¾"D x 7½"H.
4 — hard-rubber no-mar feet.
28 — plastic drawers, 2"W x 5½"D x 1⅜"H.
40 — plastic drawer-dividers.
28 — pre-printed pressure-sensitive labels.
1 — slide-rule type screw, bolt and nut sizer and guide.
170 — wood screws: 6 sizes, 6 x 3/8" thru 10 x 1½".
170 — sheet metal screws: 6 sizes, 6 x 3/8" thru 10 x 1½".
104 — cotter pins: 4 sizes, 1/16" x 3/4" thru 1/8" x 2".
405 — machine screws: 18 sizes, 6-32 x 3/8" thru 5/16"-18 x 1½".
287 — hex nuts: 5 sizes, 6-32 thru 5/16"-16.
310 — split lock washers: 4 sizes, 6 thru 5/16".
389 — toothed lock washers: 4 sizes, 6 thru 5/16".
275 — flat washers: 4 sizes, 6 thru 5/16".
GRAND TOTAL ALL FASTENERS:2,110 pieces.

NOTE: Metric kit contains the same amount of the same type of fasteners but in metric sizes. Also available as cabinet and drawers only, with dividers and blank drawer labels. Price $9.98, Catalog No. 88-8136R.

RCM PRODUCT TEST

Glen Spickler's QUICKIE-200



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 "Quickie-200" was designed by Ronald Shean for the 1/2A Pylon Races. It is kitted by Glen Spickler Radiomodels.

The kit includes constant chord foam wing, all balsa parts pre-shaped, formed landing gear, control horn, aileron torque rod wire; hinge material and assorted bolts and nuts.

The kit builds very easily and quickly, however, two items in the construction sequence must not be overlooked. The first is to make sure that the center section of the wing is reinforced with the fiberglass cloth extending out beyond the fuselage sides. Also, most important, is the 3/4" fiberglass strapping tape that runs from wing tip to wing tip. If you fail to do either step, your wing will most likely fold under the high "G" loads you will be putting on your "Quickie-200".

Our model was finished up in a combination of MonoKote and Solarfilm. With a Cox Tee Dee .049 up front and using Royal Electronics 2 channel receiver, Astro Flight 250 mah battery pack and World Engines S-10 servos, it weighed in at 20 ounces. This was with a one ounce tank (dry) which gave us a wing loading of 14.4 oz./sq. ft.

The better your engine runs the better this little plane flies. It is highly recommended to install a pressure fuel system. It will solve engine problems. The "Quickie-200" is a very capable performer and handles the wind fairly well for its size. The controls are crisp and responsive with a good rapid roll rate. This is not a beginner's airplane, however, the sport flyer should have a ball. Take-offs from either grass or asphalt create no problems with no ground looping tendencies whatsoever. Once the engine has quit, the glide is fast and flat, but can be slowed down very nicely for touch-down. Control response is good all of the way down to the stall.

Recommended for those who want to try their hand at 1/2A pylon racing or just sport flying. □

SPECIFICATIONS

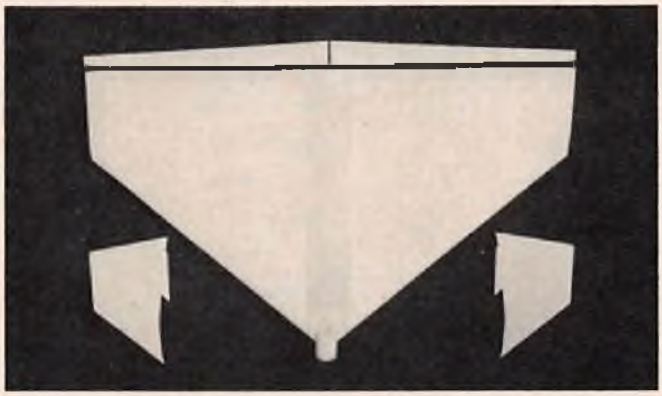
Name	Quickie-200
Aircraft Type	1/2A Pylon Racer
Manufactured By	Glen Spickler Radiomodels 4208 Santa Cruz St. Bakersfield, California 93307
Mfg. Suggested Retail Price	$19.95
Available From	Both Mfg. and Retail Outlets
Mfg. Recommended Usage	1/2A Pylon Racer
Wing Span	35 Inches
Wing Chord	6 Inches
Total Wing Area	210 Square Inches
Fuselage Length	27 Inches
Radio Compartment Dimensions	(L) 6¼" x (W) 2" x (H) 2"
Wing Location	Low Wing
Airfoil	Semi-Symmetrical
Wing Planform	Constant Chord
Dihedral	1/2 Inch
Stabilizer Span	11¾ Inches
Stabilizer Chord (incl. elev.)	3½" (Avg.)
Total Stab Area	42 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Top of Fuselage
Vertical Fin Height	4⅛ Inches
Vertical Fin Width	3½ Inches
Mfg. Rec. Engine Range	.049-.051
Mfg. Rec. Fuel Tank Size	1 Ounce
Landing Gear	Conventional
Recommended No. Of Channels	2
Recommended Control Functions	Elevator & Ailerons
Basic Materials Used In Construction:	
Fuselage	Balsa & Ply
Wing	Foam & Balsa
Tail Surfaces	Balsa
Hardware Included In Kit	See Text
Plan Size	32" x 22" (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (1 page)
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	Not Given
Wing loading based on rec. flying wt.	Not Given

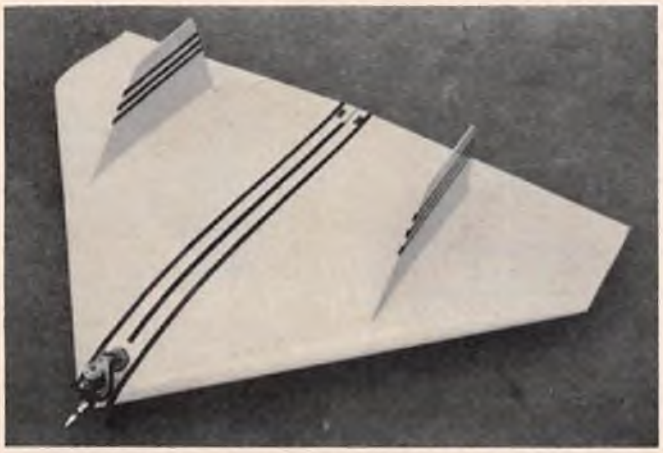
RCM PROTOTYPE

Weight, Ready To Fly	20 ozs.
Wing Loading	14.4 oz./sq. ft.
Covering & finishing materials used	MonoKote & Solarfilm
Engine Make & Disp.	Cox TD .049
Muffler Used	No
Radio Used	Royal Electronics
Tank Size Used	1 Ounce

RCM PRODUCT TEST

N.A. Model's VULCAN DELTA 1/2A





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

Building this neat little Delta was almost as much fun as flying it. That is because all the work is already done. Good examples of this are such features as a triple taper trailing edge, all parts cut to size, shaped, and sanded, and fins assembled. Best of all is the balsa engine mount fairing which you must see to believe.

The full size plans are really unnecessary because all the parts are all ready to assemble, and a complete list of everything required to finish the model is also included. The instruction booklet includes the critical elements, such as specifications for balance, trim, control surface deflection, etc. The heart of a Delta model is the control mixer (also provided in the kit) and this one is one of the finest we have seen. It is smooth, rigid and precise.

Our test model was covered with Top Flite Econokote, which is applied directly to the pre-cut foam wing. After covering, the fins were epoxied in place. Control installation was a snap with the mixer (provided) and only two control surfaces (MonoKote hinges).

The real fun is flying. To be sure the balance point was correct, we put a small eyescrew on the bottom of the Delta 9 inches behind the leading edge on the centerline, then balanced the plane front to back and laterally. With the control surfaces "streamlined" in neutral, our plane flys just as well upright or inverted. Loops and rolls are smooth and easy but the real thrill is inverted spins, which require much altitude and patience. Touch and Go's are also fun but challenging because the natural tendency is to hold the nose up on final and, with Deltas, that's definitely not necessary. Due to the extremely light wing loading, it is a great glider after the engine quits.

The suggested retail price for this Delta is $35.00 in kit form, $55.00 built and ready to cover, and $75.00 ready to fly. □

SPECIFICATIONS

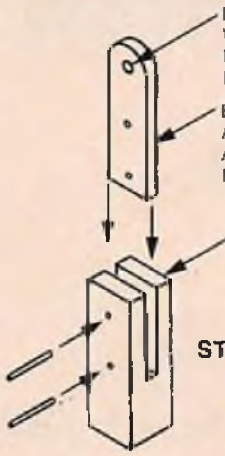
Name	Vulcan Delta 1/2A
Aircraft Type	Sport
Manufactured By	North American Model Enterprises, Inc. 7639 Grapevine Hwy. Ft. Worth, Texas 76118
Mfg. Suggested Retail Price	$35.00 Kit; $55.00 RTC; $75.00 RTF
Available From	Both Mfg. and Retail Outlets
Mfg. Recommended Usage	General Sport
Wing Span	28.5 Inches
Wing Chord	20 Inches
Total Wing Area	385 Square Inches
Fuselage Length	N/A
Radio Compartment Dimensions	(L) 12" x (W) 2" x (H) 1.75"
Wing Location	Delta
Airfoil	Reflex
Wing Planform	Swept L.E., Delta
Dihedral	N/A
Stabilizer Span	N/A
Stabilizer Chord (incl. elev.)	N/A
Total Stab Area	N/A
Stab Airfoil Section	N/A
Stabilizer Location	N/A
Vertical Fin Height	4.5 Inches
Vertical Fin Width	7 Inches
Mfg. Rec. Engine Range	.049
Mfg. Rec. Fuel Tank Size	1 or 2 Ounce
Landing Gear	Tricycle
Recommended No. Of Channels	2
Recommended Control Functions	Elevons
Basic Materials Used In Construction:	
Fuselage	N/A
Wing	Foam, Balsa, tips covered w/Econokote
Tail Surfaces	Balsa Vertical Fins
Hardware Included In Kit	Control Mixer
Plan Size	24" x 33" (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (4 pages)
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	15-20 Ounces
Wing loading based on rec. flying wt.	7½ oz./sq. ft.

RCM PROTOTYPE

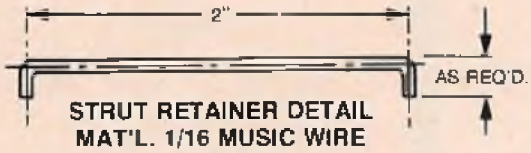
Weight, Ready To Fly	20 Ozs.
Wing Loading	7½ oz./sq. ft.
Covering & finishing materials used	See Text
Engine Make & Disp.	Cox .049
Muffler Used	No
Radio Used	Logictrol
Tank Size Used	1 Ounce

"N" STRUT ATTACHMENT

By Robert F. Meyer



STRUT BRACKET DETAIL



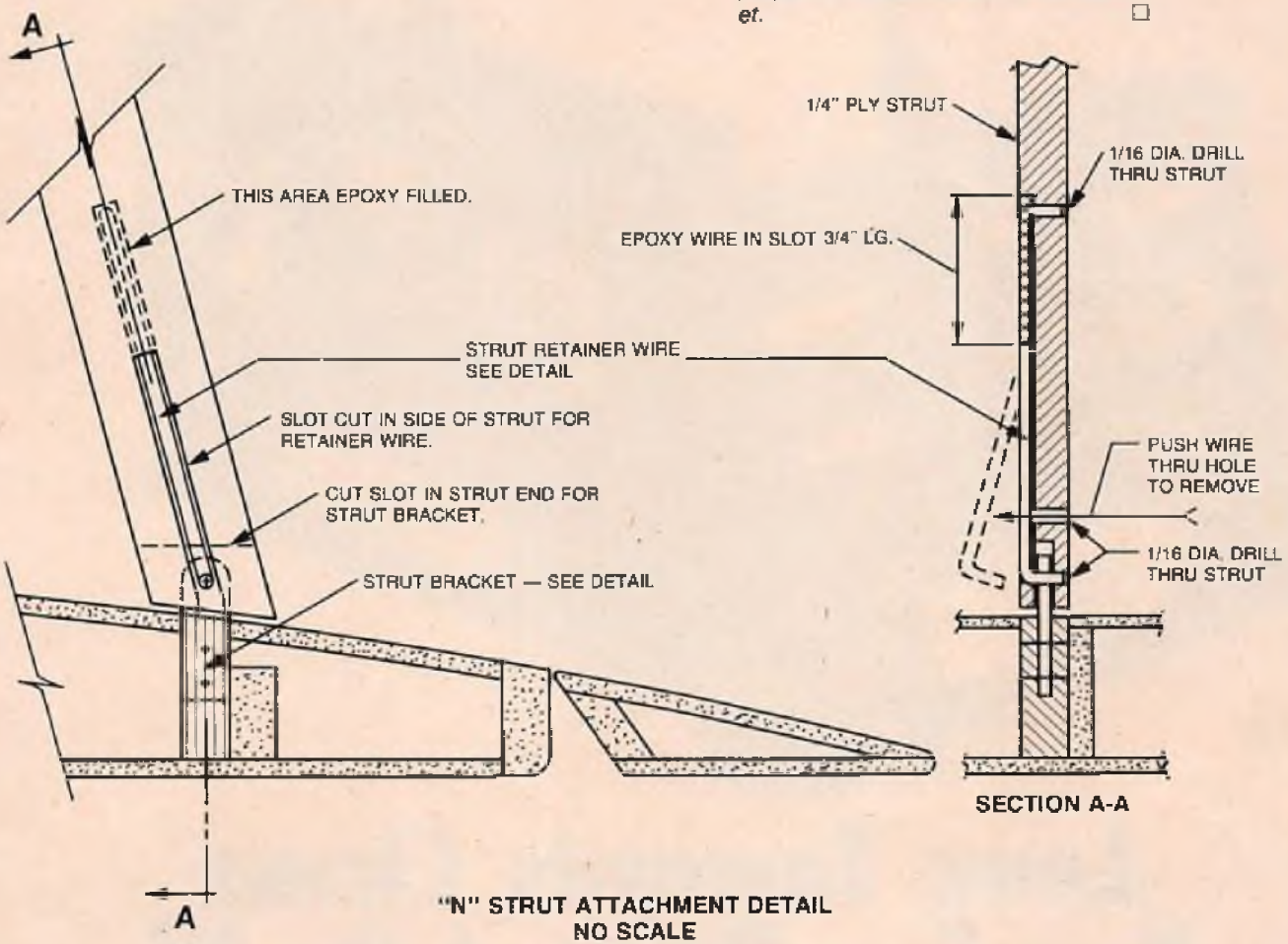
STRUT RETAINER DETAIL
MAT'L. 1/16 MUSIC WIRE

"N" STRUT ATTACHMENT

Robert F. Meyer of LeSueur, Minnesota, has designed a method of attaching the "N" struts on his Lazy Ace Biplane. This method could be used on most Stand-Off Scale or non-Scale biplanes.

The 1/16" formed music wire, epoxied in the slot cut in the strut ends, secures the strut to each strut bracket in the wings. To install or remove the struts, push a length of wire through the hole drilled in the side of the strut. This will spring the retainer wire out of its position (see Section A-A).

The drilled hole in the strut bracket that receives the retaining wire should be drilled at assembly with the wings in their proper location (see strut bracket detail). Use the hole that the retaining wire seats in, as a drill guide, to find the proper location of the hole in the bracket. □



SECTION A-A

"N" STRUT ATTACHMENT DETAIL
NO SCALE

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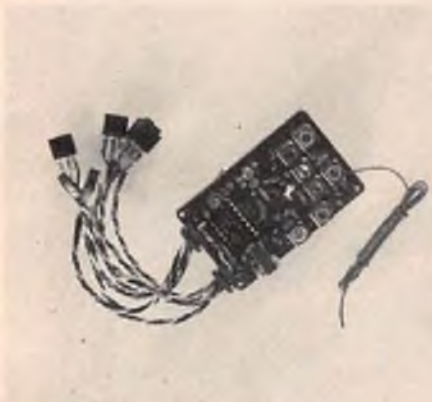
CIRRUS Hobby Shack 700 Series

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.

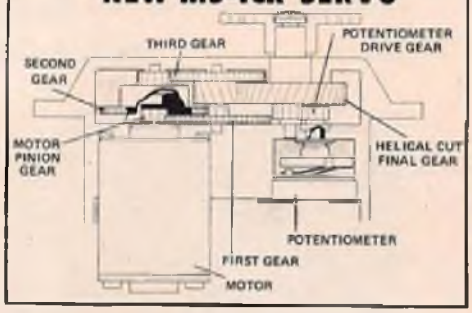
You Deserve A Safe Return On Your Investment.

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	CIRRUS THREE CHANNEL SYSTEM (DRY) WITH 3 SERVOS	CIRRUS THREE CHANNEL SYSTEM (DRY TRANS., AIRBORNE NI-CAD & CHGR.) W/ 2 SERVOS.
$109.99	$129.99	$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.	CIRRUS FOUR CHANNEL ALL NI-CAD SYSTEM WITH 4 SERVOS.
$159.99	$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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By Jim Kitchen

SON OF A BEE

Sailplanes are yet another challenge in achieving an all-round proficiency in RC flying

The builder of the Bees poses with the Bumblebee and the Son of a Bee.

The winter of 1973-74 was the time of the Arab oil embargo and the big energy scare. Gasoline rationing loomed as a distinct possibility, and there was a proposal to ban Sunday pleasure driving. I viewed all of the energy conservation measures as serious threats to my R/C flying. Here in the Yuba City/Marysville, California area, we have a choice of three available flying sites, but all three are some miles away from my home. I was disturbed by the thought of missing a beautiful Sunday flying day because of driving restrictions or lack of gasoline.

One solution was really quite simple — build a sailplane and fly it from our neighborhood school. Though I have avoided schoolyard R/C flying because of possible neighbor complaints and the potential hazards of an out-of-control model, I reasoned that a sailplane with a 1/2A power pod would be no noisier than a 1/2A control line model; and with its light weight, it would be unlikely to damage nearby windows and roofs.

While concentrating on powered flight, I had maintained a casual interest in sailplanes. I gathered that sailplanes could be grouped into three size categories based on wing spans of 72", 100", and greater than 100". The 72" size is primarily a sport class. The larger sizes are used for soaring competition in Standard and Open classes. Being a lazy builder and thinking of all the work and covering material in those big wings, I leaned towards a 72" span model as a first time sailplane project.

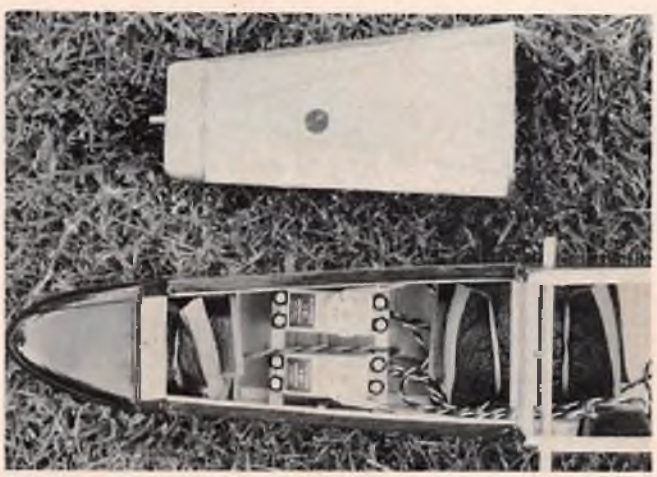
Jim Simpson, writing in the July 1974 issue of R/C Modeler, suggested the Mark's Models Windward and Airtronics Questor as the two 72" size kits best suited for the beginner. He based his suggestions on the quality of the kit, completeness of the plans and building instructions, and the flying characteristics of the finished models. Having a few extra hobby dollars about that time, I purchased a Mark's Models Windward kit.

The Arab oil embargo is now past history, and except for a big increase in the cost of model fuels, my R/C flying activities are back to normal. The Windward kit gathered dust for two years, but recent interest in soaring on the part of fellow members of the Sierra Flyers R/C Club prompted me to consider the Windward for my next modeling project. Some of the sailplanes appearing at our flying sessions are Graupner Cirrus, Craft-Air Drifter, Mark's Models Windfree, and Airtronics Square Soar. Launches have been accomplished by Hi-Start, hand towing, model towing, 1/2A power pods, and even slope soaring under favorable wind conditions (at a special site).

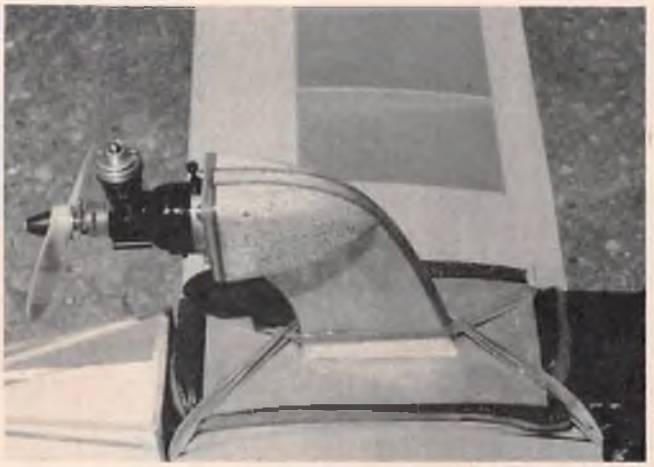
The Windward dates back to 1969 which makes it an old timer as sailplane kits go, but there are no doubts as to the qualifications of its designer-manufacturer, Mark Smith. Mark has consistently been among the winners in National and International soaring competitions. He even had a stint in the movies when he designed and flew sailplane models used as Jonathan Livingston Seagull's stand-in and stunt bird.

This kit is reasonably priced and includes high quality wood. Parts are die-cut so you have to exercise a little caution in punching them out. In the case of the wing ribs, it is a good idea to pin them together for uniform sanding of the surfaces to be exposed. A twelve-page booklet of instructions provides you with step-by-step construction sequences, some photos, and special construction hints.

I made minor modifications involving the use of plywood as inserts in the rudder and elevator, the wing trailing edge, and to reinforce a section of the fuselage



A typical sailplane R/C installation with detachable canopy for access.



Self-made power pod with Cox .049 Black Widow engine.

Tom Vincent prepares the Bee for its first powered flight.

The Bee presides over a typical Sunday flight line.

About to begin its final approach.

A sailplane's majestic flight needs no description.

bottom. The first provides a better anchorage for control horns, the second prevents the wing hold-down rubber bands from digging into the soft balsa trailing edge, and the third strengthens the tow hook anchorage.

"Build light" is the basic criterion in constructing a sailplane for thermal soaring. The Windward plans suggested that the fin/rudder, stabilizer/elevator, and fuselage sides behind the wing saddle be lightened by removing portions of the solid balsa surfaces. Geometric circular patterns are shown on the plans for accomplishing this weight reduction. It turned out to be a tedious job with an X-Acto knife, and I hope that the holes are worth the effort in terms of flight performance.

Light construction pretty well dictates the use of plastic film finishes. I haven't used any transparent coverings so far, but think that they are particularly appropriate for sailplane wings. Another consideration in choosing your particular color combination is the color schemes used by fellow flyers on their

models. Having several sailplanes of similar color in the same thermal could be confusing. I decided on transparent yellow wings and stabilizer and black fuselage and rudder. I used yellow because it is my favorite color, and I have used it on most of my models, and black because some was left over from the last time that I used yellow and black. The model was a Super Kaos 40 which I named the Bumblebee (RCM Plan No. 554). Thus, the Windward was christened the Son Of A Bee. The Bee theme was further accented by two 1½" yellow bands encircling the fuselage.

The installation of a sailplane's R/C equipment differs from that of a powered model. Your R/C components should be located as far forward as practical, beginning with the battery pack followed by the servos and receiver. Photos showing three suggested installations depending on servo size are included in the Windward instruction booklet. I hollowed out the nose block to a depth of about 1 inch. This allows the battery pack to be placed even further forward; or the hollowed area can be used for lead nose weight if necessary.

I departed from my usual practice of using nylon inner and outer Gold-'N-Rods for rudder and elevator pushrods, and in their place, used the Gold-'N-Rods with a 0.030" flexible cable and nylon casing. The casing was anchored to each fuselage vertical brace and at the fuselage exit. An advantage of these cables is that the trim should not be subject to temperature variations as with the nylon pushrods.

Because of cable flexibility, it is important to minimize the unsupported length of these cables. This can be done in two ways. First, make the casing as long as practical while still permitting control movements. About 3/8" of bare cable at each end was adequate for this movement. Second, shorten the threaded coupler provided with the pushrod package by cutting off approximately half of the threaded and half the solder ends. This coupler is properly sized for soldering to the cable. I used a threaded coupler and Kwik Link for the control horn connection, and a solder link for the connection at the servo. The scrap from the solder end of the coupler worked out just right for the solder link connection (i.e., the cable inserted in the scrap and the scrap fitted snugly in the solder link opening).

Sailplanes, of course, have no gas tank, engine, or landing gear to be installed. This simplifies the radio installation because then there is no need for throttle and steering linkages; also no ailerons on the simpler sailplanes. More sophisticated models may have ailerons, flaps, spoilers, elevons, and so on, but this comes later if you decide to take your soaring seriously. Sailplanes have a nose block to be carved, usually a

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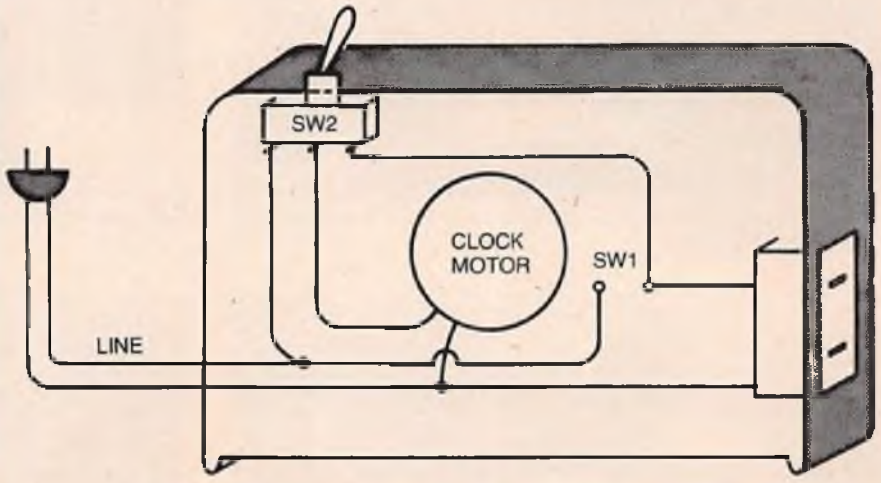
TIMER FOR NI-CAD CHARGER

By J.H. Wimbrow



REAR VIEW OF TIMER WITH BACK REMOVED

We are told by the manufacturers of Ni-cads that they should be charged at 1/10 of their rated capacity for 12 to 16 hours, and that excessive overcharging may damage the cells. Most of the chargers which we use are regulated to operate at the 1/10 rate, but the length of time they are left on charge is not automated. I find that I have trouble remembering to take them off charge after 14 hours or am not around at that time, with the result that they are frequently left on charge for an excessively long period of time until I remember them again. This recurring problem was solved with the gadget explained below.

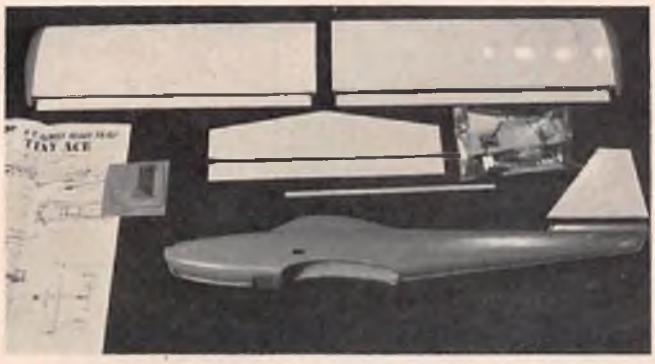
Automatic timing to prevent the accidental overcharging of batteries is provided by making a simple and inexpensive change in the wiring of a regular 24-hour light/appliance timer. These timers are designed to turn lights on and off at pre-set times each day. They are available at discount stores for a few dollars, if you do not already have one. The changes shown in the diagram do not alter the operation of the timer when the new switch is set to "normal".

To modify your timer, remove the back of the case to expose the wiring and install a SPDT switch (SW2) in a convenient place in the case. Connect SW2 as shown in the diagram by breaking the connection of the clock motor to the line and reattaching it to the center post of the switch. Connect the line wire to another of the posts of SW2; when the switch is set to connect these two posts, the timer will operate in the normal manner. Add a new wire between the remaining post of SW2 and the "load" side of the switch (SW1) built into the timer; when SW2 is set to connect this post to the center (clock) post, the timer is in the "charge" mode.

When charging your batteries, plug the timer into an outlet, plug your charger cord into the timer, set SW2 to "charge," set the "off" pointer to 2:00 p.m. and the "on" pointer to some time before midnight and then rotate the timer dial to midnight. This will turn the charger on and allow it to operate for only 14 hours regardless of how long you leave it connected. □

RCM PRODUCT TEST

Hobby Shack's TINY ACE



IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging		●				Pre-Shaped Parts		●			
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			NA								

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

The Tiny Ace is a General Sport aircraft manufactured by Pilot, and sold at all Hobby Shack stores. It is priced at $29.95, and it should find ready acceptance from those of you who like to get into the air with a minimum of fuss and bother at the building board. The Tiny Ace has a wingspan of 36½" and a total wing area of 209 square inches. The fuselage length is 27". It was designed to take an engine in the .049 to .060 range, and the one we used in the prototype was the Cox .049 Black Widow — it furnished all the power needed.

The design uses elevator and aileron controls, which proved more than adequate for the fun flying this plane is intended for. The hardware package includes: control rods and horns, screws, motor mount (installed), pre-formed landing gear. The instruction manual is four pages, but since this airplane needs only assembling — not building, these instructions were more than adequate.

The fuselage is of pre-formed ABS plastic, strong and light, with an excellent quality surface finish that can be left or painted as desired.

The wings, stab, and rudder are furnished already built (by hand at the factory, **not** punched out by machine). They come already covered with a heat shrink plastic film. With the fuselage completed when you dig it out of the box, and the wings, stab and rudder furnished, built and covered, you can see why we didn't waste any time getting into the air. As a matter of fact, total assembly time was right at two hours, which included engine, radio and control installation.

The Tiny Ace proved to be easy to build, and fun to fly, and should prove popular with the school ground or small field flyer. Control response was immediate with good flight characteristics in the climb, glide, and turn departments.

To get into the air with a minimum of fuss and building, the Tiny Ace will do the job, and it will do it without having to arrange a second trust deed on the old homestead. A Tiny Ace, indeed. □

SPECIFICATIONS

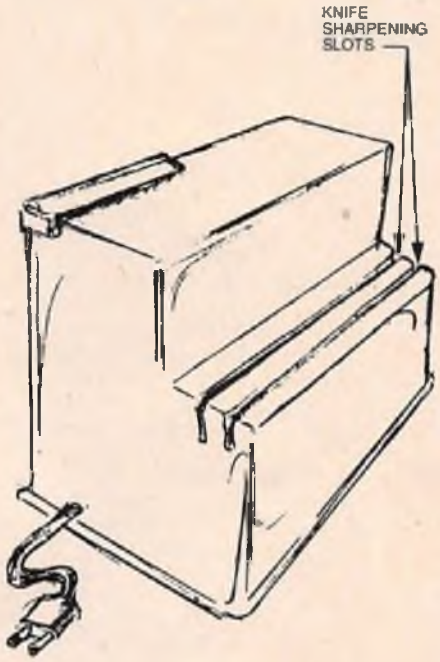
Name ..... Tiny Ace
Aircraft Type ..... Sport
Manufactured By ..... Pilot — Hobby Shack
18480 Bandilier Circle
Fountain Valley, California 92708
Mfg. Suggested Retail Price $29.99
Available From ..... Direct from Hobby Shack
Mfg. Recommended Usage ..... General Sport Aircraft
Wing Span ..... 36½ Inches
Wing Chord ..... 6 Inches
Total Wing Area ..... 209 Square Inches
Fuselage Length ..... 27 Inches
Radio Compartment Dimensions ..... (L) 9" x (W) 2" x (H) 2½"
Wing Location ..... Low Wing
Airfoil ..... Flat Bottom
Wing Planform ..... Constant Chord
Dihedral ..... 2 Inches
Stabilizer Span ..... 14 Inches
Stabilizer Chord (incl. elev.) ..... 3¾ Inches
Total Stab Area ..... 47 Square Inches
Stab Airfoil Section ..... Flat
Stabilizer Location ..... Top Of Fuselage
Vertical Fin Height ..... 5½ Inches
Vertical Fin Width (incl. rud.) ..... 4 Inches
Mfg. Rec. Engine Range ..... .049-.060 Cu. In.
Recommended Fuel Tank Size ..... 1 Ounce
Landing Gear ..... Conventional
Recommended No. Of Channels 2
Recommended Control Functions ..... Elevator & Ailerons
Basic Materials Used In Construction:
Fuselage ..... Plastic
Wing ..... Balsa
Tail Surfaces ..... Balsa
Hardware Included In Kit ..... See Text
Plan Size ..... 8½" x 11" (1 sheet)
Building Instructions on Plan Sheets ..... Yes
Instruction Manual ..... Yes
Construction Photos ..... No
Kit Includes ..... Shaped Parts
Mfg. Rec. Flying Weight ..... 20-24 Ozs.
Wing loading based on rec. flying wt. ..... 15 oz./sq. ft.

RCM PROTOTYPE

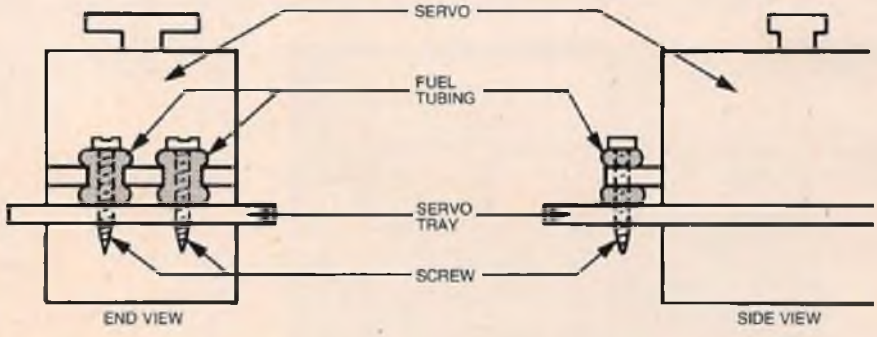
Weight, Ready To Fly ..... 24 Ounces
Wing Loading ..... 16 oz./sq. ft.
Covering & finishing materials used ..... Plastic Film
Engine Make & Disp. ..... Cox .049
Muffler Used ..... Cox
Radio Used ..... RS 2 Channel
Tank Size Used ..... 1 Ounce

FOR WHAT IT'S WORTH

This idea was submitted by Don Henry, Jr., of Baxter Springs, Kansas. Most R/C metal work (grinding) requires only a light duty unit. Fifty cents to one dollar will buy an electric can opener at most rummage sales. Look for one with a knife sharpener, cut away plastic knife slots and — shazam — instant light duty grinder! Replace the spring loaded switch with a conventional on/off switch and you have saved about $20.00. Always wear protective glasses when grinding. The accompanying sketch shows the procedure to be followed.

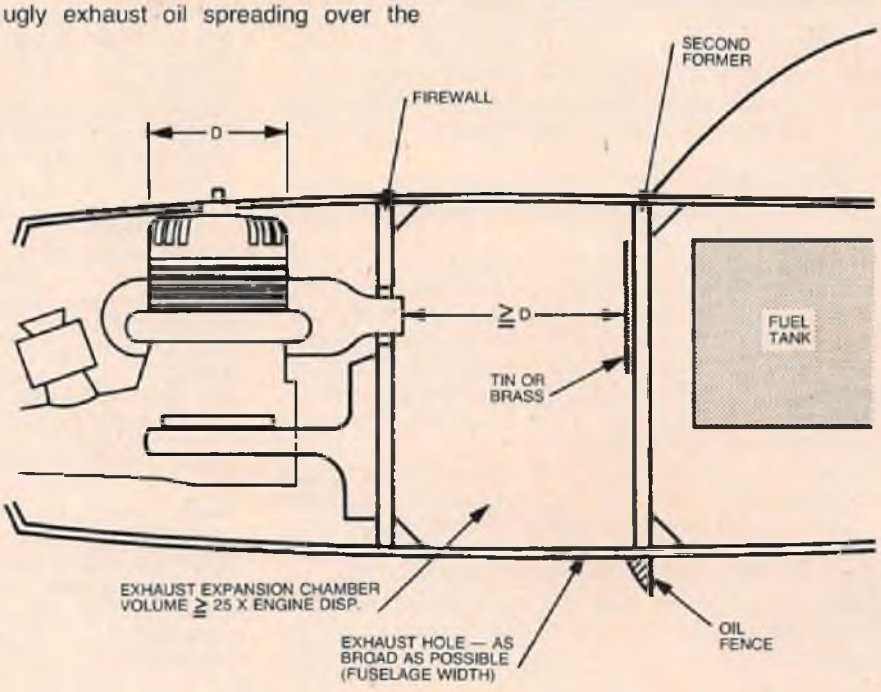


Douglas E. Ruth of Akron, Pennsylvania, submitted the following suggestion and the accompanying clarifying sketch. If you ever find yourself without the right size of rubber grommets for your servos or servo trays, fuel tubing can be used as a temporary substitution. Most fliers have an ample supply and variety of tubing, so finding the correct fit should be no problem. Select a 1/4" length of tubing which gives a snug fit inside the hole where the grommet would go. Tighten the screw till it touches the tubing and then tighten just a little bit more. This will cause the tubing to bulge a small amount above and below the hole, preventing the servo from slipping up or down and at the same time cushioning it from vibrations.



Wilfrid Camen of West Germany shows how to cover the engine nose problem — an often important thing — and, at the same time, how to give a model aircraft an original-like sound. The trick is really simple. Provide a chamber behind the firewall, with a broad exit in the bottom of the fuselage, and lead the exhaust pipe of the engine muffler through a hole in the firewall into this chamber. Don't forget to cover the interior of this chamber with epoxy or a fuel resistent paint! The area on the second former which is directly hit by the exhaust gas coming out of the muffler, should be protected by a small piece of sheet metal (cola tin, for example). A small fence behind the exit reduces the ugly exhaust oil spreading over the model (see accompanying sketch). As a rule of thumb, the chamber should have a volume of at least 25 times the engine displacement to mimimize the loss of power. And the distance between the end of the exhaust pipe and the second former should be at least as long as the diameter of the engine cylinder. So your model will be much more quiet — the high sequences diminish — and have a sound similar to the full size aircraft.

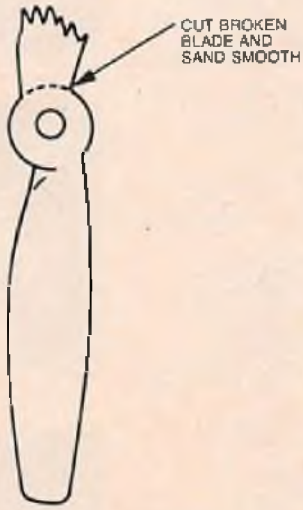
To make a simple bomb drop mechanism for your next fun fly, Bob Snyder of Brandywine, Maryland, first ties a small pill bottle to a popsicle stick or other strip of wood about 6" long. This is laid alongside the fuselage in front of the wing with the opening at the top and held in place with a rubber band. The bomb is made of an 8" square of Kleenex wrapped around a 1/2 oz. or so weight, and about a teaspoon of flour. This is tied at the top with thread for a loose fit in the bottle. A streamer of tissue or ribbon can be added for visibility. To drop the "bomb", simply pop full down and then full up on your elevator control. Inertia will cause the bomb to



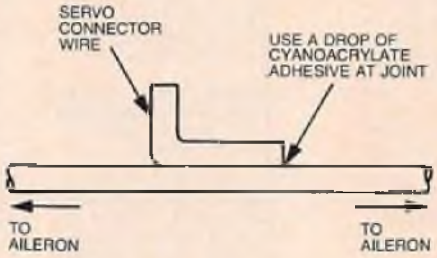
pop out of the bottle and up over the tail. If the bottle is too deep, wadded tissue in the bottom of the bottle will raise the bomb high enough to let it fly out freely. This arrangement is almost foolproof, and does not require modification to the airplane. It is simple enough in operation for even the newest beginner.

A very helpful suggestion on how to improve your workbench comes from Frank Trouba of Omaha, Nebraska. Frank has taken 4 or 5 strips of sandpaper 10" long and about 1" wide and glued to the edge of his workbench. This makes a super straight edge for sanding long sheets of balsa and it also acts like a third hand when you need to put a final touch on any piece of wood, and only have one hand free. Use rubber cement so strips can be removed and replaced easily. Be sure to coat both the bench and the sandpaper with the rubber cement and let dry. Recoat both surfaces and let dry, then apply the sandpaper.

Steven R. Harris, D.M.D., of West Palm Beach, Florida, has finally found a legitimate use for all the broken props he has accumulated. By cutting off, rounding and sanding the broken end at the hub, you are left with a very nice and efficient letter opener. He also states if you are in need of 10-15 nice letter openers, give him a call. I believe we are all in that category at one time or another.



For those of us who still like to connect the aileron servo to the main pushrod by means of a short length of wire soldered to the main pushrod, there is always a problem in holding the small wire in the proper alignment while wrapping the joint with wire. A drop of cyanoacrylate adhesive will quickly hold the two pieces of wire together while the joint is wrapped. This takes all the pain out of an otherwise aggravating task, according to J.A. Daggerhart of Cary, North Carolina. (See sketch.)



While in a paint and wallpaper store, Dan Drury of Ann Arbor, Michigan, ran across a gadget called, "Master Single Line Paint Striper". It is manufactured by the Murphy-Black Company of Springfield, Ohio. It's the perfect answer to striping on any painted model. You can use dope, acetate ink, epoxy paints or just about anything. It comes with a 1/16" wheel, with other wheels available from 1/64" up through 1/4" in width. The 1/64" wheel can be used to simulate metal panels or aileron lines on a scale ship. He has been using a special ink, created for marking plastic jewelry tags — very permanent, and goes on Mono-Kote beautifully. Also the tool works well in applying a seal over the edge of masking tape before spray painting to keep paint from bleeding under the tape. For long continuous strips as on a sailplane wing, tape a 1/8" x 1/2" stringer parallel to the lines to be drawn. Using double face tape with the adjustable guide foot, a series of lines in various colors can be easily applied. See accompanying sketch.

From Charles E. Snyder of Brandywine, Maryland, come two ideas that should be of great help to all model builders. To keep fiberglass cloth or tape from unraveling and making all those nasty, loose threads, try spraying the part to be cut with spray hair set. It dries in seconds, does not get too stiff to work and makes a nice, clean edge. In addition he has found it to be compatible with all adhesives and coatings.

When the plans for your new bird call for tape and epoxy to strengthen the wing center section, try using the same width strip of Super Coverite applied as per the normal method. Once the material has been laid in place and all wrinkles are ironed out, turn the heat on your iron up full and melt the fabric into the wood. He believes this method is as strong as any other and is the easiest to apply.

Mark Beauchamp of Queensland, Australia has solved his problem with multi-engine aircraft to where he now has a nice free operating throttle system. He was recently at a friend's house when someone broke a guitar string and upon examining the string, found it to be actually a very small diameter coil spring. It is possible to thread a guitar string through a plastic or nylon tube, and the tube can be bent in just about as tight a circle as possible and the guitar string can still be pushed and pulled through it quite freely. This use of a guitar string could very possibly be used on many more control functions.

Scott M. Colvin of Leonardtown, Maryland, has found that a 3 ounce Ban Basic bottle works great for carrying Formula 409 (a liquid cleaning soap) to the flight field for cleaning airplanes. The bottle is small in size, unbreakable, easy to hold and spray, and will last for about a week of active flying. It is easily refilled because the top screws off with no trouble. Scott also found that Formula 409 (available at most stores), works great for cleaning the #64 rubberbands. Just pour a small amount in a container and completely submerge the dirty rubberbands in it. Let them soak for about 3 hours and then dry them off with paper towels. Some rubberbands have been soaking for up to one week with no damage to the bands. The soap actually softens the bands up some, making them easier to go over large wings with very little, if any, loss in strength.

Send your hints & kinks to R/C Modeler, P.O. Box 487, Sierra Madre, Ca. 91024 & win a free 1 year subscription to RCM.

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RPM'S WORLD ARE UP AT

Every once in awhile we think it is fun to depart from the usual four colored product advertising. This month we want to talk about World Engines and some of the changes that we are making in the distribution of World Engines products to the hobby dealers in the United States, Canada and to several in foreign countries. Also, it should be interesting to the consumer to have a behind the scene peek at what World Engines is trying to do to insure good products, and to back these products up with parts and service.

First a brief synopsis of what has happened here at World Engines in the last few years. World Engines dates back to the early 50's and we are now in our 24th year. In 1972, the company was sold to the Consolidated Foods Corporation and in the summer of 1977 John Maloney, the writer, re-purchased the company from Consolidated Foods and it is again being operated as an independent corporation. World Engines, as the name implies, is one of the major importers of model airplane engines in the United States. We represent the firms: OS of Osaka, Japan—the oldest model manufacturer of model airplane engines on the planet today and Supertigre of Bologna, Italy—a manufacturer of line competition engines. In addition to our engine business we manufacture our Expert R/C system, manufacture a line of R/C kits and operate a distribution business which stocks most major lines of model aircraft supplies. These are covered in detail in our new 1978 catalog, $1.00 post paid.

So; What have we been doing lately, briefly:

1. August—We finally purchased World Engines back from Consolidated Foods Corporation.

2. September—Visited Supertigre in Bologna, Italy and worked out details to get more engines. Also some new engines. These include a rear and side exhaust X-60, an all new 15 BB, front valve schnuerle. A new .11 (eleven) which may also be offered as an out board.

3. October—Visited Japan's trade show and OS factory. Again scheduled more engine production. New from OS is a 3.5 cc (.21 cu. in.) schnuerle front and rear valve, plane and car. Also the new 45 with dykes rings, 45 FSR for airplanes. Procure OS precision metal bale stick assembly for World's coming sport R/C series.

4. November/December—Worked on the Aeronca Champ kit and got it ready to market. Program new computer.

5. January 1978—Announce new discount policy to World Engines dealers, instituted 2% extra discount on phone orders. We will take out the Wats lines—now call 513-793-5900.

6. Rewrite OS live steam loco manual — change British RR Jargon to American RR talk, 43 pages, drawings-$19.95.

7. Finish mold on Duane Johnson's ducted fan—air pump.

513 793 5900

Here are some domestic lines World Engines stocks:

APPLIED DESIGN—Sander and hack saw.
AUSTIN CRAFT—4 way wrench
AMBROID—1¾ oz. & 4 oz. tubes of cement plus pints and quarts.
ARCO—No. 62 & 64 rubber bands.
ASTRO FLIGHT—Electric powered R/C, electric motors 02 to 25 size, Malibu kit.
A-JUSTO-JIG—Full house jig, ½ A retracts.
ANDREWS AIRCRAFT—Balsa Aeromaster, H-ray, Trainermaster.
AIRBORNE ASSOCIATES—Phoenix 7 kit, fibreglass.
BADGER—Air brush—$9.95, propellants.
BRIDI—Koas, Trainer 40, Glass Cirrus, P-51, and AT-6.
B & D—Mechanical retracts, main and trike.
BURGESS—Batteries, dry cell.
CAL STRIPE—Striping tape, all colors and metallics. 1/16, 3/32, 1/8, 1/4.
COVERITE—Trim-it knife, Super Coverite, Silkspun, and Permagloss.
CB ASSOCIATES, INC.—Motor mounts—spinners, leaf type tail wheel.
CRAFT MASTER—Razor plane.
COX MFG. CO.—Eng. .010 to 15, Airtronic balsa kits and foam, Cardinal—Sanwa radios.
CARL GOLDBERG—Balsa kits and retracts, complete accessory line.
CRAFT AIR—4 ft. to 10 ft, balsa sail planes, ¼A Buhl Pup.
CONCEPT MODELS—Travelaire &, Bernstotmer, 40/60 bipe and Superfli.
CASS ENGINES—Beautiful Pulsar Bipe 60.
DAE ENTERPRISES—Flite box power panels.
DU-BRO—World stocks complete line and reduction unit.
DEVCON—Epoxy glue.
DREMEL—World stocks all bits as well as power tools.
E-Z JUST—Engine test mounts.
FIBERGLASS—Polyester, epoxy putty, cloth, pints and quarts.
FOX MFG. CO.—Glo plugs and engines.
GMP—Epoxy, motor cleaner.
GEE BEE LINE—Kit, amphib, and floats.
GLO BEE—Plugs and starters.
GRUMBACHER—Brushes ¼" to 1"
HALLCO—Alloy Gear.
HILLCREST—Spinners 1½" to 2½"
HOBBY POXY—Paint, glue and miscellaneous.
HOT STUFF—SATALLITE CITY—Instant glue.
HUMBROL—Cox engines.
HOUSE OF BALSA—¼A—40 Balsa kits.
JCM—Retract wheel well, battery 1½ volt and 12 volt charger.
R. J. JONES—Wire strippers,
JENSEN—Ugly Stick 60.
JETCO KITS—F F rubber and gliders.
K & B—Engines and fuel.
K & S Eng.—Tubing, solder iron.
MASTER KIT—40 size bipe stinger, hyper bipe.
M.E.N. KITS—Old timer bu23ard bombshell.
MIDWEST—Balsa and kits.
MILE HIGH—.049 and 15 R/C
3 M—Spray contact cement, sand paper.
MILLER—Spray outfit.
NOSEN—Big Kits, 8 - 10 feet.
PACTRA—4 oz, 8 oz, pints, quarts, dope and polyurethane.
PERFECT—Wheels, tanks, hwd-U/C
PERRY AUTOMOTIVE—Pumps & carbs.
PILOT—A.R.F., Ready to fly kits.
DAVE PLATT MODELS—Extra scale kits, 60.
PRATHER—Pylon kits, etc.
PROCTOR—Antique airplanes.
QUADRA—2.2 HP, ign eng and props-W.E. is U.S. distributor.
RC CRAFT—A world accessory line
REV-UP—Props.
ROBART—Pumpers and incidence, wheels.
ROCKET CITY—Plastic accessories
RONSON—Torcher.
J.J. SCOZZI—15/40 Duct fan.
SEMCO-Muffler.
SIG—Spruce.
SONIC SYSTEMS—Gas and mech. retract sytems.
SONIC TRONIC—Fuel line, starter, and pumps.
STERLING—Kits.
STURDI BUILT—U/C handle.
SULLIVAN—Tanks and rods.
TATONE—Muffler and mounts.
TEAM AERO—Small balsa.
TITE BOND—Alighatic glue.
TOMCO PLASTIC—Bluilder clamps
TOP FLITE—Props, kits-P 47 and monocote.
TORNADO PROPS—Props.
BOB VIOLETT—Formula No. 1 racer.
VINTAGE AERO—Cox kits.
WELLER—Solder guns.
WILLIAMS BROS.—Scale access.
WING—Wood kits and wing kits.
WALL LENK—Field solder gun.
XCELITE—Socket wrenches.
X-ACTO—Knives.
ZAP—Instant glue.

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Evett's Model Shop
1636 Ocean Park Blvd.
Santa Monica, CA 90405

Franciscan Hobbies
1935 Ocean Ave.
San Francisco, CA. 94127

Hobby Warehouse
4126¼ South St.
Lakewood, CA. 90712

Jim's Hobby Shop
120 W. Holt Blvd.
Ontario, CA. 91761

Smith Bros. Hobby Ctr.
8941 Reseda Blvd.
Northridge, CA. 91324

Authorized Radio Control Ser.
915 N. Main St;
Orange, CA 92667

Smith Bros. Hobby Ctr.
16217 Victory Blvd.
Van Nuys, CA. 91406

T & A Hobby Lobby
3512 W. Victory
Burbank, CA 91505

COLORADO

Custom Hobbies
2408 E. Platte Ave.
Colorado Springs, CO. 80909

Tom Thumb Hobby Center
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Denver, CO. 80220

CONNECTICUT

Al's Hobbies
54 Chestnut Hill Road
Norwalk, CT. 06854

Bristol Hobby Center
641 Farmington
Briston Plaza
Bristol, CT. 06010

FLORIDA

Action Hobbies
4301 N. Dixie Hgwy;
Ft. Lauderdale, FL 33334

Art's Hobby Shop
103-34 Atlantic Blvd.
Jacksonville, FL. 32211

Farmers Sundries & Hobbies
4926 E. Broadway
Tampa, FL. 33605

Field's Hobby Shop
602 S. Edgewood
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Garand Hobbies
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HAWAII

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Al's Hobby Shop
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Elmhurst, IL. 60126

M n'M Radiomodels
5544 W. 147th St.
Oak Forest, IL. 60452

Slot & Wing Ltd.
1914 S. Round Barn Rd.
Champaign, IL. 61820

Stanton Hobby Shop
4736 Milwaukee Ave.
Chicago, IL. 60630

West Side Hobby
2629 West Main St.
Belleville, IL. 62221

INDIANA

D & P Hobby World
154-13A W. Hively Ave.
Pierre-Moran Mall
Elkhart, IN 46514

Heuberger's Hobby Shop
3 Blks N. US 6 on Ind. 331
Bremen, IN. 46506

Hobbyland
343 Lincolnway West
South Bend, IN 46601

Hobbyland
343 Lincolnway West
South Bend, IN 46601

Jackson Enterprises
118 N. 3rd. St.
Lafayette, IN. 47905

Mutchler's Hobbies
217 E. 5th St.
New Albany, IN. 47150

Spencer's Craft & Hobby
2015 Ewing St. Rd.
Seymour, IN. 47274

KANSAS

Campbell Electric & Hobby
1003 E. 11th
Concordia, KA 66901

Tom's Hobby Shop
208 Poyntz
Manhattan, KA 66502

Modeler Hobby Shop
1726 S. Hillside
Wichita, KS. 67211

LOUISIANA

Hub Hobby Shop
2618 S. Broad Ave.
New Orleans, LA 70125

MASSACHUSETTS

Fisher R/C
17 Salmi Road
Framingham, MA. 01701

Ray's R/C Specialties
12 Sherman St.
Worcester, MA. 01610

MICHIGAN

Hobby World
1049 28th St. S.W.
Grand Rapids, MI. 49509

Joe's Hobby Center
17900 E. 10 Mile Rd.
E. Detroit, MI. 48021

Joe's Hobby Center
7845 Wyoming Ave.
Dearborn, MI. 48126

Joe's Hobby Center
33419 Grand River Ave.
Farmington, MI. 48024

MICH. cont.

Rider's Hobby Shop
115 W. Liberty St.
Ann Arbor, MI. 58108

Rider's Hobby Shop
920 Trowbridge Rd.
E. Lansing, MI. 48823

Trackside Hobbies
418 Main St.
Rochester, MI. 48063

MINNESOTA

Medical Center Cycle
5640 W. Broadway
Minneapolis, MN. 55428

MINN. cont.

Moon's Hobby Shop
Miracle Mile Mall
Rochester, MN. 55901

NEBRASKA

Chick Bartlett's Hobby Town
134 N. 13th St.
Lincoln, NB. 68508

NEW HAMPSHIRE

Fitts Photo & Hobby Shop
Kings Hgwy. Plaza
Stratham, NH. 03885

NEW JERSEY

Hobby Hut
567 Rte. 23
Pompton Plains, NJ 07444

Paul's Hobby Sport & Marine
540-546 Peterson Ave.
E. Rutherford, NJ. 07073

NEW YORK

Brown's Hobby Center
6031 Broadway
Bronx, NY 10471

Mardel Hobbies
351 Altamont Ave.
Schenectady, NY. 12303

NORTH CAROLINA

The Hobby House
1617 Ashville Hgwy.
Hendersonville, NC. 28739

OHIO

Airport Hobby Shop
1889 Triplett Blvd.
Akron, OH. 44312

Hobby Stop
4907 Summit St.
Toledo, OH. 43611

Kirtland Hdwe. & Hobby
9183 Rte. 306
Kirtland, Ohio 44094

Lafayette Escadrille Hobbies
1414 South Ave.
Toledo, OH. 43609

National Hobby, Inc.
5238 Ridge Rd.
Cleveland, OH 44129

Mark Riba Cabinets
32094 Detroit Rd.
Avon, OH 44011

W-K Hobbies
19 N. Main St.
Centerville, OH 45459

Wife's Hobby Shop
712 Bristol
Lima, OH 45804

PENNSYLVANIA

Allied Hobbies
6607 Rising Sun
Philadelphia, PA 19111

Groff's Hobby Shop
115 E. State St.
Quarryville, PA. 17566

J. C. R/C Hobbies
23 Easton Rd.
Willow Grove, PA 19090

Skelly Sporting Goods
2227 W. Market St.
York, PA. 17404

SOUTH CAROLINA

Bill's Teletronics
1451 Bonner Ave.
Columbia, SC 29204

TEXAS

H. Hobbs
4615 Banister Lane
Austin, TX 78745

Stew's Hobbies
1301 Custer Rd., Suite 250
Plano, TX. 75075

VERMONT

The Hobby Shop
RFD No.1, Rte 7
Swanton, VT 05488

The Hobby Shop
Burlington Square Mall
Burlington, Vt. 05401

Midd Way Shop
57 Main St.
Middlebury, VT. 05753

VIRGINIA

Bob's Hobby Center
3002 W. Cary St.
Richmond, VA. 23221

Davis Hobby Supplies
3594 Griffin St.
Portsmouth, VA 23707

WASHINGTON

B & B Hobbies (Bruce Batch)
907 E. Francis
Spokane, WA. 99207

Fircrove Model Supply
10611 - 136th St., E.
Puyallup, WA 98371

Hobbies, Etc.
16661 Redmond Way
Redmond, WA 98052

Stewart Enterprises
429 W. Chelan St.
Wenatchee, WA. 98801

WISCONSIN

Pape's Hobby Land
640 S. 3rd St.
Wausau, WI. 54401

CANADA

B & B Wholesale Alberta, Ltd.
1902-27 St., S.W.
Calgary, CAN T3E 2E5

Calgary Hobby Supply
3920 Edmonton Trail N. E.
Calgary, Alberta, Canada

Can-Air Hobbies
2363 Beaubien St. East
Montreal, Quebec, Canada

Marcoux Hobbies
5 Duchesnay
Beauport, Que., Canada

Summer's Hobby House
412-14 Hamilton Road
London, Ontario, Canada

ITALY

Model Club Shop
Barcella 22, Mestri
Venice, Italy

(2) NEW OS SCHNUERLE

OS 3.5 cc – $64.95
MARINE

Here are two new engines from O.S. Both 3.5 cc, front intake Schnuerle engines. The one on the left is the Marine version and the one on the right is the Race Car version. We presume that O.S. will come along with an

OS 3.5 cc – $59.95
CAR

Aircraft version sometime this spring. If you would like to see the 3.5 cc outboard from O.S., please write me a letter so that I can send it to Mr. Ogawa—John Maloney.

SERVICE

ARIZONA
R/C Engineering
P.O. Box 1451
Scottsdale, AZ. 85252

CALIFORNIA
L.R. Taylor & Co.
10711 Bale Ave.
Chatsworth, CA. 91311

Gene M. Davito
928 S. Centre Street
San Pedro, CA. 90731

COLORADO
Hood Electronics
5302 Howell Street
Arvada, CO. 80002

GEORGIA
Hobby Distributors
P.O. Box 102
Avondale Est., GA 30002

ILLINOIS
Stanton Hobby Shop
4734 Milwaukee
Chicago, IL. 60630

LOUISIANA
Hub Hobby Shop
2618 S. Broad Street
New Orleans, LA. 70125

MICHIGAN
Pete Waters
31219 Kendall
Lavonia, MI 48154

MISSOURI
C.W. Read
5408 Woodson Rd.
Raytown, MO. 64133

NEW JERSEY
J.A. Deneke
526 Oakemut Ave.
Glen Rock, N.J. 07452

EXPERTS

OHIO
Country R/C
12450 Amity Road
Brookville, OH 45309

Mr. G's Hobby Shop
4409 Mahoning Ave.
Warren, OH 44483

PENNSYLVANIA
Warren Hobby Shop
1027 Pleasant Drive
Warren, PA 16365

SOUTH CAROLINA
Bill's Teletronics
1451 Bonner Ave.
Columbia, SC 29204

TEXAS
Wilson's Hobby Shop
2205 W. Beauregard
San Angelo, TX 76901

CANADA
Charles Law
Dundas Hobby Supply
16 Sleepy Hollow
Dundas, Ontario, Canada

ENGLAND
World Engines, Ltd.
Unit 10, Paramount Est.
Sandown Rd.
Watford, Herts, England

ITALY
Model Club Shop
Barcella 22, Mestri
Venice, Italy

GERMANY
World Engines of Germany
Helmut Noll
4690 Herne 2
Haupistr. 6
West Germany

WORLD engines

8960 ROSSASH AVE., CINCINNATI, OHIO 45236 • TELEPHONE (513) 793-5900 • INTERNATIONAL TELEX 214 557

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.

MAGNUM POWER FUEL

Since the introduction of the glow plug in the late 1940's, glow fuels have contained lubricants that fall in the 50-55 viscosity range (centistokes @ 210°F.). With the introduction of Magnum Power Fuel, we enter a new era in lubrication processes. The viscosity of the new lubrication system in Magnum Power Fuel falls in the 9-12 range, yet the load carrying ability and protection is far greater than anything ever used before. This is also the reason Magnum Power Fuel will run longer in an engine than conventional fuels; it's thinner. Also, because it is thinner, an engine run on Magnum Power Fuel will seem dry; because there is very little heavy lubricant, ball bearings will be noisier, etc. Rest assured there is more than adequate lubrication. Repeated destruction tests, with Magnum Power Fuel in all kinds of engines failed to produce one damaged engine part. To promote ring seal and leave some oil residue in the engines, Magnum Power Fuel does contain 3% of Baker's AA Standard Castor Oil. The manufacturer points out that any fuel that contains methanol will leave some moisture residue in an engine, therefore, any engine run on any alcohol base fuel will be afforded better protection against rust and/or oxidation if a few drops of light machine oil are put in the engine after flying; 3:1 oil, Rizlone, Marvel Mystery Oil, or a rust inhibitor such as WD-40 are recommended. Magnum Power Fuel is available from Aldrich Products, P.O. Box 1426, Mission, TX 78572.

STRUT FAIRING AND COCKPIT COAMING

Two new accessories are available from Fourmost Racing Products, 4040 24th Ave., Forest Grove, Oregon 97116. These accessories are designed to make model construction simpler. The first item is their Cockpit Coaming. It is extruded from flexible black vinyl material, pre-shaped to fit around a corner. It is furnished in two sizes, 3/32" and 3/16" diameter. Price: 2 feet of each size for $1.95. The second item is an extruded rigid vinyl Strut Fairing available in two sizes, 3/32" or 1/8" I.D., packaged in two 23" lengths. Price for each size: $2.25.

FOMOFILL

D + J Enterprises, 3804 W. 81st St., Chicago, Illinois 60652, has available a new product called Fomofill. Its features are: It expands 2-3 times; no mixing — efficient/economical; non-toxic; moisture resistant; chemical resistant; excellent insulation properties; rodent and insect resistant; corrosion inhibitor; compatible with conventional finishing materials; mechanically workable; and, dispensing can be interrupted at will. Fomofill can be ordered direct from the factory and is priced at $6.95.

NIMBUS 2-CHANNEL RADIO SYSTEM

EK-Products, 3322 Stoval St., Irving, TX 75061, is proud to announce the addition of their Nimbus single stick 2-channel radio control system. This budget priced two-channel system is American engineered and backed by the company with the most experience in Digital Proportional Control. The Nimbus 2-channel systems are furnished complete and ready for use, except for batteries. Included are transmitter, receiver, two super miniature servos, battery box and switch harness, frequency flags and servo tray. The system is available on 72 MHz with a Ni-cad conversion optional. The Nimbus is covered by a 90-day warranty. Available now, the Nimbus 2-channel lists at $129.95.

MRP 1/12 SCALE ELECTRIC CLASS D R/C RACE CAR

From JoMac, 12702 NE 124th St., Kirkland, Washington 98033, comes this MRP 1/12 Scale Electric Class D R/C Race Car. This car was the winner of the 1977 Roar Nationals! with JoMac Speed Control Radio. Completely assembled and ready to run, this 6-cell nicad electric R/C car utilizes the proven MRP chassis and the all new #406 JoMac Mach 3 Electronic Speed Control Radio Control System. Features include: high power 1000 MW transmitter; proportional 20 amp electronic motor speed control with adjustable brake and torque; two cells disconnect to allow 4-cell indoor racing; quick charger included connected to any 12V battery for charging 6 nicad cell included; rugged aluminum chassis; front

end assembly designed to take the abuse of competition and is adjustable with independent front spring suspension; painted and trimmed Cobra II Lexan® body — light, strong, sharp looking, and good handling; brass bushed chrome front wheels; dipped fast charge G.E. batteries; long wearing sponge front and rear tires; heavy duty rear axle; changeable crystals on each band. Basic specifications are: speed, 29 mph — 48.5 kph; gear, 16/52; weight, with body 38.5 oz. — 1064 gram; motor, included .05 dyno tested; rear tires, included 2⅛ x 1½ wide foam rubber; range, over 500 feet. JoMac Brick receiver has a high speed front (steering) servo and built-in electronic motor speed control. This speed control works on 4 or 6 cell cars, operates smoother, is more reliable, and has faster response time than rheostat type controls. Receiver utilizes motor batteries so weight and cost are reduced. 6-month warranty on radio, 30 days on motor, batteries, and car. 6-cell electric R/C car complete and ready to run with #406 electronic speed control radio #910 is priced at $240.00.

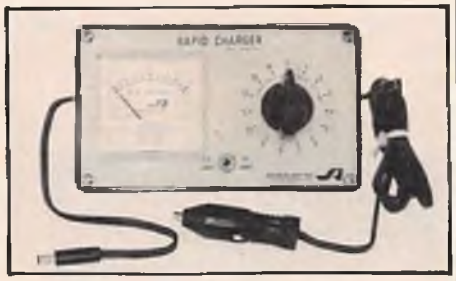
NEW HOBBY LOBBY CATALOG

Hobby Lobby's new Volume 7 completely illustrated catalog is now off the press. Over 100 pages of every item stocked, complete with illustrations and text on each and every item. This new catalog is completely revised and has all the new items you have been seeing advertised. Order direct from Hobby Lobby, Rt. 3, Franklin Pike Circle, Brentwood, TN 37027. $3.00 first class mail, or $2.00 third class mail.

SCALE R/C MODEL ELECTRIC CARS

A new line of 1/12th scale radio-controlled electric cars that promise a long service life because of their greater strength and durability has been recently introduced by BoLink Industries, P.O. Box 80653, Atlanta, Georgia

30366. Named "BoLECTRIC", the racers are designed to take full speed impact with little or no damage to their bodies. BoLink brings superior engineering craftsmanship to their contemporarily-built cars. Constructed of TUFFAK® brand polycarbonate, a virtually unbreakable plastic sheet material, these racers are practically indestructible. The lightweight TUFFAK body serves as a protective device for the car's housing without adding extra weight to the unit. In addition, the material's easy thermoformability and wide range of colors make it easy to produce models with attractive styling, intricate designs and colorful bodies. Other important features of the "BoLECTRIC" are the TUFFAK battery covers which offer an extra measure of insurance against damage to car parts. Moreover, the cars are equipped with full-length Kydex®-acrylic PVC pans, an innovative concept, that provides maximum protection for the racers. Cars in the "BoLECTRIC" line are about 14" long, 6" wide and weigh approximately 2½ pounds. Suitable for indoor or outdoor 1/12th racing, they come in 4 and 6 cell models and are available in a variety of colors, body styles and types.



RAPID CHARGER

Astro Flight, Inc., 13377 Beach Ave., Venice, California 90291, presents their Rapid Charger, designed to charge any 6 or 12 volt systems from your auto cigarette lighter receptacle. The ammeter indicates the state and condition of charge and the timer automatically terminates the charge when the charge cycle is complete. Price $24.95 from your dealer or direct.

SE-1S SWITCH-TYPE SAIL CONTROL

Photo is of the SE-1S switch-type sail control, both in and out of the case. On the left in the photo, the complete unit is in the case as it is marketed. From the bottom left, the battery powered input

cable is shown. It handles voltages from 5-9 volts, while 7.2 volts is recommended. The variable voltage feature allows you to change the speed of response as well as the power output as required. The pictured arm is made of epoxy fiberglass, a high strength plastic, and has ten chrome-plated eyelets that act as sail sheet guides. These prevent chafing of the lines. Underneath the arm is an adjustable clamping collar which allows easy adjustment and positioning of the control arm without marring the output shaft. The printed circuit board, shown with the case removed, is also epoxy fiberglass with etched and plated circuit. The unit has a fuse in case of overload in order to prevent damaging the model or the motor. The motor and gear box use precision machined gears and long-life bearings. The snap action switches limit the travel to 135°. The enclosing case is high impact plastic that protects the servo from moisture and is water resistant. The SE-1S requires a standard model airplane servo to actuate the switch. Shown in the photo of the assembled unit is the servo pushrod adapter and ball-joint connector attached to the actuating switch. This unit retails for $65.00. The SE-2S model is $70.00, and the SE-3S sells for $75.00. Available from Sail Engineering, P.O. Box 8439, Richmond, Virginia 23226.

CHIGGER BIPLANE

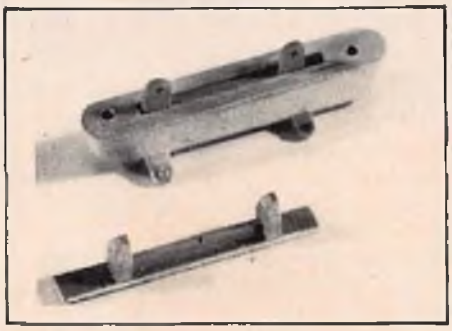
North American Model Enterprises, Inc. (NAME, Inc.) introduces their Chigger Biplane kit. It is designed for .19 size engines (have been flown with everything from .15 to .40). It is easily portable for travelers and sport car owners and comes built, sanded and ready to cover and/or paint. The wing span is 37"; area, 480 sq. in.; length, 36"; and takes a 4 or more channel radio. See your dealer or order from NAME. (Direct orders must include $5.00 for handling and shipping.) Price is $110.00.

"FORMICATOR"

Anyone who's ever carved a block of balsa will have no trouble making molds for the "Formicator", the new home vacuum former from Idea Development. Used with a home oven and a hose type house or shop vacuum cleaner, plastic parts can be easily and quickly made for any purpose with the Formicator. Sold in kit form, the Formicator takes about a half an hour to assemble. All wood parts are precision cut, kiln dried poplar, and all hardware, including the tempered and drilled aluminum top for the vacuum chamber, is of top quality. The only item not supplied with the kit is a good quality wood glue for assembly. Designed for the most economical use of standard-size plastic sheets, the Formicator heating frame holds an 8½" x 17" sheet of any heat formable material, and will work with plastics up to .090 (3/32") thick. Forms 4" or more in height are handled with ease as can be seen in the instance of the ring cowl in the photo. With the Formicator in his shop, the average modeler can begin turning out items such as those pictured; ribs, louvered panels, air scoops, wing tips, ribbed covering sections, leading edges, cowlings, and wheel pants, as well as canopies, fairings, wing seats, etc., etc. Existing parts can be duplicated with ease, and the process is described in the complete instructions that come with the Formicator. Shipped via UPS, postpaid anywhere in the U.S., the price is $27.00, direct from Idea Development only. Bulk packs of ABS plastic (white only - no clear) are also available from the company in thicknesses of .020, .030, .045, .060, and .090, as well as an assortment pack with sheets of each thickness. Each pack contains over 3½ pounds of 8½" x 17" ABS sheets. The packs are also shipped postpaid to any point in the U.S. Idea Development Inc., P.O. Box 7399, Newark, Delaware 19711.

HANGAR 37 ACCESSORIES

Hangar 37, Box 169, St. Michael, Minn. 55376, has a complete line of machine screws, wood screws, nuts and washers plus other things that are not carried in most hobby shops, like plastic gloves, plastic measuring cups, small grinding wheels, and many other things. Send for a catalog of complete listings from Hangar 37.



BOMB & DROP TANK RELEASE MECHANISM

Vortac Manufacturing Co., P.O. Box 469, Oak Lawn, Ill. 60453, has a new bomb and drop tank release mechanism that will be of interest to all R/C flyers, particularly to those flying scale and sport scale military airplanes. The release mechanism consists of a pod 2½" x 3/8" that is spring loaded and attached to the aircraft with the two sheet metal screws that are included. It can be connected to a servo by pushrod or pull cord. Also included is a release clip which can be epoxied to a bomb or drop tank. The unit is small enough to be mounted anywhere on the aircraft's surface or in a scale ordinance pylon. One of the nicest features of this unit is that the bomb or drop tank can be simply clipped onto the release mechanism without the aid of tools or a transmitter. Both parts are made of gray nylon. The unit is priced at $4.98 and extra release clips will be sold separately at two for .98¢.

CUSTOM CYLINDER HEAD

Techni-Models, 6130 Roy Street, Los Angeles, California 90042, introduces their Custom Cylinder Head which will fit the Tee Dee and ORC .049-.051 engines. Change to hotter or colder plug to compensate for variations in temperature, humidity, altitude or fuel. Use standard short reach plug. Available from Techni-Models at $2.50 each.

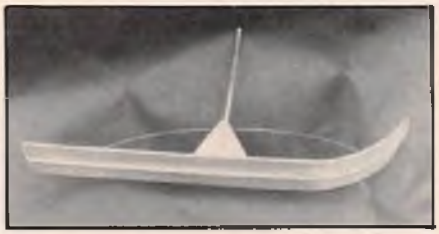
HEINKEL-162

Midwest Products Company, 400 S. Indiana Street, Hobart, Indiana, 46342, now offers you a plane kit that offers realistic jet flight performance when used with the Midwest Axiflo™ RK-40 ducted fan kit. Designed by Nick Ziroli, the Heinkel-162 is the perfect companion to Axiflo RK-40. Scaled after Germany's HE-162, the Heinkel gives you the flight performance you want. Kit consists of micro-cut balsa wood fuselage and empennage; foam core wing and balsa covering material; vacuum formed canopy; pre-formed landing gear; and authentic decal sheet. This kit is not for the novice. If you like to build, you'll love the results! Truly a unique looking aircraft that you'll be proud of. The Heinkel is a very stable and easy to fly airplane. Specifications are: Span 56"; Weight 7 lbs.; Radio 4 channels; Engine .40 with Axiflo™ RK-40.

CONTACT WIPER

The Feather Pen, 1943 W. North Lane, Suite 8, Phoenix, Arizona 85021, introduces their new single point contact wiper which ends flutter problems. Developed in Switzerland by Bruno Giezendanner and introduced in the United States by Pro-Line Electronics, Phoenix, Arizona, this new wiper is reportedly the most significant and revolutionary improvement in R/C type servo mechanisms to date. With the new single point wiper, contact is always centered on the resistant element of the pot. Tracking is positive, extremely smooth and with the closest centering reliability available today — and it's virtually

maintenance free. Pro-Line reports, in its comparative testing of the Giezendanner wiper with the traditional dual contact wiper, the new single point wiper averaged three times as many movements before needing minimal servicing. The linearity was still considerably better, as was the centering. The testing of this new wiper was conducted by a cooperating team of top flyers for over a year. The new SM-155 Servo pot wiper (for PLS-1 servos) and the SM-156 Servo pot wiper (for PLS-11, 12, 14 and 15 servos) are currently available at most hobby shops for $2.80 each. As the initial supplies were very limited, some hobby shops may already be out of stock. Call your favorite shop as soon as possible to make arrangements for your order.



ALL ALUMINUM SKIIS

Custom Machining Co., 100 Fifth Ave., Newburgh, N.Y. 12550, introduces their All Aluminum Skiis. They are adaptable to fly on snow, sand and surfaces where wheels don't work. They are light and strong and practically indestructible. They come equipped with torsion spring collars with double lock screws and socket set screw wrench. Available for 1/8", 5/32" and 3/16" wheel wire diameters. Suggested list price is $8.98 each or $17.50 a pair, factory direct only.

DOUBLE BACK TAPE SQUARES

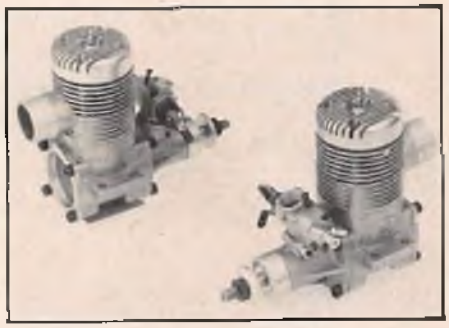
Double back tape squares from Prather Products, 1660 Ravenna Ave., Wilmington, CA 90744. They are 1" x 1" and use strong 3M adhesive. Each square has protective covering on both sides so it can be stored easily. Tape squares are great for holding servos, receivers, and batteries in sailplanes. They will hold any type of hardware in your airplane or field box. Each package contains 10 squares for 98¢.

LIL' LIGHTNING

Now from Steve Muck's R/C Boats comes the Lil' Lightning tunnel outboard hull designed by George Campbell of Arleta, California. The kit features precut frames and formers from high quality birch plywood. All necessary pieces for building this basic hull are pre-cut. Spruce strips of varying sizes necessary are included for stringers, sheers, and bracing. The kit also includes a new fiberglass rear cowl, hardwood rails, screws, and plexiglass radio box lid cover for making a radio compartment. An excellent building manual with over 26 photos depicting the different phases of the hull construction is included. The Lil' Lightning is 30" in length and carries a 12" beam. The K & B .21 outboard requires only a two channel radio. The ready to run complete boat weighs less than 5 lbs. The hull has also been designed to fit the new Auto-Trim by K & B. Price for the all wood Kit No. 53 is $48.95. For further information, write Steve Muck's R/C Boats, 6003 Daven Oaks Drive, Dallas, Texas 75248.

"40" PROP DRIVE UNIT

New from D.C. Engineering is the practical "40" prop drive unit. The "40" prop drive unit offers the versatility of unlimited choice of kits designed for .60 power that can now be flown with a .40 but still have more power available than if powered by a .60. Where a .60 prop drive is too much for several .60 sized ships, the .40 prop drive is a natural. How about that scale ship you've been wanting to build, but you know that the .60 would never swing the scale sized prop and the .60 prop drive units were too far in the other direction? The "40" prop drive will fit where any .60 will fit and swing props from 14/16 to 18/20 in diameter. The unit, unique in its one piece design with a new heavy duty belt is much stronger than current rubber belts; lightweight, 11 ozs. less engine and prop or 24 ozs. all up with engine and prop. It develops 10½ lbs. thrust using readily available Rev Up 16" props. Think about it - - - more power than a .60 with the economy of a .40. Available from D.C. Engineering, 355 Geneva Ave., Tallmadge, Ohio 44278.



S.T. 60 SCHNUERLE

A new item from World Engines Inc., 8960 Rossash Ave., Cincinnati, Ohio 45236, is the new S.T. 60 Schnuerle which will be available as a rear or side exhaust engine. Initial tests show this engine to be very competitive with any of the (60 Schnuerle) series engines on the market today.

O.S. MOUNT/HEAT SINK

A new item from World Engines Inc., 8960 Rossash Ave., Cincinnati, Ohio 45236, is a special O.S. motor mount designed strictly for the O.S. 60 (4 cycle) engines. Also shown is a heat sink designed for the O.S. 25 FSR.

SAITO GASOLINE IGNITION ENGINE

Hobby Shack, 18480 Bandilier Circle, Fountain Valley, California 92708, introduces their Saito Gasoline Ignition Engine. Saito, the manufacturer of precision model steam engines, has just released their newest line of gasoline ignition engines. These engines are finished

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to perfection as is the tradition of Saito Mfg. At the present time, the G-60 front and rear rotor versions are available in air and water cooled configuration. The marine version comes with the water cooled head, machined flywheel and universal joint. All the engines come complete with muffler, coil, condenser, spark plug, spark plug cap, 10K resister connectors, heat shrink tubing, high tension wire, fuel line and the following tools: thrust washer puller, box wrench, plug wrench, and thickness gauge. The only items needed to run the engines would be a battery box, batteries and a switch. The G-60 is a Schnuerle ported engine with an aluminum piston and chromed sleeve, and has a twin ball bearing crankshaft. Available from Hobby Shack, the prices are: Air Rear Rotor, $148.88; Marine Rear Rotor, $164.99; Air Front Rotor, $149.99; Marine Front Rotor, $169.99. □

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detachable canopy or hatch cover for access to the radio compartment, and optional lightening holes for all-balsa construction. Then there are those big wings to build straight and cover. A roll of MonoKote was used to cover the Windward wings and stabilizer/elevator.

The sailplane purist probably favors a Hi-Start for launching. It does leave you with a clean model at the end of a day's flying, but there are some disadvantages besides the cost (which is about $25.00). Launches must be made into the wind. Many flying sites do not have the unobstructed distances necessary for such launches in all directions, and even if they do, it is sometimes necessary to reposition the launching because of a wind shift. Retrieval after each launch can be a minor inconvenience, especially if you are flying alone.

A power pod offers maximum convenience for launching in limited areas regardless of wind direction. It will cost from $10.00 to $25.00, depending on the pylon (self or commercial made) and the .049 engine selected. Its disadvantages are fuel residue on the model and the added weight and drag of the pod. The extra weight may or may not be a factor, depending on wind conditions, but power launches normally will give you more altitude than a Hi-Start.

Before investing in either launching mechanisms, I decided to borrow the equipment to try it out on my sailplane. I asked Tom Vincent to loan me his power pod, and to help me test fly the Bee. Tom has many years of modeling experience. He has logged sailplane flights in excess of one hour, and is fully qualified in sailplanes as well as any other model that flies. The model did well during hand gliding tests, so Tom adjusted the control surfaces for neutral, and set up for maximum rudder and minimum elevator throws. I had used a heat gun to produce the recommended 1/4" to 3/16" wing warp for tip washout.

We rubber-banded Tom's power pod to the Bee using a piece of 1/2" foam rubber as a cushion between the pod base and the sailplane wing. This pod is self made with a Cox .049 Black Widow for power. A three-minute engine run

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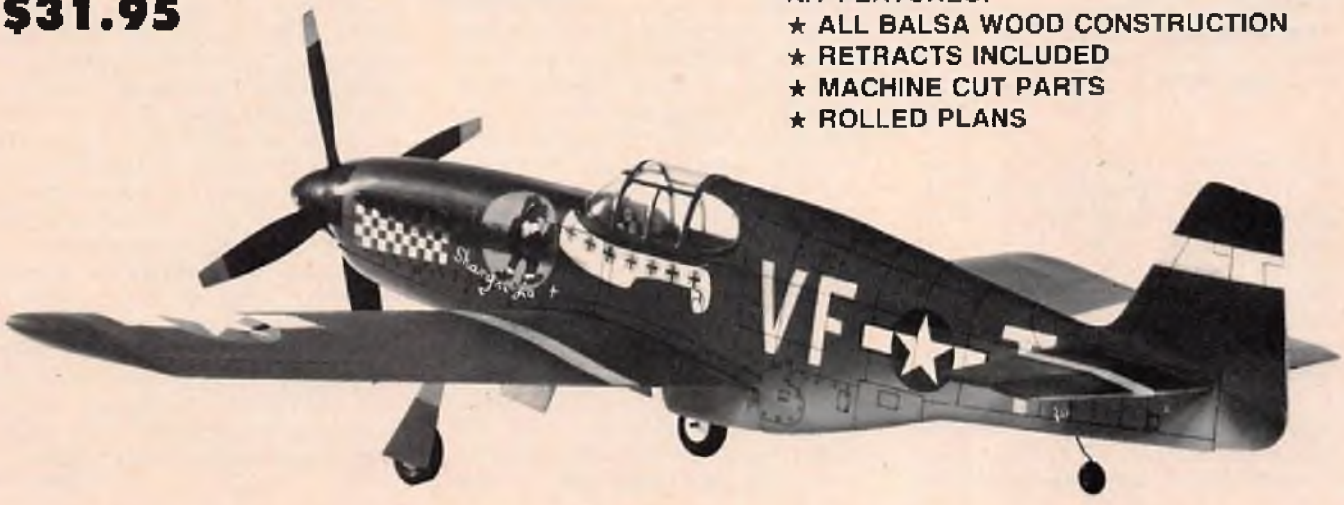

SON OF A BEE

from page 102/90

took the Bee up to about 500 feet, where its 6' wing span appeared to be only a few inches. Tom determined that 1/2 up trim resulted in a good minimum sink rate for thermal hunting, and the 1/2 to full down trim gave excellent penetration when flying upwind. He pronounced the sailplane trimmed to his satisfaction, and handed me the transmitter.

I suddenly felt like a beginner with only a few R/C flights under my belt. My orientation was complicated by the model's extreme height, unfamiliar control responses, and the fact that it was directly overhead. Overhead flying has always been a problem which I have solved by generally avoiding the situation. The Bee was several times higher than I usually fly powered models. I didn't dare take my eyes off the model for fear that I might lose sight of it, especially without engine noise as a point of reference. The black and yellow colors provided good visibility, but it was still difficult to see in certain turn attitudes. A lot of rudder was necessary before the model would begin to respond to turn commands. This is caused by the large wing area, rudder turning, and normal flying at near stall speeds. My breath came easier as the model gradually descended to more familiar heights, and eventually to a landing that was an anticlimax. The first flight had lasted seven minutes including the engine run.

Four more flights, each of 6 to 8 minutes, gave me a better feel for sailplane flying. It soon became apparent that I had neglected my sailplane ground school. I wouldn't recognize a thermal if I were floating in the middle of one. The Bee proved be a very docile flyer. Thanks to the wing washout, it did not exhibit any tip stall problems. I am very pleased with its handling, and believe that my lightening holes were worth the extra effort.

That evening, I did some homework on thermal soaring, and started to build a power pod. Leafing through back issues of RCM, I found an article "Born Free — The Art of Flying R/C Sailplanes" by Lee Renaud in the March 1973 issue (reprints available, $1.00). This article was very informative, and I highly recommend it to any beginning sailplaner. It explains slope and thermal soaring, describes procedures for trimming your sailplane, and discusses how to find lift.

The most frequent indicator of lift is when your model turns for no apparent reason. Rising air currents will tip one wing causing the sailplane to turn away from the thermal. You should immediately seek the thermal by turning **back** in the opposite direction and putting the model in a tight, flat turn as soon as you detect the presence of lift. Other indicators are either a "bumping" of the model or a "bumping" of one wing tip. In the former, you probably flew into or through the thermal. It then becomes a toss-up which direction to turn in order to find and stay in lift. The latter instance is similar to the sudden turn except that the lift is probably weaker. Turning in the direction of the "bumped" wing should find the thermal.

I patterned my power pod after Tom Vincent's, using a 6" x 12" sheet of 1/16" plywood and scrap materials. The pylon is 1/4" balsa laminated between 1/16" plywood. The firewall is 3/16" plywood shaped around the back plate of a Cox .049 Black Widow engine. 2 x 56 bolts and blind nuts mount the engine to the firewall. 1/2" scrap balsa was used to back up the firewall, and the pod was sanded to a streamlined shape. The remaining piece of the 1/16" ply sheet was used for the pylon base. Triangular balsa stock reinforced this butt joint. The base can be shaped to fit the wing or fuselage of a particular sailplane. An essentially flat base gave a good match to the Windward wing fairing. Minor variations in shape can be absorbed by the foam pad between the pod base and wing. Two coats of Formula 2 Hobbypoxy thinned about 33% with acetone were used for fuel proofing. Total cost, including the Black Widow engine, was approximately $12.00.

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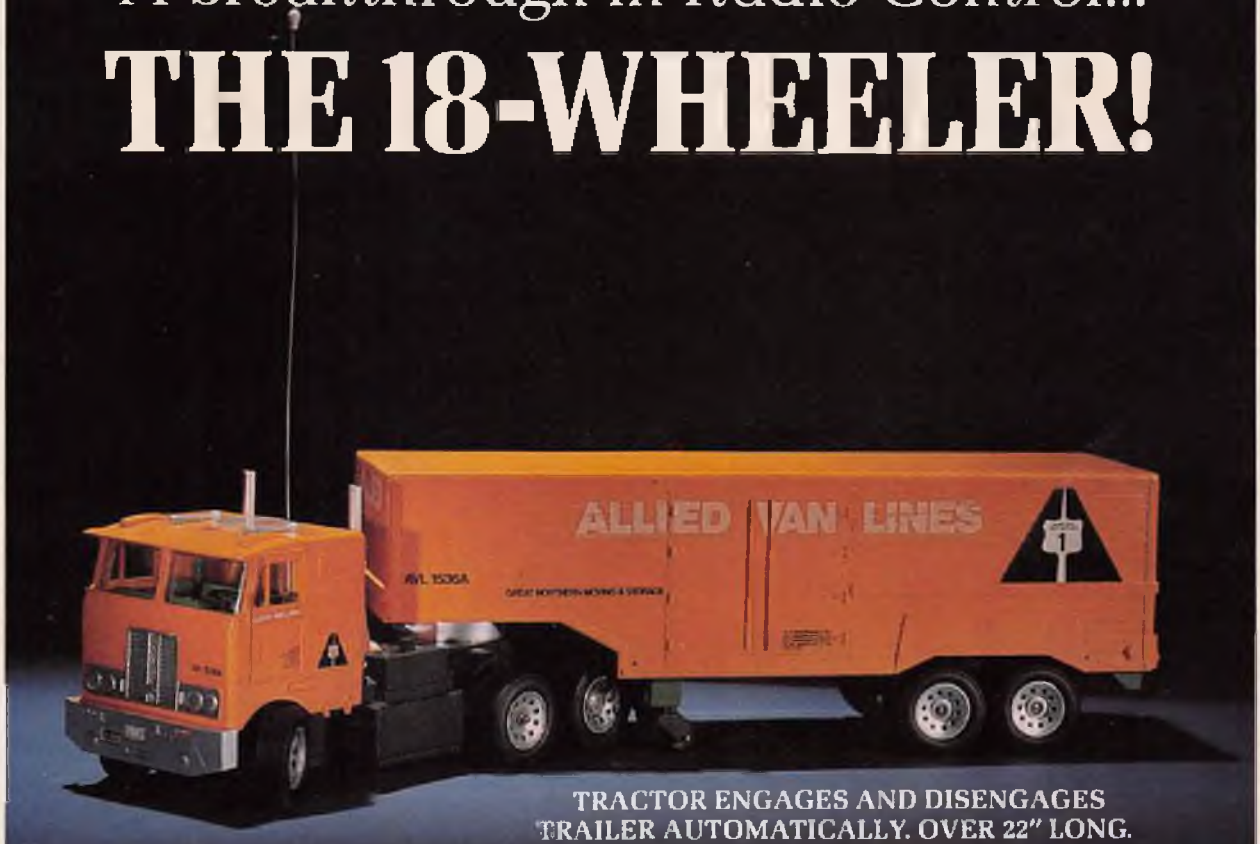

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SON OF A BEE

from page 104/90

The next weekend, I tested the power pod, and my new found knowledge of thermals. The pod worked fine, but the engine runs with a rich setting were under two minutes. A fellow modeler suggested that I change the fuel pick-up. Cox reed valve .049 engines with attached gas tanks are set up for control-line flying. For R/C use, you must carefully remove the backplate and reposition the plastic fuel pick-up tube from horizontal to vertically downward. This correction increased the engine run to 2½ minutes. Most of my flights were in the 5 to 8 minute range, but the best one of the day was 18 minutes. Each flight brings more confidence in my ability to control the Bee, and decreases my uneasiness at great heights.

My biggest difficulty in the transition to silent flight is getting used to high flying. I also get nervous when my sailplane drifts downwind in a thermal, and I have to bring it back against a fair breeze. It requires a lot of concentration on the model's flight to detect and utilize thermal power. Trim adjustments become very important. An experienced sailplane flyer is continually making trim corrections, and frequently may use only trim controls for most of the flight. As for the merits of power pods versus Hi-Start launching, I recommend a power pod for the reasons previously mentioned and because it will give the beginner more air time to develop his thermaling techniques.

I find that model sailplane flying has a fascination similar to gambling. You never know how long your flights will last, but you just might hit it big on the next one. Sailplanes are yet another challenge in achieving an all-round proficiency in R/C flying. Sort of like the real pilot who is checked out in everything from Cubs to multi-engine jets. After several months of practice, my best flight at this writing is 33 minutes. My eventual objective is a 60 minute flight. I think I'll make it! □

FASTENER ORGANIZER

from page 84

The 2,110 nuts, bolts, screws, washers, etc., are all top quality zinc-plated steel. After looking at the prices of similar packaged hardware in various stores, we estimate you would have to pay more then double the cost of the complete cabinet and contents just to buy the hardware alone. We found similar cabinets priced at $15.00 to $20.00 for just the cabinet alone. There is no doubt in our minds that this kit is an outstanding value at under $20.00 complete, and it is our guess that the Whitney organization is shipping large quantities all over the States. They have a sliding-scale of shipping charges depending on where you live (works on zip codes) which, for this particular kit, varies from $2.40 to $3.70 (it's a heavy kit — no balsa wood here). They will ship C.O.D., Mastercharge, Bankamericard, personal check or money order, but you should ascertain the shipping charges first. C.O.D. shipments require a minimum 25% cash with order.

Now, what possible excuse can you have left for not getting organized?

BERMUDA FUN FLY

from page 82

ing, though," Durner continued. "We noticed, for instance, that in the touch-and-go event, no Bermudian scored a successful touch. Granted the event was new to them and granted it is difficult for anyone to do. Still, they are used to bringing their planes down anywhere on that giant paved area, and they do not have to work on their precision the way they would if they came in on a strip as wide as a one-lane road."

Durner sees the Bermudian flyers developing fast, however, and anticipates they will be tougher in future competitions. "They have the advantage of weather," he explained. "They can fly 12 months a year. They will advance more quickly than most clubs in the United States. I have been in this for six years now. But six years in the Northeast gives you lots of building time and not that much flying time."

Most of the Bermudians, Morris pointed out, had made their first landing within the past year. The sport is new to Bermuda on an organized basis. But with easy access to a flying field year round, Morris also promises the Mid-Atlantic Club will be more competitive as time goes on.

"We need the contact with other clubs," he stressed. "The Westchester team has taught us a lot and you can bet our flyers will have practiced all these maneuvers by the next Fun Fly. Meanwhile if any other clubs in the States, or anywhere, are interested in getting together with us, we will be delighted to get together, exchange ideas, and cut down on our isolation out here." Arthur Morris can be contacted by writing to him at Box 1806, Hamilton 5, Bermuda.

Perhaps reflecting their newness, the Bermudians were all flying pattern planes, except for a biplane built by Morris and flown by him in a demonstration during the Fun Fly. Two of the Westchester flyers were trying out new Midwest Attackers, built by Midwest Products of Hobart, Indiana, and powered by Webra Speed .40's. Reaction to these relatively new styrofoam planes was generally favorable.

"We chose them," said Durner, "because they are easily repaired at the flying site. Coming down here with only one plane, that was important. It would have been a shame to travel all this way, lose the plane early in the meet, and sit around the whole time. Also, we anticipated wind. The Attacker is a 'clean' plane with good penetration."

Actually, their problems did not materialize. There was no wind and the temperatures hovered in the low 80's. The weather was ideal. Further, the planes proved exceptionally maneuverable and no emergency repairs were needed.

Overall opinion by those who flew the Attackers was favorable. "It is definitely not a beginner's plane," said Durner. "It handles best at high speeds. But if you keep the speed up, it is capable of some very accurate and tight maneuvers. It responds exceptionally well."

While some of the Westchester flyers were seeing Bermuda for the first time, Durner was not. Larry was on his 40th visit to the island. "I will let that suffice as my commentary on what I think of Bermuda," he stated, "except to say I will be back whenever we get invited to another Fun Fly."

If the experience of the Westchester Radio Control Society gets around, Bermuda may find itself a popular spot for future fly-offs. The Mid-Atlantic Radio Control Society says it would like nothing better. □

LAMBORGHINI COUNTACH

from page 79

..... the exhaust (where else?) out the back. A short-moment throttle arm is also included to replace the original one on your engine. This is needed as only half the servo rotation is available to move the throttle from completely closed to wide open. The Enya carburetor is already the right way round but, if you use an OS Max 10 or a Fuji 099, you have to rotate the carb 180°. The Fuji carb body fouled against the crankcase when it was rotated and required some careful filing before it would snug down properly.

Installation of the steering servo, receiver, battery and switch is no trick at all using the double-sided tape supplied in the kit. The throttle/shifting arrangement is very clever. All you have to do is screw a two-pin cam to your servo output shaft and mount the servo in the chassis. The cam bears against a cam-follower (which is spring-loaded and all mounted by the factory) using the central position

of the servo for idle-throttle. As the servo rotates in either direction from center, it opens the throttle proportionally and, at the same time, it moves the gears up or down. This makes them bear against the upper or lower clutch plates giving neutral at idle and forward or reverse, depending on the direction of servo travel. Clever indeed and, like the best clever ideas, it is simple.

Mounting the servo was tricky, as the nuts and lock washers have to be maneuvered into very tight situations. A bit of patience and manual dexterity is called for here. Fit the cover to the integral fuel tank, mount the fan-shroud, drop on the body, and sit back and smile.

We halt the narrative at this point because you now have a good looking piece of equipment all ready for, "Gentlemen, start your engines", and off to the local parking lot. Even with the additional work on the front end, the extra mods the Fuji carburetor required and the fiddling throttle-servo mount, we had expended a total of only 6½ hours from first opening the box — how's that for clear instructions, parts that fit, and the amount of factory pre-assembly? Any work beyond this point is left entirely to the discretion of the builder. We elected to go all the way and blew another 22 hours in detailing, which (as the picture partially shows) was well worth the effort.

The windshield and window panels were carefully removed from the body and the smoked plastic pieces for these and the turn-signal covers were shaped and beveled to an exact fit. As the turn-signal decals must be applied next, we decided to do all the decaling at one time. No problem — they all fit like the proverbial glove. All windows went in next. A small bottle of clear cement is provided for this job and is to be applied with a fine brush — **use it!** Being typical RC builders, we reached for our trusty bottle of Hot Stuff and found that the window plastic inhibits the cure. So, after 15 minutes and still no joining, we cleaned the edges and used the cement provided. A very tiny amount runs like cyanoacrylate and glues in seconds. Black striping tape is provided, but we decided to edge the windshield and windows with 1/8" silver tape and the turn-signal covers with 1/16" silver (Bridi) tape which looks real neat. Then we masked and painted the air scoops and exhaust outlets and the fan-shroud with flat black Pactra Polyurethane. The enameled-metal Lamborghini insignia was mounted on the front of the hood; all was assembled and we were finished — or were we? All the door outlines, hood & body panels have fine lines indented into the body plastic. So, we got some black 3-point chart tape (between 1/64" and 1/32" wide) and very carefully lined out these markings and around all the decals on the rear end. (Patience and time is required for this operation, but it really made a big difference in the appearance.) Then, in a fit of total enthusiasm, we decided to paint the wheel segments black. We manufactured a 5-bristle brush, gritted our teeth and later (much later), all 24 segments were finished with a considerable enhancement in the overall appearance; but don't bother with this unless you are as crazy as we are. Because of all the fine tape, etc., and clean-up operations after future engine runs, we got out our airbrush and sprayed two coats of clear polyurethane over the entire body (windows and all). We now have a hard, smooth finish all over and can clean up without having to worry about stripping off all that good work on the body surfaces. The clear hi-gloss coats also improved tremendously the appearance of the plastic body.

So, we had finally arrived at the object of the entire exercise — driving it. One look at the beautiful body work and we unhesitatingly removed it for our first runs, using just the naked chassis for our practice. "Beginners" gearing is installed in the transmission by the factory and a set of "hot" gears is supplied in the kit for installation after driving experience has been gained. Being very "olde und schmardt" after "lo these many years", we went by the book and started out with the "training wheel" set-up.

We were using the brand new version of the Fuji 099 (the SR-RC), and a very nice little piece of equipment it is. Again, being "schmardt", we had run it for 15 minutes in our MRC test stand with lots of stopping and starting for practice and got all the carb settings perfected. We used K & B 1000 fuel, as these small engines seem to thrive on lots of Nitro and, because we highly respect Gene Husting, we used the castor oil version (see, Gene, we do read and remember your column).

Well, like wow and now, man! We opened the throttle and this thing disappeared up our flying field runway so fast that our involuntary reaction was to slam the throttle shut before it dove into the Pacific Ocean. Guess what? Right! Straight through into reverse! Well, it neither tore the wheels off nor spilled the drive train, but it did stop about as quick as it had departed in the first place, executing about six snap ground-loops in the process. With the weight and the low C.G., this baby slides if you abuse it with very little tendency to flip in the process. Since our first heart-stopping experience, we have stopped it or spun it several times by going straight through into reverse, and there are no indications that doing this is detrimental to the gears or shafts (but this is not meant to be an implied warranty or otherwise — do it at your own risk).

We are now quite proficient at aiming this projectile under full power into the general area of intent, but it is still so popular with inexperienced friends and others in the "can I try it next" category that we still have the standard gears in it for their benefit. When the neighborhood novelty dies down and we feel strong enough ourselves to withstand another anxiety heart attack, we will go out alone again with the "hot" gears installed and hope that our reaction time is quick enough to keep track of where it is going — or, perhaps, where it has been.

Man! This thing's more fun than a barrel of monkeys. Try it, you'll like it! □

GERE SPORT

from page 78

Building was straightforward, but discount the 18-hour assembly time noted in the kit. Once we get to the field, we can get the Gere together in 15 to 20 minutes. Die-cutting and materials selection were literally perfect, as were parts fit to the plans and each other.

No special tools, other than large wood clamps, were used. All basic framing was performed on the cork coated side of my 6' x 2' hollow building board. Using a 36" steel scale helps assure that everything is built straight.

Fuselage initial assembly (sides and bulkheads) over the plans is a must to assure a symmetrical fuselage. The fuselage is a basic box with two square bulkheads built up from 1/4' ply strips (lengths and widths up to 9-1/2" x 1-1/2") and three aft fuselage bulkheads built up from 1/4" x 1/2" sheet balsa. Wood clamps 6" deep with a 12" throat were used to clamp the sides to the bulkheads.

And now the fuselage sides - - this is another point where you are impacted by the size of this graceful biggie. The vision conjured up by an **eight foot** bipe is overwhelming, the full size plans hammer the impact further in; the amount of wood is unbelievable; but the fuselage sides finally bring you to the full appreciation of the size of the Gere. The 3/16" thick sides are assembled first, end-splicing three 3" x 48" and 3" x 30" sheets, and then edge-splicing the 78" lengths to get a side sheet 3/16" x 9" x 78" long. The sides are then tapered fore and aft of the wing saddle area for final assembly.

The landing gear is a standard configuration, two wires (3/16") soldered together above the axle and mounted to the fuselage bottom in a ply sandwich. I added internal triangular braces to tie the plywood to the fuselage sides. The fuselage top is round with the traditional inset stringer type aft fuselage turtledeck topped by a conical headrest. The round forward fuselage top is sheeted with soft 1/8" sheet (well soaked, of course). A single stringer running longitudinally along the center of each fuselage side breaks up the slab side effect. All in all, a classic, beautiful configuration.

The right side of the upper wing was built first, then moved on the board to allow room to continue building the left side to obtain a one-piece wing (no dihedral in the top wing). Instructions were clear and correct, except that the WT-4 and WT-5 ply braces **should not** be added until the left wing is finished at least one rib bay outboard of the center section. Examine the area carefully before building and you'll see the problem. Because of the excellent parts fit, the wings were assembled "dry", ribs and spars locked in place with Hot Stuff and then, for "safety wire", we brushed the joints with thinned Titebond. Both wings use the same flat bottom airfoil - - chord is over 14". Construction is rugged, utilizing two 1/4" spruce spars top and bottom, and vertical webbing between those spars. The T.E. is made up of top and bottom 3/32" sheeting. The L.E. is made up of 1/2" x 1½" strips with an inset full length of a 1/4" square spruce strip which fits into mating slots in the rib fronts. 3/32" sheeting top and bottom completes the leading edge.

The lower wing is similar to the upper wing except that it is 6" shorter and has 1¾" dihedral under each tip.

Tail construction is by conventional framing - - except that the tail is framed with unconventionally large 3/8" x 3/4" strip with 1/4" x 3/8" bracing.

The elevator and rudder control systems are Sullivan .060 braided cable with a wishbone set-up to drive each elevator. The required lengths were made up by splicing and the outer channels are supported at about 12" intervals in the fuselage to minimize deflection. Braided cable is also used for the lower wing ailerons with the upper ailerons driven by tie-rods from the lower aileron.

K & S streamline tubing is a good application for those tie-rods as well as the upper tail braces (kit calls for dowel braces). We omitted the lower tail braces since the tail assembly was removable from fuselage. The Interplane N struts are made from aileron stock, hinged to the top wing (Du-Bro hinges) and pinned to tabs in the lower wing for flight assembly. Radio is Kraft Series '73, Single Stick transmitter - - servos are KPS-14 except for aileron which is KPS-15 II. Fuel tank is a Sullivan 16 oz. Slant Front. A Robart Super Fueler was used, and worked as advertised.

Weight is 17 lbs. - - covering is all Super MonoKote including hinges. Color scheme is a highly visable orange (fuselage) and white (wings and tail) with orange, white, yellow and black sunbursts on the wing upper surfaces and tail. The undersides of the wings are checker-boarded with 4" squares of yellow, orange and black. The upper wing checkerboards are 2" squares of orange, yellow, black and white.

We really enjoyed building the Gere, but we did beat up the basement ceiling while handling the wings. We can manage to hit the ceiling a few times with a 'tiny' Kaos wing so these 8' wings were easy to use as bats. One other size problem has to do with the proverbial joke about not being able to get your project out of the basement. Unless you built it in a hangar by the flying strip, you do have a slight problem. Our basement has an 'old-fashioned' outside door. But, once just to see what it would be like, we took the sub-assemblies (wings, fuselage and tail) out through the house. We made it, but the bride will be a long time getting over it - - ". . . watch the cat, . . . hold the door, . . . look out for the lamp, etc., etc . . .

The Gere travels to and from the field (Valley Forge Signal Seekers field at Valley Forge National Park) in my Pinto wagon. The wings ride over the front seat and are secured for transport by bungees over 1/4" foam rubber pads. The fuselage sits on its right wheel and a foam pad under the fuselage side & the tail assembly on its foam carrying pad is tucked under the fuselage. The field box is under the wings and there is still room for a folding chair, thermos, etc.

For flight assembly, the tail is secured on a fuselage mounted 1/4" ply platform with four nylon screws (8/32"). We followed instructions and dropped the T.E. of the horizontal stab 3/16". Even so, we still needed 30 oz. of lead up front with the original Max .80 engine installed. The higher weight of the Roper engine (32 oz.), and its extension from the firewall farther than the Max .80, eliminated the need for the nose weight. The CB Associates tail wheel and elevator and rudder are then hooked up (Du-Bro Kwik Links with fuel tubing keepers). The top wing is mounted on the cabanes through four nose wheel nylon fittings and locked in place by 5/32 wheel collars. The N struts hinge down and are attached to lower wing hold-downs (aileron bellcrank arms epoxied into ribs) using 1" long 2/56" screws and 3/32" wheel collars. The screws pass through brass tubing Hot Stuff'd into the struts.

The Gere ad states "Flying weight 14.5 lbs.," and ".60 Engines Required". We first flew the Gere at a weight of 16½ lbs. (With 30 oz. of lead in the nose) on a Max .80 and 14/6 prop. Performance is realistic for those of us who remember bipes from the 30's and learned to fly PT-19's, BT-13's and AT-6's or AT-17's.

The Gere has over 100 flights to date on two engines - - the original Max .80 and the current 1.4 in.^{3} Roper engine. A removable cowl was added when the Roper engine was installed. Engine cooling is provided through the use of Kaiser Sun Shade aluminum screening. This "louver" material is intended for screen doors needing air passage while restricting visibility. The rows of louvers are about 1" wide with about 3/16" between rows and provide the desired scale effect as well as a practical solution to air inlet.

Flying the Gere, we quickly learned that a 10-knot headwind was our friend. The airplane flies so slowly that it takes time to work it up to an altitude where there's room to maneuver. With a good headwind, the ground speed decreases; but rate of climb increases and that's good. So, we went to the Roper and a 20/5 prop - - later flights were with a 17/6 prop. Performance was slightly improved, but still dependent on the airplane's innate stability. We may yet modify the Gere to take a gear box unit.

Flying is slow and stable and satisfying to watch. From a short distance, most viewers think they are watching a real airplane in flight. With the enormous, boxy fuselage and 8' wingspan, it almost is a "real airplane". The first flight was made with the control surface throws set as directed in the instructions. For all subsequent flights, elevator throw was increased from the directed 1/2" up and down to 1½" up and down.

Now, the whole purpose of the planning, building, testing and worrying, is to have a good time and fly. And, in flight is where it all pays off. As impressive as the Gere is in cruising flight, we really enjoy it during take-off and landing. Take-offs are easy and smooth. The tail comes up quickly and then it's down field on the mains - - a sight to behold. A bit of "up-elevator" and she's off smoothly. The Gere is flown just like a real bipe - - gently and with lots of rudder in the turns. Approaches and landings are their own thrill. Again, it is the real thing; as the Gere settles gently on the mains for a tail-low 2-pointer, you will really know it was all worthwhile. We've made a number of deadstick landings. They're easy and as graceful as power-on landings - - with a bit of planning.

The **big ones** are here. If you're looking for something new and scale-like, try the Gere - - you'll like it! □

PIT STOP

from page 77/76

to vote for "The World's Worst Driver" by applause. It wasn't even close. Jody won it by a mile! Jan McKinley, Miss U.S. Grand Prix, presented Jody's trophy.

Three of the Formula I drivers also judged concours for us. How can you argue with their choices? Joe Zimmerman took concours with a beautiful scratch-built McLaren body. Bill Newlin's Ferrari was a close second with Jerry Thompson's Ferrari taking third.

I had a chance to run upstairs and shoot some pictures while the novices and amateurs were qualifying. It was another world. Sandy Reed, who does the announcing for Ascot Park where they race midgets and everything else on 2 or 4 wheels, was such a fantastic announcer that he had the crowd

screaming and yelling so loud, cheering their favorites on, that I couldn't even hear the cars running. And the view of the track from above was the best that I had ever seen. I was easily able to follow a car around the track. I'm sure with all the yelling and screaming the fans were doing, they must have gone home exhausted. What a difference a great announcer can make! Don Amedo made his job a lot easier by spotting for him.

The experts qualified next. Some of them had brutal horsepower, but this wasn't the kind of track for that. Ray Charbonneau was fast qualifier and Ray really made it look easy. In the second heat, Mike Carone got his car running great and finished one second behind Ray. Chuck Hallum and I always seemed to be locked up and didn't qualify too well.

The program was scheduled to run from 7:30 p.m. to 10:30 p.m. With 30 entries, we ran 2 qualifying heats, concours, Formula I drivers race, and 3 main events and did it by 10:00 p.m., thanks to an untiring Moe Loura. Bob Middleton won the novice main with Bill Newlin taking second and Larry Bain third. Bill Steele has been tearing up the Amateur Class lately, and did it again that night with a win, with Jeff Rold in second and Don Stuart in third.

In the Expert Class, Chuck Phelps took off in the lead, followed by Bill Jianas, Gene Husting, and Matt Azzara. About 15 laps later, Bill's batteries went dead; he had forgotten to change them in the excitement. Our race was shortened to a 20-lap sprint to make the 10:00 p.m. deadline and Chuck wasn't about to give up the lead and went on for his first expert win ever. I followed for second and Matt took third.

Is it possible to ever top an event like this? Moe tells me the Lions Club was so happy with the outcome that they're talking about sponsoring R/C car drivers from other countries and bringing the top 3 drivers from each country here and holding an International Race with the top 3 drivers from the U.S.A. Sound like a fairy tale? We now believe in fairy tales. Thanks, Moe.

RACE RESULTS

Worst Driver Trophy
Jody Scheckter

CONCOURS
1. Joe Zimmerman
2. Bill Newlin
3. Jerry Thompson

NOVICE CLASS
1. Bob Middleton
2. Bill Newlin
3. Larry Bain

AMATEUR CLASS
1. Bill Steele
2. Jeff Rold
3. Don Stuart

EXPERT CLASS
1. Chuck Phelps
2. Gene Husting
3. Matt Azzara □

FLUTTER

from page 75/74

minute max flight during our annual glider contest. The flaps are down, spoilers up and coming down toward the landing spot at about a 30° angle. Okay, easy now, clean it up to stretch out the flight into a 360 over the spot for the 30 seconds left to get a perfect max. Spoilers in, flaps up, a strange sound like a kid running a stick down a picket fence, the wings look blurred for a second, and the plane lazily rolls over on its back and dives into the sod about 100 feet or so from the landing spot. I put a new **hotter** engine in my "Little Mike" Formula One with the torque rod controlled ailerons. During the first test flight, I notice that sometimes the aileron control gets very weak, and the trim keeps changing, especially after the pull-out from the beautiful Split-S about a half-mile upwind. I do another one that positions the pull-out point about 25 feet high and right in front of me. Guess what! The left aileron isn't there. I quickly cut the engine

and make a careful landing. Now the left aileron is there, but it's hanging at a funny angle, and there are stress cracks in the paint around all of the hinges.

If you were one of the fortunate ones whose airplane is still flying after you begin to notice the symptoms (poor control, humming or slatting noise, sudden trim change, or loss of one control function), you should do three things. One — cut the power to slow down. Gliders — put out the spoilers if you have them. Notice: Here helicopters with collective pitch, moving along in forward flight are different. Lowering collective can actually increase blade flutter when it has started. Two — put the model into a moderately tight turn or pull out of the dive. At high angles of attack, the drag increase will help to slow the model and the flow picture is quite different. See Figure 9.

FIGURE 9

At a high angle of attack, the vortex off the lower surface forms aft of the trailing edge, so that the actual oscillating force during the vibration is present only on the upper surface. This drops the flutter driving frequency to one-half what it was at low angles of attack. This should stop the flutter immediately. For a helicopter with a fixed pitch head, reduce power and flare or turn until you get to a slower speed. For one with collective head, keep the power up (to keep the blade pitch high) and flare or turn until the speed has dropped off. If the flutter is in the rudder of an airplane, get a load on it by deflecting it as much as you can while you kill off the speed. Three — do everything you can to keep the plane flying as you make a slow careful approach (over a safe area) and landing. If the aileron control is gone, fly with the rudder if you can. At least try to steer into an area

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FLUTTER

from page 110/74

where no one is likely to be in the way. If the elevator control is gone, try to control the plane by changing power settings. Sometimes a control surface will disconnect itself completely from the pushrod during a flutter incident. In this case, it may not stop fluttering at any speed but, as you slow down, it will get less severe. Don't let the continuing flutter distract you so much that you quit flying the model. If the tail rotor control is gone on your helicopter, try to keep the speed high enough for the fin area to be effective. Fly it at that speed until it is low and over a safe area — then cut power, flare, and hope for the best.

If you do get your plane back, or if it is repairable, there are several things that you can do before you fly again that will prevent the flutter from re-occurring. Also, if you have a new model that has springy or sloppy controls or that you think will be capable of very high speeds, or a glider with a high aspect ratio flexible wing, or a helicopter that you want to fly into high speed forward flight, I'll go into some things in future articles that you might want to consider before you press them out toward their limits. □

POWER BOATING

from page 73/72

the diameter of the flexible, which is soldered into it. This shaft runs in bearings in the skeg, just like the parallel drive.

Okay, so what's the difference? Well, in the first place, simplicity. To install the flexible, you simply fit the skeg on the hull at the correct angle — usually 1 or 2 degrees positive to the hull floor — put some epoxy round the outer tube where it comes through the hull, and that's it. The coupling is a solid nut, and the flexible is held in place by a couple of grub screws. And that is honestly all there is

to page 116

Hobby Shack SAITO Gasoline Ignition Engines

Saito, the manufacturer of precision model steam engines, has just released their newest line of Gasoline Model Ignition Engines. These are absolutely superb, as is their way of doing anything, and we are delighted to be able to introduce these engines to the American modeler.

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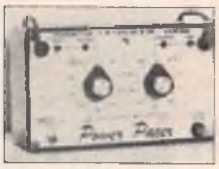

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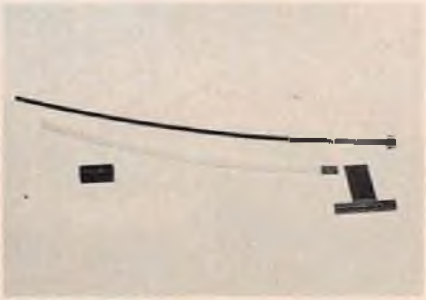
THE HOBBY MARKET

from page 112/72



A lightweight 3.5mm diameter flexible for electric motors and up to .21 c.i. glow. The blackened end of the Teflon tube is chemical etching, so that it can be glued into the skeg.

The assembled 3.5mm flexible. Experience has shown that with this size, a brass outer tube is not necessary.

to it. Nothing could be easier.

The second point is efficiency. I checked out an electric motor running free on a given voltage, and recorded 15,900 rpm. I then fitted this motor in a boat, with a 3.5 mm flexible cable drive complete, and then checked the revs, reading on the propeller boss, at the same voltage. The reading was 15,700 rpm, a power loss of 200 rpm. I can't offer any comparative figures for a parallel drive, obviously, but I think that it would be fairly difficult to obtain a similarly small loss. I may be wrong.

Next, we come to drag. I am sure that the streamlined flexible cable system just has to generate less drag in the water than the parallel drive, and I think that this will be obvious to everyone. Plus, with only one coupling, and that one solid, no power is going to be converted into noise, and there is no question of misalignment. Plus the whole thing is so simple.

One point has come to light that is worth mentioning; flexibles do not like to work in a straight line, so they should not be used as a replacement for a solid shaft. I believe this is because, in a straight line, they tend to oscillate in the

to page 118

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POWER BOATING

from page 116/72

The different parts of a 5mm flexible drive. The transparent tube is the Teflon liner.

The assembled 5mm flexible system. The brass tube is carefully bent into the appropriate curve.

middle, and rub against the outer tube. (A good flexible set-up will always have a Teflon liner in the protective tube.) In addition, an angle of about 20 degrees seems to be about the optimum as far as power losses are concerned, and it is better to use a single, smooth bend than an S bend.

Whether you use one system or the other, the ultimate aim is to get the final drive parallel with the hull. This is because if you don't, according to the parallelogram of forces, you are going to get two vectors, one horizontal pushing the model along, and a second vertical one tending to lift the hull. Ideally, the lift should be provided by the hull form, and all the available power should be used to propel the boat, hence, the use of the parallel drive. A further advantage is that, without the lift vector, when running a fast model in a chop, the boat tends to be more stable, because it is not hitting the waves at such an acute angle. In fact, I have found that all my boats fitted with parallel drive tend to jump parallel to the surface of the water, rather than lifting the nose, as with a rigid shaft set at about 12 degrees.

Anyway, Charles, I hope that more or less answers your question; and, also, maybe helps anyone else who was wondering about this subject. I'm off now to the workshop to fit a flexible drive in that prototype balloon bursting boat. See you all next time! □

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MAGNUM 12

from page 64

. . . . plete all tasks required for Level 5 of the League of Silent Flight. It is of some significance to know that in the final two tasks; the 2 hour thermal flight, and a goal-and-return of 6.21 miles out in a straight line and 6.21 miles back, John was flying . . . that's right, a Magnum 12! The Magnum 12 has an extremely good glide ratio, spoilers are very effective, and controllability is tops. In other words, this beautiful bird flys as well as it looks. And that's hard to beat. □

ALMOST A FAIRCHILD

from page 63/50

this comes off the board, simply cut the ribs to match the spar thickness. This gives an absolutely true tapered structure. The cap strips are added over the lengthwise strips to obtain the airfoil top and bottom. The rudder is built in the same manner, as is the vertical stab, with the only exception being that notches are cut for the leading and trailing edges. I've been building this way for years, but since no one in this area had heard of it, I pass it along here.

I considered making the entire tail assembly removable by running a bolt up through the bottom of the fuselage to hold it in place, but finally settled on gluing the whole ensem rigidly in place, which meant building part of it as the basics sat on the plane. The "fishtail" had me a bit concerned initially, but it went together very easily. If you build the ship and attach the rudder and elevator as I did, just remember that the elevator must be covered before it is mounted with the horizontal stab . . . and it **must** be mounted with the stab. No way to get it in once the stab is glued in place.

As mentioned previously, the ship was built in an apartment, which ruled out dope. So, the covering in MonoKote — whole bunches of it. (The local hobby shop owner has erected a shrine in my name and the name of Fairchild.) Painted areas are the horizontal and vertical stabs, and the doors, cowling parts, struts, and landing gear. I grew up on dope as an aircraft finish, and I still prefer it over all the new miracles that people have put in cans to frustrate people like me.

I tried K & B Super Poxy on the tail surfaces, but it dries too slowly for compatibility with a shag-carpeted apartment. It is also too white for MonoKote

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from page 120/50

white, which has a slight ochre cast. Too, I wasn't too pleased with the complete lack of directions, and failure to mention that they had two catalysts, brushing and spraying, nor the 12-hour set-up time before the stuff could be rubbed down . . . and through. I switched to "Perfect Paint" and had much better luck, although this stuff stays soft, too, for quite some time. Perfect Paint was a better match for the MonoKote and it set up dust free faster than the Super Poxy. It also, as a polyurethane, can be used to touch up those inevitable marks in MonoKote that slobs like me always manage to make.

In doing the gold trim striping around the blue color panels, I, of course, ran out of 1/16" width D & J striping, and naturally my shrine builder had no more in stock. Back to the artist's bag of tricks — I used a gadget that's known in studios as a railroad cutter. It's simply a razor knife with two blades that can be adjusted to varying widths to cut strips of almost anything, including gold MonoKote trim sheets to 1/16" and the 1/32" thickness I needed for the striping around the numbers of the rudder. While this cutting of your own striping works very well, you can't top the D & J for going around in intricate curves, such as the ones on the wheel pants. MonoKote would never have made it around the bends . . . through the pass, yes, but never the bends.

That's enough of the drivel to do with all the funnies of the building and finishing. As mentioned previously, the plans are a full construction article by themselves, so, moving right along . . . let's switch the scene to the flying field.

Before we go off to the field, I should mention that half the "partnership" on this project had developed a severe case of chicken feathers. Carl Cantera, who was to be the pilot in this first attempt at the Innovator's Class, got his first look at the monster and made a snap decision — "I haven't flown anything in over 200 years, so I'm too rusty to tangle with that thing". We decided that Bob Karlsson, a consistent scale flier, would be our patsy, er, test pilot.

The Summer of '77 was anything but a neat affair, especially on the eastern seaboard. Heat that would melt the doorknobs on a brass monastery (fooled you, didn't I?) and humidity that oozed through the air in greasy formations . . . all mixed with nasty thunderstorms. One weekend after another slithered by with no flight tests, and I was determined that there would be flight tests **before** this article went off to Don Dewey. I suspected that Dewey had lost all faith in me

anyway, since this whole project had been promised for almost a year. But, I, for one, am a tad tired of all the articles about planes that have never left the ground. This article was to include flight shots . . . or the whole idea got scrapped.

We finally lucked out and had a decent weekend in late August, and Karlsson and I met at a flying site in Lum's Pond State Park, just south of Newark, Delaware, at a very early hour. Site of the Delaware R/C Club's flying field, there was no one there but we two, three groundhogs, a gaggle of rabbits, and a lot of freshly cut wet grass.

I'd installed a 16/4 AMF prop (seen in all the photos), but my test pilot was all sneers about this item. "Never deliver. What we need is what a Max .80 loves — a 14/6." That Max will never rev with that dumb thing you did all the fancy decorations on." He installed his 14/6, while I installed my gear . . . a ground anchor one uses for pets. This latter was coupled with a short length of cable with a ring, which fit onto a small fisherman's pocket scale of 8 lb. capacity. The scale had another length of cable that went forward for roughly 2½' to a loop that fit over the strut of the tail wheel. All this gobbledegook was to prove what prop pulled best to develop the most pounds of readable pull on that scale.

After the usual fiddle-dum, fiddle-dee routine with the engine, our test pilot tached the engine and found it topping out at 9000 rpm — a figure he declared he wanted to see from a Max for this size prop, for this size beast. The reading on the fish scale was ranging from 5 to 6 pounds of pull. "How about trying, just for fun, my gaudy natural wood with blue, white, and gold stripes," I suggested. Smirking wisely, our T.P. installed the 16/4, restarted the engine, and lip read me the info that it was only putting out 7000 rpm. He then looked at the scale and found that the pull had yanked the unit to the top of its range . . . indicating a pull in excess of 8 lbs. I'd been holding onto Monstro through the tests, and I didn't need a look at the scale. I **knew** which prop pulled best!

The next test performed consisted of putting the ship, sans wings, out on the take-off area and running it back and forth in sprints to see what kind of inertia the throttle control would relay to the engine. Each burst of called for power had the "Almost A Fairchild" into instant action — no delays of engine or control to rudder. Karlsson announced that the rudder control was instant and finite. The elevator remained untouched at this point, since using it would prove nothing without the wings.

The wings were installed, and Karlsson looked like something out of a Hemingway novel, facing "the moment of truth". I'd told him that if he pranged it, I could care less — if it dinged, it deserved to die anyway. Nonetheless, his

take-off run was a bit erratic. He over-controlled the rudder in his nervousness, but once airborne, he found that there was no need to use the rudder, even for the landing that was to come.

In a later analysis of the test flight, Bob said that the ship was "one beautiful airplane to fly", and that the only correction he had added was a slight bit of right aileron. He also admitted that the throw I'd put in the elevator had scared him, but that, in flight, it was smack on the nose and responded beautifully. So you know, should you wish to build one, throws on the elevator are max up and down, as are those of the ailerons (roughly 20° plus in either direction) and the rudder.

Flaps were given a 60° maximum down ala the full scale ship, and these, according to our test pilot, were on the money. The landing, after a number of **very** low passes, was a classic. The big oleos flex beautifully, and the whole gear system smoothed out a rough field to make the landing look as though done on concrete. The only mishap was a broken strut from the landing; this strut was one of the minor struts that runs from the main strut juncture up to the cabin. It has been replaced with a new strut, as has its mate on the other side, with new ones made of streamlined brass tubing, 3/8" wide, with brass end fittings as shown on the plans and an inner fitting of a length of birch dowel to stiffen them.

The in-flight shots were made on the first test flight. Other than the strut mentioned, no modifications are required — the thing I find the most satisfying about getting my nose into such a project. After that flight, my interest died. My design and theories had worked; meanwhile, there was this really great crop duster the Grumann Co. had developed that could be redesigned a bit here and there, and maybe some talc could be fitted into a hopper. . . □

TRANSITIONING

from page 49/46

wrong was attempting to fly the craft in much the same way that I would land my pattern ship. Mentally, I was attempting to land the Cessna 152 as if it was my .60 Kaos, and it just doesn't work; in fact it was clearly the wrong perception and technique.

On balance, it is undoubtedly true that your involvement with R/C modeling and piloting will be of assistance in many ways, but most importantly **not from any pragmatic sense** of translating that which you know from the world of R/C modeling into full scale aircraft piloting; what really matters is that your R/C piloting means you have a deep and abiding

love of airplanes and the world of flight - - - and that, I would argue, is the greatest advantage that you have in transitioning to full scale flight. But isn't that true the other way around as well; what does the experienced and competent full scale pilot bring to R/C modeling and piloting? In reality, not much more (but importantly!) the love of airplanes and flight.

Q. Just how hard is it to learn how to fly full scale aircraft?

A. Far more difficult than the advertising of the aviation industry would lead you to believe. In fact, take something of a close analysis of the advertising put out by the advertising industry and their cooperative advertising voice, the General Aviation Manufacturers Association. Cessna used to advertise, "If you can drive you can fly". They've backed away from that one for the simple reason that it's not true. The ability to drive a car in no way is an assurance that you can learn to fly an airplane with any level of competency or safety, and the two are synonomous. Now Cessna advertises, "If I can fly you can fly". This is open to more interpretation but plainly their aim is to convey the idea that literally, there is very little to learning how to fly. That's just not true. The same comment can be made concerning those, "How I learned to fly - - - wasn't it easy - - - anyone can fly" books that are on the market. Once again, tremendous distortions are involved. The world of flight is a complex one, for many, overwhelmingly so. To enter into flight training is to enter into a new, challenging, bewildering and just plain difficult world. Certainly there are those who adapt easily and quickly, but isn't that true of R/C flying as well? For most of us, there's a long struggle in learning to fly with proficiency and consistent safety for our plane and equipment. I don't know what "multiple of difficulty" you could pose for flying full scale aircraft as against R/C piloting, but it's gotta' be an awfully large one in the transition to that of flying full scale. If you remember how difficult the R/C learning process was, how bewildering it was to have to react so quickly with your mind and fingers, then you should be able to accept and understand that to enter the world of full scale aircraft piloting is, for the overwhelming majority of people who try it, not at all easy. Quite to the contrary, it is a very difficult undertaking. In part this is true because you have to expand your horizons of knowledge with lightning rapidity as you study for that license through some form of ground school training. In all aspects of the learning process, the demands upon your physical and mental abilities are tremendous. Now the fact that so many have accomplished full scale pilot proficiency does not belie this truth any more than the fact that so many have stuck to it and become competent R/C pilots is a denial of fact that, for most, learning to fly

R/C aircraft is a really difficult task. This, and many other relevant areas will be explored in future articles.

Meanwhile, if you do not have one already, why not pick up one of the general aviation magazines and start getting a feel for that special world called full scale flight. □

S-TEE

from page 44/40

stringers in the following sequence: First, glue the top stringer in place, centering it on the fuselage. Next, attach the two outside stringers, warping them slightly along their length so they conform to the curve of the formers and are flat on the fuselage at the stab cross piece. Finally, glue the two intermediate stringers in place, centering them between the top and outside stringers. Epoxy formers F-3 and F-4 in place beneath the side longerons.

(11) Trim the fuselage sides to match the angle at the top of the nose doublers. Cut the cowling parts from 3/16" balsa sheet. Cut out the top nose sheet according to the plan template and glue to the front fuselage. Cut the nose side sheets and glue to the firewall and the top sheet. Leave enough material outside the fuselage sides to allow sanding to a smooth contour shape. Cut and glue the nose bottom sheet in place. Note that the grain on this part runs crosswise to the fuselage.

(12) After the glue has thoroughly dried, carve the nose sheets to finished shape. Block sand until a smooth, even contour is achieved. The pushrod tubing that exits from the rear of the fuselage is trimmed flush and sanded smooth. Lightly sand the remainder of the fuselage and slightly round all corners.

(13) The wing is attached to the fuselage with two nylon screws. Mark the screw center lines on the wing. Position the wing on the fuselage, making sure it is centered. Drill a 3/32" diameter hole through the wing and former F-4. Remove the wing and enlarge the hole in the wing to 5/32" diameter, then tap a 6-32 thread through F-3. Re-attach the wing using one of the 6-32 nylon screws. Note that the rear mounting screw will have to be cut off to 9/16" to clear the pushrod. Trammel the wing so it is perpendicular to the fuselage and drill a 3/32" diameter hole through the forward portion of the wing and former F-3. Remove the wing, enlarge the hole in the wing to 5/32" diameter and tap the threads into F-3. Re-mount the wing, check alignment and correct any misalignment before continuing.

Sanding:

Sanding is intended to smooth the surfaces of the wood so that the finished model will look better. Any defect will not

to page 128

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S-TEE

from page 126/40

be hidden by the final finish, but will show up more visibly. The care and patience spent now will reward you with pride when you show your model to your friends and provide you with the self-satisfaction of doing an outstanding job.

The difference between a good looking or poor model is usually sandpaper and there are no substitutes. One hour with a sanding block now will provide satisfaction for the life of the model.

We suggest that the following tools and materials will make this work easier and provide better results:

A small block plane such as Sears No. 37057 is great for shaping the leading edges and hardwood parts. In addition, a razor plane is excellent for shaping balsa.

Several different sanding blocks, covered with different grades of paper, will give true, flat surfaces. Emery boards are also helpful for tight corners or stubborn spots.

Use the better grades of sandpaper such as Aluminum Oxide or Silicon Carbide open coat. Garnet paper is also satisfactory, but the more common

grades of flint paper wear out so quickly that their low cost is offset by the inconvenience and wasted time. Check the shelves of your local hardware store or automotive supply outlet if you can't find these materials elsewhere. We recommend that you use No. 120 for rough sanding, switching to No. 220, then to No. 320 or No. 400 for final sanding. One sheet of each grade is more than enough to complete this model. Use long strokes and blend the surfaces smoothly. A little water or saliva on dents may raise the wood fibers enough to eliminate the need for filler in most cases. Bad dents or cracks should be filled and sanded smooth.

Re-sand all surfaces with worn No. 320 or No. 400 paper by hand and you are ready to cover and finish your model.

Covering and Finishing:

Every modeler usually develops his favorite methods of covering and finishing models. Many times, however, a great deal of weight is added to the model trying to get a super finish. This is bad for any model. For a small airplane, disasterous! Whichever method you choose, keep it light!

We strongly recommend that the entire model be covered in Super Monokote or Solarfilm. We know of no other

to page 134

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way to get a slick, good looking surface with minimum weight build-up. You can use silkspan and dope if you prefer, but be careful to avoid warps.

If you do use one of the plastic film materials, we suggest that you apply a protective coat of fuel-proof paint to the inner surfaces of the cowl and firewall, plus the wing supports and cabane uprights. We used clear Hobbypoxy, brushed on for the prototypes, as this gives a varnished wood appearance. You might also use polyurethane varnish or any fuel-proof dope, either clear or colored. We definitely feel that these surfaces should be painted, as the covering with film is very difficult and time consuming, and the wood will become oil-soaked very quickly if left unprotected. This painting should be completed before starting to cover.

Remember that you have to see the model clearly while in flight, to be able to control it properly. Use high visibility colors such as orange, red or yellow for the flying surfaces. The fuselage can be the same or a contrasting color. A longitudinal trim stripe on the top or bottom surface of the wing will help orient the model when it's far out. A few areas of chrome MonoKote or Mylar trim will give excellent visibility on sunny days. The transparent colors are very effective and look good with this type of structure. It's your choice and a good opportunity to express your individuality.

The wing is covered in 4 separate pieces, and the stabilizer with 2 pieces. Follow the instructions provided by the supplier if you use Super MonoKote or similar material. Be careful when shrinking the material to avoid warping or distorting the structure. Be sure to adhere the covering to the ribs on both the top and bottom surfaces for greater strength.

We suggest that you cover the vertical and horizontal tail surfaces separately, and then remove the material locally to assemble. We also find it easier to cover the tail surfaces before installing the hinges.

Final Assembly:

After all parts are finished to your satisfaction, and you have checked all the flying surfaces for twists or warps, and removed any present (except the wing tip washout noted on the plans for the trainer), you are ready to start final assembly.

(1) Remove a narrow strip of covering material to uncover the slot in the top of the stabilizer where the fin mounts. Also, remove the covering from the base of the fin, so that there is wood to wood contact between the fin and the stab center ribs. Epoxy the fin into the stab,

checking that it is properly seated and perpendicular to the stab. Use your square or triangle and check while the epoxy is curing. Use thinner, acetone or alcohol to remove any excess epoxy.

(2) Install the hinges into the stabilizer, using a pin or No. 11 X-Acto blade, to force epoxy down into the slot. Be sure that the molded crease in the hinges are lined up exactly with the stab trailing edge, and remove any excess epoxy that oozes out before it cures. Allow to dry thoroughly, then install the elevator, being very careful to ensure free action and to remove any excess epoxy. Next, install the hinges in the fin first, then add the rudder, once again checking that the surfaces move freely.

(3) Hold the tail group in place on the top rear of the fuselage and use masking tape or pins to secure it temporarily to the fuselage. Use a strip of masking tape across the bottom of the rudder and aft fuselage to ensure that they are properly aligned. Visually check that the fin is aligned with the fuselage center line, using the top stringers as a sighting guide. Check this very carefully, as a misaligned fin will cause turning tendencies while flying. When you are satisfied with the alignment, use the point of a pin held tightly against the fuselage sides to mark the bottom of the stabilizer leading and trailing edges where they meet the sides. Remove the stab and cut away the covering material from the bottom of the stab, using the pin holes as a guide. Remove any covering material from the fuselage sides and top stiffeners where the stab mounts. Coat these areas with epoxy and re-position stab in place, securing with pins. Check alignment carefully and let dry completely before handling the fuselage.

(4) Bend the tail skid from a bobby-pin (or use 1/32" diameter music wire). Drill a small hole vertically into the tail post and cut away the covering material under the skid. Epoxy the skid in place. Push the wheels over the axle ends and screw on the small spring retainers to hold the wheels in place.

(5) The next step is to mount the engine on the firewall. We highly recommend that you use the muffler called out on the plans, particularly if you plan to fly near houses or buildings. This muffler causes very little loss in power, is light and effective, and is easy to install following the instructions provided with the unit. Use four No. 2 x 3/8" long sheet metal screws to fasten the engine to the firewall. Slip a No. 2 flat washer between the firewall and mounting flange in the upper right hand corner (see plans) to provide a little right and down thrust for the first flights. Be sure to tighten all four screws snugly, but don't overtighten, as the holes in the firewall will strip.

(6) Thread the No. 2-56 x 1 studs into the end of the inner pushrods at least 3/16". Use pliers if you can't turn the stud with your fingers. If you have access to a

No. 2-56 tap, we suggest pre-tapping the pushrods and clevis to make assembly easier, but it is not necessary. Install the clevis on the other end of the stud and position the clevis so that approximately 1/8" of the stud protrudes into the slot in the clevis. Insert inner pushrod into outer tube from the rear until it comes through in the servo compartment. Spread clevis with a small screwdriver and insert pin through outer hole in control horn. Now mount control horns, lining up holes for the clevis with the hinge line. Hold in place with your fingers and use a nail or toothpick to punch through the film covering over the mounting holes. Assemble horns to the surface using the No. 2-56 x 5/16" long screws and the small square piece attached to the horn as a nut. (Cut horn and nut plate with razor blade or knife before assembly.) Check control action for binding and you are ready to install the radio equipment.

(7) Using the template provided on the plan, cut out the cockpit back and sides. Cut strips of MonoKote from the wing in the area where these parts attach. Glue the cockpit back to the wing. Sand the cockpit sides to conform to the contour of F-5A. Bevel the top and bottom edges as indicated and glue in place. Use small pieces of MonoKote to cover these parts, slightly overlapping the MonoKote on the wing. Cut the

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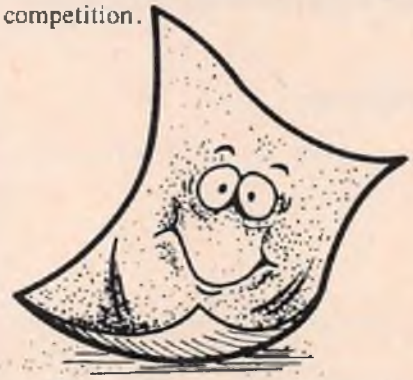
Again, because of it's unique formula, Glaskote is thoroughly compatible with all paints (epoxies, urethanes, butyrates, nitrates, enamels, lacquers, etc.) Once you have achieved the color you want with your favorite brand of paint, add one final coat of Glaskote and the finish will be transformed from flat or semi-gloss to high gloss. It is also thoroughly compatible with all model airplane coverings, especially Coverite. For example, one quick coat of Glaskote over Coverite and you have achieved the gloss of mylars, while retaining the authentic appearance and extra strength of Coverite's unique 100% polyester fibres.

Even beginners love it.

You don't have to be an expert to achieve excellent results with Glaskote. Although it dries rapidly, it flows like butter, shows no brush marks, has perfectly smooth levelling. Under normal atmospheric conditions, Glaskote sets up in 30 minutes, and is completely dry in about 4 hours.

Sands without losing its smile.

Using wet #600 sandpaper, dust particles can be removed rather easily, without removing the Glaskote shine. This means that multiple coats of Glaskote will produce a deep, ultra high gloss finish suitable for "Toledo" competition.



Fuel falls off like water on a duck.

High nitro racing fuels and synthetic oils can wreak havoc with model airplane finishes. But they have no effect on Glaskote, even when allowed to remain on its surface for an extended time. In addition, when fully cured, Glaskote will be quite scratch resistant, absorbing the abuse of most pit stops and hard landings.

Remarkably long lasting.

You might expect some drawbacks with a product that is as tough as Glaskote and as shiny; but its remarkable resins keep working for a long time. Glaskote is non-tautening, will remain pliable and will resist yellowing. Glaskote really is the ultimate finish!

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windshield from the acetate sheet using the plan template as a guide. Cut a paper pattern to match the contour of the windshield bottom as shown on the top view of the plan. Place this pattern on the wing and carefully cut away a thin strip of MonoKote where the windshield will attach. Place the windshield on the wing, wrap around and pin to the cockpit sides. Carefully apply a bead of fast setting adhesive to the windshield base. Make sure it is firmly glued to the wing and cockpit sides, then remove pins. Apply a thin strip of MonoKote around the windshield base to hide the joint. Attach a narrow piece of tape to the back edge of the windshield to represent a metal frame. The strip of foam tape is used to seal the radio compartment. Cut the tape into two 7" long pieces. Peel the backing material away and press the tape onto the top of the fuselage sides.

Radio Installation:

If you use a different radio system than shown on the plan, you will have to locate the equipment to suit; be sure to follow the manufacturer's instructions. Plan the installation carefully so that you don't have to keep moving things around, and check the balance before finalizing locations. Fasten the servo and switch into the tray and screw the tray to the servo rails. Wrap the battery pack and receiver in foam and install in the forward compartment. At this time, we suggest that you connect all cables, install antenna leadout and run antenna rearward along the outside of the fuselage.

Secure the free end of the antenna with a rubber band or tape, letting any excess length trail behind the model.

Make up the two servo links, bending as required with pliers. Thread into inner pushrod at least 10 turns, align with servo arm and make final bend. Install through hole in arm, press on retainer

and check neutral position. Adjust if necessary by screwing the clevis in or out. You should now check the balance point of the completed model by supporting the wing on your fingertips near the center. The model should balance in a level attitude about 1/8" forward of the main spar for the first flights. Slide the battery pack back and forth if necessary to balance the model. Be sure that it is firmly secured so that it will not shift around during flight or landing. If the model still won't balance properly, then you must add weight to the nose or tail to obtain good flights. It is far better to add an ounce of lead to the nose, than to try to fly a tail heavy model, which will be very difficult to handle for the inexperienced pilot.

Pre-Flight:

At this point, you are ready to make the pre-flight checks before going flying. A few minutes spent now, will give you more confidence and help to eliminate any problems at the field.

(1) Inspect the model carefully. Wiggle the tail surfaces to make sure the joints are secure. Check that the radio equipment is securely mounted.

(2) Check that the surfaces are not twisted or warped. Correct any warps with low heat or steam on the surface, while you twist in the opposite direction.

(3) Mount the wing. Make sure the rear attachment screw does not interfere with the pushrod movement.

(4) Check the balance point. Add or remove weight from the nose until it's correct.

(5) Check the radio operation. Try all the control positions and make sure the controls move in the proper direction. Check that the surfaces are at neutral position when the transmitter trims are at neutral. Adjust clevises, if required.

(6) Check your batteries, both in the transmitter and airplane. If you are using dry batteries, be sure they are fresh; if Ni-Cads, that they are fully charged. Remember that more radio failures occur from defective or improperly charged batteries than any other causes. Don't be a statistic!

Now let's go flying!

Flying Your S-Tee:

Pick a large, grassy field, without obstructions, if possible, for your first flights, even if you have to travel to find such a site. Since you are going to hand-launch the model, you don't need a paved strip or similar runway. If you can find a nearby R/C club, or someone in the area who knows how to fly R/C proficiently, by all means seek help before going flying. We will assume that you are on your own, without experienced assistance.

Before going to the flying field, run the engine at home until you are able to start it and adjust the needle valve consistently. You should also be completely familiar with the operation of the transmitter sticks and trim levers, so that you can locate everything by touch without looking away from the model. A few evenings spent hangar flying in front of an old TV movie is time well spent. Check that the controls move in the proper direction, etc., before you go the field.

Select a calm morning or evening when there is no more than a 5 mph breeze for the first flights. You will have enough trouble coping with the excitement and nervousness of your solo flights, without worrying about wind. Force yourself to wait for the right conditions!

Start the engine and adjust the needle valve until it's running smoothly. Point the nose straight up and make sure the engine doesn't quit. **Turn on the receiver and transmitter.** Develop the habit of operating the sticks and watching the control surfaces respond **before** releasing the model! Face directly into the breeze and release the model with the nose pointed directly at the horizon and the wings level. Don't throw the ship or just let it drop — just push it forward and let it fly out of your hand. She should fly out straight and level in a slight climb.

If there is a slight turning tendency, don't worry about correcting it now. If a tight turn develops, move the stick in the opposite direction to correct. The angle

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SECOND ANNUAL RHINEBECK CLASSICS

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Hosted by the Mid-Hudson Radio Control Society, this contest will be for R/C aircraft modeled after airplanes of the Classic era: 1919 to 1937.

Motel rooms have been reserved for contestants and there will also be camping facilities available.

For further information contact Vance Sutton, C.D., 21 Greenvlae Farms Rd., Poughkeepsie, New York 12603.

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MICRO COMPONENTS

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- Double sided PC boards
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MICRO Size: 1.28x1.3x.6 Wt. 0.7 oz.

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- Double sided PC boards
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- Gold plated Deans connectors
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FREQUENCY: 72.08, 72.16, 72.24, 72.32, 72.40, 72.96, 75.640

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	S5443	Rotary Dunham micro servo, assembled	544 IC	29.00	
	S1001	Rotary Dunham servo, assembled	543 IC	25.00	
	S1003	Rotary D&R servo, assembled	543 IC	25.00	
	S1005	Rotary Dunham micro servo, assembled	543 IC	33.00	
	R2000	Receiver regular, assembled	Frequency ____	36.00	
	R2001	Receiver micro, assembled	Frequency ____	39.00	
	R2001A	Modular receiver RF module, assembled	Frequency ____	22.00	
	R2001B	Modular receiver decoder module, assembled, 2 channels		13.00	
		Each additional channel for R2001B		1.50	
	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	
	S1001K	Kit of S1001 servo	543 IC	20.00	
	S1003K	Kit of S1003 servo	543 IC	20.00	
	R2000K	Kit of R2000 receiver	Frequency ____	30.00	
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S-TEE

from page 140/40

of climb is controlled with the elevator and trim movement. If the model is hanging on the prop with the nose high, reduce the climb by trimming in down elevator. Try to keep the model upwind and flying away from you by making large, gentle S-turns. Face in the direction the model is flying at all times, even if this means looking back over your shoulder. You will find that it is easy to fly when the model is going away from you but very confusing if it is coming toward you, as the turning motions are reversed. Remember that if you do get confused with the model flying toward, push the stick **toward** the way the model is turning to stop the turn. Let the model climb all the time until the fuel runs out. Usually, the engine will burp a few times and run with more power as it runs out of fuel. This may cause the climb angle to steepen, so be prepared to add down elevator to stop the zoom.

The model should now be gliding and flying slower than when the engine was running. Try adding a little up trim to slow the glide even further. Make sure that you keep the model upwind as it glides and start to think about landing. Continue to let the model lose altitude until it is down to 40 or 50 foot altitude.

You should now have the model lined up with your landing patch, and heading into the wind. Avoid making any tight turns and let the model fly toward the ground. Don't worry where it's going to land, as long as you won't hit something. When you get within two feet of the ground, hold slight up elevator to flare the glide path and let the model land. Don't give any commands after it contacts the ground. Don't feed in too much up elevator on the flare out as it may stall the model. The object is to land on the wheels with minimum forward speed. If you just fly into the ground without flaring, the model will bounce and the land-

ing gear will probably need to be bent forward.

Now that you are back on the ground, pick up the model and turn off the radio. Take the wing off and inspect everything, including your radio installation, very carefully. Make sure the engine mounting screws are tight and wiggle the tail to make sure it's still attached to the fuselage. Put the wing back on, fill up the tank and you're on the way to another flight. Good Luck!

For more information on building and flying R/C model aircraft, we suggest you get a copy of *RCM Flight Training Course – Volume I.*

Three Channel Version:

The S-Tee construction just described is for a two channel version (rudder and elevator). It is possible to add a third channel for throttle control. Modification is minor, however, the additional components create a very tight fit. For this reason, we recommend that if you are a first timer in R/C, you should stick to the stock two channel version.

The fuselage modifications for the 3 channel S-Tee consist mainly of a new nose cowl. Servo rails are positioned further aft and former F-4 requires slots for access to the servo tray mounting screws. The plan insert is self-explanatory. All components are called out. If you plan to use other than the Cox/Sanwa radio gear indicated, you should carefully check the fit of the components to the plan. Note that the Cox/Sanwa battery pack must be removed from its case in order to fit into the forward compartment.

With the components positioned as shown, the plane's C.G. will be approximately correct. Since the components cannot be moved fore or aft, a small amount of weight may be necessary in the nose or tail to achieve perfect balance.

When installing the throttle linkage, make sure the wire is kept as close to the side wall as possible. Clearance for the fuel tank and receiver is very close. □

HERE'S HOW

from page 38

cable must be fabricated to connect the servos to the receiver. Two sets of connectors (if you can buy individually, then 2 females and 1 male) along with #26 ga. hook-up wire and shrink sleeving are required to make up the special cable. This material is available from most R/C hobby dealers. Make sure the servos are centered and have about the same throw so as not to introduce unwanted differential.

If you have an eye for one of the big ones, and don't have those extra big powerful servos, this could be the idea you are looking for. Give your servos a break and make sure they'll do the job! □

A SIMPLE ANEMOMETER

from page 36

same basic 7 volt DC permanent magnet motor; the tuning meter in most CB radios is generally a 1 mil unit.

Any permanent magnet motor will work if it generates some current. It doesn't take much and it doesn't matter what the current might be. When you calibrate the anemometer, you will match the need to the current, whatever the amount.

The PM motor is acting as a generator and how much it generates is not important. The big requirement is its physical size. If all you can scrounge is a big PM motor, use a big piece of PVC pipe. That also doesn't **have** to be a certain size, as long as it isn't so ungainly that you can't use it.

Sources include tape recorders, cassette players, small garden tools, electric toys, most any of those useless Ronco electric convenience items you see around Christmas time, small record players (kid's units, etc.).

I'm sure that a little creative thought will come up with dozens of other sources, but this is the general idea.

The switch S-1 is a range switch. The original unit was set up to read 0-15 mph with the switch in the closed position and 0-30 mph in the position shown in the drawing. The cap C-1 is to dampen out the meter oscillations. R-1 and R-2 are the calibration pots and should be mounted so they may be adjusted via small holes with the unit assembled.

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Hobby Shack

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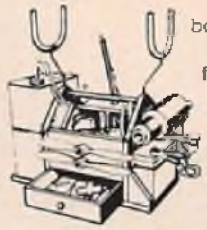

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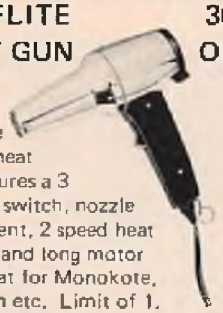

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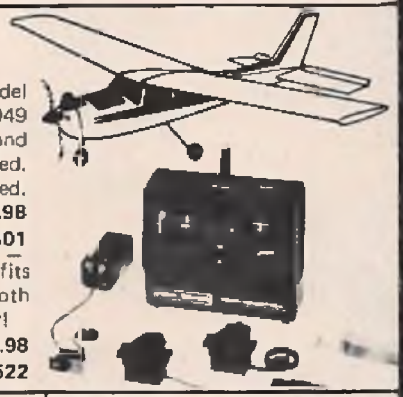

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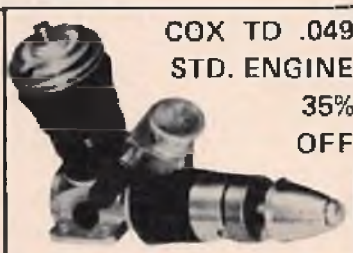

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This is the Siguma-Ace .19 size dune buggy distributed by Leisure Electronics. See the Dec. RCM article for more details.

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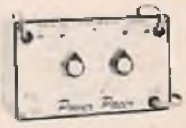

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A SIMPLE ANEMOMETER

from page 144/36

Don't glue the PVC joints together as the push fit of this plastic pipe is strong enough and, if some part should fail, it sure makes it easy to work on.

The motor will probably fit into the 1½" PVC. If the fit is loose, wrap the motor with tape; if it's too tight, use your heat covering gun and soften the tubing. This will allow it to stretch.

The length of the pieces of tubing is up to you. Just be sure that the top section is long enough so the wheel doesn't hit you in the head when you try to read the meter.

The suction cup was not on the original. This is an added goody so you can stick the unit on the roof of a car at the flying field. It is a short (6") piece of PVC.

To calibrate the unit, pick a day with little or no wind, and get a friend to drive you at a constant speed of 10 mph. With the range switch in the closed position and the unit stuck out the car window, adjust the pot, R-1, to indicate 10 miles per hour.

Now increase the speed to 15 mph and note the reading. If the indication is too low, move the cups in on the spokes a little and repeat operation.

If the reading is high, move the cups out. Once the unit is balanced (reads properly at 10 and 15 mph), place S-1 in the open position and increase your speed to 20 mph and adjust R-2 for proper indication at this speed.

One final note about the mount. The one indicated is slick but not essential. You can use a pole or a car antenna or most anything else that will support the anemometer. Only criteria are that mount be strong enough to support unit and that it allows you to read meter.

That's it. Now you have one cheap, easy to build anemometer and Fritz has one more competitor with the same edge he has.

Now — wonder what that strange device he had tucked away in his flying box was — something for his transmitter maybe — hmmm. □

RCM TWIN TRAINER

from page 33/32

grain, to plank the bottom of the fuselage.

Glue the rear cabin block up against the rear edge of the wing saddle ply and balsa parts. Use the 1/4" tri-stock to strengthen the joints between the block, saddle, fuselage sides and B-3. "Tack" the front cabin and nose blocks in posi-

to page 154

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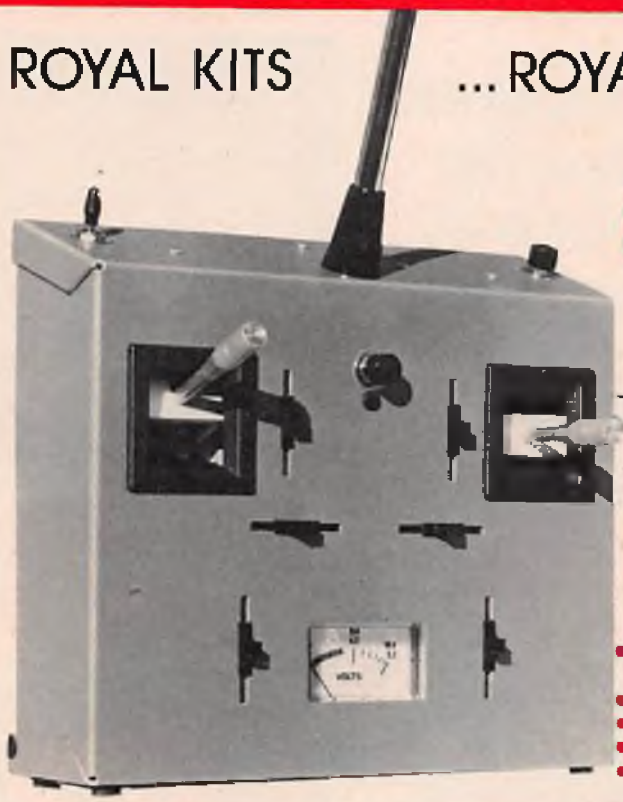

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- *Non-linear controls*
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Charge rate can be adjusted from 15MA to 250MA by knob on front panel. Chart supplied lets you set the proper charge rate to the MA/hr. capacity of your NiCad battery.

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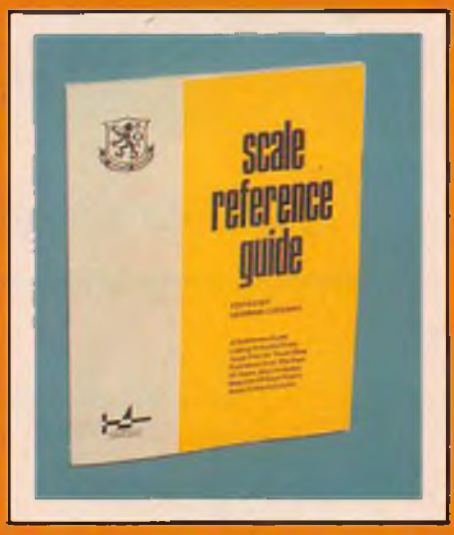

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RCM TWIN TRAINER

from page 150/32

tion. Cut and sand the blocks to shape. Glue the cabin block to the nose block. The forward section will become removable to adjust the steering gear and allow access to the "baggage" compartment. Remove the front cabin-nose unit and hollow out. Also make provisions for mounting. If foam is used, cover with 2 oz. glass cloth Hobbypoxy II.

Glue the horizontal and vertical stab in place making certain that they are perpendicular to each other. Also glue the dorsal fin in position. Don't forget the tri-stock strengtheners at the base of the vertical stab and the horizontal stab-fuselage joint. Sand the fuselage, vertical and horizontal stabs, elevator and rudder. The rudder and elevator can be hinged now or after finishing. Lock the hinges within the balsa. I use straight pins, cut to length, and Zapped in place.

Nacelles: Epoxy the 1/16" ply doublers to the nacelle sides. Decide what engine-motor mount combination you will use and make certain the prop-spinner will be in the proper position — outside of the nacelle! Mark each N-1a, drill and install the blind nuts. Install the motor mounts temporarily. Mark the insides of the nacelles for positions of N-1, N-1a, N-2, N3A and N-3. J-bolt the main landing gear struts to each N-3. Epoxy N-1, N-1a, N-2, N3A and N-3 to one nacelle side making certain each is perpendicular to the side. When set, epoxy the other side to the assembly. Glue the nacelle bottom planking in place. Drill N-1a for the fuel line, vent line, etc. Plank the top portion of the nacelle. After dry, cut out a section to install your engine. Trial fit your engine, prop and spinner. Mark the location of your engine mount holes. Also trial fit your mufflers and

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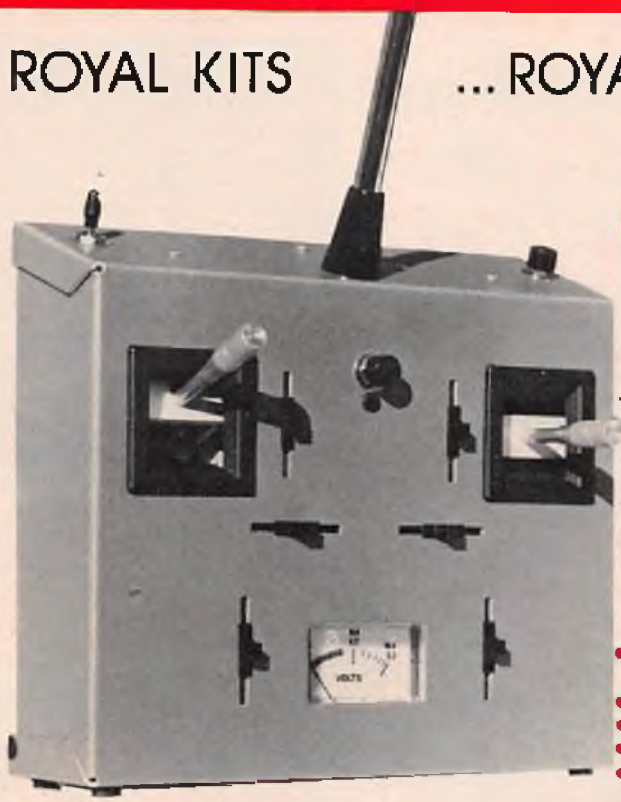

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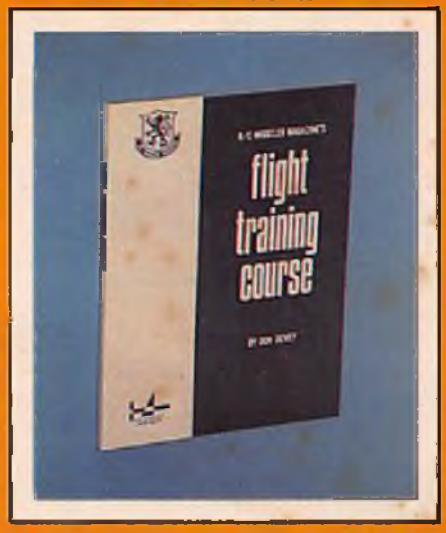

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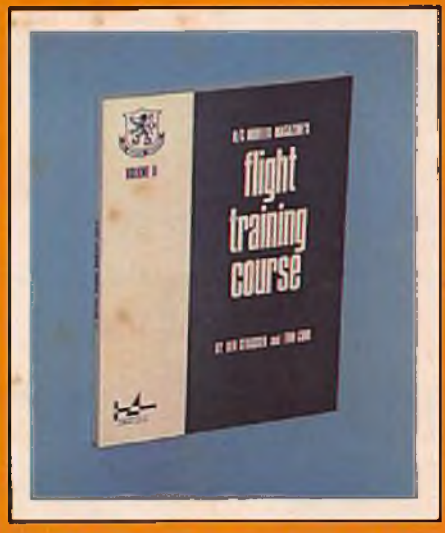

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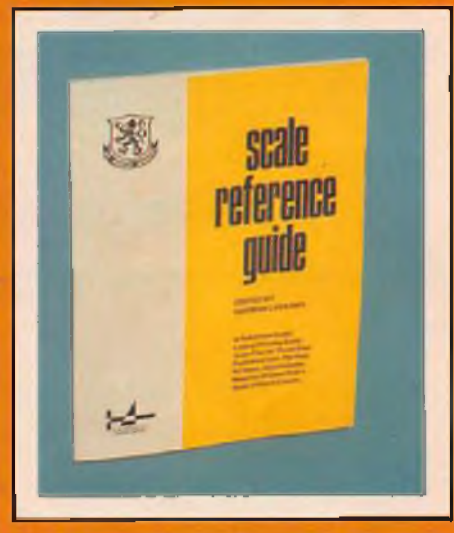

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RCM TWIN TRAINER

from page 150/32

tion. Cut and sand the blocks to shape. Glue the cabin block to the nose block. The forward section will become removable to adjust the steering gear and allow access to the "baggage" compartment. Remove the front cabin-nose unit and hollow out. Also make provisions for mounting. If foam is used, cover with 2 oz. glass cloth Hobbypoxy II.

Glue the horizontal and vertical stab in place making certain that they are perpendicular to each other. Also glue the dorsal fin in position. Don't forget the tri-stock strengtheners at the base of the vertical stab and the horizontal stab-fuselage joint. Sand the fuselage, vertical and horizontal stabs, elevator and rudder. The rudder and elevator can be hinged now or after finishing. Lock the hinges within the balsa. I use straight pins, cut to length, and Zapped in place.

Nacelles: Epoxy the 1/16" ply doublers to the nacelle sides. Decide what engine-motor mount combination you will use and make certain the prop-spinner will be in the proper position — outside of the nacelle! Mark each N-1a, drill and install the blind nuts. Install the motor mounts temporarily. Mark the insides of the nacelles for positions of N-1, N-1a, N-2, N3A and N-3. J-bolt the main landing gear struts to each N-3. Epoxy N-1, N-1a, N-2, N3A and N-3 to one nacelle side making certain each is perpendicular to the side. When set, epoxy the other side to the assembly. Glue the nacelle bottom planking in place. Drill N-1a for the fuel line, vent line, etc. Plank the top portion of the nacelle. After dry, cut out a section to install your engine. Trial fit your engine, prop and spinner. Mark the location of your engine mount holes. Also trial fit your mufflers and

modify the nacelles to fit. Drill and tap the motor mounts. Sand the nacelles to the final shape. Fuelproof the engine compartment and tank compartment with resin. Install the gas tanks and motor mounts.

Wing: This is the most difficult part of this building sequence. If you read it over a couple of times before actually starting, it'll be a lot clearer. I suggest you use a wing jig. If you can't buy one, make one using 1/4" rod and some spacer blocks. Make certain the blocks are the correct height. I'm assuming you will be using one. (Note: The rib template shows alignment tabs for those builders who prefer to use a flat building board for the wing assembly.)

We will build a half of the wing at a time. Mark spars L.E. and T.E. Notch the T.E. as indicated. Place the ribs on the 1/4" rods. Glue the top spar in position. Glue the L.E. in place making certain the ribs are centered on the L.E. Glue the T.E. in position. Cover the **top** of the wing with 1/16" balsa sheeting. Remove this half from the jig and build the other half. Remember to sheet the **top** surface of each half. When dry, place both halves on the jig with the sheeting (top surface) down. Glue the bottom spars in position and epoxy the halves together. Install your throttle servo tray. Use the 1/8" ply bellcrank mounts and balsa blocks of approximately 1/4" thickness to build your throttle bellcrank mounts. Trial fit them in the wing between ribs 3 and 4. Fit your throttle servo into your tray. Install your bellcranks temporarily. Connect the servo to your radio gear and set the throttle at the lowest throttle position (idle) with full **up** idle trim. Bend the 1/16" wires to fit between the servo arm and the bellcrank. Leave the pushrods in position. Mount the engines into the nacelles. Tape the nacelles onto the wing. Set both engine throttles at idle. Measure the distance between the engine throttle arm and the bellcrank output arm. Bend another pair of 1/16" rods

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HARDWARE & ACCESSORIES

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505 h.d. launch pail	25.75

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1/4"	3.55
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225 fuel line- silicon sm. 24"	.72
226 fuel line- silicon lg. 24"	.81
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11	5,6,6W,7,7W,7-1/2,8	6.91	1.28

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to fit in these positions. Don't forget, the clevis end is at the engine. Remove the nacelles from the wing and the engines from the nacelles. Drill N-1a to allow the pushrod to pass through to the engine throttle arm. Place the pushrods in position with the R/C gear connected, and work the throttle through the total travel including trim. After you are certain everything is alright, reset the throttle to idle with full up trim. Again, install the engines into the nacelles. Guide the pushrods through the nacelles and tape each nacell onto the wing. Adjust the clevises to set both throttles at the idle position. Check your throttle movement with your transmitter. Use the clevis and engine throttle arm to adjust both engine throttles to function identically. Make absolutely certain that the throttle linkage assembly operates smoothly with no binding. Once we cover the wing, it won't be easy to get back into the wing. When satisfied with the movement, epoxy the bellcrank mount nut in place. The real trouble of adjusting the throttles are in the throttle arm radii, bellcrank arm radii, the servo arm radii, and the start of the engine-throttle arc.

Remove the nacelles from the wing. Don't forget to mark where each engine goes. If you are certain all is fine, cover the bottom of the wing with 1/16" balsa. When dry, trim off the excess and install the wing tip blocks. Tape over the throttle servo and sand the wing to shape. Epoxy the nacelles in position. Use glass cloth and resin to strengthen the wing mid-section. Cut and shape the ailerons from 5/16" balsa. Install the aileron horns. The ailerons can be hinged now, or after finishing. Install your aileron servo and pushrods.

Final Assembly: Install the 1/4" hardwood dowels into the body if you have not already done so. Mount all hardware: engines, spinners, props, nose gear and tires. Strap the wing onto the fuselage. Use your radio gear as ballast and find their correct positions within the body to get the proper C.G. position. Install all R/C gear. Make certain the wing is perpendicular to the vertical surface and parallel to the horizontal surfaces. Trim the rear cabin block for aileron clearance.

Finish: I used Fas-Cal iron-on film to cover the plane completely. It's cheap and easy to use. A Miller spray outfit was used to shoot the Perfect Paint. I like to use two primary colors as a basis for all my planes. It is also easier to fly when one top panel is "different" from the other side. Everyone uses symmetrical paint schemes; be different!

BASIC MATERIAL LIST

Ply
1 ea. — 1/4" x 6" x 12"
5 ea. — 1/16" x 6" x 12"
1 ea. — 1/8" x 6" x 12"
2 ea. — 1/32" x 6" x 12"

Balsa
12 ea. — 1/16" x 4" x 36" Sheeting
2 ea. — 3/32" x 4" x 36" Sheeting
4 ea. — 1/8" x 4" x 36" Sheeting
1 ea. — 1/4" x 4" x 36" Sheeting
2 ea. — 1/4" x 3" x 36" Sheeting
1 ea. — 3/16" x 4" x 36" Sheeting
6 ea. — 1/4" x 1/4" x 36" Tri-Stock
6 ea. — 3/8" x 3/8" x 36" Strip
4 ea. — 3/16" x 1/4" x 36" Strip

Foam or Balsa Blocks
2 ea. Wingtip blocks — 2" x 1" x 11"
1 ea. Rear cabin block — 1.5" x 3" x 4"
1 ea. Nose block — 3" x 3" x 3"
1 ea. Forward cabin block — 2.5" x 3.5" x 9"

□

Coming Next Month: Dick Russ's Pattern Ship "REVENGER"

RACING AT RANDOM

from page 30

Medal Series, 4 channel receiver with 4 KPS-12 servos and a 225 ma. battery pack weighing 10.25 oz. The accessories include a Fox 1¾" aluminum spinner, wood prop, Sig foam rubber padding, pushrods, SS-4 fuel tank, Prather QM racing wheels, exhaust extractor, nuts, bolts, and fuel tubing. The weight of the accessories turned out to be greater than I anticipated and the airplane was built to weigh less. Weight differences will occur due to different brands and accessories chosen, and any weight saved or gained in this area directly affects the final outcome.

★

The following is a letter from Len Wiederhoeft, President of NMPRA-QM.

Dear Fred:

Five years ago, at about this time of the year, I bought my first Quarter Midget kit. In short order I had built and finished it ready for testing. With my R/C flying ability barely beyond the H-Ray

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RACING AT RANDOM

from page 159/30

stage, that first QM survived all the mistakes I could make and got me involved in pylon racing. I remember very well the excited feeling and anticipation as I went to my first race.

Today, as I write this in early December, I am again looking forward with excited optimism when I see what now becomes possible for Quarter Midgets. At this time, there are more QM races firmly scheduled for 1978 than were held this past season. QM is now an official AMA event with the rules very much as the majority wanted. Prospects for several Regional NMPRA-QM events are shaping up. The old thorny issue of joining forces in one national organization now, too, is being resolved.

Bob Smith, newly elected President of NMPRA for 1978, is offering the cooperation the Quarter Midget holdouts have been asking for. One of the loudest complaints had been the feeling that QM members were supporting Formula One events and got little in return. Bob has announced there will be a financial statement, a membership count, and a breakdown of how many are involved in Formula One and QM.

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RACING AT RANDOM

from page 160/30

Then, after common expenses, the remaining funds will be distributed on a direct percentage of members. If 60% are Formula One fliers, and 40% QM, that's the way it will be divided. Those who have listed themselves as flying both events will be counted for both. For those who have doubts if they are being counted as QM fliers, George Zink has been authorized to accept membership applications on behalf of the NMPRA. Additionally, George will be editing a portion of the NMPRA News Release, devoted to Quarter Midget information.

Bob Smith has taken a giant step toward resolving bygone problems and now it is entirely up to us Quarter Midget fliers and hold-outs to respond in kind. We can show Bob he is going in the right direction by backing him up by joining NMPRA now. It's our turn to show how sincere we are about making this event grow.

Sincerely,
Len Wiederhoeft

□

SOARING

from page 27/26

pilot. All communications should be between the pilot and the timer.

★

From Ottawa, Ontario: John McMillan is very happy holding his Standard Class "Pokey" sailplane. He just placed first in the two-day Ottawa sailplane event.

John McMillian smiles with his Pokey, after taking 1st Place Standard Class, Ottawa, Ontario annual contest.

John mentioned that the contest was windy both days with 15 to 28 mph winds all day long. Nice looking sailplane, John.

Good Lift. □

SUNDAY FLIER

from page 16/15

An Open Letter To The Editor Of The Skywriters & The Skymasters
By Jack Goodrich

By Golly I found it very enjoyable reading the Welcome Back issue of the "Skywriter"; I wonder if I am the only Skymaster who feels this way! I think probably not.

I extend my personal thanks to the editor and contributors of this issue, and I would mention them by name if I only knew who they were. Let's not be so modest or bashful in acknowledging the ram rods (or is it push rods) behind the revival of our club newsletter. Besides, the work you put into getting the issue together, your writing style is very good.

I imagine that our exalted President, Chet Brady, (Chet is a mortician), put more than a little time into the re-launch of the newsletter, but then I understand he has some time now and then while he is waiting for some fluid to drain (and I don't mean emptying a gas tank). However, I expect our officers and leaders to do all the work and organization necessary to keep our club interesting, appealing, functioning, interesting, etc., etc., etc., . . . Don't you!? After all, why did these men campaign so hard for their coveted positions.

We, the rank and file of this club (the infamous silent majority), demand that our leaders do all the work and planning necessary to make it a desirable club to belong to. We further expect you leaders to have the Auburn Road flying field in good condition at all times, even the dirt entrance road during and right after the rainy season.

(Note: You guys are not doing your job here as the road has a few low spots and some mud puddles develop after a rain. How do you expect me to keep my car clean when I have to drive through your mud puddles? Answer me that, you leaders.)

Don't forget that we also expect you to spend some time at the Hamlin Road field keeping things ship-shape out there also, after all, you are the leaders of the club and you have responsibilities to the rest of us. You certainly must have more time for this sort of thing than we do.

Look how busy I am! I had to get up an hour early for two days in a row just to write this letter pointing out where you are falling behind. You leaders should have everything under control. I don't know why we have to spend any time at all reminding you what the rest of us want and expect. Here are just a few things that we want you to take action on.

We The Silent & Non-Contributing Majority Of The Skymasters Demand The Following:

(1) You should develop a better way to keep us informed of what's happening. Just because we almost never go to the club

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SIG SALUTES THE "SPIRIT OF AMERICA" SHOW TEAM

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The Spirit of America Show Team of Toledo, Ohio is one of the growing number of RC demonstration groups who use Sig designs in their public performances. In the heading photo, we see Jim Lasik and his Kougar, Dave Baum with a Skybolt and Dave Whitaker holding his Clipped Wing Cub. In the background is the unusual silhouette of the Neil Armstrong Space Museum in Wapakoneta, Ohio, where the team starred in the Fourth Annual Armstrong Museum Festival of Flight. The team members come from three northwest Ohio radio control clubs and they have performed in the Canadian Expo in Ontario and the U.S. Nationals held in Lake Charles, LA and Dayton, OH, as well as many other places.

Upper Right: One of the show acts of the Spirits of America RC Show Team is an aerobatic biplane routine performed by Dave Whitaker and Dave Baum using Sig Skybolts. The Skybolt model has a full symmetrical wing section and is capable of a wide range of maneuvers. Surprisingly fast and clean flying for a biplane, it can take unplanned problems like high winds in stride. Although widely used as a show team and International Model Aerobatic Club competition design, it also is a favorite of sport fliers, who like its docile handling characteristics. Best of all, it is strong, able to take the punishment of high "G" stunts and rough field landings.

Right: The full team of "Spirits" decked out in their non-flying uniforms as seen at the annual Toledo Exposition: Left to right are: Bob Roach, Rick Witte, Randy Lewis, Tom Rice, Dave Whitaker, Jim Lasik, Dave Baum and Ken O'Brien.

THE SIG 'KOUGAR' . . . a great show plane

by Jack Anglin Reprinted from DCRC NEWSLETTER

"The Sig Kougar is a .40 sized intermediate trainer that would be a good addition to any sport flier's stable (hangar?) of planes. It is quick and easy to build, a smooth flier, and good looking on the ground and in the air.

The construction of the Kougar is about as simple as any build-it-yourself RC plane can be. The fuselage is a basic balsabox which is nicely disguised by the addition of a plastic cowling, canopy and long turtleback which fairs neatly into the vertical tail fin. Tapered stock is provided for the rudder, elevator and ailerons. Foam cores speed construction of the wing and virtually guarantee no twists or warps. Unlike some .40 size planes, this one has plenty of room for easy installation of the fuel tank and radio gear. The instruction booklet is better than average, which is fortunate because there are no full sized plans.* My only complaint, aside from the lack of full sized drawings, is that the instructions do not even mention incidence and thrust angles. I set mine up 0-0-0 and it trimmed out with all control surfaces centered, so that must be what was intended.** . . . . .

.....After nine or ten flights, I can say that the Kougar is going to be a good show plane. It handles smoothly, is not sensitive to turbulence, and lands slow and easy even in a crosswind. A big plus also is that it has the "real airplane" look that appeals to audiences not attuned to the functional beauty of a contemporary pattern ship. . . . . "

THE KOUGAR DESIGNER COMMENTS:

*We don't furnish plans in the kit, Jack, because we feel they are not really necessary with the Kougar's method of assembly. The savings from not having to print and store the big sheets are passed on to the kit buyer. Take the fuselage, for example. The "plan" is printed---full size---directly on the fuselage side wood and the building is done right on the sheet, a short cut that eliminates some steps as compared to building on a plan, removing the structure and then sheeting it separately. Covering the foam wing core with balsa doesn't require a plan either and the tail parts are printed full size on the wood also. We feel the many thousands of Kougars that have been built using this simplified construction system are proof that there are no serious hindrances to the builder.

**You are absolutely right! The model is intended to be 0-0-0 but we should by all means state this in the instruction book. We will correct this omission in the next printing. Incidently, the Kougar is designed so that, if built with average care, the parts go together and provide the 0-0-0 setup automatically without any extra effort on the part of the builder. The model comes off the work bench ready to fly.

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Unlike other models with plastic fuselages, the Kwik-Bilt Cessna doesn't depend on the shell for strength. The Cessna fuselage is based on a solid balsa center profile, beefed up with plywood doublers. Tail, wing, engine and landing gear are all mounted on this profile center. The plastic fuselage shells are really only streamlined fairings, decorations that add the scale shape, instead of functional parts of the fuselage. Minimal flight and vibration loads are imposed on the shells. Even if they should crack, the structural integrity of the model is maintained.

Some kits use styrene or other types of plastic that are difficult to glue and paint. The ABS plastic parts furnished with the Cessna can be welded together in seconds with butyrate dope thinner, acetone or MEK. A wide variety of finishing materials - Sig Supercoat dope, epoxy paints or enamels - can be applied to the ABS plastic used in Sig kits.

"MA HACKER" SPROUTS WINGS!

by Carmen Edmunds Reprinted from HAWK TALK - Newsletter of the Omahawks

This article is not for all the "Hot Shot" pilots who are already tearing up the sky with no help from anyone. This is a message for those of you who are still asking "Can I really build an airplane and fly it without putting it in the ground on my first attempt?" After watching and listening to and listening to my husband build and fly many airplanes in the course of 8-1/2 years I decided "Why Not". Maybe if somehow I could learn to fly it would help pass some of those long days at the field or those "exciting" nights in the building room.

So, with Paul's full encouragement we forged ahead and he selected a Sig Kadet for me; my only definite opinion of the subject being that it GO SLOW! I kept a watchful eye on the engine that was going to go into my airplane- I had no intention of winning any races! In one very full week we built and covered the Kadet. We would both build at night, and I would build during the daytime while Paul was at work. One of the main points I would like to make about the Kadet is the ease of construction. The kit comes with a book which has step by step instructions on the building sequence; this removed three-fourths of the puzzlement out of building for me. Previously, when Paul would open up kits, I'd see this one sheet of plans that you build from and say, "You've got to be kidding! How do you know what to do? "Fortunately, the Sig kit eliminated that problem. With the airplane completed, whitewall tires and all, we set off to Hawk Field for the maiden flight; I was a little nervous to say the least!

Now, I have an advantage (?) over some people. I have heard blow by blow descriptions of Paul's million or so flights. And what he didn't know, Bill Ferretti did. But let me tell you, when that plane got into the air my mind went blank! I didn't even know where my right hand was, let alone how to make the airplane go that direction. By the end of the evening though, things began to look a little less hopeless. After two or three more trips to the field, I could maneuver the plane around the sky most of the time without my big friend having to grab the transmitter from my hands during occasional moments of "Temporary Insanity". I have yet to take off and land by myself, but Paul says "NO SWEAT!" - let's hope so!

So, if you are looking for an airplane that is easy to build and quick to learn to fly on, even if you've had no previous experience, I would recommend the Sig Kadet. One lesson I learned from all of this is never to say "I can't do that" because maybe you CAN! And you might even enjoy it.

(Okay ladies, the gauntlet has been thrown. Carmen Edmunds has built her very own airplane and is FLYING IT! What's holding up the rest of you? Keep in mind that Carmen had to overcome a severe handicap that none of the rest of you have- Paul Edmunds.) - Ed.

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from page 163/15

meeting is no reason for us to be uninformed!

(2) You should have at least two instructors at the field seven days a week until dark. After all, the instructors did volunteer to help us new guys learn to fly; now it's up to you to get them organized so we can be sure they will be out there at the field in case we need them.

(3) We want a better wind sock at the field. That piece of clap trap we have out there now is really mickey mouse. Why, if I had the time, talent, tools and material, I could make a better one myself.

(4) We want a better sign made up for the field entrance. After all, we do have a sign painter in the Club who has done quite a few free-bee jobs for us in the past, so why doesn't he come up with a nice entrance sign?

(5) We want fresh chalk lines on the field for our flight line, pit and parking areas. We feel you could find someone to volunteer to keep them up if you would only work at it a little bit harder.

(6) We want you regular fliers to be more friendly and cordial to us guys who only come out to the field once or twice a year. You should study our roster so you can come up and greet us by name and talk all that airplane talk to us just like you do amongst yourselves. You guys seem to have a clique where you have more fun and help each other all the time, so it's up to you to come over and get to know us better. After all, we pay dues too!

(7) We want to know who the bubble head is that picked the location for our back-up field. It doesn't show any class to have a place to fly which is located between a dump and a disposal plant. I'm sure if this guy put a little more time in researching the area, he could have leased a flying field with more desirable neighbors.

(8) We want the officers to make our club meetings more entertaining. We have no suggestions or contributions as to how to do this, but we expect you to do it. Okay?

(9) We have three members in our club who have hobby shops. Now why don't these guys have super big sales that offer better deals than the big national mail order houses. After all, they are brother Skymasters. Every time we try and do business with them, they usually only offer a small discount, when we're sure they could be making a lot of money even at 50 to 60 percent off their normal competitive prices.

(10) We want better organization at our club flying contests. Those of you who volunteer to put these things on should be completely familiar with what you are doing, even though it might be the first time you are doing it. So get organized and let's not have any delays or confusion.

If I only had more time I could come up with a lot more things that you officers and leaders should be doing to make a better club of the Skymasters, but as I said, I am a busy man. However, if we, the silent majority, run across something else that we don't like about your club, you can be sure we will not hesitate to let you know about it as soon as possible. Also there is a lot of talent in our ranks. We

have solutions to most all of your problems. All you have to do is ask us, as we are not dumb or stupid, but do not count on us to do any work because we are just too busy.

Unless I miss my guess, Jack Goodrich has pretty well stated the attitude of so many R/C club members that we could all take a look at ourselves and say, "You mean me?"

☆

To close out this month's column, I have to admit that occasionally, we at RCM, have to bow to the pressures of economics. As a result, in my February column, two color shots of my 1/2A Jenny model of my father's airplane had to be omitted. The result was that I described to you how to modify the Sterling kit — and then didn't show you a picture of the model. So, as the saying goes, due to conditions which got out of control, here are a couple of belated photos of Jenny 2805, the Sterling kit which, by the long arm of coincidence, is a model of my dad's airplane in WW I. And if any of you decide to make your own version,

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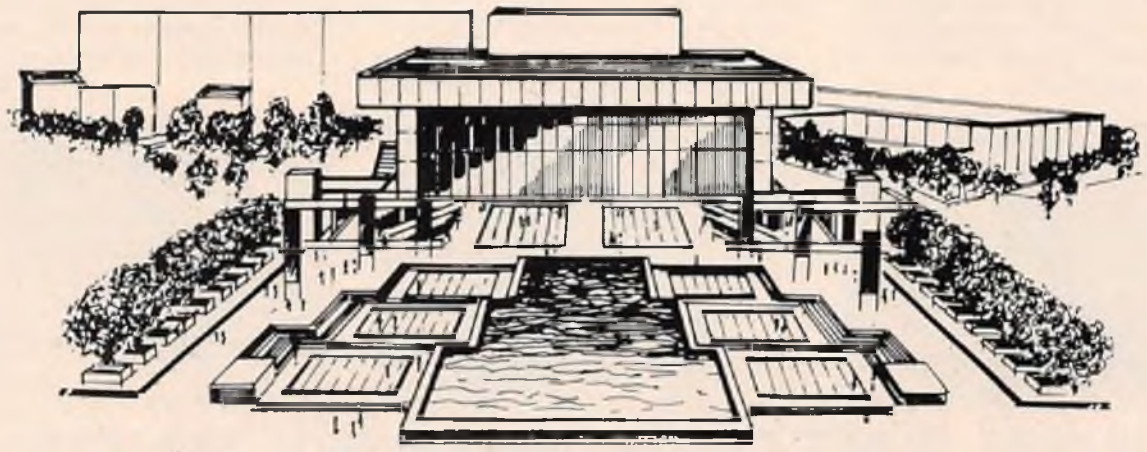

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SUNDAY FLIER

from page 167/15

I'd be very grateful if you'd send me a photo of your model.

An interesting sidelight. My model weighs a little over 12 ounces — yet it is marginally powered with an .049. Why? Because I have it strung with the complete rigging wires of the full scale job, and it's almost like pushing a board through the air. 1/2A engines normally can be expected to fly jobs up to as heavy as a pound and a half. But it depends on the model.

Next month's column will describe some of the tests I've been making with 1/2A engines, plus an interesting variation. I think it will intrigue you. □

ENGINE CLINIC

from page 12/10

bar to allow more air into the engine. I finally reduced the spray bar to .075" and this made the engine open up quite a bit, all that extra air and mixture.

The last, I would not recommend for the layman to do as it requires very careful alignment of the bypass holes in the carb between the spray bar and the carb body and, since the spray bar is a press fit into the carb body, this can't stand too many removals, so one has to know where he is going and what he is doing.

Keep up the good work on your column - - - it sure helps many flyers to understand the workings of an engine.

Yours truly,
Ray Gareau
Laval, Quebec

Sure sorry to hear that I got your blood rushing, Ray, but my answer was not speculation. I have flown my own .61

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from page 169/10

many, many hours with the Tarno carburetor performing tests, etc. This column would not have lasted 10 years now if I had been passing out incorrect information based on guess work.

Any number of carburetors will work on an engine in conjunction with the Perry pump, but will not work well. Because of the pump pressure, any carburetor that will work properly on a non-pump engine is going to load badly through the mid-range if used with the Perry pump, this due to the fact that few carburetors have a mid-range mixture adjustment. The idle mixture you can set as well as the high speed. But without any means of adjusting the mid-range, the engine is going to load up. Carburetors that have only an air bleed adjustment for idle mixture do not work well with the Perry pump either. Any carburetor that does have a mid-range adjustment will work with the Perry pump. The Perry pump carburetor does not have a mid-range adjustment, but the carburetor itself has been calibrated to compensate for the increased richness through the mid-range; any fine tuning then done with the pump pressure.

In the case of the Tarno carburetor, the last model I received also had the idle mixture adjustment eliminated. There was no way of adjusting either the idle mixture or mid-range — only the high speed. Earlier model Tarno carburetors did have an idle mixture adjustment which is what you must be using unless Tarno has gone back to the idle mixture adjustment on later model carburetors. If this is the case, I did not know of it. At any rate, without a means of adjusting the mid-range mixture, the Tarno, like any other carburetor not intended for pump use, loads through the mid-range. This can be helped by reducing pump pressure but, by the time the pressure is low enough to lean the mid-range, it is usually not high enough to supply sufficient fuel at high speed. You must have an unusual pump that will supply enough fuel at high speed with the pressure backed out to minimum. Most fellows would not be able to do this.

Dear Mr. Lee,

I have been an active model builder and motorcycle racer for more than 20 years. I feel I have a fair understanding of engine principles, but there is something that has been bothering me for some time. Why is it that a racing motorcycle engine, which puts out about 3 horsepower per cubic inch at upward of 10,000 rpm gets by quite happily on 20 to 1 gasoline and oil mix (up to 50 to 1 with some lubricants), while our model engines must have a mixture on the

order of 3 to 1 alcohol and castor? When you consider the relative burning ratio of alcohol and gasoline, it seems that the motorcycle engine is running on about 5% to 7% as much lubrication as the model engine. Why is this?

I'm sure there must be some flaw in my thinking, but I can't seem to put my finger on it.

Sincerely,
Sonny Mosel
San Antonio, Texas

Your question is one which I do not know the complete answer myself. There seem to be many factors involved. Theoretically, we should be able to run far less oil in our fuels than we do, but practical application proves that this cannot be done. 18% is just about the minimum amount of oil we can get away with and 22% is a much safer amount. On the test bench, I have run fuels containing 10%-12% oil with no problem. However, in the air, it is another story and herein lies part of the answer. Motorcycle engines run with a fairly constant mixture setting because of a somewhat more complicated carburetor and better control of ignition due to a distributor and spark plugs. If our model engines were run on spark ignition, as in the old days, and with a constant mixture setting, we could also use a low oil content fuel. However, our model engines are subjected to periods of lean running where combustion temperatures and cylinder head temperatures skyrocket. The extra oil is necessary to help carry away heat and provide lubrication during these periods of lean running. If you could keep your engine running on the rich side of a two cycle all the time, with no tendency to ever go on the lean side, you could cut the oil content in half. Unfortunately, this just is not possible with glow ignition and the type of carburetion used on our model engines.

Many people will tell you that the use of needle and roller bearings on the rod, wrist pin, etc., in motorcycle and outboard engines, allows the use of the low oil content fuels. This is true in motorcycle and outboard engines. Needle bearing rods, ball bearing cranks, etc., have been used in many model engines over the years, but the piston/sleeve then becomes the weak point in the chain. The use of low oil content fuels always results in scoring of the piston/sleeve, if not actual seizing. So it is obvious that the operating temperature exceeds the oils limitations and film strength. When the oil film breaks down the parts seize. The additional oil helps to carry away the heat and provides more lubrication.

We could naturally increase the cooling fin area to make the engine run cooler, but then the engine would run too cold with a rich setting and the glow plug would not stay lit. With spark ignition, you can use more cooling area and let

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KRAFT SEVEN CHANNEL

KPT-7CS

1976 Centennial 7 channel Kraft 2 Stick and 1 Stick Systems. List Price $515.43, and we are letting them go for only $359.95. Brand spanking new, famous Kraft guarantee, and your choice of frequency, and servo. Choose the KPS-15 workhorse or smaller KPS-14.

Your Choice! KRAFT'S ONE OR TWO STICK SYSTEM ON 72-75 MHZ OR 50 MHZ

LIST PRICE $515.43
BHC PRICE ONLY. **$359.95**

KRAFT SYSTEMS, INC.

'77

	LIST	BHC
KRAFT		
KP-2A	129.95	89.95
KP-3C	219.95	178.95
KP-3CS	219.95	178.95
KP-4A	299.95	194.95
KP-5C	375.43 *	259.95
KP-5CS	375.43	280.00
KP-6A	339.95	224.98
KP-7C	515.43	380.00
KP-7CS	515.43	380.00
KPS 14, 15 SERVOS	38.95	

Brand New Fully Guaranteed By Kraft Systems Inc.
KRAFT TRAYS, MOUNTS, TANKS WHEELS, NICAD PAKS, ENGINES

$SAVE $ • BHC SINCE 1952 • LOWEST PRICES ANYWHERE! • PROVEN INTEGRITY!

WORLD ENGINES NEW LOW, LOW PRICE
5 CHAN. "EXPERT" ONLY
$235.95

NEW MARK II

	LIST	B.H.C.
EXPERT 7 CHAN 2 STICK 4 SERVOS	433.00	263.95
EXPERT 7 CHAN 2 STICK 5 SERVOS	465.00	271.95
EXPERT 5 CHAN 2 STICK 4 SERVOS	400.00	236.95
S-10 OR S-11 SERVOS	45.00	36.95
550 MAH BATTERY PAK	19.00	15.95
MISS. WORLD	49.95	37.95
SKYWAGON, SKYKNIGHT	59.95	48.00
SHELL FLY B	59.95	48.00
DAS BOX FLY BIPLANE	39.95	29.95
DAS BOX FLY SHOULDER WING	29.95	23.95
DAS BOX FLY LOW WING	34.95	27.95
PIPER CHEROKEE	42.95	34.40
NEW CUB	39.95	31.99
CARDINAL, OLYMPIA	42.95	34.40

WORLD ENGINES 5 CHAN, 1 STICK ALL NICADS 3 SERVOS ONLY $169.95

OS ENGINES	LIST	BHC
OS 10 FSR std	22.95	18.40
OS 10 FSR R/C	28.95	23.20
OS 15 std.	29.95	24.00
OS 15 R/C	35.95	28.80
OS 20 std.	30.85	24.80
OS 20 R/C	37.95	30.40
OS 25 std.	33.95	27.20
OS 25 R/C	38.95	32.00
OS 25 FSR R/C	56.95	45.50
OS 25 FSR std	49.95	40.00
OS 30 std.	40.95	32.80
OS 30 R/C	45.95	36.80
OS 35 std.	41.95	33.60
OS 35 R/C	47.95	38.40
OS 40 std.	57.95	46.40
OS 40 R/C	69.95	55.00
OS 40 FSR R/C	84.95	68.00
OS 60 R/C BLK HD.	94.95	76.00
OS 60 FSR R/C	114.95	92.00
OS 60 FSR R/C w/pump carb. & muff		116.00
OS WANKEL	104.95	87.00
OS 60 RSR	129.00	103.20
OS 65 RSR	133.95	107.20
OS 60 four cycle R/C	199.95	139.95

	LIST	BHC
OS 10 FSR R/C MARINE	35.95	28.80
OS 20 R/C MARINE	47.95	38.40
OS 40 SR R/C MARINE	94.95	76.00
OS 45 RSR MARINE	104.95	84.00
SUPER TIGRE ENGINES		
X-15 FI pch. std	59.95	47.95
X-15 ABC R/C	62.00	48.00
G-15 R/C	38.00	31.00
ST 23 std	35.00	26.00
ST 23 R/C	49.95	35.50
X-29 RV ABC	74.00	58.00
ST 35 std	50.00	39.00
ST 35 R/C	45.00	34.95
ST-X 40	76.95	61.60
ST 46 R/C	56.00	44.00
ST G 2,1/35 std	50.00	39.00
G60 FI PYP R/C	85.00	67.00
G60 ABC PYP R/C	93.00	74.00
G60 B H w/pump & carb	104.00	83.00
G71 FI R/C	99.00	78.00
ST 60 FI BB R/C	70.00	55.00

★ **BHC SUPER SPECIAL!** ★

KRAFT SYSTEMS, INC

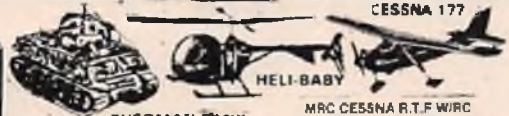
BRAND NEW '77 KRAFT 5 CHANNEL, 2 STICK (KP5C) SYSTEMS. ON ANY 72 THROUGH 75 MHZ. CHOICE OF SERVOS-14's OR 15's. **WHILE THEY LAST!**

LIST $375.43–BHC $259.95

SEND MONEY ORDER FOR IMMEDIATE DELIVERY. ADD $3.00 FOR SHIPPING. EXCESS REFUNDED.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

MRC



SHERMAN TANK

SHERMAN TANK W/RC
LIST $230.00 BHC $175.00
SHERMAN TANK W/O RC
LIST $119.95 BHC $93.95
LEOPARD TANK W/O RC
LIST $153.00 BHC $112.95

MRC CESSNA R.T.F W/RC
LIST $569.99 BHC $415.00
CESSNA W/O RC R.T.F.
LIST $340.00 BHC $225.00
CHEROKEE R.T.F. W/RC
LIST $649.99 BHC $449.99
CHEROKEE R.T.F. W/ORC
LIST $390.00 BHC $259.00
HELI-BABY COPTER
LIST $265.00 BHC $193.95
SUPER BABY COPTER
LIST $299.95 BHC $219.95
CHEROKEE & CESSNA
IN COMBO WITH #774 R/C UNIT.

MRC SYSTEMS	LIST	BHC
772-2 CHAN	109.95	87.50
774-4 CHAN	269.95	189.95
765-5 CHAN	339.95	219.95
775-5 CHAN	369.95	229.95
REMOCALL	24.95	19.99

NEW "SUEVIA" 2.5 H.P. ENGINE. LIST $249.95 BHC $179.95

MRC "FLIPPER" ONLY $199.95

NOW IN STOCK. ADD $4.00 FOR SHIPPING

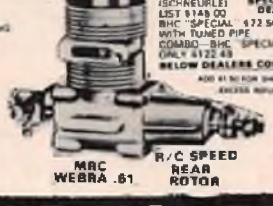
Length 25" Beam 10"

ALL FIBRE GLASS READY MADE HULL, FOAMED WRAP AROUND WINDSHIELD, SELF SEALING HATCH COVER FOR R.C. COMPARTMENTS, MOTOR MOUNTS, RUDDER, PROP SHAFT STUFFING BOX, UNIVERSALS, BEARINGS, FLYWHEEL, COOLING CLAMP, ALL TUBINGS, TANK, OIL FILTER, SEPERATOR MUFFLER FOR CLEAN ECOLOGY, SPECIAL SILICON ASSEMBLY, ALSO INCLUDED PAIRS OF FINEST QUALITY MACHINED STEEL AND BRASS PROPELLOR, PASSED ENGINEERING BY FAMED DIETER SCHLUTER OF HELICOPTER FAME. EASY ASSEMBLY, TIME LIMITED QUANTITY. R.C. ENGINE NOT INCLUDED

ANOTHER BHC EXCLUSIVE!

MRC WEBRA .61 R/C SPEED REAR ROTOR ENGINE (SCHNEURLE) LIST $148.00 BHC "SPECIAL" $72.50 WITH TUNED PIPE COMBO—BHC "SPECIAL" ONLY $122.45 BELOW DEALERS COST!

ADD $1.50 FOR SHIPPING. EXCESS REFUNDED.



MRC WEBRA .61 R/C SPEED REAR ROTOR

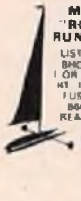
MRC PORSCHE R/C CAR

LIST $56.95
BHC $45.99

2 CHANNEL, 2 SERVOS NEEDED

REMOCALL LIST $24.95 BHC $19.99

MRC "ROAD RUNNER"



LIST $89.95 BHC $54.95 1 OR 2 CH. RC KIT 1650 MM FUSELAGE 860 MM REAR WHEEL SPAN 820 MM

E.K. LOGICTROL'S "NIMBUS"

BHC ONLY $179.95

E.K. LOGICTROL	BHC
"NIMBUS" 4 CHAN 2 ST	$179.95
CHAMPION 5 CHAN 2 ST	$219.95
SUPER-PRO 7 CHAN 2 ST	$249.95

ALL ABOVE COMPLETE—4 SERVOS, RECHARGEABLE BATTERIES, CHARGER, TRAYS, ACCESSORIES, WARRANTY, ETC.

$SAVES ALL MAJOR R/C SYSTEMS, KITS, ARFS, AND READY TO OPERATE EQUIPMENT.

INCLUDE $4.00 FOR SHIPPING—EXCESS REFUNDED IN CASH. SEND MONEY ORDERS FOR PROMPT SHIPMENTS—EXTRA FOR AIR & OVERSEAS. PRICE LIST 35¢—FREE WITH EACH ORDER.

BROWN'S HOBBY CENTER

6031 BROADWAY, BRONX, NEW YORK 10471 ONE BLOCK NORTH OF 242nd STREET "EL" STATION
OPPOSITE VAN CORTLANDT MANSION TELEPHONE (212) 796-5422 CLOSED ON WEDNESDAY AND SUNDAY

$ SAVE BROWN'S SAVE $
HOBBY CENTER

PRICES SUBJECT TO CHANGE RESIDENTS OF NEW YORK STATE ADD 7% FOR SALES TAX SALE PRICES FOR LIMITED TIME ONLY NO C O D POSTAGE INSURANCE EXTRA—ADD $4 00 WE REFUND ALL EXCESS IN CASH WITH ORDER

DREMEL SPECIAL!

Variable Speed MOTO-TOOL Kit 381
Includes Model 380 Moto-Tool with ball bearing construction and .9 amp motor, 115V 60 Hz AC. Contains over 30 accessories in carry/storage case.

LIST 69.95
BHC 43.95

Model 572 Deluxe MOTO-SHOP
Includes a rubber backing pad, adapter, 6 sanding discs, 9 saw blades, 1 cloth wheel, 1 wire brush, 1 adapter, 1 polishing compound stick, 1 flexible shaft attachment and complete accessory kit.

LIST 87.95
BHC 61.60

DREMEL EXTRAS

219 BHC $25.40
223 BHC $10.50
217 BHC $16.80
BHC $7.70
210 BHC $15.40

WE HAVE A COMPLETE LINE OF DREMEL TOOLS AND ACCESSORIES

ASTRO FLITE STARTER LIST $16.95 BHC $11.95
ALSO NEW "POWER PANEL" AT ONLY BHC $16.10

DAE POWER PANEL
STANDARD $14.95
DELUXE $24.95

CUSTOM CRAFT MITER SANDER LIST $27.95 BHC $19.99

DUBRO "COPTERS"
DUBRO SHARK 601 LIST $375.00 BHC $249.95
SHARA TRAINING GEAR 326.10
TRI STAR BODIES $20.00 $28.00

BANTAM PLUG R/C
WITH IDLE BAR LIST—$2.00 BHC—$1.40
STANDARD BHC—$1.20
PRIME THRU PLUG

K&B ENGINES

#6525 61 RC W/MUFF LST $85.00 BHC $59.50
#6535 61 RC W/PUMP/MUFF LST $110.00 BHC $77.00
#6712 19RC CAR/BOAT/PL'N LST$47.00 BHC $32.90
#7860 36 UKIE LST $29.95 BHC $21.00
#7861 35RC LST $34.95 BHC $24.45
#8011 40RC "75" LST $62.50 BHC $43.75
#8060 40RC MARINE LST $75.00 BHC $52.50
#8360 40RC FRW/PP LST $89.50 BHC $62.95
#8380 3.5ccSI FR W P LST $67.50 BHC $47.25
#8382 3.5ccSI OUTBOARD LST $99.50 BHC $69.95
#8384 3.5ccSI MARINE LST $89.50 BHC $48.65
#8450 3.5ccF/F or U/C LST $57.00 BHC $39.90
#8500 4.9ccRACING F/F or U/C $95.00 BHC $66.50
#8550 3.25cc F/F or U/C $57.00 BHC $39.90
#8600 5.8ccF/F or U/C $95.00 BHC $66.50
#9000 6.5cc FR/MUFF LST $110.00 BHC $77.00
#9001 6.5 RACING LST $89.50 BHC $62.70
#9020 6.5ccFF or U/C LST $95.00 BHC $66.50
#9030 6.5ccRS III RR LST $92.00 BHC $64.40
#9040 6.5ccRS3 MARINE LST $99.50 BHC $69.95

PANAVISE

SULLIVAN

2 VOLT 4 AMP SUPER/GEL EXPRESSLY FOR MODEL USE BHC—ONLY $19.99

SULLIVAN CHARGER A GREAT TEAMMATE
BHC—ONLY $7.95

SUPERSTAR OF STARTERS
DELUXE $25.90
STANDARD $23.80

FULL LINE OF CONTROL LINE KITS, ENGINES, & ACCESSORIES, AT BIG DISCOUNTS

DUBRO FUEL PUMP

ONLY ONE MOVING PART NOTHING TO BREAK OR WEAR OUT!
LIST $10.95 BHC $7.98

BRITISH 4-4-0 SO WINCHESTER LOVE STEAM LOCOMOTIVE AND TENDER IN 1 1/2" SCALE COMPLETE WORKING MODEL 22½" LONG BUILT PAINTED READY TO RUN SECOND FREQ 4-4-0 ONLY $500.00—$319 AT $340.00

STAGGER WING LENCO

LIST $119.95 BHC $109.95

SELECTOR HEAT IRON

LIST $22.40 BHC $15.99

#8382 K&B MARINE OUTBOARD

LIST $99.50 BHC 159.95

DUBRO PROP DRIVE UNIT

FOR BIG AIRPLANES
LIST 100.00 BHC 69.95

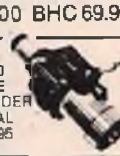
GEE BEE IN STOCK

MALLARD . . $32.99
ISLANDER . . $34.95
SEA HAWK . $34.95
FLOATS 33" . $16.49
FLOATS 28" . $14.95

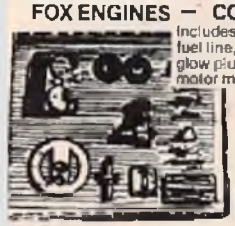
$ SAVE $

INCLUDE $4.00 FOR SHIPPING—EXCESS REFUNDED IN CASH. SEND MONEY ORDERS FOR PROMPT SHIPMENTS. EXTRA FOR AIR & OVER SEAS PRICE LIST 35¢ FREE WITH EACH ORDER

ARROW .60 R/C IN LINE SINGLE CYLINDER BHC SPECIAL ONLY $289.95



FOX ENGINES — COMPLETE CONTROL LINE KITS



Includes appropriate tank, handle, control lines, wheels, fuel line, line connectors, bell crank, elevator horn, spare glow plug, wrench, fuel filter, wheel collars, spinner nut, motor mount bolts, and landing gear clips.

	LIST	BHC
FOX .15 BAFFLE	39.33	27.00
FOX .15 SCHNEURLE	46.33	32.00
FOX .19	43.43	30.00
FOX .35 (PROFILE)	46.33	33.00
FOX .35 (FUSELAGE)	46.03	31.80

PAK OF 4 GOULD NiCADS 475 MA 4.8 VOLTS EASILY SEPERATED $5.98 AS ABOVE 500MA $6.98

STEVE MUCK'S LIL LIGHTNING

ALSO AVAILABLE LIL NORTHWIND 33.30" LONG LIST $59.95 BHC $41.30 NORTHWIND 40.32" LONG LIST $67.00 BHC $43.40 DOLPHIN 23 dy NEI ADD $2.00 SHIPPING EXCESS REFUNDED

D&B KITS	BHC
P-40	109.99
ZERO	109.99
CORSAIR	119.99
STUKA	129.99
T-2J BUCKEYE	129.99
YANKEE	76.99
SABRE JET	139.99
P-51	119.99

Add $5.00 for shipping

DUMA S BOATS AND PLANES

DUMAS HIGHEST QUALITY BOATS AND PLANES IN WOOD AND FIBERGLAS AT 30% OFF-FITTINGS AT 20% OFF. SEE OUR LIST, SAVE $$

POWER PACER LIST $59.95 BHC $44.95

LOWEST PRICES ANYWHERE ON ALL KITS. BOATS. ENGINES BATTERIES ADHESIVES ETC.

R/C	LIST	BHC
CER	19.95	14.00
STICK		3.10

DREWS	BHC
ROMASTER	55.00
INERMASTER	39.95
AY	27.95
AY	34.00

RO FLIGHT	LIST	BHC
V 17	79.97	56.00
V 15	54.95	42.00
	44.95	31.50
SHMASTER	44.95	31.50
CTRA FLY	24.95	17.50
NTEREY	44.95	31.50
JBU	29.95	21.00
CTRIC FLIGHT SYSTEMS		
RO 5	44.95	31.50
RO 10	79.95	56.00
RO 15	99.95	70.00
RO 25	109.95	77.00
RO 02 F/F	19.95	14.00
RO 02 RC	22.95	16.10
WIN	29.95	21.00
WIN	54.95	38.50
WIN	125.00	87.50
WIN	175.00	122.50
ARINE	69.95	49.00
ARINE	27.95	19.60
ARINE	99.95	70.00
ARINE	110.00	77.00
TART	34.95	24.50
hi-START	45.00	31.50
D CHARGER	39.95	28.00
CHARGER	7.95	5.60

ASTRO FLIGHT	LIST	BHC
RAPID CHARGER	29.95	21.00
ANALYZER-CHARGER	37.95	27.00
ELECTRA TWIN	99.95	70.00
½A ASTRO STARTER	16.95	11.95
ASTRO POWER PANEL	22.95	16.10
ELECTRONIC SPEED CONTROL	59.95	42.00
MECHANICAL SPEED REDUCER		23.00

AIRBORNE	LIST	BHC
NUTCRACKER	73.50	49.00
TIGER TAIL	73.50	49.00

BRIDI KITS	LIST	BHC
DIRTY BIRDI.40 (wood)	59.95	45.50
DIRTY BIRDI.60 (wood)	84.95	59.95
SHRIKE	185.00	135.00
RCM 15-500	40.00	30.00
T-20	45.00	32.00
KAOS 40	55.00	42.00
SUPER KAOS	70.00	51.50
TRAINER 40	55.00	42.00
TRAINER 60	63.00	53.00
BASIC TRAINER	40.00	30.00
TRAINER 10	27.95	21.00
SPORTSTER	40.00	30.00
P-51	135.00	102.00
QUICK CHARGER		19.00
TWEEDY BIRD	43.95	35.00
QUICKEST 500	43.00	32.00
SUN FLI 4-20	29.95	23.00

COVERRITE	LIST	BHC
½ PINT CAN BALSARITE	2.95	2.39
PERMAGLOSS	9.10	6.40
COVERITE	7.75	5.60

DAE	LIST	BHC
POWER PANEL	19.95	14.95
DELUXE	34.95	24.95

D&B KITS	LIST	BHC
P-40	145.00	109.99
ZERO	145.00	109.99
CORSTAIR	160.00	119.99
STUKA	170.00	129.99
T-2J BUCKEYE	170.00	129.99
YANKEE	110.00	76.99
SABRE JET	180.00	139.99
P-51	159.95	119.99

DUMAS	LIST	BHC
STAR CLASS 30	42.95	30.65
STAR CLASS 45	99.95	69.97
BINGO	240.00	168.00
EQUATION	148.50	103.95
ETCHELLS 22	215.00	150.50
DUMAS PROBAR	47.50	33.25
DV-10 MAH	9.75	7.80
DV-20 PLY	27.50	19.25
DV-40 PLY	42.95	30.65
DV-60 PLY	59.95	41.97
DV-20 FIBERGLASS CF	71.50	50.05
DV-40 FIBERGLASS CF	84.95	59.47
DV-60 FIBERGLASS CF	94.95	66.47
PT-109	34.75	24.33
LIFEBOAT 44"	49.95	34.97
TUNA CLIPPER	40.95	28.67
FOSS TUG	69.95	48.97
ATLAS VAN LINES U-76	44.95	31.47
EAST COAST 12 METER	225.00	157.50
BIG SWAMP BUGGY	28.95	20.27
HOT SHOT	26.95	18.87
PAY-n-PAK	34.50	24.15

ALL HARDWARE IN STOCK AT 20% OFF. KITS OVER $15.00 LIST AT 30% OFF. COMPLETE DUMAS LINE IN STOCK

GOLDBERG	LIST	BHC
RANGER 42	23.95	19.20
FALCON 56	34.95	28.00
JR. FALCON	11.95	9.60
SKYLARK 56	34.95	28.00

GOLDBERG	LIST	BHC
JR. SKYLARK	12.95	10.40
SKYLANE 62	55.95	44.00
SKYLANE 42	13.95	11.00
HANDITOTE	14.95	11.99

MIDWEST KITS	LIST	BHC
ATTACKER	39.95	28.00
SILENT SQUIRE	34.95	24.50
CARDINAL SQUIRE	69.95	49.00
CESSNA CARDINAL	28.95	20.30
SUPER CHIPMONK	28.95	20.30
DAS LIL STIK	26.95	18.90
SWEET STIK	39.95	28.00
MACH 1	79.95	56.00
PITTS SPECIAL	89.95	63.00
STRIKEMASTER	59.95	42.00
MINI STAR	90.00	59.95

PROCTOR KITS	LIST	BHC
NIEUPORT	145.00	125.00
ANTIC	84.50	74.50
ANTIC BIPE	99.50	80.00

SIG KITS	LIST	BHC
KADET	34.95	27.96
KOUGAR	44.95	35.96
KOMANDER	39.95	31.96
KOMET	47.25	37.80
CITABRIA	57.95	46.36
KLIPPER	20.95	16.76
SUPER SPORT	19.95	15.96
P-51	57.95	46.36
CHIPMONK	59.95	47.96
J-3 CUB	39.95	31.96
CLIPPED WING CUB	39.95	31.96
SKYBOLT BIPE	62.50	50.00
LIBERTY SPORT BIPE	64.75	51.80
CESSNA 150	69.50	55.96
RYAN STA	73.50	58.80
ZLIN AKROBAT	54.95	43.96
SMITH MINIPLANE	49.95	39.96

OTHER SIG KITS ALSO IN STOCK

SOLAR ENERGY	BHC
SOLAR POWER MOTOR	14.45
SOLAR CELL ONLY	7.95

TOP FLITE	LIST	BHC
AIRCOBRA	59.95	47.95
P-40	59.95	47.95
SE5A	59.95	47.95
P-51	57.95	45.95
CONTENDER	45.95	35.95
HEADMASTER	25.50	19.95
P-47 T-BOLT	79.95	63.95
FRESHMAN TRAINER	49.95	39.95
TAURUS	53.95	43.20

VK MODELS	LIST	BHC
CHEROKEE	59.95	51.95
CHEROKEE BABE	36.95	29.95
NAVAJO	62.95	50.40
NIEUPORT	62.95	50.40
CORBEN	41.95	33.95
FOKKER TRI-PLANE	62.95	50.40
SOPWITH CAMEL	62.95	50.40

FOX ENGINES	LIST	BHC
FOX RC 19	31.95	22.40
FOX 25 RC	31.95	22.40
FOX 29 RC	34.95	24.50
FOX 36 RC	34.95	24.50
FOX 40 RC	45.95	32.20
FOX 45 RC	51.95	36.40
FOX 60 RC	84.95	59.50
FOX 78 RC	96.95	67.90

ALL FOX U-CONTROL ENGINES IN STOCK 30% OFF LIST PRICE

GEL CELLS	BHC
6 VOLT, 4 AMP	10.39
6 VOLT, 7 AMP	12.95
6 VOLT CHARGER	9.95
12 VOLT, 4.5 AMP	19.99
12 VOLT CHARGER	7.95

ZAP	BHC
X-30 .36 FL. OZ.	2.75
ZAP .18 FL. OZ.	1.60

SAVE $$ SAVE $$ SAVE $$ SAVE
RHOM RETRACTS, SET OF 3.
LIST $116.95 BHC. $79.95
SET OF 2 $54.95.

ROSSI	LIST	BHC
ROSSI 60 RC W/TUNED PIPE MUFFLER	146.00	109.95
W/PERRY PUMP AND CARBURETOR	179.00	129.99

WORLD ENGINES	LIST	BHC
MISS WORLD	49.95	37.95
SKYWAGON, SKYNIGHT	59.95	48.00
SHELL FLY "B"	59.95	48.00
BOX FLY LO WING	34.95	27.95
BOX FLY HI-WING	29.95	23.95
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ENYA .40 RC	77.00	53.90
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ENGINE CLINIC

from page 171/10

the engine operate at a cooler temperature to begin with.

There have been some new developments in oils coming out of Switzerland lately that do allow the use of only 2%-3% oil. This oil evidently has exceptionally high film strength and flash point. Quite a few of the fellows running R/C cars and U-control speed models have been using it. I had a sample myself for testing. However, the oil I had would not mix with higher percentages of nitro methane. The oil is also extremely expensive, almost prohibiting its use in model fuels from a commercial standpoint. I rather suspect that George Aldrich is using one of these new oils in his Magnum fuels now being marketed by Carl Goldberg. George has evidently found a less expensive source for the oil, or possibly a U.S. equivalent. Care to comment, George?

Dear Mr. Lee,

Although I am not actively engaged in modeling at the present time, I was in it from 1946 to 1953. If I remember correctly, my first engine was a Torpedo. And I did, at one time or another, own some 30 engines, including a Super Cyclone and a Dooling 61. But, if I have not actively been engaged in modeling, I have stayed abreast of it, which leads me to what I really want to say.

In the April issue of RC Modeler, Mr. Steve Richman asks about a prop and engine combination that would keep him closer to scale in the construction of a Fokker D-VIII. The way I see it, he would need about a 36" prop, if he has a 12" cowling and wants the aircraft to look authentic. I also know that there isn't any engine that would cowl into a 12" cowling and swing a 36" prop – or is there? Would it be possible, through the

to page 176

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Scale Ratio	1 1/8" = 1'

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Engine Size	Twin .40-.61
Wing Span	.83 1/8 In.
Fuselage Length	.56 7/8 In.
Wing Area	767 Sq. In.
Scale Ratio	7/8" = 1'

from page 174/10

use of a sun gear, to maintain engine speed, thus power, while slowly swinging a big prop? And before you say, "What about cooling?", we both know that adequate cooling systems are in use in model helicopters. It should be possible to run a cooling fan (possibly a ducted fan for one of the .099-.15 engines) at shaft speed. If a scale engine were vacu-formed of lightweight plastic, it would act as a duct while providing a scale look. To continue it one step further, an exhaust augmentor could be incorporated, because the exhaust pipes (in scale size) would be quite large. I know that Convair had to reduce the size of the cowling inlet and only use ground cooling flaps, because the exhaust augmentation system was so efficient on the 340/440 series aircraft. If properly constructed, it should do the job. It is also because of the model helicopters that I believe a sun gear set-up could be made to work. Cooling air would be pulled through the gears, by the impeller. The prop would be "bolted" to the outer gear and sure would give a scale appearance.

Just for the fun of it, let's say that we have a good .60 that will swing a 12/6 prop at 12,000 rpm. If we geared it down 3 to 1 and counted for our gear and fan losses, it might swing a 36" prop at 2,000 rpm. If it did, we would be pretty close to scale prop speed.

I don't know, Mr. Lee, maybe I'm all wet, but I sure don't like seeing a large model with a tiny prop. It ruins their scale proportion. I'd like to know your outlook on this. Has it ever been tried before? More to the point, do you think it would be worth trying? I know that you didn't suggest it to Mr. Richman, but he didn't ask about gearing.

I await your reply.

Sincerely,
Gerald L. Norway
Concord, California

To my knowledge, no one has ever come up with a reliable reduction gear drive using a gear box for model engine use. Weight and lubrication are always a problem and such units are usually fairly short lived. Rotating speed of the gears has a tendency to throw off the oil, causing them to run dry. Because of this, they have to be enclosed in a box or housing containing oil which means considerable weight. Another problem is glow ignition. All of the power impulse occurs on two or three gear teeth resulting in rapid wear. Having built several reduction gear boxes in years past for U-control models and some in-line engines using 90° bevel gears, I have had some experience in this field.

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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.

APRIL WINNERS

2ND PLACE

Chuck .J. Holder
Palmerston North, New Zealand

Pitts Special, scratch built from M.A.N. plans by Jerry Nelson. Span 48" and powered by OS .60 Blackhead with C.B. Enterprises muffler mount. Flying weight 8.6 lbs. using a Kraft KP-7 radio. Covered with Japanese silk and colored dope.

1ST PLACE

Fred House
Copueville, Washington

Built from a Royal kit, modified to a F4-U4, has scale flaps & gear doors. Doors close after gear retracts. Retractable B & D tailwheel. Powered by ST 71, mod. Semco muffler, Rhom-Air mains (mod. to rotate 90°), scale prop by Ira Keeler, Kraft KPS-7 using all 7 channels. Finished with Aero-Gloss dope over K & B resin.

3RD PLACE

Thomas A. Rebenklau
Avon, Massachusetts

Scratch built, original design, open pylon racer. Wingspan 50", Length 38", Weight 5 lb. Powered by an OPS .40 custom built by the designer. A Kraft system used. Finished in Aero-Gloss. Approx. 1 year went into the creation of this model.

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 quality 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.

THE ANNUAL UPPER GREAT LAKES MEET

May 27-28, 1978

To be held at Sinclair Model Airport, Sault Ste. Marie, Ontario, Canada. Competitions will be for Classes A, B, and C Pattern and Stand-Off Scale.

For further information write C.D. Craig Knight, 11 Broadview Dr., Sault Ste. Marie, Ontario, Canada.

ENGINE CLINIC

from page 176/10

The new reduction drive units using drive belts seem to have solved many of the problems associated with gear units of the past. Their main shortcoming being fairly short belt life. The Du-Bro which I have tested required a belt change about every two hours — the life somewhat shorter if you use the throttle a lot accelerating and de-accelerating. However, even with the short belt life, they have opened up a whole new field for scale modelers.

Although you propose several interesting concepts, cooling is not really that much of a problem. It is not necessary to get into exhaust augmentors, etc. A few baffles directing air to the cooling fins and ample exit area are all that is required.

One thing that you have not taken into consideration in regards to a 36" propeller - - - if it were to turn only 2,000 rpm, it would have to have a fairly high pitch to provide sufficient air speed. A 15" pitch prop, if 100% efficient, would result in an airspeed of only 28 mph. This would require more horsepower than any of our model engines are capable of producing, even when used with a reduction drive unit. 20"-24" is about the maximum diameter most units can handle. I am afraid trying to keep prop size and rpm to scale is one of those things that will be pretty difficult to do in a scale model aircraft.

Dear Clarence,

I am getting started on plans for a couple of sport scale airplanes (P-38, F4U) for use with smaller engines (.049, .15) and have run into a potential problem which I hope you can clear up. When scaled down to an appropriate wing area, the F4U has only 1"-1½" of the propeller tips operating outside the cowl. I will be using 6" props on a TD .049 and 8" props on a Conquest .15, with Robart pumps on each.

What will be the effect of a large cowl in back of the prop on the power/thrust of the engine? Will there be enough power to fly the airplane in a scale-like fashion (fast)? Would it be better to put the same engine in a smaller scale of airplane; to alter the scale cross-sections in order to get more prop into the airstream; or to somehow ventilate the cowl to get the air out?

I hope you, or someone else at RCM, can help me and others who may have this question, as this is a problem common to almost all radial-engined scale airplanes, as well as some others.

Sincerely,
E. Scott Hinckley
Tempe, Arizona

As with the previous letter, Scott, yours is a problem that most scale

modelers face when building a radial cowled airplane. It pertains to 1/2A and .60 size aircraft and all sizes in-between.

There is no answer I can give to solve the problem other than to use a larger engine that will swing a larger prop and run it at reduced speed. You might even install a smaller than normal carburetor on the engine to hold rpm to a desired maximum.

You do have enough propeller extending beyond the cowl to do some good and this should be at least 50% of the blade. So, with a 6" prop with 1½" of each tip extending beyond the cowl, the model will fly but don't expect any great performance such as vertical climbs, etc. The lighter the model and lower the wing loading, the better it will fly naturally. 2/3 of the blade extending beyond the cowl would be more desirable.

Don't figure on any pull from the portion of the propeller in front of the cowl. There is no way you could get enough air flow through the cowl to achieve any prop efficiency. Just be sure you do have enough opening at the back of the cowl for good air flow for cooling purposes.

Dear Mr. Lee

For Christmas last year, I received a brand new Fox 74 RC engine. This engine is approximately 10 years old and, in the instruction book, it said that this motor was broken in for 1 hour at the factory. So, as you can imagine this engine was frozen solid. I sprayed WD-40 in the engine and got the engine and the carburetor moving pretty freely.

Now here is my question - - - if I run the engine like it is now, will the bearings be damaged by flat spots being worn on them? The Fox 74 has dual ball bearings on the crank and dual needle bearings on the rod. If running the engine would damage the bearings, is there a way of cleaning them without tearing the engine completely apart? If I sent Fox the engine, would they clean it?

I have a question maybe you could write about in one of your columns. Can the use of Varfree, Zip, and other such products harm your engine? Could you mix a small amount in your fuel to help keep varnish from building up in your engine with no ill effects? If so, how much?

This is about my third year of flying RC, and my father has been in the hobby for many years; we both enjoy your column. I have even read back issues of your column to see what I missed. I especially like it when you review products like the Robart fuel pump. Keep up the good work.

Sincerely,
Andy Heuberger
Bremen, Indiana

Andy, if your Fox has sat around for 10 years and the oil has become gummy, the engine will have to be taken apart and cleaned. The WD-40 will have

loosened it up, but pieces of congealed castor oil are still packed in the bearings, etc. There is no way you can get all of the old congealed oil out of the engine without disassembly. To try and run the engine with congealed oil in the bearings could result in their "skidding" rather than rolling and developing flat spots. Needle bearings are especially susceptible to skidding and developing flat sides. Removing the back cover and head, and soaking the engine in alcohol, lacquer thinner, etc., might do the job but, for best results, it should be completely disassembled. I imagine Duke Fox would service the engine if you sent it to him. You should check with him before shipping, however.

Most of your automotive varnish removers have little effect when added to model fuels. At least I have never found one that would really do the job. Some, when poured down the intake of the engine while running, would reduce the stickiness but only for a few flights. Added to the fuel, they do not seem to be of much use. Some can even be harmful as they cause pre-ignition, being volatile themselves. Many others do not mix with alcohol and just lay in the bottom of the fuel can in beads. □

CUNNINGHAM ON RC

from page 7

that vibration will not be transmitted to the receiver. It won't hurt to wrap it in plastic wrap also. EK radios have a super mounting board that mounts the receiver and the servos all into one unit and this is what I use all of the time. In their set-up, the receiver is not wrapped in foam, but mounted on the servo tray with vibration protectors. Seems to be pretty sturdy in the event of a crash also. Make sure that the wire coming from the battery pack and the receiver do not rub against the fuselage sides or bottom, or any of the pushrods. The receiver switch can be mounted on the servo board in many radio sets, or on the side of the fuselage. If you mount it to the side of the fuselage, be sure to mount it on the side away from the engine exhaust. Don't glue it to the fuselage side, but use the small mounting screws provided with the switch. Be sure to route the receiver antenna through the fuselage side, and again be sure that it's the side away from the exhaust. When routing the antenna wire, make sure that it is not near, or wrapped around, any of the wires from the receiver, the battery, or the switch; nor is it fouled by any of the pushrods to the throttle or nose gear. It is a good idea for the antenna wire to exit the fuselage ahead of the receiver, then let the wire

go back along the fuselage side, under the wing (if a shoulder wing or a cabin job) then up to the tip of the rudder. Don't tie the antenna to the rudder. Simply loop a rubber band around the antenna, slip this rubber band around the vertical stab, and let the remainder of the wire trail behind the aircraft. On small airplanes, I usually let the antenna go through the slot at the top of the fin between the vertical stab and the rudder, then go off in the direction of one end or the other of the horizontal stab. Do not cut off any of the antenna wire just because it is too long for your airplane. The antenna length is critical to the working of the radio, and if you alter the length of the antenna wire in any way, you will be altering the life of your aircraft.

In mounting the servos into the aircraft, be sure to make use of a servo board. Each radio manufacturer makes a servo board to use with his radio - - - a board that has been designed to keep the servos as safe from harm as possible, and to also protect them from vibration. The servo board is, in turn, held in the aircraft in an easy method. Glue 1/4" square servo rails (made of spruce of other "hardwood") to each side of the fuselage. Make sure that they are exactly square with each other, and glue these servo rails to the fuselage sides with epoxy adhesive. Spanning across the fuselage from one rail to the other, use 1/8" x 1/2" plywood, with the main grain of the plywood running across the fuselage. Adjust these cross braces so that the servo board will fit nicely into them, and then glue in place with epoxy. You can tack them in place with a super glue but, for safety, use epoxy for the finished product. Don't spare the glue. Of course, when doing this, make sure that you are setting the servos in about the place indicated on the plans so that the Center of Gravity of the aircraft can be set up in the correct position without too much trouble.

Before the next step, fasten the servo board to the cross braces with #3 x 3/8" sheet metal screws. Okay, now, with the servos in place, it is time to make the pushrods. These can be any one of several materials. Pushrods are normally made as a combination of wire and wood. I make mine this way. I use a 1/16" piece of wire at the servo end of the pushrod. I bend a 90° bend in the end of the wire going through the servo arm and then keep this wire firmly in place on the servo arm by using a 1/16" wheel collar. I like to make my pushrods for small models from 1/4" square hard balsa. For the big aircraft, I use 1/4" square spruce. Let the wire lay along the wood pushrod for about 4". Make a 1/16" 90° bend in the wire, drill a 1/16"

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COMING SOON FROM THE PUBLISHERS OF RCM:

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CUNNINGHAM ON RC

from page 181/7

hole in the pushrod, then slip the wire into the hole. Then wrap this end of the pushrod with electric tape. Some builders like to wrap the pushrod ends with thread and then smear glue all over it, but I have used electrical tape on many, many models, and found it to be quick, easy and permanent. The other end of the pushrod is made in the same way, except that I use a threaded rod and a metal clevis on the end that is to be connected to the control surface. Try to make the wire exit the aft end of the fuselage without making any bends. The wire will be much stiffer, and will transmit your command to the surface in a very positive way. A bent pushrod wire will allow the control surface to flex and, in some cases, even cause vibration of the entire tail surface. Make sure that the control rods do not bind on the fuselage side or with each other. The servo has enough to do without having to overcome a too tight exit hole.

The reason that I like to use a plain piece of wire bent to a 90° on one end and a clevis on the other is to keep the pushrod from coming loose from vibration. If you have a clevis on each end, then vibration can, and will, cause the pushrod to completely unscrew itself from the end clevises.

The secret to making a good hook-up inside your aircraft is to keep it simple. Pushrods can be made from other items, such as wood dowels, fiberglass aeroshafts, or plastic tubing, one sliding inside of another, and so on. In recent past columns, I have mentioned the use of 1/16" wire pushrods, so I won't go into it again now.

Protect your radio from damage and vibration; the same for your battery. Firmly mount the servos, make your pushrods straight, and strong, route your antenna out the side, and don't cut it off. Do all these things carefully and soon you will really get the hang of this radio installation business and will develop favorite methods of your own. □

FROM THE SHOP

from page 2

titude is admirable and we need all our present flyers encouraging all the prospective flyers if we are to grow as a hobby. However, there is a situation where the R/C flyer may wish to present a very conservative image of our sport. This is when the would-be flyer is a pre-teen boy or girl.

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We all have seen them. You just made a super flight; everything was perfect, and here come the on-lookers. In almost every crowd there are several pre-teen boys or girls. They ask the same questions we all have heard ever since we first put our planes in the sky: What is it? How much does it cost? Where can I get one? Feeling as though we are the final authority on R/C, we answer these questions while giving the impression that a retarded Yak could fly R/C; no one ever crashes; and it is cheaper than many hobbies (like sailing America's Cup yachts or building your own Saturn booster for a civilian attempt at a moon landing). My situation causes me to see even more of these pre-teens than the average R/C flyer would.

I am a fifth grade teacher and fly my planes at the local school football field. My students are very interested in my planes and in becoming R/C flyers. When I first encountered students who wanted to enter R/C, I encouraged it. I called their parents; told them I would do all the assisting; all that would be required of them is the funds. In my area, upper middle-class, money flows quite freely (ever see a $70.00 skateboard?). The parents were all for it and the student and I went ahead with the building and first flights. When the tyros found out how hard R/C flying is and how much dedication is required to just be able to take-off and land, they soon tire of this new hobby. During this period they discovered junior high sports and girls. What resulted were boys with planes, radios, engines, and zero interest in R/C — a waste of my time and their money.

There are several possible solutions to this problem. Let's take them in descending order; the most desirable ones first.

My first answer would be to get the father (mother) interested in R/C. This would allow the father and son to work together and with the father involved, thus your involvement can be reduced as their experience increases. Most R/C flyers have trouble enough just building and maintaining their own planes without having to help build (completely build) a novice's plane. This arrangement lets the father and son spend time together; a solution to the complaint that is made more and more frequently today — fathers and sons do not spend enough time together. Also, the father can make the necessary, adult decisions concerning the hobby: starting with a trainer, not a full-scale B-17, the amount of money and time R/C will occupy in their family. Then, too, an adult is needed for the FCC license. If the father feels that R/C is not right for his pre-teen then he, and not you, can be the one to tell (convince) the pre-teen. We have enough problems in R/C without adding poor public relations to the list. Let Dad be the "heavy".

Answer 2: If you are the type who has little patience, wants to spend your time flying and not instructing, or feel that you cannot adequately teach someone to fly R/C, then suggest a qualified instructor, preferably at a local R/C club. Most clubs

have some type of training program; from a club owned trainer and formal course, to the "bring your own plane out and we'll see if it flys". This answer is somewhat of a buck-passing and places the final solution on someone else's shoulders; but using the above criteria, it is a solution many R/C flyers choose to use.

Another solution is to direct the pre-teen to UC. Here he can learn to work with the materials of our hobby (balsa, plywood, glue, dope, etc.) and develop the skill needed to successfully enter into R/C flying (engine mounting and starting, balancing, trimming, etc.). I am not belittling UC - I started there myself - but you can almost make a brick fly on wires. The cost is very low compared to R/C and the pre-teen can become quite proficient without help from home or large amounts of money. (I do not encourage plastic .049's. Balsa kits with 1/2A engines are great beginner's planes — easy to build, fly, and repair.) By using this method, a pre-teen's commitment to the model flying hobby can be developed while he is is maturing. You, as the R/C flyer, should either personally help him or direct him to where he can get help in UC. Don't just push him into UC to get him out of your hair. After all, we are trying to develop future R/C flyers and not drive every young person away.

Number 4 on the list of answers is to let the pre-teen use your equipment and teach him to fly (I said the answers would be getting less desirable). Over a period of time, once the newness has worn off, you can better evaluate the boy's true desires; does he really want to get into R/C or is it just a passing fancy. If, after a time, he still is interested, then by all means encourage him to get his own outfit. His chances of destroying it are lessened since you have taught him to fly during this time. Some R/C flyers sell their present rig to the novice and update their own equipment. The novice gets an outfit he knows works and can fly; the instructor invests in the latest equipment - - - both win.

My last solution is really a restatement of the opening sentence of the article. If none of the other solutions are feasible, then you may have to tell the pre-teen not to take up R/C flying at this time. Considering the time, money and commitment needed, some (many) pre-teens are just not mature enough to handle an R/C plane. Whether we consciously realize it or not, R/C can be dangerous — it can kill or maim. Most pre-teens are just not mature enough to fly safely all the time. Ever have someone ask you to buzz a full-scale that is flying over your field? Pre-teens ask me to do so all the time without realizing the danger. Remember that by using this type of solution, you haven't eliminated R/C flying for the pre-teen forever; just until he has become more mature, more able to determine his own true desires.

We need new R/C flyers — people who are committed to our sport. We do not need the "wishy-washy" types; those who try any and everything that comes along. We owe it to our sport, ourselves, and to the new flyer to give them a true picture of R/C; the good as well as the bad; the friendships and fun as well as the cost and crashes. To do anything less would be a disservice to all concerned. □

R/C Modeler Magazine is pleased to announce its "Retail Display Allowance Plan" available to retailers interested in earning a display allowance on R/C Modeler Magazine. To obtain details and a copy of the formal contract, please write to the Marketing Department, Kable News Company, Inc., 777 Third Avenue, New York, New York 10017, our national distributor, who will act as administrator of our plan. Under our Retail Display Allowance Plan, in consideration for fulfilling conditions of the agreement, you will be entitled to receive a display allowance. This plan will become effective for all issues you receive subsequent to written acceptance on our behalf of your application.

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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.

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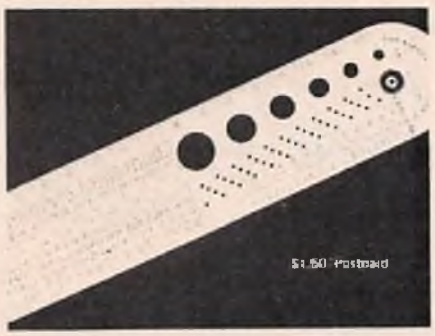

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50.	Fourmost Racing Products	100.	Mark's Models	172.	Vantage Designs
51.	Futaba Electronics	106.	Mile High Models	173.	Vantec
53.	Galler Electronics	112.	MRC	176.	Tower Hobbies

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HUGHEY 20-Rigger
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CAL-Stripe Tape 3/32 & 1/8" wide
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RADIO CONTROL SYSTEMS

WORLD EXPERT MARK II

	List	Indy
7 Ch. D.S. (5 servos)	$464.95	$279.95
7 Ch. D.S. (4 servos)	$432.85	$260.00
5 Ch.O S. (4 servos)	$399.95	$239.95

NEW EXPERT RADIOS

3 ch. 3 servos, nicads	$239.95	$169.95
2 ch. 2 servos, nicads	$179.95	$129.00
4 Ch. Glider,S.S., 3 servos, all nicads	$234.95	$169.95

FLIGHT PACKS

7 Ch. 5 servos	$264.95	$188.95
7 Ch. 4 servos	$259.95	$182.95
5 Ch. 4 servos	$249.95	$157.98

SERVOS

S-10 & S-11	$45.00	$36.00
Retract	$52.00	$42.00

COX SANWA

2 Ch., 2 servos, all dry	$99.95 $73.00
4 ch. 4 servos, nicads	$299.95 $199.95
6 ch. 4 servos, nicads	$369.95 $245.00

KRAFT

KP-3C dual stick	$219.00 $175.95
KP-5C dual stick	$375.43 $295.00
KP-5CS single stick	$375.43 $295.00
KP-7C dual stick	$515.43 $399.00
KP-7CS single stick	$515.43 $399.00

NEW FROM KRAFT

KP-4A dual stick, 4channel, 4 servos, all nicads	$299.95 $214.00

SERVOS

KPS-11,12,14 & 15	$44.95 $38.00
KPS-15H & 16	$49.94 $41.00

RADIO CONTROL SYSTEMS

NEW FROM WORLD

4 channel, 3 servos, Transmitter takes dry batteries. Nicads and charger in airborne system.
L.$229.95 . . . . . I.$139.00

3 channel, 2 servos, Transmitter takes dry batteries. Nicads and charger in airborne system.
L.$169.95 . . . . . I.$103.00

PRO LINE ELECTRONICS (SPECIAL SALE)

PLN-3C 3 Ch. S.S. closed gimbal, all nicads	$250.95	$169.95
PL-5-D 5 ch. dual stick, open gimbal competition	$559.35	$369.00

MICHIGAN HOBBY HANGAR SMALL WONDER

MICHIGAN HOBBY HANGAR

Quickie	28.95	20.25
Quickie Bips	35.95	25.17
Miss Vintage	54.95	38.47
Small Wonder	33.95	23.75

WORLD ENGINES KITS

GLASS HAWK

MULLIGAN

WORLD ENGINES
DAS BOX FLY SERIES

20-L (low wing)	34.95	28.00
20-W (Biplane)	39.95	31.00
10-MG (motor glider)	24.95	19.95
20-S (shoulder wing)	29.95	23.95
15-H (high wing	22.95	18.50
ARF BOX FLY	34.95	28.00
Miss World	49.95	38.95
Mr. Mulligan	47.95	38.95
W.E. Cub	39.95	31.00
Lil John (H wing)	54.95	43.00
Lil John (L 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
Mattlas 20	43.99	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	21.00
Mach I	94.95	74.00
Das Lil Stick	32.95	25.70
Sweet Stik	39.95	29.00
Chipmunk	29.95	21.00
Attacker	39.95	29.00
New Hawk Glider	139.95	104.00

BUD 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	95.98
Trainer	79.95	65.00

SIG

Super Sport	19.95	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
Kommander	39.95	31.00
Kougar	44.95	35.75
Smith Mini plane	49.95	39.95
Zlin Akrobat	54.95	43.99
Yak 18	73.50	59.00
Citabria	57.95	45.00
Liberty Sport	64.95	51.50
Ryan STA	73.50	59.00
Clpd 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	14.95	11.95
Throttle for .09	3.50	2.98

MILLS

0.75 Diesel	19.95	15.95
1.3 Diesel	28.95	19.95

COMO

COMO

OS MARINE ENGINES

	List	Indy
OS 10 Sch	36.	27.75
Os 20	48.	37.00
OS 30	58.	40.00
OS 60 RSR	137.	105.95
OS 65 RSR	137.	105.75
OS 45 RSR	105.	81.00

NEW OS ENGINES LESS MUFFLERS

	List	Indy
OS 60 RSR	130.	100.00
OS 65 RSR	134.	103.25
OS 40 SR RV	79.	60.95

OS ENGINES/MUFFLER

	List	Indy
OS 10 FSR std.	23.	17.75
OS 10 FSR R/C	29.	22.25
OS 15 std.	30.	23.00
OS 15 R/C	36.	27.75
OS 20 std.	31.	23.75
OS 20 R/C	38.	29.25
OS 25 std.	34.	26.25
OS 25 R/C	40.	30.75
OS 25 FSR std.	50.	38.50
OS 25 FSR R/C	57.	43.95
OS 30 std.	41.	31.50
OS 30 R/C	46.	35.50
OS 35 std.	42.	32.25
OS 35 R/C	48.	37.00
OS 40 std.	58.	44.75
OS 40 R/C	70.	54.00
OS 40 FSR R/C	85.	65.50
OS 60 BH R/C	95.	73.25
OS 60 FSR R/C	115.	88.75
OS 60 FSR R/C w/Perry pump & carb	145.	110.95
OS Wankel	105.	82.50
OS 60 Four Cycle	210.	145.00
OS 45 Helicopter	90.	69.50
OS 80 R/C	120.	95.00

COMO
40 R/C w/muffler & S.T. Carb . 69.95 43.50

SUPER TIGRE ENGINES

	List	Indy
X-15 R/C	60.	48.00
G-15 R/C	38.	31.00
X-21 Speed	70.	49.95
ST 23 std.	35.	26.00
ST 23 R/C	43.	34.00
X-29 RV ABC	74.	58.00
ST 35 std.	37.	29.00
ST 35 R/C	45.	36.00
ST 46 R/C	56.	44.00
ST G21/35 std.	50.	39.00
G60 FI PYP	85.	67.00
G60 ABC PYP	93.	74.00
G60 BH w/pump & carb	104.	83.00
ST X-46	77.	61.00
G60 ABC w/pump & carb	114.	89.00

NEW RELEASE SUPER TIGRE ENGINES WITH MUFFLERS

G71 FI R/C	99.	78.00
ST 60 FI BB R/C	70.	55.00
ST 23 R/C	50.	39.00

K&B (VECO) ENGINES

	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 RSII	92.	64.00
K&B 3.5 Outbrd	99.	69.00
K&B 61 R/C	85.	59.00

Pump - 2 oz. per revolution so you can partially fill tank if you desire. Extra heavy duty gear train for rugged service. Fast pumping not necessary as with most hand pumps. These manual hand pumps are always ready to go - no batteries to worry about. List - $12.50. Indy - $8.95.

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THESE SPECIAL PRICES GOOD THRU 5/25/78 SUPPLIES MAY BE LIMITED

KITS
Indy's Special Low Prices

AIRTRONICS

	List	Indy
Questor	34.95	26.50
Grand Esprit	129.95	95.00
Super Questor	39.95	30.50
Aquila	64.95	49.95
Olympic II	49.95	35.95
Q-Tee	19.95	14.75
Acro Star	89.95	70.00
New Era III	46.95	36.50

ACE

Pacer	19.95	15.95
Dicks Dream	11.95	9.50
Ace High	19.95	15.95
Up-Start	17.95	14.00
All Star	24.95	19.95
Whizard	18.95	15.00
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 Master	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/4	44.95	33.75
Malibu	29.95	22.50
Monterey	39.95	29.95

DIRTY BIRDY

BRIDI

Shrike	184.95	129.99
Brown Racer (B-2)	129.95	89.95
Chipmunk	119.95	89.95
Dirty Birdy (Balsa)	84.95	63.95
Tweedy Birdy	43.95	34.50
Sporster	39.95	31.00
RCM Trainer 10	24.95	18.00
RCM Trainer 20	44.95	34.00
RCM Trainer 40	49.95	39.00
RCM Trainer 60	59.95	45.99
Lockheed Citrus	129.95	89.95
P-51 Mustang	129.95	89.95
RCM 15-500	39.95	31.00
Super Kaos 40	52.95	41.00
Super Kaos 60	69.95	54.00
Basic Trainer	39.95	31.00
Dirty Birdy 40	58.95	46.00
Sun Fly 4-20	24.95	18.00

KITS
Indy's Special Low Prices

CASS ENGINEERING

	List	Indy
Pulsar Bipe	95.00	79.95

CRAFT AIR

Windrifter	44.95	33.75
Sailaire	129.95	97.50
SO-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 42 (ARF)	23.95	19.00
Sr. Falcon	55.95	44.00
Falcon 56 MK II	34.95	25.00
Skylane 62	55.95	44.00
Jr. Falcon R/C	11.95	9.95
½A Skylane	13.95	11.00
Skylark 56	34.95	26.00
Jr. Skylark	12.95	10.00

AIR CAMPER

HOUSE OF BALSA

Miss Dora	39.95	27.99
Pietenpol	49.95	39.95
½A Pietenpol	29.95	23.99
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
Rebel II	99.95	69.95
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	2.75
Blue Line H.S.	4.95	3.50
Giant Zap	3.50	2.75
X-30 Adhesive	1.15	1.00
Ambroid 4 oz.	1.15	1.00
Ambroid ¼ oz.	.60	.50
Super Cement	.55	.45
Blue Goo	2.95	2.59

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
Silkspun	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

Opague	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	4.95
quarts clear	3.95
Gallons clear	9.95
gallons Thinner	5.95

GLIDER ACCESSORIES
AIRTRONICS

Std. 12 inch pail	34.95	27.99
HD launch pail	36.95	28.00

CRAFT AIR

Del. Hi-Start	37.95	31.00
Std. Hi-Start	34.95	25.00
Para Pod	9.95	7.00

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	97.50	78.00
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	1.60
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	65.00
40 Rigger	110.00	93.50
19 Hydro	77.00	67.00

SAIL BOATS

Blue Sonic 900	129.95
Indy special	S99.95

PUMPS STARTERS

STARTERS

Std. Sullivan	33.95	23.99
Del. Sullivan	36.95	26.99
Sonic Tronic	38.50	27.00
Kavan	45.00	32.00
Astro-½A	15.00	12.00

FUEL PUMPS

Sonic Tronics MK II electric fuel pump	13.95	10.95

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	320.00	275.00
Alouette II	160.00	139.95

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
Freon		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
Serie V	34.95	24.95
Std. panel	18.95	14.95

ELECTROSTAR SYSTEMS

Super Cycle	89.95	59.95

STEVE MUCKS

Lil Lightning	48.95	38.95
Buschwacker	109.95	74.95

Indy 30% OFF
OS 10 FSR Standard
L.$20.95
I.$14.66

Indy 40% OFF
OS 60 RSR U/C engine
L. $119.95
I. $ 72.00

Indy 30% OFF
NEW MIDWEST Klampon-Kai
L.$44.95
I.$31.47

Indy 40% OFF
Sure-Flight DEAD-BEAT Glider
L.$69.95
I.$41.97

Indy 36% OFF
Pr. 5½ inch. Du-Bro Wheels
L. $13.95
I. $ 8.93

Indy 36% OFF
Pr. 6 Inch Du-Bro Wheels
L. $15.95
I. $10.21

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FRANCHISED DEALERS

INDY R/C

CALL TOLL FREE 1-800-428-4682

INDIANA RESIDENTS call (317) 846-0766

IT IS GETTING TO BE TIME FOR THE TRADE SHOW AGAIN—We are rushing to get all of the details in order for our booth at Toledo. We will be looking forward to seeing all of our franchised dealers and hoping to chat with them at the Toledo Show. It is quite possible that hobby dealers located in areas where there are presently no Indy franchised dealers will want to discuss an Indy R/C franchise with us while we are at Toledo.

We give Indy dealers an exclusive franchise for the county in which their hobby shop is located.

Our franchised dealers generally charge a little more than the mail-order house prices because of the convenience they are offering you by having the items in stock and avoiding the delay of the mail. Even the biggest retail chains operate this way.

INDY FRANCHISE HOBBY DEALERS

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1314 Army Post Road
Des Moines, Iowa 50315

The Modeler Hobby Shop
1726 South Hillside
Wichita, Kansas 67211
ph. 316-681-2941

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Ron's Hobbies
713 E. McNeese
Lake Charles, La. 70605
ph. 318-478-8651

MAINE
Hobby Corner
70 Main Street
Houlton, Maine 04730
ph. 207-532-9289

Pets & Pastimes
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Bangor, Maine 04401
ph. 207-942-9346

MASSACHUSETTS

Bill's Hobby Supplies
600 N. Main St.
E. Longmeadow, Mass.
ph. 413-736-7711

MICHIGAN
Barry's Hobby House
3535 10th Avenue
Port Huron, Mich. 48060
ph. 313-982-1237

Avco Model Supplies
1885 Dyson St.
Muskegon, Mich. 49442
ph. 616-726-3400

Hobbies Unlimited
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Kalamazoo, Mich. 49007
ph. 616-344-8711

Models & Things
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Charlevoix, Mi. 49720
ph. 616-547-9658

MINNESOTA
Mac's Models, Inc.
1322 N. Rice St.
St. Paul, Minn. 55117
ph. 612-489-6060

Wicklund's Hobby House
Route 1
Lake Lillian, Minn. 56253

MISSISSIPPI

H & B Models
319 W. Main
Tupelo, Miss. 38801
ph. 601-844-7946

Creative Sources
1002 Jackson Avenue
Oxford, Miss. 38655
ph. 601-234-2475

MISSOURI
Smiths Hobby Supply
830 Chestnut
Joplin, Mo. 64801

MONTANA
Viking Hobbies, Inc.
1745 E. Main
Billings, Mont. 59101

NEW HAMPSHIRE
Hobby Hill
1 Cannon Drive
Nashua, N.H. 03060
ph. 888-3576

NEW JERSEY
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28 Fairfield Road
Fairfield, N.J. 07006
ph. 210-227-1878

NEW YORK
Custom Hobbies
785 Broadway
Kingston, N.Y. 12401

Hobbies Galore
99 Central Ave.
Lancaster, NY 14086
ph. 716-681-8567

Jim's R/C Hangar
R. 4 Box 4 Canton Rd.
Ogdensburg, N.Y. 13669
ph. 315-393-2580

King Arthur Ceramics & Hobbies - Co. Bridge Road
Hudson Falls, N.Y. 12839
ph. 518-747-5818

Thompson Outboard S&S
Upper East Street
Oneonta, N.Y. 13820
ph. 607-432-5368

Rays Hobby Supplies
468 Jerusalem Ave.
Uniondale, N.Y. 11553
ph. 516-486-4047

NORTH CAROLINA
B & J Hobby Enterprise
4909 Western Blvd.
Raleigh, N .C. 27606
ph. 919-851-4492

Thornton's Hobbies
100 N. Main St.
Four Oaks, N.C. 27524

Tripps Gulf Service
1100 N. Ellis Ave.
Dunn, N.C. 28334
ph. 919-892-5946

Edros Hobbies
1318 Lakeside Drive
Wilson, N.C.

NORTH DAKOTA
Crafts Etc.
Northport Shopping Ctr.
Fargo, N. D. 58102
ph. 701-293-7121

McGiffins, Inc.
1228 9th Ave. S.
Grand Forks, ND 58201

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American Modeler
2 Berea Commons
Berea, Ohio 44017
ph. 216-826-3088

OHIO Cont.
Dad's Toy Shop
129 E. Auglaize St.
Wapakoneta, Ohio 45895

Hobby Road Hobby Shop
2483 E. Dublin-Grandville
Columbus, Ohio 43229

Lafayette Escadrille Hby.
1414 S. Avenue
Toledo, Ohio 43609
ph. 419-385-8739

Lighthouse Hobby Supply
507 E. North St.
Prospect, Ohio 43342
ph. 614-494-2110

Lima Radio Control Spls.
307 N. Cole St.
Lima, Ohio 45805
ph. 419-229-5117

Paul's Hobbies
Route 4 Box 125
Lucasville, Oh. 45648
ph. 614-259-5298

S & M Print Shop
7154 Calvary Road SE
Amsterdam, Ohio 43903
ph. 614-543-4024

The Model Hanger
321 N. Market
Galion, Ohio 44833
ph. 419-468-7694

White Beech Tree Hobbies
114 Park Ave. West
Mansfield, Ohio 44902
ph. 419-526-4093

Xenia Hobby & Craft Center
195 Bellbrook Ave.
Xenia, Ohio 45385

OREGON

Crabtree Store
37626 Crabtree Drive
Crabtree, Oregon 97335

Chezem's Enterprises
2495 Commercial NE
Salem, Oregon 97303
ph. 503-581-5276

Strictly R/C
7868 SW Capitol Hwy.
Portland, Oregon 97219
ph. 503-244-3358

PENNSYLVANIA
Hobbies Galore of Pa.
Great Sthrn. Shopping Ctr.
Bridgeville, Pa. 15017
ph. 412-221-2600

H & S Sales & Service
Rd. No.1 box 440-A
Indiana, Pa. 15701
ph. 412-463-0191

Laurel Shop
178 Main St.
Brookville, Pa. 15825

INDY FRANCHISE

ARIZONA
Hobby Den Inc.
3347 W. Greenway Road
Phoenix, Arizona 85023
ph. 602-993-6630

ARKANSAS
Family Hobby & Toy Ctr.
Route 5 Box 848
Conway, Arkansas 72032

Ron's Hobbies
300 N. Wright St.
Siloam Spgs, Ark. 72761

Cash Auto Supply Inc.
P.O. Box 155
Cash, Arkansas 72421

CALIFORNIA
Dave's Custom Models
1844 W. Glenoaks Blvd.
Glendale, Ca. 91207
ph. 213-240-5810

Root's Hobby
6036 Telegraph Ave.
Oakland, California 94609

D & D Hobbies
8781 Cuyamaca St.
Santee, California 92071
ph. 714-449-5656

Active Hobby
717 E. Main St.
Santa Maria, Calif. 93454

The Hobby Shop
9295 12th Ave.
Hanford, Calif. 93230
ph. 582-5571

COLORADO
G. Al. Inc.
Musick Drug & Hobby
309 E. Fontanero St.
Colorado Spgs, Co. 80907

Jensen Cycle & Auto Parts
Box 182
Granada, Co. 81041
ph. 303-734-5337

FLORIDA
Action Hobbies
4301 A. North Dixie Hwy.
Ft. Lauderdale, Fl. 33334
ph. 305-561-5811

A & J Models, Inc.
Coralwood Mall
Cape Coral, Fl. 33904
ph. 813-542-8858

FLORIDA, Cont'd
The Hobby House, Inc.
300 U.S. Hwy. 17-92
Maitland, Fl. 32751
ph. 305-647-3442

GEORGIA
Hangar 7 Hobbies
6125 Roswell Road N.E.
Atlanta, Ga. 30328
ph. 404-255-9033

ILLINOIS
Wings & Things Inc.
1122 Broadway
Rockford, Ill. 61104
ph. 815-963-7363

INDIANA
ABC Hobby Craft
2155 E. Morgan Avenue
Evansville, Ind. 47711
ph. 812-477-9661

Craft & Hobby House
324 Main St.
Vincennes, Ind. 47591

Franks Hobby Shack
4954 E. Robin Crt.
Rolling Prairie, Ind. 46371
ph. 219-778-4670

Hobby Hangar
509 S. Monroe St.
Hartford City, Ind. 47348
ph. 317-348-1931

Hobby World
154-13A W. Hively AVe.
Elkhart, Ind. 46514
ph. 219-293-3715

Hobbyland
343 Lincolnway West
South Bend, Ind. 46601
ph. 219-287-0180

Kirks Hobby Shop
117 E. Main
Muncie, Ind. 47305
ph. 317-282-4121

Wings N Rails, Inc.
1824 E. Main St.
Plainfield, In. 46168
ph. 317-839-5383

IOWA
Family Craft & Hobby
2034 S. Saint Aubin
Sioux City, Iowa 51106
ph. 712-276-7086

Howards Hobby Shop
313 W. 5th St.
Waterloo, Iowa 50701
ph. 319-236-0695

JIM GOAD SEZ:

We finally received some Mills 1.3 Diesels. Our MK II Indy Film has arrived. Our 12 volt batteries are on order but, out for the moment.

If you dial our Wats line number and get a busy signal, we suggest you dial again. Sometimes the busy signal is due to a trunk line load—not because the phone is in use.

We are going to have a new catalog by the end of March. Only 64 pages, but the pages are loaded just like the first two pages of this advertisement.

We are stocking Cal Stripe Tape. This is for fuel proof stripping on your paint or film covering jobs. It is available in White, Yellow, Red, Black, and Silver.

1/4" . L-3.69 . Indy-2.20
3/8" . L-2.69 . Indy-1.60
3/32" . L-2.69 . Indy-1.60
1/16" . L-1.98 . Indy-1.20

Our second production run of Como 40 R/C with mufflers is completed and in stock. This is a twin ball bearing 40 with a relatively large venturi and Perry Porting along with a cast piston and one ring. The engine qualifies for Quickie 500.

Our new catalog will contain list prices and Indy prices plus a detailed run-down on Indy's exclusive items.

HOBBY DEALERS

S.C. cont.

Creative Pastime Shop
1011 Third Avenue
Conway, S.C. 29526

TENNESSEE
Bike & Hike Shop
1305 N. Roan St.
Johnson City, Tn. 37601
ph. 615-928-8682

Myers Auto & Farm Parts
105 Elmore Road
Crossville, Tenn. 38555
ph. 614-484-6168

TEXAS

G.T. Enterprises
Olton Rt. FBC Bldg.
Plainview, Texas 79072
ph. 806-889-3541

Hobby Towne
1421 W. Houston
Sherman, Texas 75090
ph. 214-892-1821

Hobbies UNLTD
3031 Woodland Hills Dr.
Kingwood, Texas 77339
ph. 713-358-2224

Mercantile Park Hobbies
3727 Dilido Suite 138
Dallas, Texas 75228

Sight & Sound
715 Porter
Dumas, Texas 79029
ph. 806-935-7422

Tee Pee Hobby Shop
420 N. Main
Borger, Texas 79007
ph. 273-7037

VERMONT
The Hobby Mart
Rt. 100 North
Wilmington, Vt. 05363

VIRGINIA
Kilowatt Kage, Inc.
Waterlick Plaza
Lynchburg, Va. 24502

WASHINGTON
Bill's Hobby Town
11112 Pacific Ave.
Tacoma, Wash. 98444
ph. 206-531-8111

Hobby World, Inc.
70 Front St.
Issaquah, Wa. 98027

WASHINGTON
Kitsap Hobby Supply
Poulsbo Jct. & Hwy 3
Poulsbo, Wa. 98370
ph. 206-779-7676

Stewart Enterprises
at McCarey's TV & Radio
429 S. Chelan St.
Wenatchee, Wash. 98801
ph. 509-663-3232

WEST VIRGINIA
B & B Hobbies
222 Central Avenue
Beckley, W. Va. 25801

McCoy's Inc.
Box 51
Smithville, W. Va. 26178

Mountaineer Shop
117 Court St.
Ripley, W. Va. 25271
ph. 304-372-8544

WISCONSIN
Happy House Gift Shop
216 S. Knowles Ave.
New Richmond, Wisc.
ph. 715-246-2184

Lake Geneva Model Center
726½ Ann
Lake Geneva, Wisc. 53147

CANADA
A.B.C. Model Craft
34 Merritt St.
St. Catherines, Ont.
Canada

Calgary Hobby Supply Ltd
3920 Edmonton Trail
Calgary, Alberta,
Canada

Elgin Cycle & Hobby Centre
441 Talbot St.
St. Thomas, Ont. Canada

Royal Oak Hobbies
4454 W. Saanich Rd.
Victoria, B.C. Canada

Skycraft Associates
139 York Road
Dundas, Ontario, Canada

Smart's Hobby Supplies
163 King St. West
Brockville, Ont. Canada

INDY

10620 N. COLLEGE AVE., INDIANAPOLIS, IN. 46280

$1.00 Handling on all orders. Prepaid domestic order post paid; foregin orders allow $10.00
Orders—check, M.O. or C.O.D.—also BankAmericard or Master Charge (bank number) 4% IND. RES. TAX

INDY R/C 1-800-428-4682 INDY R/C

BEST FROM INDY

1. Mount the Indy Power Panel in your tool box. Operates from 12v. and services your engine starter, fast field charger, and glow plug. List: $34.95. Indy: $23.50.

2. We have included this picture of a Dremel tool to remind you that Indy stocks a complete line of domestic tools, kits, engines, and R/C systems. See our other adjacent two pages.

3. Como 40 engine. Twin ball bearing, cast aluminum piston, chrome ring, special porting. Complete with Supertigre carburetor and muffler. List: $69.95. Indy: $43.00. U/Control version less muffler - List: $55.95. Indy: $33.95.

4. Indy US-2 Servo. DS mechanics, Signetics IC 544. For use with systems like Futaba, Kraft, Standard, World - positive pulse systems. Mitsumi connector. List: $23.95. Indy: $16.95.

5. Snap-in servo tray for US-2 servo. Center section is spacer which cuts out. List: $0.99. Indy: $0.69.

6. Round output arms for US-2. List: $0.50. Indy: $0.35.

7. US-1 servo similar to above described US-2 servo except in Dunham mechanics with dual racks. List: $28.95. Indy: $20.95.

8. Capillo .09 Italian glow engine. List: - $14.95. Indy: - $11.95. Throttle. List: $3.50. Indy: $2.98.

9. Mills .075 diesel engine. Sentimental favorite. Excellent for small R/C. List: $19.95. Indy: $15.95.

10. Panasonic pencell nicads with tabs. New. (4) ea. $1.80 - $7.20. (8) ea. $1.65 - $13.20. (12) ea. $1.55 - $18.66.

11. 2 volt Gell Cell starting battery. List: $9.95. Indy: $6.85 and charger for battery. List: $9.95. Indy: $6.95.

Notes - the bore in the Como 40 U/Control venturi will be about .275. We also offer a 12v. Gell Cell with 6v. and 2v. taps. Gives you power for your electric starter and your glow plug. List: $25.95. Indy: $18.50.

ORDER INSTRUCTIONS

$1.00 handling on all orders. Prepaid domestic orders postpaid. Foreign orders allow $10.00. We will take your check or money order or ship your order C.O.D. Also, we honor BankAmericard (VISA) or Master Charge (Bank Number). Indiana Residents. - Include 4% Sales Tax

1-800-428-4682

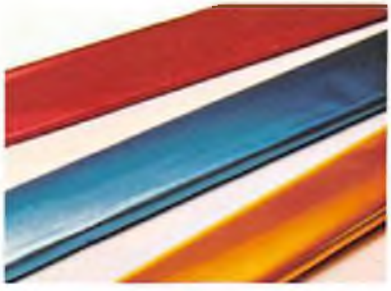
Indiana Res. (317) 846 - 0766

IZUMI RACE CAR

One each scale Porsche. Engine 15 to 20. Engine not included. One of the most popular Japanese race car products. Many have been sold to hobbyists and Indy dealers in the U.S.A. List: $129.95. Indy: $89.95.

MK (KATO) CURARE

MK's all balsa kit of Hanno Prettner's famous Curare. MK's quality really shows on this kit that Mr. Kato is building under an agreement with Hanno. 60 size - List: $98.50. Indy: $79.00. 40 size - List $79.50. Indy: $63.00.



INDY FILM MK II

MK II — new colors like K & B epoxy. Solids — white, cub yellow, orange, black, royal blue. Flag red. $7.50/roll. Introductory price $3.99/roll or 3 rolls/$9.99.

MK'S HAPPY - 20

This is an all balsa trainer for the beginner who is looking for a quick and easy 3 Ch. building project. It would make a nice airplane for an experienced flyer to take along on vacation. List: $29.95. Indy: $23.95.

CALL TOLL FREE
1 - 800 - 428 - 4682
CALL TOLL FREE

INDY R/C

Own It And Suddenly
You're The Envy Of Every Flier On Your Field

Look at it. One glance will tell you that without question it's the most magnificently finished production model, almost-ready-to-fly ever made. And without doubt the simplest to assemble.

You may be only a novice builder, a neophyte flier, but with one quick, sensibly priced purchase, you're up there with the best of them. There probably isn't a builder in your group who can match the scale-like perfection of the MRC Cessna Cardinal as it comes right from the box. Flawless mirror finish and 3-tone fuel-proof paint shine brightly over a rugged, true fiberglass molded fuselage. (No sheet plastic.) The foam cored, balsa sheeted wing is meticulously painted and trimmed. And the dependable Enya-35 is mounted up front. The stab is finished, the elevator hinged with horn, even the push rod and fuel tank are in place. Total assembly time . . . even for a novice . . . approx. 1 hour.

Beauty That's More Than Skin Deep

Flight performance is a pleasant combination of stability and maneuverability. It's high wing silhouette makes it a great trainer as well as a super craft for the sport flier . . . and scale buffs take pride in it's "right out of the box" realism.

Buy an MRC Cessna Cardinal and suddenly you're a big man on your flying field . . . sporting a superb examble of the ultimate in building skills.

Ask your hobby dealer to show you MRC's magnificent Cessna today. While you're there, ask to see our low wing Cherokee . . . just as beautiful and complete with an Enya .40.

Cessna Specs: Wingspan: 55 inches Total Wing Area: 508.7 sq. in. Available with or without MRC radio system.

Send $1.00 for MRC's 1977 Model Aircraft Products Catalog in Color

Model Rectifier Corporation / 2500 Woodbridge Ave. / Edison, N.J. 08817

MRC's Magnificent Cessna