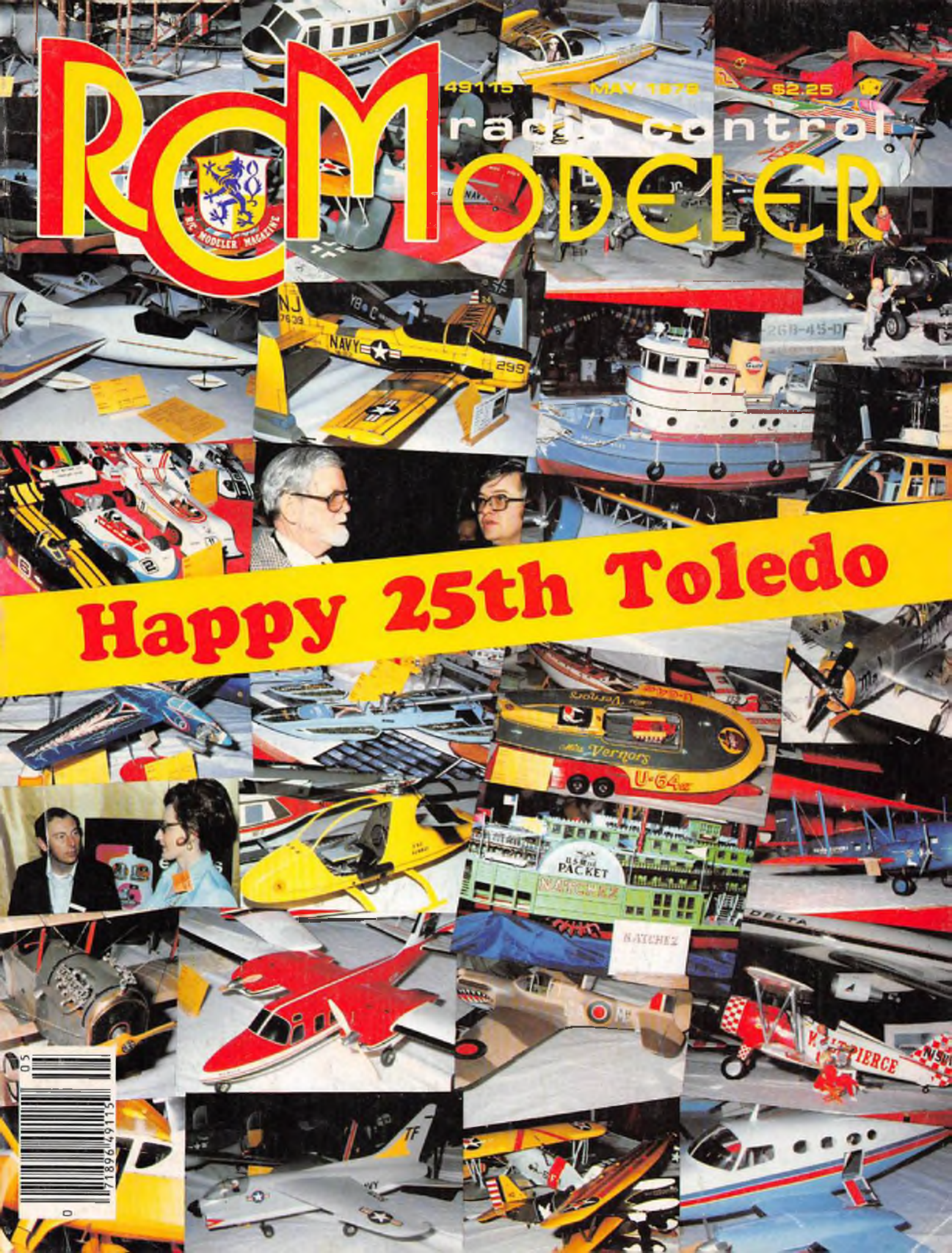
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MODELER
radio control
49115
MAY 1978
$2.25
Happy 25th Toledo

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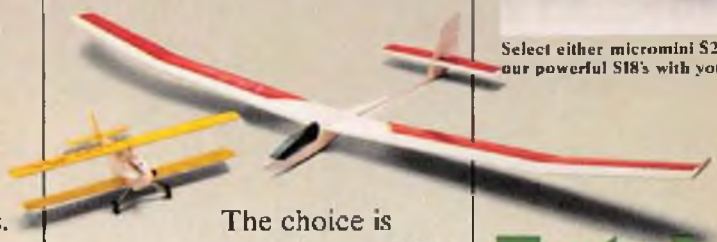
The Futaba FP-3S provides precise, single-stick control of rudder and elevator.

The Futaba FP-3S system makes a great combination for the RC sailplane or ½A pilot. First, you get smooth, accurate control with the single-stick operation preferred by competition flyers. Then you can match up our R3F double-tuned, RF amplified receiver with your choice of S18 or S20 servos to best suit your model and your budget. Equipped with a pair of S18's, the 3S system is just $144.95. Or you can specify our mighty mite, ball-bearing S20's with the 3S for $169.95.

Select either micromini S20's (shown) or our powerful S18's with your 3S system.



The choice is yours, but either way you'll be flying with the leader in radio control performance, reliability and service. Futaba.

Futaba

2065 East Victoria Street
Compton, California 90220

The FP-3S. Three channels. Two servo choices. Single-stick control.

VOLUME 16 NUMBER 5 MAY 1979

RCM MODELER

This Month's Cover
features a colorful montage of photos saluting the Toledo RC Exposition's 25th Silver Anniversary Celebration. RCM congratulates the Weak Signals on behalf of the entire industry for their fantastic efforts in putting on a bigger and better show every year. Ektachrome transparencies by Dick Tichenor.

R/C MODELER MAGAZINE is published monthly by R/C Modeler Corporation, Don Dewey, President. Editorial and Advertising offices at 120 West Sierra Madre Boulevard, Sierra Madre, California 91024. Telephone: (213) 355-1476. Entered as second class matter at Sierra Madre, California, and additional offices. All prices appearing in this magazine are subject to change without notice. All subscriptions will be taken at the prevailing rate.

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From the Shop

DON DEWEY

A SALUTE TO THE TOLEDO RADIO CONTROL EXPOSITION --- 25 YEARS OF GROWTH

In 1979, the radio control modeling world celebrates the Silver Anniversary of the world's most comprehensive RC Show. We're proud to have the opportunity to honor the hosts of this event and we're looking forward to the continued growth of the Toledo Radio Control Exposition.

During the 25 year history of the Toledo Exposition the RC hobby has grown tremendously. New technology, new materials and imaginative thinking have drastically changed the way we build and control our models.

As the popularity of the RC hobby has grown, the Toledo Exposition has become the stage on which new products are unveiled. Hundreds of new products have been seen publicly for the first time in Toledo and thousands of models have been displayed in competition.

Here's how the Toledo Conference started and how it has evolved during the past 25 years:

In February 1955, a group of RC Enthusiasts from Detroit and Toledo got together at a cemetary accessory sales office in Detroit to talk shop. They enjoyed the session so much that they decided to hold an annual get-together.

The Conference was held in the same Detroit location in 1956 and attendance grew. At that time the event was co-hosted by the Detroit RC Club and the Toledo Weak Signals.

In 1957 the Conference was moved to Toledo, primarily because of the expressway and Ohio Turnpike connections which made Toledo readily accessible by car. Also in 1957, the Toledo Weak Signals Club took over operation of the Conference. Site of the show in 1957 and 1958 was the Trilby Log Cabin (now an automobile dealership).

Among the first manufacturers to exhibit at the Conference were Bramco, Controlaire, Min-X, DeBolt Model Engineering, Citizenship Radio and other pioneers in our hobby.

Attendance grew and there was a need for a larger exhibit area. In 1959 the Conference moved to the Miracle Mile Ballroom and remained there through 1961.

The Expo is put together in Bob Hisey's basement. Seated (L to R): Joe Vislay, model displays; Wayne Yeager, awards; Bob Hisey, co-director; Bill Ruppert, swap shop; Rick Ledderman, communications; Roy Hinger, security; Don Belote, co-director. Standing (L to R): John Root, finance; Ed Grabbenstresser, AMA raffle; Dave Leach, judging. Booze was hidden for photo.

Toledo Expo co-directors (R) Don Belote and Bob Hisey with Miss Dorothy Rade, 1976 Miss Weak Signals.

The need for more space was answered in 1962 with a move to Sunningdale Country Club. That year 12 manufacturers and about 1,000 visitors attended.

It was in 1962 that Carl Goldberg unveiled his now famous Falcon 56. Also in 1962 a California manufacturer, Space Control, showed an analog proportional radio system. How many of us have built and flown a Falcon 56; and how many of us remember analog proportional?

Because of rapid growth, the Conference moved again in 1963, this time to the Champion Spark Plug Company hangar at Toledo Express airport. By then the show was attracting participants from many parts of the country and even a few visitors from Canada and overseas. The Conference was held at the Champion Spark Plug Company hangar again in 1964, and in 1964 R/C Modeler Magazine began sponsoring a trophy for best finish.

In 1965, the Conference moved to the Lucas County Recreation Center and remained there through 1974. Rate of growth is indicated by these statistics: 1967 — 26 manufacturers and 4,000 visitors; 1968 — 40 manufacturers and 5,000 visitors; 1969 — 80 manufacturers and 9,000 visitors; 1970 — 100 manufacturers and 10,000 visitors.

During the years when the Conference was held at the Lucas County Recreation Center, the RC hobby experienced explosive growth. Products such as MonoKote, Coverite, retractable landing gears, 5-minute epoxy, more reliable engines and greatly improved radio equipment were introduced.

The Toledo Sports Arena became the home of the Conference in 1975 and that year there were 150 manufacturers and 12,000 visitors. Also in 1975 the official name was changed to the Toledo Radio Control Exposition. In 1978, there were a record 190 manufacturers and some 30,000 visitors --- a sure testimonial to the growth in popularity of the RC hobby.

Manufacturers and visitors come from all parts of the world. This makes the Toledo Exposition a truly international event.

Throughout the years, the objectives of the Toledo Weak Signals Club in hosting the Exposition have been to:

Provide a location where the modeler can display his building skills in competition with others.

Provide space for manufacturers to exhibit their wares, to

to page 201

SALE! Hobby Lobby 6 Radio $199.95

HERE'S WHAT YOU GET:

6 channel Transmitter, 6 channel Receiver, 4 Servos, all rechargeable nicads (for both transmitter and receiver), built-in dual nicad charger, AC and DC charge cords, servo mounting grommets and extra output arms and wheels, Illustrated Owners Manual, 6 month limited warranty and your choice of any 72-75 or 27 mhz. band frequency. The system operates right out of the box and is ready to install in your RC plane, boat, or car.

Here's why a Hobby Lobby Radio System is your best buy:

1. Spare servos for the main flight functions cost you only $14 each.
2. There is no radio made that is more reliable than a Hobby Lobby radio.
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4. The Hobby Lobby Radio will still work even if one cell goes dead in its airborne battery pack.
5. You can reverse the direction of rotation of a Hobby Lobby servo in less than a minute.
6. Control stick tension is adjustable.
7. The servos are tiny but strong enough for the largest 1/4 scale RC planes.
8. Hobby Lobby radios are so precise that the servos center within 1/2° of the same center every time.
9. Hobby Lobby radios have very low current drain — they'll fly longer (and safer) on a charge.
10. Service on HL radios is performed by the same people who sell them — us!

SALE! Hobby Lobby 3 Radio with 3 servos $129.00

HERE'S WHAT YOU GET:

3 channel Transmitter, 3 channel Receiver, 3 Servos, airborne battery box and switch harness, servo mounting grommets and extra output arms and wheels, Instructions, 3 month limited warranty and your choice of any 72-75 mhz. band frequency. The system requires 4 alkaline pen cells for the receiver and a 9 volt battery for the transmitter and is ready to install in your RC plane, boat, or car.

☐ **HOBBY LOBBY 6 DIGITAL PROPORTIONAL .....$199.95** ☐ **HOBBY LOBBY 3 RADIO with 3 SERVOS.....$129.00**

( ) I enclose check for $ _____, plus $1.80 handling. ( ) Charge to my Master Charge No. _____ Expires _____.
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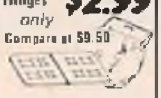
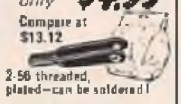
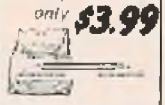


BULK PACKAGE RC Metal Clevises
35 Clevises only **$4.99**
Compare at $13.12
2-56 threaded, plated—can be soldered!



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



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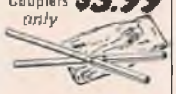
35 Couplers only **$3.99**



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Compare at $7.25

BULK PACKAGE Mini Nylon Pin Hinges
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4 Pairs: 2" thru 2¾"
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25 Links only **$4.99**
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20 feet nylon tubing
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When you phone for your kit, order the KIT ACCESSORY PACK. We've figured out every hardware and covering item that's needed for each kit in this ad. Our ACCESSORY PACKS contain everything you need to complete the plane except for engine, radio and tools. Cost? Usually less than the kit.

Bridi RCM TRAINER 40 **$35.99**
List price $54.95
54" span for 4 channels, .35-.49 engine. ADVANCED TRAINER.

FOAM A-R-F KITS

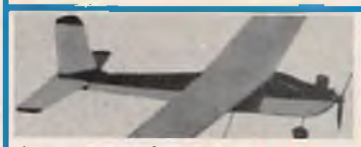
Sureflite PIPER J-3 **$24.99**
List $37.95
For .15-.19 engine, 52" span, 2 to 4 channels, 2 hour assembly.

Bridi SUN-FLI 4-20 **$19.99**
List price $29.95
MINI PATTERN PLANE. 48" span, 4 channels, for .15 to .25 engine.

Bud Nosen AERONCA CHAMP **$69.99**
List price $99.95
9 FOOT SPAN!

Sig KADET **$30.99**
List price $39.95
GREAT TRAINER. For 3 channels, .19 to .30 engine. 57" span.

Sureflite CESSNA SKYLANE 182 FOAM A-R-F **$24.99**
List $37.95
For .15-.19 engine, 53" span, 420 sq. inch area, 2 to 4 channels. Steerable nose gear, 2 hr. assy.



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Each nylon cable-tie is 3½" long. Forms a permanent, self-locking, very strong clamp from ¾" dia. to ZERO inch diameter. Handy for: Organizing radio wires; supporting nyrods in fuselage structure; as a hose clamp for fuel lines; attaching fairings to struts; clamping metal rod to dowel for pushrod . . . you'll think up dozens of uses when you see them.

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

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NEW LOWER PRICE!

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Tests, cycles, recharges digital nicads.

Balance ANYTHING!

Would you ever believe it's possible to balance not only a prop, but also the prop NUT? Don't laugh–this thing'll do just that. It'll also balance spinners, flywheels, boat props–anything that's got a 1/8" to 3/8" hole in it. Beautifully made.

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SKYGLASS FIBERGLASS & FOAM AIRPLANE KITS

We don't know of a cheaper way for you to outfit yourself with a high performance fiberglass RC plane.

F-15A Deluxe	$129.95	$94.00	Phoenix 6 - 60	$ 65.00	$47.45
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Replace old worn connectors with these gold-plated male-female connector sets. Deans Connectors can be retightened for secure fit.

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3 Pin Connector set $1.15
4 Pin Connector set $1.20
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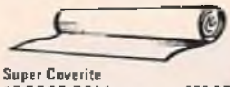
Coverite for . . . BIG airplanes!



Super Coverite 15 FOOT ROLL $28.97
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Revolutionary! Variable Pitch Prop!

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If you haven't tried MULTI-PROPS yet . . . you can save $ by trying them NOW!

Prices in effect until May 31, 1979.

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Hobby Lobby-S.L.E.C. 10" $7.99
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Spare 10" Blade, 99¢ – Spare 12" Blade, $1.49

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Fox 15 RC Schneurle with Fox Muffler
Total list value $43.90
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SUPER-LOW PRICES ON EK-LOGICTROL RADIOS!

EK-Nimbus, 4 chan. List $309 ..... **$185.00**

EK-LRB 5 channel. List $310 ..... **$175.00**

EK-Champion, 5 channel. List $370 ..... **$225.00**

EK- Super Pro, 7 channel. List $420 ..... **$255.00**

SPECIAL!

G.E. Nickel-Cadmium Batteries

1.2 volt 500 mah. Pencell size

4 for $9.99

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

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

(Almost-Ready-to-Fly)

HERE'S WHAT'S IN THE BOX:

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

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

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

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

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

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

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

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

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

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

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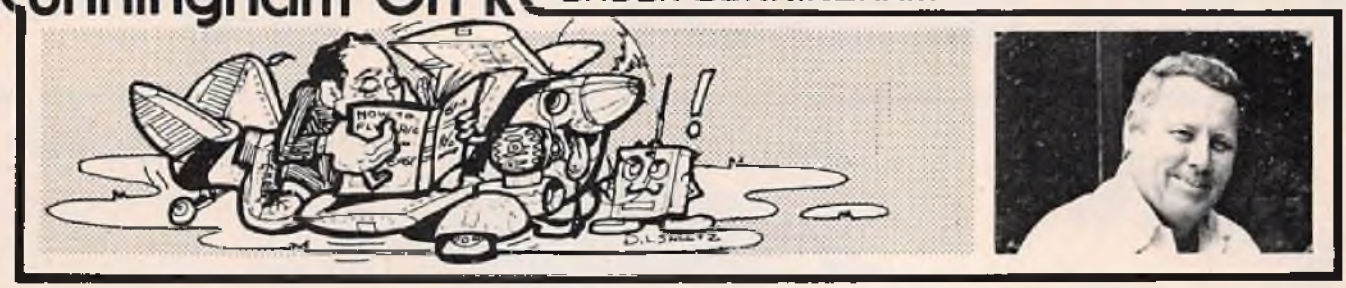
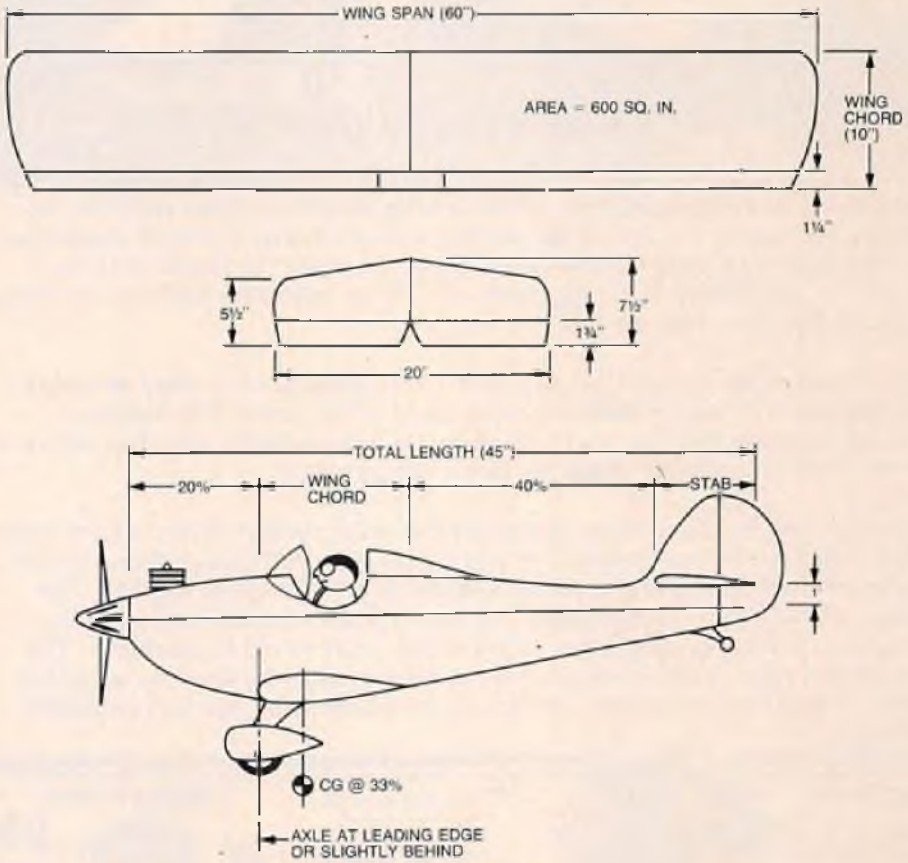


R/C DESIGN MADE EASY PART I

For the Fourth time around we are going to try to take you down the road to discover the really easy way to design your own R/C aircraft. This series was first done in 1965, then later in 1969, then more recently in 1976, and now, again in 1979. The rate of growth in our hobby/sport has been fantastic the last five years or so bringing in a great amount of newcomers. Perhaps you are one of these newcomers who missed earlier design articles, and who now find that what you really want to do is design your own. Well, come along for the ride --- this series will make it very easy for you to design your own R/C aircraft with the complete knowledge that when you go out to fly the finished product, it will fly well. That is if you are a competent pilot. No amount of safe design knowledge will make up for a lack of flying skill. Often, a mis-designed model can be successfully flown by a skillful pilot, but never can a successfully designed aircraft be flown by a pilot with no experience. Don't let this series confuse you into believing that you can put the cart before the horse. If you're new to the sport, learn to fly first, than begin to exercise your designing skills.

We are going to cover a wide range of design subjects in this series, from biplanes to monoplanes, from trainers to pattern aircraft, from fun fly machines to soaring aircraft, and from little airplanes to jumbo aircraft. But, we are going to be looking at these aircraft through the eyes of a sport flier. The vast majority of us are sport, or Ken Willard's Sunday Fliers, and this group is the target of this series. We will also be taking a look at the question of structure on the jumbo aircraft, since structure seems to be the most screwed up of all of the problems in designing your own jumbo. I have seen many that are too lightly designed structure-wise, and also many who were way over-designed in the beef department, thus resulting in an aircraft with marginal flying ability. Of course, this can hold true for the smaller aircraft also, so we will begin at this point . . . just what is the best size aircraft to design for a given engine size?

First, we must determine what type of aircraft that we want to design, what size engine we are going to use, and what type of flying we are going to do with the finished product. Well, I can't exercise mental telepathy with all of you, so I will start by making some assumptions on my part, and hope that those assumptions will tally with your thinking.



R/C DESIGN MADE EASY
PART I
SPORT DESIGN FOR .40 ENGINE

Assumption number one. Gee, we've got a really good .40 size engine that runs well, and idles like a dream, and we would like to design a sport type low wing aircraft that looks kind of like it stepped off of the pages of a 1934 issue of a sport aircraft magazine. (Actually, I'm planning to design just this aircraft for one of my next projects, when I can squeeze in the time, so you may beat me to it.) We want an aircraft that will fly well, will have good landing characteristics, won't be too hot to handle, and will look good. Furthermore, we want it to be a tail dragger. How many trike geared ships did you see in the thirties? But, if you're worried about using just two wheels, we can take a look at the gear placement if we make it a tail dragger also.

Assumption number two. That you have a roll of paper to draw upon, a long straightedge, a sharp pencil, a scale (or ruler if you wish), and a pocket calculator, or a slide rule . . . slide rule, now there is an item that has disappeared in just a few short years, kind of went the way of the buggy whip, and we didn't even realize that it was gone.

Let's get started.

First, size. We've decided upon a .40 engine, so what size do we make our airframe? We want it to fly well, but not burn up the sky like a racer, so we must plan on something a bit larger than a Formula I aircraft. A Formula I sports a wing area of 450 square inches, so we should be larger than that. 500 square inches isn't much larger, and Quickie 500 models go like a bat out of heck, so let's jump up some more. How about 600

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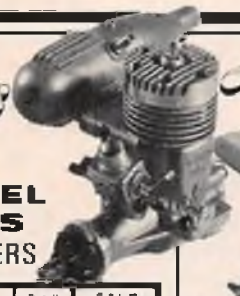

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Engine Clinic CLARENCE LEE

Dear Mr. Lee:

Many thanks for your previous answers to my questions. Your advice is highly appreciated. I am sure that other fans around Mexico City will benefit from your comments, as I did.

I take this opportunity to request further details on how you would raise the compression ratio of a K & B .61, which is my favorite engine, e.g., how much would you reduce either the head or the seat of the engine? Any hint will be very useful, since I have not had previous experience in this type of work, but do have access to people with precision machines and surely I will be engaged in some experimenting, therefore, your advice will help me not to spoil engines.

I thank you in advance for your kind assistance in this matter.

Cordially yours,
Ing. Guillermo Villa Novoa
Mexico

As regular readers of the column know I get quite a few letters from fellows living in parts of the country and world at higher elevation wanting to know how they can improve the performance of their motors --- Colorado and Mexico City, in particular, where the elevation is in excess of 6,000 feet. The main thing that will benefit an engine the most is a raise in compression ratio. This, in conjunction with a fuel in the 25% nitro range, is about the only thing that can be done. As in Mr. Novoa's case the fellows want to know how this can be done.

Unfortunately, in order to raise the compression ratio, the combustion chamber has to be made smaller and this can only be done on a lathe. All modification should be done to the head. This way if you goof, or at a later date move to a lower elevation, a stock head can be installed on the engine. The compression ratio can be raised by machining material off of the top of the sleeve if it is thick enough and extends high enough above the top of the case. However, once this route is taken you cannot change back without replacing the sleeve — which would, in turn, mean a new piston if a lapped engine, or rings, in the case of a ringed engine. So modification of the head is the preferred method.

The amount of material to remove from the head will depend on the particular engine involved. Some have higher compression to begin with than others. In the case of the K & B .61 .015" to .025" should be removed from the seating surface of the head. Fellows living at elevations 3,500 to 5,000 above sea level should go with .015". Above this .025". When you remove material from the head it is then going to drop deeper into the sleeve so the same amount must be removed from the squish band portion of the head if the engine uses this design head. If a hemi or other shape, the same amount must still be removed from the portion of the head that extends into the combustion chamber to assure there will be no interference with the top of the piston. If the engine is of ABC design and uses a flat top piston, that's all there is to it. If the engine piston has a baffle, as does the K & B .61, then the baffle slot in the head must also be made the .015" to .025" deeper. This should be done with an end mill either using a milling machine or lathe milling attachment. Naturally a "Swiss mill" (that's a file, son) can be used if you are careful. If using a file it is a good idea to install an old head gasket or mask the gasket seat with masking tape to avoid marking with the file. One swipe with the file and no compression. I should also have pointed out that in the case of squish band heads, the squish band is usually machined at a slight angle --- usually 2°-3° --- so when removing material maintain the same angle as the stock head.

While we are on the topic of lathes there is a real bargain available that few fellows are probably aware of. Most fellows are now familiar with the small Unimat type mini lathe. The best of these, in my opinion, being the Sherline manufactured by Joe Martin and Carl Hammons. However, these miniature lathes are limited in the amount of work that can be performed on them.

For years Sears sold their 6" Craftsman lathe that was actually made by the same people that make Atlas lathes (Atlas Press Co.). The Atlas 6" lathe is available through Atlas dealers throughout the country. A year or so back Atlas started a new policy of direct sales only and cut the prices of their machinery almost in half. A 6" Atlas lathe can now be had for $295.00 plus $30.00 shipping not including the motor. Although still a small lathe it is considerably larger than the mini type and just about anything you would want to do involving a model engine can be handled on it. I started out with a 6" Craftsman lathe myself over thirty years ago. Advanced to a 10" Atlas, purchased a second 10" Atlas, and now have a 12" Clausing. Atlas Press is a subsidiary of Clausing. So for about the same price that you would pay for one of the mini's you can get a larger lathe if your needs require one. If interested, write to the Atlas Press Co. and ask for their Catalog — 2019 N. Pitcher St., Kalamazoo, Michigan 49007. Tell them you read about it in "Engine Clinic." Maybe they will buy some advertising space in RCM.

Dear Mr. Lee:

Your monthly "Engine Clinic" in RCM has provided me with very helpful information concerning many aspects of R/C flying in addition to its valuable data concerning engines. I'm writing now to seek your advice concerning the use of an engine in a pusher type aircraft. Specifically I have the following questions:

(1) I'm presently flying a Super Kaos with a Webra .61 Speed using an 11/7½ prop. If this engine were used in a pusher type aircraft such as the L-39 Albatross, depicted in the January '78 RCM, with an 11/7½ pusher prop could I expect about the same power output or engine thrust from this pusher arrangement as I get with the conventional tractor application in the Kaos?

(2) In general would most engines produce about the same thrust using a pusher prop as they would using a tractor type prop assuming similar prop diameter and pitch?

(3) One sees few pusher type aircraft depicted in the magazines or appearing at contests. Is this a reflection of some inherent disadvantage in the pusher type configuration or is it merely a personal preference?

(4) Is there an ideal sized prop for pusher use or should one generally use the data available on tractor props and

to page 15

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from page 10

apply this to the pusher?

Thank you very much for your help in this matter.

Sincerely,
Frank J. Leary
Rochester, Minnesota

There shouldn't be any change in power output of an engine just because it is being used in a pusher configuration. This assuming the engine has double ball bearing crankshaft which the Webra .61 does.

Pusher configurations usually lead to balance problems and fuel feed problems. It usually takes a lot of lead in the nose in order to get the ship to balance. Fuel feed has always been a problem although with the introduction of the Perry and Robart pumps this has been helped considerably.

Ideal prop size is going to be dependent upon the aircraft design the same as for a tractor type aircraft.

Dear Clarence:

I would like to say that I never miss reading your column in RCM, finding it most interesting and informative. I am now in need of advice from an engine expert – so this letter.

I needed a good .60 mill for my new Top Flite P47 so I thought I would try a new K & B with Perry pump-carb and I ordered one through the local hobby shop. Upon purchasing the engine and looking at the instructions, the first thing I read was it is not recommended that the engine be mounted inverted. Now, Clarence, I'm already committed to an inverted mounting in that T'bolt and cannot change it without rebuilding the complete nose, mounts, tank compartment, extra cooling outlets, etc. I have been successfully flying scale with inverted engines for years, but the pump is new to me. The vent hole on the pump cannot be rotated 180° to put it in the recommended bottom position on an inverted engine without adding another flat spot on the backplate to clear the piston skirt. Rotating the pump also puts the pump outlet on the opposite side of the carb inlet. Any problems with leaving the hole on the top? Dirt is no problem on our plush green airstrips here. Also what can I expect from the slide valve on the carb in an inverted position?

With retracts, flaps and lots of extras on this ship, I have lots of labor and love involved and do not want to undo it with engine problems. Do you think I can use this system successfully inverted or would I be better off putting a conventional fuel system on this engine?

Thank you for your time and consideration.

Sincerely,
Norman J. McCormack
Boston, New York

Perry does not recommend inverting the Perry pump due to the vent hole then being on the top. The purpose of this vent hole is to provide atmospheric pressure for one side of the regulator diaphragm. If it becomes blocked or fuel enters the vent hole that will not drain back out, the regulator will not work. Things have a tendency to get pretty oily in the engine compartment and it is surprising how much fuel/oil can find its way into the regulator --- look how much works its way down the throttle cable into the inside of the airplane.

The best solution would be to file a flat on the pump housing and keep the vent hole inverted as intended. Although this places the fuel outlet on the wrong side the extra length will not hurt as long as you are careful that the extra length does not flap around in the slipstream or be pinched off under "G" loads, etc.

As far as the slide valve — just screw the adjustment screw all the way down and forget about it. It hasn't proved to be that beneficial and new carburetors from the factory come with it out of operation now.

Dear Sir:

I own an Enya .40 TV engine which has proved to be a very smooth running and powerful engine. So far it has been used in a beefed-up Falcon 56, a Hobby Shack SST 40, and is now being mounted in an original design, scratch bipe.

With a 10/6 wood prop, this mill pulls the SST 40 through most maneuvers, including outside loops. It has been run on two different fuels (since break-in). I have used Duke's Mixture and also our club fuel which is Blast 7% nitro.

Two basic problems prevent my total satisfaction with the motor. First and foremost, it is very difficult to get a reliable idle. A fairly fast idle is necessary to keep the engine from quitting, and this makes for fast landings. Adjustments to the air bleed, changes in props, changes in fuel, changes in glow plug, new tank and fuel lines, have made no difference. The idle problem existed in both the Falcon and the SST 40 although the mid-range and top end are great. The stock carburetor has a very large intake and, while the engine is idling, it seems to spit fuel regardless of the air bleed adjustment.

The second problem is with fuel draw when the eight ounce slant tank gets below half full. I am using muffler pressure and have tried both the stock muffler and a Semco closed end muffler with no change. Tank location seems proper and as reported, I have changed tanks and fuel lines with no change in performance. The engine has been cleaned with great care, and after re-assembly no improvement was noted.

I own four other engines, all OS, and have no problems with idle or fuel draw, even in the same planes. I thought of replacing the stock carburetor with a Perry type, but I am told that Perry does not make one to fit the Enya .40. If you can shed a little light on the situation it would be greatly appreciated, as this engine runs beautifully and starts very easily and seems to be very powerful for a .40. Your recommendation for the proper prop would also be appreciated. The manufacturer calls for an 11/6 but everyone tells me that 10/6 should be the proper size.

Yours very truly,
Art Gingras
Pittsfield, Mass.

The airbleed type carburetor used on the Enya .40 leaves a lot to be desired. I am not sure about the carburetor neck size but Perry does make a carburetor for the Enya .45 which I imagine will fit.

Spitting fuel out the intake is characteristic of Enya engines. For some reason they use very late closing timing of the crankshaft — later than many racing engines. This causes considerable blow back at low speed. Large venturi area will also cause quite a bit of spitting at the carburetor, and also accounts for the low fuel draw. Many manufacturers are getting more power out of their engines by increasing the size of the carburetor venturi. This only results in lower fuel draw ability. A Robart pump would help considerably in this case but not help the idle problem.

Prop size is rough on a .40 size engine. An 11/6 is too much prop and the 10/6 not quite enough --- the 11/6 being a .45 size and a 10/6 a .35 size. You want your engine to turn in the 12,000 rpm range. If it is turning higher than this try an 11/5. If the engine is loaded down too much cut down the tips until the engine is turning in the 12,000 rpm range.

Dear Mr Lee:

I am quite interested in building radio control scale aircraft. Frankly the WW II types hold the greatest interest, however, my biggest objection to most of them is the engine cylinder head protruding from the cowling. It appears that building a model of say a Spitfire or Bf 109E, large enough to completely hide the engine would present weight problems and attendant poor flight characteristics.

In reviewing available power plants two come to mind that may have practical application. The OS Wankel appears to be quite suitable particularly since the aircraft would be somewhat smaller in overall size than the typical "60" sized model. A scale of about 1¼" to the foot seems satisfactory. However,

to page 186

Save $150 on Your Next Radio!

Double Deck Receiver with Bantam Servo Flite Pack Kit. Receiver measures 1" X 1 7/16" X 1 3/4" and weighs 1.5 oz.

A Digital Commander Flite Pack Kit Can Avoid Unnecessary Duplication and Save You Money!

In these days of skyrocketing prices, all of us are faced with having less money to spend on our leisure activities so we have to try to find ways to save money and yet we'd like not to give anything up. Ace R/C's Digital Commander line of receivers, servos, and flite pack kits avoids unnecessary duplication so it save you considerable money without having to downgrade the quality of your equipment.

STANDARD BANTAM servo option. Measures 0.75" X 1.375" X 1.5", weighs 1.25 oz. and has 5 lbs. of thrust. Our best all around servo.

COMPATABILITY AVOIDS DUPLICATION

Say that you're building a couple of new planes this winter and you'd like to put a radio in each plane that you get ready to fly but it would mean having to buy two new systems . . . that could cost you $500 and up! You probably already have a good radio with a transmitter you are used to and like. No matter what brand, a Digital Commander Flite Pack kit is compatible with your transmitter without ANY modification to the transmitter as long as they are on the same frequency! There are only a couple of isolated exceptions to this statement.

BANTAM MIDGET servo option. Measures 0.7" X 1.125" X 1.43", weighs .85 oz. and has 20 in. oz. of thrust. Perfect for full house 1/2A's or .60 pattern ships!

You can build a flite pack kit, tune it to your existing transmitter, and install it in your plane just as if you had bought a complete new system and at a fraction of the cost. By the same token, if you have some extra servos, no matter what brand, our Digital Commander receiver will operate them. Or, if you want to have servos in all you planes and switch one receiver from plane to plane, our servos are compatible with your receiver, no matter who made it.

MICRO servo option. Measures 0.625" X 1.25" X 1.28", weighs .75 oz. and has 4 lbs. of thrust. Where you need the smallest size and weight possible.

KITS ALLOW COMPATABILITY

Because the Digital Commander units are kits, and because there is very little difference in the basic electronic concept between brands of radios, they can be matched and tuned to your existing equipment as you are building. Also you learn a good deal about the operation of your system that can save some trips to a service center.

SINGLE DECK RECEIVER option. Measures 13/16" X 1 3/8" X 2 7/16" and weighs 1.75 oz. Compatable with any digital transmitter on the same frequency.

YOU CAN BUILD A KIT

We recommend that if you have the patience and ability to build a decent airplane, access to the proper tools including a small tipped soldering iron and a voltmeter, you can build and tune a Digital Commander kit. If you don't think you have the ability or desire to handle a kit, Ace R/C offers the complete line factory custom assembled--please write or call for details.

Write for our complete catalog today! Contains thousands of quality products just for the R/C enthusiast. Please send $1 and add $.50 if you want 1st Class mail return.

PERFORMANCE AND SERVICE SOLIDLY BACKED

TOP QUALITY parts and design combine for high performance and dependability.

For over twenty-five years Ace R/C, Inc. has been serving the R/C'er--you can be assured that we're here to stay and back your Digital Commander system for years to come. If we didn't produce a quality product with good performance, we couldn't have stayed in business this long!

Following is a list of the Flite Pack options we have available. All of them except the Micro Servo flite packs come less ni-cd batteries and contain connectors and switch. The Micro Servo flite packs have 100 mah ni-cd batteries included also.

These Flite Pack Kits are unassembled and less ni-cd batteries

12G18-2	Single Deck Receiver and Two Bantam Servos	$ 74.95
12G18-4	Single Deck Receiver and Four Bantam Servos	114.95
12G28-2B	Double Deck Receiver and Two Bantam Servos	94.95
12G28-4B	Double Deck Receiver and Four Bantam Servos	114.95
12G18-2N	Single Deck Receiver and Two Bantam Midget Servos	80.95
12G18-4N	Single Deck Receiver and Four Bantam Midget Servos	126.95
12G28-2R	Double Deck Receiver and Two Bantam Midget Servos	80.95
12G28-4R	Double Deck Receiver and Four Bantam Midget Servos	126.95

These Flite Packs are unassembled and have 100 mah ni-cd batteries

12G28-2M	Double Deck Receiver and Two Micro Servos, 100 mah batts.	94.95
12G28-4M	Double Deck Receiver and Four Micro Servos, 100 mah batts.	146.95

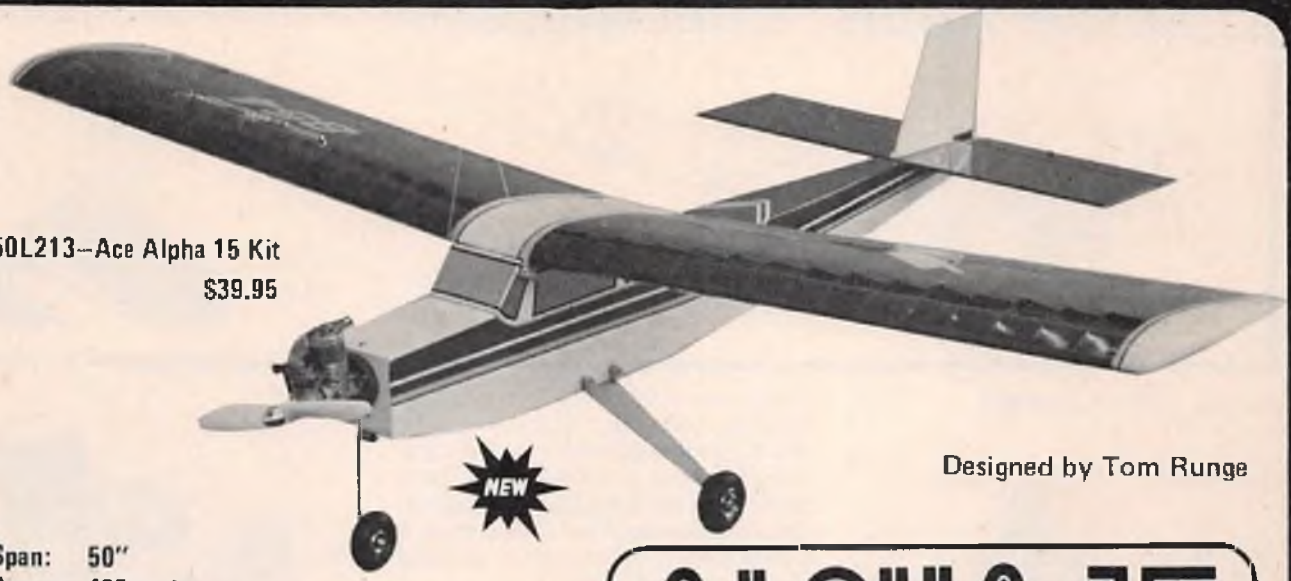
Besides the flite packs, we have complete systems, separate receivers and servo kits, batteries, chargers, plus much more. For more details on the Digital Commander line please send $1 for our complete catalog (add $.50 if you want 1st Class mail return).

All of Ace R/C's products are available through your dealer or may be ordered direct. Please add $1 handling on all direct orders. Visa and Mastercharge OK.

There are literally thousands of R/C'ers that currently are enjoying the savings and quality of the Digital Commander concept. Why not join them today.

ACE R/C, Inc.

BOX 511B, HIGGINSVILLE, MO. 64037
(816) 584-7121



50L213--Ace Alpha 15 Kit
$39.95

NEW

Designed by Tom Runge

Span: 50"
Area: 425 sq. in.
Engine: .15 to .25 R/C
Functions: Three or Four Channels

ALPHA 15

A big brother to the Alpha, the Alpha 15 is a sturdy, easy to build, rock stable trainer/sport plane for three or four channel control and a .15 to .25 engine. On a .15 this plane will easily take off of grass and has plenty of power for loops and rolls. It doesn't have any bad spin or snap roll tendencies and has excellent slow flight characteristics.

Plywood fuselage and built up wing construction is featured for sturdiness and durability. Even at the reasonable price, the kit contains complete hardware: steerable nose gear, formed main gear, all control linkage and hardware; all you need to complete the model is tools, glue, finishing material, engine with mount, tank, wheels and radio.

A perfect full house trainer/sport plane!

KIT IS NOW AVAILABLE!

DIGIPACE 1

A sophisticated piece of lab quality equipment for cycling ni-cd batteries. Accurate, dependable, and attractive.

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

--Switch for three different transmitter voltages, (6V, 9.6V or 12V).

--Switch for two different receiver charge rates, (20 ma or 50 ma).

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

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

--Available in kit form or assembled and tested.

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

THE KIT IS RECOMMENDED FOR EXPERIENCED BUILDERS ONLY.

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

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ACE R/C, Inc.

BOX 511B, HIGGINSVILLE, MO. 64037

Scale Views

CLAUDE McCULLOUGH

Scale Spotlight

Wendell Hostetler liked the flying performance of the Sig Skybolt and called last fall to ask my opinion of an englargement of the design to Quarter Scale size. It sounded like a great idea and I told him to let me know how it worked out. As you can see, it worked out beautifully. The big bird looks like a winner. Wendell should be awarded some sort of a trophy himself for going out in January of the Midwestern winter of 1979 to test fly. He had never seen a Quadra powered ship fly before but said the Skybolt exceeded all his expectations. It is fast and "smooth as glass," loops from level flight with ease, rolls equally well left and right and has no bad stall tendencies. The only trim needed was a hair of up elevator.

It was not necessary to add any balancing weight. The C.G. came out about 1" behind the leading edge of the bottom wing, which is within the percentage range commonly used on the smaller Sig version. Flying weight is 23 pounds, pulled by a homemade 20/8 prop. That slick color finish was applied with K & B Superpoxy paint.

Wendell designed the structure with extra strength so as to be able to use larger and more powerful engines if desired. He has two 44" x 80" sheets of construction drawings and a building instruction booklet available. A set can be obtained from him at 1041 Heatherwood Lane, Orrville, Ohio 44667, for $21.50 postpaid. His evening phone number is (216) 682-8896. He plans to be at Toledo with the Skybolt and will bring sets of drawings along to the Swap Shop.

Mail Call

It was Ed Kazmurski, if memory serves correctly, who delivered that famous comment, "If you fly them, you're going to bust them!" So it was that a memorable scale effort of 1978 departed for the great Model Museum in the sky, as we heard from Art Johnson in a recent letter, along with a quotable opinion on Sport Scale:

"I enjoy your column in R/C Modeler and thought your comments on the Sport Scale Rules in the December issue were right on the money. I think that the days when some people looked at Sport Scale as another event for pattern flyers with semi-scale models are about over. At the same time I don't ever remember seeing a model entered in a Sport Scale contest that came close to the detailing required for today's Precision Scale competition. I also don't remember anyone complaining at the local level recently about having to build a better model for Sport Scale. Maybe time and more participation has helped to sort these things out.

"I am still learning things about large twins. I solved my engine problems by installing a couple of Max FSR .60's in my F-82G. It flew so well that I got carried away in a diving full throttle approach to an Immelman. (Something I would not do with head screwed on straight.) The outboard wing panel failed at the dihedral joint and that was the last flight for the F82G."

Art is thinking about building another twin to replace it --- an event to be anticipated --- his touch on the stick when flying a twin is something to see.

Sparks Are Flying

L & L cranks out new products so regularly that it is hard to keep up on reporting them. Their new Electronic Ignition System #301 is now available for $24.95. Designed for one cylinder, point triggered magneto type engines like the Quadra, they claim many advantages over regular ignition or simple transistor electronic units. They are: easier starting, lower idle setting, increased point life, better fuel economy, more power, smoother operation, increased plug life, and point gap setting is less critical.

The same 2 volt G.E. sealed lead-acid cell used in the L & L On-Board Ignition System and Portable Ignition System also powers the E.I.S. #301. Maximum

L & L gave permission for Scale Views to open the box to display the "works" of the #301 Electronic Ignition for Quadra type engines. Guarantee is voided if you do this to yours. Set includes switch, charging jack, battery and shrink tubing.

flying time per charge is about 4 hours, but recharge after 3 hours is suggested. (See Scale Views in the March issue for information on the special L & L charger intended for these systems.)

Installation is not difficult and involves disconnecting wires from the points and magneto, then hooking in leads from the #301. It is suggested that the unit be mounted inside the fuselage of the airplane to cut down vibration. I'd recommend wrapping up the box in a foam rubber package in the manner often used for radio receivers. Secure it so it can't bang about during aerobatics, of course. I weighed the system at 9 ounces, including the battery.

A design feature is incorporated to minimize radio interference and, although L & L has not encountered any interference in their pre-production tests, they wisely recommend that the radio installation be thoroughly checked out before use. As many Quarter Scale fliers have discovered, the combination of long cords extending to dual aileron servos, fuselages strung with wire control cables, and the static hash from spark ignition systems, can play havoc with radio operation, particularly in the case of some brands of sets. My opinion is that on one count at least, the fact that much smaller current is being triggered by the points when the E.I.S. is used, should result in less potential for interference.

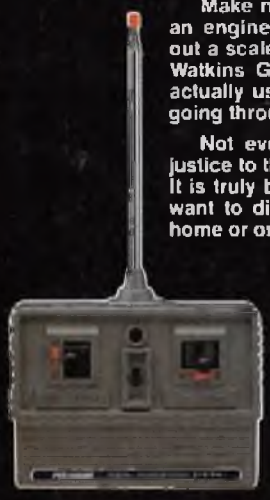
to page 20

Can you handle it?

This Porsche can creep like a snail, go like a bat and stop on a dime! It won't lean on a curve or wander on a straight. And response is instant to every command.

Think you can handle it?

It's Pro-Cision's fabulous 15 inch 1/12 scale replica of the Porsche 935 Turbo. And it is completely radio-controlled!



Make no mistake, this is not a toy. It is an engineering masterpiece. In fact, lay out a scaled-down version of the course at Watkins Glen or at Sebring and you can actually use this car to plot your best line going through a curve!

Not even the above photograph does justice to the exquisite detailing of this car. It is truly beautiful. When not in use you'll want to display it on your coffee table at home or on your desk in the office.

But what makes this car truly exceptional is what's underneath that glamourous exterior. Super-heterodyne circuitry of the highest order. The state of the art in solid state electronics.

The driver's seat

The dual stick transmitter which comes with your Porsche is your "driver's seat." It signals your every command to the car for instantaneous response. The stick on the left can be moved forward for "go" and back for "reverse." How far you move it determines exactly how fast you go. Beneath the stick is a trim adjustment to make sure the car stands still in neutral.

On the right is your steering stick. Move it right or left—a little or a lot. Steering is precise. This stick, too, has a trim adjustment so that when the stick is untouched the car will run straight and true.

Three different frequencies

Pro-Cision makes three versions of the Porsche—each on a different frequency. This means all three Porsches can race together. Great for car clubs or for you and a buddy or two to learn who is the best driver.

Extras

Each Porsche comes with an extra high-speed gear so that once you've learned how to handle your car you can change the gear ratio for even faster performance. Full instructions are included.

As an optional extra, Pro-Cision offers a charger that plugs right into the car. With this charger and a set of Ni-Cad batteries you'll probably never have to buy car batteries again.

There are many radio-controlled cars on the market. Most of them are toys. If you want the real thing...if you want true quality and lasting satisfaction, look for the name Pro-Cision—the industry leader. Pro-Cision's quality control, research and famous service center are your assurance of lasting quality.

See Pro-Cision's cars and trucks wherever toys and hobbies are sold.

EXCELLENCE IN RADIO CONTROL

PRO-CISION

PRO-CISION, 6501 FLOTILLA, DEPT. RC, LOS ANGELES, CA 90040 IN CANADA: 6010 AMBLER DRIVE, MISSISSAUGA, ONTARIO L4W2B1

SCALE VIEWS

from page 18

Use of CMOS devices has permitted the incorporation of an automatic shut-off which cuts the battery power shortly after the engine stops running. When the propeller has not made a complete revolution for 55 seconds, the power is switched off. Turning the prop one full revolution will reset the system for use again. Sounds tailormade for absent minded modelers who are allergic to switch handles.

I would like to be able to tell you how the unit worked out but the neck-deep snow cover and open ended blizzards have pretty thoroughly shut down engine running or test flights. I'll gladly surrender the Wheaties medal to Wendell Hosteller and get back to you later on a running evaluation. (Anyway, it doesn't look like they have much snow in Ohio, along with jacket-weather temperatures!)

Bookworm Trip

Last month we covered the subject of back issue magazines as a scale material source and that is where most

to page 180

the ONE set that does it ALL...

super sport

CHOICE of TRANSMITTER

(CLOSED STICK SHOWN ABOVE)

OPEN STICK

SINGLE STICK

The performance-proven Super Sport is the ONE set you need for ALL your radio needs. Built in Denver by modelers for modelers, the Super Sport is light enough for the smallest models and strong enough for the largest models. Super Sport was first with IC decoders, first with FE7 Mixers, first with 3-wire servo systems, and first to give an UNCONDITIONAL 90-day guarantee. Super Sport has it all . . . just for you.

6-CHANNEL SYSTEM WITH ONE PROPORTIONAL AUXILIARY CONTROL AND RETRACT SWITCH.

$349.95 WITH 4 SERVOS

See your dealer first. To order direct, add $1.50 postage in the U.S.

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RS-4
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SUPER SPORT Gives You MORE...

- LIGHTWEIGHT: complete airborne system weighs only 12.3 oz.
- MORE FLYING TIME: Up to TWICE the flying time of any comparable system.
- CHOICE OF FREQUENCY: 72.08, 72.16, 72.24, 72.32, 72.40, 72.96, 75.64
- UNCONDITIONAL 90-DAY GUARANTEE: No exceptions or fine print.

UNCONDITIONAL
90-DAY GUARANTEE

Royal Electronics Corp. will repair any Super Sport radio control system FREE for 90-days from date of purchase regardless of reason, including crash damage, with NO exceptions.

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MASTERCHARGE BANKAMERICARD

Hobby Shack — pilot

RADIO-CONTROL

Quick Built Series

IT'S A 'Snap' TO BUILD

All of these kits are specially designed for the modeler who wants to build a model fast, with a minimum amount of work, yet have a good flying model when he is finished! These kits feature a "Snap Lock" type of construction which means that the fuselage, for example, is already die cut to accept the formers. These snap into notches in the fuselage in exactly the correct positions, all without checking the plans! Because of the special Quick Built design, covering is easy using Kwik-Cote, Monokote or your favorite covering material. The Q.B. designed kits are a lot of kit for the money!

ALL KITS FEATURE: EXACT DIE CUT PLYWOOD FUSELAGE SIDES • BEAUTIFUL HAND MACHINED BALSA PARTS • DURABLE LANDING GEAR • CONTROL HORNS & OTHER NECESSARY ACCESSORIES • FULL SIZE PLANS WITH RADIO INSTALLATION GUIDE • FULLY ILLUSTRATED CONSTRUCTION GUIDE •

Q.B. 60 MONSTER — FOR AIRBORNE PHOTOGRAPHY

Q.B. 60 MONSTER — FOR AERIAL BOMB DROPS

Q.B. 60 MONSTER — FOR AERIAL PARACHUTE DROPS

Q.B. 60 MONSTER — WHAT CAN YOU THINK OF?

The Model That Does It All!

SPAN: 84 inches (7 ft.) ENGINE: .60
AREA: 1,069 sq.in. RADIO: 4 - 6 channel
LENGTH: 59 inches WEIGHT: 8.37 lbs.

Comes complete with all needed wood & metal parts for the glider launching pad.

RETAIL $109.95

Hobby Shack DISCOUNT PRICE
$79.99

Q.B. 15H

Span: 49½ in.
Area: 409 sq.in.
Engine: .15
Radio: 2 - 3 channel

RETAIL $32.95
$24.99

Q.B. 20S

Span: 52 in.
Area: 420 sq.in.
Engine: .20
Radio: 3 - 4 channel

RETAIL $36.95
$28.99

Q.B. 40S

Span: 59 in.
Area: 573.5 sq.in.
Engine: .40
Radio: 4 channel

RETAIL $59.95
$44.99

Q.B. 2500

Span: 96.5 in.
Area: 590 sq.in.
Length: 40 in.
Radio: 2 channel

RETAIL $49.95
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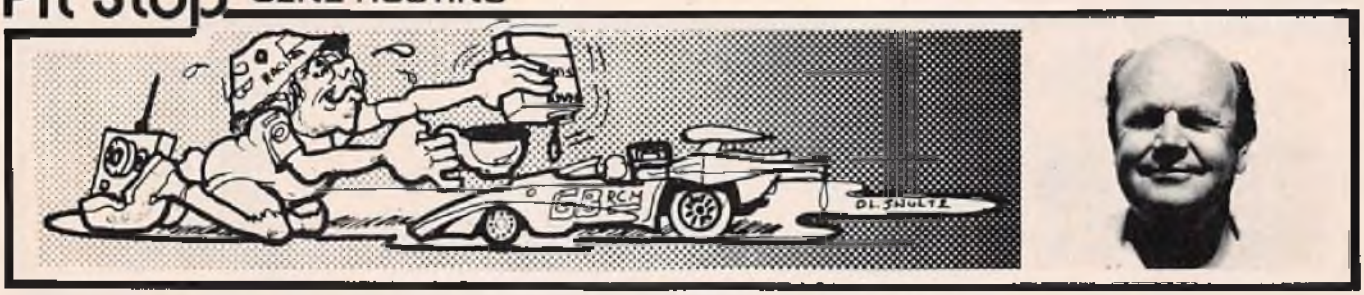
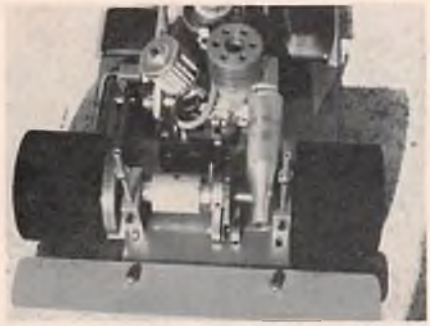
Pit Stop GENE HUSTING



Although this is my first experience with differentials, differentials are certainly not new in R/C cars. John Thorp pioneered the use of differentials in R/C cars over 6 years ago. John is certainly sold on the use of differentials, because I don't ever remember seeing John run his car without the differential. When I asked him about this, he said he obviously had tried it without the differential, but it just did not handle as well without the differential as it did with the differential.

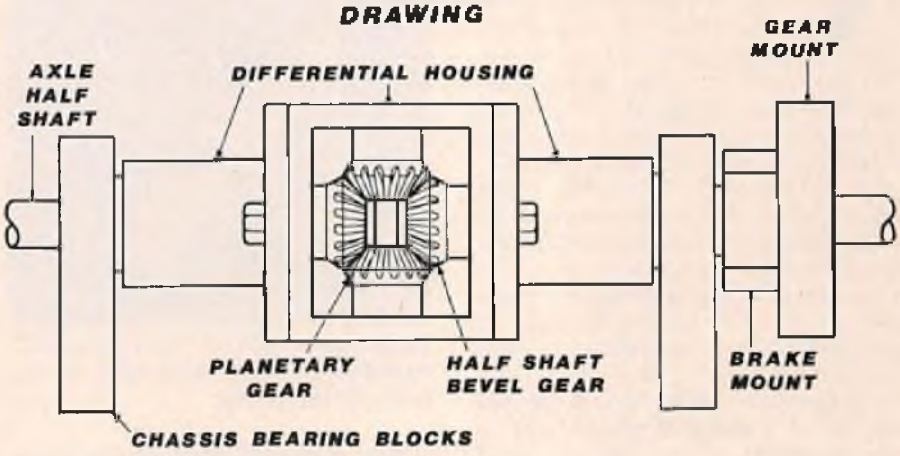
We, of course, have been observing the performance of these differential cars for years, and it appeared that the diff (differential) cars had their advantage when the traction on the track was down, like on Saturday practice sessions. But on Sunday the bite would be up and the solid axle cars appeared to benefit more and more as the bite went up and up.

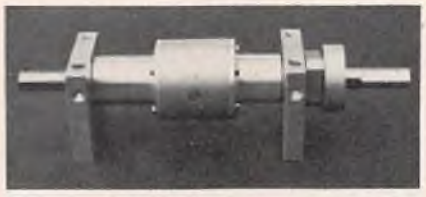
During the World Championships, in 1977 at Thorp Raceway, Phil Booth, from England, became interested in the Thorp diff, bought one, and upon returning to England, installed it in his P.B. car. A quote from Phil: "Whilst I admit I was more than a little disppointed that the differential was not going to make me a World Champion overnight, the thought of chasing Dave Martin's exhaust smoke around the circuits for another year made me persevere for a little longer. Unfortunately some difficulty has been experienced in achieving an acceptable braking performance with the single rear disc, which appears to favour locking one rear wheel when braking heavily into tight turns, against the lighter loaded wheel. On top of this, one has to consider two other factors against its use. One is the added complication of two half-shafts and four bevel gears, which add a wear and reliability factor to an otherwise trouble-free part of the car. The second point, a penalty which most people would not even consider important at all, is the (Thorp) unit adds approximately 8 ozs. to an already heavy car. To sum up, the tests so far have proved inconclusive against a standard car with drivers of comparable skill, and even John Thorp himself (with a few exceptions) has not prevented the almost total domination of most events by the solid axle cars."



John Thorp's car has featured a Thorp differential for over 6 years. Last year the Europeans discovered the differential and now it is a "necessity" item on their cars.

DIFFERENTIAL CUT-AWAY DRAWING





This the the first commercial differential from Europe. It is made by AMPS in England. This particular one is made for the Associated RC200 and will be available through Associated.

Gene Husting's car with the AMPS differential installed. This differential was 4 ounces heavier than the stock axle, but without the wing, only added 2½ ounces to the car.

Phil wrote this after his first tests and quite a few things changed since then. He became more familiar with the car, and started to impress some people. Among those who heard of his experimenting were Bob and Ian Agnew of AMPS in England. They became interested and made some prototype diffs and Phil Booth and Phil Greeno did the testing. They soon had some reliable working prototypes that Booth and Greeno used in Monaco. Booth was Top Qualifier and Greeno won the race, and you just can't do any better than that with new parts.

After Monaco, all the European Experts had diffs and all the major races in Europe were won with the cars equipped with diffs. The diffs became so popular that there are now a dozen manufacturers in Europe making diffs for R/C cars.

With this sudden popularity of the diffs overtaking Europe, we decided we better take another look at them. AMPS made diffs for the P.B. car and also the Associated RC200, so I ordered 6 AMPS units to test. They arrived on a Thursday, giving me enough time to test the next Saturday. I installed one on my car, but left my son Curtis' car stock. We went to Thorp's Raceway for testing. It took me about 10 minutes to adjust to a totally new driving technique. Normally with the RC200, on a high bite track, and a typical corner, you punch up to the corner, back off the throttle to automatic

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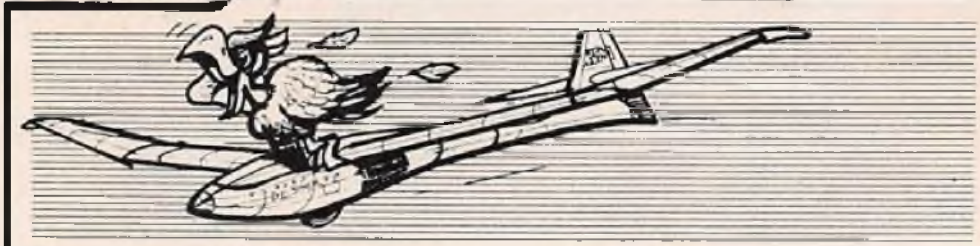


The second team member of the United States Soaring Team is Terry Koplan. A resident of Sherman Oaks, California, Terry has a ten year modeling career with 7 years devoted to R/C sailplanes. He is former President of the San Fernando Valley Silent Flyers, holds a Level 4 in the LSF, is a graduate of California State University with a B.S. in Marketing and is employed by International Rectifier as a product marketing manager.

Competition is something Terry really enjoys. Prior to getting involved in sailplanes he was competitive for eight years in the AAU.

The plane he will be flying in Belgium will be the "Viking II", and at this time he has no plans for any major (if any) modifications. The wing loading on his Viking is just over 6 oz/ft² and he flies it with the CG pretty far back, around 37%.

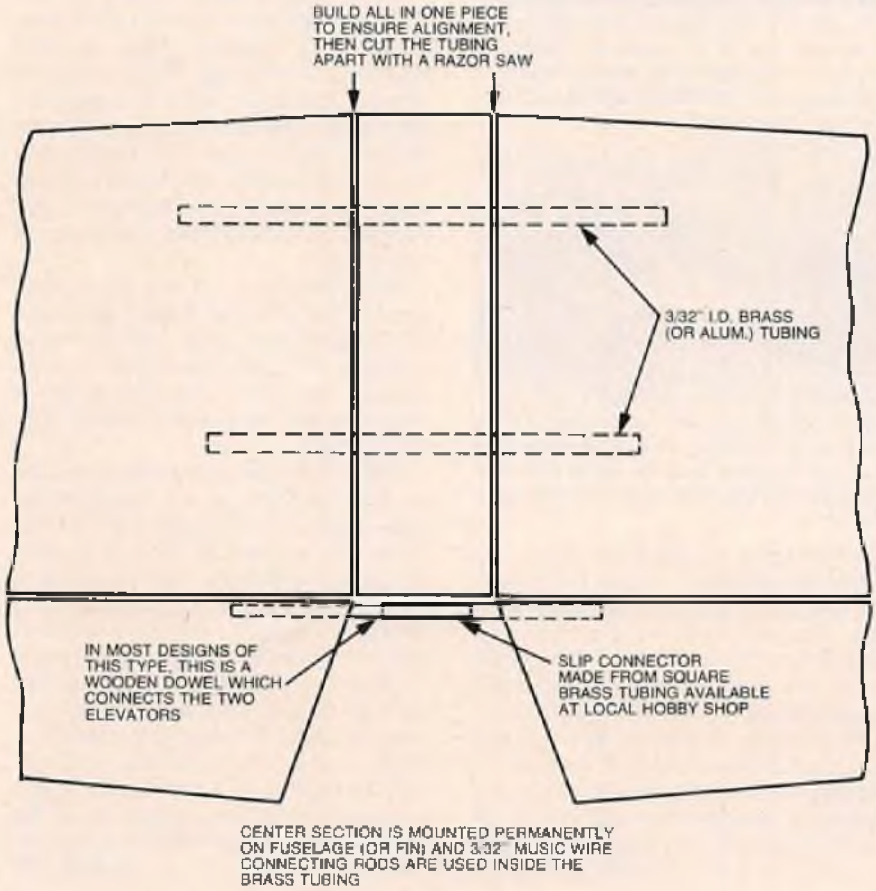
When the plane is loaded up to 10 oz/ft² it really moves. In the speed event, in Florida, the Viking had the fastest time

Terry Koplan with his "Viking Mark II". Practice is what Terry says is the name of the game.

of the contest and with further practice can go even faster. Rumors have it that the Sitar Brothers have a plane that can go the course consistently in 10 seconds. (Approximately 3 seconds faster than anybody can consistently do it in the U.S.) Terry considers his biggest strength is duration. Against 200 contestants at the '74 and '75 SOAR Nationals he was able to place Third both years in Duration. His experience is now much broader and his sailplane is better than what he flew back then. Also at the '76 SOAR Nats, he placed First overall in Precision. The reason he brings this up is because one half of the contest consists of Duration with a spot landing and, rumors also have it, that the people with the fast ships have trouble staying up and come in so hot, making a spot landing is extremely difficult.

Our team may be young, but it is loaded with experience. Skip Miller will be defending his title, as we know. Steve Work has been tested and re-tested and has our team's only Level 5 in the LSF. In addition to the previously mentioned contest accomplishments, Terry Koplan has several others that he is very proud of. Besides the club and local SC² wins and yearly standing placements he has been Third overall in 1974, 2nd Unlimited in 1975, 1st in Standard in 1976, plus being a member of the SFVSF team which won both in 1975 and 1976 at the SOAR Nats in Chicago.

Buzz Waltz about to launch a 100" Soar Birdy. A truly fine sailplane.



With lots of experience among the flyers, in addition to having Dan Pruss once again as our team manager --- to quote Skip, "Our team is at least as good as last time, but I feel that the present team is better and more aggressive." With a lot of practice and hard work -- how can we lose?

I personally have known Terry for years --- flown against him in many contests, attended his club meetings, and attended contests that were CD'd by Terry. I will say that he gives his all to do

to page 168

THE MONSTERS ARE COMING.
Are you ready?

There are all kinds of monsters – but the ones we're talking about are the giant R/C airplanes. At every trade show this year, they have been the runaway favorite. And this is just the beginning.

The only covering that provides adequate strength and resistance to scuffing is Coverite. Whether it be Silkspun, Super or Permagloss, you will get the unique properties of 100% polyester fibres. Incredible strength to weight ratios, yet only 9/100ths of an ounce per sq. ft. heavier that the more fragile plastic films. And that difference is for Permagloss. Silkspun and Super weigh exactly the same as the lightest film iron-on!

To make your Monster building easier and more economical, we make special Monster size rolls in all colors (see box below). Your favorite dealer should have them in stock, as they are a standard item in our line.

Incidentally, all 3 Coverite coverings are dynamite over sheeted foam surfaces. All you do is lower the temperature, start tacking in the center, and work your way out to the edges. Coverite's adhesive activates at 250 degrees, which is usually cool enough for any foam/sheeted construction. By adjusting the iron temp, you can control the amount of shrink needed. For solid surfaces, full shrink is objectionable because the covering has nowhere to go but up (away from the wood), causing bubbles. At 250-275 degrees, full adhesion will be achieved, with minimal shrink. At 350-375 degrees, same adhesion, but maximum shrink.

For quickest, most consistent results, we strongly recommend a light coat of Balsarite, about 1 hour prior to covering. So, if you're having trouble getting the film coverings to stick without bubbles, switch to Coverite. The difference will be obvious.

THE COVERITE LINE

Permagloss Coverite. 100% polyester iron-on covering. Prepainted. 38"x43"/ 43"x15 feet/ 5"x36"/ Red, white, blue, yellow, orange, aluminum, olive, dayglow orange, dayglow yellow, black.

Super Coverite. Same material as Permagloss, but not painted. 38"x47"/ 47"x15 feet/Red, white, blue, yellow, orange, antique, hi-viz red.

Quikstik. 1/2 pint & full pint cans of iron-on adhesive.

Silkspun Coverite. 100% spun polyester that looks like tissue. Unpainted. 38"x 54"/38"x25 feet/ Red, white, blue, yellow, orange.

Balsarite. 1/2 pint & full pint cans of wood conditioner.

Glaskote. 1/2 pint cans of clear, fuelproof, final coat. Pint cans of thinner.

Trimit. Micro sharp knives for cutting all coverings.

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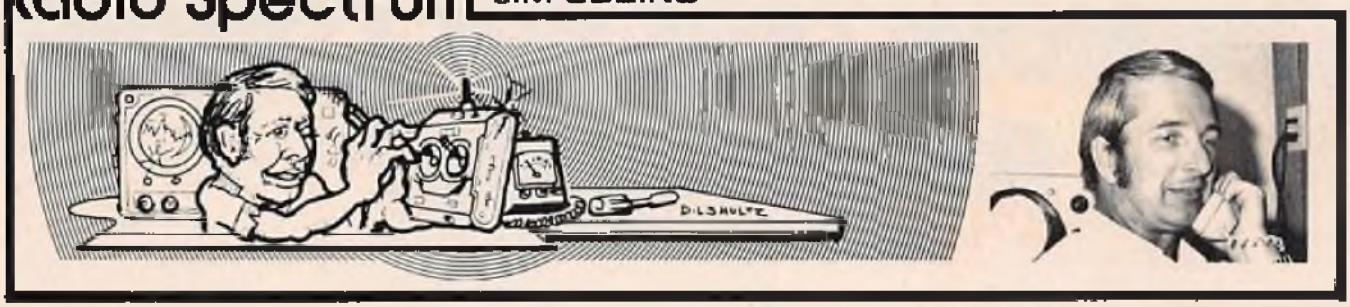
Coverite products are distributed world wide: Australia, Belgium, Canada, England, France, Germany, Holland, Italy, Japan, Malaysia, Philippines, South Africa, Sweden, Switzerland, United States.

Radio Spectrum

JIM ODDINO



Engineering Projects

In the October 1978 issue of RCM, we offered to supply ideas for engineering projects that might be suitable for college or even advanced high school students. My original idea was to send one idea to each one who wrote in. Then I thought I would write a form letter to send out to everyone. Even that could become a big hassle and, considering all the interest, why not publish it right here. Besides, for every one that writes, there are probably ten to twenty who are interested but never write. Who knows, maybe the next great RC invention will come from one of those guys, if I can just get them started.

Speaking of writing letters to magazines, or rather not writing, I'm a good example. I can't tell you how many times I've had good questions but never got around to writing. One of these days I'm really going to let Don Lowe or Dave Brown or Hal DeBolt have it. Notice that none of those guys writes for RCM. Sounds to me like RCM could use an expert on model aerodynamics and aerobatics. Anyone interested? The pay will make you rich. (That's just a little joke.)

The following represents a list of things that I would like to work on myself, if I didn't have the bad habits of eating and sending kids to college. They're not all my ideas, but things that I think have potential to make RC better in some way, whether it be more performance or reliability or cheaper to produce. Many of the projects lend themselves to strictly study programs, while others could actually be breadboarded and evaluated. I'm fairly certain that all of these things are achievable and in fact they've probably all been done before. However I don't think you can find anything published on these subjects directly applicable to RC. In other words you will have to do a little engineering to see if it really makes sense for RC. Let's start with an easy one.

FET Power Amplifier — FET's appear to have some advantages over bipolar transistors for use as RF power amplifiers in our transmitters. Higher efficiencies can be realized which means longer battery life and/or fewer batteries. In fact new concepts such as class D and E amplifiers are made possible with FETS. They also take less drive which would allow us to eliminate the usual buffer between RF oscillator and output stages. They are very tolerant to mis-matched loads, such as we create with hand-held transmitters, with antennas dragging on the ground, collapsed and even removed. The other neat thing is that you can get the power at a lower voltage so it makes it easier to charge your transmitter from a 12v source such as a car or motorcycle battery. I would design for one watt output at 8.4v nominal. This would be easy to charge and would allow adequate voltage to operate even if you lost a cell or two. Kraft Systems uses a FET in their sport series radios, but I can't tell you how it has worked out.

This is a project that can easily be breadboarded and tested. Many devices are available at very low cost so you can even afford to blow a few.

Higher Frequencies — While you're at it you might as well design for higher frequencies. There is going to be more and more demand by the people of the world for communications equipment. If the AMA were asking for additional frequencies up in the 400 to 1000 MHz area, I think we'd have a better chance. Besides, I think we'd be better off the more line of sight our radios are. After all we've got to see our model to control it and we're not trying to transmit from Alabama to Arizona like I've heard on the CB radio. That's not to say you don't have to worry about reflections. However the ham radio activity seems to be moving from 144 to 220 and 440 MHz so the technology is there. Let's apply it to RC.

Front End Automatic AGC — RC receivers are designed to work on low voltage so we don't have to carry lots of batteries. This coupled with the fact they must work over a large dynamic range, that is, with very weak signals and very strong signals is a very difficult task. Most receivers on the market suffer degradation under very strong signal conditions such as taxiing under another transmitter. What is needed is some type of attenuator that senses this condition and drops the signal amplitude before cross modulation and intermodulation can occur. Proline receivers have such a circuit, but to my knowledge, they are the only ones.

Another approach might be to add a DC to DC converter to the receiver and build a front end that works on high voltage which would allow the signal to be kept linear. With FETS it wouldn't require much current.

10.7 MHz Intermediate Frequency — It would seem possible to build a single conversion receiver with a 10.7 MHz IF that would surpass the performance of a dual conversion receiver. Monolithic crystal filters are now available at reasonable prices that would yield acceptable selectivity. Integrated circuits are also available that would allow plenty of gain and stability at 10.7 MHz. I don't understand why someone hasn't done this yet. It should eliminate image problems and many other spurious responses and probably result in a smaller receiver.

Wider Band FM — We've talked about this before. It seems obvious that 15 KHz deviation is better than 3 KHz but someone needs to go through the calculations to see if it is worth it. The actual design and fab of the hardware should be pretty straightforward, inasmuch as the ham radio guys have already done it.

Exponential Control — Lots of people have talked about this one and a few companies have incorporated this feature in their transmitters. However nobody really knows if it is an advantage and if it is worth it. We need circuits that allow the pilot to adjust the slopes and break points which would allow him to shape the gain in each channel. A lot of work has been done in the aerospace industry in this regard and maybe someone already has the answer. The normal technique is to put a man in the loop with a computer and let him play a skill game much like the TV Pong games while adjusting stick gains. Someone would have to design a game equivalent to flying a model. A very interesting project.

Force Stick — Along the same lines, I've also wanted to investigate the feasibility of a force stick as opposed to our current displacement sticks. You could do the same thing, a computer test to see if it is better. However, there is always that big proving ground in the sky — just is a lot harder to measure improvement if there is any.

Wing Levelers/Auto Pilots — There

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New Cox Hydroblaster. Take a first in R/C racing.

Get radio control's first ready to race, engine-powered boat for the price.

The all-new Cox Hydroblaster makes you a contender, even if you haven't raced before. This kingsize craft, 22 inches long and *unsinkable*, supplies first-place speed from a Cox .049 engine. And from racing's latest pickle fork design.

Plus you get a head start with easy, 30-minute assembly. The Hydroblaster needs no gluing or painting. A complete, fully proportional R/C system is also factory installed.

And it offers two separate frequencies for real side by side racing.

You're off and running fast with the Hydroblaster's new Snap Starter, to ensure forward starting. You charge through turns with fully proportional steering, for total rudder control. A dual throttle lets you change speeds *during* the race, while a lightweight muffler keeps down engine noise.

And at the finish line, you're still going strong. An extra-large fuel tank gives you over 15 minutes running time.

Get the new Cox Hydroblaster at your hobby store. For price and performance, no other ready to race boat can beat it in engine-powered R/C.

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COX HOBBIES INC., a subsidiary of Leisure Dynamics, Inc.,
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Check the yellow pages for your nearest hobby store.

RADIO SPECTRUM

from page 26

was a flurry of activity in this area a few years ago, but I think it is time to revisit, because new devices are always becoming available. Integrated circuit pressure transducers for example. Yes, believe it or not, you can sense which wing tip is higher than the other by sensing pressure. Lot's of work here but could be very rewarding.

Automatic Mixture Control — Most modelers have had trouble setting needle valves at one time or another and many have added servos and used up another channel to have in-flight mixture control. They normally depend on sound to know if they are rich or lean and this can be a problem particularly with tuned pipes. My thought was to sense head or exhaust temperatures and position the mixture control accordingly. It would automatically make corrections for altitude changes, load changes, etc. A lot of testing needs to be done to determine if temperature is the right input, and a means of enabling the loop only after the engine was up to temperature would have to be devised. It might be that you would want to have some override capability from the ground. Lots of possibilites.

New System Approaches — This is getting a little bit long so I thought I would lump a bunch of things together under this heading. Most of these are pretty vast projects but a student could do a portion such as a study only or one piece of a system such as an encoder. The first one that comes to mind is a true digital system with shaft encoders, maybe even stepping motors. Next is the spread spectrum system we talked about a few months ago. Then you could look at phase modulation instead of AM or FM and of course a micro processor might come in handy in any or all of these systems. Another thing to look at is our present use of our assigned frequencies. Seems like we ought to be able to transmit more control information than we do in the present 8 KHz allowed. Maybe we can fly more than one plane at a time on a frequency if we used different modulation techniques.

Well that ought to keep a lot of people busy for a long time. If I had unlimited funds and a big engineering department, those are some of the things I'd turn them loose on. While most of these things are aimed at the systems analysts and electronics types I really think the mechanical guys have got a lot of work to do to keep up. We could use better pots (or other means of measuring position), motors, gear trains, connectors, etc. That is the beauty of this hobby. There is something for everyone.

Sorry I couldn't answer everyone directly who responded to my offer, and I hope this isn't too late.

Servo Motor Cleaning

Last month one of our readers described a technique for cleaning motors in which the complete assembled motor was submerged in alcohol. I had hoped to evaluate the method decribed below which might be an improvement on it.

Dear Jim:

After reading your column in the December R/C Modeler, I am convinced of something I have long been suspect of. That is, modelers tend

to close themselves into their particular segment of the hobby world too much, they don't talk to other modelers with other modeling interests or read their publications. The end result is what may seem to be a problem for the RC modeler may have already been solved by the model train enthusiast. For example, there seemed to be some concern about servo care and cleaning, in particular sealed servo motors. Well sealed or not these little gems are too complex for the novice modeler to mess with, especially the motor. Here is a possible solution (no pun intended). Model railroaders use a cleaning solution called EN-IRT offered by Kyle Products, and according to David Sutton in ***The Complete Book Of Model Railroading:*** *"The liquid has some amazing properties. For example it is essentially a non-corrosive solvent, it is non-inflammable, non-toxic and removes surface oil due to its high evaporative rate and low surface tension; because of this it may dry your fingers a bit, but is completely harmless."*

The clincher here is that it is also non-conductive, "thus enabling you to completely immerse locomotive, motor and all in the solution and fire it up. It cleans armatures, brushes, wiring, wheels and drivers, removing grease, sludge, oil and accumulated gook completely." After cleaning, re-lube where needed.

I may be wrong but this seems to be the answer to oil soaked servos and cleaning sealed servo motors without a major tear down. A simple routine maintenance for the novice RC modeler, though I have not yet tried it myself. It does, however, seem reasonable noting the similarities in miniature motors and nylon and metal gear trains.

Sincerely,
Jack Arnouts
Poughkeepsie, N.Y.

I wasn't able to find the solution at the local hobby shops but maybe someone can track it down. The one thing that worries me is the part about re-lubing. The input we got last month was that Oilite bearings should never be oiled. However it sounds like this solution could take the lube out of the bearings and wipe them out. Anyone out there a bearing expert?

Big Plane Problem Solution

Dear Jim,

I just read your column in the February RCM, particularly the letter about the J-3 Cub and Quadra combination. I have built and flown the same combination with similar results. I also used the separate aileron servos and approximately 24" pigtails. My first flight was very short ending in a crash, even though the range check was okay.

Two days later the plane was ready to fly again. Since the weekend was still several days away, I decided to determine the cause of the crash. I set the plane up in the shop and hooked up the oscilliscope to the receiver output (detector). With everything hooked up and the power on, but with the aileron cables disconnected, the receiver output looked okay. Hooking up just one aileron extension cable (without the servos connected) caused a severe distortion in the receiver output pulse train, primarily in the aileron channel. With both cables connected plus servos, the system became jittery

beyond the normal range check.

To correct the problem I tried heavy current chokes and bypass capacitors at the receiver end without much luck. Next, I built new extension cables with shielded wire, Beldon #8444. I also built a pulse buffer amp (see Figure 1) which I plugged into the aileron cable from the receiver. Then I installed a new receiver pack since I had suspicions that the old pack had higher than normal internal impedance. Now the scope display was back to normal with no distortion in the aileron channel and no servo-jitter at the normal range check.

At the field the next weekend, extensive ground checks were made with Quadra running at all speeds, the antenna fully collapsed and at a range of close to 150 feet no glitches could be detected; so the acid test!

The test flight was a complete success --- the J-3 performed beautifully with absolutely no radio problems. The second flight also went quite well, even though it ended in a crash caused by the elevator linkage disconnecting from the servo end due to vibration.

The purpose of the pulse buffer was to better isolate the two aileron servos from the receiver. The pulse buffer, shielded extension cables and new battery pack all contributed to the cure; the biggest improvement being the shielded cable.

The radio equipment used includes a 6 year old Heath GDA-19 XMTR, Ace 8 channel single deck RCVR and 5 Heathkit high torque servos. Operating frequency is 53 MHz.

Sincerely,
Jack D. Barnes
Seattle Radio Aero Club

I don't think I have to add anything. The buffer is an interesting addition and pretty logical. I've long suspected that RF is radiated from the servo cables. The buffer may just eliminate this. Thanks for the input, Jack.

Fast Charger Mod:

Dear Jim:

I have two hobbies, one of which supports the other. I'm a Field Engineer by trade, and always tinkering and building electronic gadgets to try in my model hobby. I really enjoy building the projects your readers send in, and in some cases, have built extras for our local flyers.

One of the projects was the Fast Charger you depicted in June, 1975 Radio Spectrum, pg. 19. I guess I have built 50 or so of these, and incorporated a modification, see attached, that has proven to be very useful.

The first mod. was to install a 3 amp. 50v diode, in series with the 12 volt input. This addition virtually eliminates any possibility of someone damaging the charger by hooking the supply voltage reversed. This came about after I loaned my charger to the visiting

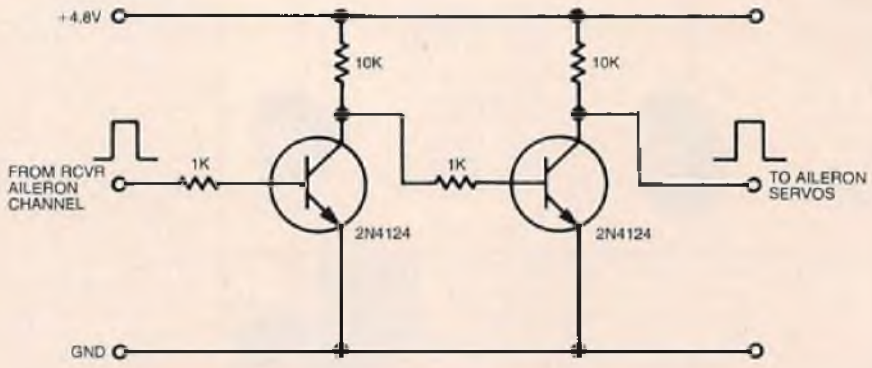
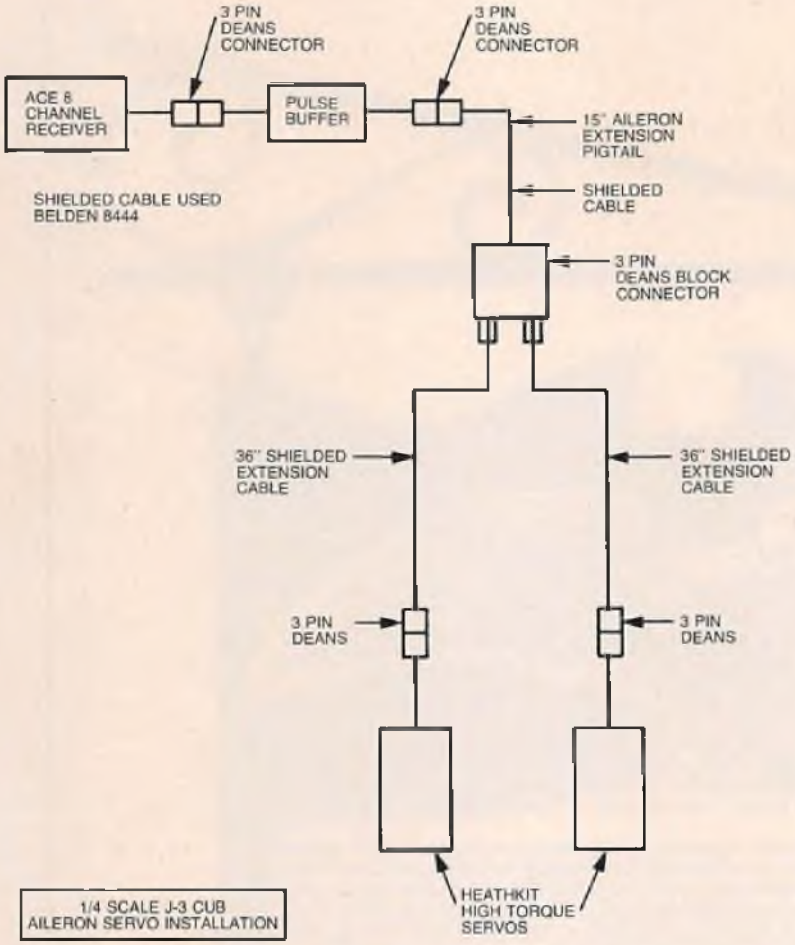


FIGURE 1
PULSE BUFFER



1/4 SCALE J-3 CUB AILERON SERVO INSTALLATION

contestants at our local Falcon Tournament, held annually in Council Bluffs, Iowa. Most were campers, and some didn't have commercial power available to use their regular charging systems, so my Fast Charger really got a work out overnight. As a matter of fact, it was used all night, and never got tired, until towards dawn, a polarity reversal was accomplished and the transistors were destroyed. Hence a 3 amp. diode modification.

The second modification was to reduce the entire circuit to a size that would fit most standard field power panels in use, on the field boxes. The complete charger has been mounted on a printed circuit board that measures 1" wide, 1¾" long, and with all components mounted, only 1½" in height. This makes the unit highly mobile and readily mounted to most commercially available power panels, or mounted in its own metal box (metal needed to heat sink the largest transistor). Mounting the charger in its own separate box, you can adapt it to car batteries, cigarette lighters, or field box. If you loan it to someone to charge his batteries, he depletes his field box battery, and not yours. I also used a 0-3 amp panel meter with my portable charger, and a regular panel amp meter on my field box, with a charger permanently mounted to the rear of the panel. Any amp meter capable of some resolution below 1 amp and a full scale of at least 2.5 amps works well.

I have complete kits, assembled and tested, available for $14.95 plus $1.00 shipping and handling, if anyone is interested.

One more thing, and I'll quit. I read in your past articles, that some people are having trouble getting repairs, calibration and/or parts for the old "Flight Life Battery Cycle" units. If they will send them to me, postage paid both ways, I will repair them for $10.00 plus parts. (Average repairs are $13.00 to $16.00, well worth the cost, providing the printed circuits are still serviceable).

Thanks again,
R.E. (Bob) McDaniel
2303 Victoria Avenue
Bellevue, Nebraska 68005
(402) 291-4287

I ran into the same problem at a contest some time ago. I asked Joe Bridi if I could use his 12v battery, which had his starter connected. Naturally I connected the red to red and black to black, never looking at the battery. Unfortunately the starter had red on the negative terminal and black on the positive and I had one blown charger. Since then all of my chargers are diode protected.

There are integrated circuits available now that will do the job of all those transistors, but they also need the diode protection.

Fast Charging Questions

There still seems to be a lot of reluctance to accept fast charging even though it has been in use for quite a few years now with great success as evidenced by the previous letter. It is a good example of how a little learning can be dangerous or, as in this case, can keep us from using nicad batteries to their full potential. The following letter is quite typical.

Dear Jim,

After reading the GE nicad battery handbook, I have some reservations about fast charging batteries in my radios. I'd appreciate your response to the following questions and opinions.

(1) Cell pressure and temperature increase rapidly as the state of charge

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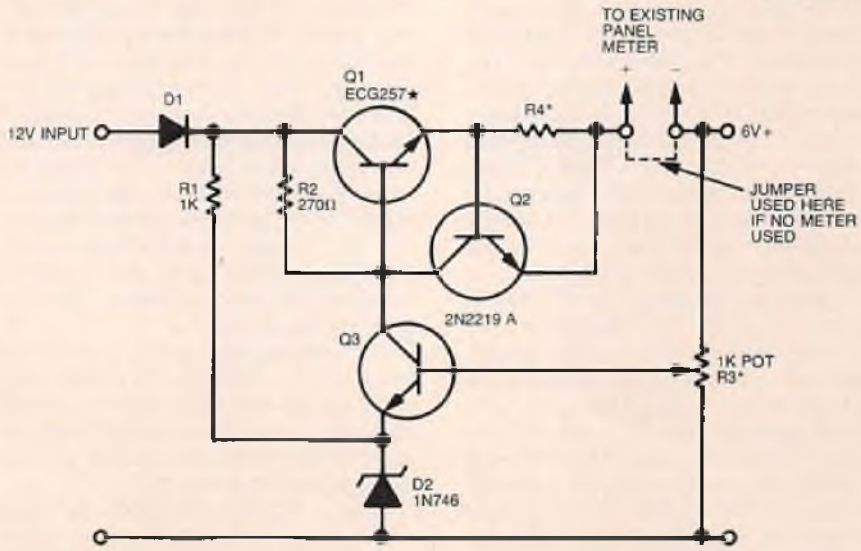

SPECIAL NOTE:
D1 — 3 AMP 50V (STEERING OR "ANTI GOOF") DIODE.
D2 — 3.3V ZENER.
Q1 — ECG 257 (★OR EQUIV.) DARLINGTON PASS TRANSISTOR (★MUST BE HEAT SINKED).
R4 — NI-CHROME WIRE (LENGTH SET FOR 2.5 AMP WITH 6V TERM SHORTED TO GND).
R3 — 1K POT (SET FOR 6V WITH 6V LEAD ACROSS 120 RES. TO GND).

ABOUT THE AUTHOR

George R. Smith is an Aeronautical Engineer who graduated from Alabama's Auburn University in the 1950's. After several years in aircraft and aerospace industries, Mr. Smith is now employed by the US Army in Huntsville, Alabama, as a Technical Manager of advanced research projects. He is an active member and twice past President of the Rocket City Radio Controllers, Inc., of Huntsville. When not on business trips for the Army, he spends much of his time at the club's flying site which is provided by the City of Huntsville at the, now inactive, old city airport. An avid modeler for 30 years, Mr. Smith expresses an interest for modeling of many types but admits to a true love and fascination for powered RC aircraft. He has always derived great satisfaction from "scratch" building and has gained even more satisfaction from building his own designs. He feels that the natural progression for him was toward the development of custom designed aircraft to provide customized performance. Mr. Smith looks at the Double Eagle as a jump in the technology of high performance aircraft and, possibly, as the first in a series of advanced designs for increasingly better, or more individualized performance.

What is it? The first time this aircraft shows up at the flying site and any time thereafter that it's seen by somebody new, you'll hear a chorus of, "what is it?" You smile and explain, "It's a Double Eagle." The Double Eagle is certainly a curiosity but, much more than that, it is the newest concept in high performance pattern aircraft technology. The Double Eagle not only **looks** different, it is different! Its aerodynamics are different; its weight distribution is different; and, most significantly, its flight performance is different from any other aircraft flown in competition today. But, "difference," per se, is not what the design of the Double Eagle was intended to accomplish. The intention was performance and **performance** was the result. The differences are the means by which the Double Eagle obtains its superior pattern performance and resultant competitive scoring ability. They are numerous, are readily apparant, and are substantial departures from the recognized convention in today's pattern aircraft; but they are not departures from good solid aerodynamic design. One feature was cranked into the last design iteration which would, at first glance, appear to be for "looks." A hint of the "jet fighter look" was added by notching the tail-end of the fuselage to simulate exhaust nozzles, and by squaring off the fuselage transition section to simulate intake ports. These additions are more useful than decorative. The "tailpipes" provide a little on-axis drag which is helpful at this extreme alt-end location and the "intakes" substantially reduce the helical prop wash and assist in straightening out the airflow over the wing center section.

But, getting back to the question of "what is it?" — in short, it is an ultra high performance aerobatic pattern aircraft designed to perform the total series of competition pattern maneuvers with an extra degree of perfection.

Why is it? Why the Double Eagle came about is relatively easy to explain. I needed an aircraft that even I could fly in competition and, with it, have a good chance of winning. I wanted an aircraft that would think for itself, that wouldn't make any mistakes, that would even correct the mistakes that I gave it during a maneuver. Of course, the Double Eagle can't do all of that but, within the realm of reality, I needed an aircraft that would approach it. To accomplish this, it would need to possess the ultimate in directional stability, to exhibit a proportional response to **all** controls in **all** flight attitudes, and to have an ability to maintain altitude and direction in all flight attitudes with a minimum of controls adjustment and with no perceptible changes in angle of attack. Low-drag, high speed flight performance would be a **must** but, coupled with that, would be the need for rock-steady slow flight with totally predictable and controllable stall characteristics. Absolute lateral control with the wing partially stalled during the landing flare would also be essential.

At about this point in the thinking comes the realization that, in order to put these ideas into flight hardware, the normal airframe construction methods; the techniques of assembly that most of us have been using; and the "that's close enough" attitude for weight, alignment, etc., would just not be good

DOUBLE EAGLE

By George R. Smith

What is it?
It's a truly exciting new pattern ship that not only looks different, but has such ultra high performance that it may interest the U.S.A.F.

enough. The aerodynamic "fine points" that would be primarily responsible for those special "think for itself" flight characteristics would be easily masked to totally obliterated by a warp or a slight misalignment. So, it follows that the airframe design and the assembly methods would have to conform to a rigid concept of built-in accuracy. One example of built-in accuracy is, **all alignment measurements must be made from the same reference throughout construction with no transfer of datum.** Other examples of built-in accuracy will be discussed during the "construction" portion of this article. The built-in accuracy concept contributed much to the "why is it" of the airframe and structural design and dominated the construction and assembly procedures — to produce a winning pattern aircraft.

How is It? A discussion is in order concerning the design philosophy of the Double Eagle and what is behind its ability to accomplish some of its almost startling flight performance. I won't clutter up the discussion with any formulas or mathematical justifications which, at this point, are relatively meaningless but I will attempt to explain why the various aspects of the design do what they do.

Powerplant — The Double Eagle was sized to be an all-out performer with a "hot" .61 engine and to be almost unchallengeable with the addition of a piped Schneurle engine. The design was developed around a Veco .61 with Perry Pump and Carb., customized with PDP ala Clarence Lee. The development proved so promising that the prototype of the final design was completed and tested using that powerplant. With its sleek lines, low-drag aerodynamics, and 9½ lbs. flying weight, its speed and vertical performance are truly spectacular. With the design now proven, two of the identical aircraft with only slight modifications to accommodate piped engines are now in the works, and will soon be off the boards and flying.

Low Drag Design — Of all the factors that produce aerodynamic drag on an aircraft, the greatest, and most difficult to reduce is the drag that is "induced" by the production of lift. Of lesser severity, but still with great affect, are the frontal area (flat plate) drag, the "profile" or skin friction drag, and the various parasite drag producers such as: open wheel wells, exposed wing-bolt heads, etc.

The Double Eagle was specifically designed to reduce the major drag producers to a minimum. The basic wing section was chosen for its excellent high-speed/low induced drag characteristics. Also, its relatively thin airfoil section provides a mininum of frontal area drag. The mounting of the wing with its upper surface coincident with the top surface of the fuselage provides a smooth airflow transition and eliminates the traditional wing to fuselage buffet area which usually can be only partially helped with transitional fillets. The wash-out in the wing, though primarily designed to enhance low-speed stability, provides a considerable contribution to a reduction in the induced drag during high-speed flight; with this airfoil, the reduced angle of attack at the tips slightly reduces total lift but greatly reduces the overall induced drag of the wing. The configuration of the wing tips with the extended span at the trailing edge help to minimize vortex losses and the accompanying tip drag.

The total frontal area of the aircraft has been reduced to the minimum; note that the cross section of the front end is about the size of the average .40 powered pattern ship. The profile and parasite drag has been reduced wherever possible.

The simulated intake ducts at the fuselage transition forward of the wing are obvious "flat plate" drag producers but the structural and aerodynamic advantages of these ducts far outweigh the small amount of drag produced. The structural advantage is obvious from the plan; they provide support for the extremely long nose. They substantially break up the helical flow of air around the fuselage from the propeller wash thereby helping to provide a straight air flow over the wing center section, over the upper fuselage, to the vertical fins, and also, the sharp leading edge of the simulated ducts greatly assist the stall characteristics of the wing. At stall speeds, it forces the wing to stall first at the root section and, in conjunction with the wash out, assists in assuring a progressive stall from the root to tip. This allows the full availability of lateral control with aileron, even when the wing is almost completely stalled and the aircraft is in its landing flare.

Slow Landing Speed — Given a high speed/low drag airfoil and a low drag/high powered airframe, the attainment of really impressive flight speeds should not be any surprise. The Double Eagle is not the usual aircraft; and what is surprising, after watching the Double Eagle in flight performance, is seeing a power-on, nose high landing approach that you can almost walk beside.

Stall — The rock steady power on slow flight capability is a direct indicator of the stall characteristics of the Double Eagle. With power off, the stall speed is a little slower than you would expect from a high speed aircraft, but not too much slower. The stall is clean but not abrupt, and is dead straight ahead.

Symmetrical Lift — For an aircraft to roll inverted and maintain altitude and direction, the forces on it must be the same in the inverted condition as they were in the upright condition.

DOUBLE EAGLE
Designed By : George R. Smith

TYPE AIRCRAFT
Pattern
WINGSPAN
62 Inches
WING CHORD
Root 15" — Tip 7½"
TOTAL WING AREA
675 Square Inches
WING LOCATION
Shoulder Wing
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Double Taper
DIHEDRAL, EACH TIP
3/8" at Chord Line
OVERALL FUSELAGE LENGTH
57⅜ Inches
RADIO COMPARTMENT AREA
(L) 8" x (W) 6½" x (H) 2½"
STABILIZER SPAN
27 Inches
STABILIZER CHORD (Incl. elev.)
Root 9" — Tip 4¼"
STABILIZER AREA
172 Square Inches
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Mid-Fuselage
TWIN VERTICAL FIN HEIGHT
6⅝ Inches
VERTICAL FIN WIDTH (Incl. rud.)
7½" (Avg.)
REC. ENGINE SIZE
Schneurle .61 w/pump
FUEL TANK SIZE
16 Ounces
LANDING GEAR
Tricycle Retracts
REC. NO. OF CHANNELS
5
CONTROL FUNCTIONS
Rud. Elev., Throt., Ail., Retr.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Foam & Ply
Empennage	Foam, Ply & Balsa
Wt. Ready-To-Fly	152 Ounces
Wing Loading	32.4 Oz./Sq. Ft.

The design of the Double Eagle capitalizes on the unsymmetrical aspect of the wing due to wash-out to produce a wing with symmetrical lift rather than a wing with symmetrical airfoil. The root section is a symmetrical airfoil. The tip section is an airfoil that is similar in contour to the root section on the upper surface but distinctly different on the bottom surface. Notice that "wash-out" in the upright condition changes to "wash-in" in the inverted condition and the resultant angle of attack at the tips is decidedly positive. The bottom surface is designed to use that positive angle of attack when inverted to provide a significant amount of lift.

When the aircraft is upright, straight and level flight is maintained primarily by the lift generated by the inboard portion of the wing. The outboard portion, being appropriately "washed-out" to produce less lift and substantially less drag, is really going along for the ride. In the inverted condition, with no change to the straight and level attitude of the aircraft, the generation of the primary lift shifts to the outboard portion of the wing which is not blanked by the fuselage and which has a significantly high angle of attack.

The symmetrical lift on the Double Eagle is dependent upon a critical location of aircraft Center of Gravity (CG). That is to say, the CG, once established and trimmed for, must remain fixed within precise limits for the symmetrical lift feature to be effective. A CG location of 40%—42% of the mean aerodynamic wing chord (MAC) will provide adequate pitch stability and still allow excellent maneuverability both in the inverted and upright conditions. The dual tank arrangement devised for the Double Eagle allows for a full 16 ounce of fuel but still provides a localization of fuel mass which is adequate to maintain the CG well within limits. The slight lateral fuel mass shift from tank to tank during fuel utilization is totally insignificant in flight.

Lateral Lift — Lateral lift is the lift provided by the fuselage in lateral flight. The design of the Double Eagle's forward fuselage provides approximately 65 square inches of lifting surface that is forward of and unencumbered by the wing. If the reader has been wondering why the Double Eagle has such an extremely long nose, this is the reason. The lateral area of the forward fuselage was sized and the aerodynamic contour was developed to produce an adequate lateral lift to maintain straight and level flight at the higher speed ranges. As with the symmetrical lift, don't expect adequate lateral lift for slow speed knife-edge flight. Keep the speed up to keep out of the ground.

Twin Fins — The twin vertical fins were put into the design to satisfy a need for yaw stability. The 65 square inches of lateral area of the nose is considerably larger than the nose area of any conventional pattern aircraft. The negative yaw moment created by the nose is in proportion to its size — large! The vertical fin area that would be required to establish an adedquate positive yaw stability, if relegated to a

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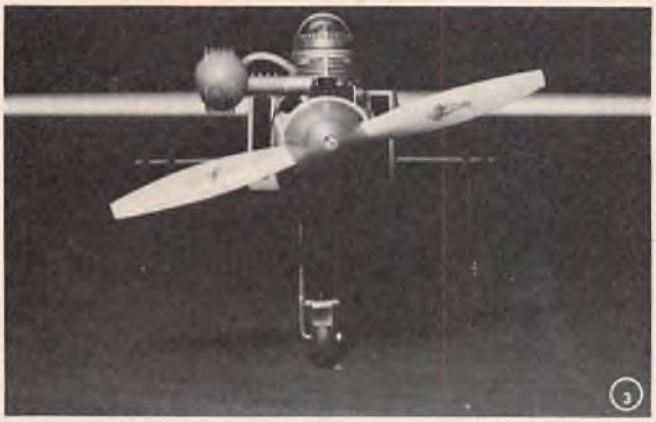
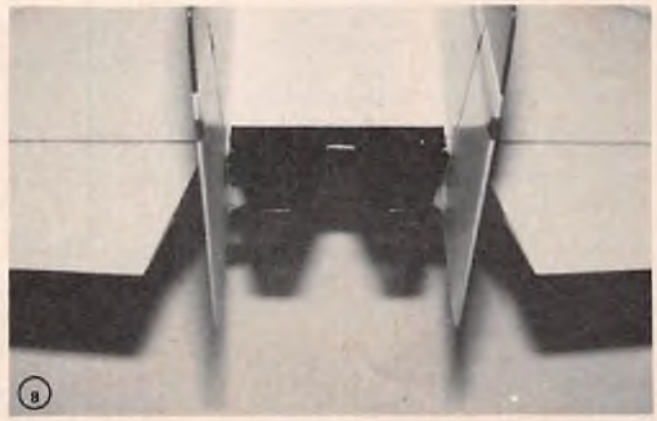




(1) The forward section of the fuselage has 65 sq. in. of lateral lifting area to sustain altitude in knife-edge flight. (2) The simulated intake ducts stop the helical propwash and help to straighten the air flow over the wing center section. (3) The extremely clean front end helps to minimize drag. (4) A Wing Mfg. Co. "Sport" style canopy blends perfectly into the aerodynamic contour of the fuselage. (5) The twin vertical fins are aerodynamically functional; they are not just for looks. (6) The wing contour is coincident with the top of the fuselage, thus eliminating the traditional wing to fuselage buffet area. (7) Superb performance on prototype using a K & B .61 with Perry pump and carb. Engine shown was customized by Clarence Lee. (8) The stab has a symmetrical airfoil for efficiency and is sized for positive pitch stability.

single surface, would make it look like it came off of a C-5A. Therefore, the required total area was split in half and put into two surfaces. The area was then proportionately assigned above and below the CG level to provide true yaw response and to minimize roll coupling. All other aspects of the design that deal with flight dynamics are pretty standard.

A fully aerodynamic horizontal stabilizer with symmetrical airfoil was provided for efficiency and was sized for positive longitudinal stability.

All surfaces and the engine thrust line are set at 0-0 degrees.

The wing is designed to have a very slight dihedral, actually, the amount of dihedral is only to assure that there are no anhedral characteristics.

All control surfaces are close-hinged, with **no** hinge gap, for control efficiency and reduced drag.

Structure — A brief discussion of the structure of the Double Eagle is in order, to complete the "How is it" portion of this description and to show how the structural design complements the aerodynamic design.

The fuselage forward section is a conventional beam-mount structure designed to retain its stiffness in spite of its extremely long nose moment and slender cross section. The beams carry the primary load and are assisted by plywood doubled sides. Hollowed out top and bottom blocks complete the contour. The beams are hardwood, are shaped to establish the lateral lift contour, and are notched to provide accurate alignment of the bulkheads. The canopy is, of course, non-structural but its contour is an integral part of the lifting body shape.

The fuselage aft section has a rectangular cross section and is stiffened by a dual crutch which also distributes the load applied to the top of the fuselage by the twin vertical fins.

The forward and aft sections are coupled by the wing saddle which is stiffened by plywood doubled side pieces. The wing saddle section provides adequate stiffness to resist any bending in the fuselage, but it is somewhat dependant upon the wing center section to provide additional resistance to torsion. The wide setting of the wing support dowels and screws assist in providing torsional rigidity and is much more effective than mounting the same attachments closer to the aircraft centerline.

The wing and horizontal stabilizer are similar in structure: polystyrene foam cores covered with 1/64" plywood. Plywood was chosen for the rigid surface because it is as light as 1/16 balsa and is stronger.

In the horizontal stabilizer, enough of the foam is cut away for the installation of a tip-to-tip spar which becomes integral with the fuselage aft structure at assembly.

Construction and Assembly

The construction and assembly methods and techniques that are suggested for the Double Eagle were devised for the express purpose of imparting the built-in accuracy to the assembled aircraft that is required to take advantage of all the aerodynamic fine points just discussed. The structure was designed to utilize these techniques and the ease with which extreme accuracy can be obtained by using them will be surprising.

A flat building surface that is large enough to accommodate the assembled aircraft is desirable but not absolutely necessary. The "flatness" of the surface is mandatory; the size is according to relative convenience. It is necessary, however, to have enough total area capability for the assembled aircraft to sit flat on the surface and for enough of the aircraft to be over the surface for vertical measurements to be taken.

The builder will need a foam cutter capable of cutting a 30" wing panel. (I heartily endorse the RCM design. I have used one for at least 20 wings and I like it.) The foam cutter should be mounted above and used in conjunction with the flat assembly surface to assure trueness.

The idea is to build everything on the flat surface and impart its accuracy to the aircraft. The fuselage is built with the bulkheads sitting on the flat surface; the wing and stab are fitted to the fuselage and aligned to be paralled to the flat surface; the vertical fins are added and made to be perpendicular to the flat surface. After **all** alignments are completed, the bottom plate can be added to the fuselage, sanded to contour, and it's finished.

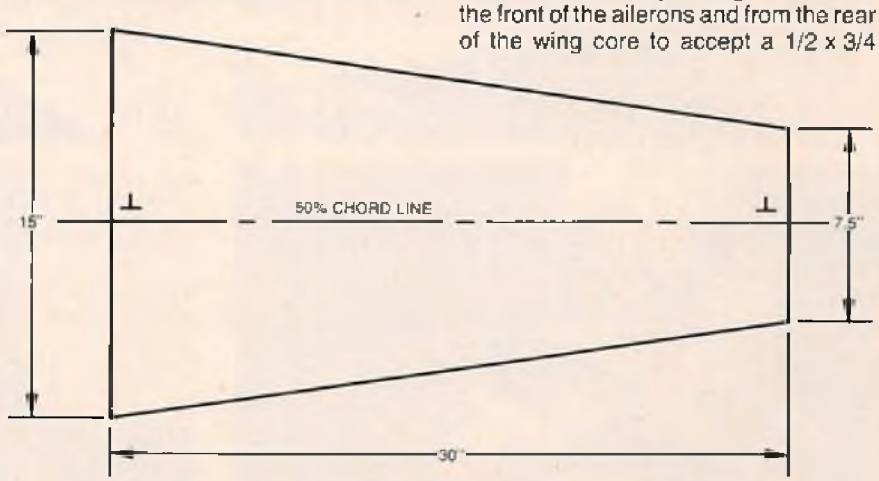
Wing — The wing cores are cut from a solid block of medium density polystyrene foam. The foam blocks should have smooth, parallel surfaces and should be at least 3" thick (4" would be even better) since we're going to use the top and bottom "waste" as construction molds.

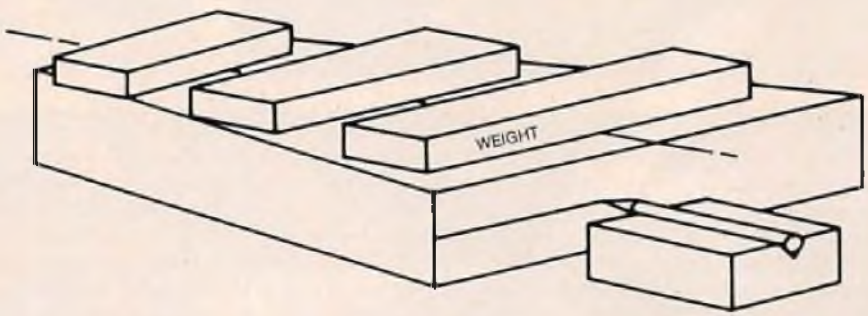
Accurately cut a planform of each wing panel, including ailerons. Be certain that the root and tip cuts are exactly square with the top and bottom surface. Note that the 50% chord line is perpendicular to the centerline of the aircraft so that the fore and aft wing taper is symmetrical.

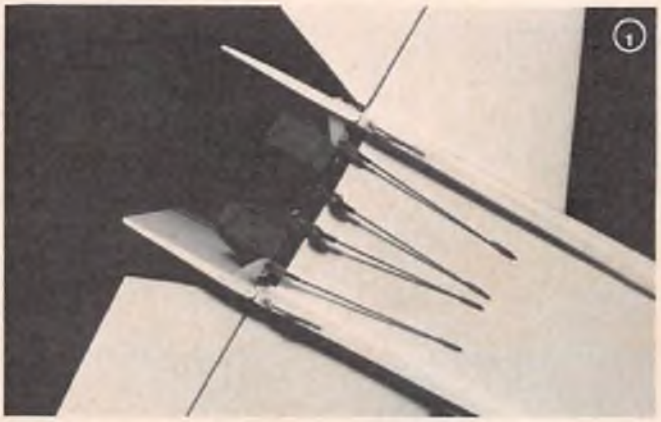
With the wing blocks weighted down on the flat surface, and using a marking gauge, made as shown, mark the chord line on the root end of both foam blocks. All marking should be done with a fine line felt tip or ball point pen and done with extreme care and accuracy.

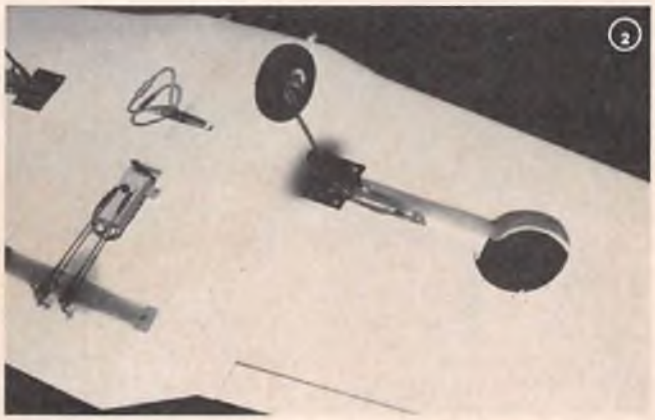
The chord line is to be marked on the tips in the same way, **except** that it is done with a 3/8" spacer under the marking gauge. This will provide the exact amount of dihedral in the assembled wing. Make your airfoil templates as accurately as possible, using 1/32" plywood or phenolic, and include the aileron. The root template must be exactly on chord line. The tip template is placed with the nose end exactly on the raised chord line but with its tail end 0.15" **above** the raised chord line. This is the wash-out and it must be exactly the same on both wing panels. Take care to place the 50% points of both templates on the 50% chord line.

Carefully mark and cut away the ailerons. Trim away enough foam from the front of the ailerons and from the rear of the wing core to accept a 1/2 x 3/4









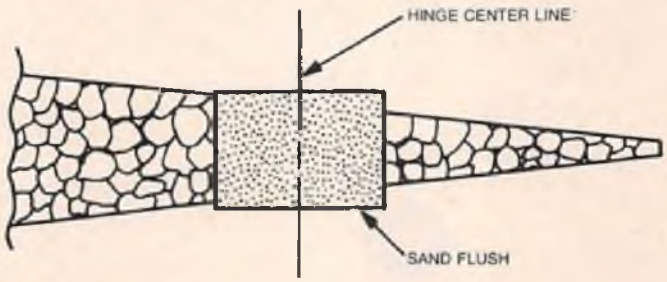
(1) Bottom view of elevator and dual rudder pushrods. Note wire skids on sub fins. (2) The main gear retracts outward to maintain good gear-down geometry. (3) Ample room inside for dual fuel tanks and radio equipment. Dual tanks help to localize the fuel mass at the C.G. (4) Inside of fuselage looking aft. Everything strapped in place. (5) Hatch removed on bottom of fuselage to show rudder and elevator servos.

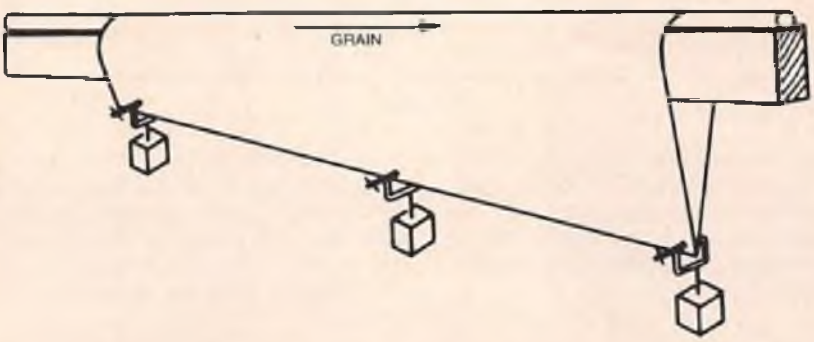
balsa hinge support to be centered on the proposed hinge line.

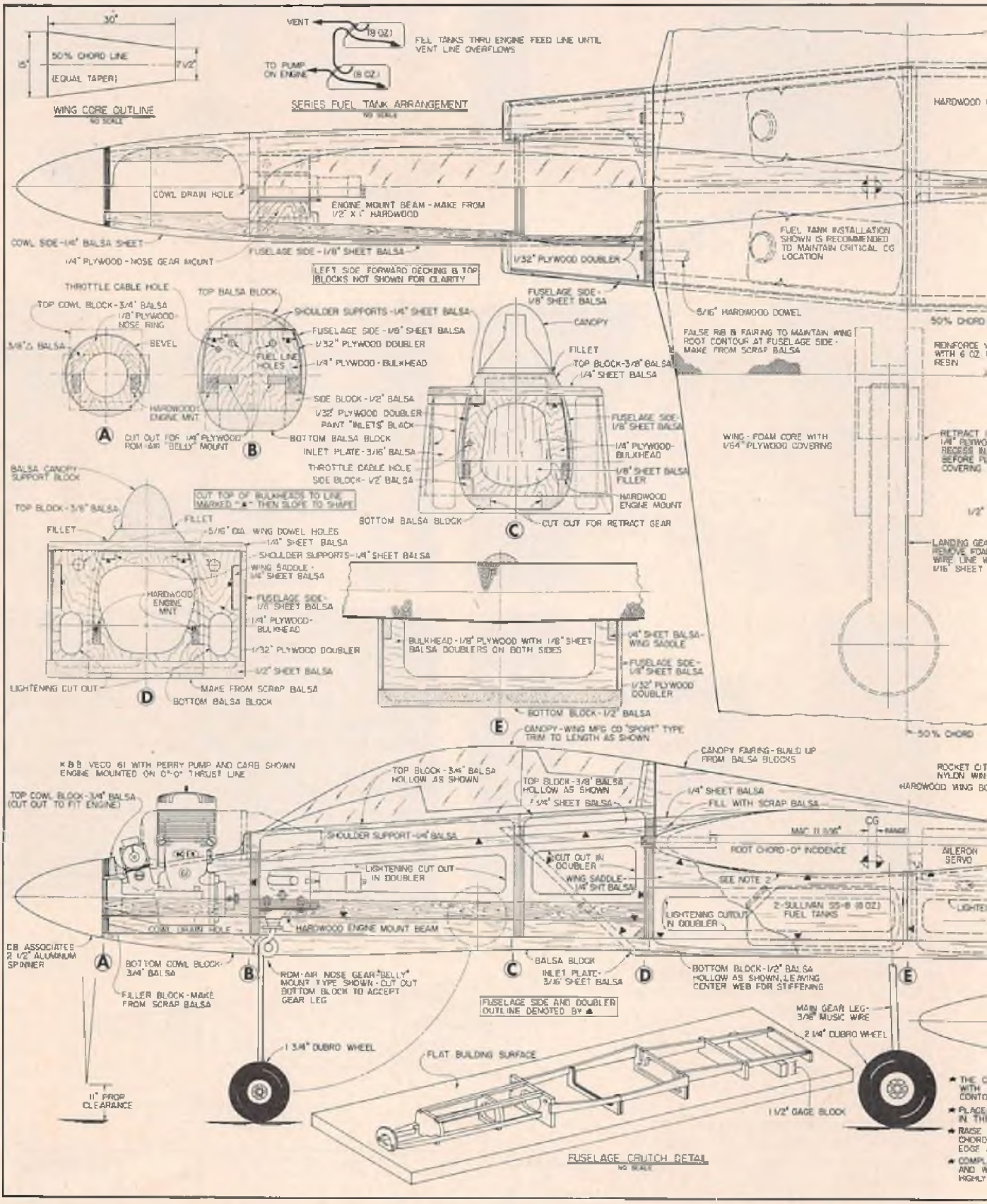
Using Hobbypoxy No. 2 or Titebond, glue the hinge support to the rear of the wing core. Use care to keep the core straight. When dry, carefully sand the balsa flush with the top and bottom surface of the foam, maintaining the contour as accurately as possible.

While the panels are drying, you can prepare the landing gear mounts. I prefer a 1/4" plywood mount recessed into the foam. Your favorite method, or a commercial mounting would be fine also. After the wing cores have dried thoroughly, carefully measure and remove just enough foam to allow the mounting to lay flush in the core and epoxy in place.

Each half of the wing will be covered with a single piece of 1/64" plywood, joined at the trailing edge. The grain is to be aligned with the leading edge. To

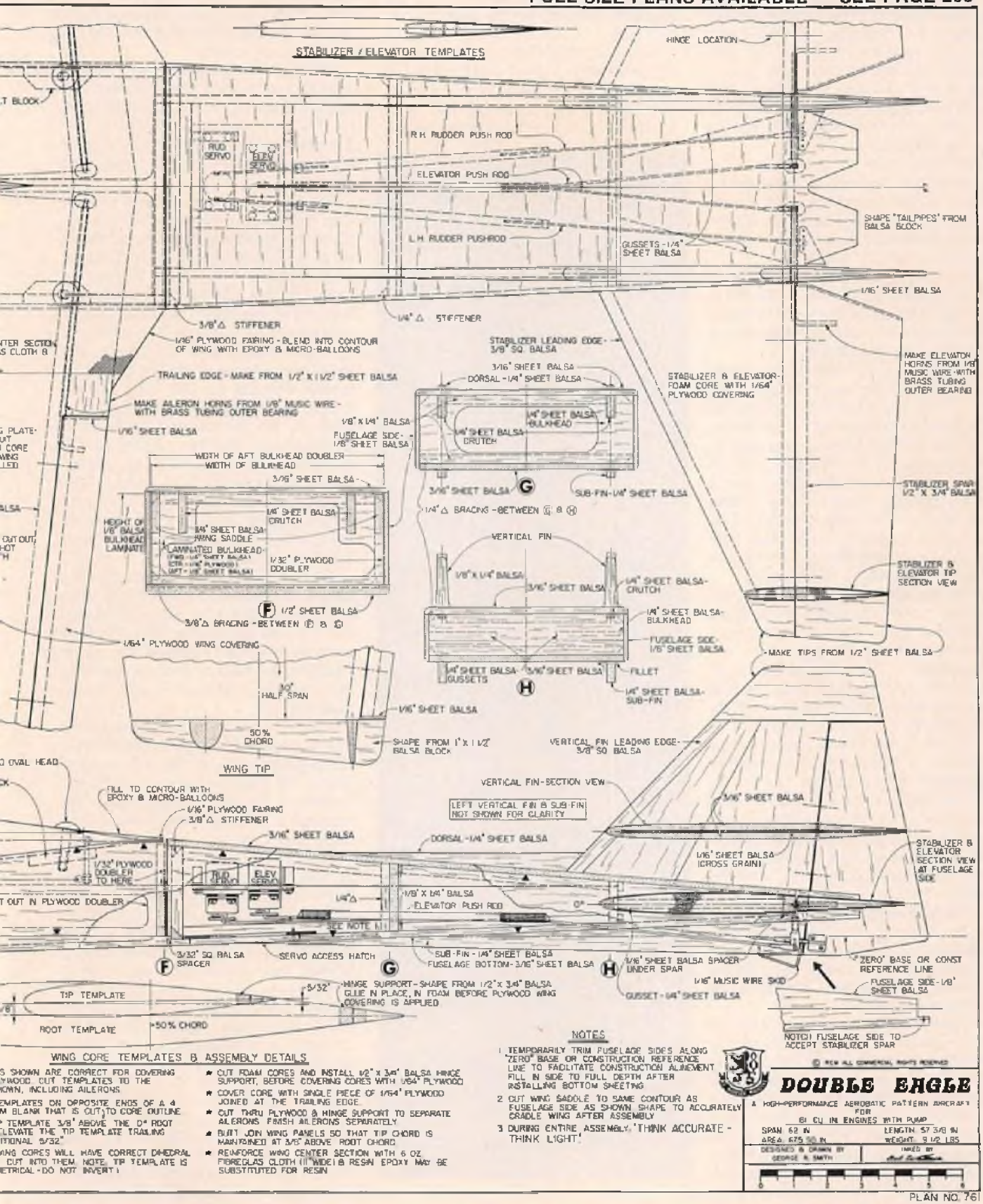






prepare the plywood, align the leading edge over a 1/2" dowel that has been backed with a piece of 1" x 2" for strength, wet down the leading edge, hang weights on the plywood (using "C" clamps), and let it dry.

Slightly thin approx. 1/8 pint of Hobbypoxy 2 to a good brushing consistency. Lightly coat both the foam core and the inside of the plywood envelope with the brushed on Hobbypoxy. Slip the core into the envelope and replace into the molds. Use plenty of weight, uniformly placed. Unlike contact cements, the Hobbypoxy will allow the core to align itself inside the plywood and will allow the plywood to assume the true contour of the core



without any warps. Allow to cure thoroughly. Carefully remove the molds and keep them — you're not through with them yet.

Carefully razor saw the ailerons along the hinge line, cutting through the plywood and the balsa. Also, razor saw through the plywood and remove enough foam for the landing gear. Trim any excess plywood and sand the root edge flush with the root airfoil.

The two halves are now joined. To aid this, cut approximately 1" off of the root end of the molds and replace the wing panels into them. Weight them down again on the flat surface with the root sections in contact and carefully butt glue the panels together, using

Hobbypoxy. (I wrap masking tape around the bottom of the joint to keep the Hobbypoxy in place.) If you have carefully followed the cutting and covering procedures, you now have a wing that is as close to perfect as is possible to produce. Notice how easily you have completed both the wash-out and the dihedral.

The wing can be completed in a conventional manner. A solid balsa trailing edge containing the aileron torque rods is added. The center section is strengthened all around with 6 ounce fiberglass to an 11" width.

The forward edge of the center section is built-up by adding false ribs to the nose of the airfoil at a width to match the fuselage and then filling between the false ribs with scrap balsa.

Stabilizer — The stabilizer is made almost exactly the same as the wing, with a few exceptions. Of course no dihedral and no wash-out is cut into the stab. The leading edge is too sharp to wrap the plywood around so the top and bottom are covered separately and a piece of balsa is placed on the leading edge and shaped after covering. The balsa hinge support is, in the case of the stab, a tip to tip spar that is glued to both halves of the stab before covering.

After the elevators are cut away, the required rudder clearance angle is cut and the raw foam edges of the elevators are covered with 1/16" balsa.

Fuselage — The major bulkheads, A, B, C, D, E, and F are flat on the bottom **at the same level** and provide the basis for the alignment of the fuselage. The longitudinal members key into the bulkheads and tie the structure together (see sketch of fuse. crutch). Lay out the fuselage plan on the flat surface and tape it down. The major bulkheads are stood up on the plan and the total crutch is built in place using a square to align each component precisely over its image on the plan. The aft crutch beams must be supported between bulkheads G and H by a 1½" gauge block throughout assembly. Bulkheads G and H are merely glued to and hang on the aft crutch, unsupported, until the sides and top are added.

I used Hot Stuff to assemble the crutch system and for much of the structural assembly after that. It was great! The fuselage side panels and the plywood doublers are added to the crutch. Since the forward section's side panels must be formed to a slight complex curvature at assembly, I like to "lay up" the doublers and sides simultaneously onto the crutch with epoxy and tape and/or clamp everything in place until the epoxy cures. This prevents the build-up of any stresses in the balsa sheeting caused by the compound bending of sides that have the doublers already installed. The side panels for the transition section and the wing saddle section require no bending on assembly, therefore may have their doublers installed before assembly to the crutch.

When all side panels are in place and all strengthening gussets, triangle corner braces, etc., are holding everything rigid, the stab and wing should be mated to the fuselage before the fuselage is moved from the flat surface.

DOUBLE EAGLE
Bill of Material

BALSA SHEET	
1/8 x 3 x 36	6 pieces
1/8 x 4 x 36	2 pieces
3/16 x 3 x 36	2 pieces
3/16 x 4 x 36	2 pieces
1/4 x 3 x 36	2 pieces
1/2 x 3 x 36	2 pieces
1/2 x 4 x 36	1 piece
5/8 x 3 x 24	1 piece
5/8 x 4 x 24	1 piece
BALSA SHAPES	
1/2 x 3/4 x 36	3 pieces
3/8 x 3/8 x 36	1 piece
3/8 triangle x 36	2 pieces
1/4 triangle x 36	1 piece
BALSA BLOCKS	
1½ x 1½ x 10	1 piece
1½ x 1 x 10	2 pieces
AIRCRAFT PLYWOOD	
1/4 x 6 x 12	1 piece
1/8 x 6 x 12	1 piece
1/16 x 6 x 12	1 piece
1/32 x 6 x 24	4 pieces
1/64 x 50 x 50	1 piece
POLYSTYRENE FOAM	
4 x 24 x 48	1 piece
HARDWOOD	
1/2 x 1 x 18	2 pieces
PIANO WIRE	
1/8 x 36	1 piece
5/32 (nose gear)	1 ea.
3/16 (main gear)	1 pr.
FIBERGLASS	
3/4 oz. Medium wt. Structural	3 sq. yds. 1 piece 11 x 36
CANOPY	
"Wing Mfg." Sport style	1 ea.
SPINNER	
2¼ - inch CB Associates	1 ea.

Mounting The Stab — The two halves of the horizontal stabilizer should fit snugly against the fuselage side panels. Align the stabilizer to be accurately parallel to the flat surface, i.e., the chord **plane** of the stab, as measured on the leading edge, on the spar centerline, and on the tip airfoils, must be the **same distance** from the flat surface at all points.

Mating The Wing — The fuselage wing saddle must be mated to the wing, i.e., any sanding or fitting must be done to the saddle to fit the already fiberglassed wing center section. I found the carbon paper method to be most effective.

Tape a piece of carbon paper (carbon side out) to the bottom of the wing. Carefully place the wing in the saddle, as close to correct alignment as possible, and "wiggle" the wing a bit. The carbon marks on the saddle will indicate the high points that should be sanded. Work with great care and don't be in a hurry to take down too much wood at a time. It's awfully easy to go too far! The alignment measurements for the wing are as critical as for the horizontal stabilizer. A point on the tip should be the same distance from the flat surface as the corresponding point on the opposite tip. The 0-0 degree angle of attack of the root section must be maintained exactly. Notice that the 0-0 chord still shows on the tip airfoil — it must also be level with the flat surface.

When you are satisfied with the wing saddle, the wing hold-down bolt holes are drilled through the wing and tapped into the fuselage blocks. With the wing securely weighted in place, the dowel locations are back drilled into the wing leading edge through the holes in bulkhead "D".

A 1/16" plywood fairing is added to the trailing edge of the wing center section to complete the wing planform. Filleting of epoxy and micro-balloons to fair the top surface of the wing into the top of the fuselage is added after the fuselage top decking is in place.

The top decking can be added and the vertical fins can be fitted in place. The fins must be parallel and symmetrically placed relative to the aircraft centerline.

Engine and Landing Gear — The installation of the engine and retractable landing gear should offer no problem whatsoever to the experienced RC builder. The only difference is that the main gear must retract outward to maintain a reasonable wheels down geometry — different but no problem!

Some of the fitting-out of the Double Eagle is a little different from the usual and needs some explanation.

Fuel Tanks Hook-up — As was already discussed, the location of the fuel supply is critical to the maintenance of the CG of the Double Eagle. Also, the use of two 8 ounce tanks instead of a single 16 ounce tank helps to localize the fuel mass; also to maintain the critical CG location. A simple series hook-up of the tanks allows the use of the full 16 ounces as reliably as from a single tank.

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By Richard Shilling

HOW TO "SEE" A TRADE SHOW

WRAMS, Toledo, MACS, etc. ... to many modelers these names evoke different meanings. To some, they represent a chance to chat with flying buddies not seen for months or years. For others, the opportunity to display the model that's been 'a building for a long, long, time. But to most, the trade show is a chance to go to an under heated barn-like structure, grab a few hand-outs, be jostled and squashed by all humanity, and maybe learn something.

Is there a better way? Is there some way that you could optimize your time at a show and get more out of it? Yes! There is. Why go to a show? Basically, there are three reasons: Diversion, Social, and Education. Diversion means that you're bored out of your mind and if you don't find something to do with yourself you'll climb the wall. Social means flapping your jaw with your buddies. Education is learning. Whether it's a new model that's "coming soon" or one that's available now that you somehow missed, a neat new technique that **really** works, or a great gadget — you're being educated. Look at a trade show this way: the manufacturers and the people who built the models on display are the teachers. You are the pupil. The real question is "how can you learn all that there is to learn?"

Step number one is to allocate your time. How much time do you have available? Most trade shows require at least one full day. The show at Toledo is so big that if you stay two days you probably won't see all there is to see! The more time you allocate, the more you'll learn. This is also influenced to an extent by your physical state. If you're going to drive 5 hours to spend 3 hours at a show, you might as well stay home and read RCM. You wouldn't do that if you were taking a class, so why do it for a trade show? If you're serious about going you might as well spend a night in a motel or impose on a flying buddy and sleep on his building board. The idea is to spend as much time as is practical.

Allocating your time also applies to how you spend it at the show. First, get a map of the floor outline and booth locations. Mark out where the booths are that apply to **your** special interest. There are obviously some things you just "have" to see. It doesn't matter if they are pattern ships, Stand-Off Scale, sailplane or what. Make sure you see what's important to you. Mark your map indicating those booths and visit them first. This makes sure that at the end of a tiring day (or days) you won't realize "Omigaud, I never saw..." Then, set up a logical path to see as much of the show as time permits. Speaking of time, the best time to see the show is early. The crowd usually fills around noon and stays heavy till late. If you get going early, you can beat the rush. There really is an advantage to standing in line before the place opens.

Now, here comes the real message in this article. Every exhibitor, at every stand is there because he or she wants to be. These people are experts. They do the development, the thinking, the production and, in general, make the hobby happen.

Trade shows are regarded by most manufacturers as public relations. They are committed to spending 2 to 3 days in the same place talking to people and they don't mind at all — that's what they're there for. The best approach is to ask the person behind the counter for their sales pitch. Give them the opportunity to tell you why they're there. If you just walk up to a booth, say "Hi," grab a brochure and walk away you'll never know what you've missed. If you give these people a chance you'll get all kinds of information. When they're through — ask questions if you've got any. And, if you should happen to have a complaint — fire away. Everybody would rather get a compliment than a complaint, but if there is a problem with a product, any manufacturer would rather know that you're unhappy than think that everything's wonderful when it's not.

You also might ask if they've got anything "under the counter." No, not contraband, but it's not unusual for companies to bring pre-production samples to get some feed-back from the folks. You might see a new engine, kit, accessory or what have you. But, if you are shown one of these gems, then play fair and give your opinion — positive or negative — and why. If a manufacturer is trying to make up his mind about putting an item into production, every little bit of information helps!

Then there are various kinds of literature — brochures, etc. These range from Xeroxed sheets to 4 color professionally done brochures. All are worthwhile. Don't be shy about asking for one. After all, little kids will grab 30% to 40% of the available material so a serious modeler is more than welcome to it. Some manufacturers keep their hand-outs under the booth so it will get in the hands of those who are really interested, so ask. Don't forget. Someone who brings several pounds of hand-outs 1,000 miles would probably rather give them away than carry them back!

So, now that you've seen the booths that you absolutely had to see, what about the rest of the show? Start at one end and work your way to the other end. Stop at every booth and listen to the presentation. Bring a shopping bag to put the brochures and hand-outs into. Listen to everybody and don't block anything out. There is a lot to be learned. A sailplane manufacturer will give you a hint about adhesives, handy even if you're a pattern flyer. A boat racer has forgotten more about tuned pipes than most people will ever know. The point here is that the principle of serendipity (finding valuable things in unexpected

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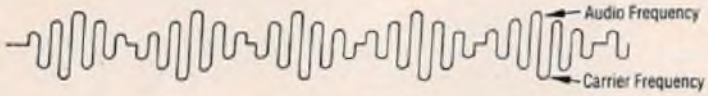
NOW WE HAVE AM

By Mike Gilbertson

Figure 1

By turning the RF carrier on and off with a pushbutton switch, a certain number of times, a command was given.



Tone Modulated Transmission (Resonant reed receivers, some single channel systems)

Figure 2

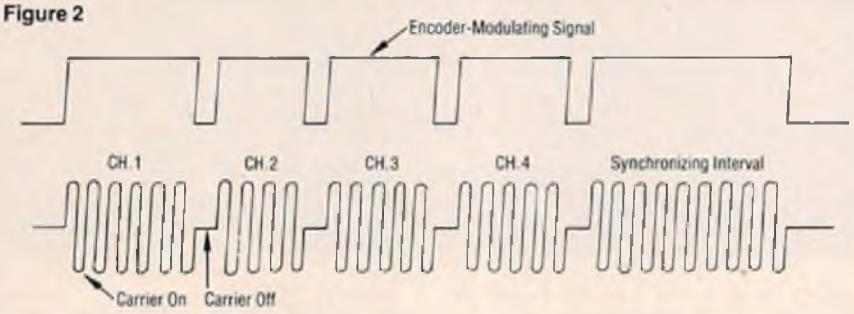
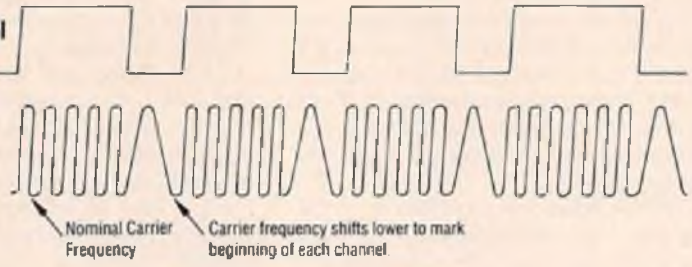


Figure 3



Pick up a brochure on most R/C radio equipment here in the United States and you will see specifications like...

"Series clipper for enhanced noise rejection and..."

"Modulation: carrier on-off amplitude modulation..."

"Adjacent channel spacing (min) 30 KHz..."

"AGC range..."

If you were in Europe, you might pick up a brochure with specifications which say things such as...

"Capture ratio 2.5db..."

"Modulation: narrow-band frequency modulation..."

"Deviation 2.5 KHz peak..."

"Adjacent spacing (min) 10 KHz..."

"Full limiting at 20 uV..."

What does all this mean to you? Probably not much, except it seems that Europeans aren't using the same gear we are; or do they have a strange way of saying the same thing?

It turns out that they **aren't** using the same gear. Besides transmitter trays, 6" long stick tips and neck straps, there is something different **inside** those big transmitters on the "Continent" — FM. What do they have that we don't? Not very much; but what a little difference! (More about that later.) What do we have? **AM.** Going back to the 1930's when the R/C service first became its own entity, AM (Amplitude Modulation) was, and is today, the only form of R/C transmission in the United States legally usable according to FCC rules. (The sole exception being Amateur Radio Operators using "ham gear" for R/C purposes.) At that time many R/C transmissions consisted of turning the transmitter on or off a certain number of times in rapid succession to effect a given command within the aircraft.

Later, commands were given by modulating the transmitter with a precise tone to equally precise and unforgiving resonant reeds in the receiver to effect the desired command. In these units, it was necessary to employ a separate servo just to **trim** the aircraft since the command servos always (or nearly so) neutralized when the command switch was released.

All these methods utilized what is known as **Amplitude Modulation (AM).** In other words, the RF carrier was altered (modulated in **Amplitude**) whether by being turned on and off (Figure 1A) or made to vary at a rate determined by the frequency of a specific tone (Figure 1B)

When the pulse-width tracking servos we have today became available, a "new" transmission system was developed. The RF carrier wave is turned off (or on) at specific intervals to correspond to the desired channel position signal. (See Figure 2.) This pulse interval is then transmitted to the desired servo by the receiver and decoder, and the servo responds (hopefully) to the desired position commanded by the transmitter. This permitted a single servo to be "trimmed" by the control stick (one less servo on each channel from reed days!) Welcome to the age of proportional R/C!

The common denominator in all of this development was AM as the modulation method. What's wrong with AM? Nothing at all! Every CB set made today

ABOUT THE AUTHOR

Currently the Director of Engineering, Mike joined Kraft System, Inc., in 1967, following his education at Loyola University and work at Northrup Corporation and Gulton Space Power Division. He participated in the design of the famous Kraft "Gold Medal Series," was responsible for the development of the "Sport Series" lines, first introduced in 1971, and the first successful I.C. servo amplifier. Mike began working with FM R/C systems in 1968 with Jerry Pullen while Jerry was with Kraft Systems. This first FM system was flown by Maynard Hill during a successful record altitude attempt later that year. He says the past year has seen the rebirth of FM for R/C with Europe opting for dense channel spacing and new integrated circuits which make FM practical for R/C. The accompanying article attempts to tell you what FM is and isn't, and why there is such a sudden interest in this old form of transmission.

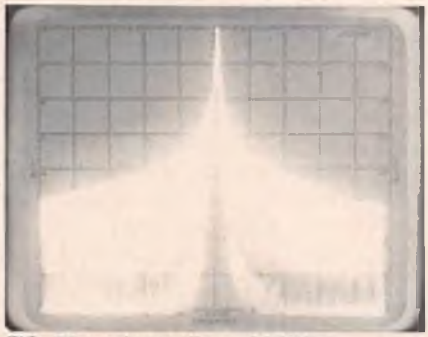


FIG. 5A ea. large div. = 20 KHz.

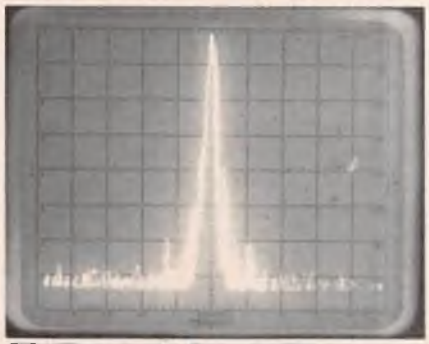
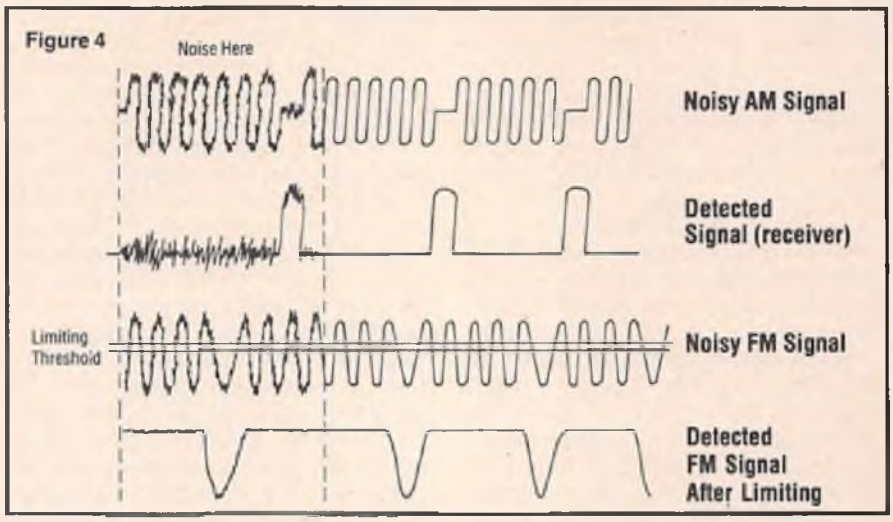


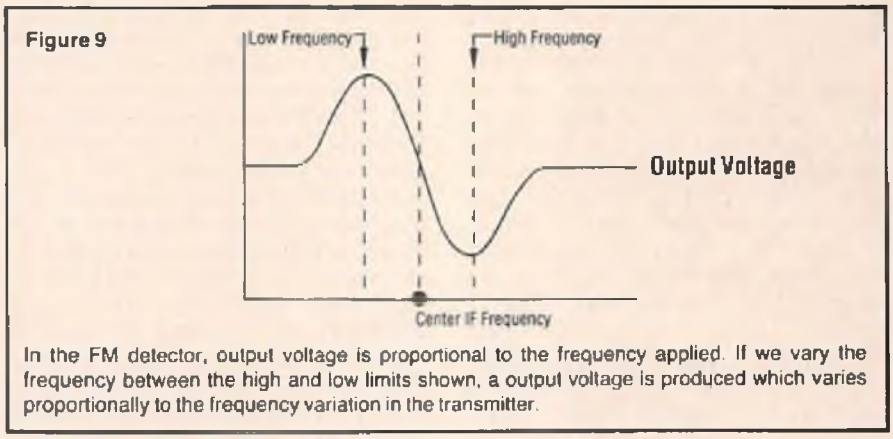
FIG. 5B ea. large div. = 20 KHz.

FIG. 5C ea. large div. = 5 KHz.

FIG. 6 ea. large div. = 50 KHz.

FIG. 7 ea. large div. = 50 KHz.





In the FM detector, output voltage is proportional to the frequency applied. If we vary the frequency between the high and low limits shown, a output voltage is produced which varies proportionally to the frequency variation in the transmitter.

uses AM with very good results. Single-sideband is actually a method of amplitude modulation utilizing the carrier modulation "by-products" rather than the carrier itself to convey all the information.

Why Do We Have Only AM Today With FM All Over The World? Do We Need FM At All?

Is the reason we have AM only simply because that's the way it's always been in the past? Not really. The simple fact is that AM is the easiest method of modulation to produce and the easiest to detect (the receiver's job). Remember your first crystal set? Four parts plus an earphone and you had an AM broadcast band receiver! In addition to this, the first FCC frequency allocation for R/C was in the 27 MHz band, which is today still approved for AM only. In 1966 when allocations were first made for R/C in the 72 MHz band, the new frequencies were simply added to the Class C Citizens Radio Service along with the existing prohibitions against anything but AM in

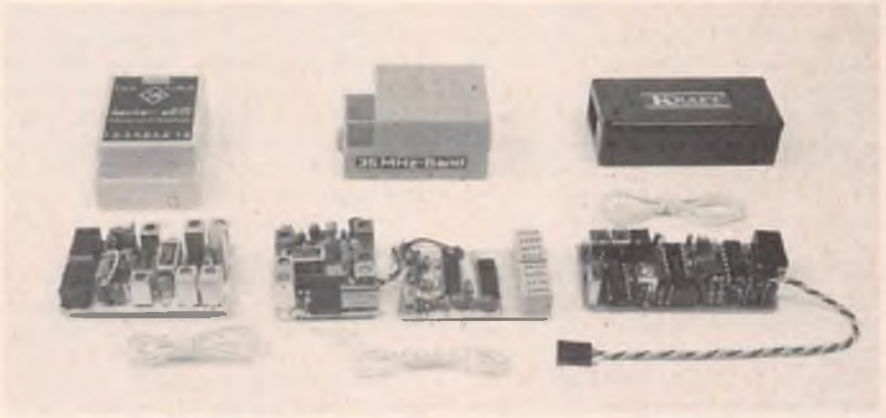


FIG. 8: Pictured LEFT, the Becker (Germany) FM receiver; MIDDLE, the Multiplex (Germany) FM receiver; and RIGHT, the Kraft (USA) FM receiver.

this service. The R/C manufacturers didn't **really** want FM either owing to the increased complexity of both the transmitter and receiver so, at that time, it wasn't an issue. So this brings us to today's equipment in the United States. What's coming tomorrow? Maybe more of the same, or maybe...

Frequency Modulation

Mention "FM" and most people think of the stereo receiver in the living room marked 88 to 108 MHz. Does this mean Hi-Fi servos are next? No, of course not.

FM is merely a different means of accomplishing the same thing AM does; modifying the RF signal from the transmitter in some predetermined manner the receiver can detect to convey the desired information. Instead of modifying the **amplitude** of the carrier, the **frequency** of the carrier is changed by the modulation. (See Figure 3.) Is that all? Well, it's more than that. Let's look at what this means to the receiver. Going back to the AM receiver, the **information** being conveyed lies in the instantaneous relative amplitude of the signal. This means that the receiver must preserve this amplitude variation even though the signal at the receiver is 1 volt or 1/1,000,000 of a volt. This requires a method of adjusting the receiver gain over this wide range of signals (AGC or Automatic Gain Control). Since with FM, the **amplitude** of this signal means little or nothing (ideally), no means of preserving the relative amplitude variations is necessary (nor desired, as we'll see later), this AGC function can be despensed with. Hey! The receiver is simpler, right? Well, not really. Now it's AM's turn. Since the frequency of the signal isn't important to AM (within reason), crystal frequency and drift don't materially affect the signal quality. With FM, the frequency of the signal **is** important — **very** important. In the home stereo FM receiver we mentioned earlier, we've traded AGC for AFC (Automatic **Frequency** Control). (In reality, FM receivers use both AGC **and** AFC. Since you can be quite near a 50,000 watt station, the receiver must reduce gain somewhat to prevent overloading. But, practically speaking, the gain control required is very little.) This circuitry must continually adjust the receiver local oscillator to keep the transmitted signal centered in the receiver IF amplifier passband. This is generally much more complex than AGC in the AM receiver. There's a way out, however, if we "simply" make the transmitter and receiver circuitry so frequency stable that AFC isn't necessary. A not so easy feat in R/C gear that must operate in temperature extremes seldom seen in the family living room! And when was the last time the floor shook like a plastic fuselage with an O.S. 80 running a nicked prop? Despite that, FM R/C gear doesn't really need AFC. So we've given up AFC **and** AGC, but at the expense of better crystals and more careful attention to frequency drift throughout the receiver.

If the FM receiver's interest is in frequency rather than amplitude, is there a benefit? You bet there is! Why? Most electrical noise, whether it's from an electric motor or two metal surfaces rubbed together, or the kid's car down the street with the trick ignition system, is **amplitude** noise. The frequency spectrum of such noise (or interference, if you're watching a football game or flying your latest model) extends from 0.1 MHz to well above 400 MHz. Since our AM R/C gear falls somewhere in the middle of all this, it affects it to a greater or lesser degree; plus the amplitude noise is faithfully reproduced by our AGC'ed receiver! (Turn on your R/C set; transmitter, receiver and servos. Wrap a few turns of receiver antenna wire around a screwdriver and rub the blade against another screwdriver. Unless the transmitter antenna is fully extended, watch the servos twitch!) This is the phenomenon of electrical noise and AM receivers. Do this same test with an FM set and you'd be lucky to see a twitch at all. Why? Let's go back to the fact that the FM set doesn't care about signal **amplitude** just frequency. In fact, FM receivers employ a few amplifying stages called **limiters.** These stages amplify the received signal and actually "clip" any signal over a certain maximum. (See Figure 4.) This effectively eliminates most of the amplitude variations imposed on the carrier by outside sources of electrical noise. This gives FM a decided advantage when operating ignition engines, helicopters with metal to metal transmissions, and electric motors. Obviously, FM is great, right? Frankly, yes — but it isn't the answer to all our problems.

For example, it doesn't provide any protection from someone in the pits turning on a transmitter on **your** frequency (whether AM **or** FM). FM doesn't offer any improvement in harmonic interference, image rejection or the myriad of other problems which beset even the best AM receivers. Other than the electrical noise advantages mentioned above, the R/C FM sets in use today are no more immune to the interference problems we've all seen using AM. Then why FM at all?

One very overwhelming reason — **congestion.** In saying congestion, I should say crowding of the frequency spectrum. With the number of entrants at a major contest, whether airplanes, cars, or boats, the number of frequencies available for all entrants often proves a limiting factor. In Germany, for example, there is no 72 MHz band — only 27 MHz; until a few years ago, that is. The German Bundespost (Post Office) allocated a band of frequencies from 35.000 MHz for R/C operations. In addition, the Bundespost allowed FM to be used — specifically "narrow-band" FM. What does "narrow band" FM mean? Let's drop back to AM again. Yes, again! Most AM R/C rigs today use what is called carrier "spike-off" modulation. The carrier is turned off (spiked-off) for a short period of time to mark the beginning and ending of each channel.

A look at a spectrum analyzer display (Figure 5a) showing spike-off modulation and FM for comparison (Figure 5b & c) shows significant energy produced as much as 25 KHz away from the carrier frequency. This energy is generated because the RF signal is interrupted by the modulation, much the same as house current is interrupted when a switch is opened or closed. Have you ever seen the TV flicker when an appliance is turned on or off? This action produces a "spectra" around the carrier, the dispersion directly proportional to the speed with which the carrier is interrupted (Figure 6 shows the spectrum produced with a modulation pulse which turns the carrier off and on in 20 microseconds. Figure 7 shows the same spectrum width but with the carrier turned off and on in 200 microseconds.) But whatever the speed, the AM spectrum generally requires at least 15 KHz on either side of the carrier for the "sidebands" which contain the modulation information. This means that each channel **should** be at least 30 KHz apart to keep one sideband from bothering an adjacent channel's sideband information.

Back to Germany for a moment. Given a band from 35.000 to 35.200 MHz, this would provide seven 30 KHz channels. But if the channel spacing could be cut to **10 KHz** using narrow-band FM this would mean **twenty** channels — why not? If it were 1965, there would **be** a reason. In the intervening years, however, integrated circuitry put into two chips a basically complete FM receiver providing a gain of over 1,000,000; requiring only tuning components and a few resistors and capacitors.

All very neat, but how do we squeeze the 30 KHz AM into 10 KHz FM? The answer lies in the method. Remember that in AM the carrier is **interrupted,** thereby generating the "sidebands" as a direct result. In narrow-band FM, the carrier is **not** interrupted but merely changed in frequency **slightly.** With narrow-band FM, the carrier frequency is changed about 3 KHz to mark the beginning and ending of each channel. The **rate** at which the frequency change takes place determines the width of the spectra, but since the carrier is never **interrupted,** the resulting spectra is still

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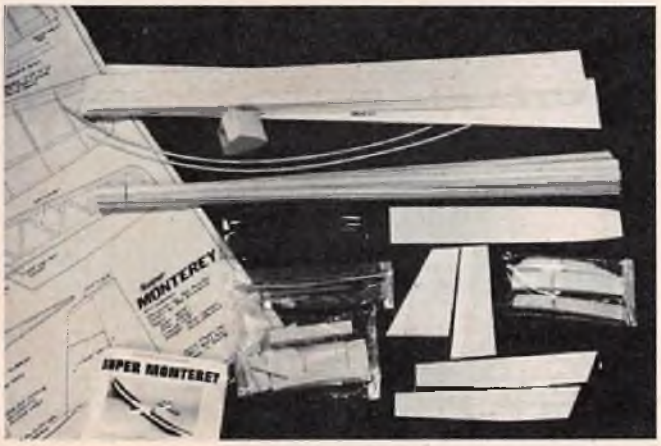
RCM PRODUCT TEST

Astro Flight SUPER MONTEREY



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

Manufacturers love to use superlatives when introducing their latest products to the public, labeling them either (a) new; or (b) improved; or (c) great; or (d) super; or (e) all of the above.

Astro Flight's Bob Boucher also touts his new products. In marketing the latest version of his popular Monterey sailplane Bob chose (d) super.

The natural question follows: how super is this Super Monterey? Well, since everything is usually judged in relation to something else, I just happen to have that "something else" — a four year old Monterey (my first standard class sailplane) which served me faithfully throughout my initial year of soaring competition. And even though she's battered and somewhat disfigured, the old girl is still going strong as a trainer.

In comparison to her older sister the new bird is more complete, with full hardware and a canopy that is already tinted my favorite canopy color, light green. The instruction booklet has been improved and now includes 55 construction photos and a list of tools and materials necessary for completing the model. The quality of the wood is still quite good with some variation in weight and grain. All parts, apparently band-sawn and sanded, fit exceptionally well. The new plans and instruction booklet also include specific information for installing an electric motor for power assist.

From a construction standpoint, kid sister seemed to build faster and with less fuss, mainly because of the wings. I remember laboring over the sheeting and shear webbing on the first Monterey's wings; she had dihedral only and both of the wing panels were awfully long and very tedious to work on. Because this new wing has polyhedral and is built in four smaller sections, I found construction to be much less of a chore (or perhaps I've just become accustomed to sheeting sailplane wings and installing thousands of inches of shear webbing).

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SPECIFICATIONS

Name ..... Super Monterey
Aircraft Type ..... R/C Sailplane
Manufactured By ..... Astro Flight, Inc.
13377 Beach Avenue
Venice, California 90291
Mfg. Suggested Retail Price $44.95
Available From ..... Mfg. & Retail Outlets
Manufacturer's Rec. Usage ..... Sport/Competition
Wingspan ..... 98½ Inches
Wing Chord ..... Inboard 8½" — Outboard 6½" (Avg.)
Total Wing Area ..... 734 Square Inches
Fuselage Length ..... 41½ Inches
Radio Compartment Dimensions ..... (L) 6⅝" x (W) 2⅛" x (H) 2"
Wing Location ..... Shoulder Wing
Airfoil ..... Flat Bottom
Wing Planform ..... Constant Chord & Double Taper
Dihedral (each tip) ..... 2 Inches
Polyhedral ..... 2½", 2nd Panel 4½"
Stabilizer Span ..... 25 Inches
Stabilizer Chord (Incl. elev.) ..... 4⅜" (Avg.)
Total Stab Area ..... 118 Square Inches
Stab Airfoil Section ..... Flat
Stabilizer Location ..... Top Of Fuselage
Vertical Fin Height ..... 6 Inches
Vertical Fin Width (Incl. rud.) ..... 5½" (Avg.)
Mfg. Rec. Engine Range ..... Astro 05
Recommended Fuel Tank Size ..... NA
Landing Gear ..... Skid
Recommended No. Of Channels 2
Recommended Control Functions ..... Rud., Elev.
Basic Materials Used In Construction:
Fuselage ..... Balsa & Ply
Wing ..... Balsa & Ply
Tail Surfaces ..... Balsa
Hardware Included In Kit ..... See text
Plan Size ..... 50¼" x 36" (1 sheet)
Building Instructions on Plan Sheets ..... No
Instruction Manual ..... Yes (3 pages)
Construction Photos ..... Yes
Kit Includes ..... Shaped Parts
Mfg. Rec. Flying Weight ..... 34 Ounces
Wing loading based on rec. flying wt. ..... 6.7 Oz./Sq. Ft.

RCM PROTOTYPE

Weight, Ready To Fly ..... 35½ ozs.
Wing Loading ..... 7.0 Oz./Sq. Ft.
Covering & finishing materials used ..... See Text
Engine Make & Disp. ..... Astro 05
Muffler Used ..... NA
Radio Used ..... Heath & Royal
Tank Size Used ..... NA

THE ALUMNUS

A CONVERSION OF THE TOP FLITE SCHOOLBOY TO TWIN ENGINES

By Randy Wrisley

Way back in 1967, my first attempt at R/C was with a Schoolboy, designed by Ken Willard and kitted by Top Flite. It actually flew, briefly, with 6 pencells, a single channel radio and an .049! (Sorry, Ken.) Forgotten as I progressed onward, the moldy old bird lay in the closet. After I got my Cannon Super Mini radio, I looked once more at the Schoolboy. This time though, let's try two engines! Quickly I sawed off the nose, added a block, and enlarged the rudder. The nacelles went on easy and I was ready to fly. She flew good, but the engines were too far apart. The wide aft fuselage seemed to blanket

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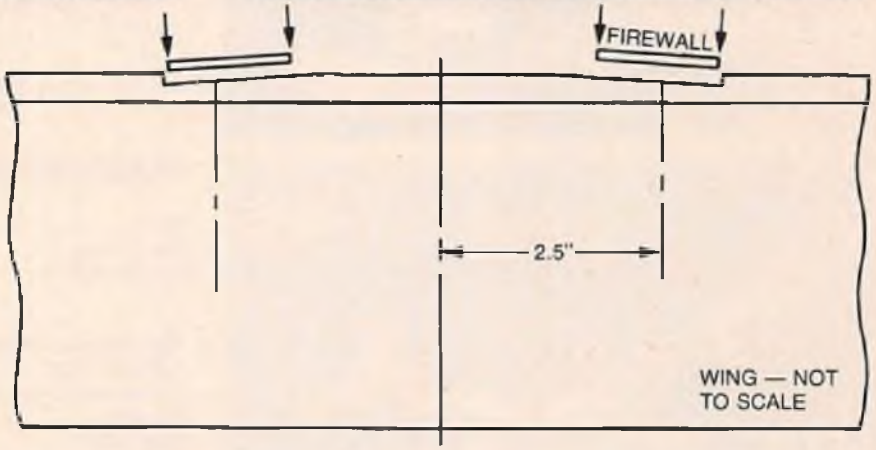
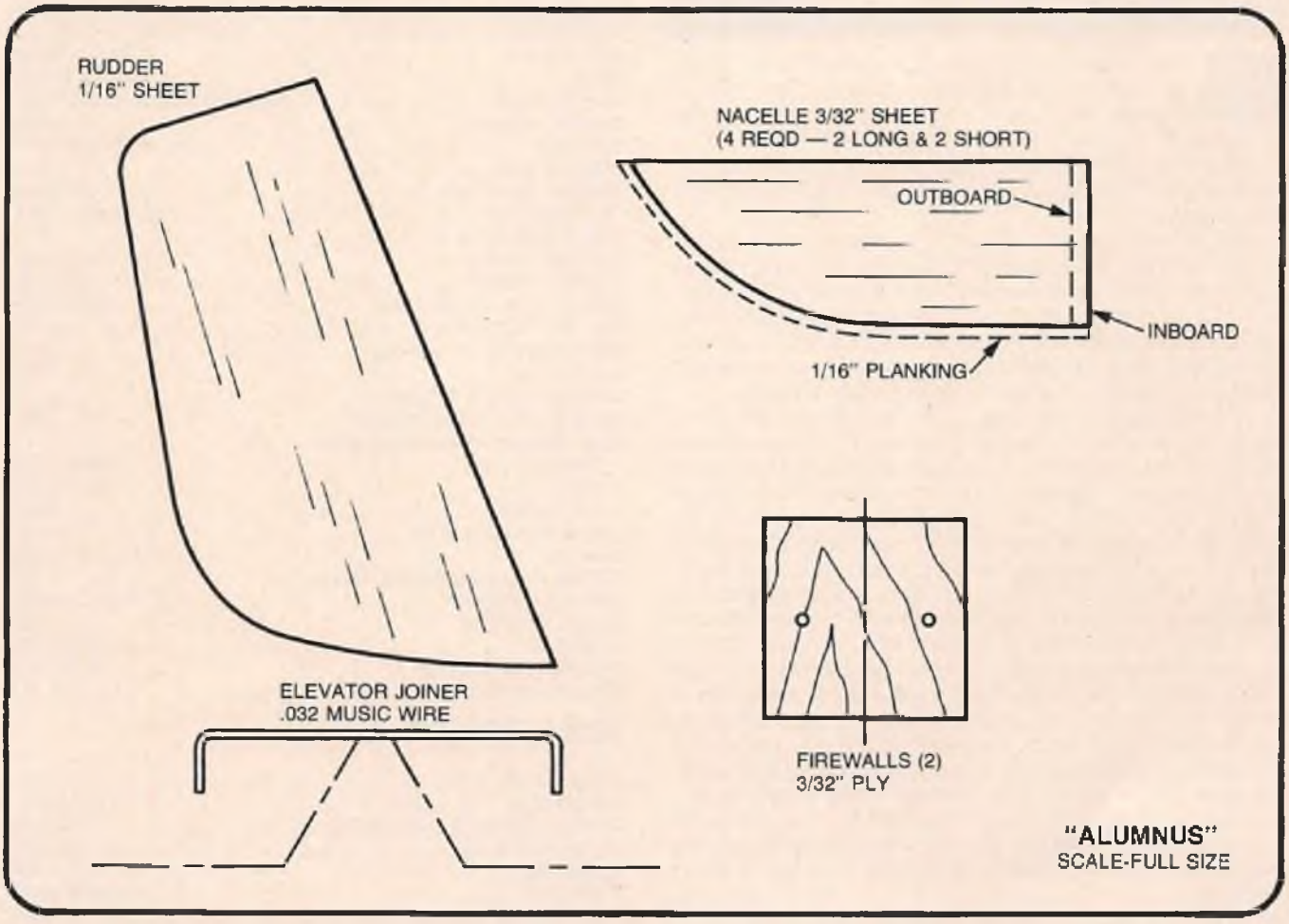




CAUTION: ADDICTION TO R/C MAY AFFECT YOUR BODY

☐ CHECK HEAD FOR ANY SWELLING DUE TO NEW AIRCRAFT OR NEW RADIO

☐ CHECK SCALP FOR PULLED OUT HAIR

☐ CHECK EARS BENT BY FRIEND'S SUGGESTIONS AND ADVICE

☐ CHECK EYES FOR STRAIN WATCHING OTHERS FLY

☐ CHECK TONGUE IN CHEEK FOR TELLING HOW GREAT THE NEW AIRCRAFT IS

☐ CHECK HEART FOR
1. SOFTENING (IF A JUDGE)
2. HARDENING (IF A COMPETITOR)
3. BEAT (GLIDER PILOT)

☐ CHECK NECK FOR PAINS IN . . .

☐ CHECK TEETH FOR GRITTING WHEN A CRASH IS INEVITABLE

☐ CHECK LUNGS FOR
1. HOLDING BREATH LONG PERIODS OF TIME
2. LONG SIGHS OF RELIEF
3. INHALING GLUE AND SOLDER FUMES

☐ CHECK BODY FOR SCRATCHES FROM BEATING BUSHES LOOKING FOR LOST AIRPLANES

☐ CHECK ELBOW DAMAGE DUE TO LIFTING FAVORITE LIQUID CONTAINERS

☐ CHECK FOR NEW ULCER

☐ CHECK KIDNEYS FOR EXCITABILITY

☐ CHECK THUMBS FOR TX STICK WEAR

☐ CHECK HANDS FOR MISSING FINGERS CAUSED BY FLIPPING PROPS ON BALKY ENGINES

☐ CHECK THIS AREA FOR DAMAGE CAUSED BY LIFTING HEAVY FLIGHT BOXES

☐ CHECK KNEES FOR DAMAGE IF MOST FLIGHTS ARE FROM CONCRETE

☐ CHECK LEGS FOR WOBBLES (PRIMARILY FOR COMPETITION AND PYLON PILOTS)

☐ CHECK FEET FOR DAMAGE FROM KICKING AROUND IN BRUSH LOOKING FOR LOST PARTS

PRE-SEASON CHECK-UP CHART FOR R/C PILOTS

By Jay Richard

DRAGON

This is not a Curtiss XP-55, but you may call it an ascender

By Alfred Neuhaus

When they see the Dragon for the first time, most people ask which direction it flies. Comments about this unusual model are enjoyable to listen to, but best of all is watching it perform in the air. If anyone wants to bet it won't fly, take them up on it as it does fly and very well at that.

The design credit really belongs to the early aviation pioneers who thought the birds were ignorant and believed that the proper place for the pitch control was at the front of the flying machine. If set up properly, this does afford some advantage, such as preventing violent stalls as we have come to know and love

DRAGON
Designed By : Alfred Neuhaus

TYPE AIRCRAFT
Sport
WINGSPAN
50 Inches
WING CHORD
10½ Inches
TOTAL WING AREA
525 Square Inches
WING LOCATION
Shoulder Wing
AIRFOIL
Symmetrical
WING PLANFORM
Double Taper Swept Back
DIHEDRAL, EACH TIP
None
OVERALL FUSELAGE LENGTH
42 Inches
RADIO COMPARTMENT AREA
(L) 15½" x (W) 2¼" x (H) 2½"
CANARD SPAN
24 Inches
CANARD CHORD (Incl. elev.)
4⅞ Inches
CANARD AREA
114 Square Inches
CANARD AIRFOIL SECTION
Flat
CANARD LOCATION
Front Of Fuselage
VERTICAL FIN HEIGHT
4¾ Inches
VERTICAL FIN WIDTH (Incl. rud.)
11 Inches
REC. ENGINE SIZE
.35-.46 Cubic Inch
FUEL TANK SIZE
6 Ounce
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Spruce
Empennage	Balsa
Wt. Ready-To-Fly	90 Ounces
Wing Loading	24.7 Oz./Sq. Ft.

them as part of the tail aft type of configuration. With four degrees positive angle of attack of the canard surface, it will stall before the wing, and drops to a lesser angle and continues flying. Of course the wing will continue to provide lift through this cycle. If the aircraft is placed in a steep climb attitude it can be forced into a stalled condition, but makes a rapid recovery. In level flight with power off, if up elevator is fed in gradually, the attitude of the plane becomes alternating nose high, to level, in a gentle bobbing motion. Aileron and rudder controls remain effective.

Landings may be made with full back elevator and the descent rate adjusted with the throttle, causing the Dragon to appear like a Navy aircraft carrier coming home. If the speed is kept higher a more normal landing is easily done as the pitch and directional control is very positive.

Hanging the engine at the back end was done for several reasons, such as, the airplane stays clean --- after flying just wipe the prop off. Also the prop does not get broken or gets to eat things that you may taxi into.

Construction is conventional and either a foam or balsa built-up wing can be utilized. If your choice is foam, use the tip and root rib patterns for the core templates, and remember to set up for the proper sweepback angle. The wing is built with no wash-out.

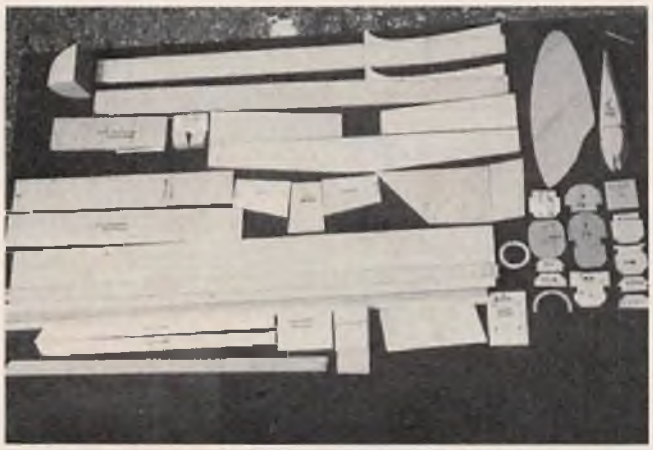
Fuselage construction can start by cutting the bulkheads and other pieces

first to make assembly proceed quickly. Select two medium hard 1/4" x 3" balsa sheets, true one edge, and trim to 2¼" wide and 32⅝" long. Cut the lower edge fore and aft as shown by small black triangles on the side view. Shape and add the wing saddle parts, using Zap to attach them. Place the sides on top of each other and make sure they are alike, then mark the locations of the bulkheads across both at once to make sure they will assemble squarely.

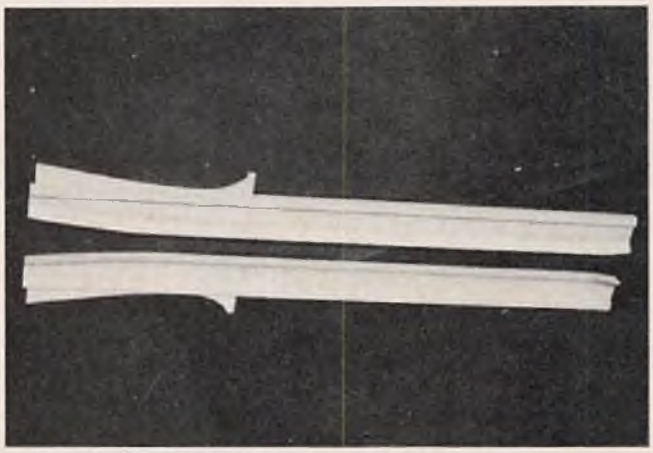
Using Titbond glue, pin the triangular stock and the 3/16" x 1/2" longerons to the sides. I hope you remembered to make one right and one left side. After the glue has dried you can glue bulkheads F10, F5, F2a and F2 in place on one side, using a small square to check that they are truly perpendicular to the side. When these are dry, glue the other side to these bulkheads and set aside. Now grab the ply bulkheads and put the blind nuts in F11 and attach the nose gear bearing to F3. Place the ply bulkheads in the correct places and epoxy well. After installing the blind nuts in the landing gear plate it should be epoxied to the fuselage, and follow up by covering the rest of the bottom with 1/4" balsa as per the plans.

Note that where the curvature of the bottom is pronounced, a short section is covered with 1/4" sheet with the grain across the fuselage aft of Fl. A series of kerfs (shallow cross-cuts made with a Zona saw) likewise help the 1/2" triangular stock corner pieces and the 1/4" bottom sheeting assume the proper curve between F10 and F11.

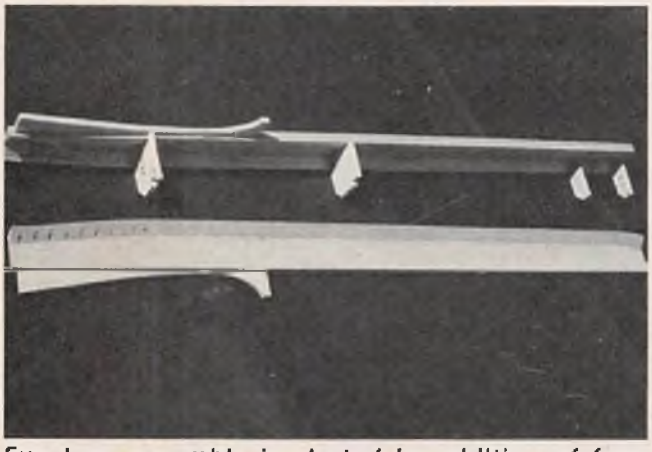
Pre-shape the nose blocks and tack glue together, then glue them to the ply



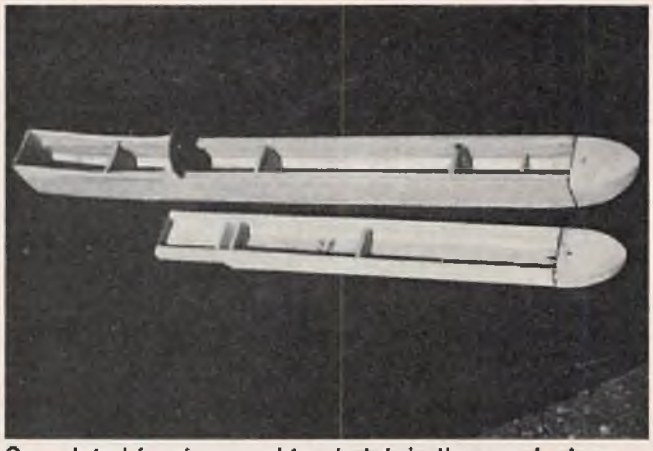
Excellent way to start – cut a complete parts kit and label parts.



Fuselage sides with top doubler and lower triangle stock glued in place – note reference lines for bulkheads.



Fuselage assembly is started by addition of four bulkheads.



Completed fuselage and top hatch in the rough stage.

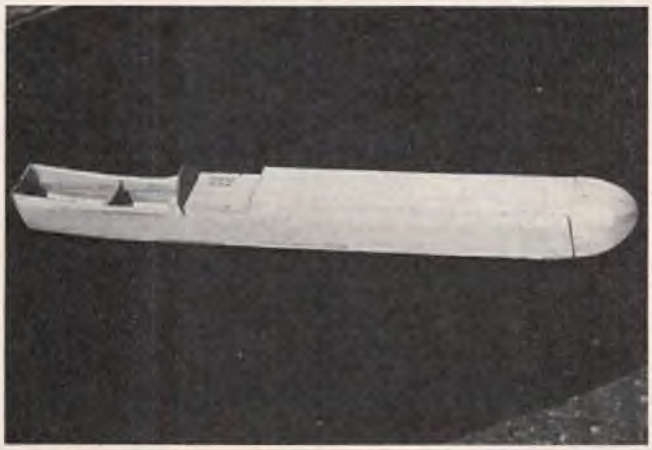
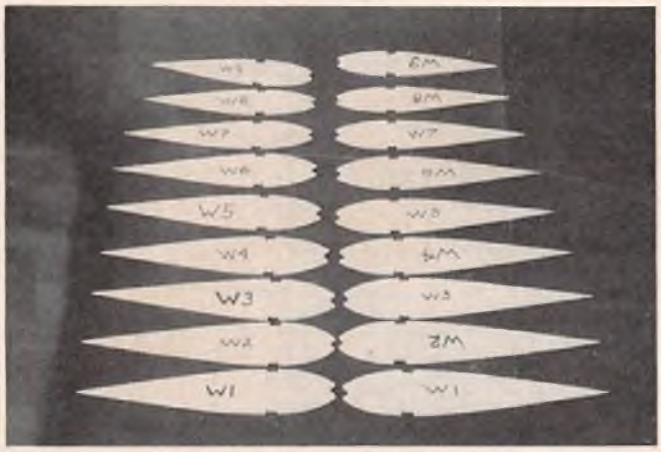


Photo shows fuselage with hatch in place.

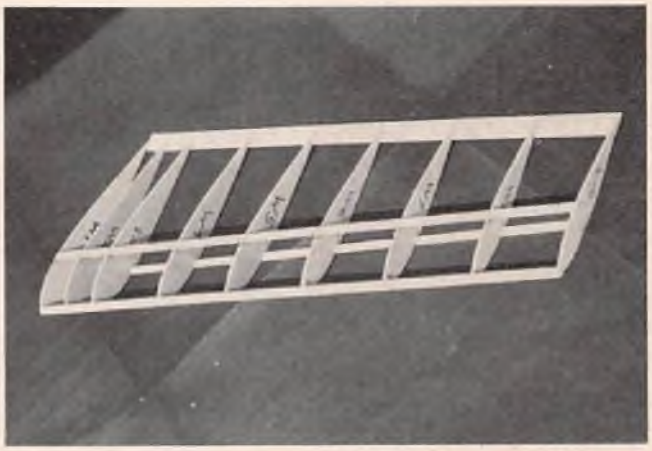
K & B .40 installed in tail of fuselage. Cowl blocks are being installed. Note rear portion of Goldberg spinner used for guide.

bulkhead F1. Hatch construction starts by pinning the top bulkheads in place and fitting the top sheet to them. Remove this sheet and attach the triangular stock in place, then glue this top sheet assemly to the bulkheads. When the top is dry, fit the side sheets (cut as per the small black diamonds). Attach the 3/16" x 1/2" longerons to the sides and then glue the sides to the top triangular stock and the bulkheads. Do not forget to plan ahead for removal of this top later. A little glue to hold things together now, and after it is apart more glue can be added as needed. Add the instrument panel after the cockpit floor has been glued in place.

Mount the engine either vertical or at the angle shown if a muffler is to be used. Even if your flying site does not require a muffler, it would still be a good idea to use one as the trend toward keeping the noise down will help to retain the flying sites. With the engine temporarily in place, spot glue a 1/16" ply ship ring to the back of the spinner plate and tack glue ply bulkhead F12 to

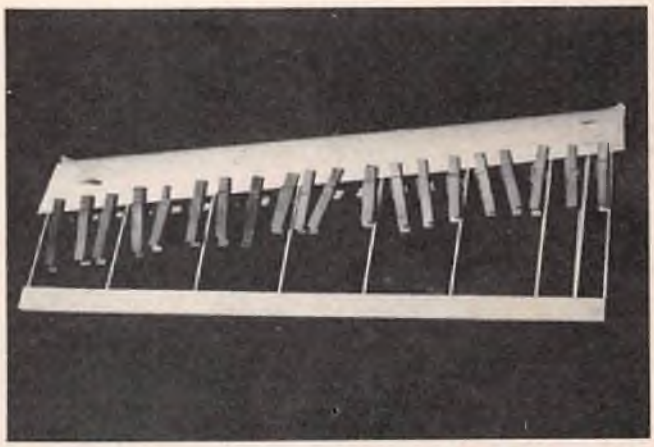


Complete set of wing ribs for both wing panels.

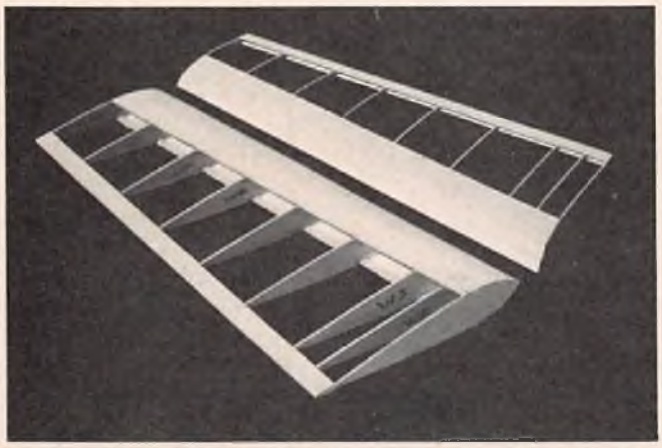


Initial wing panel construction. Panel is built flat on board with a 1/4" x 1/2" shim strip under trailing edge of ribs.

Basic wing panels completed prior to adding the leading edge sheeting.



Leading edge sheeting is taped at front and held down at spar with clothespins.



Leading and trailing edge sheeting completed. Next steps are joining panels and cap strips.

A very impressive sight as our "Dragon" lifts off headed for the open sky.

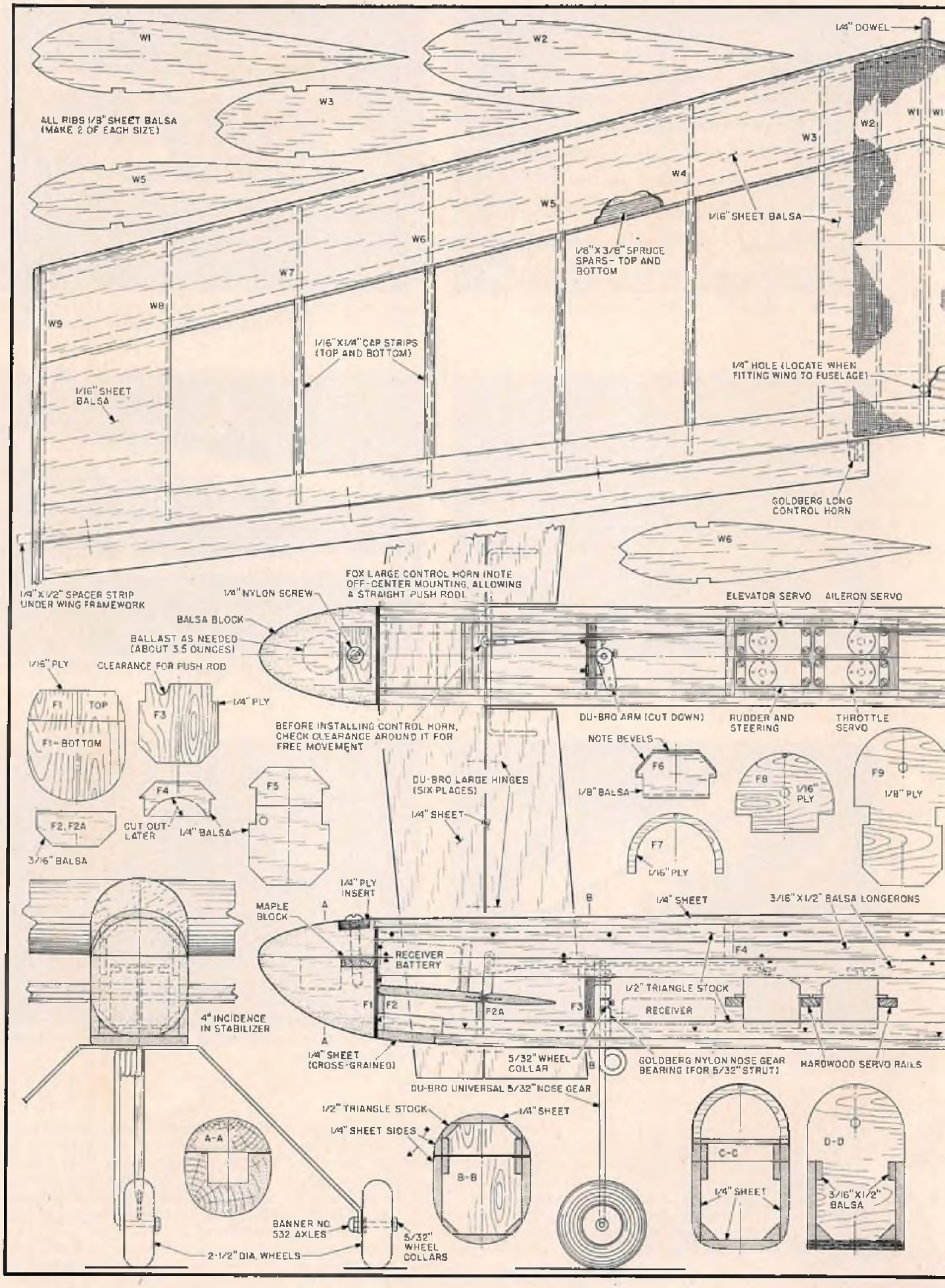
this, thus positioning F12 for constructing the engine cowling.

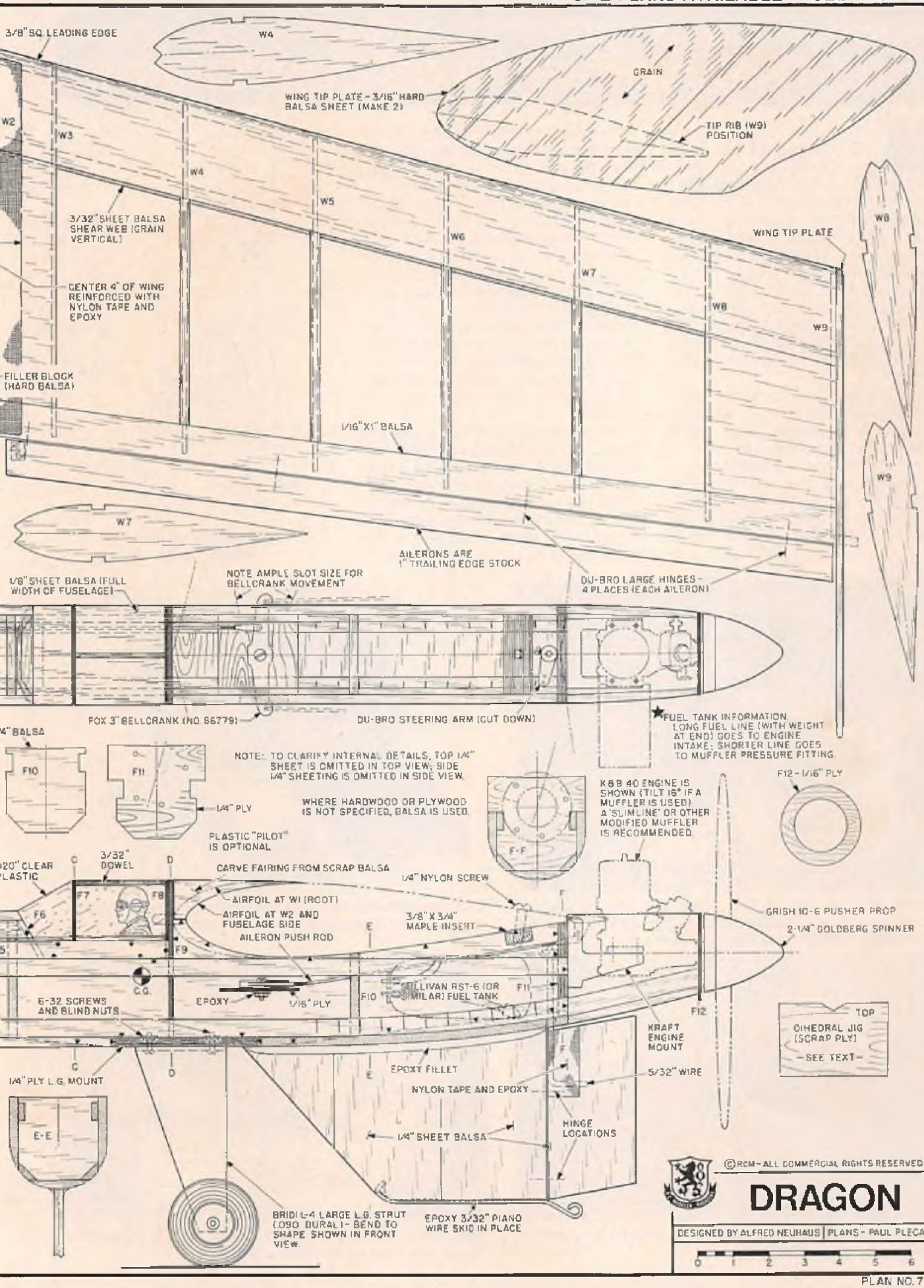
To build the cowling, start by fitting the bottom plate between F11 and F12, then the side pieces. Epoxy these parts to the bulkheads and each other. Pass a razor blade between the spinner backplate and F12 and remove the engine. Add the triangular stock to the lower corners inside the cowl and give the area a coat of epoxy to seal it from engine oils. Carve and sand the fuselage assembly to the oval shape as shown in the cross section views. I found that a small wood plane made fast work of rounding off the corners.

Add the canopy frame F7 and the 3/32" dowel brace. Paint the inside of the cockpit black, add a pilot figure, and some instrument panel detail if you are so inclined. Install the top glass, then the windshield, using Zap to hold the plastic in place. A bead of epoxy was used to neatly seal and secure the seams of the enclosure.

The fuel tank brass tubes should be

text to page 124


W1
W2
W3
W4
W5
W6
W7
W8
W9
ALL RIBS 1/8" SHEET BALSA (MAKE 2 OF EACH SIZE)
1/4" DOWEL
1/16" SHEET BALSA
1/8" X 3/8" SPRUCE SPARS - TOP AND BOTTOM
1/16" X 1/4" CAP STRIPS (TOP AND BOTTOM)
1/4" HOLE (LOCATE WHEN FITTING WING TO FUSELAGE)
1/16" SHEET BALSA
GOLDBERG LONG CONTROL HORN
1/4" X 1/2" SPACER STRIP UNDER WING FRAMEWORK
FOX LARGE CONTROL HORN (NOTE OFF-CENTER MOUNTING, ALLOWING A STRAIGHT PUSH ROD)
1/4" NYLON SCREW
BALSA BLOCK
BALLAST AS NEEDED (ABOUT 3.5 OUNCES)
ELEVATOR SERVO
AILERON SERVO
1/16" PLY
CLEARANCE FOR PUSH ROD
F1 TOP
F1 - BOTTOM
F3
1/4" PLY
F4
F5
F2, F2A
CUT OUT - LATER
1/4" BALSA
3/16" BALSA
BEFORE INSTALLING CONTROL HORN, CHECK CLEARANCE AROUND IT FOR FREE MOVEMENT
DU-BRO ARM (CUT DOWN)
RUDDER AND STEERING
THROTTLE SERVO
DU-BRO LARGE HINGES (SIX PLACES)
1/4" SHEET
NOTE BEVELS
F6
1/8" BALSA
F8
1/16" PLY
F9
1/8" PLY
F7
1/16" PLY
1/4" PLY INSERT
MAPLE BLOCK
A
B
1/4" SHEET
3/16" X 1/2" BALSA LONGERONS
RECEIVER BATTERY
F1
F2
F2A
F3
F4
1/2" TRIANGLE STOCK
RECEIVER
4° INCIDENCE IN STABILIZER
1/4" SHEET (CROSS-GRAINED)
5/32" WHEEL COLLAR
GOLDBERG NYLON NOSE GEAR BEARING (FOR 5/32" STRUT)
HARDWOOD SERVO RAILS
DU-BRO UNIVERSAL 5/32" NOSE GEAR
1/2" TRIANGLE STOCK
1/4" SHEET
1/4" SHEET SIDES
A-A
B-B
C-C
D-D
1/4" SHEET
3/16" X 1/2" BALSA
BANNER NO. 532 AXLES
5/32" WHEEL COLLARS
2-1/2" DIA. WHEELS



DRAGON

DESIGNED BY ALFRED NEUHAUS | PLANS - PAUL PLECAN

0 1 2 3 4 5 6

PLAN NO. 762

RCM Product Report

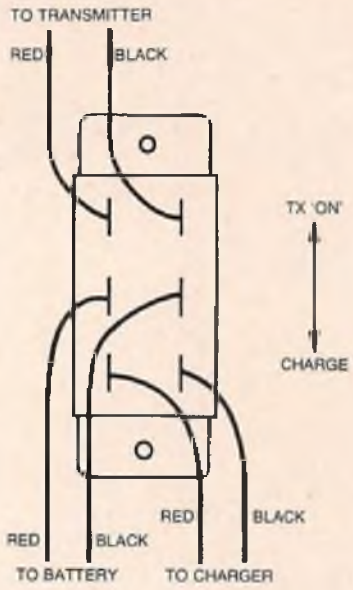
By Eloy Marez

ACE TRANSMITTER NI-CD CONVERSION

Have you priced good quality dry cell transmitter batteries lately? If you have been using an alkaline cell powered transmitter, we don't have to tell you about how expensive they are. Unfortunately, there is no such a thing as a **good** cheap alkaline battery, nor is there a sure way of knowing that they are good for 'one more flight,' so in the interest of safety and insurance, they need to be replaced some time before they roll over and die completely, compounding the expense of powering R/C equipment in that manner.

Aviation fans from the World War II era will remember the "Look to Lockheed for Leadership" saying of that time. The same applies somewhat to Ace R/C, in the radio controlled field — they seem to continuously come up with fairly priced but reliable solutions to many of our R/C model problems. They recently tackled the transmitter battery problem and solved it with the introduction of the Ace R/C 9.6V Ni-Cd Conversion Kit, Stock Number 38K9, a true bargain, priced at only $19.95. Comparing that with the price of individual alkaline cells at about $1.00 each, or a No. 276 9-volt battery at about $5.00, it doesn't take a programmable calculator to figure out that it won't take many sets of alkaline batteries to equal the cost of a ni-cd system. Eventually, you'll be flying for free, battery-wise, plus you will have the reliability of the ni-cds and the insurance and peace of mind of knowing that when you start out for a day's flying, your transmitter batteries are topped off and carrying their full capacity.

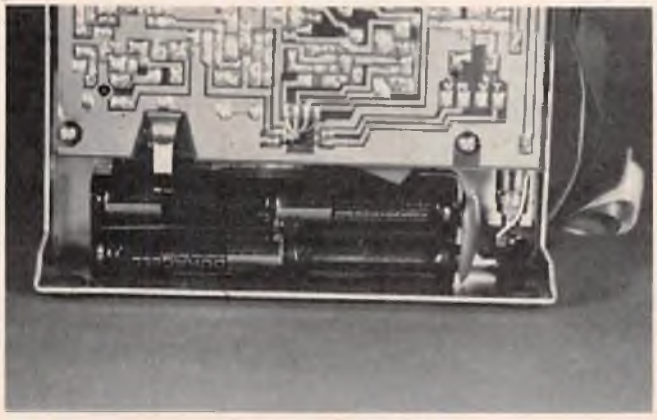
Before we get much further into this subject, it might help our understanding of the matter in general if we first review some of the nomenclature. First, a cell, which is the single familiar cylindrical unit — often erroneously referred to as a battery. The latter, a battery, is the correct name for a multi-cell unit only. In



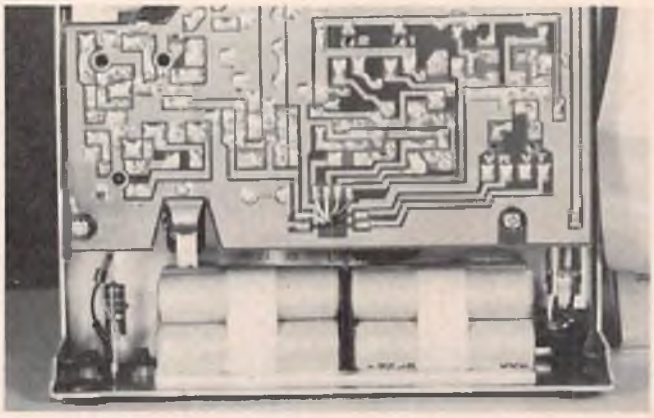
RECOMMENDED SWITCH WIRING DIAGRAM

Futaba FP-T 2F transmitter, previously alkaline battery powered, to which we added the Ace R/C ni-cd conversion. Shown with Peerless Porsche.

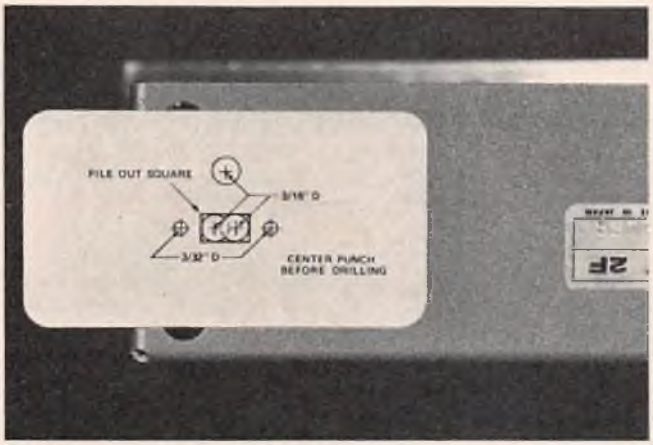
Charger, batteries, etc.; everything required is included in the conversion package, all you'll need is a few tools.



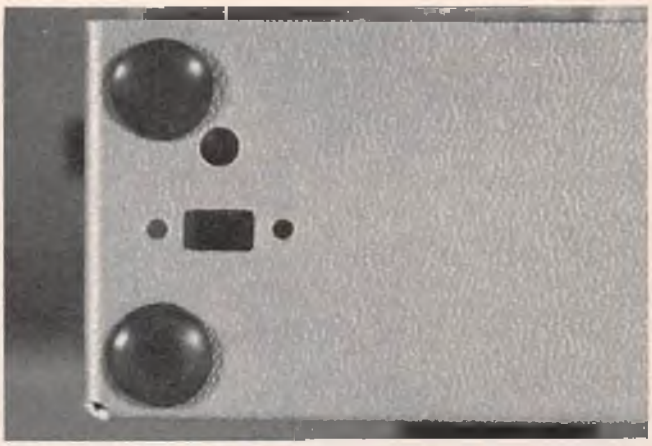
The original expensive to replace alkaline cells originally used, installed in their holder.



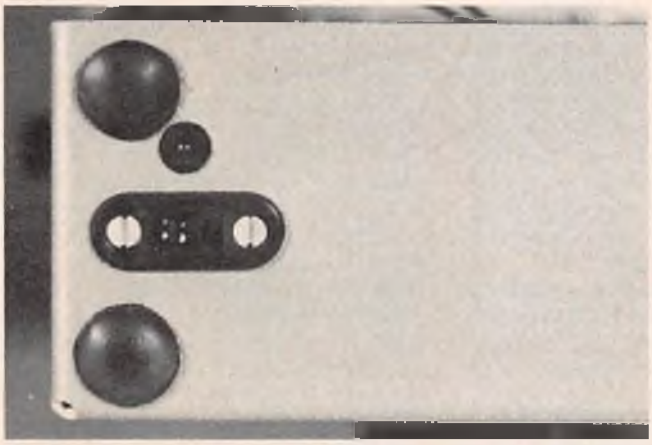
The completed conversion, as inexpensive a transmitter power package as available anywhere.



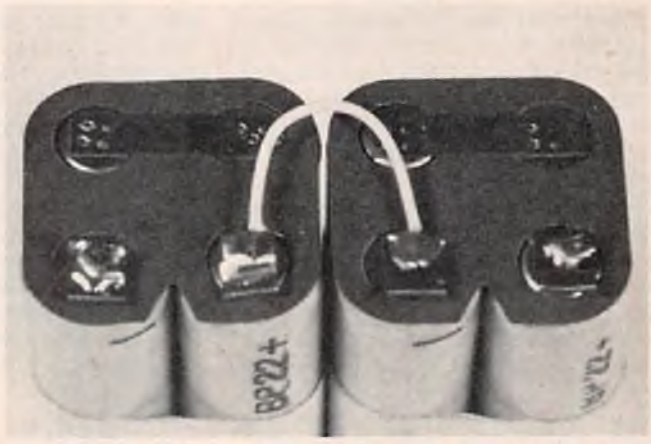
The sticky backed drilling guide in position greatly simplifies the installation.



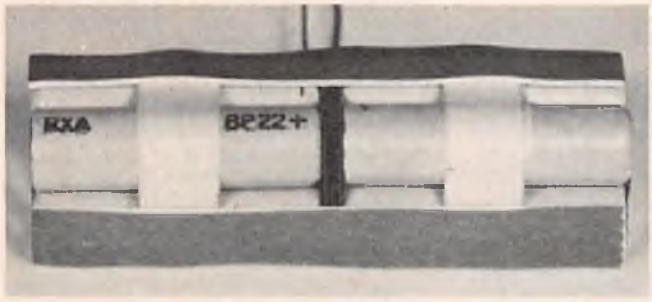
The completed holes are easy to make in the aluminum case material and are few in number.



The charge plug cover, and LED grommet in position, provide a neat dressing for the holes.



The two 4-cell packs, connected positive to negative, into an 8-cell battery.



The two packs, end to end, as they are to be installed, will be held in place by lengthwise strips of two sided tape.

Charger plug installation, shrink tubing over each pin, with a larger piece which will go over the entire plug rear and body.

other words, our normal airborne battery pack is a 4.8 volt battery, made up of four 1.2 volt cells.

Which brings up the word volt, the unit of measure of electromotive force, or pressure. For chemical cells such as we are talking about, it is determined by the physical composition of the cell. A lead-acid wet cell has a 2 volt rating; a so-called dry cell which included alkalines is good for 1.5 volts, while the ni-cds are only 1.2 volts. These voltages are not subject to the desires or whims of the manufacturer or designer, but are products of the chemical reactions involved. Naturally, a battery made up of a number of these cells will give us a voltage equal to the cell voltage times the number of cells.

The only other term of interest at this point is the capacity, measure in amps or, more generally, in milli-amps; thousandths of an amp. It is like the capacity of your fuel tank, the more ounces the more running time, and also alike, the higher capacity cells are bigger in physical size than those rated at less milli-amps.

The Ace Conversion Kit mentioned contains everything you'll need to convert your transmitter to ni-cd battery operation, from a wall plug-in transformer and two high quality 4-cell 500 milli-amp ni-cd packs, to a LED (Light Emitting Diode) rectifier/charge indicator, a transmitter case mounted charge receptacle, and all the wire, screws, double sided tape, shrink tubing, and a charge rate regulating resistor. Even the solder is included, and, what I thought was an exceptional touch is, an adhesive backed drilling template that gives you hole spacing and sizes for the charge receptacle.

A note about the eight cells mentioned — as in most cases, you will be replacing only seven alkaline cells or a No. 276 battery. The single cells supply a nominal 1.5 volt per cell, for a total voltage of 10.5 volts, no load, for a fresh set of 7 cells. The No. 276 battery supplies exactly 9 volts. The ni-cds, at 1.2 volt each, will total 9.6 volts for the eight cells to be used. The slight

difference in voltage will not matter at all to the transmitter, the difference in power output will be almost unnoticeable to the average field strength meter and, more important, will not cause any decrease in range to speak of — you'll still have full radio control of your bird long after you've ceased seeing it.

There are two slight problems that might occur with the installation of ni-cds in your transmitter. They are both mentioned in the instruction sheet; one has to do with the possible violation of the manufacturer's warranty on your system, if it is still in effect. Now, if done according to Ace R/C's instructions, installation of these ni-cds is not going to harm a transmitter in any way, but some manufacturers are extra touchy about anyone other than themselves or their authorized service centers working on their equipment. Having seen some of the butcher jobs that are attempted to be passed off as "it was this way when I got it," it is not hard to understand such a policy. But on the other hand, it does not take a full blown electronics engineer to install a set of batteries, though to save misunderstanding later, it would be best to check with your manufacturer prior to making this move.

The instructions are complete and perfectly detailed. Our attempt here is not to improve on them, but merely to convince you that such an installation is worthwhile, and to assure you prior to your making an investment, that you'll be pefectly capable of doing the work necessary.

The first step is to plan your installation. The Ace instructions show photos of the ni-cds installed in place of a No. 276 battery; we chose to install them in a Futaba FP-T 2F transmitter, which uses seven individual cells in a long holder. In either case, there is plenty of room for the installation of the ni-cds and no decision is necessary — the ni-cds simply occupy the space previously used by the other batteries.

What does require a decision is the location of the charge receptacle, and the accompanying LED, which changes the alternating current of the transformer into the direct current necessary to charge the ni-cds, as well as providing a visual indication that charging is actually taking place. The space required for these components is about one cubic inch, which is not hard to find in most transmitters.

Most factory made installations of ni-cds have the charger connections on the base, and that is where we chose to put ours. However, there are no raw ragged holes visible after the installation is complete, so if you have to, or prefer a front mounted connector, it will not ruin the looks of your transmitter.

As mentioned earlier, a sticky backed template is furnished to be used to determine hole location and size. After assuring yourself that the necessary clearance exists internally, place the template in the desired location and drill the necessary holes. The two smaller 3/32nd holes are critical as to spacing and, knowing the wandering that takes place with the electric hand drill that most of us use, I recommend you drill the hole slightly undersize, no larger than 1/8" and file it out to the required diameter and location. The rectangular hole is made by squaring off two 3/16" holes, and there is some leeway as to size and location as the charge receptacle is provided with a neat cover plate that effectively hides any jagged edges or an oversize opening.

On an aluminum case transmitter, the charge receptacle will extend past the cover plate about 1/8" on the outside. In case of a base mounting, such as this one, this is enough to interfere with the normal sitting of the transmitter on its rubber feet. Thus, a couple of 1/8" spacers were cut from plastic tubing and installed internally between the case and the receptacle mounting ears. This spaces the receptacle and cover plate flush on the outside, and allows the transmitter to set normally.

In all cases, during all drilling and filing operations, hold the transmitter in such a manner that all metal chips will fall away from the insides. And immediately after such operations, remove any and all metal pieces that may remain inside. Use compressed air if available, a vacuum cleaner, or even a good lungful, followed by a dusting with a small paint brush.

About right here, you will be making your first solder connection, so let's take a look at what you intend to do it with. If you have already dug out that 250 watt gun, or that big clunker iron you bought last year to solder the car radiator with, forget it. You need a small pencil tip iron, of no more than 30 watts. A couple are listed in Aces's catalog, such as a K & S 30-watter and a variety of models by Ungar. My choice of the latter would be a 32K776 or 32K777 handle, a 32K535 heating element, and a 32KPL333 tip with a 32K100 adapater. There are others, of course, as close as your local hobby or electronics store. In any event, be sure it has a small pyramid or chisel tip, and is of the specified wattage.

The receptacle and LED can be installed, and wired according to the instructions and illustrations. Pay particular attention to the physical connections as shown — they affect polarity of the various components and voltages and can affect operation and even cause damage if not done properly. Note that the LED's polarity is indicated by a flat on the side of its body; install as shown.

The battery packs can now be prepared for installation. They have to be wired in series, i.e., positive on one pack to negative on the other, using the white wire furnished. The red lead from the LED will go to the unused positive terminal on one pack, and the black lead from the receptacle to the negative terminal on the other pack. The battery terminals are those not already connected to another pack with straps, and are clearly marked.

As in the case of the receptacle and diode, polarity is very important. Important also is not to short out these batteries. As received, they are not fully charged but they do contain enough current to cause damage even to completely burning wires in two, if they are allowed to fall between the terminals. In all cases, before soldering a wire to a battery terminal, be sure that the other end still has the insulation so if it brushes against a hot point, a short will not occur. Remove the insulation from the other end only when you are ready to solder it in place.

Prior to permanently fixing the batteries in the case, you have to make your other decision of the day as mentioned in the instructions under "Charging" and in the accompanying "Caution." This is the second of the two possible problems mentioned at the beginning, and has to do with how you will connect the batteries to the charger and to the transmitter input. As shown in Ace R/C's schematic and block diagrams, the output of the charger, and the wires carrying the battery current to the transmitter are both connected directly to the battery terminals. Thus, if the transmitter switch is "on" while the charger is connected, the charger output is also going directly to the transmitter electronics.

Now, as the charging voltage is always higher than that of the battery being charged, it is possible that some marginally voltage rated components could be damaged. The possibility of this happening can be prevented by wiring everything to a DPDT (Double Pole, Double Throw) switch, as stated in the instructions, and as is done in all factory ni-cd installations.

This type of switch is almost always found installed in most transmitters that can also be purchased with ni-cds installed and such was the case with our Futaba. If one is not already installed in your transmitter, we strongly recommend that the one there be replaced with a DPDT type.

If you decide to go with the direct charging connection, follow the block diagram or schematics. Connect the red wires from the LED and from the transmitter electronics to the unused positive side of the now dual battery pack. Both black wires go to the negative side of the pack.

If you would rather switch than possibly burn, we have included a simple diagram showing the connections to a DPDT switch. It's as

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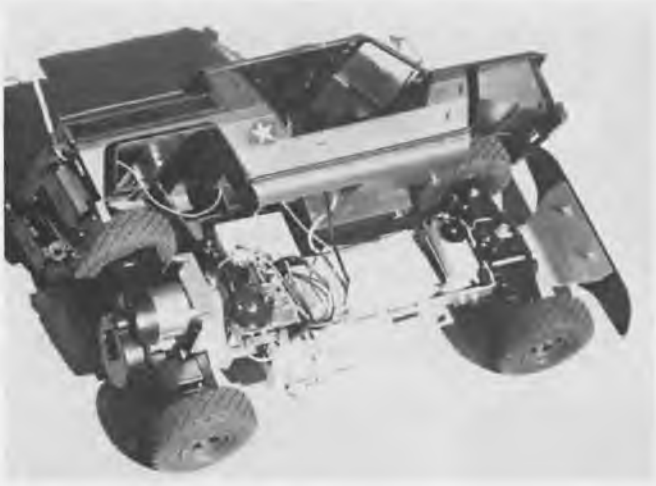
RCM PRODUCT TEST

Tamiya's XR311



SPECIFICATIONS

Name	XR311
Car Type	1/12 Scale Military
Manufactured By	Tamiya Plastic Model Co.
Available From	Model Rectifier Corp. 2500 Woodbridge Ave. Edison, New Jersey 08817
Mfg. Suggested Retail Price	$74.98
Available From	MRC & Retail Outlets
Length	15.75 Inches
Width	6.6 Inches
Height	5.5 Inches
Weight	3.96 lbs. (incl. batt., rcvr., servos)
Suspension	Double wishbone, 4 wheel independent coil spring torsion bar (adjustable)
Gear Ratio	Various (See Text)
Power Plant	Mabuchi RS540, 6v, 1.7amp, 10,700 rpm
Power Source	5 cell nicad (See Text)
Rec. Number of Channels	2
Recommended Control Functions	Steering, combined throttle & gear shift
Basic Materials Used In Construction:	
Chassis	Duralumin
Body	High impact polystyrene
Wheels	ABS
Tires	Rubber, semi-pneumatic balloon
Plans	None
Building Instructions	Yes
Instruction Manual	20 pgs.
Photos & Drawings	Yes
Kit Includes	Everything except power source (see text), paint, adhesives

RCM PROTOTYPE

Engine Used	NA
Muffler Used	NA
Radio Used	Kraft

What sports a roll bar, big oversize tires, has its engine in the rear, and eats up sand dunes as well as swamps and mud flats? Anybody knows it's a VW dune buggy . . . right? Well, yeah. But the U.S. Army has now gotten hold of the idea, and added a few frills of its own. They call it the XR311 (the X stands for Experimental), and MRC has a beautiful 1/12th scale model that has been reproduced in exacting detail by Tamiya Plastic Model Co. Priced at $74.98, it is available from Model Rectifier Corporation, 2500 Woodbridge Ave., Edison, N.J. 08817, and retail dealers everywhere.

Before we dig into the kit, perhaps a word of two about the full size car is in order. Powered by a 215 h.p. gasoline rear mounted engine, it has a three speed automatic transmission and 4 wheel drive. When you learn that it can cruise at over 80 mph on the road, conquer sand dunes, mud flats and swamps, wade water 30" deep, and climb a slope of 60°, you can easily understand the army's interest in this vehicle. Its potential for the performnce of such missions as reconnaissance, escort, transport of weapons, command, ambulance duties, and police action is at once apparent. But enough about the big stuff, let's take a look at its 1/12th size baby brother.

Prior to opening up the sturdy carton, we stopped for a moment and admired the full color, detailed picture of the XR311 on the cover. It was detailed enough that we referred to it several times during construction and finishing stages, and good looking enough to make us anxious to get on with the building.

Inside, we were immediately impressed with what we saw. Everywhere we looked, we saw top quality scale reproductions of individual components, beautifully packaged. A close second look turned up such other goodies as an Allen wrench, a double ended end wrench, a bit of double faced adhesive tape, and a small tube of grease. No plan sheet was furnished, and none was needed. Instead, MRC included a great 20 page instruction manual that overlooks absolutely nothing at all. For example, the cover has two photos of the car, body removed, with much detail of suspension, steering, battery and servo placement. Inside the front cover is a photo of the real vehicle, plus a rundown on its history, development, specs, etc.

If you are new to radio control . . . or, for that matter, an old timer, you'll enjoy the brief, informative, and well written resume of radio control units, how and why they work, radio control safety and operational behavior, radio interference, interference avoidance, and standard operational behavior.

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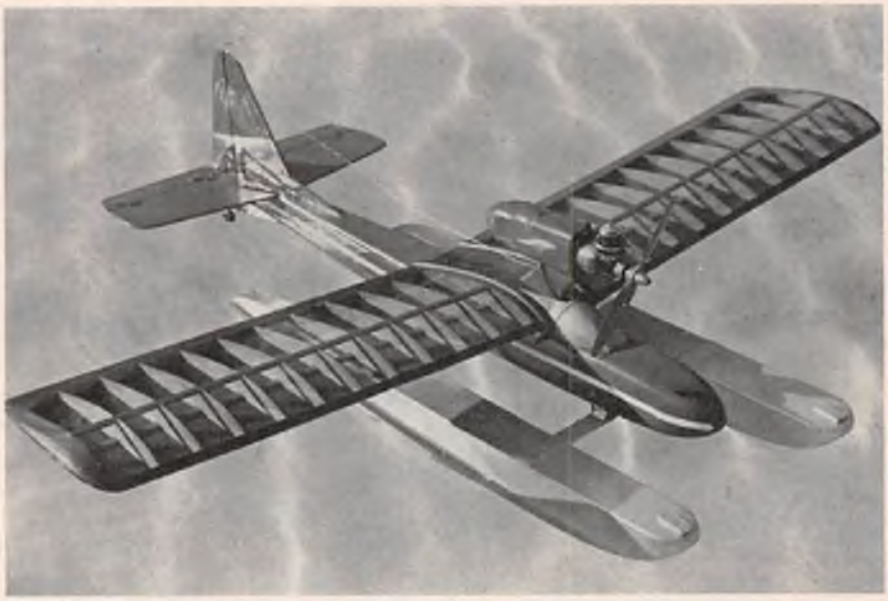


The Simple Sunday Seaplane at its best -- on the water.

SIMPLE SUNDAY SEAPLANE

By Ken Willard

The name says it all on Ken's latest. The beginning took place 15 years ago, with the final results presented now.

Fifteen years ago (January 1964 RCM) I published a design named the Virus. It was intended for the absolute beginner in building. All balsa, sheet wings, single surface, it was ultra simple to construct, and it also was a good flying model.

For several years, the original Virus flew as a landplane. Then I had an idea --- convert it to a seaplane. So, I built up a set of twin floats and tried it. No luck. It was underpowered. I increased the power from an .020 to an .049. Still it would not take-off from the water, but it was pretty wild in the air. I modified the float design a bit; originally they were straight sided from nose block to tail block. I tapered the back end to the shape which they now have. Still no take-off --- so at that point I figured there was something basically wrong and discarded the idea. But it kept haunting me through the years.

Meanwhile, with several flying boat designs working very well, I kept learning through trial and error what hull design worked best. Perhaps the most significant event was during the design phase of the Wavemaster. I had specified a step design, but the production manager for the ABS plastic version wanted to modify it to save production costs. We tried his version --- it was totally unsatisfactory. Although the model would take-off from the water, it was strictly by brute force. When we went back to the specified step design, the model would take-off at half throttle.

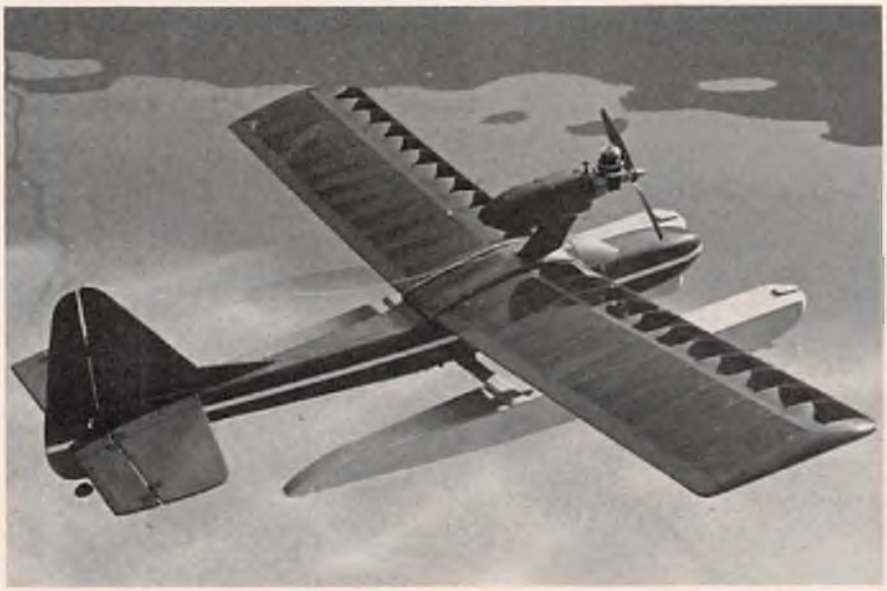
With that experience in hand, I knew what had to be done to the floats which were originally designed for the Virus. But many things had happened to radio control in the intervening years, so a new design was in order. And, thus, the Simple Sunday Seaplane was conceived. I would use the Virus floats, with the step modified to give the right depth and upsweep to the float bottoms.

Some modelers look at the Simple Sunday Seaplane and say, "Hey, isn't that a bit of overkill on the float size?"

"Nope. Y'gotta keep in mind what this design is intended for." I always keep a straight face when saying that.

"So what is it for?" He took the bait.

"Ever been in the South Seas?" It doesn't matter how he replies --- yes or no. "Well, there's a lot of inter-island transport, and it's a mix between cargo and passengers --- who don't like to be mixed. So, this design solves the problem. With a U-shaped dock, you berth the seaplane in the slip between. Hatches on the tops of the floats allow loading access for the cargo, which is distributed equally between them. The cross braces serve as walkways for the passengers to enter the fuselage. No



Three quarter rear view of SSS on water. Note tail wheel in water acting as water rudder.

Landplane conversion of the SSS.

SIMPLE SUNDAY SEAPLANE
Designed By : Ken Willard

TYPE AIRCRAFT
1/2A Sport Seaplane
WINGSPAN
37½ Inches
WING CHORD
7 Inches
TOTAL WING AREA
262½ Square Inches
WING LOCATION
Top of Fuselage
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
1½ Inches
O.A. FUSELAGE LENGTH
29 Inches
RADIO COMPARTMENT AREA
(L) 8" X (W) 1¾" X (H) 1¾"
STABILIZER SPAN
13⅛ Inches
STABILIZER CHORD (incl. elev.)
4½" (Avg.)
STABILIZER AREA
57½ Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
5⅜ Inches
VERTICAL FIN WIDTH (Incl. rud.)
4½" (Avg.)
REC. ENGINE SIZE
.049-.051 Cu. In.
REC. FUEL TANK SIZE
Tank Mount
LANDING GEAR
Twin Floats (opt. wheels)
REC. NO. OF CHANNELS
3
CONTROL FUNCTIONS
Rud., Elev., & Throt.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Ply
Empennage	Balsa
Weight Ready-To-Fly	18 Ounces
Wing Loading	9.89 Oz./Sq. Ft.

cargo mess in the passenger cabin, simultaneous loading and unloading and, best of all, since the load is distributed between the fuselage and the floats, there is no exceptionally heavy load on the crossbraces, like there is on a conventional float design. Very strong, and very stable in high seas."

"Uh-huh. Sounds logical."

"Another plus is that the prop is way up there above the fuselage, and doesn't pose a danger threat to the passengers."

"Yeah, that's right."

By now, he's convinced that a lot of thought went into the design, so there's no sense in telling him that it came about because a fifteen year old design didn't work. We'll just keep that a secret between you and me. All 120,000 of us.

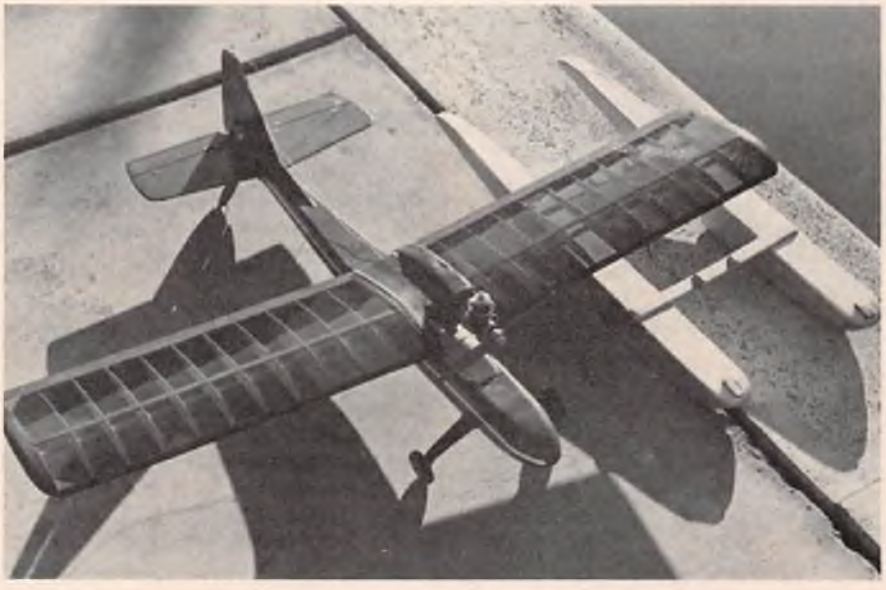
For a while, it looked like I still had a problem. During the initial testing, I flew the SSS as a landplane, strapping the Hallco gear to the bottom of the fuselage with double stick tape, and with the wheels properly located just under the leading edge of the wing. Flew very well, and handled well on the ground, using the Ace throttle for low speed taxiing.

So, up to the lake for water tests. Taxied fine; the tail wheel serves double duty as a water rudder, and the model steered well, so I applied power. It came up on the step, scooted over the water, and took off. Great. After a few banks and turns, I tried a loop. Right at the top, without any help from me, it snap rolled! When it came out, with a bit of down elevator, and was headed down for the water, I applied up elevator; another snap roll! And that process repeated itself until the model snap rolled into the water.

It was only about seventy feet out so, with my trusty spinning rod, I cast a one ounce weight out and beyond the model, the line dropped on the model and, as I slowly retrieved the weight, it hung on the model and I brought it in.

While the SSS was drying out (one of the best things about crashing in the water is that damage is either slight or there isn't any), I analyzed the problem. It was two-fold; the vertical tail area was insufficient for the big side area of the floats, and the Center of Gravity was too far back. This wouldn't show up in the landplane version.

I had a couple of stick-on weights with me and I attached them to the front of the floats. You can still see them there in the photos. When the radio dried out about a half hour later (this was **fresh** water, of course) I fired up and tried again. No luck. Wouldn't take-off. Although I moved the C.G. forward, I couldn't make

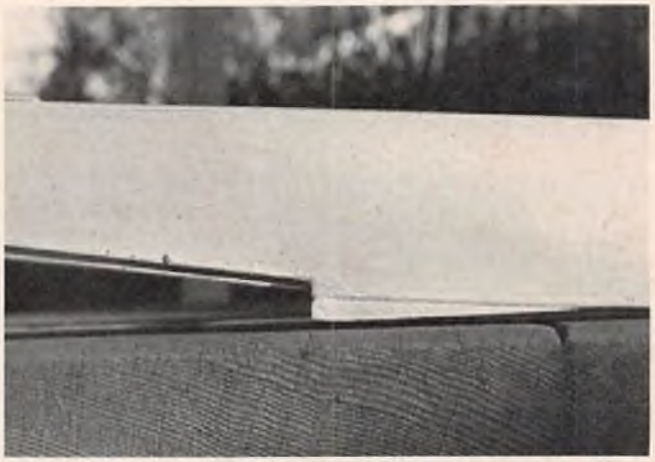


Simple Sunday Seaplane with Hallco gear installed. Floats are alongside.

Float structure of the SSS. Note aligning blocks, and balance weights on nose.

Pylon structure of the SSS prototype. Shows engine control.

View of vertical tail surface after additional area added. Indentation line shows original size which caused snaprolls.



View of step modification of float needed to make take-offs.

a field modification and move the floats, and so the step was too far back, which made the model "plow" through the water.

When I got home, I did what was required, enlarging the vertical tail area and rearranging the float attachment so the step would be properly located as now shown on the plans.

The next day I went back to the lake for more water tests. To say that I was pleased is an understatement. The performance far exceeded my expectations; the Simple Sunday Seaplane performs better than any other twin float seaplane I've ever designed. Note that I refer to the twin float designs only, since I still find that a single float, or hull, with centerline drag, is usually the most reliable on water.

Then I had another surprise. After several flights off the water, I replaced the floats with the landing gear. At first I had planned to mount the gear in the conventional location, slightly forward of the C.G. about under the leading edge of the wing. As most of you know, when the gear is too far forward, it tends to cause ground looping. However, since the dowels were there for the floats, I thought that just for an experiment I'd attach the landing gear to the front cross brace dowel attachments. I was both fascinated and surprised to find that the SSS takes-off with the gear that far forward and doesn't appear to have any ground looping tendencies at all. Of course, a good part of that is due to the light weight of the model and the relatively high power for its weight. But since it simplified the design, that's where I show it on the plans.

The Golden Bee engine, with the Ace throttle installed, and using Magnum fuel with 25% nitro, gives plenty of power for water take-offs. The throttling, once you get it properly mixed at the needle valve, lets you taxi around on the water and even do touch-and-goes. You have to set the SSS down easy so water doesn't splash up into the prop and kill the engine --- usually just out of reach so you have to go after it with a boat. On one occasion I didn't, and tried to cast over it with my one ounce retrieval weight. I was right on target; the lead weight went through the wing instead of past it.

You'll find the Simple Sunday Seaplane easy to build, easy to fly, and a real attention getter, either at the lake or the flying field. Here are some brief building hints.

CONSTRUCTION

Wing And Pylon: The conventional wing structure needs little or no explanation; the plans show all the necessary details. Dihedral angle is established by use of the dihedral braces. The center ribs are cut out so the dihedral braces can be full depth; also the center ribs are fitted together to form a solid 1/8" surface to which the 1/16" plywood sides of the engine pylon can be glued. Then the 1/8" balsa filler between the plywood sides can be fitted to the top of the center ribs. This gives a very strong pylon mount for the engine.

The pylon engine mount is built up with the two pieces of hardwood --- either basswood or pine --- glued to the sides of the plywood, and then the 1/2" balsa block is attached on the left side of the plywood mount immediately behind the hardwood engine mounting block. With that side installed, you then temporarily mount the engine, with the Ace throttle backing installed, and tailor the servo and throttle linkage as shown. Note the guide pin in front of the servo; it is required to keep the linkage from buckling as you push the needle in for idling.

With the throttle servo and linkage installed, the plastic sheet housing from the right side of the pylon then can be cut

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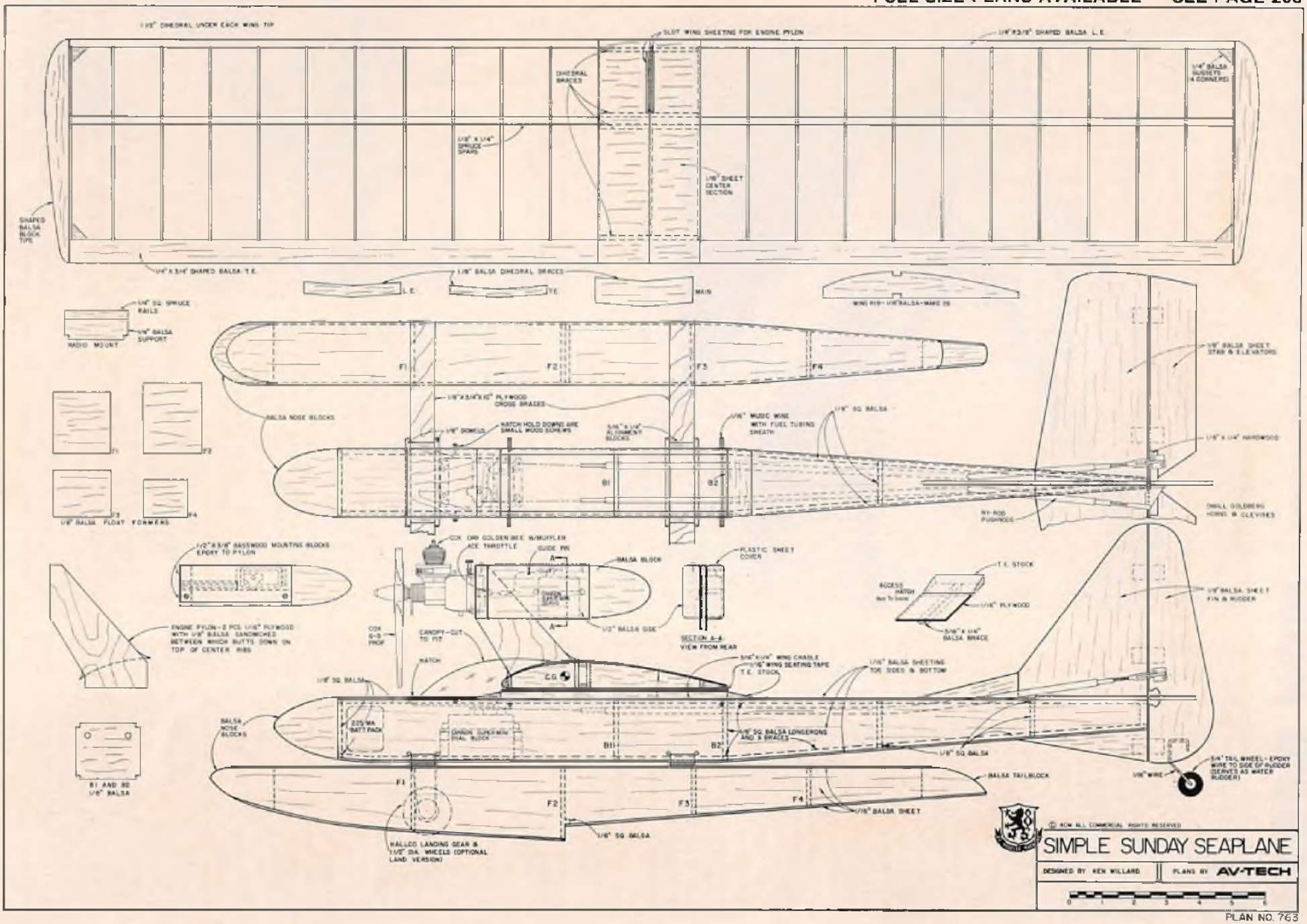
FULL SIZE PLANS AVAILABLE — SEE PAGE 203



SIMPLE SUNDAY SEAPLANE

DESIGNED BY KEN WILLARD | PLANS BY AV-TECH

0 1 2 3 4 5 6

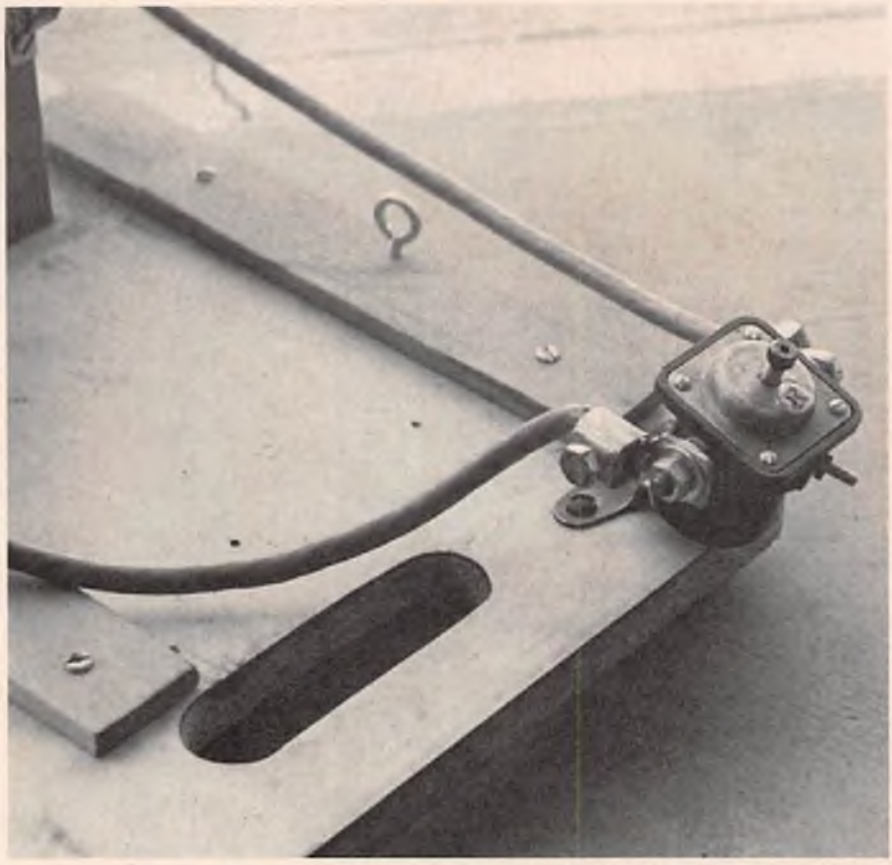
PLAN NO. 763

HERE'S HOW

My modeling career began back in the late thirties and I can still remember some of those model designs that came off the old kitchen table. It makes me chuckle to think of some of those crazy designs. Every time I got the urge to design a new airplane, I would head for the butcher shop to beg for a long piece of wrapping paper to draw my plans on. Old Al, the butcher, always came through. Then it was home to my straight-edge (yard stick), the kitchen table and my latest dream plane. (Yes Dick Kidd, I still do it the same way — yard stick and all.) Of course, back in those days airplane kits were few and expensive, however, there was plenty of balsa sticks to be had. Just look at any old timer and you will know what I mean. My airplanes never won national fame nor did I follow the contest route to prove them out. But, what stands out in my mind is that they were completely mine, original, **no others like them in the world.** And, they flew! What a feeling! Some of you out there know that feeling. Great, huh?

The idea you see on the following page was sent to me from Victor Zugel of Parma, Ohio, and was first used by Chester Lanzo on his sailplane winch. Many of you remember Chet Lanzo and the great Lanzo Record Breaker. Chet was a member of the famous "Cleveland Balsa Butchers" whose membership consisted of many well known modelers like George and Bob Reich, Dick Korda, Joe Elgin, (who is working with Vic on model projects), John "Red" Hillegas and Marty Zugel, Vic's brother. Chet is now retired from the Lewis Research Complex of NASA in Cleveland, Ohio. He is active on the study and application of Solar Heating Units for home use. He lives on an old farm (not worked) in Valley City, Ohio, from which he still flies radio control gliders and Old Timer R/C gas jobs for his pleasure and competition. He was nominated to the Model Aviation Hall of Fame in 1976. With Chet's permission Vic cleaned up the idea as it is presented here. A manual switch for the tow winch. The purpose in going manual with this switch is both to conserve battery power and also for better control of the model under tow besides eliminating the electrical foot switch. Control of the winch is accomplished by depressing the top of the switch plunger extension the same as you would the electrical foot switch. The switch is mounted in a convenient location on the winch mounting board.

Begin by purchasing a standard automotive starter solenoid and alter it with the following instructions. Use a 1/8 diameter drill and remove the (4) rivets which hold the cover to the solenoid body.



Modified auto starter solenoid mounted and ready for action. Manual switch uses less battery and will handle any power requirement. Better control of the model under tow.

Rebend mounting bracket approximately as shown (use caution to prevent breaking the mounting rivet on the body).

Drill a 17/64 diameter hole through the center of the cover plate — locate this hole accurately to allow the plunger extension to operate without binding.

Drill and tap the plunger for #10-24 thread, at least 1/2" deep.

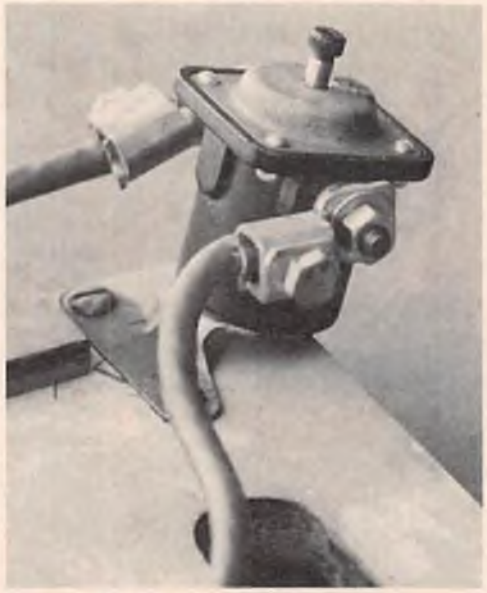
Assemble the 1/4 diameter x 1/2 long shoulder screw through the cover and the gasket and screw into the top of the plunger and tighten securely. Either use Loctite or Epoxy cement on the threads to prevent loosening.

Assemble the cover-plunger assembly to the Bakelite switch body (make sure the return spring is under the big copper washer as shown in the sketch) by (4) round head screws #5-40 x 3/8 long with #5 lockwashers and #5-40 hexagonal nuts.

This will allow you to use any automobile starter solenoid regardless of voltage for your winch.

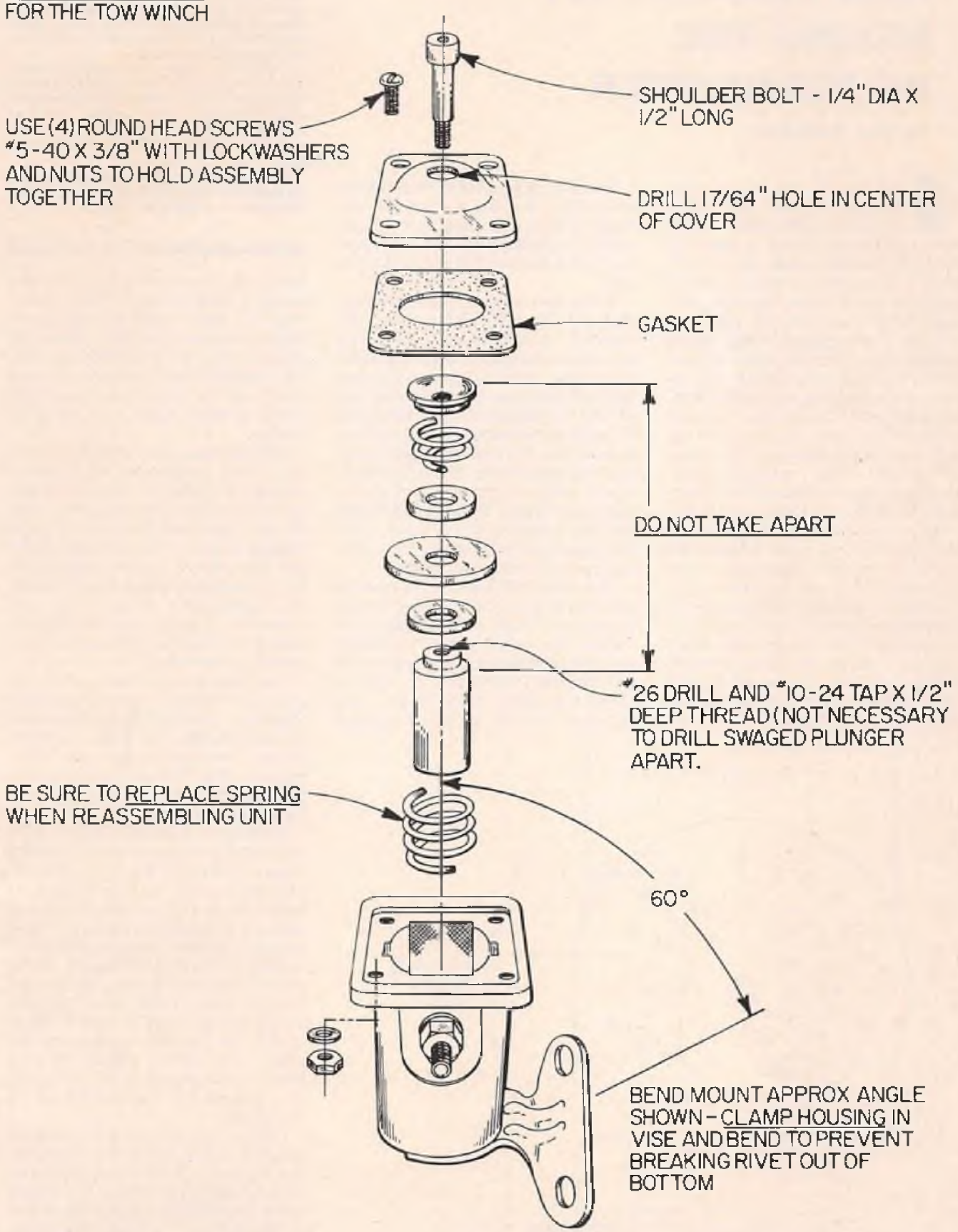
I would like to point out that it is quite a safety feature to eliminate the loose foot switch which could be buried in the grass. Vic observed an accident when a modeler was trying to untangle the winch snarl and someone accidentally stepped on the remote switch buried in the grass. That smarts!

Thanks, Vic Zugel, for sending us your spectacular idea to share with others. Our best to Chet Lanzo in a happy retirement. And also your good friend, Joe Elgin. □



Modified solenoid. Note shoulder bolt to operate switch with foot. Screws and nuts replace rivets that retain cover after modification.

MANUAL SWITCH
FOR THE TOW WINCH



THE PREPARATION FOR, AND PROCESS OF, MIXING THE RC HELICOPTER

By Ray Hostetler

I would like to thoroughly discuss mixing the radio controlled helicopter, a task that I consider to be one of **the** most important areas of chopper set-up. From what I've learned talking to other helicopter pilots, mixing seems to be a guess effort more often than not.

To be more specific, many people have had many problems with the Kavan Jet Ranger and the Alouette. Actually they are encountering mixing difficulties, but they probably don't know it. Improper mixing can turn the best set-up helicopter into a squirrely flying beast . . . literally. When set-up properly, nothing flying today equals the beauty and smoothness of a Kavan Jet Ranger.

With the advent of the Schluter Heli-Boy, many more people are learning to fly helicopters more proficiently, and quicker. Why? The Heli-Boy is a bolt-together helicopter for one thing, but a more subtle point lies in the fact that no matter where the Heli-Boy is set-up, the mixing is close to perfect. This is a credit to the Schluter machine: the mixing is much easier to set up than a Jet Ranger.

Mixing is, sadly, a compomise of sorts as we shall see; but we can get very close to being absolutely right. Please follow the illustrations as we go, and mixing should no longer be a problem for you.

At this point I want to make a brief note about the throttle settings and the "wheel" illustrations. In all of my examples, I will assume that we hover at half throttle, which is also synonymous with half collective, which is exactly half stick on the transmitter. If your helicopter hovers at three quarter throttle and three quarter stick, fine: just treat those points as if they were half throttle and half stick. We're after the point at which the helicopter **hovers**. By using half throttle and half collective as the same, I can also speak generally about fixed pitch and collective machines together.

Now refer to Figure 1. If the screw to the mix bar is in hole 18 at half throttle (expressed 18 aht), and we go to full throttle, the wheel rotates clockwise, and hole 18 aht now becomes hole 21 at full throttle (expressed 21 aft). In throttling back, hole 18 aht now becomes hole 15 at idle (expressed 15 ai). With this procedure, I can now speak of hole 15 ai and hole 18 aht, meaning that I have advanced the throttle from idle to half, and I **have not** changed the mix bar to different holes. For simplicity's sake, I will always have a three "hole" movement from idle to half, and three more "holes" from half to full throttle.

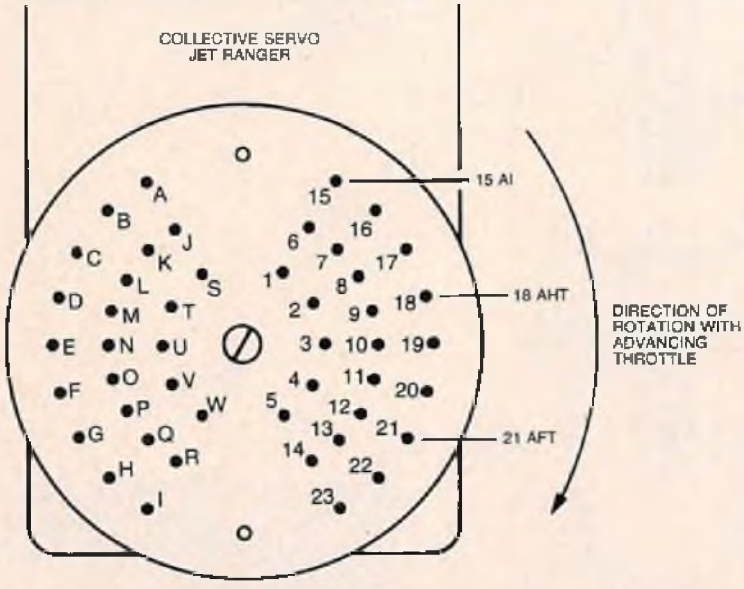


FIGURE 1
KAVAN LARGE OUTPUT WHEEL
(SEE FIG. 2 FOR SERVO POSITION IN JET RANGER)

With this clear, we can now go on to the mixing procedure itself. When setting the mixing (or mix), we **always** start from a hover and we go after what we want from there. Mixing is a delicate balance suited to each individual engine and pilot. Notice please, **engine** and pilot. One Webra Speed may run similar to another and, then again, two "identical" engines may be different enough to throw the mixing out as much as four or five holes.

Any machine can be set-up as you like using this method. I am going to deal specifically with Jet Rangers, because I am most familiar with them and more people have more problems with them. However, **all** of these principles to come are generalities to any machine with provisions for mixing.

Set the pick-off point as in Figure 2. Do not touch it anymore. Locate the tail rotor throw in hole one or two. If you consider yourself upper intermediate or advanced, go with hole two. If novice or lower intermediate, go with one. This is merely a guideline to be suggested.

Back at the tail rotor bellcrank, set the link to whatever hole feels best for your type of flying. Outer holes for less sensitive, inner holes for more sensitive control. Set the tail rotor response and "feel" **now**, before setting the mix, because if you adjust tail rotor sensitivity after you set the mix, the mix will be thrown off.

For rpm on a Jet Ranger, try not to run less than 5,200 on the tail. If you run slower, your engine will probably not be in its most powerful range. Two effects follow. Number one: the rotor speed may fall off significantly when pitch is applied to climb out, thus causing number two:

ABOUT THE AUTHOR

Ray Hostetler is 23 years of age and has been flying R/C models for 13 years. In the fall of 1974, his father, Wendell, built his first helicopter, a Kavan Jet Ranger. Father and son learned to fly the helicopter as a team, coordinating their efforts and ideas as they flew together. The following spring, Ray also built a Jet Ranger, and nearly 100% of his spare time since then has been devoted to helicopters.

In 1975, Ray took First at the NRCHA Nats in Novice. In 1976, he won the NRCHA Nats in Intermediate. In 1977, he took Third place in both NRCHA and AMA Expert events. This past summer, Ray won First place in the Expert class at the 1978 NRCHA Nats, held in Columbus, Ohio.

With this article, he wishes to explain some of the ideas that he has found to be helpful in flying helicopters — in this case, mixing.

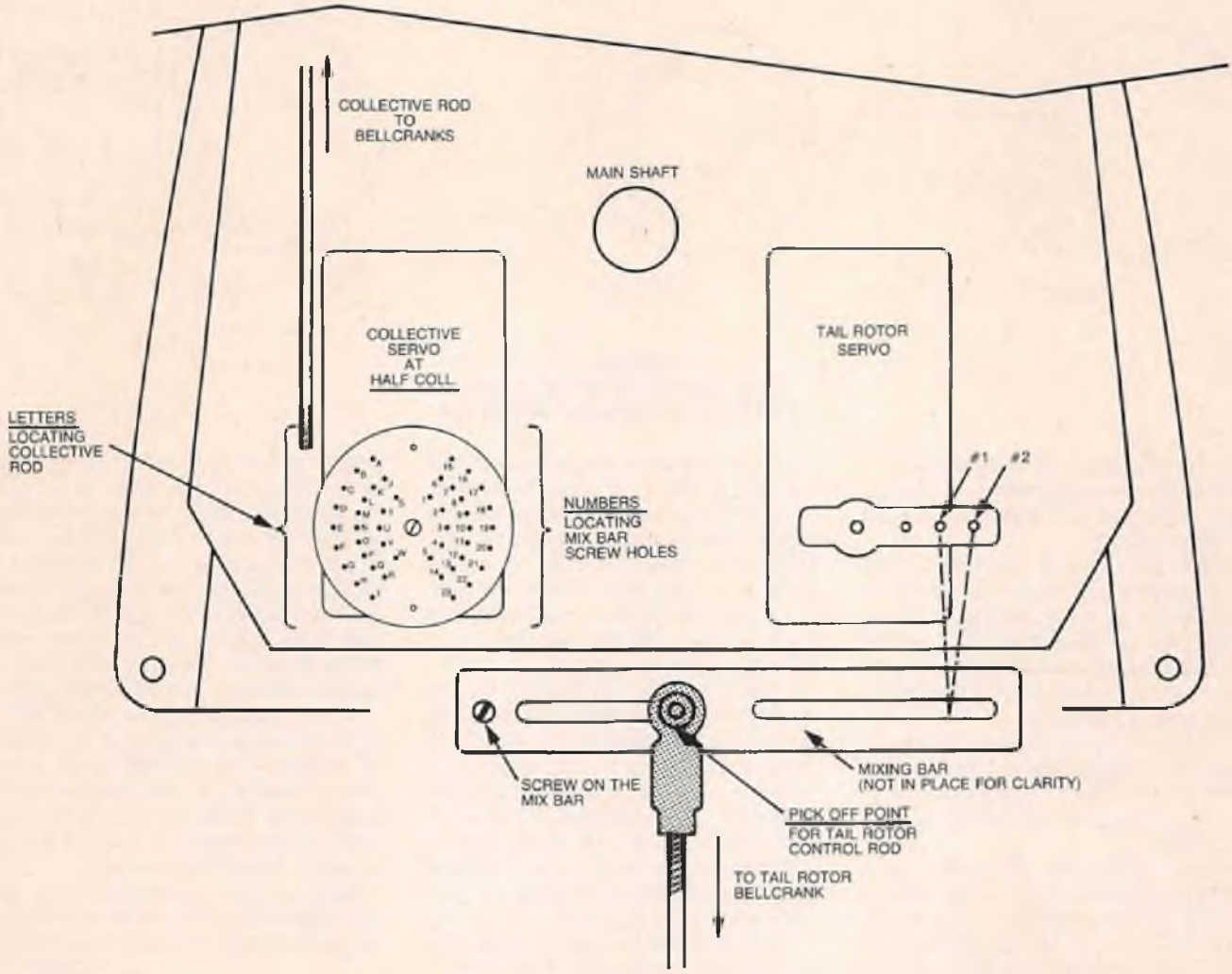


FIGURE 2
UNDERNEATH VIEW OF JET RANGER TOP HATCH SHOWING SERVOS, MIX BAR, AND PICK OFF POINT

not enough servo throw to mix the helicopter properly.

As a starting point, put your collective rod (from the collective servo to the bellcranks) in the middle holes of the collective servo, at hole M aht. Take the machine out and get the feel of the collective "crispness." If you desire quicker and crisper response, move the rod to the outer set of holes, starting with holes E aht or D aht. Assuming that we go with the outer set of holes merely for this example, we'll continue. If you now start from a hover and give full throttle quickly and smoothly into a vertical ascent, ignore the mixing and listen to your engine rpm. If it slows down slightly, you will get maximum ascent for the first 20 feet or so. Then the engine may not be able to keep up with the pitch applied, and the rotor speed may fall off more yet. If it falls off significantly once the first 20 feet of ascent has passed, you have too much pitch. Move the collective rod to hole D aht or hole C aht. If this is still too much pitch, move the collective rod to hole B aht. If one of these settings doesn't give you the ascents with little or no rpm loss, then go to the middle holes where the total amount of collective throw is less, and the engine isn't as likely to "bog down." You could stay in the outer holes and accept a loss in performance, or you could obtain a more powerful engine which would maintain rotor speed. This is another step that must be done **before** setting the mix.

If you have a Rossi or a strong Webra Speed, refer to Figure 2 and put the mixing bar screw in hole 9 aht. If you have a "used" Speed, or similar, start with the mixing screw in hole 18 aht. The principle behind this is basically a simple one. The stronger the engine, the better it will be able to keep the rotor speed up when pitch is applied. As we approach a constant rotor speed, or rpm, we need less mix.

For our example, we will use a Webra Speed, and start out with the mixing screw in hole 9 aht. Hover the helicopter and adjust the long tail rotor control rod so the helicopter's nose remains straight with the stick or knob at neutral, and neutral trim. Unfortunately, we will have to make this adjustment every time we change the mix bar to different holes in the collective servo. Changing holes essentially alters the length of the control rod, and we must compensate.

From a hover, quickly but smoothly, move the throttle to full to start a vertical ascent. Without correcting for yaw (tail rotor) notice which way the nose goes. (I will always refer to the nose of the helicopter. If you fly the tail, reverse all nose directions.) If it goes to the right, we need more mix, and if the nose goes left, we need less mix. In this example, let's say the nose goes right. We conclude we need more mix, and more servo throw will provide the needed mix. Since we are already at our maximum throw for the middle holes at hole 9 aht, we'll move the mixing screw to the outer set of holes. Use hole 18 aht. If the nose would have gove to the left, we would have gone to hole 10 aht or 11 aht. Try again from a hover. If the nose still goes right, you should run the helicopter faster, take pitch out of the top end of collective, or consider a more powerful engine. If the nose now goes left, we must reduce mixing throw without falling back into the middle holes. We do this by moving to hole 19 aht, or hole 16 aht. This decision is made final after we're done mixing for

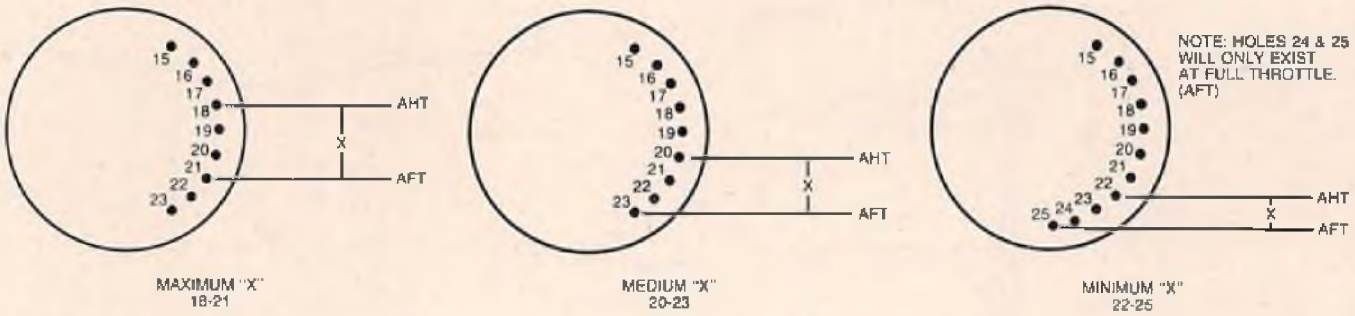


FIGURE 3
HOW THE VALUE OF "X" IS SET,
SHOWING THE 3 MAJOR POSITIONS

ascent and start to mix descent. I recommend that you start in the "upper" hole, 19 aht, as this is where most Jet Rangers will be.

Again from a hover, open the throttle to full quickly and smoothly, hands off the tail rotor as we did before, and note which way the nose goes. By now, the mix ought to be close. If the nose goes left, move to hole 20 aht. If it goes right, back to hole 18 aht.

Try again. If the nose goes slightly left, move the mixing screw to hole 21 aht or even 22 aht. One of these holes from 18 aht to 22 aht will be perfect, or very close to it.

If you do find that the middle set of holes is suitable, use the same steps to "zero in" on the mixing as we did on the outer holes, i.e., if the nose goes left in hole 9 aht, move the mix screw to hole 10 aht, and so on. If the nose goes right, that automatically sends us to the outer set of holes, as stated before.

The only time you will use the inner set of holes is in mixing a govenor controlled machine. If the govenor is working correctly, start at hole 3 aht, and go from there, just as we did in our other examples.

Now refer to Figure 3. What we're actually doing by manipulating the mix bar on the collective servo is varying the distance "x" to suit our particular machine. We said if the nose went right, we needed more mix. In other words, we were looking for a larger "x". Since we started at hole 9 aht, the only way to get a larger "x" was to go to the outer holes. Once we're in the outer holes, we fine tune the mix for ascent by going to holes 19-20 aht, "medium mix," or holes 21-22 aht, "little mix." If the mix was okay at hole 18 aht, you know that you're working with the "maximum mix" available from the wheel.

Once the ascent is straight up and "hands off," we actually measure the distance "x" by removing the hatch and using a dividers or a rule. Again, our distance "x" is from half collective to full collective. Say the distance of your "x" was 7 mm. This tells you that anywhere on the wheel you can get 7 mm of throw from half collective to full collective, your vertical mix will be perfect.

There are really only two holes on the wheel where you can get 7 mm of throw. One is where the measurement was taken from, and the other is on the "descent" side of the wheel, which will be from 16 ai to 19 aht, if the 7 mm ascent measurement was from hole 19 aht to hole 22 aft. See Figure 4. Now, you could set your mix at hole 16 aht to hole 19 aft, and you will still have 7 mm of mix. But **now**, the descent "curve" is radically different. Please see Figure 5.

In "A" the descent curve, from 13 ai to 16 aht gives us a very small "y", while "B", from hole 16 ai to hole 19 aht, gives us a much larger "y". We now try each of these holes to see which is better. As stated earlier, Figure 5b will most likely be very close to what we want.

Let's assume you went with your mix as shown in Figure 5b. One last thing we can do is "fudge" the ascent curve with

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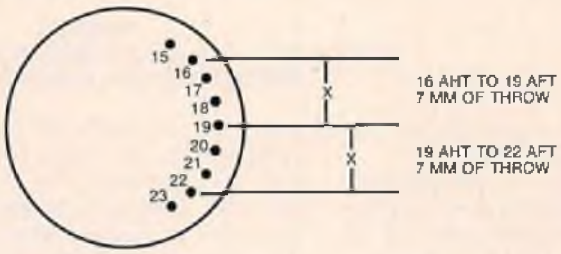

FIGURE 4
ILLUSTRATING THE TWO POINTS ON THE WHEEL
WHERE WE CAN GET EQUAL "X" VALUES

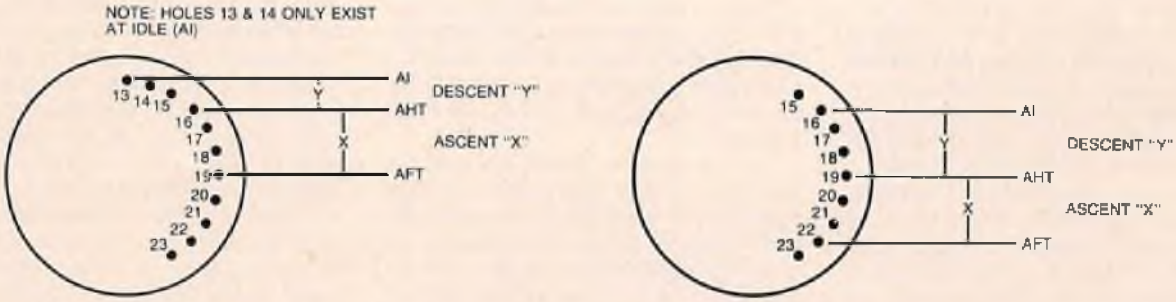

FIGURE 5
"X" ASCENT VALUES ARE THE SAME, WHILE
SHOWING THE TWO DIFFERENT "Y" DESCENT VALUES

RCM PRODUCT TEST

House of Balsa P-51D MUSTANG

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

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

Building this P-51 is a real pleasure. The plans are well detailed and are easy to follow. The construction manual contained over 160 photos of various phases of construction along with detailed instructions of each phase. The quality of materials used throughout the kit was excellent and all the parts fit just as they were supposed to. The box that it is packaged in has compartments for the various components. Construction of the P-51 begins with the wings and since we decided to install retracts on our model we had to make a few minor changes in the construction.

Basically, this addition meant leaving out the large landing gear blocks and installing the retract mounts as described in the Goldberg retracts instructions. Of course, there was a lot of fitting and trial, and then more trial, but this was not at all difficult.

Although the leading edge had to be cut out to allow for the wheels when retracted, the wing is very stong and shows no traces of a weakness after minor reinforcement during construction. Since the wing is quite thick at the center, the retract servo was nearly completely concealed inside the wing. The remainder of the construction was by the book!

As this model begins to take shape you really start to appreciate the work that the manufacturer has put into this fine kit. The large pre-shaped blocks, the pre-cut plywood parts, the complete hardware package (which includes a very clever tail wheel bracket which supports the tailwheel strut) and, of course, the plastic canopy-turtle deck, all add to its desirability. In building our model we used Wilhold Aliphatic resin glue, quick set 5-minute epoxy and Wilhold contact cement. The canopy was attached with R/C 56 cement and Hobbypoxy P.F.C. was used to fill any gaps or holes and for the fillets. The entire model was given 4 or 5 coats of K & B Super Poxy

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SPECIFICATIONS

Name	P-51D MUSTANG
Aircraft Type	Sport Stand-Off Scale
Manufactured By	House of Balsa 2814 E. 56th Way Long Beach, California 90805
Mfg. Suggested Retail Price	$59.95
Available From	Both Mfg. & Retail
Mfg. Recommended Usage	Sport & Stand-Off Scale
Wing Span	49 Inches
Wing Chord	9½" (Avg.)
Total Wing Area	425 Square Inches
Fuselage Length	39 Inches
Radio Compartment Dimensions	(L) 11" x (W) 2½" x (H) 2¾"
Wing Location	Low Wing
Airfoil	Semi-Symmetrical
Wing Planform	Double Taper
Dihedral (each tip)	2 Inches
Stabilizer Span	18 Inches
Stabilizer Chord (Incl. elev.)	4½" (Avg.)
Total Stab Area	90 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Top Of Fuselage
Vertical Fin Height	5¾ Inches
Vertical Fin Width (Incl. rud.)	5½" (Avg.)
Mfg. Rec. Engine Range	.29-.40 cu. in.
Recommended Fuel Tank Size	8 Ounce
Landing Gear	Conventional
Recommended No. Of Channels	4-5 w/retracts
Recommended Control Functions	Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:	
Fuselage	Balsa, Ply & Plastic
Wing	Balsa, Pine & Ply
Tail Surfaces	Balsa
Hardware Included In Kit	See text
Plan Size	25" x 38" (2 sheets)
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (31 pages)
Construction Photos	Yes
Kit Includes	Die-Cut & Shaped Parts
Mfg. Rec. Flying Weight	68-76 Oz.
Wing loading based on rec. flying wt.	23-26 Oz./Sq. Ft.

RCM PROTOTYPE

Weight, Ready To Fly	80 Ounces
Wing Loading	27 Oz./Sq. Ft.
Covering & finishing materials used	See Text
Engine Make & Disp.	OS Max .40
Muffler Used	OS
Radio Used	Mathis 5 ch.
Tank Size Used	6 Oz.

BIG is Beautiful

BY DICK PHILLIPS

Those of you who have been following Big is Beautiful since it became a regular feature in RCM last March will recall that the first few columns were dedicated to means and ways of enlarging both three-views and existing plans to Quarter Scale. I'm sure some of you looked at the directions and thought, "To heck with that, it's too much trouble."

Since that time, I have been trying to find an easier way and one which would be done commercially by someone properly equipped to do so, hopefully at a price within reach of the average modeler. Well, by a very circuitous route, I've found someone. You may recall Chuck Cunningham detailing a visit to Eddie Chavez some time ago in RCM. Chuck mentioned that Eddie had his prints enlarged to the size he wanted. I wrote to Eddie and, fine gentleman that he is, he has shared his source with me.

That source is Brownies Blueprint Co. Inc., 1119 G Street, Sacramento, California 95814. They tell me they can enlarge plans by 50% which means your 2" = 1' plan can be raised to 3" = 1' by them and they can also blow a three-view up to Quarter Scale. Eddie also assures me that even with such huge enlargements, the result comes out with fine lines rather than an enlarged line as one might expect.

Brownies can also reproduce your plan to exact scale if you require. There are a couple of limitations. Maximum paper size is 42" x 60", so your big ones might have to be on more than one sheet of paper, but we've all had to do that at one time or another. Prices are very reasonable, each piece requires a negative at $4.00 plus the cost of paper reproduction at $1.25 per square foot. That would mean the size mentioned above would be priced at $21.88.

Scale reproduction would necessitate Mylar sheets at a cost of $3.25 per square foot, almost three times the cost. At any rate, it's better than not having a plan at all! For further information, please contact Brownies direct at the above address or you can call them at (916) 443-1119 in Sacramento.

★

In a recent letter Dave Platt indicated that he is now working on a 1/5 scale Me109G which will be intended for the .90 sized engine. I had mentioned to him that I plan to use an engine of about 1 cubic inch in his Bucker Jungmeister I am now building. Dave says he feels the best alternative is the .90 sized engine, direct drive and glow powered for this model and he is the builder after all and should have the facts straight. However, I have managed to locate an Ohlsson and Rice industrial engine of about .90 cubic inch, gas fueled and a small Japanese industrial engine of about the same size and I am gong to try one of these in the Jungmeister, which I have altered a bit in order to take the added power.

Ohlsson & Rice Industrial Engine being modified by the author for use in Dave Platt Bucker Jungmeister.

Japanese 250 watt power plant. Engine will be modified for model use by author. Cylinder head is immediately under handle base, everything to the left of the "3" in "300" will be discarded.

Canadian Tarno (Homelite) engine 1.9 C.I., 32:1 gas/oil mix produces up to 11,000 rpm. More details in text.

Naturally the engine mentioned will require some modification in order to be used as model engines and this will be done over the next few weeks as I get to them. Pictures of the engines are included as they were obtained and I'll be reporting on the alterations required as they progress.

★

Another Canadian firm is on the market with yet another gasoline engine for models. Ben Tarnofsky of Tarno Aero Engines (942 Grou, Montreal, Quebec H4N 2C7) is now marketing the 1.9 c.i. Tarno engine which is a converted Homelite engine. Displacement is 1.9 producing 2 H.P. Carburetion is a Walbro pump type and a crankcase piston pump is standard for pressure feeding a smoke system. The engine also incorporates a choke (hand operated) which most engines do not have. Fuel tank and an on/off switch are supplied. The engine operates on 32:1 gas/oil mixture and will produce 11,000 RPM although peak power is produced at 6000 to 7000 RPM. The engine as shipped also includes an aluminum motor mount, rotor shroud, prop extension and throttle arm. Tarno mentions in their advertising piece that parts are available through your local

Homelite outlet with the exception of the special parts (i.e., prop extension, motor mount, shroud and throttle arm will be available through hobby outlets).

★

A couple of columns ago, I suggested a few of the pros and cons of large models. Since that column, I have been getting some requests for advice as to what model would be a good beginner's project in the larger models.

Most of those asking have been individuals who are relative newcomers to the hobby/sport and to them, the same advice applies as would apply if they were going to build a smaller model, with a couple of exceptions.

We are all familiar with the beginner who selects a hot pattern or scale WW II fighter as a first subject, and we've all been through the throes of trying to talk him out of it. That's still good advice --- if you haven't flown a good deal, then stick with something that gives you a fair chance of success. Better to build something that qualifies as a trainer than to build a screamer that augurs into the ground 25 seconds off the end of the strip.

I'd suggest (as would anyone) a high winged monoplane such as Sid Morgan's Cub (see May 1977 RCM) with some alterations to accommodate a larger engine. Be sure the servos you use have the best power rating you can get --- the more the better with large control surfaces to be moved. Joe Bridi's new Rearwin Speedster would be a good flier, but Joe himself suggests it is not for the inexperienced builder.

Most of the available plans are intended for the scratch-builder but you won't find easier building than these large sizes. There are few tiny pieces in a model this size and most construction is pretty straightforward. Do, however, resist the temptation to build your favorite WW II fighter, that route leads too often to disaster, even though larger models fly much better (properly built) than do the smaller sizes (i.e., 2" to the foot and smaller).

For the experienced modeler, and especially those with a fair amount of "stick time," the sky can indeed be the limit. If you have ever flown a pattern model for any length of time, or any of the hotter performance models, you won't have too much trouble with the hottest of the Quarter Scale jobs. They are much more stable than the smaller sized model and they don't travel quite so fast so you seldom find yourself behind them, panicking to try and catch up!

In addition, the power available from most of the current large engines is more than enough to pull you through the 'white knuckle' take-offs we so often see when a new model is being flown for the first time. It's been my experience that too much power will get you in less trouble than too little. Often, the 'too much' power makes the difference between getting a plane out of trouble where 'too little' would have resulted in a disastrous crunch.

Fortunately, as more and more manufacturers get into the market with large kits, there is a better choice available making a wider selection from which to choose. Hopefully this trend will continue.

★

Things are still happening in this big area and there are a few things in the works which will make even more good stuff available to us in the future. I have heard from many modelers who are doing their own design work and have suggested to them that when they design a new model, for goodness sake, make a good plan for it and do it in such a way that it can be reproduced. There is an excellent market for the large models (and plans) and you can't participate if your plan is on four odd shaped pieces of corrugated cardboard, and they're covered with fibreglass resin! Don Godfrey of Binghampton, New York, has sold a gang of his plans for the Super Stearman and is still getting calls for it. More than enough to offset the amount of work that goes into making a good plan right from the start. If you are doing a design of your own, do it right and let me know about it. There are plenty of guys out there who'd love to get their hands on something that isn't going to appear at every fun fly in the country.

As a case in point, P-51's were a dime a dozen at the QSAA Rally in Las Vegas last fall. I don't mean to short change the guys who were there with them, but the P-51 has been done many times and, while it is certainly an outstanding model (especially in the larger sizes) and was an outstanding aircraft, there are plenty of others which would make excellent subjects. How about a Quarter Scale Sea Fury? Or a Spitfire? Or a Feisler Storch? Or even a Lysander.

My point is, if you are drawing plans, make 'em good, and let us know about them. I don't think there is anything more encouraging than to have a design picked up by others. Good for the old ego too!

★

The February 1979 issue of RCM had an article on page 57 by Col. John A. deVries. If you didn't read it at the time, dig it out and read it over. You'll find an excellent way to make very strong, very light wing ribs for your large models. As the Colonel points out, the method works best with constant chord wings (tapered wings would require a jig for each rib), it makes wing ribs which are identical and very strong; and it makes them quickly. Pre-cutting all the material required and then assembling the ribs in a jig makes for quick assembly. Two jigs allows one to set while the next is being built.

The method also lends itself well to the use of box spars which can add significantly to the strength of long wing spans in our larger models. The Colonel knows whereof he speaks --- I wish I could have said it so well!

★

Keith Cavanaugh of Perth, Ontario Canada, dropped me a note recently detailing a 1929 Heath Parasol he built in 1/3 Scale starting from an RCM plan in the April 1976 issue. The unusual thing about Keith's Parasol is the construction

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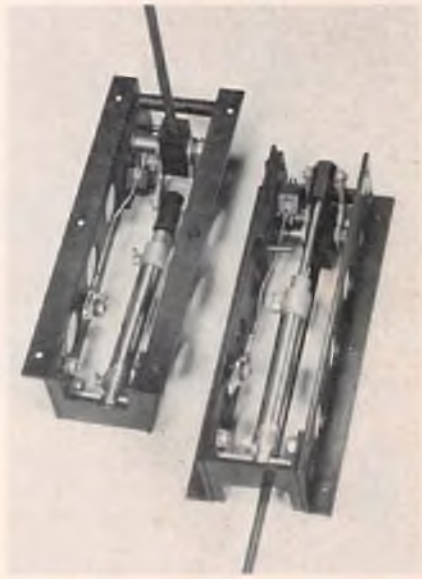
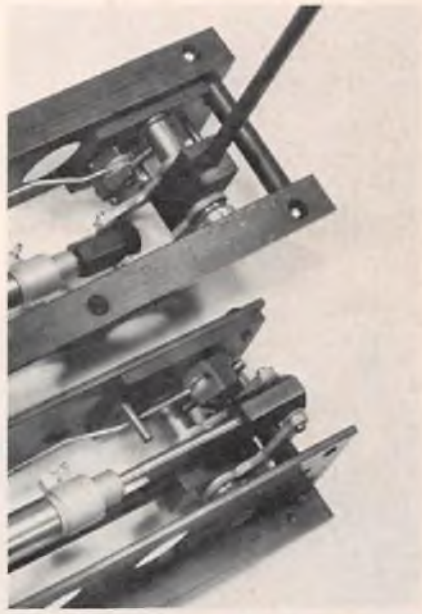


Originally designed for use with the Nosen P-51, these retractable landing gear systems are adaptable to other large models. For complete information write Custom Retracts Mfg., 16751 Noyes Ave., Irvine, Ca. 92714 (714) 540-5094.



Close-up of the pivoting and locking details of the Custom Retracts. Left and right hand units are shown.

South Bay Model Yacht Club

SECOND ANNUAL MONTEREY REGATTA

By David Casseres

Photos By Bob Eger, Jr.

I guess there are still some R/C modelers out there who haven't heard about R/C model sailboats, the best thing since sailplanes (and they don't crash!). All I can say is you should have been at Monterey, California, for SBMYC's two-day regatta on October 14th and 15th. This has become an annual SBMYC affair, kicking off the winter sailing season.

Model sailboats make no noise, use no fuel, and don't require fancy radios. Most run on two channels: one for rudder and the other for sail control (mainsail and jib controlled together). Hulls are usually fiberglass, with wooden masts and booms. There is lots of room for ingenuity and experimentation, as designers and skippers try to find some way to squeeze another half ounce of thrust out of a 5 knot wind, or make a boat point a couple of degrees higher into the wind.

Kit prices range from about $60.00 right up to the sky, and you spend another $30.00 (or more) for a sail-control unit. The best bet for a beginner is to find your local R/C sail club and ask around for a used boat. Good second-handers are always available because skippers can't resist the urge to sell the old boat and try out the latest hot hull and rig. R/C sailing is **competitive!**

There are two national associations for model boats: the American Model Yacht Association (AMYA) which is all sail, and the North American Model Boat Association (NAMBA) which is mostly power boats. SBMYC, based in the San Jose area, is NAMBA's most active sailing group, and we're developing a new, ultra-simple set of sailboat racing rules so as to emphasize the fun of R/C sailing. At Monterey, we tried out the new rules for the first time, and sure enough, it was fun! After we shake out these rules for a while, we will try to have them adopted as the official NAMBA sailing rules.

The winds at Monterey were . . . well, entertaining. They ranged from dead calm to 10 knots, and they shifted all over the compass, requiring the utmost skill on the part of the skippers. Also, there were a lot of brand-new boats being tried out for the first time, including a new design, the Talon, by Tom Wheeler and George Ribeiro. Quite a few of the new boats were John Amen designs. John designed the Pointing 36, the Snakeye, and the Eclipse and, after Monterey, he will probably be selling a lot of kits. The Pointing 36's in particular, looked very good.

Instead of reporting a lot of point

SBMYC members line up in front of their boats at Monterey.

The pit area at Monterey.

Howard Brown tweaks up his boat as Jesse Tanner looks on.

Beating hard to windward, a boat nears the finish line.

John Amen adjusting the backstay on his "Pointing 36."

standings, I'll describe the three classes that we race and tell you who got first in each class, and with what kind of boat.

The 36/600 Class boats are 36" long and have 600 square inches of sail area. When the wind blows hard they are squirrelly little devils and very challenging to sail. First place in this class was a tie between John Amen with a Pointing 36 and Angus Foss with a one-off design of his own.

The 50/800 Class is also called "M Class." The boats are 50" long and have 800 square inches of sail area. This is the most popular class, as the boats are big enough to take a stiff breeeze and still reasonably easy to transport. First place here was another tie, Howard Brown with an Epic and Bob Leonard with a Snakeye.

The X Class is unlimited. It's an SBMYC invention for boats that can't race in the other two classes. The X Class boats at Monterey ranged from Howard Brown's ultra-light modified Cherokee 50 to Jesse Tanner's majestic 8-footer, designed and built by Tom Wheeler. Angus Foss took first in X Class with a Newport 12-Meter.

If you're interested in something new and different, check out R/C sailing. I promise you, there's endless enjoyment and fascination here. At Monterey, we collected a crowd of spectators who were just driving past the pond, saw the display of multi-colored Dacron on the water, and stopped to watch. One was an experienced racing skipper in full-size boats, and he hung around until the races were over. Then someone handed him a transmitter and said, "Here, try it." He'll probably have his own R/C sailboat by the next time we see him. And another spectator looked over the line up of sailboats waiting on the shore, paint shining and sails fluttering, and said, "I never saw so much class in one place before in my life."

□

A three-boat contest, near the finish line in very light air. What could be prettier?

RCM PRODUCT TEST

Model Factory PEGASUS

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

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

The Pegasus is a 1/2A powered trainer manufactured by The Model Factory, 15907 Victory Blvd., #202, Van Nuys, Ca. 91406. Designed by Bob Lyons, it is an interesting approach to the small universal airplane since it can be used for everything from a slope or thermal glider to a pylon racer, with or without landing gear, and from 2 to 4 channels. It is available either direct or through retail outlets at a list price of $21.95.

The Peggy is available with a choice of airfoils, a thin version for more experienced flyers and a thick version for beginners or glider use. In fact if you have a spare wing with a chord of 6¾" or less, up to 72" span, it can be used with the Peggy to make a sport glider.

Construction of the fuselage and tail follows normal procedures. The fuselage is a basic balsa box with a hatch on top of the front section. The tail feathers are sheet balsa with nothing unusual or difficult in their construction. We did like the use of triangular stock to support the fin, rather than just a butt joint.

Wing construction incorporates the use of balsa leading and trailing edges, balsa cap strips, and balsa center section and tips on the basic foam wing core. This gives the wing additional strength and the appearance of a built-up structure without the need for framework construction. Dihedral varies, depending on use and number of channels. Our test model used the standard thick wing and 4" of dihedral as called for in the instructions. Hardware included consists of two sets of horns and clevises with rods.

The fuselage was finished by first applying a coat of finishing resin, sanding, and then followed by two coats of silver Hobbypoxy. The tail feathers and wing were covered with

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SPECIFICATIONS

Name	PEGASUS (Peggy)
Aircraft Type	Sport Trainer
Manufactured By	Model Factory 15907 Victory Blvd., No. 202 Van Nuys, California 91406
Mfg. Suggested Retail Price	$21.95
Available From	Mfg. & Retail Outlets
Mfg. Recommended Usage	Basic Powered Trainer
Wing Span	48¼ Inches
Wing Chord	7⅛ Inches
Total Wing Area	326 Square Inches
Fuselage Length	30 Inches
Radio Compartment Dimensions	(L) 6¾" x (W) 1¾" x (H) 3"
Wing Location	High Wing
Airfoil	Flat Bottom
Wing Planform	Constant Chord
Dihedral (each tip)	Varies
Stabilizer Span	16 Inches
Stabilizer Chord (incl. elev.)	3½ Inches
Total Stab Area	56 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Bottom of Fuselage
Vertical Fin Height	5¼ Inches
Vertical Fin Width (incl. rud.)	4 Inches
Mfg. Rec. Engine Range	.049-.09 Cu. In.
Recommended Fuel Tank Size	1 Ounce
Landing Gear	NA
Recommended No. of Channels	2-4
Recommended Control Functions	Rudder & Elevator
Basic Materials Used In Construction:	
Fuselage	Balsa & Ply
Wing	Foam & Balsa
Tail Surfaces	Balsa
Hardware Incl. In Kit	See Text
Plan Size	30" x 36" (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (7 pages)
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	20-28 Oz.
Wing loading based on rec. flying wt.	8.8-12.0 Oz./Sq. Ft.

RCM PROTOTYPE

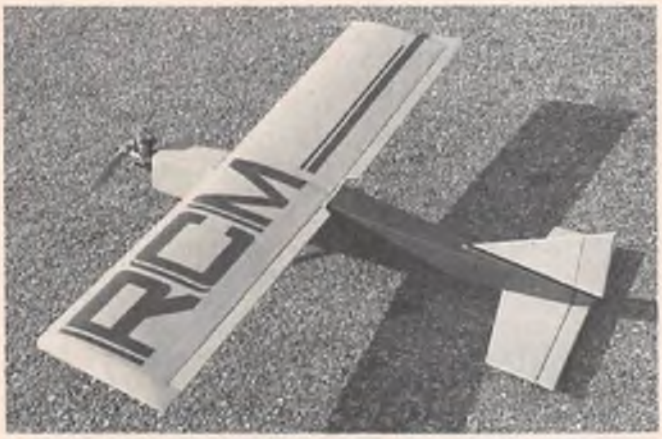
Weight, Ready To Fly	21 Ounces
Wing Loading	9.1 Oz./Sq. Ft.
Covering & finishing materials used	See text
Engine Make & Disp.	Cox .049 TD
Muffler Used	NA
Radio Used	Ace
Tank Size Used	1 Ounce

RCM PRODUCT TEST

Flite Line Products EZ SPORT

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 EZ Sport is, as the name implies, a model intended for general sport flying. This 51" wingspan fun flyer was designed by Riley Wooten and is manufactured by Flite Line Products, 3207 34th Street, Lubbock, Texas 79410. Coming in at a nickel under thirty dollars, the spirited EZ Sport is almost ideal for one design club events, and makes a fine second plane. It can be built as a tail dragger, or with tricycle landing gear. As you can see in the photo, we opted for the tail dragger.

Every once in awhile a low priced kit comes along that truly does all the things that you wish some of the higher priced brands would do. For example, Flite Line claims that EZ Sport can be built in 4 to 6 hours, and we found this to be right. Construction design has been kept straightforward, but this is only part of the reason for the fairly fast building time. We found that with the pre-shaped parts, the parts match to plans, the overall parts fit, and the ease of assembly were all excellent. Building time of 4 to 6 hours is no exaggeration.

EZ Sport comes with a single plan sheet, and has all necessary building instructions right on the sheet where they can easily be referred to while a-cutting and a-gluing. We built according to plans, but did add 3/8" triangular stock behind the first former in order to beef up the landing gear attachment area. The wings are foam, and we used Supertape to "glue" on the Chromekote card (furnished) covering. Hardware included in the kit consisted of hinges, control horns, aluminum landing gear, tailwheel bracket, 1/16" music wire for tailwheel, hatch screw, and control horn screws. We installed 2½" Du-Bro wheels on the main gear, and a 1" Perfect wheel on the tail. Gold'N-Rods were used for elevator and rudder, and Gold'N-Rod cable for the throttle. A Kraft motor mount

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SPECIFICATIONS

Name	EZ SPORT
Aircraft Type	Sport
Manufactured By	Flite Line Products 3207 34th Street Lubbock, Texas 79410
Mfg. Suggested Retail Price	$29.95
Available From	Mfg. & Retail Outlets
Mfg. Recommended Usage	General Sport
Wing Span	51 Inches
Wing Chord	10 Inches
Total Wing Area	505 Square Inches
Fuselage Length	38 Inches
Radio Compartment Dimensions	(L) 9⅝" x (W) 2¼" x (H) 2¼"
Wing Location	High Wing
Airfoil	Symmetrical
Wing Planform	Constant Chord
Dihedral (each tip)	1½ Inches
Stabilizer Span	18 Inches
Stabilizer Chord (incl. elev.)	5½" (Avg.)
Total Stab Area	100 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Bottom of Fuselage
Vertical Fin Height	6 Inches
Vertical Fin Width (incl. rud.)	10 Inches
Mfg. Rec. Engine Range	.19-.40 Cu. In.
Recommended Fuel Tank Size	6-8 Oz.
Landing Gear	Conventional
Recommended No. of Channels	4
Recommended Control Functions	Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:	
Fuselage	Balsa, Pine & Plywood
Wing	Foam, Chromekote Card, Pine
Tail Surfaces	Balsa
Hardware Incl. In Kit	See Text
Plan Size	23" x 35" (1 sheet)
Building Instructions on Plan Sheets	Yes
Instruction Manual	No
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	56 Oz.
Wing loading based on rec. flying wt.	15.8 Oz./Sq. Ft.

RCM PROTOTYPE

Weight, Ready To Fly	56 Ounces
Wing Loading	15.8 Oz./Sq. Ft.
Covering & finishing materials used	See Text
Engine Make & Disp.	OS .35
Muffler Used	OS
Radio Used	Kraft 5 ch.
Tank Size Used	6 Oz.

SCALE SQUADRON'S UNCONTEST

By Dick Tichenor

A Southern California R/C club's approach to conducting a successful scale event

The Scale Squadron of Southern California is an R/C Club devoted specifically to R/C scale aircraft. It was originally formed as a special interest splinter group from one of the country's largest AMA sanctioned general R/C clubs. As the group grew, picking up members from various other clubs, it developed into a formal club and is incorporated as a non-profit organization.

Since scale modeling is a highly personal activity (each enthusiast has his own favorite aircraft, etc.), the Squadron quickly discovered that although members would bring their models to the club "show and tell" each meeting, there wasn't a tremendous enthusiasm toward bringing the models out to enter a scale contest. That situation is normal for any R/C club throughout the country; this we have learned from over 200 club newsletters that we read each month!

A solution was conceived by the Squadron's perceptive Board of Directors. They decided to try an **Uncontest** and it was an unqualified success!

What is an **Uncontest**? It is not a contest. It is not a fly-in. There is no judging. There are no flight requirements. It is an opportunity for the scale modelers to display their models, examine other models, ask questions, talk about their projects, and to enjoy being around beautiful scale models. Then, there is the flight activity, with only the minimum regulations required for safety.

When someone wants to fly, he goes to the transmitter impound and signs up for his frequency. When his turn comes, he fires up and does his thing. All he has to do is to conform to the field safety rules such as not flying over the pit areas and spectators, observing right-of-way, etc.

Besides the usual aerobatics, the guys do things like bomb drops, show off their smoke systems, tow banners, fly formation, have dog-fights (with the Red Baron, of course), and any other spectacular things that they feel like doing.

By not having judges, required maneuvers, or schedules, there is no pressure and everyone can enjoy what he wants to do. As of this writing, the Scale Squadron has held four **Uncontests** with each drawing over a hundred models. Anyway you look at it, that is an extraordinary turnout for a scale event. (How many did your club have at its last scale contest?)

If your club would like to stage a scale event, why not try an **Uncontest**? It takes a minimum number of workers, no prize or trophy solicitations, no entry fees, can be most enjoyable, and has the greatest spectator appeal of any modeling activity. All you have to do is to spread the word to clubs and hobby shops in your vicinity; you will probably be surprised at the response.

RCM congratulates the Scale Squadron leaders, Harris Lee, Bert Baker, Bob Olson, Don Lein, Noel Allsion, and Jerry Ortega for conceiving and conducting this effective new modeling event. □

Bob Olson and Bert Baker, two of the Scale Squadron charter members, wait for a turn with Bob's Hurricane.

Photos on this and the following page are a cross section of the turn-out at an uncontest.


NX258Y


NJ
NAVY


86


40

RCM PRODUCT TEST

Bud Barkley's CESSNA 150

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

Bud Barkley has come up with a delightful 3 channel sport aircraft founded along the lines of a Cessna 150. Although named after one of Clyde Cessna's finest products, the kit doesn't qualify as a sport scale project. It does, however, offer that little extra satisfaction of flying a trainer that does look reminiscent of a Witchita product.

Opening the box revealed a collection of balsa and hardwoods in excellent condition except for one piece of wing sheeting that was weak. The hardware had its own usual bag with the smaller shaped parts packaged likewise. Other shaped parts and conventional stock were laying just waiting the modeler's touch.

Construction started with the wing which is built in three sections. Two sections of 26" span flank a 4" center section, thereby allowing dihedral and a flat center section. On the other hand there are two center joints but, with the two large plywood braces and fiberglass, the wing comes out very strong. There are two full spars of generous size, capstrips top and bottom, sheeting for the center, leading, and trailing edges, and solid balsa wing tips. The end result is a solid wing which is not hard to build straight. The plans have parts numbered that correspond to the steps in the instruction manual. Reasonable care will result in a mistake-free wing, while building the right panel first will keep the detailed drawing uncovered.

The fuselage is a basic box which produces a light, strong, and true result. There are 1/16" balsa doublers from the nose to the rear of the cabin area to reinforce the 3/32" balsa sides. Five formers of 3/16" x 1/2" or 1/8" x 3/8" are constructed to allow a rigid, but light, bracing. The fuselage top and bottom sheeting is 3/32" with shaped parts finishing the nose. The only problems with the fuselage were the combination of one improperly notched engine bearer and parts F-22 and F-23 left off of the construction manual. The plans clearly showed the placement of these parts as well as all others. The engine mounting is somewhat different in that a 3/16" plywood motor mount plate is notched to fit your particular engine. This plate is then screwed to the hardwood engine bearers. This would allow a quick engine change if one had another plywood plate made with the engine already in place. Concerns about excessive vibration caused by bolting the engine to the

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SPECIFICATIONS

Name ..... CESSNA 150
Aircraft Type ..... Sport Trainer
Manufactured By ..... Bud Barkley's Vintage Models
Imported By ..... Technl Models
1300 Yosemite Drive,
Los Angeles, Calif. 90041
Mfg. Suggested Retail Price $49.95
Available From ..... Retail Outlets
Mfg. Recommended Usage ..... Basic Powered Trainer
Wing Span ..... 56 Inches
Wing Chord ..... 9 Inches
Total Wing Area ..... 504 Square Inches
Fuselage Length ..... 40 Inches
Radio Compartment Dimensions ..... (L) 8½" x (W) 3½" x (H) 4¼"
Wing Location ..... High Wing
Airfoil ..... Flat Bottom
Wing Planform ..... Constant Chord
Dihedral (each tip) ..... 1½"
Stabilizer Span ..... 21½ Inches
Stabilizer Chord (incl. elev.) ..... 5¼ Inches
Total Stab Area ..... 113 Square Inches
Stab Airfoil Section ..... Flat
Stabilizer Location ..... Mid-Fuselage
Vertical Fin Height ..... 7 Inches
Vertical Fin Width (incl. rud.) ..... 5½ Inches
Mfg. Rec. Engine Range ..... .19-.35 cu. in.
Recommended Fuel Tank Size ..... 6 Ounce
Landing Gear ..... Tricycle
Recommended No. Of Channels 3
Recommended Control Functions ..... Rud., Elev., Throt.
Basic Materials Used In Construction:
Fuselage ..... Balsa & Ply
Wing ..... Balsa & Hardwood
Tail Surfaces ..... Balsa
Hardware Included In Kit ..... See text
Plan Size ..... 60" x 35" (1 sheet)
Building Instructions on Plan Sheets ..... No
Instruction Manual ..... Yes (8 pages)
Construction Photos ..... No
Kit Includes ..... Shaped Parts
Mfg. Rec. Flying Weight ..... 56-64 Oz.
Wing loading based on rec. flying wt. ..... 17.1 Oz./Sq. Ft.

RCM PROTOTYPE

Weight, Ready To Fly ..... 58 Ounces
Wing Loading ..... 16.6 Oz./Sq. Ft.
Covering & finishing materials used ..... See Text
Engine Make & Disp. ..... OS .25
Muffler Used ..... OS
Radio Used ..... Kraft KP4A
Tank Size Used ..... 6 Oz.

RCM PRODUCT TEST

Bob Martin's COYOTE

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

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

The Coyote is an attractive low wing aerobatic slope soarer that looks fast just sitting there. In the air it is fast. It was designed by Dave Lloyd and is being kitted by Bob Martin's R.C. Models, 3058 N. Marengo Avenue, Altadena, Calif. 91001.

After expending considerable effort getting the lid off of the box, we found to our delight that everything needed was there except for hinges, covering material, a small piece of 1/8" plywood, and material for servo mounting. The twelve page instruction manual is clearly written and is complete. There are several sketches and photographs for clarification. A modeler with limited building experience should be able to build this slope soarer.

The 72" span foam core wing has swept leading and trailing edges with taper in both chord and thickness. The strip ailerons are almost full span. The horizontal tail has a swept planform with a swept hinge line. The swept fin is fixed.

The wing cores are smoothly cut and required a minimum of sanding. The 1/64" plywood wing sheeting is cut to shape with a small trim allowance. The sheet was adhered to the cores with Hi Johnson's Supertape (see RCM July 1978). It was this reviewer's first experience in sheeting a foam wing. With Supertape, it was a "snap." After sanding the excess plywood to the core shape, the balsa leading edge was glued in place. We used aliphatic resin but now wish we had used epoxy per the instructions, since it will make a bettter bond with the plywood skins. Care must be taken when sanding the leading edge to shape since its contour varies from sharp at the root to blunt at the tip. This is to control tip stall. The wing halves were joined with epoxy. The joint was then reinforced with the nylon tape supplied in the kit. We used K & B resin to stick it on. In

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SPECIFICATIONS

Name	COYOTE
Aircraft Type	Slope Soarer
Manufactured By	Bob Martin's RC Models 3058 No. Marengo Pasadena, California 91001
Mfg. Suggested Retail Price	$74.95
Available From	Retail Outlets
Manufacturer's Rec. Usage	Aerobatic Sailplane
Wingspan	72 Inches
Wing Chord	8¾" (Avg.)
Total Wing Area	630 Square Inches
Fuselage Length	36½ Inches
Radio Compartment Dimensions	(L) 15" x (W) 1¾" x (H) 1¾"
Wing Location	Low Wing
Airfoil	Semi-Symmetrical
Wing Planform	Swept L.E. & T.E.
Dihedral (each tip)	1/4 Inch
Stabilizer Span	19¾ Inches
Stabilizer Chord (incl. elev.)	5" (Avg.)
Total Stab Area	99 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Top Of Fuselage
Vertical Fin Height	5¼ Inches
Vertical Fin Width (incl. rud.)	3½" (Avg.)
Mfg. Rec. Engine Range	NA
Recommended Fuel Tank Size	NA
Landing Gear	NA
Recommended No. Of Channels	2
Recommended Control Functions	All., Elev.
Basic Materials Used In Construction:	
Fuselage	See text
Wing	See text
Tail Surfaces	See text
Hardware Included In Kit	See text
Plan Size	None
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (12 pages)
Construction Photos	Yes
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	Not Given
Wing loading based on rec. flying wt.	11½ Oz./Sq. Ft.

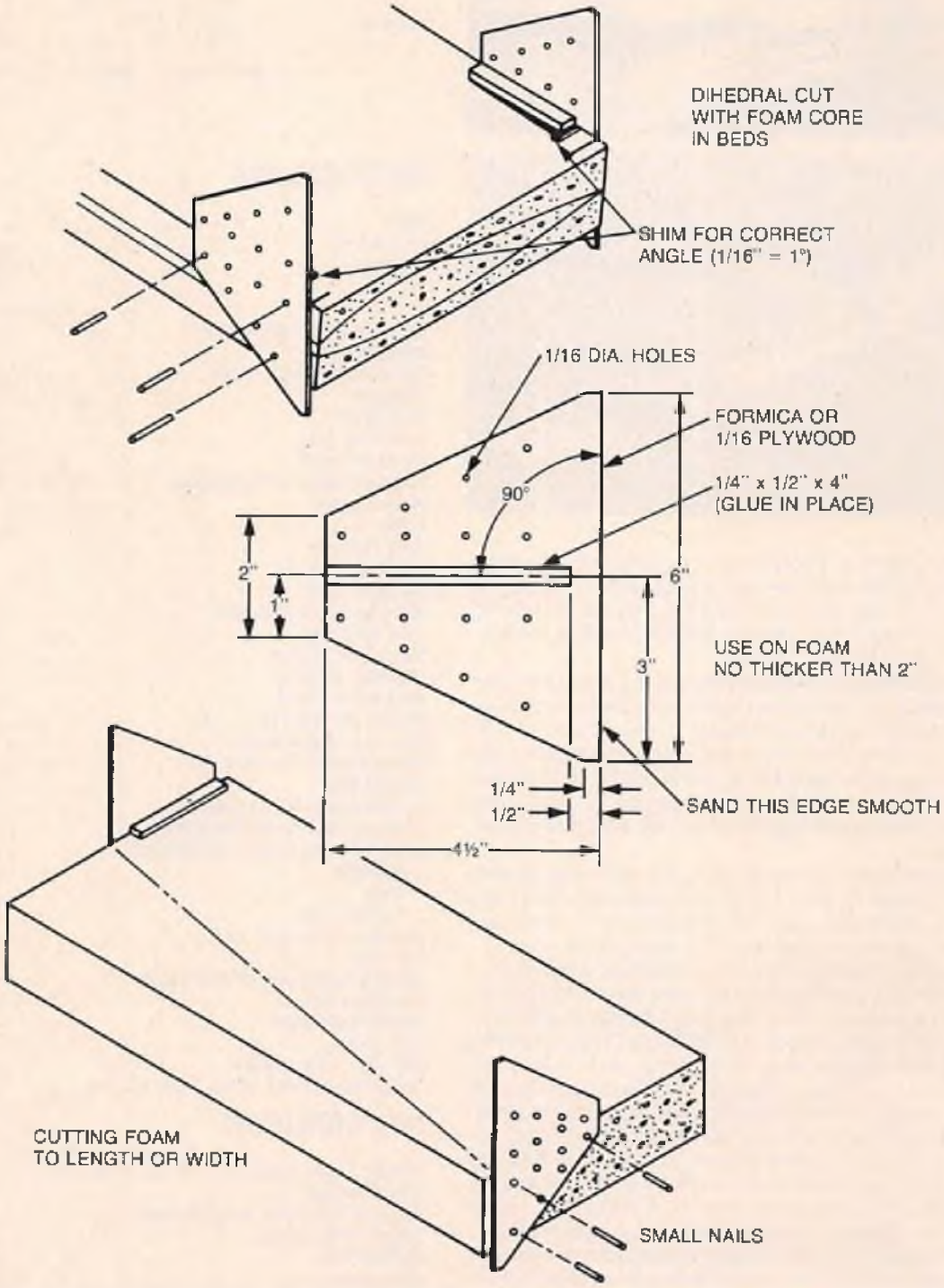
RCM PROTOTYPE

Weight, Ready To Fly	54 Ozs.
Wing Loading	12.5 Oz./Sq. Ft.
Covering & finishing materials used	See text
Engine Make & Disp.	NA
Muffler Used	NA
Radio Used	Cox/Sanwa 4 ch.
Tank Size Used	NA

A FOAM BLOCK AND DIHEDRAL ANGLE CUTTING GUIDE

By Clark Ross

The most inexpensive way to purchase expanded bead polyester foam for model building purposes is in stock sizes as handled by its maker and suppliers. These stock sizes are never the size needed, and must be trimmed down to a workable size. This multiple use guide can be used to make little ones out of big ones, of any size and shape. As an added bonus, it can be used to cut that all important dihedral angle.

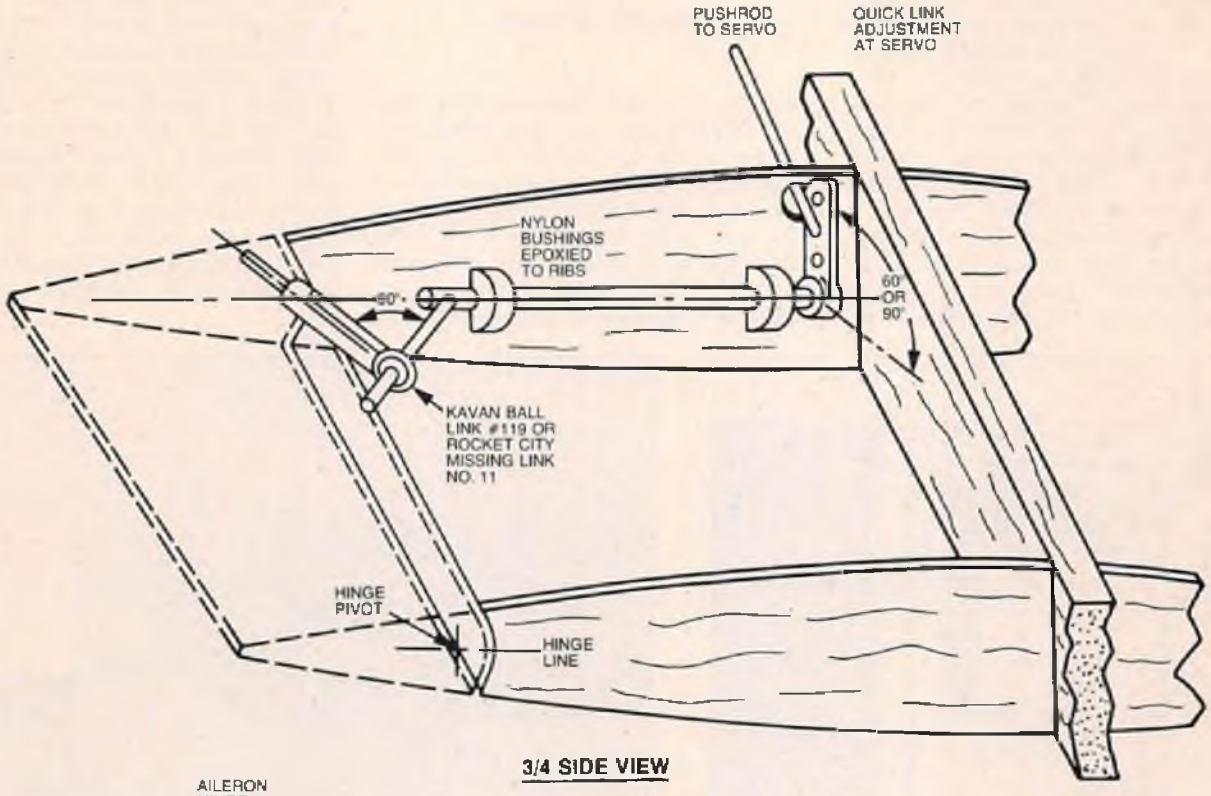


Internal Aileron Drive Mechanism For Scale Realism

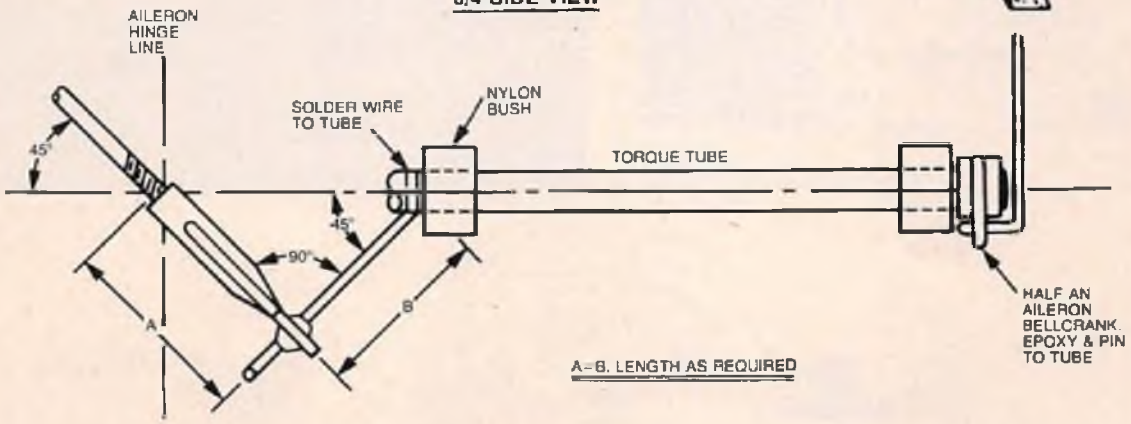
by Jim Brennan

Using a ball link of the Kavan type or Rocket City's missing link No. 11, some brass tubing .375" O.D. and half an aileron bell crank, assembled as per drawing, you are half way there. The nylon bushings are from scrap nylon prop hubs or whatever you might have available. The wire rod, that comes with the Kavan Ball Link No. 119, fits perfect through the eye of the ball. The wire is first screwed into the ball link and then cut off, leaving about 1" protruding from the link. This is epoxied into the aileron at the junction of the pivot and hinge line, at a 45° angle to the hinge line.

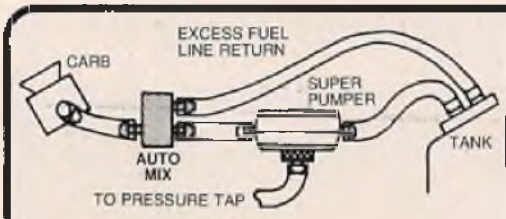
For aileron differential, attach the horn at 60° to the vertical. The length of "A" and "B" can be decreased equally to fit into smaller and/or thinner wings. Note, as per drawing, the center line of the torque tube goes through the hinge line of the aileron.



3/4 SIDE VIEW



TOP VIEW

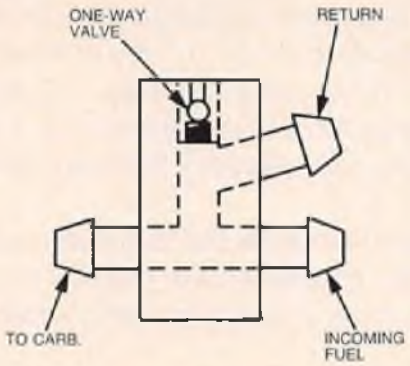


IDLE WITH A ROBART AUTO-MIX

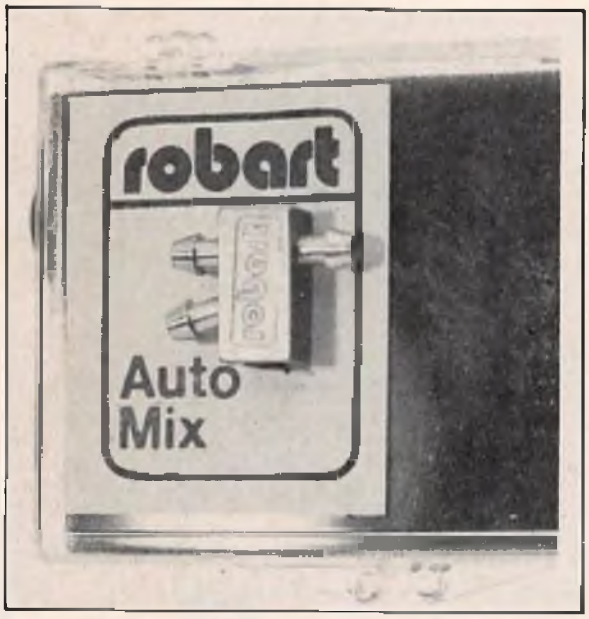
By Paul Goders

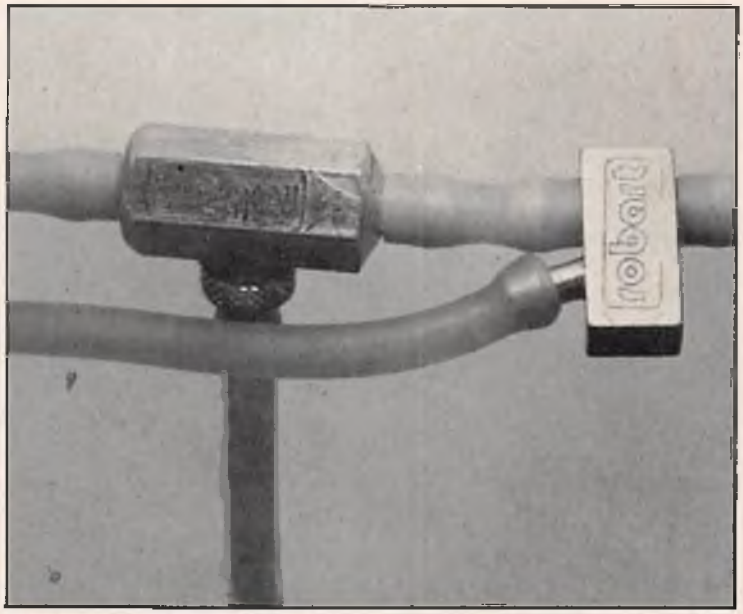
Reprinted from "Carrier Wave" newsletter of McDonnell Douglas Model Airplane Club.

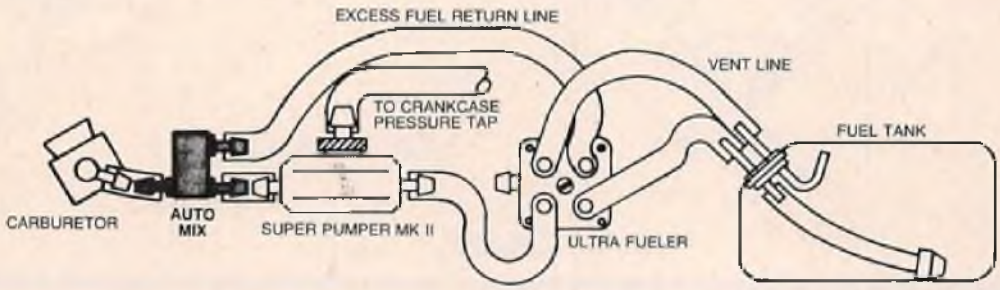
Robart's "Auto-Mix" is beautiful. It was the only thing that cured my problems. You see, I had this engine-tank combination that didn't want to work together. It would run wide open on crankcase pressure as long as everything was kept level. Drop the tail and it leaned out; drop the nose and it went rich. Just because the tank was 4" below and 12" forward of the engine shouldn't matter — Oh Yeah! (Yes it's a pusher.) Well you all know you can't idle on crankcase pressure, so I decided to install a Robart Super-Pumper. Well as long as you were wide open it ran fine nose up, down sideways it didn't matter; try and idle .. no way. What do I do now — call Robart. "We have this new device called an Auto-Mix that will cure your problems." Okay! Send me one. It arrived and immediately I wanted to know what made it work. It had three fittings for fuel lines. I could look right through the two that were in line. "This can't work," I said. The other fitting was set at about 45° . On top was this little one-way valve. I installed it per the instructions and started the engine, set the needle valve for peak rpm. Now for the test --- will it idle? Idle, it did, from 21,600 down to 3,000 and never missed a beat. The Auto-Mix, at idle, vents residual fuel back to the tank via the fittings set at 45°. Now for the neat part. On a lot of set-ups when you go from idle to full throttle there is a tendency for the mixture to go rich and the engine hesitates or bogs. Not so with the Auto-Mix; you see that little one-way valve bleeds outside air into the incoming fuel at the needle valve and, therefore, you have a leaner mixture through mid-range; thus no hesitation or bogging, just a smooth transition of power. The engine this was tested on was a worst-case subject and will not idle without the Super-Pumper, Auto-Mix combination. Seems I wanted to go as fast as I could --- this meant bored out intake (almost three times its normal diameter), glo-bee racing head, 50% nitro and a 5/3 prop. The engine is a Cox Tee Dee .049 souped to the hilt. What does all this mean? Well we now have a way to take racing configured engines and make them idle reliably. This really applies to critical carb/tank/engine combinations ala Duane's F-15. Try one, guys, you'll love it. □

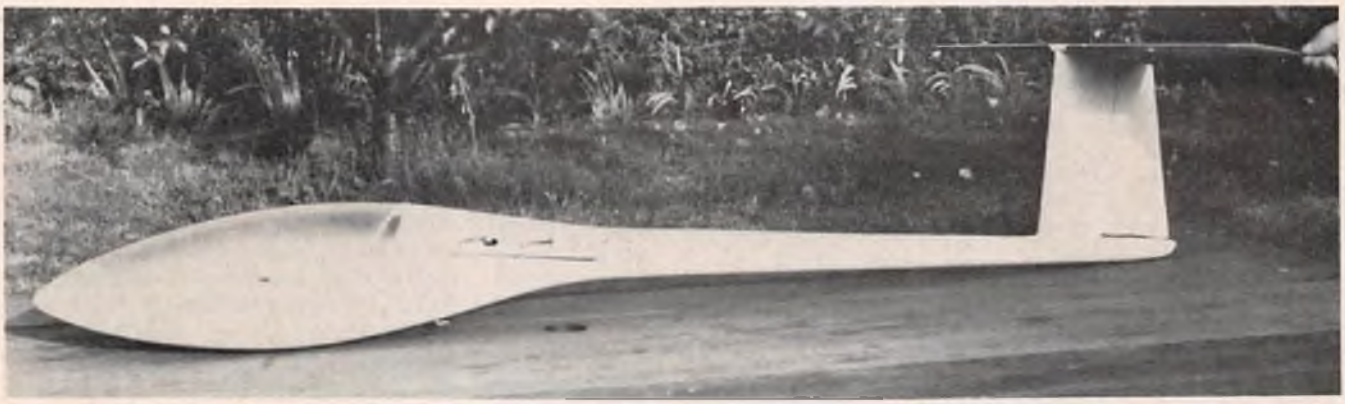


ROBART AUTO-MIX









T-TAIL LINKAGE

By Bill Baker **Photos By Paula Baker**

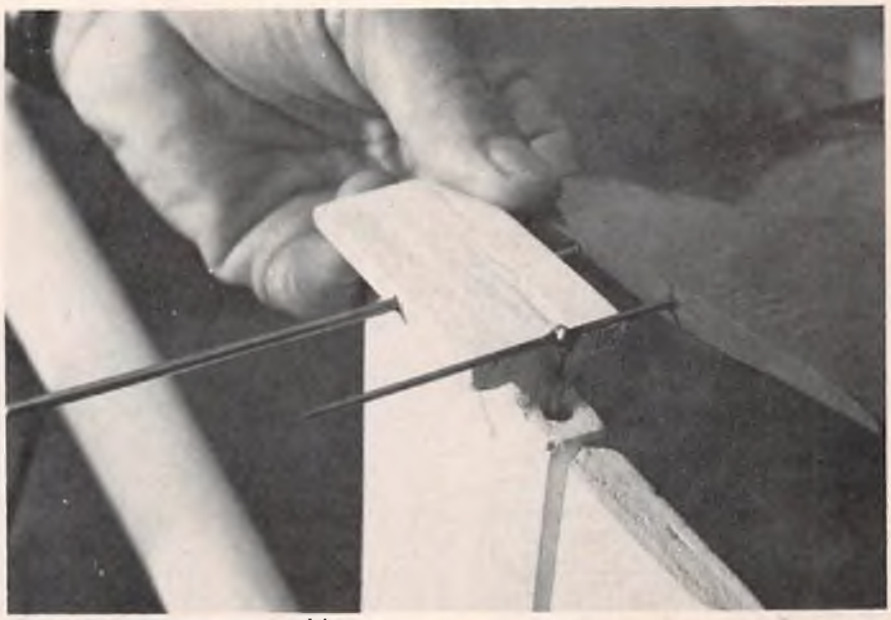
Here is a linkage for T-tail flying stabs that is superior to any I have seen in print. The heart of the system is the T-shaped linkage from the control rod to the stab. It is made with a threaded rod like that supplied with most types of clevis. Hammer the rod on an anvil to the flat shape, about 1/8" wide at a point about 1½" from the threads. Drill a 1/16" hole in it and cut off the excess wire. A simple jig can be made by drilling a 1/16" hole vertically in a scrap of wood. Then you can place a suitable length of wire in the wood block and slip your modified rod over it and solder. I used a hard solder (Sta-Brite), but I suspect that common solder would be strong enough.

The stab is made "Windfree" style except that it has two sets of tubes to support a front pivot wire and an aft control wire (the top of the T.) Note in the photo the 1/2" wide balsa pieces at the top edge of the fin. This provides about 1½" of width for the brass tube bearing for the pivot wire, providing the necessary strength and rigidity to bear the flight loads.

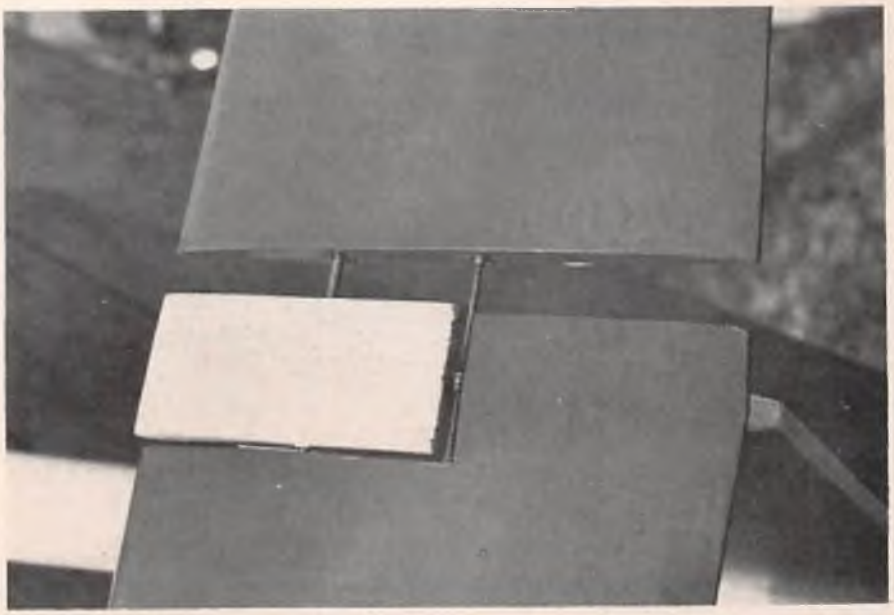
The fin is made like a sandwich. The filling between two sheets of balsa is a minimum of structure, made of strips the thickness of the outer plastic control tube, which is routed through the fin in a large radius curve. The sailplane in the photos is a modified "Spirit of Freedom" from Hartman Fiberglass, Argenta Illinois.

The major advantage of T-tails in my opinion, is that they are less damage prone (compared to conventional tails) when landing in tall grass. As with any system using flexible plastic tubes, it is important to fix the outer tube solidly for its entire length. I recommend the polyurethane foam (Superfoam, sold by Sig) for this. Fill the whole fuselage aft end. Put an extra tube (large outer) in the aft fuselage first and then you can push the antenna through it.

Thermals, you all. □



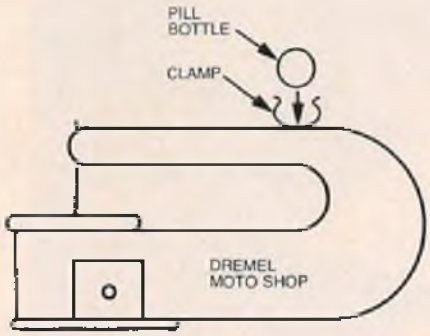
Pushrod shown in up position.



Stabilizer halves being assembled.

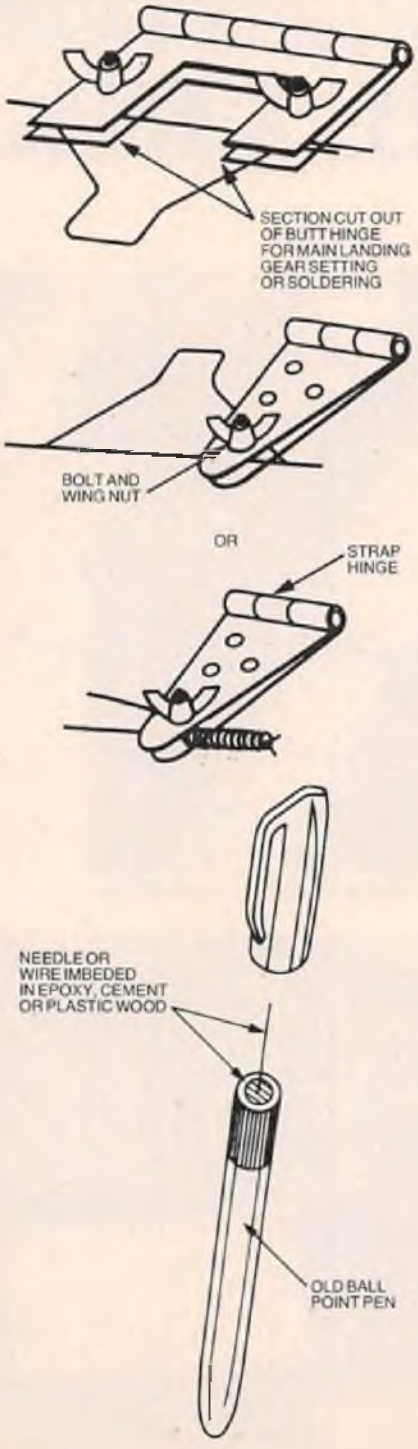
FOR WHAT IT'S WORTH

Submitted by Alan T. Knight Jr., of Woodbury, New Jersey, are these two helpful suggestions. First, when covering with silk, try placing the silk between two sheets of newspaper when making your initial rough cuts to approximate size. You'll find it is much easier to handle and reduces the fraying. For suggestion number two, if you have a Dremel Moto Shop with a clamp on the top for sometimes holding a flex shaft accessory, try this: By obtaining an appropriate size pill bottle, large enough to store extra saw blades and which will fit into the clamp, you can make use of the seldom used clamp. If your moto shop doesn't have the clamp, they are available at most hardware stores. See sketch.



After having trouble with large bulky glue bottles, R.L. Shearer of Grand Rapids, Michigan, believes that he has found — or at least rediscovered a solution. He now uses a 3 oz. Pearl Drops Tooth Polish bottle. After getting your teeth bright, this empty bottle makes a handy container. The small size permits access to places that the larger glue bottles would not. The bottle holds just the right amount of glue for the work to be done and has a needle-like tip to allow the smooth flow. It is also very easy to refill through the removable lip. The resealable cap keeps the glue from drying out.

The following two suggestions were sent in by Asad Ullah of Lahore, Pakistan. The first is how to make miniature vises and clamps from door hinges, using bolts and wing nuts to tighten them. You have a wide assortment of hinges to choose from to suit your needs. Or you can cut and shape these for yourself for even more specialized uses. When working with delicate parts, pad the clamping area with felt. (See sketch). (2) Here is a clearing wire holder to use on the orifice of your paint sprayer or to open the clotted mouth of most any cement tube or bottle that will clip to your pocket so you will always know where to find it. Remove the ink cartridge from an old ball point pen and fill the longer part with plastic wood. While the plastic wood is still soft, insert the clearing wire and let the assembly dry. (See attached sketch.)



Uses for empty MonoKote cardboard tubes has been submitted by Dave Cutrona of North Olmstead, Ohio. They are as follows: (1) Cut into varying lengths as needed. Using contact cement, glue various grades of sandpaper around tube pieces. Excellent for sanding wing tips, nose cowls, fuselage formers or any concave surface. (2) Tubes store plans efficiently for future reference with no wrinkles or smudges. (3) Stores same size categories of pushrods, plastic tubing, and dowel rods.

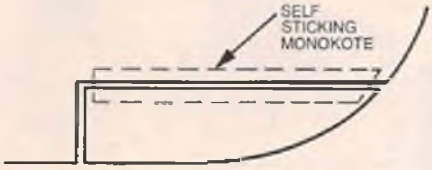
In the process of finishing up a New Era II kit from Cox/Airtronics, S. Stephen Gilbert, Jr., of Gibsonia, Pennsylvania, had put several coats of epoxy on the firewall and engine compartment. Three of the four holes in the firewall through which the engine mount bolts pass into blind nuts on the rear were plugged. Of course, the unprotected blind nut was clogged with epoxy. Later when attempting to install the motor mount the bolt became lodged in the blind nut and refused to go forward or backward. It was thought a bit of pressure would carry the day, so he laid on with a screwdriver (this was a machine screw as provided with the kit) and the head popped off. Brute force and a variety of tools would not budge it. The answer was right at Stephen's fingertips, and the next day, he reached for his soldering iron. A brief heating at about 150 watts and the screw was free. Next, a fresh screw was inserted to the point where it would not go further because of the epoxy. It was heated up with the iron and screwed all the way in and out a couple of times and the blind nut was free and functioning again.

Grady Morgan of Stockton, California, built Dave Platt's Waco F-3 and was very disappointed in the roll rate. According to the instructions with the kit, the model did have the same poor aileron response as the full size aircraft. Grady discovered that by covering the gap between the wing and the aileron, the roll rate can be improved to such an extent you need worry no more about the roll rate and the flying characteristic is improved tremendously.

It seems the air leaking through the gap between the wing and aileron creates a turbulence which slows the roll rate.

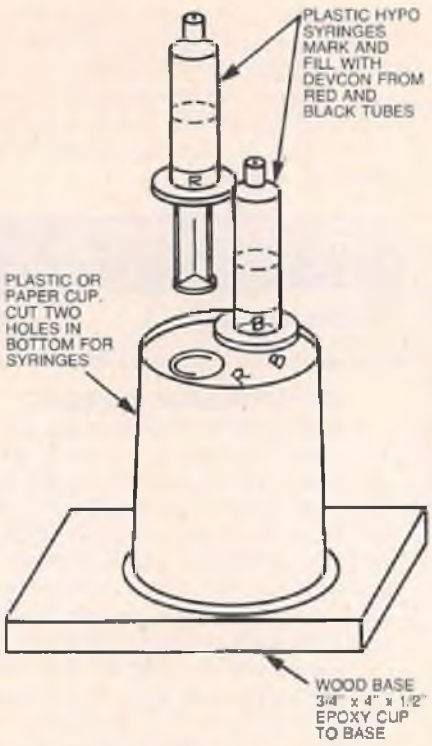
Disconnect the control horn and let the aileron hang. Use a strip of self sticking MonoKote about an inch wide and as long as the aileron. Place the MonoKote overlapping the wing about 1/2" and, with the aileron all the way down, press the MonoKote onto the front of the aileron. Bring the aileron back level and crease the fold down in the

space between the aileron and wing. This only needs to be done on the top of the wing. In the case of the Waco, the same was applied to all four ailerons. See accompanying sketch.



For years, modelers have known that just about the best thing for making fillets or other fairing jobs is an epoxy glue and filler (micro-balloons, balsa dust, etc.), mix. It is very strong, light, and flexible. But, anyone who has ever tried to sand the finished product has sworn to never do it again! It is like trying to sand steel. Lee Taylor or Roseville, California, solved the problem and submitted it to RCM. Remember those little wire brush wheels you got with your Dremel Moto-Tool, and have never used? Chuck one of them up in the tool, and **very gently** touch your epoxy and filler fillet where you want to cut it down. That little wire wheel will walk through it like it was warm butter. Lee found that the wheels will do many of our difficult sanding jobs on balsa and plywood. Recently he used it to cut slots in 1/16th plywood in a difficult location. They work very well for difficult forming jobs, such as cowl cut-outs, but be careful, because they can cut very fast. A word of caution: Do not use these wire wheels without good eye protection. They shed wires frequently, and the thrown-off strands are like miniature spears.

Jim Bucrimann of Tinley Park, Illinois, submitted his handy work bench epoxy syringe stand. The syringes should first have the nozzle ends drilled with a 1/16" opening. The Devcon red tube does have a habit of crystallizing in the nozzle occasionally and using the drill to clear it out works best. Be sure to mark the syringes with print tape or marker to insure the right plunger gets back into the correct holder. After using, retract plungers as far as possible. It stays in the stand better, keeps the nozzle clear, and makes it easier to free up the plungers when they become stuck. To fill, simply remove the plunger, put the syringe into the hole and squeeze the Devcon in to about 1/2" from the top. Hold the plunger in place, invert and let the bubble rise to the top. At that time, the plunger can be slipped into place. Clean up any mess with acetone. The base can be wood or plastic or whatever.



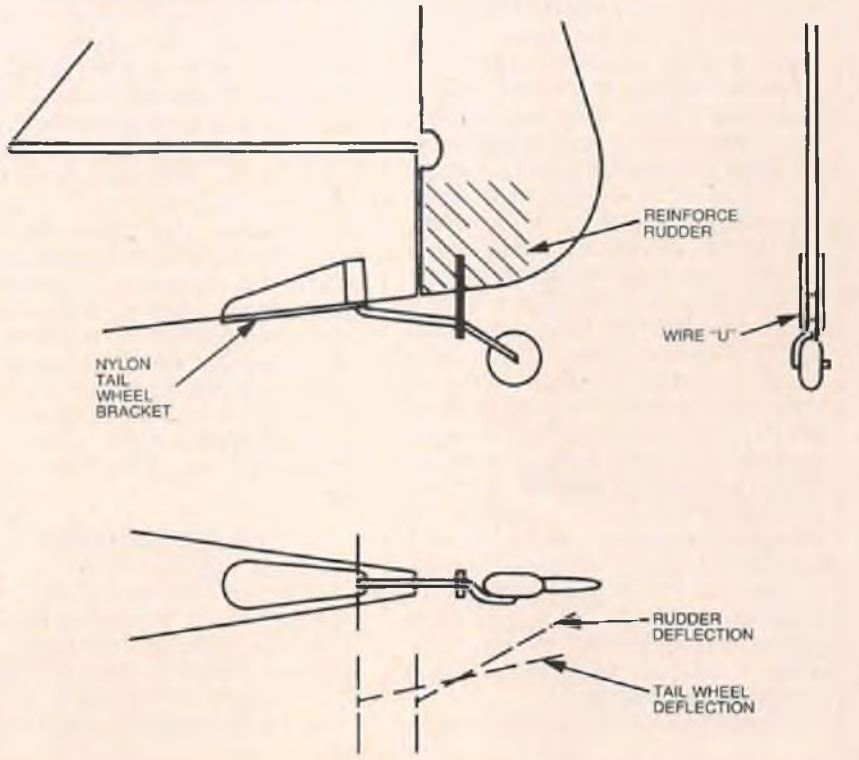
The heavier the base is, the better, as the weight prevents tipping over. Jim has been using this method for about 3 years and finds it is like having a third hand. The accompanying sketch is self-explanatory.

The following ideas were submitted by Walt Hall of Centre Hall, Pennsylvania. The first suggestion applies to spray painting. Walt has the problem of getting the over-spray all over his hands and arms. To relieve the clean up problem, he uses baby oil on a cotton swab to remove it. Almost any type of paint will lift right off. (And one doesn't have to worry about the cumulative effect of chemicals from whatever thinner one would ordinarily use.)

The second suggesion is to keep a few of those rubber "art gum" erasers on your work bench when you build; not only do they do a great job of fixing mistakes, but they will serve as pin cushions, mini-sanding blocks, and really handy spacers while you adjust the dihedral angle on the proverbial flat bottomed building surface.

And, finally, the best surface that Walt has found for mixing epoxy glues, or assembling small items with instant adhesives, turns out to be a piece of plate glass about a foot square. You clean it by scraping it with a knife or razor, and you can get a piece of it for nothing if you talk real nice to your local glazier.

Tail draggers with steerable tail wheels, as most of us know, are known to be a bit feisty during the initial take-off run. The accompanying sketch from Gary Avalear of Highland, New York, shows his method to reduce the tail wheel movement relative to rudder deflection. The greater the distance between the rudder hinge line and the rudder pivot, the smaller the relative movement. □



showcase '79

All items appearing in Showcase '79 are press releases supplied by the manufacturer of the product and/or their advertising agency unless otherwise specified. Note: The review or discussion of any product by Radio Control Modeler Magazine does not consititute an endorsement of that product nor any assurance as to its safety or performance by RCM.

F4U-1A CORSAIR KIT

A Stand-Off Scale model of one of World War II's most popular fighters, the F4U-1A Corsair from Top Flite Models, Inc. of Chicago, Illinois, is the company's latest addition to a long line of radio control planes. With a wing span of 61" and a length of 48", the all new F4U-1A Corsair has 693 square inches of wing area and is designed for a .60 engine. Weighing approximately 7 to 9½ lbs., this model of the Black Sheep Squadron's famous fighters features all balsa construction; "Superfoam" fuselage shells to eliminate time consuming block carving; heavy duty 3/16" diameter formed landing gear wire; a two-piece, extra strong injection molded cowl; and a clear plastic canopy. Also included are top quality die-cut balsa & plywood parts; precision machined leading and trailing edges; accurately shaped wing tips; machine cut crutch strips for positive alignment; full balsa sheeting for fuselage, wings, and stabilizers; fuel-proof, matte finish authentic MonoKote mylar markings, and quality crafted hardwood motor mounts and wing mounting blocks. Other highlights of Top Flite's all new and dependable F4U-1A Corsair include a fully illustrated, check-off instruction booklet; three full-size, easy to understand plan sheets; silver soldered control horn assemblies; hardware package; and nylon fittings. Of special note is that each kit includes the "F-4U Corsair In Action" book from Squadron/Signal Publications. This is a complete 50-page reference on the Corsair with 13 full color paintings, 14 drawings, and 125 black and white photos. It is the foremost source on the plane's history, modifications, and detailed graphic designs.

Other Stand-Off Scale kits currently available from Top Flite include the P-51B Mustang, P-40 Warhawk, P-39 Airacobra, and P-47D Thunderbolt. Information on the Corsair and other Top Flite products are described in their 12 page catalog. Send request for catalog along with 50 cents to: Top Flite Models, Inc. 1901 N. Narragansett Ave., Chicago, Ill. 60639.

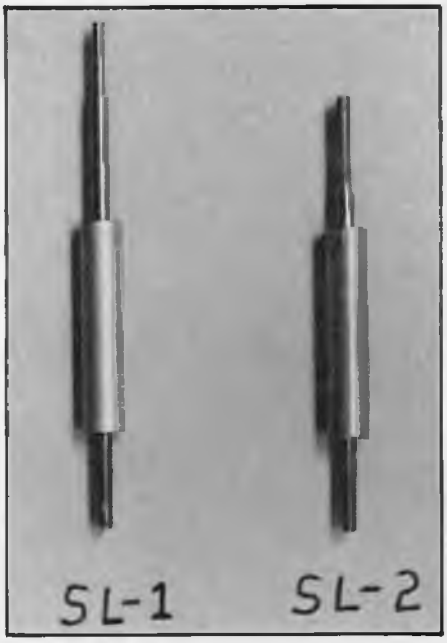
OFFSHORE RACING BOAT

Added to the Mariner pleasure yacht and the Cobra Jet speed boat introduced last year by MRC is the new Offshore Racer. This brightly finished scale like Deep Vee comes complete with the exclusive Turbo-Trol water jet propulsion system that offers maneuverability and control even in stump-filled waters plus an ability to run in reverse and turn on a dime. This product needs less than one hour to install the radio and be ready for operation. The Offshore Racer comes complete with factory installed waterproof box to house your radio control equipment, control rods, decals, fuel tank, muffler, glow plug, starter belt, Enya 35TV marine engine and MRC Turbo-Trol. With the Turbo-Trol you can run the craft aground and still not damage the control mechanisms. There's no prop shaft or rudder assembly to break. The boats are great fun and excitement for the entire family. The new Offshore Racer measures 39" in length with a 9.5" beam. Suggested retail: $279.95. A two channel radio (not included) will operate the boat. A third channel can be used should the modeler want to utilize the brake or reverse control of the Turbo-Trol system. The boat is also available in ARF configuration. This allows the expert boater the opportunity to install a hotter engine and prop drive for competition type racing. It comes complete with brightly finished hull and waterproof box factory installed. Retail price for the ARF model is $99.98. For further information, see your hobby dealer. If he can't help you, contact Model Rectifier Corp., 2500 Woodbridge Ave., Edison, New Jersey 08817.

ENGINE MUFFLERS

Quarter Headquarters, P.O. Box 12321, San Francisco, Calif. 94112, manufacturers of 1/4 scale accessories, now have available a complete line of mufflers for the big .90 to 1.5 engines. These mufflers are made in three models to fit inverted or upright engines.

They are made of aluminum and attach easily to the engine with a stainless steel screw style clamp provided with the muffler. The muffler for the Suevia 1.5 engine is slightly different in that it bolts directly to the engine with two screws. Two lengths of fuel and heat resistant neoprene tubing are supplied to extend the exhaust out of the cowling if necessary. The prices for these mufflers are: No. M-ST (side tubes for upright engines) $18.95, No. M-BT (bottom tubes for upright engines) $17.95, No. M-TT (top tubes for inverted engines) $17.95. Prices for the Suevia 1.5 mufflers are: No. SM-ST (side tube for upright engine) $19.95, No. SM-BT (top tube for upright engine) $18.50, No. SM-TT (for inverted engine) $18.50.



CAR AND BOAT SHOCK LINK

Robinaire of Boca Raton, Fla., has announced a companion to their highly successful SL-1 aircraft steering shock link and over-travel device. Designated the SL-2, the new unit is a super duty shock link specifically designed for car and boat steering servo protection. Developed in close cooperation with Steve Pottols, and extensively tested,

this link not only protects your servo from normal road shock, but has been reported to actually improve the steering. There are currently two West Coast stocking distributors, and dealers should contact them for stock. With the SL-1 for throttle overtravel, and the SL-2 for steering, you have powerful pair of helpers running for you. To "borrow" a well-known phrase, you better be running with 'em, 'cause you're sure gonna be running agin 'em! Also available soon through these distributors are the FM-1 and FM-2 Foampocks, closed-cell foam pouches for receiver and battery pack protection. The closed-cell foam will not absorb water, and if the opening is properly sealed, the pouch is waterproof. The distributors are The Other Pottols Throttle Shop, P.O. Box 992, Saratoga, Calif. 95070 and The RC Car Shoppe, 6561 Mason Court, Pleasanton, Calif, 94566. Dealers and distributors should contact Robinaire at P.O. Box K, Boca Raton, Florida 33432.

REED VALVE ENGINE THROTTLE

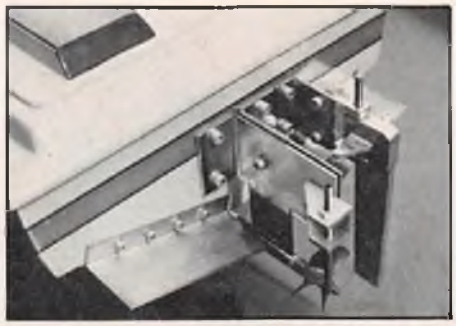
This simple, yet ingenious throttle designed by Ralph Cooney of Fourmost Racing Products will fit all Cox rear reed valve .049 engines: the Babe Bee, Golden Bee, Black Widow and ORC. It doesn't cut any RPM's off the top end as an exhaust restrictor would and effectively idles the engine down to less than 3000 RPM's — adds only a few grams of weight. Still allows use of a muffler. Price $2.50 from Ace R/C, Inc., Box 511, Higginsville, MO 64037.

CESSNA 182 KIT

It's big (72") and graceful in flight, with all the stability a high wing cabin monoplane can offer. The generous 702 sq. in. of wing will permit some over-building on the part of the novice. But, the best thing about the 182 is that it is a very competitive scale model. Even though the Cessna sports a semi-symmetrical airfoil, it is still a real pussycat in the air. Since there are no retracts, the airframe can be built in the 5-7 lb. range, so that a .40 would be adequate power. A .60 affords a wider latitude of aerobatics, of course. If you're looking for something "out of the ordinary" to campaign on the contest circuit, or if you are in need of a realistic looking trainer, then the 182 is for you. The model is designed for "full-house" operation, with optional flaps available for added scale appeal. The Cessna 182 is manufactured by Pica Enterprises, 2657 N.E. 188 St., Miami Fla. 33180. Phone (305) 932-8008, Price $89.95.

RACE CAR KIT

This six cell electric car kit includes ready to follow instructions, powerful 05 motor, kydex full protection plate, wide racing tires, fast charging GE nicad batteries, and D/C charge cord. Priced for the economy minded hobbyist — $79.95. Catalog available, send $1.00 to BoLink Ind., P.O. Box 80653, Atlanta, Ga 30366.



STERN DRIVE HARDWARE FOR THE STREAKER DEEP VEE

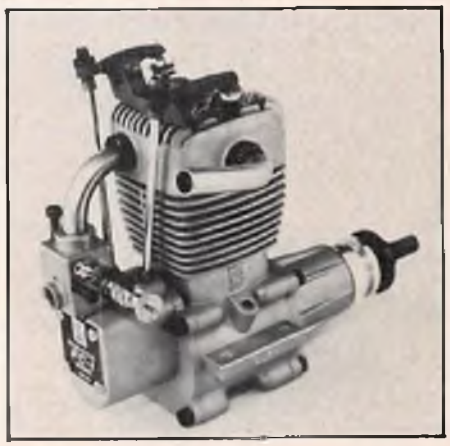
This stern drive hardware set along with a 5" motor mount will complete your Streaker Deep Vee. Hardware set includes stainless steel drive brackets, stainless steel strut with Teflon bushings, stuffing box with Teflon Tubing, offset rudder bracket, wedge rudder with adjustable bracket, water pick-up assembly, 3/16" flex-cable assembly with drive dog, thrust washer, and propeller nut, stainless steel ride plates and aluminum turn fin. Propeller not included. For more information about hardware set #66 contact your dealer or Steve Muck's R/C Boats, 6003 Daven Oaks Dr., Dallas, Texas 75248.

DAY-GLO TRIM SHEETS

New Day-Glo Red and Day-Glo Orange MonoKote trim sheets are now available from Top Flite Models, Inc., of Chicago, Illinois. Joining the ranks of fourteen other trim sheets, these brilliant fluorescent colors add visibility to your model, making it easier to locate "lost" models. Additionally, they allow you to make authentic military and other distinctive markings. The variety of striping designs and patterns are limited only by your imagination. The new Day-Glo trim sheets are 5" wide and 36" long and are applied by pressure, without ironing. Suggested price per sheet is $1.79. More information on this and other Top Flite products is available in their 12-page catalog. Send request for catalog along with 50 cents to: Top Flite Models, Inc., 1901 N. Narragansett Ave., Chicago, Illinois 60639.

20, 40, 60 SIZE DEEP VEES

Futuraglass Design, One Cannon Dr., Nashua, N.H. 03060, presents their Deep Vee's in 20, 40 and 60 sizes. They feature joined deck and hull, brilliant Gelcoat finishes, and hand laminated fiberglass. These are already proven competition boats. They also are available with metal flake decks and a matching solid color panel on the side for an additional charge. Hardware kits for these Deep Vee's are also available.



KALT FC-1 FOUR CYCLE ENGINE

The Kalt FC-1 is a single cylinder, pushrod OHV unit with spur gear driven

camshaft at the rear. It is the smallest of all the four strokes announced to date. With a piston displacement of just over 0.45 cu. in. Construction, featuring a barrel-type crankcase casting with integral full-length finned cylinder jacket, a separate front housing containing a twin ball-bearing mounted crankshaft with overhung crank and a ringed aluminum piston running in a hardened steel cylinder liner, is very much along familiar two cycle model engine lines. Where the Kalt differs from the other four cycle engines is in the use of inclined valves on separate rocker shafts in conjunction with a hemispherical combustion chamber and a totally different timing gear design contained in a separate housing attached to the crankcase backplate. Present four cycle motors such as the Kalt, are designed to run on glow plug ignition and regular fuel constituents (methanol, castor oil and nitromethane) and present no problems to those accustomed to operating conventional two cycle glow engines. The only additional point to be kept in mind when using a four cycle motor is the need to occasionally check valve clearances. The Kalt FC-1 is in stock and is priced at $209.95 plus $5.00 shipping and handling, direct from International R/C Specialities, 2310 Cimarron Road, Las Vegas, Nevada 89117.

RADIO COVERS

These brick red vinyl battery pack and receiver covers offer an inexpensive way to package battery packs in cars, boats, and airplanes, and they can be used to package receivers as well and to keep fuel, water, and grime out of that valuable radio gear. They have enjoyed great success in 1/8 scale R/C car racing, one of the worst environments for R/C gear. Ask for part number RBC-770 at your local hobby dealer, or order direct from Delta Manufacturing, 27 Race Car Court, Lorimor, Iowa 50149.

FLAKPANZER GEPARD TANK

The most sophisticated and advanced radio control tank MRC-Tamiya has ever released, it is a well detailed 1/16 scale version of a famous West German anti-aircraft tank. The sturdy aluminum alloy frame and ABS plastic housing makes this a rugged model weighing

over 11 pounds less radio equipment. The tank requires a 3 channel radio control system and a 6 volt battery for operation. It comes complete with three separate motors which are used to operate different functions in the Gepard. One servo provides proportional speed control for forward and reverse direction. A second servo, by the use of two clutches, provides proportional steering control which allows the Gepard to make wide turns or to pivot. The third servo will operate the 360° revolving turret and also allow the anti-aircraft guns to move up and down. When the third channel operates and turns the turret, the radar antenna also revolves in a prototypical manner. Many of the hatch covers are hinged and can be manually opened and closed. The Gepard also features a suspension system, metal treads and an all metal gear transmission for realistic running. This tank is a true conversation piece and will also provide many, many hours of enjoyable operation. The list price for this model is $249.95. For further information, see your hobby dealer or contact Model Rectifier Corporation, 2500 Woodbridge Avenue, Edison, New Jersey 08817.

TWO CHANNEL RADIO

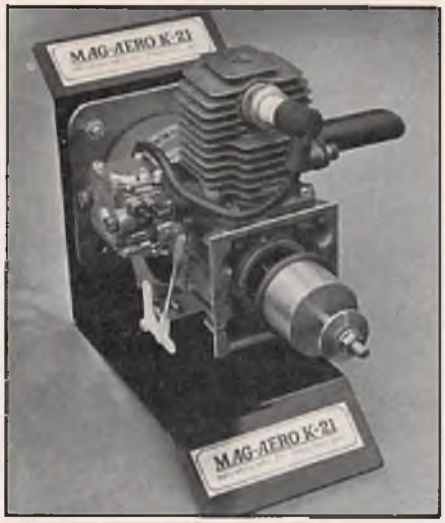
Peerless announces a new line of radio control equipment. The Astro GX202 ... a dependable, high quality digital proportional control 2 channel system suitable for use with planes, cars, and boats. Some features of this new system: Dual stick with rachet type trim controls, lightweight transmitter case with comfort contour, precision control gimbal sticks with positive neutral return, level meter to monitor transmitter battery output, interchangeable plug-in 27 MHz crystals, lightweight, powerful hi-torque servos, glass filled nylon servo cases and output arms, and 8 section telescoping transmitter antenna. Complete system available with 1 or 2 servos. Receivers, servos, crystals and repair parts available separately. For complete set of catalogs, send $1.00 to Peerless Corporation, 3919 'M' Street, Philadelphia, Pa 19124.

ELECTRIC PROPULSION MANUAL

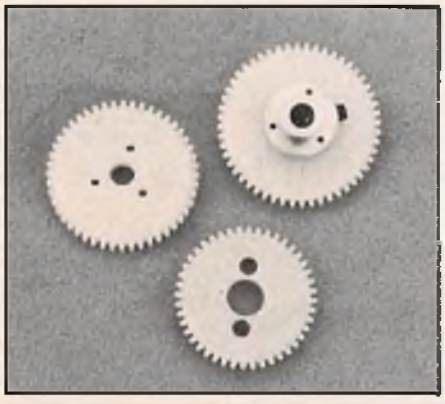
This book tells you everything you ever wanted to know about electric flight and many things that we bet you haven't even dreamed of yet. Over 100 photos and detailed drawings of models of every type and description that you can build and operate. Free flight planes, R/C planes, scale models, autos, boats, even manned electric planes and solar powered planes. Extensive references of successful designs and where to get plans. What kits are available to use with your motor. A list of electric articles in the leading U.S magazines. Do's and don'ts and other helpful hints. This book is a must for everyone who owns an electric system or is thinking about buying one. A bargain at $5.95. See your dealer or order direct from Astro Flight Inc., 13377 Beach Avenue, Venice, Calif. 90291.

NEW R/C AIRCRAFT ENGINE

A new ready-to-fly 21 CC radio controlled model aircraft engine, the Mag-Aero K-21 is being introduced by Mag-Aero Manufacturing Co. The Mag-Aero K-21 is intended for use on radio controlled model aircraft in the 15 lb. category, and extensive testng has been done with up to 19 lb. aircraft with excellent results. The Mag-Aero K-21 features heavy duty ball bearing main bearings and a double counter weighted crankshaft making the K-21 extremely smooth and almost vibration free. The



rear mounted ignition system is completely enclosed and shielded to prevent radio interference. The Mag-Aero K-21 has a suggested retail price of $169.95, and is in stock for immediate delivery. For additional information on the Mag-Aero K-21, contact Mag-Aero Manufacturing Co., P.O. Box 498, Freeland, Washington 98249.



COMPETITION GEARS

The Pipeline offers a pro class gear for the serious electric car competitor. This gear has the lowest possible friction coefficient that current gear technology offers. An instrument grade gear made of Virgin DuPont 501, that excels in improving a car's speed. Gears are available for any electric car using a 1/4" round axle and are fixture drilled for either the Thorp rear hub or as a replacement gear for the Associated Car. Available in 44, 48, 52 and 56 tooth gears with Thorp rear hub for $4.95; without hub $2.75. Gears can be ordered from The Pipeline, P.O. Box 1868, Fremont, Ca. 94538.

DREMEL MOTO-TOOL FINGER-GRIP

Dremel, a Division of Emerson Electric Co., Racine, Wisconsin, is introducing a new "Finger-Grip" for use

on all Dremel Moto-Tools. The Finger-Grip provides for better control and reduces fatigue while doing detail work. The new Dremel Model 616 Finger-Grip is comfortable to hold when in use, and is simple to snap on or off the Dremel Moto-Tool. It is perfect for any do-it-yourselfer or hobbyist who uses the Moto-Tool continously or does a lot of detail cutting or polishing. The Finger-Grip fits Dremel Moto-Tool Models: 381, 371, 281, 271, 761, and 245. Made of durable, shock resistant plastic, the attractive orange colored Dremel Finger-Grip No. 616 has a suggested list price of $1.10 and can be purchased wherever fine Dremel creative power tools and accessories are sold. For further information, write or call Dremel, Division of Emerson Electric Co., 4915 Twenty First St., P.O. Box 518, Racine, Wisconsin 53406. Phone: (414) 554-1390.

STINSON SR-6 KIT

G-S Products Corp., Box 488, LaGrande, Oregon 97850, (503) 963-6742, introduces a deluxe kit for the Stinson SR-6. It is designed to 1½" = 1', has a 62" wingspan, weighs 5½ lbs, and uses a .40 engine. The design features a removable wing with internal attachment and detachable interchangeable landing gear for wheels, floats, or skiis. Float kits are available. The Stinson Reliant SR-6 kit with coventional landing gear is priced at $89.50, with floats $114.50. Float kits with formed wire mounting struts are $28.50. From your hobby dealer or direct from the manufacturer.

ON-BOARD ELECTRONIC SYSTEM

From L & L Electronics, P.O. Box 13434, Albuquerque, New Mexico 87112, comes an on-board electronic system compatible with most one cyliner, point triggered, magneto type engines such as the Quadra. The system, designated EIS #301, offers benefits, over the magneto, such as easier starting, more power, lower idle and smoother operation. A design feature is incorporated to minimize radio interference and the use of CMOS devices has made possible a unique "Automatic Shutoff" capability. The circuit continously monitors the engine and, after approximately 55 seconds from the time the engine stops running, the battery is turned off, automatically. To reset the system, simply rotate the propeller at least one complete revolution. Maximum flying time with the system is approximately 4 hours. Instructions and a wiring diagram are included. The EIS #301 is available from your hobby dealer or order direct. Retail price is $24.95.

AERONCA C-2 BOOK

The second volume of "Famous Aircraft of the National Air and Space Museum" series, entitled The Aeronca C-2: The Story of the Flying Bathtub, has just been announced, following in the slipstream of Volume 1, Excalibur III, The Story of a P-51 Mustang. This profusely illustrated 125 page volume describes the introduction of the C-2, and its significance to the beginnings of general aviation in the United States. It further describes the development of this then popular airplane, and that of its two seated big brother, the C-3. Also included is a description and photos of many other light planes of what has come to be called the "Flivver Plane Movement," such as the Curtiss Wright

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7th ANNUAL MINT JULEP STAND-OFF SCALE MEET AND QUARTER SCALE FUN FLY

APRIL 28-29

Rough River Dam State Resort Park
Falls of Rough, Kentucky
70 Miles Southwest of Louisville.

Sanctioned A by AMA 17, sponsored by R/C Modeler, Fliteglas Models, R/C Sportsman, the Kentucky Department of Parks and the Southern Indiana R/C Modelers, and Scale R/C Modeler.

Awards include silver trophies through fifth place; merchandise, and special awards for highest-scoring contestants entering kits by Top-Flite, SIG, Sterling and Pica.

Rough River Dam State Resort Park, on 4,860-acre Rough River Lake, offers swimming, fishing, boating, tennis and miniature golf . . . lodge rooms, cottages, camping areas. A 2,500-foot paved airstrip is in the park. The airstrip will be closed to full-size traffic from 7:30 a.m. till dark, Saturday and Sunday. Land at the Hardinsburg airport and call the park on 122.8 or by phone, for transportation.

The entry fee is $10.00 if Pre-Registered or $12.00 if not. There is no entry fee for the scale fly-in, and all fees are payable at the field.

For information on reservations, write Rough River Dam State Resort Park, Falls of Rough, Kentucky 40119, or phone (502) 257-2311.

ENTRY AND PRE-REGISTRATION FORM
7TH ANNUAL MINT JULEP STAND-OFF
SCALE MEET AND QUARTER SCALE FUN FLY

Dale Arvin C.D.
3428 Charlestown Pike
Jeffersonville, Ind. 47130
Phone (812) 283-5719
Don Childers CO C.D.
Phone (812) 283-7638

Name _____

Address _____

City _____

State _____ Zip _____

EVENTS
STAND-OFF SCALE

( ) SPORT* ( ) EXPERT
*For contestants who have never placed 1st. or 2nd. in any AMA sanctioned stand-off scale contest of fifteen contestants or more.

( ) SCALE FLY-IN
(scheduled open flying, no fee)

( ) QUARTER SCALE FUN FLY
(fee same as sport-scale)

ENTRY FEE IS $10.00 if pre-registered and $12.00 if not.

( ) Do you plan to attend our Saturday Night Banquet.

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 Dremel 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. If you would like further information concerning the winning models, write to us giving us the winner's name and what month he won, and we will forward your letter on to the winner. For rules of Model Of The Month Contest, see the February 1979 issue.

MAY WINNERS

FIRST PLACE

Sven Corsak
E. Granby, Conn.

A scratch-built Cessna 177 Cardinal finished and detailed to duplicate a full size Cessna at a local airport. The model has a detailed cabin with seats, instrument panel, and controls. It has a 7' 6" span, weighs 19 lbs., and Quadra power. Features operating flaps, stabilators, and nose shock strut. Hobbypoxy finish over Super Coverite. Futaba 6 channel radio.

SECOND PLACE

Dale K. Nelsen
Fremont, Calif.

This TWA DC-3 was built from a Royal kit. At 7/8" = 1' scale, the model has an 88" wingspan and is powered by two K & B .40 engines with Perry pumps. It is finished with automotive primer and acrylic enamel. A 5 channel Futaba radio steers the Big Gooney Bird.

THIRD PLACE

Norman Miller
Listowel, Ontario, Canada

The famous Astro Hog, built from a Berkley Models kit, weighs 7 lbs., has a 72" wing span, and is powered by an O.S. .60 engine. Among the modern touches are the Super MonoKote covering and the Cirrus Super Sport Six radio. The kit was obtained from a collector as Berkley Models has long been defunct.

MODEL OF THE MONTH CONTEST HONORABLE MENTION

(NO PRIZES AWARDED)

FRANK ROALES
Vincennes, Ind.

EDWIN G. DAUCH
Huntington Mills, Penn.

W. CRAIG PARHAM
La Grange, Ind.

ERNEST T. VARILONE
Livonia, Mich.

MELVIN J. GAGNON
Perris, Calif.

LEE GAUTHREAUX
Oceanside, Calif.

LT. COL. EVERETT B. MOORE, JR.
Winter Park, Fla.

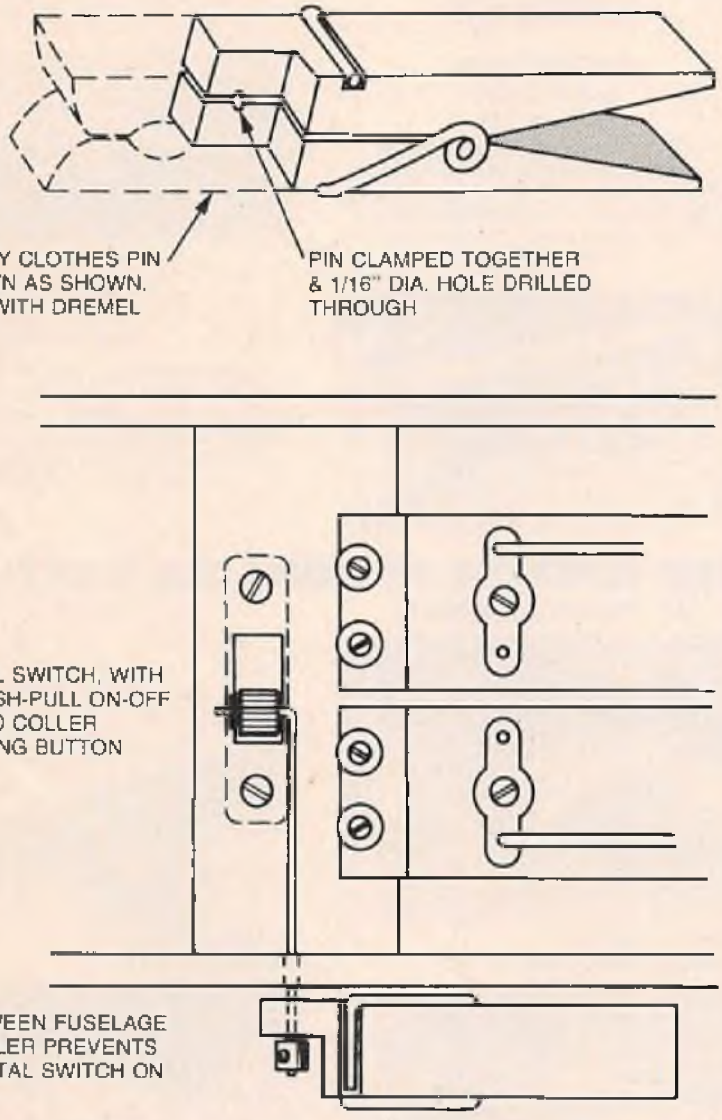
DANA W. McNEIL
West Chicago, Ill.

FRED L. SOUCHEK
Concordia, Kan.

TRANSPORTATION "SAFETY" WEDGE

By James D. Anderson

A great idea for a safety wedge for transportation purposes to prevent accidental switch-on of your aircraft



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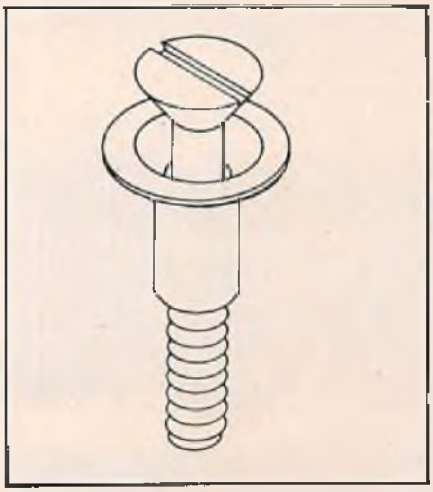
Junior, the Heath Parasol, and many others. While this book does not contain three views, it does contain many photographs and data invaluable to the prospective builder of a model C-2, as well as providing a tremendous amount of construction details. Very enjoyable reading about the early days of aviation and some of its personalities. This 8½ x 11 paperbound volume is priced at $4.95 and is available from its publisher, Smithsonian Press Books, P.O. Box 1641, Washington DC 20012. Future volumes in this series will cover the ME-262, the Lockheed XP-80, and the Albatross DVa.



FLUSH HEAD CAPTIVE WING BOLTS

At last! No more lost or forgotten wing bolts. Vortac Mfg. Co., P.O. Box 469, Oak Lawn, Ill. 60453, introduces these 2¼" x 20 nylon bolts that stay in the wing after it's removed from the fuselage. They may be easily removed if

VIKING

NOW with precision machine sanded ribs

A COMPETITION SAILPLANE

designed by

Tom Williams

Wingspan . . . . . .3 meters (118 in.)
Wing area. . . . . 120 in.^{2}
Flying Weight . . . . . Mark I, 52 oz.
Mark II, 54 oz.
Wing Loading . . . . Mark I 6¼ oz./ft.^{2}
Mark II 6½ oz./ft.^{2}
w/Ballast 17 oz./ft.^{2}
Mark I Airfoil . . . . 11½% Flat Bottom
(Craft-Air Windrifter)
Mark II Airfoil . . . . . .
. . . . . New 12% Semi-symmetrical

A NEW CONCEPT
***ONE* SAILPLANE DESIGNED**
TO BE THE *BEST* AT *ALL* TASKS
UNDER *ANY* CONDITIONS

VIKING

MARK I or MARK II

$79.95

THE VIKING IS MORE THAN JUST ONE GOOD SAILPLANE – IT IS TWO – THE VIKING MARK I USES AN 11½ % THICK FLAT BOTTOM AIRFOIL TO EXCEL IN THERMAL PERFORMANCE. THE VIKING MARK II USES A NEWLY DEVELOPED 12% SEMI-SYMMETRICAL WING TO EXCEL IN WINDY CONDITIONS AND IN SPEED EVENTS. THE KIT CONTAINS ONE WING (YOUR CHOICE) AND A **SPECIAL DISCOUNT COUPON** FOR THE OTHER WING.

Drifter II

a Competition Sailplane for only $19.95

"The easiest to fly R/C plane I have ever flown – but this is not just a trainer, it's a contest winner."

Designed by
TOM WILLIAMS

6 FOOT WING

Wing Span . . . . . .71½"
Wing Area . . . . . .573 sq. in.
Weight Without Radio . . . . . 9 oz.
Typical Flying Weight . . . . . 18 oz.
Wing Loading . . . . . .4.5 oz/ft^2
Airfoil. . . . . .Windrifter 11½% Flat Bottom

2 METER WING *

Wing Span . . . . . .78¾"
Wing Area . . . . . .635 sq. in.
Weight Without Radio . . . . . 10 oz.
Typical Flying Weight . . . . . 19 oz.
Wing Loading . . . . . .4.3 oz/ft^2
Airfoil. . . . . .Windrifter 11½% Flat Bottom

*material for 2 meter modification listed but not included.

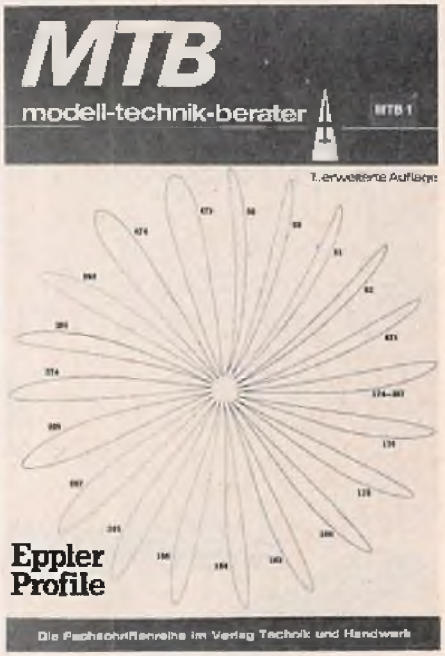
• machined parts • top quality wood • I beam spar • fuselage reinforced with plywood & triangle stock longerons • plans for power pod • and with all of the extra goodies, including . . . control rods . . . horns. clevises . . . hinges . . . tow hook . . . servo mounting material . . .
. . . absolutely nothing else needed except glue, covering, and radio.

Craft-Air, Inc.

20115 NORDHOFF STREET • CHATSWORTH, CALIFORNIA 91311 • (213) 998-3700

from page 90/84

desired. Aircraft type flush head bolts means no more unsightly bolt heads sticking out of the wing. Easily installed in the airplane you're now flying. The nylon bolts may be cut to any desired length and the large contact area eliminates crushing. Complete 6 piece wing mounting set includes: 2 bolts, 2 sleeves and 2¼" x 20 blind nuts. See your dealer. Suggested retail price, $1.69.



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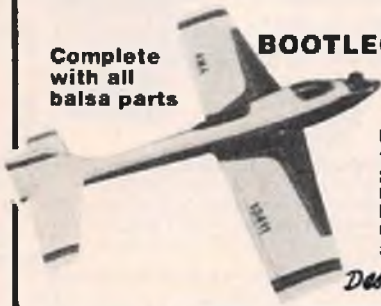

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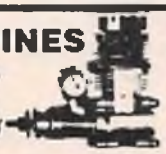

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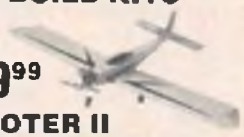

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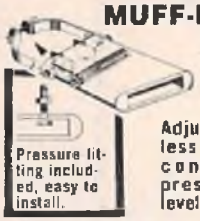

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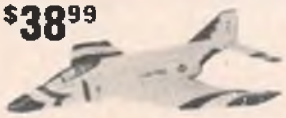

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THE HOBBY MARKET

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counterpart. There is some text for which a knowledge of the language would be nice, but the charts, graphs, and airfoil profiles in various chords are the same in any language. An invaluable guide for the model designer interested in the use of these popular wing sections. Also from the same source, there is available a modeler's dictionary, a 272 page "Modelflug Lexicon" for which most of us would need yet another dictionary, but which would be just the thing for the German speaking modeler, especially the beginner who is unfamiliar with the language and terminology of our hobby. This profusely illustrated encyclopedia-like manual covers and describes everything from A1 Free-Flights to Zylinders (even **we** know what those are). No English; recommended for German readers only. Both books, as well as a number of other modeler's publications in German, are available from Verlag fur Technik + Handwerk, Fremersbergstr. 5, 7570 Baden Baden, West Germany.

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COYOTE

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. . . . the area of the wing attaching screws we used a double thickness of nylon. In order to get an accurate match between the wing halves, we cut off a short piece of the foam saddle and used it as an alignment jig. The halves were joined upside down so that the top of the wing is straight. This gives about 1/4" dihedral at each tip.

The stabilizer and fin are made from 3/16" medium balsa. The pre-cut shapes are nicely machined and the wood is of good quality. We assembled the pieces with Pica "Gluit" and reinforced the center joint in the stab with nylon tape although this is not called for in the instructions and probably isn't necessary.

The wing and tail were covered with Super MonoKote — orange on the top and dark blue on the bottom. Orange, dark blue and white Top Flite Trim Cote

were used for final trim.

The fuselage is a one piece, rotational molding of a medium density cross-linked polyethylene trade named "Dura-Lene." It is an opaque white which can be painted. The manual gives instructions for the proper surface preparation. We painted the canopy only on our prototype. The nose decoration is Trim Cote.

A unique feature of the "Dura-Lene" fuselage is the one year guarantee it carries. Break it and Bob Martin will replace it. It is literally tough enough to be used as a softball bat.

This review was skeptical about successfully attaching the stabilizer and the servo mounting to the polyethylene fuselage with epoxy, but found that by following instructions, good joints could be achieved. Our RCM prototype has made several javelin type contacts with the ground (crashes?) without knocking the tail off. The elevator servo mount did come loose once when the plane hit at 30-40 mph. It was epoxied back in place and has stuck ever since.

The fuselage used on our prototype was one of the first off of the mold and was heavy, particularly in the tail end. This, plus the lead added in the nose for balance, resulted in our prototype being 6 to 8 oz. heavy.

We found that placing the C.G. 15" back of the nose per the instructions resulted in a "squirrely" airplane. Our prototype flys best with the C.G. at 14¼" back of the nose.

No control surface deflections are given in the instructions. We suggest that both elevator and ailerons be initally set with no more than 1/4 up and down movement. Once you have the feel of the plane, increase the deflection to whatever suits your style. We are now flying our prototype with 5/16 up and 7/16 down on the elevator and 7/16 up and down on the ailerons.

The Coyote will fly slowly in relatively light lift but it must be flown with a gentle touch. In low speed straight ahead flight, the stall is sharp and considerable altitude is lost. However, there is little tendency to drop a wing. If it is stalled in a turn, both the nose and inside wing drop sharply. Low speed turns into the hill just don't work out. This reviewer tried it — splat.

When the lift is good, feed in the down trim and have some fun. The Coyote will fly fast and it goes where it is pointed. You will find that it must be flown into and out of each maneuver.

Our RCM prototypes performed the following maneuvers: loops, Immelmans, split esses, spins, barrel rolls — and with lots of speed — axial rolls and outside loops. Inverted flight is good, and in good lift it will climb inverted. In smooth air the plane is stable about all three axes. In turbulent air it has a tendency to yaw. In rolling

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If you live in or near one of the cities or towns listed on the left, it may be more convenient for you if a World Engines dealer was in that location. If you know of a hobby dealer or a hardware and paint store that sells model airplane products, we would like to have their name and address. Given this, we will send said dealer the World Engines catalog, price lists and a World Engines dealer application.

Where did we get this list of towns and cities? Our Madge Patrick carefully spotted all of our dealers on a Rand McNally Road Atlas. To the left is a list of towns and cities in which World Engines does not have an active hobby dealer. Actually, World Engines is servicing about 3500 dealers scattered all over the United States. Most of the major urban areas in the United States do not appear in the list on the left, which says something for the continuing growth of the World Engines distribution system.

World Engines is the exclusive distributor in the United States for the OS engines, R/C systems and live steam trains, Supertigre engines, and World Engines Expert R/C systems and World Engines kits. We have pride in these products; but, we are not too proud to ask you, the customer, for some help in locating some good hobby dealers in an area where we do not have one. Also, we hope that our dealers will know that we are not soliciting new dealers in areas where we are being served by our present organization.

John Maloney

Pictured above are some of the exclusive products available from World Engines. The Expert Dual Stick is a successful competition radio. Mr. Mulligan, manufactured by World Engines, is a sport, 3-channel airplane. The OS 45 Marine is a popular engine among racing boat enthusiasts. Shown immediately above, is Supertigre's latest entry into the Schnuerle ported, large pattern type engine — the ST X-60 side exhaust.

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COYOTE

from page 97/77

maneuvers there is a slight yaw toward the down wing side. We tried adding a 1" wide strip to the aft end of the fin. This increased area seems to have eliminated the yaw.

In our initial flight tests of the Coyote, the roll rate was rather slow. We sealed off the aileron hinge gap with MonoKote and got a much faster roll. Now with enough speed, the Coyote will do a very nice axial roll.

A competent glider pilot who has had experience flying with ailerons (either power or glider) will have no difficulty flying the Coyote.

So, if you are bored with elevator, rudder floaters, try the Coyote. You'll add challenge and zest to your flying. And, if you do have a wipe out, you can still use the fuselage for batting fungos to your kid □

CESSNA 150

from page 76

. . . . plywood plate and then screwing the plate to the hardwood bearers were not justified by the end result.

The tail surfaces are 3/16" balsa except for the built-up horizontal stabilizer. This helped keep the front and rear in harmony as the Center of Gravity came out on the button.

Hardware included landing gear, nose steering items, horns, and assorted small parts. The nosegear does not have the axle pre-bent. This is a bit of a job to do and the kit could easily have contained the usual pre-formed gear.

White MonoKote was used throughout with red MonoKote trim accented with black edging. Balsarite was used prior to covering to encourage the MonoKote to stay put. An O.S. Max .25 was used to keep the power low and the flight characteristics realistic. A larger engine isn't necessary and would cause the model to fly less realistically.

Flying the aircraft can be summed in one word — easy. Even with relatively large amount of rudder and elevator travel, the Cessna 150 refuses to let the pilot get himself into trouble, unless he absolutely demands it. Slow passes are really slow and, although the .25 engine limited climb possibilities, the usual 3 channel aerobatics are possible. This airplane will fly slowly enough to give a beginner a chance to think before needing to act while still remaining solid on the sticks. This reviewer highly recommends the 150 as a 3 channel trainer since it combines two strong assets: a good flyer and a good looking trainer. □

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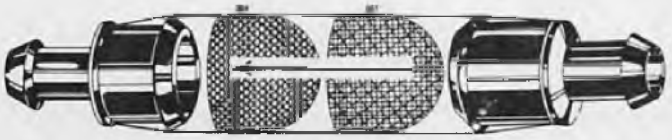

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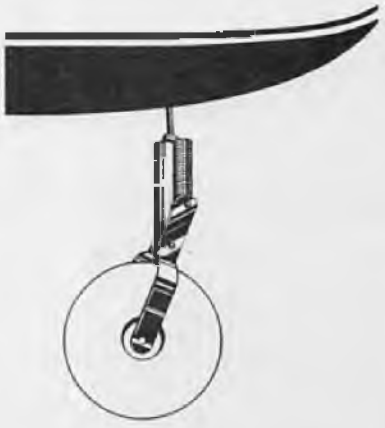

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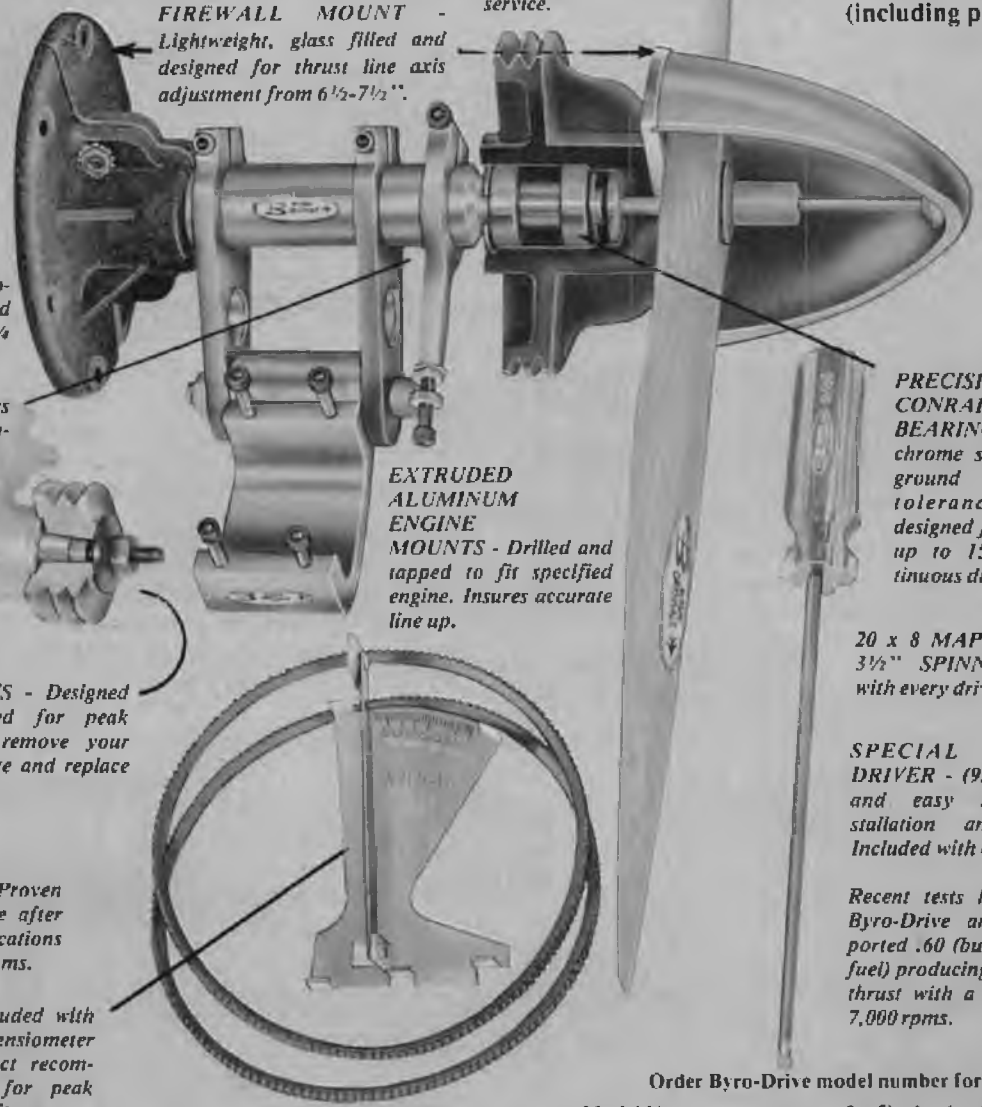

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EZ SPORT

from page 73

. . . supplied support for the OS .35 engine which, in turn was supplied fuel from a 6 oz. Sullivan slant tank. We covered EZ Sport with red and yellow EconoKote, and sparkled it up with DJ trim tape. Adhesives included Sig 15-Minute Epoxy, and Glu-it.

Out of the hangar and onto the field we found that ground handling was a hair touchy, but immediately improved by extending the tail wheel approximately 1" over that shown on the plans. We sealed the fuel tank access hatch with silicone sealant so fuel wouldn't soil the interior. About the only other modification we found necessary was the reduction of elevator throw in order to decrease sensitive reaction to this control. This was one of those "personal preferences," and you may find it is not needed. EZ Sport flies fast, goes where you point it, and stays there until you tell it otherwise. The model doesn't know right side up from upside down. No trim change was required for inverted flight.

Flite Line Products advertises EZ Sport as a versatile fun fly plane, perfect for knock around sport flying. We found Flite Line's advertising is like the EZ Sport ... that is, right on! □

PEGASUS

from page 72

. . . . silver Solarfilm with black ID panels on the bottom of the wing. The model was powered with a TD .049 using a 6/3 gray Cox prop and a Sullivan SS2 tank. Glu-it was used throughout except for high stress areas such as the firewall and wing center section where 5-minute epoxy was used.

We used an Ace Digital Commander with micro servos for control juiced by a 450 ma battery and would have had ample room for installation of 4 channels if we so chose. Although the instructions covered use of an optional landing gear set-up, we kept the belly clear and chose instead to hand launch our take-offs.

The one ounce tank gave more engine run than was required to test Peggy's gliding abilities. We were forced to stooge around with loops and slow rudder rolls and even inverted flight to keep the model within visual range.

With the rate of climb built into the wing, the length of the engine run and the size of the model, we are sure she would have gone OOS very easily. The fun of this airplane, as we built it, really starts after the engine quits. From that point on it really shows its ability to use the slightest up draft. The glide is slow and flat and yet with surprisingly good

to page 106

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PEGASUS

from page 104/72

penetration. Control response was good in the glide without being touchy under power and, with practice, we feel that catch landings can be done consistently.

All in all we like the kit and the resulting model, probably because it is easy to build and relaxing to fly. For these reasons we recommend it to anyone wanting a just plain fun airplane. □

BIG IS BEAUTIFUL

from page 69/68

material used, 200 pound test "C" flute corrugated cardboard was his choice of material. The model has a 100" span and a 20" chord and Keith says, "It was very cheap to build." The cardboard fuselage was covered with Solarfilm and the finished weight on the bird was 20 pounds, flown off a Quadra with EK radio. When Keith's letter arrived it mentioned 42 flights to that time and the model loops, hammerheads, tail slides and flies inverted (short distances) on three channel control. Unfortunately the photos Keith sent along were a bit too lacking in contrast to reproduce well, but here's another guy who has tried cardboard construction in a big bird and has been pleased with the results. I'll bet there are all kinds of materials no one has thought to try yet, just waiting to be flown.

Well, troops, that's all for this month; stay tuned, as they say, more next issue in the wonderful world of Big Is Beautiful. □

P-51D MUSTANG

from page 67

. . . . primer and wet sanded between coats. The final color was then applied by spraying on about 6 coats of Pactra Formula "U" flight aluminum. This paint really gives a super finish that goes on easy, cleans up easy, and looks great. All this and it lasts as good as anything tried by this modeler to date.

The kit comes complete with two full sets of decals and three-view sketches with trim details for both the candy man version and the military version which we decided to use.

The radio gear was moved around so the model balanced at the point called out on the plans, so no weight was required for balancing. With everything ready to go, the big day came when it was time to fly our P-51. Our first attempts to fly the P-51 were on a grass

to page 110

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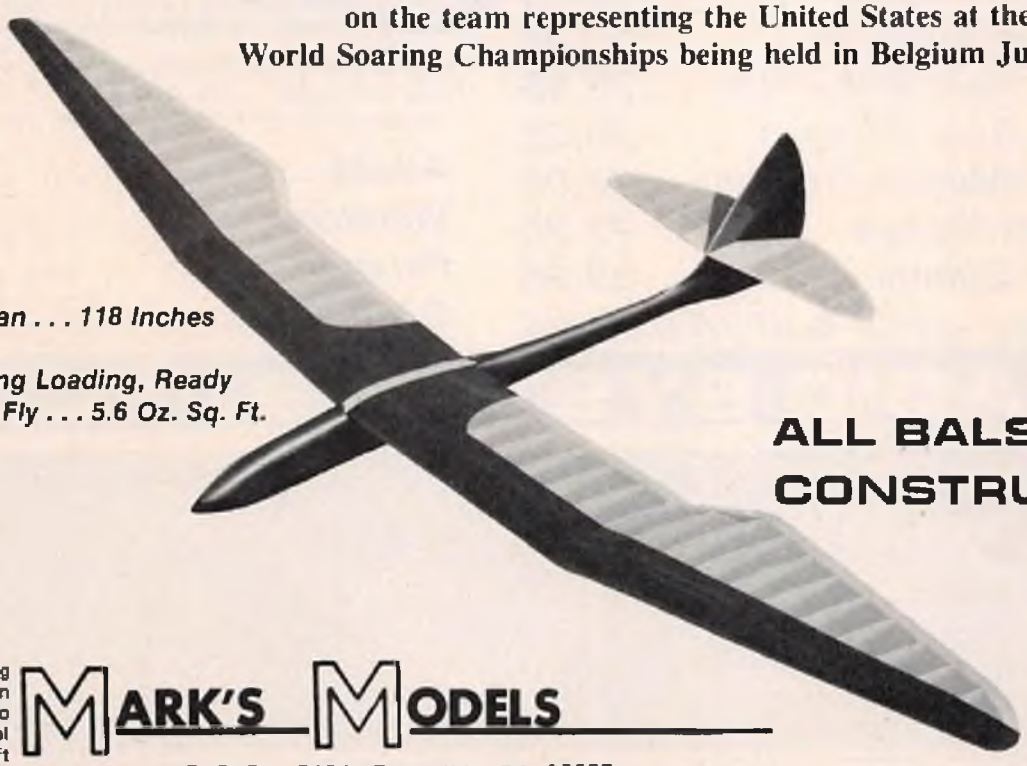

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P-51D MUSTANG

from page 106/67

field, but the grass was just a little too high so we moved over to the hard surface alongside and off we went.

The model takes off at about 1/2 to 3/4 throttle with very little rudder correction for torque. After it's up a bit, full throttle and full throttle trim, and up come the gear. Man, what a beautiful bird! The flight characteristics of this model are, in the opinion of this modeler, great. The model is very responsive, but not overly so. With the O.S. .40 up front, this airplane really moves out, but when it comes time to land, it slows down to a reasonable landing speed. With the throttle cut to idle and the trim set to full slow, down come the gear and you're ready to set up for the landing. Be careful on the first few landings not to over-shoot the field. Although our model came out with a rather high wing loading it doesn't seem to hamper its flying ability which says a lot for the design. The only problem that I encountered with this fine model, is that the joint area where the turtle deck and nose block meet, has a crack completely across the joint. Other than this minor situation the model was great. □

MIXING THE R/C HELICOPTER

from page 66/64

the descent curve. To do this we must take a look at the descent. From your normal landing approach to hover, note which way the nose goes with hands off the tail rotor. If the nose goes left, we need less mix on the descent curve. If it goes right, we need more. (More is a larger "y" on the **descent** curve, from half throttle to idle.) If you are a beginner who hovers, the descent curve is from a hover to a landing.

Refer again to Figure 5. Based on the assumption that moving from one hole to the next closer (18 aht to 19 aht, for example) gives us a relatively small change in mix, we could move from hole 18 aht to hole 19 aht if the nose was going right on landing approaches. This gives us a slightly larger descent curve, from hole 19 aht to hole 16 ai. It also gives us slightly less mix on ascents (19 aht to 22 aft), so the nose might have a tendency to go slightly right on a vertical climb-out. But overall, we now have a better mixed helicopter.

Now that you have looked at most situations for trimming the mix, you can now take full advantage of how you want your helicopter mixed. It is not necessary to mix ascents first; descents could be mixed before ascents if so

to page 112

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MIXING THE R/C HELICOPTER

from page 110/64

desired. A compromise approach is not necessary either. If you wish, you can mix ascents perfectly, and let any "error" be in the descents, or vice versa.

Hopefully, a good understanding of mixing has been achieved. It may be necessary to re-read the article and clear up any hazy areas. If possible, it is best to memorize the corrections needed for your particular helicopter, then when you fly the next time you can check ascents and descents without referring to the article while at the field. It is a lot easier this way, and with some practice you will be able to perfectly mix your helicopter to your own tastes in one tank of fuel.

Most important, understanding your mix makes flying helicopters easier and more enjoyable, a goal I believe we are all aiming for. □

SIMPLE SUNDAY SEAPLANE

from page 60/58

to fit. Note that the design calls for only one axis of curvature, so a flat sheet can be fit over the front and back blocks, then held in place with small wood screws. No, it's not waterproof, but unless you really screw up your landing, water doesn't get in there

Fuselage: The fuselage is the old familiar slabsider, with a nose block up front and tailpost at the rear, with 1/8" longerons running the full length. Top, bottom, and side sheeting is all 1/16" balsa, and formers are made from 1/8" balsa sheet. The wing cradle structure, using trailing edge stock front and rear, and 3/16" x 1/4" sides, gives a strong base to hold the wing on, using wing seating tape and rubber bands to pull the wing down tight.

The radio installation shows a Cannon Super-Mini Block, and the mounting rails are tailored to fit. Access is provided without having to remove the wing by means of the hatch, which is held in place by a small rubber band. When flying off water, rub some Vaseline around the edges of the hatch to repel water which sprays up from the floats on take-off.

The canopy is strictly cosmetic. It is cut from a commercial 8" plastic canopy, and painted on the inside, either black or silver, whichever suits your taste. The float mounting dowels rest on top of the bottom longerons, and the wing mounting dowels are inserted just below the top longerons.

Tail Surfaces: All tail surfaces are cut from 1/8" sheet balsa, grain running as shown. Round off the edges, install hinges, and then control horns. The tail wheel wire is simply epoxied to the side of the rudder, and the tail wheel serves double duty as a water rudder, and works very well for that purpose. When you run the flexrods out to the control surfaces, fill the holes where they come out of the fuselage with epoxy.

Floats: The floats are a simple box structure with 1/16" sheet sides, top and bottom, and rectangular 1/8" formers. The nose block and tail block inserts are rounded to shape and the floats are finished.

The crossbraces of 1/8" x 3/4" plywood are glued right to the top of the floats, and the edges rounded to give a streamlined appearance. Note the little alignment blocks which are glued to the crossbraces so the fuselage is cradled between them and stays in place.

Optional Landing Gear: The small Hallco landing gear can be strapped on to the forward mounting dowels for the floats, replacing the floats for landplane flying. Surprisingly, the model tracks very well with the landing gear that far forward.

Finishing: In covering and finishing the model, the choice is yours. Personally, I used transparent MonoKote on the wing, then spray

to page 114

Pioneers

Pioneering major developments in radio control is second nature to us; it's the way we started. Back in 1959, a Kraft single channel receiver was introduced, the first of its kind. Simple as it may appear today, it far surpassed in performance and reliability anything then available. In fact, it was immediately put to the test by many leading contestants in the 1960 R.C. Nationals.

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KRAFT SYSTEMS, INC.

SIMPLE SUNDAY SEAPLANE

from page 112/58

painted the fuselage and floats with Aero-Gloss. To me, that was the easy way to do it. Just be sure that no bare balsa is exposed to the water. It's a good idea to coat the inside of the fuselage with clear dope, too. You're bound to dunk it at one time or another, and that will keep the balsa from soaking up water and swelling.

Flying: The Simple Sunday Seaplane is as easy to fly as it is to build --- easier, in fact. Set up the linkages to the control surfaces so they travel about 1/4" in either direction, be sure the C.G. is properly located, fire up the engine and adjust for a good full throttle two cycle run. Run it down to idle, set the SSS in the water, take a deep breath, taxi it out, head into the wind, push full throttle, hold neutral elevator, and then, when the model is on the step and gathering speed, gently feed in a slight amount of up elevator. Let it fly itself off the water; don't try to "horse" it off, or it will probably break loose on one float, spin around on the other, and stop. If you're lucky, and the engine is still running (usually water sprays up when this happens and kills the engine) you can reduce throttle, get lined up, and start over.

No flying in salt water, please! Unless you want to chance losing your receiver and servos. Corrosion sets in immediately if they get wet. Fresh water will short things out, but it has been my experience that if you retrieve the model after a fresh water dunking and blow it as dry as you can, then let the radio dry in the sun, no harm is done, and you can fly again in a half hour or so.

The Simple Sunday Seaplane is one of the best flying 1/2A models I've flown, either as a landplane or a seaplane.

Build one, and tell me if you agree. I think you will. □

XR311

from page 57

....Getting further into it we found that the manual was divided into two sections: Step 1 to 25 was concerned with chassis assembly, and Step 26 to 35, the body. **Each** and every one of these 35 steps is beautifully illustrated with some of the cleanest, sharpest exploded view drawings we have seen in a long, long time. And with each drawing are explanatory notes. Just to make all you bi-linugal fans happy, the notes are in German as well as English. We can't vouch for the German, but we can tell you that the instructions in English are, without exception, exact, concise, and leave no

to page 118

DREMEL

Yes! I have the whole Dremel line in stock. Order what you want or what you haven't been able to purchase at your local hobby shop. My catalog shows all the items with their discounted price. Listed are just a few of the larger ticket items.

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217	Foot Speed Control	16.95
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245	Moto-Tool Kit	23.95
260	Moto-Tool	25.95
261	Moto-Tool Kit	31.95
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370	Moto-Tool	31.95
371	Moto-Tool Kit	37.95
380	Moto-Tool	37.95
381	Moto-Tool Kit	41.95
571	Moto-Shop	44.95
572	Deluxe Moto-Shop	61.95
573	Moto-Shop Accessory Kit	16.95
701	Deluxe Moto-Lathe	39.95
796	Dremel Shoe Polisher	41.95
2217	Moto-Tool Holder & Base	9.95
220	12 Pc. HS Cutter Set	22.95
240	24 Pc. HS Cutter Set	45.00
500	6 Pc. HS Router Bit Set	17.95
9900	12 Pc. Carbide Cutter Set	45.00
990801	Repair Kit for 270, 280, 370, 380	4.00

DREMEL
NO. 580
4" Tilt Arbor
Table
Saw

PATTY'S Price To You
$ 61.95

PREPAID FREIGHT VIA UPS IN THE 48

All of this in less than 1 square foot of space. Light weight approx. 13 lbs. easily portable, but may be bolted down to a work board or another portable work surface.

Ideal for the apartment dweller, or anyone who does not have the room for a standard size saw. Customers who have complete shops are buying them just for the .046 thickness of the blade. This is a big help in working with expensive modelers wood or veneers.

This little gem will cross cut up to 1" thickness, can rip to 1" thickness with self-aligning rip fence. Bevel cuts to 45° — up to ¾" stock and mitre cuts to 45° on right or left. Can cut morlise and tenor joints compound angles to 45°, chamfers to remove slivered edges and can even cut tongue and groove joints with ease.

You must see this to believe it — the work this little saw can do will amaze you. Blade tilts and locks, also adjustable height with controls up front. Orange blade guard covers all angles for safety, plus anti kick back pawls. Bag or vacuum may be attached to saw dust chute for a cleaner work area.

580	4" Circular Table Saw w/Comb. Blade	61.95
8003	Combination Blade 30 Teeth	4.00
8004	Combination Blade 100 Teeth	4.00
8014	Sawdust Bag Attachment	4.00

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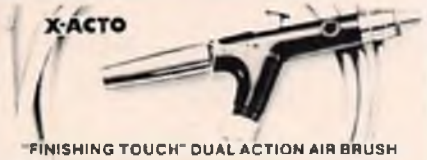

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X-8010	Finishing Touch	19.97

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HS211	Hobby Sprayer Complete	34.95
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HS-201	Compressor only from 211	27.95
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HS-410	Compressor & Bleeder Valve	48.95

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Ideal for air brush use, plus many other uses around the home, garage or work shop. An economical, portable outfit that delivers a constant, steady supply of air. Five-gallon steel air storage tank holds ample air for home, farm and small shop use. Nicely balanced with handle for carrying. Easily stows in car trunk. Oilless diaphragm type compressor is built for rugged service. Permanently sealed ball bearings never need lubrication. Motor and compressor built as one unit. Complete with air shut-off cock, pressure switch set at 30-45 PSI, 10 ft. air hose and tire chuck. No. 331 multi-purpose spray gun uses 1 qt. cup or 2½ gal. paint tank.

Air delivery 2.4 CFM at 30 PSI, 4.2 CFM air displacement, 50 PSI safety valve setting, ¼ in. IPS thread, 1/3 H.P. 110V 60 cy. AC motor. 21x9x19 in. overall. 10 ft. cord.

ST-370	Porto Tank Spray Outfit	118.95

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I now stock the line of Paasche Air Brushes and Sets. See my catalog for complete description.

FASTEST SELLING NEW KIT WE'VE EVER PRODUCED!

Designed By Claude McCullough

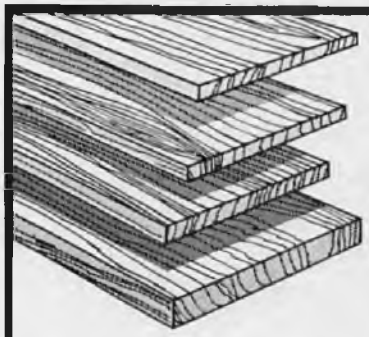
Kavalier

WITH DIFFERENTIAL AILERONS AND WING WASHOUT FOR SUPERIOR STABILITY AND CONTROL

Within six months of its introduction, the Kavalier had climbed to the No. 2 spot in our kit line and was still going up. Looking at our letter file, full of such comments as "flew right off the board, "outstanding performance" and "great stability," we can understand why. Here, for example, are some exerpts from a long and enthusiastic letter from Clayton M. Bergman, (USAF retired) of Friendswood, TX: "A few months ago I bought the first Kavalier kit sold by Clear lake Models in Clear Lake City (Houston). It was the most beautiful kit I ever bought. Everything in it was of excellent quality. . . . . I built the Kavalier and entered it in our club (Manned Spacecraft Center Radio Club) monthly meeting where plane of the month is awarded a small trophy. I covered it exactly like your picture and it was pretty if I do say so. I won the little trophy of which I am very proud. . . . . I for one know that when I buy a Sig kit I am going to get quality." See your friendly Sig dealer and join the growing crowd of Kavalier fliers!

55-1/2" Wing Span
For .29 - .40 Engines

SIG KIT RC-39 **$44.95**



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New!

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BW-001 1/32" x 1/16"	08
BW-002 1/32" x 1/8"	09
BW-003 1/32" x 3/16"	11
BW-004 1/32" x 1/4"	13
BW-005 1/32" x 5/16"	15
BW-006 1/32" x 3/8"	18
BW-007 1/32" x 3/4"	26
BW-008 1/16" x 1/16"	08
BW-009 1/16" x 1/8"	09
BW-010 1/16" x 3/16"	11
BW-011 1/16" x 1/4"	13
BW-012 1/16" x 5/16"	17
BW-013 1/16" x 3/8"	20
BW-014 1/16" x 3/4"	28
BW-015 3/32" x 3/32"	11
BW-016 3/32" x 3/16"	13
BW-017 3/32" x 1/4"	14
BW-018 3/32" x 3/8"	20
BW-019 3/32" x 3/4"	30
BW-020 1/8" x 1/8"	11
BW-021 1/8" x 3/16"	13
BW-022 1/8" x 1/4"	12
BW-023 1/8" x 5/16"	20
BW-024 1/8" x 3/8"	21
BW-025 1/8" x 3/4"	33
BW-026 3/16" x 3/16"	15
BW-027 3/16" x 1/4"	18
BW-028 3/16" x 5/16"	21
BW-029 3/16" x 3/8"	23
BW-030 3/16" x 3/4"	38
BW-031 1/4" x 1/4"	19
BW-032 1/4" x 5/16"	23
BW-033 1/4" x 3/8"	28
BW-034 1/4" x 3/4"	43
BW-035 5/16" x 5/16"	29
BW-036 3/8" x 3/8"	33

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BW-051 1/16" x 3"	80
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BW-053 1/8" x 3"	90
BW-054 3/16" x 3"	95
BW-055 1/4" x 3"	1.05
BW-056 3/8" x 3"	1.25
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BW-058 1/16" x 4"	1.05
BW-059 3/32" x 4"	1.15
BW-060 1/8" x 4"	1.25
BW-061 3/16" x 4"	1.30
BW-062 1/4" x 4"	1.45

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BW-076 1/2" x 1-3/4"	30
BW-077 7/8" x 1-3/4"	60
BW-078 7/8" x 2-3/4"	70
BW-079 7/8" x 3-3/4"	95
BW-080 1-3/4" x 1-3/4"	85
BW-081 1-3/4" x 2-3/4"	1.40
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BW-083 1-3/4" x 4-3/4"	2.55

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BW-092 7/8" x 1-3/4"	1.15
BW-093 7/8" x 2-3/4"	1.40
BW-094 7/8" x 3-3/4"	1.90
BW-095 1-3/4" x 1-3/4"	1.60
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Designed by Maxey Hester

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KIT KBRC-4

CESSNA 150

Designed by Hank Pohlmann

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Designed by Maxey Hester

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Designed by Claude McCullough

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KIT RC-34

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WING SPAN: 51"
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BALSA RIB CONSTRUCTION WING WINGSPAN: 56"

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KIT RC-26

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ENGINE: .60
WING SPAN: 64"
FOAM CORE WING

KIT KBRC-1

SUPER CHIPMUNK

BALSA RIB CONSTRUCTION WING
WINGSPAN: 72"

Designed by Maxey Hester

RC-27

RYAN

ENGINE: .60

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ENGINES: .40 TO .45

KIT RC-38

MINIPLANE

$54.95

Designed by Mike Gretz

BALSA RIB CONSTRUCTION WINGS WING SPAN: 44"

PLAN TO ATTEND SIG'S INTERNATIONAL MINIATURE AEROBATIC CHAMPIONSHIPS FOR AEROBATIC BIPLANES AND MONOPLANES - JUNE 16 & 17, 1979

SIG FIELD Montezuma, Iowa
(1-1/2 Miles South on U.S. Highway 63)

5 EVENTS: CONTEST OPERATION BY DES MOINES MODELAIRES

BIPLANES - SPORTSMAN CLASS *

BIPLANES - ADVANCED CLASS *

ANY BIPLANE MAY ENTER, BUT 10% BONUS FOR SCALE TYPES.

MONOPLANES - SPORTSMAN CLASS *

MONOPLANES - ADVANCED CLASS *

SEE MONOPLANE REQUIREMENTS AT RIGHT.
* BELOW 11 LB. WITH .61 CU. IN. ENGINE OR LESS.

SPECIAL ADDED EVENT FOR MAMMOTH SCALE AEROBATIC MONOPLANES AND BIPLANES COMBINED - OVER 11 LB., ANY SIZE ENGINE, MUST BE SCALE TYPES.

AMA SANCTION #222
NO ENTRY FEE
PRIZES FOR ALL CONTESTANTS

Full-Size Aerobatic Demonstration by the SIG MINI AIR FORCE - SUNDAY NOON!

For More Information, Contact:

Maxey Hester, Contest Director
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PH:515-623-5154, 623-5157 or 623-2194

MODIFIED 1977 AMA/IMAC RULES WILL BE USED

120 DEGREE AEROBATIC ZONE

SPORTSMAN CLASS SEQUENCE

1. INSIDE LOOP
2. ONE ROLL
3. ONE SPIN
4. HALF CUBAN EIGHT
5. IMMELMAN TURN
6. HALF REVERSE CUBAN EIGHT
7. ONE INSIDE SNAP ROLL
8. SQUARE INSIDE LOOP
9. ONE FREE STYLE MANEUVER
10. PRESENTATION

ADVANCED CLASS SEQUENCE

1. 45 DEGREE CLIMBING SNAP ROLL
2. HAMMERHEAD
3. REVERSE SPIN - ONE TURN EACH WAY
4. OUTSIDE LOOP
5. SLOW ROLL
6. INSIDE LOOP - SNAP AT TOP
7. KNIFE EDGE FLIGHT
8. 4 POINT ROLL
9. TWO FREE STYLE MANEUVERS
10. PRESENTATION

Monoplanes must be a stand-off or full-scale copy of an aerobatic aircraft that was designed for and flown in full size competition aerobatic "box". Contestants must furnish proof of the aircraft's identity and connection with full-size aerobatic competition.

* SPECIAL NOTE: Pilots who have placed in the top 10 of the sportsman class at the 1978 SIG contest, are urged to enter in the advanced class this year.

SEND A SELF-ADDRESSED, STAMPED ENVELOPE FOR A COPY OF THE RULES THAT WILL BE USED AT THE CONTEST.

from page 114/57

questions about what they were saying.

We were a little apprenhesive about some of the more complex portions, but, for example details regarding assembly of the gear case and integral rear suspension was combined with the motor mount unit, and proved to be a pleasure to put together. Incidentally, at this stage, a choice of gear ranges can be made, depending on proposed operations. There is a "fast" gear for racing, a "medium" gear for running on rough surfaces, and a "slow" gear for practice.

A word here about the motor and power requirments are definitely in order because, as we found, there is a direct link between the **type** of battery used, and the gear ratio chosen. The power plant furnished in our kit was a Mabuchi RS540 motor, 6 volts, 1.7 amps, with a rated 10,700 rpm. Batteries are not furnished but a choice of three types is suggested: a single 5-cell nicad 6 volt, 1200 mah (recommended), or 4 C-cells (dry), or 4 C-cells nicad. The car will run well with either power source . . . the single 5-cell nicad, or the 4 C-cells, but the proper gearing must go along with the power choice. XR311 is quite happy with any of the three gears mentioned: fast, medium, or slow speeds when using the single 5-cell nicad, but will tolerate the slow gears only, if the 4 C-cell power package is selected. You pays your money and you takes your choice.

Lest you think this is a little snap together plastic toy, let us set your mind at ease. The body is made of high-impact polystyrene (and beautifully so, we might add). The chassis is pre-formed dural with all necessary folds, bends, notches, grooves, and holes (square and round) already present when we unpacked it. This particular part is, quite literally, the backbone of the model. It is on this unit that just about everything in the car is bolted to, clips on, or otherwise depends. To it is mounted the front suspension, front underguard, rear suspension, motor, batteries, servos, receiver, receiver battery, and, of course, the body. When we say all the folds, bends, and holes were already in the chassis, we not only say it, we say it gladly. No folds to fold, bends to bend, or holes to drill on this little jewel.

So, once the suspension, body, wheels, and radio gear are aboard we are ready to go, right? No way. This vehicle goes first cabin. By that we mean take another look at the manual, because there are still things left to be done. Like the assembly and painting of

to page 120

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from page 118/57

our life-like scale driver who, by the way, is clad in the latest XR311 uniform complete with crash helmet and combat boots. Ready to go now? Not quite. Would you believe we still have: three front seats complete with sub-assemblies, steering wheel, gear selector lever, 4-wheel drive lever, fire extinguisher, headlights, side view mirrors, rear view mirror, windshield wipers, windshield glass, top, two jerry cans, and rear bumper complete with pintle hook to install? Yeah, we do, and we did. And we haven't even mentioned painting. If you think all of this sounds like good stuff, you couldn't be more right. The pleasure that assembling a kit like this one gives has to be experienced. The sheer number of springs, gears, rods, pre-formed parts, and all the rest could overwhelm at first look, but we found that all went very quickly and easily by following the step by step instructions of the manual. Parts fit was found to be near perfect in every instance but one, and that was a minor bit of slop that allowed the press fit we were shooting for to have a bit more movement than we cared for. We solved it easily with a shim, and can say honestly that that was the only time we came across anything that didn't resemble "fit like a glove" workmanship. We used Loctite on all set screws, and recommend you do the same . . . good insurance.

Paint, and decals. Just in case you think MRC might have overlooked the subjects, worry no more. Yes, the good old manual has complete instructions (in two languages, still) on painting and marking. It covers painting implements, before painting procedures, colors to be used, and bemalung mit sprayfarben . . . uh, spray painting, that is. After painting, there is a section on markings and decals (furnished) that really puts the finishing touch on things.

Before we put away the manual, we should comment on the two full pages of fine print (along with descriptive sketches) regarding the operation of XR311. Topics include driving techniques, running in, running of electric motor, and trouble shooting.

As you might suspect, this is strictly a fun project. You won't find a ready class of cars you can compete against, although you might get together with a fellow XR311 enthusiast and fling a challenge his way (just remember which set of gears you have in before you decide whether to race on the flat, or up a hill). But leaving racing aside, real pleasure awaits when this very realistic looking little car responds to your evey whim in a most scale-like way. Forward, increase speed, stop, back up, forward

again and turn to the left and right . . . with **no** noise, as the electric motor does its stuff. Remote control fascinates us all, and when you see something as detailed as this . . . even down to that helmeted figure, you begin to seriously wonder if the car is really all that small, or are you just extra big!

For real fun on four wheels, and a change of pace, try the XR311. It's not only great fun . . . it's quiet! □

ACE NI-CD CONVERSION

from page 56/54

simple as everything else about this conversion — keep all the red wires on one side of the switch, and all the blacks on the other. Handle them in pairs, one black and one red to or from the same place, and you won't go wrong. We recommend that the wires to the battery be connected last, to preclude the possibility of a short circuit while working with the close spacing of the switch contacts. And be sure that the switch is in the "off" position before you make that last connection.

The battery packs are held in place with the furnished double sided tape. This tape is also used to insulate the packs from each other if they are used end to end, such as in our installations, or on the ends if they are to be placed against anything metallic such as side by side against the bottom of the case. The rule is: If in doubt, insulate.

All done? No, you definitely are not! Remember how the last thing you do before letting go that new bird is to check the controls "one more time," to be sure that up is up, left is left, etc. The same thing applies to your ni-cd battery installation — go over every connection once again for proper color wires, proper terminals, etc. A mistake found and corrected now can save a lot of future grief.

Now, and only now that you have given it one last pre-flight, throw the switch to "on." You are allowed a smile of satisfaction: it is going to work. Though probably not for long, as the battery will not have much of a charge — certainly don't run out to the nearest flying field to test fly it.

The power plug coming from the wall plug-in transformer will require that a male plug be installed on the end. Again, a clear and concise diagram is furnished by Ace, with all the necessary instructions. This plug is keyed for proper polarity into the receptacle by a tongue that fits into a mating slot. The two wires are identified from each other by a red stripe on one of them. Don't make the mistake of assuming that red is positive, as it isn't in this case. Don't worry about polarity, just solder them in the proper relationship to the tongue, as per the diagram.

Prior to soldering the wires, be sure to slip a piece of shrink tubing over each wire. After soldering, slip the tubing over the terminal and, finally, a larger piece of shrink tubing goes over the entire plug except for the pins. The tubing can be shrunk neatly with your MonoKote heat gun.

Now, read and heed the charging instructions, which recommend an initial charge of at least 24 hours, and 12 to 14 hours for subsequent chargings. The measured rate of the installation in the Futaba is 46 mils, which is well in accordance with the above times as recommended by most manufacturers for their 500 mah batteries.

Now that you have charged the battery for the recommended 24 hours, turn the transmitter on again, and note the meter reading. It might be higher than you are used to seeing; if so, your meter is probably hooked up to read voltage, and not RF output as is the case with some transmitters. An RF reading meter will probably read so close to what it used to, as to be almost unnoticeable. One method is not really better than the other and both are subject to your interpretation of what the meter is telling you. If you are in doubt as to what type you might have, touch the antenna and watch the meter. An RF meter will indicate some change, a voltage reading meter will not.

Back to the voltage reading meter — the higher reading is the result of what is called a surface charge on the ni-cds, a temporary higher voltage of 1.35 volts per cell, which rapidly falls off under use to the normal 1.2 volts. This surface charge will result in a total pack voltage of close to 11 volts, and the higher meter reading.

In some transmitters, this reading might be high enough to peg the needle, with a rather disconcerting "boing." Not only that, but the meter is now somewhat useless, until the reading gets down into that portion of the scale that will allow it to show any variations in battery voltage. A too high reading can be corrected by the simple addition of a 500 to 1000 ohm resistor of the smallest wattage obtainable, in either lead going to the meter. Such a change will definitely not result in reduced transmitter output, **only** in meter reading.

If your transmitter has no meter at all, one is highly recommended. Most transmitters will have at least 3/4 square inch of unused panel space, which is all that is required for installation of the Ace R/C 9.6V Mini ESV (Expanded Scale Voltmeter) and which we highly recommend so you can accurately monitor battery condition.

We have only one more suggestion for you before you head out for the local field to tell everyone what a great investment you've made, and what a piece of cake it was to make the

to page 124

THIS MONTH'S SPECIALS FROM ORANGE COAST HOBBIES

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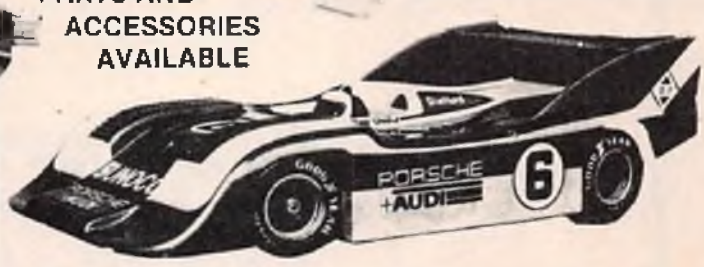

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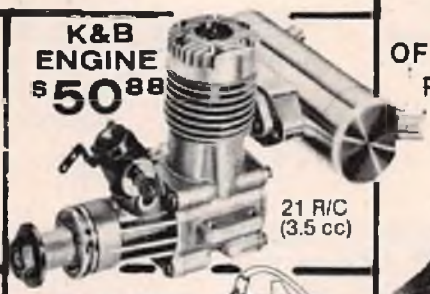

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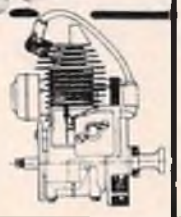

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ACE NI-CD CONVERSION

from page 122/54

installation. And that is that you grease pencil in the date and meter reading on the inside of the transmitter rear cover. One to remind yourself just how long the battery has been in there, and how much you really saved by not buying dry cells. And the other is so you will have a ready reference to fall back on after long periods of inactivity. Remember — any decreased reading should keep you on the ground until the cause is found and corrected.

Now, finally, you can go fly. Enjoy! □

DRAGON

from page 51/48

formed from soft stock with no kinks, and the complete tank fitted into the fuselage. Modify a large metal Fox bellcrank as shown and assemble it to the ply mount plate. Trim open the slots in the fuselage to allow the ears to protrude, and mount the bellcrank plate with epoxy. The slots should be trimmed later when it can be determined exactly how large they need to be as determined by the maximum control throws, including trim lever setting at the extremes.

Now for the canard, or if you wish, elevator. Cut the slot and trial fit the 1/4" sheet surface in place, making certain it is true with the fuselage both horizontally and at right angles when viewed from the top. Remove the surface, place the elevator control horn in the slot and place the canard back in the slot. Epoxy the canard in place by putting epoxy along the inner edges and forward edge. Do not worry about gluing the surface to the bulkheads underneath as it will be a simple matter to remove a damaged surface later, if needed, by using a hot

soldering iron to remove the hardened epoxy and sliding out the broken part. Fit the elevators to the wire horn and hinges. Fit and epoxy the fin to the bottom of the fuselage, and assemble the rudder and rudder shaft with epoxy then fit this assembly to the fin.

Mount the servos and set up the pushrods, using the plans for the general arrangement. The receiver and the battery can be placed as shown, and ballast added later to bring the Center of Gravity to a spot 3/4" forward of bulkhead F9.

Wing construction can start with the left panel. If you have the room on your workbench to build the whole wing, do so. Pin a 1/4" x 1/2" spacer strip to the board at the trailing edge in the position shown on the plan, then pin the lower spar to the board. A 1/16" x 1" strip is pinned to the top of the trailing edge spacer, and the ribs fitted and pinned in place. Some trimming of the notches and front end of the ribs will be needed to match the sweep angle. Fit and pin the top spar and leading edge in position making sure the ribs are vertical except for the root rib which is tilted slightly toward the tip. The dihedral jig makes this easy to set up (the "V" cut is just to identify the top, so you won't use the jig upside down). Now open up the windows and start applying the Zap or Hot Stuff to all the joints. Once the framework has been firmed up, reinforce the joints further through the use of Titebond or similar glue. Use enough glue so that a small fillet shows at each joint, at least before it dries (and virtually disappears).

Construction of the right wing panel is similar to that described above, except that when you are about to cement or glue W1 in place, there won't be room for the dihedral jig this time. Leave a 1/16" gap between the tops of the W1 ribs. This is necessary so that in the final assembly stages you will be able to join the panels in a "zero dihedral" condition. (When viewed directly from the front or

rear, no anhedral or dihedral should be apparent.) To put it another way, if you sight along the span, the leading edge or trailing edge should line up straight across the entire span. Early versions of the Dragon had 4° dihedral, but the new "flat" wing allows better inverted stability and improved axial rolls. The rate of climb has improved too.

When the wing panels are dry, pin the trailing edge to a flat surface and glue on the other side of the trailing edge 1/16" sheet. While the wing is pinned down, install the leading edge sheet by using masking tape to hold the sheet to the leading edge, then laying it back, applying Titebond at contact points and laying the sheet back on the ribs. Use clothespins to hold the sheet to the spar until the glue is dry. Be sure to mount and trim the filler blocks between the W1 and W2 ribs where the rear wing hold-down hole will be drilled later. After these blocks have been sanded flush with the ribs, the center section sheeting and the tip bays can be sheeted also. Allow sufficient time for the glue to dry, then turn the wing over and glue the spar webbing between the W1, W2, and W3 ribs. The remainder of sheeting can be glued on at this stage. When all is dry, trim the leading edge sheets flush with the aft edge of the spar and install the rest of the vertically grained webbing. Capstrip ribs W4 to W7.

Sand the panels to the proper contour. Cut out a groove to lay the 1/4" dowel into rib W1 so that the dowel lays half into each root rib, then epoxy the dowel to one rib. When this has set, check to see that the dowel keys the wing panels accurately, with no twist. If you are happy with the alignment, epoxy the panels together. Apply the 4" nylon tape with epoxy to strengthen the center section. Drill out the 1/4" hole for the wing mounting screw.

Cover the tip plates and mark them where they will be in contact with the wing, then carefully cut that covering away. Fit the ailerons but don't install them until the the wing and ailerons have been covered. Small vent holes should be drilled in each rib and closed section so that changes in air pressure will not cause the covering material to buldge and change the flight characteristics. Remember to make a vent hole in the underside of the center of the wing. Cover the wing and ailerons and install the ailerons, and tip plates.

Trial fit the completed wing to the fuselage and trim the wing saddle to align the wing horizontally, checking also to have an equal distance from a point at the nose centerline to each wing tip. Secure the fitted wing in position with tape and drill through the mounting hole made earlier, using a #10 drill. Remove the wing and thread the maple hold-down block 1/4-20 for the nylon hold-down screw.

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DRAGON

from page 127/48

The maple hold-down block should be secured with a liberal application of epoxy. Cover the fuselage and control surfaces and assemble. Put the wing on and, with the controls set in neutral, fabricate the aileron pushrods to fit from the bellcrank to the aileron horns, with the servo centered. Adjust the control throws as follows: Elevators; 3/4" up, 3/4" down. Rudder; 1/2" left, 1/2" right. Ailerons; 3/16" up, 3/16" down. Install the main and nose landing gear and wheels, and take some pictures.

Let's go fly it. Ground handling is similar to most trike gear airplanes. Taxi out, line up and apply throttle to the firewall. The take-off roll will be short and straight, using rudder to maintain track and a bit of back stick to rotate the nose up. After a comfortable amount of altitude has been gained, trim out the ship to fly hands off at reduced power. Try an aileron roll from a slightly nose up position, then use rudder and aileron together for a fast rate of roll. Loops, inverted flight, and the rest of the sport flying maneuvers are fun to do with this strange looking machine, while listening to the "I'll be darned, it flies!" comments in the back of you. In the air, the Dragon takes a little getting used to, as one's senses seem to say that it is going the wrong way. Try slow flight at altitude to get the feel for the descent rate at different power settings. The speed range is quite wide, in that at full power in level flight the Dragon moves across the sky like a UFO, which to many people it just might be, yet it will hang in the air like a kite when it is flown into a moderate headwind.

If something that looks different and flies different appeals to you, go ahead and have a Dragon for your personal pet. □

THE ALUMNUS

from page 46

out the effect of the larger rudder. The lure of twin engines is strong, however, so I bought another kit. Doing some measuring this time, and a few minor mods, brought fantastic results. Two screaming .010's is a sound like no other! The bird flies well on either engine, or both. Ready to fly, mine weighs 10 oz. I'll outline the changes to the kit briefly. Full size drawings are provided for the extra parts necessary.

FUSELAGE: Eliminate former F-6. Pull the fuselage sides together at the tail. The two top sheet alignment keys must be removed from the aft fuselage. The bottom planking is used as is,

to page 134

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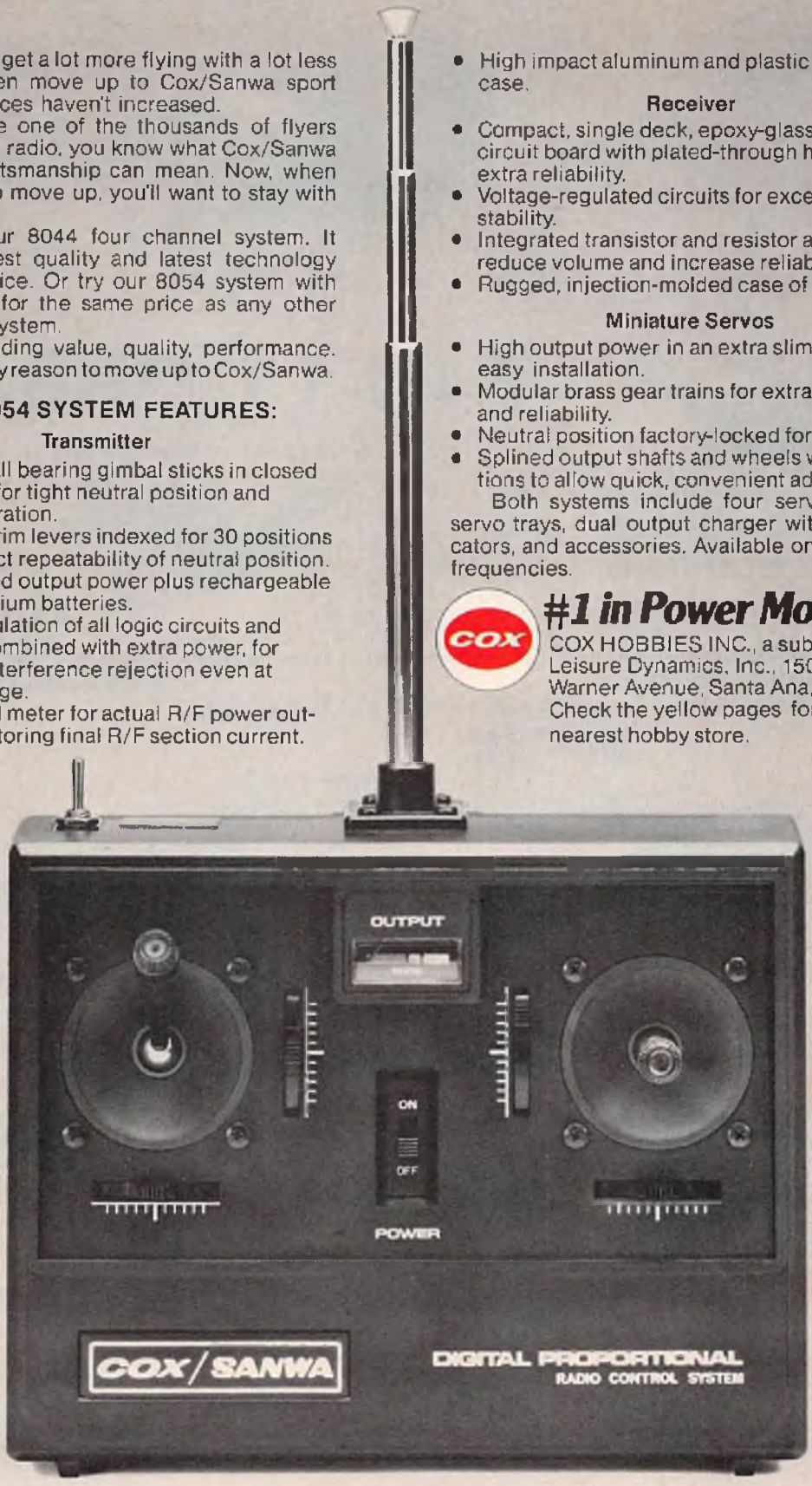

8054 shown. 8044 identical except for toggle switch.

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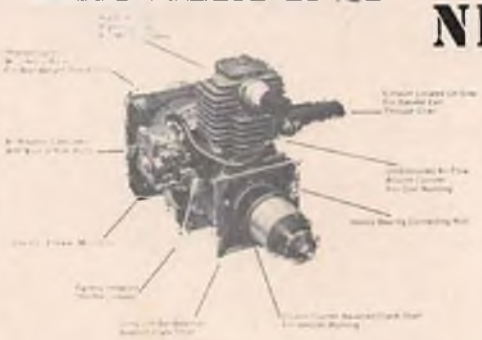

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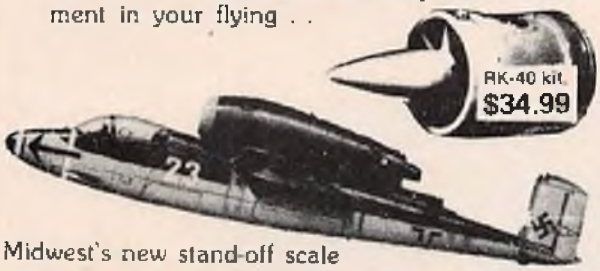

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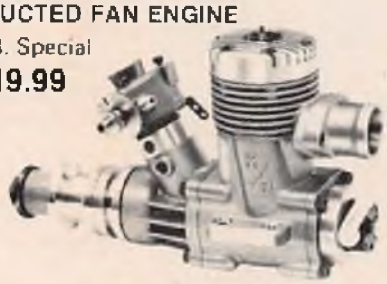

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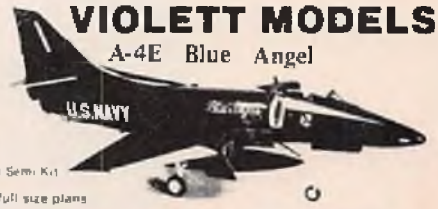

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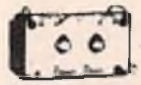

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THE ALUMNUS

from page 128/46

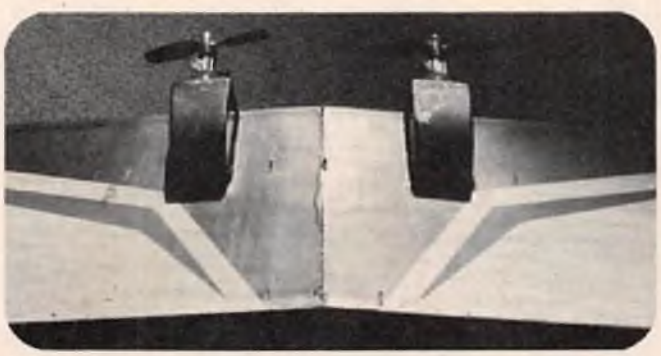
resulting in a bottom slightly wider than the top. Build the nose as shown on the plan. When completed, remove that portion ahead of the firewall and install a balsa block 1¼" long. Sand the block to a pleasing contour. Install the vertical fin, moving it back far enough to continue the hinge line to the bottom of the fuselage. Make up a new rudder from 1/16" sheet and fit it in place.

WING: Build exactly as shown. You may lower the dihedral 1" per tip if you so desire.

STABILIZER: This is also built as shown. The elevator is modified by installing a joiner bent from .032 wire and cutting a "V" to clear the new rudder.

NACELLES: Cut four sides from 3/32" sheet balsa. The inboard sides should be 3/32" longer as shown. Firewalls are cut from 3/32" ply. Mark these with a vertical centerline. Measure out 2½" from the wing's center. Mark that spot on the wing's L.E. and line that up with the centerline of the firewalls. Cut a notch on the wing to seat the firewalls. Each firewall is flush on the tip side and protrudes 3/32" on the fuselage side. When things line up, Hot Stuff the sides and firewalls together, directly on the wing. The reason for the out thrust is to improve single engine performance. Before planking the nacelle bottoms, install the engines making sure both are aligned alike. After planking, finish the bird in your favorite manner.

FLYING: I told you it was simple! Balance point is 1/2" ahead of the point shown on the plan. Fuel both engines. Start #1 — once adjusted, stop it and top off its tank. Start #2 and follow quickly with #1 again. In flight, when one quits, watch which way the model turns. Use rudder trim to make it fly straight, and it will. Though flights are short, they sure are sweet! □



SUPER MONTEREY

from page 45

The fuselage is more rugged thanks to the ply bottom and doublers. I like the new, removable, wing center section, partly because it holds the canopy in place, but mainly because it allows the bird to be ballasted — something you could not do on the older model. The horizontal stab is now built up which makes it a tad lighter, even though it is 50% larger.

The entire plane is held together with Elmer's Professional Carpenters Wood Glue, which is dandy stuff. I did use epoxy for installing the wing tubes and the polyhedral braces and speeded up construction by supplementing the Elmer's with Hot Stuff.

The wings and tail were covered with what I had available — purple and orange-red Kwik Cote. The purple went on the inboard sections and the orange-red on the outboard sections with white trim separating the two colors. Since I'm convinced that any fuselage needs more strength than it can get from an iron-on, I did my usual number on the fuselage and finished it with 3/4 ounce glass cloth and two coats of resin topped by three spray coats of white automobile lacquer. Contrary to "old modeler's tales," a resin finish does not have to weigh a ton. By judicious scraping with a single-edged blade, a resin finish should weigh little more than the iron-on. The secret is the scraping; it keeps (wet) sanding to a minimum and results in a light, strong, smooth fuselage.

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SUPER MONTEREY

from page 134/45

"Supple Sybil" (my wife names all my planes) did need 2½ ounces of lead in her nose in order to balance at the recommended C.G. I'm sure this was due to the lighter weight of my new airborne equipment (three ounces less) and not because of the resin finish. I did have to add 1/2 ounce to the right wing tip to achieve lateral balance. (I must have put all the heavier wood in the left wing.)

Dr. Boucher must be commended for the excellent job of cosmetic surgery he did on the Monterey. He took a good looking sailplane with racy lines and transformed her into a beautiful sailplane with racy lines. This face lifting included: polyhedral wings; 100 more square inches of wing area; different shaped tail surfaces; a larger horizontal stab; and a sexier looking fuselage.

However, as beautiful and supple as Sybil is, even she's not perfect. I did find three discrepancies (all have been brought to Bob Boucher's attention) that could cause problems for beginners:

(1) Although the wing rods are pre-bent to the dihedral angle, there is no mention of this angle in the kit. If the wing center section ribs are not installed to compensate for the dihedral, the wings and center section will never butt properly.

(2) There is no mention of securing the wing rods in the center section. I roughed them up and used epoxy. Bob, I learned, prefers silicone rubber. However you choose to do it, these rods should be held in place.

(3) The inner NyRods supplied with my kit had I.D.'s that were too large to accept the 2-56 threaded clevis rods. It was such a loose fit that I couldn't even use Hot Stuff to hold them in. I got around that problem by substituting braided cable in place of the NyRod.

That brings us to the bottom line. Did the Super Monterey measure up to expectations? Did she usurp her sister, sending the poor old gal to the balsa dust factory? I think Mary Poppins summed it up best in one simple word, "Supercalifragilisticexpialidocious."

Test flying took place on a balmy, 32 degree day using an old, tired hi-start. After one hand chuck to insure that there would be no surprises during the initial launch, "Supple Sybil" took her first ride up on the 500 foot slingshot. In view of the low temperature, the rather forward placement of the towhook and the C.G. and the "not too resilient" rubber, Sybil made a beautifully steep and controlled ascent. She eased off the line at about 350 feet, making the transition with grace and aplomb.

Her first flight lasted six and a half minutes. Not a bad debut for the young

to page 140

PICA PRODUCTS. INNOVATIONS IN MODELING.

SPITFIRE MK-9

Still the best combinaton of looks and performance you can buy. Nobody ever designed a more elegant ship than the Spitfire. The model flies superbly and has won countless stand-off scale contests. The standard kit builds into a MK-9. Plan includes details for other Marks, like the beautiful MK-22. Kit features: Machined and diecut balsa, formed LG. nylon fittings, metal parts & moldings. Two full-size plans: complete radio & retract gear installation shown. Isometric diagram & illustrated instructions make building easy and fun. Six-color accurate decals. Span 65", Area: 714 Sq ", 4 to 6 channel, Engine: .40 to .60

THE WACO

We chose the Waco F-3 as our biplane flagship because it best represents the "Golden Era" of the 1930's, when flying was an adventure. Add to this, easy, snag-free building and safe, gentle flying—the result of the thorough kit engineering and careful prototype development that are features of all Pica Kits—and you have a satisfying building and flying experience ahead of you. Kit features: Top-quality diecut and machined balsa and plywood. Full size plans. Separate instruction book with isometrics. Decals. Injection-molded (Not vacuum-formed) plastic cowl, cowl blisters, and wheel pants.

FW 190 D-9

The qualities that make a model a NATS winner are the same ones that Sunday sport-scale fliers look for. Exceptional appearance to start with, of course. The FW 190's stark and sinister shape has always excited modelers. But even more important are friendly flying qualities. Our designs have always emphasized safety at low speeds, and the FW 190 has inherited the ability to fly from 80-90 mpg right down to a near-hover for landing. The wide-track gear makes it an ideal first "tail-dragger." Kit features: Full-size plans showing radio and retracting gear installation. Color schemes (and decals) for THREE different FW 190's. Separate 16-page instruction booklet with cutaway diagrams and in-depth flying hints. Diecut and machined balsa nylon fittings, formed wire cowl, canopy, etc. Span: 65". Area: 730 Sq.", 4 to 6 channel, Engine: .60

T28-B

Plenty of dihedral (7°) for lateral stability. Radial cowl prevents speed buildup in a dive. Large stabilizer and long tail moment give wide CG position tolerance. Special airfoil and washout maintain stability down to a very low speed. Tricycle LG makes good rough-ground handling and easy landings. Bright color schemes help pilot orientation in flight. Large flaps incorporated in basic design. Over 700 sq. ins. for light wing loading even when loaded with options. Kit features: Our now-famous detailed plans (2 sets) showing flaps, retracts, RC equipment, etc. Beautiful 3-sheet detailed fuelproof decals. Machined & diecut balsa, formed wire Nylon fittings (flap hardware included), canopy and the best cowling ever put in a kit. Span 65", Area 710 sq.", 4 to 6 channel. Engine .60

CESSNA 182

Perhaps you need something a bit out-of-the ordinary for scale competition? Our Cessna 182 is a big, stable airplane, ideal as a scale trainer on only a .40 engine. Put a .60 under the cowl and fly circles around the competition. The semi-symmetrical airfoil makes the 182 groove, yet it's as docile as a kitten. For total scale realism, add the optional flaps. Trike gear for pleasant ground handling. The kit is all-balsa, with lots of hardware and molded parts for speedy construction. The clear plans and special illustrated construction booklet make it a kit that anyone can build. Span: 72". Area: 702 Sq ", 5-7 lbs. flying weight, 4 channel, Power: .40 to .60

DUELLIST 2/40

The Duellist 2/40 has been designed as an easy-to-fly and safe handling twin engined R.C. model. Combining elegant appearance with simple structure, it's ideal for the modeler who has progressed through the usual trainers and pattern or low wing sport ships. As such, it offers a further level of enjoyment in the R.C. hobby, and a new accomplishment in flying skills to the builder. Wing span: 67". Wing chord: 14". Total wing area: 795 sq.". Fuselage length: 56". Stabilizer span: 27". Verticle fin: 10-¼". Rec. engine: .23-.40. Rec. fuel tank: 8 oz.. Gear: Fixed or retract. Channels: 4 (5 w/ret.). Control functions: Ailerons, Elevator, Throttle, Rudder. Construction: Balsa. Plan sizes: 35" x 67". Instruction manual and construction photos included. Kit includes: Die cut balsa, shaped parts, hardwood, plywood, aileron torque rods, hardware and sample fillit. Flying weight: 6-8 lbs.

pica
2657 N.E. 188th Street
Miami, Florida 33180
Telephone 935-1436

SUPER MONTEREY

from page 138/45

lady considering that I paid more attention to my wife's attempts to get inflight pictures than I did to trying to work available lift, which there was plenty of. (Yes, Virginia, there is thermal activity in the winter time.) Adding the combination of polyhedral, more wing area and a larger stab proved to be very sound judgement indeed. This bird is extremely stable and will make tight turns without falling off on a wing. And Bob Boucher was right about the stalls: they are sharp but recovery is quick and straight ahead with little loss of altitude. She's very receptive to thermal activity and telegraphs this information back with a good deal of body English. Even with a light wing loading, the relatively thin airfoil allows her to penetrate and search for lift without sacrificing too much altitude. Consistently good spot landings will require practice because she has no spoilers and ground effect lets her keep right on trucking.

Any sailplaner should enjoy having this machine in his stable. The neophyte, especially, will appreciate the easy price, the easy construction, and the easy way she handles in the air. She's an honest airplane and, in retrospect, I think Mr. Boucher was definitely too conservative when labeling her; he should have called her "(E) All Of The Above Monterey." □

NOW WE HAVE AM . . .

from page 44/42

much narrower than the corresponding AM set. Therefore, more channels in less space is a reality, not a possibility. Additionally, FM exhibits a phenomenon known as "capture effect." In short, if the desired signal from, let's say **your** FM transmitter signal is stronger than an FM transmitter some distance away with the same power on the same frequency, the receiver "captures" your signal and ignores the "undesired" signal. Neat, huh? That's fine unless the "undesired" signal overrides yours. What happens? The "undesired" gets it all and **totally** ignores yours. This capture effect, then, is both good **and** bad. Great if the undesired FM transmitter is "antenna down" in the pits, but bad news if its antenna is up at the boat basin or car track 1/4 mile away as you fly near them. At this point, it's not a glitch, it's a total loss of **all** control. In the specification game, it's called **capture ratio.** It means how much stronger **your** transmitter must be than the undesired signal for the receiver to "capture" your transmitter. Usually expressed in db (decibels), less

to page 142

INTRODUCING: CESSNA 182

**IT'S AEROBATIC,
YET IT'S A TRAINER
. . . AND IT'S SCALE**

Looking for a good scale ship to get you started? Perhaps you need something a bit out-of-the-ordinary for scale competition? Our Cessna 182 is a big, stable airplane; ideal as a scale trainer on only a .40 engine. Put a .60 under the cowl and fly circles around the competition. The semi-symmetrical airfoil makes the 182 groove, yet it's as docile as a kitten. For total scale realism, add the optional flaps. Trike gear for pleasant ground handling.

The kit is all-balsa, with lots of hardware and molded parts for speedy construction. The clear plans and special illustrated construction booklet make it a kit that anyone can build.

SPECIFICATIONS

- 72″ span
- 702 sq. in. area
- 5-7 lbs. flying weight
- Power:
  - .40 (as a trainer)
  - .60 (for aerobatics)
- Four channels
  (flaps optional)

PICA

PICA PRODUCTS, 2657 N.E. 188 ST., MIAMI, FL 33180
TELEPHONE 932-8008

$89.95

from page 140/42

is better. For example, a 6db capture ratio means that your receiver must receive twice as much desired to interfering signal to "capture". A 2db capture ratio means the receiver must see only 30% more desired signal and will then totally ignore the interfering signal. A nice feature, but hardly a predictable circumstance is it? Regardless of that though, narrow-band FM is desirable from the standpoint of more resistance to electrical interference, density in a given band, and recently, simplicity in receiver design.

Since you say FM ignores **amplitude** variations, and AM is relatively insensitive to **frequency** variations, then AM and FM can be used on the same frequency at the same time — right?

Absolutely Not! Remember that AM is sensitive to amplitude variations. Well, another signal on the same frequency (AM **or** FM) will be combined in the mixer stages of the receiver. This "undesired" signal adds and subtracts its amplitude from the "desired" signal resulting in **Amplitude Modulation** of the desired signal. This is knows as "heterodyning" and essentially amounts to severe interference (and a crash if it happens while airborne).

Okay, AM doesn't work with FM. What about FM working around AM. Those limiters you talked about keep amplitude variations from bothering the FM detector, right? Almost right, except if you look back at Figure 4, there was a **limiting** threshold which supresses variations **over** a certain amount. If the interference causes the **carrier frequency** amplitude to be reduced to lower than the limiting threshold, then the protection no longer exists and the FM signal is just as susceptible to destruction as its AM counterpart. Two transmitters in the same area, at the same power, on the same frequency are going to produce about the same signal level in the receiver and thus, severe interference. So, despite what you may have heard or think, there won't be AM and FM clothespins for each frequency at the flying field.

to page 146

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...outshines the competition

ULTRAGLOSS THERMALON lives up to its name! Offering what we feel to be a superior finish to other iron-on fabrics, ULTRAGLOSS adds a deep gloss painted quality to any model. Since the paint is applied in layers, the finished material has more depth than the plastic iron-ons and more STRENGTH since THERMALON is woven.

THERMALON was developed by Royal to combine the quality, strength and beauty of a silk and dope finish with the convenience, speed and odorless application of the plastic iron-on films. It is a woven polyester fabric that is coated with a thermal activated adhesive on one side and painted to a high gloss, fuel-proof finish on the other. When heat is applied, the fabric will adhere to the uncovered structure and will shrink tightly into place.

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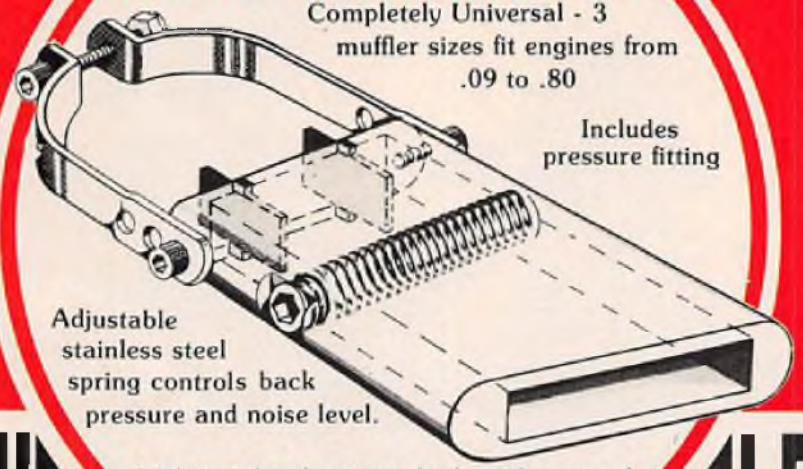
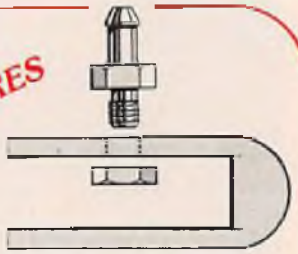


Adjustable stainless steel spring controls back pressure and noise level.

Lightweight aluminum body with tapered end- exits exhaust straight away from plane

SUPER CLEAN-SUPER SIMPLE

FEATURES



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Only $6.95

SPECIAL K&B .40 MUFFLER ALSO AVAILABLE NOW!

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INCLUDES TWO SPECIAL EXHAUST PORT PLUGS.

BLACK ANODIZED BODY.
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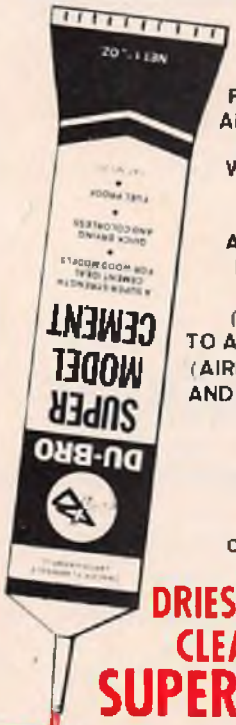

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$100.00
Completely assembled less engine & prop.

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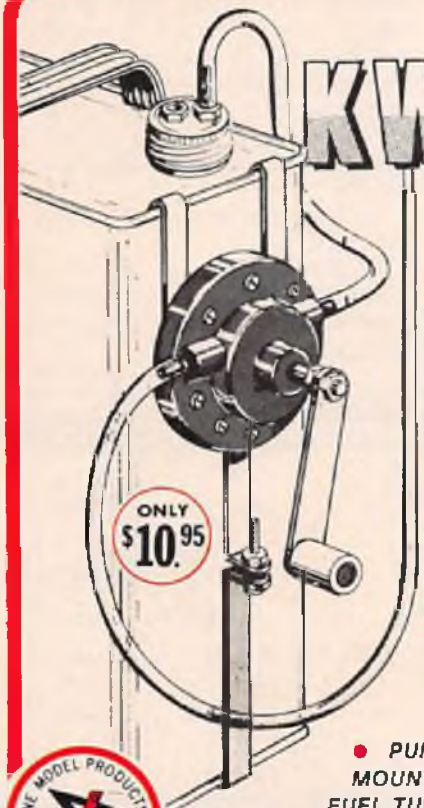

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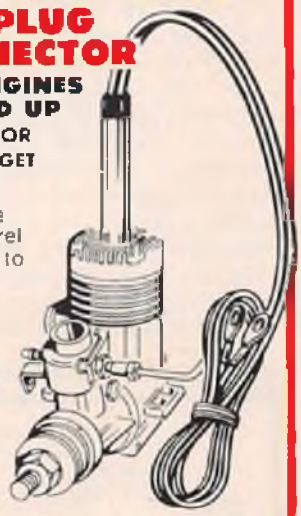
FOR ENGINES .10 AND UP

PERFECT FOR HARD TO GET AT PLUGS

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

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



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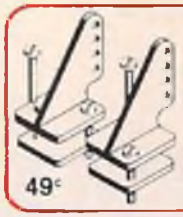

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1/2A CONTROL HORNS

3/8" LONG. 4 ADJUSTMENT POSITIONS. EACH SET CONTAINS 1 RIGHT AND 1 LEFT CONTROL HORN FOR SAFER INSTALLATIONS

CAT. NO. 107

NOW WE HAVE AM . . .

from page 142/42

What Is Available Today In FM?

Most FM R/C equipment today is available only in Europe and some in Australia and the Eastern Pacific. (Canada has recently allowed FM on a limited basis.) In the United States, only one manufacturer is offering FM equipment, and that only on the 53 MHz Amateur band where it's legal to sell. Tests with current FM equipment show exceptionally good performance in ignition engine models and helicopters where AM equipment has been less than perfect. Figure 8 shows some of the equipment currently offered. A remarkable similarity can be seen in all receivers. This is due to two integrated circuits developed by Siemens in Germany specifically for the narrow-band FM receiver market. This market owes its maturity not to R/C receivers, but to the pocket paging receivers (beepers) everyone seems to have, which lets them know their office wants them to call. (On second thought, it is R/C — "radio controlled people!")

The first integrated circuit, the SO42, contains both the local oscillator and a balanced mixer stage. This chip takes the incoming signal and converts it to an intermediate frequency for later amplification, very similar to the local oscillator and mixer stages in an AM receiver.

After filtering, the intermediate frequency (IF) is passed along to another IC, the SO41, which amplifies and "limits" the signal prior to detection. Also within the IC is the detector stage which converts the frequency variations into a usable audio frequency signal. This section, a "quadrature" detector produces a voltage directly proportional to the **frequency** of the IF signal and essentially ignores the **amplitude** of the signal.

If we look at a frequency sweep of the detector, we see an "S" curve laying sideways on the horizontal axis with detector output voltage on the vertical axis. (See Figure 9.) The frequency variations from the transmitter are, therefore, reproduced in the receiver as amplitude variation which can then be decoded normally in the following stages into output pulses to the servos.

Since the narrow-band FM transmission occupies only 3 KHz or so (Figure 5c), we can theoretically make the receiver IF section much narrower (selective) than a corresponding AM receiver requiring 15 to 20 KHz. In practice, however, some allowance is made for crystal drift and tolerances so the NBFM receiver IF sections are about 6 to 7 KHz wide. This still requires more expensive filters, but allows operation with adjacent frequencies only 10 KHz away, **if** the transmitter 10 KHz away is **also** a narrow-band type. (Recall that a typical AM R/C transmitter has significant energy output 25 KHz away from the carrier frequency.)

The primary benefits of narrow-band FM, then, can be summarized as follows:

(1) Operation with 10 KHz frequency spacings.

(2) Some improvement in noise rejection with ignition engines and severe metal to metal contact, e.g., helicopters.

to page 148

"New"

PIPER TRI-PACER

(44" Span)

Kit FS37

Another Great R/C Kit

Scale 1½" = 1'
Wing Span-44"
For .049-.10 Engines

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NOW WE HAVE AM . . .

from page 146/42

(3) Slightly simpler receiver design, but with more costly components.

Why do we need narrow-band FM here in the United States if there really isn't an improvement over most AM sets? Most modelers aren't flying ignition engine powered helicopters anyway.

The answer lies ahead in the next few years. The 72 MHz spectrum is becoming more and more crowded, placing high power users only 20 KHz away from existing R/C channels which we also share with higher power stations. With the prospect of even more channels being added on the 72 MHz band, it behooves us to keep the receivers as narrow-banded as possible.

Lastly, we cannot rule out the possibility of some future FCC allocation similar to the one in Germany all to ourselves. How many channels would we like to have — 7 or 20? □

HOW TO "SEE" A TRADE SHOW

from page 41

places) really works at a trade show. And, let's face it, just because **today** Quarter Scale or helicopters aren't your thing, doesn't mean that in 6 months you won't be very interested. Won't it be handy if you can recall a conversation about your new-found interest, and in the shopping bag under your workbench you've got two or three brochures on the subject?

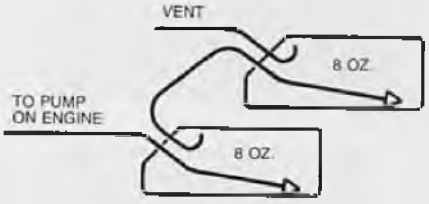
Then of course, there are the display models. Frequently the proud papa will be found hovering around his "baby." How did he get that finish? How did she put on that MonoKote? Walk up and ask, after all you've paid the entrance fee and have nothing to lose. The people who did the work that we all admire so much don't mind at all talking about it. If they did mind why would they drive several hundred miles and stand by a display model for 2 or 3 days for no pay? Obviously they don't mind and part of their satisfaction comes from talking about their handiwork. Think of the contacts you can make with fellow modelers from all over the country. Get their address and phone number and throw it in your bag with the brochures. Write yourself a little note so that you'll know that Fred Smith was the guy who did that fantastic Quarter scale B-36 with full working everything. Who knows, in 6 months you might want to call him or drop him a note if you're stumped by something that is child's play for him.

What about buying books, etc., at the show. Somehow I always forget to bring my checkbook when I see that great book on scale subjects or finishing technique. Don't forget yours, some of the gadgets and things that are available only at these shows are downright irresistible.

So, there you are, some tips to make your next trade show experience your best one. See and absorb as much as you can, but above all — enjoy yourself and have fun, 'cause that's what the whole hobby is all about! □

DOUBLE EAGLE

from page 40/32



To fill the tanks, break the line to the engine pump and fill until the vent line overflows and replace the line. There can be no other openings to the system or the series hook-up will not work.

to page 150

American R/C Helicopters'
Fully Aerobatic

"COMMANDER"

INDESCRIBABLY THRILLING!

NOW *with Engine Shut-Down* *AUTOROTATION!!!*

Authentic autorotations with our **exclusive** system are simple and easy to do. Whether you are 10 feet or 300 feet above the ground you can confidently handle the possibility of engine failure, and at the same time experience the thrill of performing the newest and **most exciting** of R/C helicopter maneuvers!

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- REQUIRES ONLY A 4-CHANNEL RADIO SYSTEM (Not Included)
- USES CONVENTIONAL .61 ENGINE (No Schnurle Engine Required)
- MOST RUGGED CONSTRUCTION OF ANY .60 SHIP AVAILABLE
- EASY, BOLT-TOGETHER ASSEMBLY
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from page 148/32

Servo Hook-up — The servo mountings for the ailerons, throttle, and landing gear are conventional, so the builder shouldn't have any trouble.

The rudder and elevator are a little different. The prime consideration is centerline action to guarantee symmetrical movement of the control surfaces. The arrangement shown on the plan allows both of the elevator pushrods and both of the rudder pushrods to be symmetrical about the aircraft centerline.

The extreme rearward location of the rudder and elevator servos keeps the pushrods as short as possible (for stiffness) and helps to put the CG far enough rearward.

Finishing

After the construction is complete, the canopy is in place, and all crevices filled and filleted, the total aircraft should be fiberglassed with 3/4 ounce glass cloth and polyester resin. Don't forget the control surfaces. A couple of coats of thinned resin should be adequate to fill the glass cloth. (K & B's toilet paper procedure is highly recommended — Ed.)

The builder's favorite method of finishing an aircraft should be satisfactory but for weight saving and ease of excellent finish I use K & B Super Poxy, sprayed on. Two coats of Super Poxy primer, well sanded, provide the base for two coats of color. One coat of trim color and two coats of clear complete the finish. The Super Poxy cures to a wet-look shine that's hard to beat.

Pre-Flight

Carefully "zero" all control surfaces on the flat assembly surface.

Make certain that the CG location is in the range 40%-42% MAC **with the landing gear up.**

Make certain that the completed aircraft is in balance laterally. It should be able to sit level when placed on a 1/4" x 1/4" piece of wood placed longitudinally beneath the aircraft centerline. Add weight to the light wing tip if necessary.

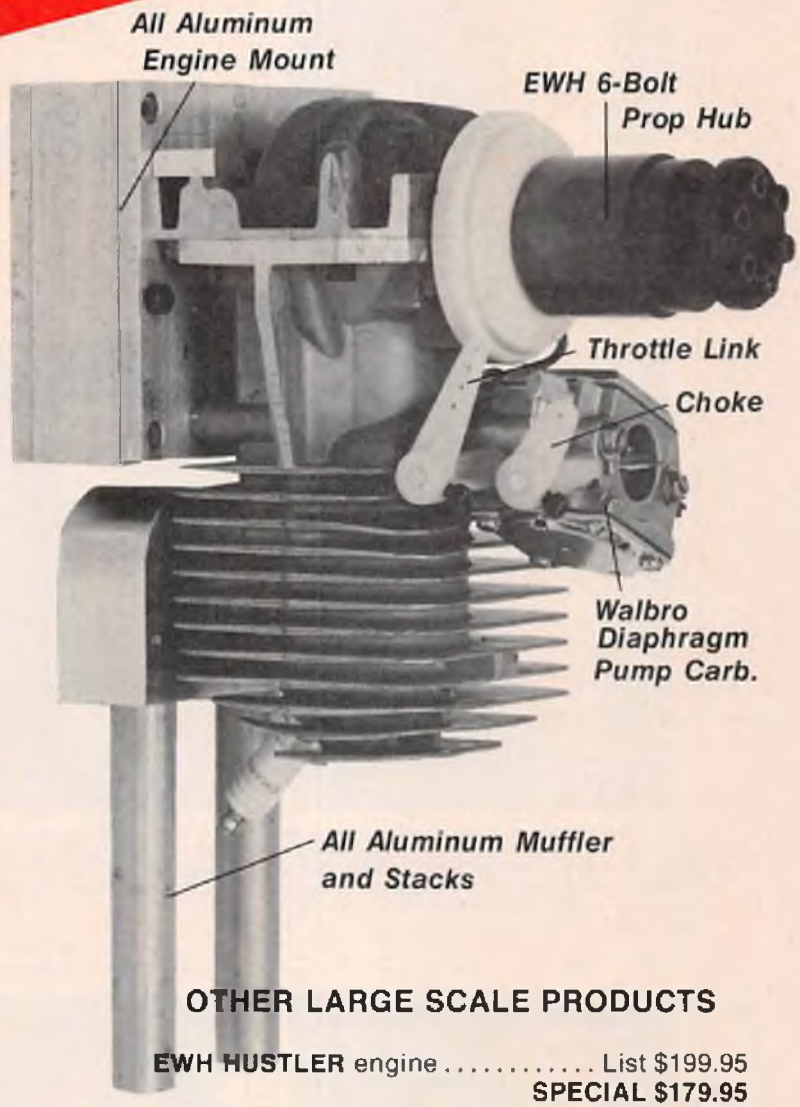
Flying It

Taxiing out the Double Eagle for the first time is a real experience. On the take-off roll, you notice that the rudder control becomes very effective as soon as the Double Eagle starts moving. Don't over-control in yaw.

Recognize that there is a lot of mass forward of the wing to be lifted and don't try to lift it too quickly. Let it build up plenty of speed and then lift it gently. The landing gear placement and gear

to page 154

New! EWH Specialties SUPER HUSTLER power by HOMELITE®



the ultimate ¼ size and ⅓ size power plant

Quality
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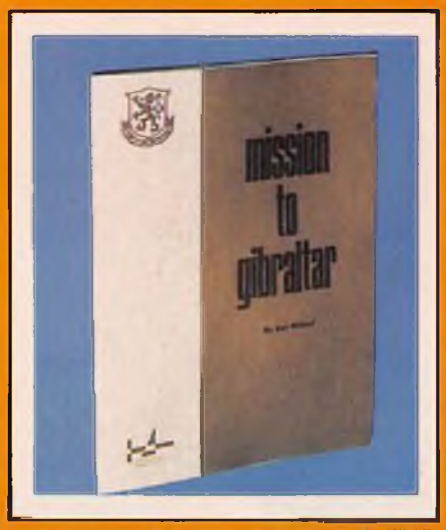

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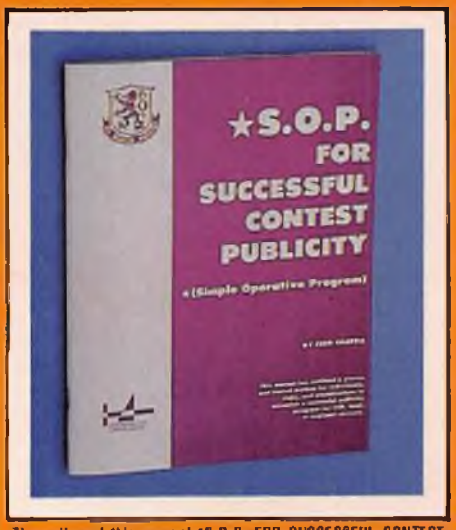

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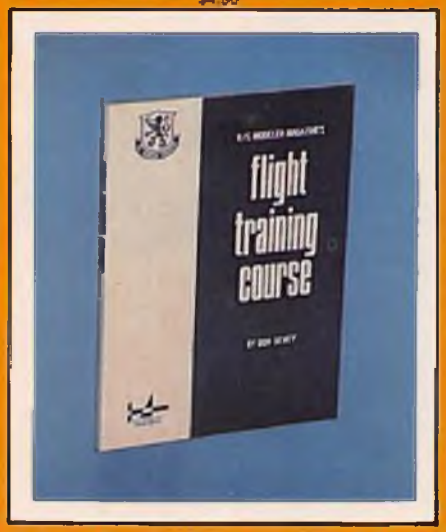

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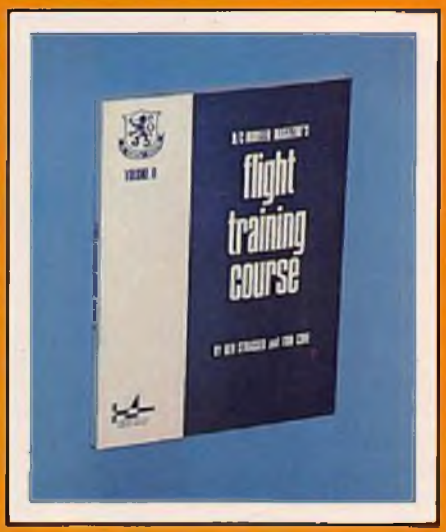

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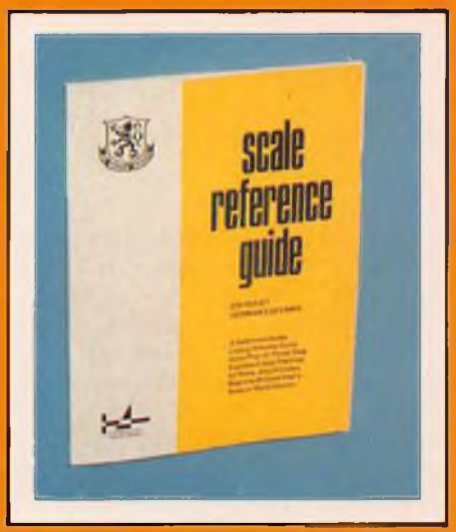

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DOUBLE EAGLE

from page 150/32

lengths shown on the plan gives a ground attitude that will allow the Double Eagle to build up plenty of speed without trying to leap into the air prematurely.

When you come in for your landing, don't come in as "hot" as you would with a conventional pattern aircraft. Make a couple of "check" passes to assure yourself that it's not going to "fall out" on you at slow speed then come on in. Keep a little power on, bring the nose up, and slow it down.

The first flights that I had with the prototype surprised me. When I rolled it over inverted, it was hell to get used to **not** pushing down elevator. Similarly in knife edge, the first time I rolled into one, I touched top rudder a little hard and she gained about 20' of altitude on me.

I also found some added benefits of Double Eagle's design: she snap rolls beautifully at reduced power with the application of elevator and rudder only. Similarly with spins, the entry is dead straight ahead and it will drop to either side with equal ease. Beautiful spins will result after a complete stall with elevator and rudder control only.

Modification For Piped Engines

Several designs of tuned pipes and engines designed for pipes are now available. Two piped modifications of the Double Eagle are now in the works.

For a side exhaust design, a radial mount is used to allow a rotation of the engine to an angle more convenient to the mounting of the pipe. To change to a radial mount, simply cut off the beam mounts at the forward surface of bulkhead "B" and attach a radial mount directly to the bulkhead.

For the rear exhaust engine, the design change is more radical. The beam mounts may be retained but a pipe covering fairing is substituted for the canopy. The engine exhaust is on centerline above the wing making a beautiful and very efficient installation.

Whichever mode of Double Eagle you decide to build, I'm sure it will fulfill your every expectation. It certainly has fulfilled mine! □

RADIO SPECTRUM

from page 31/26

approaches 100% and is a function of the charging rate. If charging is continued at a fast charge rate, venting will probably occur. In order to avoid these circumstances, a standard 15 minute fast charge should only be

applied to a cell that has a low state of charge. In practical application, this means determine the state of charge of the TX and RX batteries with an ESV and fast charge only when the state of charge has reached a predetermined point – say 25%. Since the TX and RX batteries discharge at different rates, most of the time, they won't be fast charged simultaneously.

(2) Since a cell may vent due to over charge, it's desirable to have a resealable vent to prevent eventual cell failure due to electrolyte loss. GE states their cells have resealable vents, do all other brands?

(3) Excluding cells that are specifically designed to be fast charged, it seems that fast charging will reduce a cell's useful life.

Two questions I have not related to fast charging are:

(1) It seems to me that cells can be stored in any state of charge without degradation. Do you agree?

(2) From a chemical standpoint, why does memory occur?

Sincerely,
Mike Powell
Redmond, Washington

The first two statements are true. Temperature and pressure do go up rapidly once the cell is charged, and continuing at a high charge rate will cause venting. The next statement is nebulous because I'm not sure what a standard 15 minute fast charge is. The Astro Flight and S & O fast chargers decrease the charge rate as full capacity is approached so those circumstances are avoided. I have taken a fully charged battery and charged it for 15 minites with an S & O fast charger with no problems. What happens is, the charger senses that the battery is charged and delivers less current. I don't recommend you do this, because under certain high temperature conditions you could get in trouble but normally you know if your battery is fully charged. Note, if it has been a week since you charged it, you can be sure it is **not** fully charged and the tolerance to a 15 minute fast charge is much greater. I have **never** heard of anyone damaging a battery by fast charging with this method for 15 minutes. The only failures I've heard of occur when someone forgot to take it off charge and it was on for 45 minutes or more.

I normally fast charge when my cells get down to 50% and probably never get them over 90% full. I'm convinced this enhances rather than reduces cell life. I do charge them simultaneously, but notice that they will not accept the same rate of charge. Whichever is more discharged will charge faster. The

to page 166

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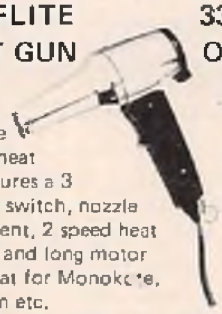

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RETAIL $99.95 — NOW ONLY $69.98 — RCM105

FUTABA FP-2GS 2 CHAN. RADIO 30% OFF

This is the least expansive 2 channel available anywhere. It comes with 2 servos and is ideal for cars, boats, small airplanes, or gliders. Works great in the Centurion or Sportavia. Requires 12 pencell batteries.

RETAIL $99.95 — NOW ONLY $69.98 — RCM091

DUMAS HOT SHOT 21 35% OFF

This fiberglass tunnel hull with pickle fork bow is 27" long and is very competitive. Add the K&B .21 outboard engine and a 2 ch. radio and go!

RETAIL $70.00 — NOW ONLY $45.48 — RCM008

K & B .40 RC ENGINE 40% OFF

The most popular .40 ever made! Features a Perry carb.

Quantities are limited. Limit of 1 engine per order until sold out.

RETAIL $72.50 — NOW ONLY $43.48 — RCM009

COX READY TO FLY CESSNA CENTURION 30% OFF

Like the Sportavia, this all molded foam scale Centurion with 36" span comes complete with a Cox .049 engine, prop, push rods, horns, and all other fittings already installed. The Sanwa No. 8020 radio drops right into place, but with very slight modification any 2 channel radio will fit easily into this kit. Great for the beginner who wants the most airplane for the least amount of money. Radio not included.

RETAIL $64.95 — NOW ONLY $45.48 — RCM001

K & B .61 R/C ENGINE 40% OFF

The most popular .60 engine in the R/C hobby!

This outstanding engine features a Perry carb and muffler.

RETAIL $96.50 — NOW ONLY $57.88 — RCM012

ZAP ZAP ZAP ZAP 44% OFF

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

RETAIL $3.50 — NOW ONLY $1.98 — RCM013

DU-BRO KWIK FILL FUEL PUMP 36% OFF

RETAIL $10.95
NOW ONLY $6.98
RCM010

HOUSE OF BALSA P-51D (.29-.40) 30% OFF

This all balsa sport, stand-off scale ship is beautiful. It has a 49" wing span and takes a .29 - .40 engine.

RETAIL $59.95 — NOW ONLY $41.98 — RCM011

HOBBIES

PHONE
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ILLINOIS TOLL FREE: 800-252-3336
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TOP FLITE SEALING IRON — 30% OFF

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

RETAIL $19.95 — NOW ONLY $13.98 — RCM202

DREMEL MODEL 381 MOTO-TOOL WITH FULL ACCESSORIES — 41% OFF

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

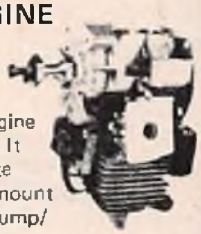
RETAIL $72.95 — NOW ONLY $42.98 — RCM015

MILLER No. 2017 SPRAY SET — 40% OFF

Complete set includes a 12 foot air hose, compressor, spray gun, air brush, and nozzles.

RETAIL $77.95 — NOW ONLY $46.78 — RCM016

QUADRA 2 CUBIC INCH ENGINE



The perfect engine for the biggies. It comes complete with muffler, mount and Tillitson pump/carb. Longlasting.

RETAIL $139.95 — NOW ONLY $99.98 — RCM017

DEVCON 5 MINUTE EPOXY IN ECONOMY 9 OZ. SIZE — 40% OFF

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

RETAIL $5.80 — NOW ONLY $3.48 — RCM018

DREMEL 572 MOTO SHOP — 36% OFF

This deluxe saw features a complete accessory set of blades, discs, etc. and flexible shaft. Limit of 1.

RETAIL $94.95 — NOW ONLY $60.98 — RCM019

GOLDBERG FALCON 56 — 40% OFF

This all time best seller is now redesigned with ailerons. 56" span. Uses a .15 - .35 engine, all balsa construction. An excellent trainer.

RETAIL $47.95 — NOW ONLY $28.78 — RCM020

ZINGER WOOD PROPS — 35% OFF

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

10X6 WOOD PROPS(6)
RETAIL $8.40 — NOW ONLY $5.48 — RCM021

11X7 WOOD PROPS(6)
RETAIL $9.60 — NOW ONLY $6.28 — RCM022

POWER PACER BATTERY TESTER — 22% OFF

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

RETAIL $59.95 — NOW ONLY $46.98

RCM023 — 9.6 volt
RCM024 — 6 volt

GOLDBERG SKYLARK 56 MK II — 40% OFF

Fun to fly sport airplane with pattern capabilities. 56" span. .30 to .40 size engine, all balsa construction. New improved design!

RETAIL $49.95 — NOW ONLY $29.98 — RCM025

SULLIVAN ELECTRIC STARTERS

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

RETAIL $38.95 — NOW ONLY $23.98 — RCM026

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

RETAIL $41.95 — NOW ONLY $27.28 — RCM182

BOLINK ELECTRIC CAR

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

RETAIL $99.95 — NOW ONLY $79.98 — RCM027

Bolink Car with Futaba FP-2F Radio already installed.

RETAIL $239.95 — NOW ONLY $164.98 — RCM113

CRAFT-AIR FIELD BOX — 33% OFF

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

RETAIL $29.95 — NOW ONLY $19.98 — RCM028

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

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

RETAIL $42.95 — NOW ONLY $27.98 — RCM029

AIRTRONICS OLYMPIC II — 30% OFF

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

RETAIL $49.95 — NOW ONLY $34.98 — RCM030

S & O BATTERY TESTER — 33% OFF

Tests 8 cell transmitter and 4 cell receiver nicad packs under load. Extremely accurate scales. Detects bad cells and/or abnormal current drain.

RETAIL $29.95 — NOW ONLY $19.98 — RCM031

TOWER

P.O. BOX 778
CHAMPAIGN, ILLINOIS 61820

THESE SPECIALS ARE GOOD UNTIL MAY 15th, 1979, ONLY.
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DA ENTERPRISES SERIES IV POWER PANEL — 36% OFF

The all-in-one power panel !

This quality panel distributes power from your 12 v. battery to starters, plugs, pumps, etc., & allows you to fast charge your radio at the field.

RETAIL $34.95 — NOW ONLY $22.48 — RCM033

BRIDI RCM TRAINER 40 — 32% OFF

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

RETAIL $54.95 — NOW ONLY $37.38 — RCM034

COX TD .049 STD. ENGINE — 38% OFF

A super hot ½A engine ideal for free flight, control line, ½A RC, and more.

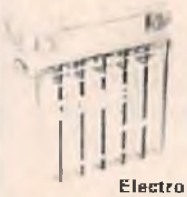
RETAIL $20.95 — NOW ONLY $12.98 — RCM035

DUNE BUGGY — 25% OFF

This unbelievably rugged kit can tackle the roughest course imaginable. Uses a 2 ch. radio and a .19 size RC engine. 17" length.

RETAIL $199.95 — NOW ONLY $149.98 — RCM036

12 VOLT MOTORCYCLE BATTERY — 50% OFF



These are high quality, heavy duty motorcycle batteries that are perfect for all electric starters. Brand new.

Electrolyte not included

RETAIL $23.95 — NOW ONLY $11.98 — RCM037

12 VOLT BATTERY CHARGER

To go with your 12 volt motorcycle battery, or any other 12 volt battery, we now have this high quality charger that does a perfect job. Safe and easy to use. Works great with battery at left. UL approved.

RETAIL $13.95 — NOW ONLY $6.98 — RCM038

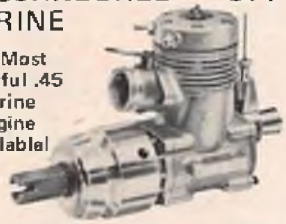
O.S. MAX .20 RC W/MUFFLER — 30% OFF

This reliable and long lasting RC engine is a favorite! O.S. Max engines are known for their high quality.

RETAIL $42.95 — NOW ONLY $29.98 — RCM232

K&B .45 (7.5cc) RC SCHNEURLE MARINE — 40% OFF

The Most Powerful .45 Marine Engine Available!



Features ball-bearings, butterfly throttle, and a water cooled head. Its rotatable case permits changing of exhaust from forward to aft.

RETAIL $120.00 — NOW ONLY $71.98 — RCM238

MARK'S MODELS WANDERER — 35% OFF

This easy to build and easy to fly glider has a 72" wingspan. So stable it will fly free flight without a radio. Great for the beginner!

RETAIL $19.95 — NOW ONLY $12.98 — RCM041

K&B .61 RC W/PERRY PUMP & CARB & MUFF

40% OFF

Equipped with a Perry Pump/Regulator and a larger Perry Carburetor specifically designed to be used with the Pump/Regulator system. Easy to start. Number 6535

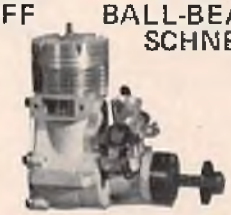
RETAIL $125.00 — NOW ONLY $74.98 — RCM042

BRIDI RCM TRAINER 60 — 32% OFF

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

RETAIL $62.95 — NOW ONLY $42.78 — RCM043

40% OFF — FOX .45 RC BALL-BEARING SCHNEURLE



Tests show this to be one of the most powerful .45's on the market. Puts out over one horse. Starts easily- idles well- extremely durable.

RETAIL $64.95 — NOW ONLY $38.98 — RCM044

VK CHEROKEE — 30% OFF

This semi-scale model features a 65" span and uses a .40-.61 engine. Full length die cut sides. A good-looking high quality kit.

RETAIL $69.95 — NOW ONLY $48.98 — RCM045

O.S. MAX .25 RC — 30% OFF

This popular and powerfull engine comes with a muffler. Super value.

RETAIL $44.95 — NOW ONLY $31.48 — RCM261

LANIER COMET II — 33% OFF

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

RETAIL $62.50 — NOW ONLY $41.98 — RCM047

ASSOCIATED RC 200 KIT — 39% OFF

See Tower Hobbies Catalog P. 118 for available bodies. 22" body length. Features ballbearings for rear axle & clutch, glass chasis, disc brakes. Kit comes complete less engine, body, and radio. Best gas car anywhere!

RETAIL $195.00 — NOW ONLY $119.98 — RCM048

HOBBIES

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K&B .40 RC W/ PERRY PUMP & CARB NO. 8360 — 40% OFF

Features Perry Pump/Regulator and a larger Perry Carb specifically designed to be used with the Pump/Regulator system. Adds 1000 RPM's!

RETAIL $105.00 — NOW ONLY $62.98 — RCM049

ASSOCIATED RC 12E ELECTRIC CAR KIT — 30% OFF

This rugged 1/12 scale race car kit is the ultimate in electric competition. The basic RC12E kit No. 3000 does not include motor, batteries, or body.

RETAIL $54.00 — NOW ONLY $37.78 — RCM245

Kit No. 3012 with engine and 6-cell batteries.

RETAIL $102.00 — NOW ONLY $69.98 — RCM246

PICA DUELIST 2/40 — 35% OFF

This easy to fly, all balsa kit is an ideal twin engine trainer. 67" span. Uses two .23 -.40 size engines and a 4 or 5 channel radio.

RETAIL $89.95 — NOW ONLY $58.48 — RCM051

JENSEN DAS UGLY STICK — 36% OFF

This all balsa kit is the ideal trainer. 60" span. Uses a .45 to .61 size engine and a 4 ch. radio. Very stable.

RETAIL $62.50 — NOW ONLY $39.98 — RCM052

MRC PORSCHE 934 TURBO — 30% OFF

This electric RC favorite is 1/12 scale & 15" long. It features a high output electric motor, 2 forward & 2 reverse speeds, precise scale detailing, & a rugged ABS plastic body. Requires any 2 ch. radio.

RETAIL $64.98 — NOW ONLY $45.48 — RCM074

MIDWEST ATTACKER — 35% OFF

This all molded styrofoam kit builds fast and flies great. 48" span. Uses a .19-.35 engine. Very popular.

RETAIL $42.95 — NOW ONLY $27.98 — RCM054

A-JUSTO-JIG — 33% OFF

This complete wing & fuse jig holds alignment within .1%. Allows you to make up to a 6 foot wing. Fuse jig fits on without tearing down your wing jig.

RETAIL $59.95 — NOW ONLY $39.98 — RCM055

DREMEL 580 TABLE SAW — 39% OFF

CUTS UP TO 1" THICKNESS!

Multi-purpose table saw especially designed for hobbyists. Rips, cross cuts, miters, straight cuts, dadoes.

RETAIL $99.95 — NOW ONLY $60.98 — RCM056

MIDWEST CARDINAL A.R.F. — 35% OFF

This all foam trainer has a 46" span. Uses a 2 - 3 ch. radio, & a .049 to .15 size engine. Rugged and flies great.

RETAIL $32.95 — NOW ONLY $21.38 — RCM057

STERLING PUDDLE JUMPER MK II — 38% OFF

This airboat has a plastic hull and cabin with balsa and plywood parts. It uses a 2 channel and a .15 to .35.

RETAIL $41.95 — NOW ONLY $25.98 — RCM058

LATRAX CORVETTE W/RADIO — 31% OFF

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

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

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

RETAIL $152.00 — NOW ONLY $104.98 — RCM244

O.S. MAX .60 FSR RC W/ MUFFLER — 32% OFF

This is a front rotor, Schneurle ported ball bearing RC engine that comes complete with a muffler. O.S. Max is known for high quality!

RETAIL $129.95 — NOW ONLY $88.98 — RCM243

BRIDI UFO — 28% OFF

The ultimate in pattern! This new release is .60 size with fiberglass fusealage and foam wings.

RETAIL $129.95 — NOW ONLY $93.58 — RCM061

STAFFORD TWIN COMMANCHE — 30% OFF

This museum scale twin engined favorite is always in high demand. It's all-balsa, has a 72" span, and needs two .40 engines.

RETAIL $139.95 — NOW ONLY $97.98 — RCM062

DUMAS BIG SWAMP BUGGY — 36% OFF

This rugged and stable airboat runs on water, dry grass, or snow. Really moves out with a .40 and speeds with a .60. Lots of fun!

RETAIL $35.00 — NOW ONLY $22.38 — RCM063

X-ACTO No. 5087 KNIFE & TOOL CHEST — 30% OFF

Contains Nos. 1,2, & 5 knives, complete asst. of blades, gouges, routers; plus X-Acto planer, sander, hobbycraft saw, spokeshave, balsa stripper, pin vise, screwdriver, asstd. drill bits. Comes in a large fitted wood chest.

RETAIL $29.95 — NOW ONLY $20.98 — RCM004

TOWER

P.O. BOX 778
CHAMPAIGN, ILLINOIS 61820

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ANDREWS AEROMASTER — 35% OFF

The world's most popular RC biplane! This balsa kit has a 52½" span. Uses a .60 - .78 size engine and a 4 channel radio.

RETAIL $79.95 — NOW ONLY $51.98 — RCM065

K&B .21 OUTBOARD — 40% OFF

This water cooled 3.5cc competition engine is the ultimate in outboard engines. It offers the superior control characteristics of outboard drive.

RETAIL $99.50 — NOW ONLY $59.98 — RCM152

FOX 1.2 CU. IN. OPPOSED TWIN — 30% OFF

One of the finest 2 cylinder model airplane engines ever produced! Develops over 3 horses! The Fox Twin is a smooth running power plant.

RETAIL $250.00 — NOW ONLY $174.98 — RCM234

TOP FLITE F4U-1A CORSAIR — 40% OFF

61" span. Requires a 4 ch. radio & a .60 size engine. Balsa sheeting for wings and stabs, hardware, and nylon fittings are included.

RETAIL $99.95 — NOW ONLY $59.98 — RCM277

BUD NOSEN CITABRIA — 28% OFF

Flies like a trainer! 105¾" span. Requires a 3 or 4 ch. radio and a .60 size engine. Hardware and landing gear included. 3 piece wing.

RETAIL $99.95 — NOW ONLY $71.98 — RCM278

MRC RTF HAWK TRAINER — 25% OFF

You can be ready to fly this foam trainer within one hour. Comes with an Enya .15 engine already installed with muffler. Uses a 2 or 3 ch. radio.

RETAIL $98.00 — NOW ONLY $73.48 — RCM069

MRC FMC COMBAT VEHICLE — 20% OFF

This 1/12 scale electric RC vehicle has 2 forward & 2 reverse speed control. Big output electric motor for indoor or outdoor quiet running. Excellent detailed scale! Requires a 2 ch. radio. 15" length.

RETAIL $74.98 — NOW ONLY $59.98 — RCM070

MRC SHERMAN TANK — 20% OFF

Building is simple due to a complete manual containing about 50 photos, and exploded views. Requires a 2 ch. radio with 2 servos and 6 "D" size batteries. 14" length.

RETAIL $134.98 — NOW ONLY $107.98 — RCM071

MRC LEOPARD ELECTRIC TANK — 20% OFF

18" length. Takes 40 degree inclines with ease. Movable latches, swiveling periscope, and authentic decals. Operates forward, reverse, left or right. It turns on a dime.

RETAIL $174.98 — NOW ONLY $139.98 — RCM072

COX READY TO FLY CUB TRAINER — 25% OFF

RADIO ALREADY INSTALLED!

Designed for the 1st time RC pilot! Single channel proportional radio system and Cox .020 engine already installed! Rugged foam construction. Has a 28¾" wingspan.

RETAIL $99.95 — NOW ONLY $74.98 — RCM233

GOLDBERG HANDI TOTE — 34% OFF

This flight box is compact yet has room for everything you need.

Most popular flight box ever made!

RETAIL $15.95 — NOW ONLY $10.48 — RCM006

PICA WACO — 33% OFF

This balsa and plywood kit has a 60" span. Uses a 4 - 6 ch. radio and a .40 - .60 size engine. All nylon fittings, wire landing gear, and struts included.

RETAIL $79.95 — NOW ONLY $53.58 — RCM165

MRC MARTINI PORSCHE — 30% OFF

This 1/12 scale RC electric racer has 2 forward & 2 reverse speed control, high output electric motor, & scale detailing. Requires any 2 ch. radio. Batteries not included. 15" length.

RETAIL $67.98 — NOW ONLY $47.58 — RCM073

SOFTGLAS — 22% OFF

NEW

The new, complete sealer-filler-primer for balsa wood models. Sands as easily as primer! Easy to apply. Dries hard, fast, and flexible.

RETAIL $8.95 — NOW ONLY $6.98 — RCM077

MIDWEST SWEET STIK — 40% OFF

54" span. Uses a .19 to .45 size engine. Requires a 4 ch. radio. This is a small version of the famous Ugly Stik. It's an excellent, ultra simple trainer.

RETAIL $42.95 — NOW ONLY $25.78 — RCM078

GOLDBERG SR. FALCON — 40% OFF

The Sr. Falcon is the standard big trainer. 69" span. Uses a 4 ch. radio and a .35 to .60 size engine. Every design element is engineered for simplicity and fast - building.

RETAIL $64.95 — NOW ONLY $38.98 — RCM079

HOBBIES

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MODEL	RETAIL	NOW ONLY	STOCK NUMBER
KRAFT KRAFT KRAFT	KRAFT	KRAFT	KRAFT
KP-2AW (Wheel) w/14IIA's	$129.95	$88.98	RCM080
KP-2AW (Wheel) w/15IIA's	135.95	92.98	RCM267
KP-2A (2 Stick) w/14IIA's	129.95	88.98	RCM081
KP-2A (2 Stick) w/15IIA's	135.95	92.98	RCM268
KP-2AS (1 Stick) w/14IIA's	129.95	88.98	RCM082
KP-2AS (1 Stick) w/15IIA's	135.95	92.98	RCM269
KP-4A w/KPS-14IIA's	299.95	187.98	RCM083
KP-4A w/KPS-15IIA's	311.95	196.58	RCM270
KP-6A w/KPS-14IIA's	329.95	204.98	RCM084
KP-6A w/KPS-15IIA's	341.95	211.98	RCM271
KP-5C w/14II's or 15II's	375.43	267.98	RCM085
KP-5CS w/14II's or 15II's	375.43	267.98	RCM086
KP-7C w/14II's or 15II's	515.43	367.98	RCM087
KP-7CS w/14II's or 15II's	515.43	367.98	RCM088
KPS-14II Servo	44.95	34.88	RCM089
KPS-15II Servo	44.95	34.88	RCM090
KPS-18 Servo (Super Mini)	54.95	43.98	RCM222
KPS-14IIA Servo	39.95	27.98	RCM272
KPS-15IIA Servo	39.95	27.98	RCM273
FUTABA FUTABA FUTABA	FUTABA	FUTABA	FUTABA
FP-2GS	109.95	69.98	RCM091
FP-2F w/S-7's or S-20's	149.95	98.98	RCM092
FP-2F w/S-18's or S-22's	129.95	86.98	RCM274
FP-2E w/S-7's	149.95	98.98	RCM093
FP-2E w/S-22's	129.95	86.98	RCM275
FP-3S w/S-18's	144.95	94.98	RCM094
FP-3S w/S-20's	169.95	109.98	RCM208
FP-4FN w/S-18's	289.95	185.98	RCM096
FP-4FN w/S-16's or S-20's	319.95	204.98	RCM097
FP-5FN w/S-18's	319.95	204.98	RCM276
FP-5FN w/S-16's or S-20's	359.95	229.98	RCM098
FP-6FN w/S-18's	339.95	216.98	RCM099
FP-6FN w/S-16's or S-20's	369.95	236.98	RCM100
FP-7GN w/S-15's	579.95	369.98	RCM101
S-18 Servo	29.95	22.48	RCM247
S-16 Servo	39.95	29.98	RCM103
S-7 Servo	39.95	29.98	RCM104
MRC	Call For Low, Low Prices!!		
SANWA SANWA SANWA	SANWA	SANWA	SANWA
No. 8020 2 Channel	99.95	69.98	RCM105
No. 8044 4 Channel w/4 Minis	279.95	177.98	RCM248
No. 8054 5 Channel w/4 Minis	299.95	189.98	RCM249

STOCK NUMBER	DESCRIPTION	RETAIL	NOW ONLY
RCM107	Airtronics Aquila	$69.95	$48.98
RCM251	Badger 200-1 Air-Brush Kit	32.95	21.38
RCM209	Bridl Dirty Birdy 40 - wood	59.95	40.78
RCM114	Bridl Dirty Birdy 60 - wood	84.95	57.78
RCM210	Bridl Dirty Birdy 60 - glass	124.95	89.98
RCM115	Bridl Sun Fli 4-20	29.95	20.38
RCM116	Bridl Super Kaos 40	55.95	37.98
RCM118	Bridl Super Kaos 60	69.95	47.58
RCM124	Coverite Balsarite	3.20	1.98
RCM125	Cox Electric Ferrari	119.95	83.98
RCM128	Craft-Air Butterfly II	49.95	32.48
RCM212	Craft-Air SD-100 Glider	59.95	38.98
RCM129	Craft-Air Windrifter Glider	47.95	28.78
RCM214	Craft-Air Drifter II Glider - NEW!!	19.95	13.98
RCM215	Dubro Lg. Nylon Hinges (15)	2.49	1.78
RCM216	Dubro Flex Cable - 20"	1.49	.98
RCM217	Dubro No. 203 Kwik-Switch Mount	1.75	1.28
RCM252	Dubro Muff-L-Air II - K&B .40	8.95	6.28
RCM131	Dumas Atlas Van Lines U-1	47.95	31.18
RCM219	Dumas Hot Shot - wood	30.00	19.48
RCM236	Edson Adjustable Motor Mount	6.95	5.58
RCM132	Fox .15 RC Schneurle	37.95	22.78
RCM133	Fox .19 RC	36.95	22.18
RCM135	Fox .36 RC	39.95	23.98
RCM136	Fox .40 RC Schneurle	45.95	27.58
RCM137	Fox .45 RC Schneurle	51.95	31.18
RCM138	Fox .60 RC Eagle	69.95	41.98
RCM139	Fox .60 RC Hawk	84.95	50.98
RCM140	Globee Fire Plug	26.95	18.88
RCM237	Goldberg RG3 Tri-gear Retracts	24.95	17.48
RCM253	Goldberg RPS1 Retract Power System	29.95	19.98
RCM141	Goldberg Skylane 62	64.95	38.98
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RCM153	K&B .21 Inboard	69.50	41.68
RCM266	K&B .45 (7.5cc) RC Schneurle	160.00	95.98
RCM222	Kraft KPS-18 Super-Mini Servo	59.95	43.98
	Kwikcote - ALL COLORS	8.00	2.98
RCM239	L&L On-Board Ignition System	19.95	13.98
RCM156	Mark's Bushwacker w/accessories	52.95	31.78
RCM157	Men Trainer (.15 - .25)	31.95	22.38
RCM158	Microflame Dlx. Welding Kit	35.95	23.28
RCM161	Midwest Little Stik	33.95	20.38
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RCM242	OPS .60 RC Marine w/Tuned Pipe	189.00	139.98
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RCM201	Wing Love Machine	49.95	27.98
	O.S. Max & Supertigre Engines		Call For Prices

RADIO SPECTRUM

from page 155/26

current will give you some indication of the state of charge so you may want to take the transmitter off before the receiver or vice versa. Normally the current will be around 0.5 amps when you are fully charged. A little lower when it is cold, a little higher when it is real hot. But once again, it is not that important to get 100% capacity. Your car would never run out of gas if the tank was always 50 to 90% full.

The resealable vent will not prevent cell failure due to electrolyte loss. If you overcharge and vent the cells enough they will eventually fail. What the vent does is prevent an explosion. Once again, the fast charging technique I recommend **never** over-charges. You quit when you are about 90% full. On the other hand, the 5 to 24 hour (quick/slow) charges almost guarantee over-charging although it is done at a safe rate.

You do not need cells specifically designed for fast charging although they must have low impedence and vents are recommended.

Cells can be stored in any state but must be cycled before use. Don't know and don't care about the chemistry. A lot has been written, but there is little we can do about it. I don't think it is a problem under our use, but I do recommend cycling once every couple of months to equalize all cells in your battery pack.

You may get the idea I'm biased in favor of fast charging. I am. It works, period.

Preconditioning

In my discussion of the Kraft FM system I mentioned that with the new encoder you shouldn't have to run your batteries in for a few minutes after charging anymore due to the excellent stability of the encoder. This prompted a

to page 168

Semi-big fun scale

Fokker D VII

Quick build up
Kit OL781 $97.50

FOKKER DVII:
Engines .60 - .80
Wing span 72"
Wing area 1488 sq. in.
Weight 10 lbs.
4 channel radio required

Sopwith Pup

Quick build up
Kit OL792 $119.50

SOPWITH PUP:
Engines .60 - .80
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Wing area 1586 sq. in.
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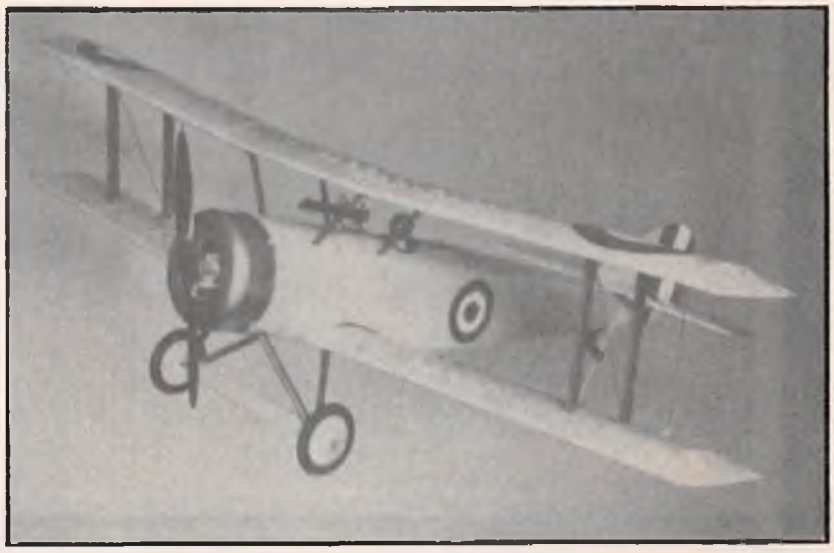
4 channel radio required



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RADIO SPECTRUM

from page 166/26

letter from a reader who suggested that he must be in trouble because he never heard of this, much less practiced it.

First let me say that the objective is to eliminate any neutral or trim drift. Some systems were sensitive to the extra few tenths of a volt you get immediately after charging. This is usually dissipated in three to five minutes so many super critical flyers used to turn their system on for a few minutes prior to the first flight to let things stabilize or get on the plateau of the battery discharge curve which has a very gradual slope compared to the first few minutes. You may not see this phenomena if you just let your battery stand for a few hours after charging or if you have a system with a lot of deadband. Also sloppy linkages and/or an insensitive airplane could mask it. If you're not bothered by trim changes on your first flight don't worry about it. □

SOARING

from page 24

a superb job. His practice program is completely documented, so a critique can be held afterward to discuss where improvements can be made. All in all, Terry will be a strong asset to our team and a great ambassador to the United States.

◆ ◆

Ralph Mennell of Dryden, Ontario, sends in a very good idea for the builder of large sailplanes and owners of small cars or when a sailplane is transported over a long distance with luggage.

The problem — take apart stabs are nice, all flying stabs are complicated. Conventional stabs — elevator tails don't come apart very well because the two elevator halves are connected together or, if they're not connected they need two control horns and a split or double pushrod. The answer — build a conventional type tail, with one horn only, by connecting the two elevator halves with a slip connector. Easy to build and very reliable. I have used this method on a Windrifter and two other gliders of my own design and have never had a failure in two full years of using them.

I use round brass tubing of two sizes where one telescopes inside the other. With the tubing cut to approximately 3" long, slip one inside the other for a distance of 1". Now very carefully squeeze this section with smooth pliers or a vise to an oval shape. At this point it is very important that the oval is even in size and smooth; if it is not, you will not be able to pull apart the two sections of tube. Some model and hobby shops do not handle square tubing, but if they do,

the square telescoping tubing would be far superior. The round or square tubing is available from the K & S Engineering Co. of Chicago, Illinois. Try your local hobby shop first.

The drawing shows the placement of tubes for the stationary portion of the stabilizer. The stab is built by the conventional method. The brass tube is epoxied in place. When the whole assembly is dry, take a razor saw and cut the center section out. This becomes a permanent part of the sailplane. Rods inside the brass tubes (that you epoxied in while building) will accurately align the stab, and the square or flattened tube will give positive coupling to the control surface.

◆ ◆

Most of you have read about the popularity of the two meter sailplane. One of the fine models in this class is the Soar Birdy kitted by Joe Bridi. It performed so well that Joe has put together a standard class 100" Soar Birdy. The concept worked out very well as it flies thermals, has excellent penetration, and will hold its own with anything in its class. Look for it, I feel that after I had the privilege of flying it that it will be a strong contender.

◆ ◆

Bob DeMattei sends word that the RCM Trophy Race is going to be better than ever this year. This prestigious affair is attended by every notable in the slope soaring scene. About every conceivable device or method is used at this event to get that last ounce of speed and performance out of their slope ships.

The race will be held in the San Jose, California area on May 5-6. If you would like to participate, get in touch with Bob for details. Bob DeMattei, Contest Manager, RCM Trophy Race, 1580 Parrot Ave., Sunnyvale, Calif. 94087 (408) 732-3009.

◆ ◆

Craig Foxgord, timer for Marla Johnson, is all smiles. She is flying her sailplane not his.

Craig Foxgord, of the Pasadena Soaring Society, is all smiles because Marla Johnson, also of the Pasadena group, is not flying his sailplane. Marla has been doing very well at the local contest scent. W.I.N.G.S. should latch on to her.

◆ ◆

to page 172

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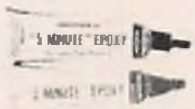

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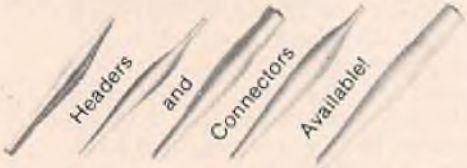

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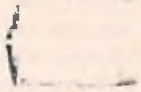

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SOARING

from page 169/24

The L.S.F. and the NSS is there waiting to do their thing for you, step forward and participate. They need you and you need them.

National Soaring Society, Jim Barr, 899 Logan St., Denver, Colo. 80201.

League of Silent Flight, P.O. Box 39068, Chicago, Ill. 60639.

Support The USA Soaring Team

Help send the 1979 USA Soaring Team to Belgium in July to defend their World Championships. Funds are needed to cover travel expenses and practice sessions in Europe, and all soaring enthusiasts are asked to send donations. A donation of $5.00 will get you a beautiful four color jacket patch and decal. Send to: FAI R/C Soaring Team Fund, P.O. Box 4319, Irvine, Calif. 92716.

This is a worthy cause, and deserves your support. The AMA provides funds for the three team members and team manager only during the contest plus travel from New York to Belgium. All other costs including travel from the team's home city to New York, and pre-contest practice sessions must be paid out of this special fund. Take a few minutes right now to send your contribution. Fund chairman is Lee Renaud, with Barbara Renaud and Gordon Pearson as co-chairmen.

1979 Western R/C Soaring Championships

Set aside the weekend of June 23 and 24, 1979, and plan to attend this great soaring contest. Sponsored by Forest E. Olson/Caldwell Banker Realtors and Cox Hobbies, this two day meet is a must. The contest will be managed by members of the Harbor Soaring Society and the Torrey Pines Gulls, two of the country's oldest soaring clubs. Meet proceeds will be donated to the FAI R/C Soaring Team Fund.

Events will include 2-meter Standard, Unlimited classes, plus a Junior event. The Junior event is limited to 100" span maximum, and is open to anyone who has not reached their 18th birthday by June 1, 1979. The site will be Mile Square Recreational Park in Orange County, California. Seven rounds of 6-minute Precision Duration, with one throw-away round will be flown.

Entries will be limited to 120 contestants, on 72 and 53 frequencies only (27 cannot be flown at Mile Square). Entry by pre-registration only during the period May 1 to May 15. For more information contact the Contest Director: Lee Renaud, P.O. Box 4319, Irvine, Calif. 92716.

◆ ◆

In closing is a note to the flyers who qualified to fly in the LSF Tournament on July 24, 25, 26, of 1979, at Lockport, Illinois. You are not restricted, in this contest, to fly in the same class that you flew in to qualify for the finals. You have your choice of class plus scale if you wish.

July 22, and 23 is a last chance contest for those who missed the LSF Regionals in 1978. Entry to this contest is restricted to those LSF members who did not qualify (or enter) at the Regionals in 1978. If interested, contact Warren Tiahrt, 7647 Twilight Ct., Clarkston, Mi. 48016.

Good Lift. □

from page 23

For 1979 our rules require quieter mufflers. This is McCoy's can muffler which Gene moved to a forward location for better weight distribution. Notice the 2 piece prototype plastic front end which will be used on the all new Associated RC300 car.

brakes, turn into the corner, punch the throttle again and go full throttle around the corner. With the RC200 diff car on the same corner, with an Elfin body and **no** wing, you can go further towards the corner, back off the throttle and turn tighter into the corner. Then you must **wait** for the car to coast 1/3 way around the corner, then you can punch it again. If you don't **wait** the correct amount of time, one of two things happens. If you punch too soon, the inside rear wheel is light, breaks loose, and the car goes forward about 1/2 speed. If you waited too long to punch, and are still pointed towards the outside wall, when you punch it, the car goes to total understeer and heads right for the outside wall. You then have to brake again, **wait** till the car turns and then punch it again. Everyone, naturally, had to drive my car. Curtis, Bill Jianas, Rich Lee and a couple other guys drove it. They couldn't believe driving an Elfin bodied car without a wing! Only Rich Lee liked it. He said it was impossible to spin the car out. Curtis and Jianas didn't like it. They said it was too frustrating waiting for the car to coast around the corner.

Right here I think it's important to point out that the Associated RC200 with diff, does not run like a Thorp car with diff. Simply installing a diff on an RC200 car does not turn it into a Thorp car, anymore than running a Porsche 30 KL body on the Standard RC200 would make it run the same as a Thorp car with an identical Porche 30 KL body. They are two very basically different cars, and they handle differently. Each different type of car will handle differently with a diff.

Back to the track. It rained Friday, which had washed the bite off Thorp's track. I ran against Jianas and Curtis on the track with my RC200 with diff. It was no contest. I could easily run away from them. In 10 laps I could be a lap ahead. What was happening, because of the slippery track, Jianas and Curtis were trying too hard to keep up with me.

Although they're both better drivers than I am, I could punch anywhere on the track and the car would not spin out. If they tried to go a little too fast through the corners, they would spin out. The more they spun out, the farther ahead I got.

There were about 25 to 30 cars practicing this day, and after about 4 hours running, the bite on the track started to get much better. I went out with Jianas and Curtis again. I could still easily beat them, but not as far. My car wasn't going any faster, and it was almost impossible to make mistakes with it. With the increased traction, they could get on the throttle sooner, but a little too soon resulted in another spin out.

By the end of the day the traction had improved considerably, to the point that it was probably 80% maximum for Thorp's track, which is about a 100% level for most other tracks. Jianas and Curtis were out racing each other and running bumper to bumper, lap after lap. The bite was obviously improved. I decided to join in. My car didn't run any different. It felt exactly the same when the track had bite as when it was slippery. But the difference now was that Jianas and Curtis were able to go faster. Now, after 10 laps, we would be dead even. I could go into the corners faster, but they could come out of the corners faster. They weren't spinning out now. They might slide a little, but that's all. My car had not improved at all as the bite came up, but theirs got better and better. We all agreed that if the bite got any better, they would then be beating me.

As I said earlier, Phil Booth and Phil Greeno were both running diffs on their cars at Monaco. If their cars handled anything at all like mine with a diff, then they had one great advantage on that track, especially with Formula cars. They, of course, deserved their wins, but now it's a little easier to understand a lot more of what was actually happening.

I don't think there's any question that differentials will improve all driver's performances under some conditions, and some driver's performances under all conditions. Beginners, Novices and Amateurs could improve their driving with diffs on 95% of the tracks they run on. Experts could improve their times on 75% of the tracks they run on. Everyone running a Formula or GT car would benefit with a diff. And in Europe where they run on damp tracks and race Formula cars on Saturday and GT cars on Sunday, a diff would be an absolute must. We'll have more on this as it develops.

How A Differential Works

The fastest Sports Car in the world was the Porsche 30 KL driven by Mark Donahue to a Can Am Championship Series win and a closed course speed record of over 220 mph. This car **did not** have a differential, but a solid rear axle. It

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CONTEST ANNOUNCEMENTS

THE FLYING KNIGHTS OF HAMBURG N.Y. PRESENTS

AIRSHOW '79

Come Fly With Us In Our R/C Airshow
August 11-12 1979
NO COMPETITION — NO EVENTS — NO PRESSURE

Demonstration Program plus Open Flying being planned for your pleasure and spectator interest ... Super grass R/C airfield ... Write for details

The Flying Knights
Of Hamburg, N.Y., Inc.
P.O. Box 363
Hamburg, N.Y. 14075

GALESBURG R.C. MODELERS

BIG BIRD FUN FEST

June 2nd & 3rd — At Carl Sandburg College

- Door Prizes
- Merchandise Prizes
- $20.00 Cash For The Entry Who Drives The Greatest Distance
- Min. Wing Area: 1200 Sq. In.
- Max. Weight: 35 Lbs.
- Max. Displacement: 3.0 Cu. In.

Practice & Gab Fest Sat. Afternoon — Weenie Roast for Pilots & Families Sat. Evening
Competition - Sunday
NO ENTRY FEE

For further info, contact Kenny Morss, 1309 Campbell Ave., Galesburg, Ill. 61401

ANNUAL LADY BOATERS REGATTA

Sponsored by K & B Mfg.,
L.A. County Dept. of Parks & Rec.,
So. Calif. Model Boat Assoc.

June 24, 1979
Legg Lake, S. El Monte, Ca.

The Regatta is limited to women only ... No age limit ... Because of liability insurance, this Regatta is sanctioned by NAMBA. Therefore, all contestants must be NAMBA members.

For further information contact:
Jack Garcia, 12152 S. Woodruff, Downey, Ca. 90241

JOHN SPANGLER MEMORIAL REGATTA

Hosted By Al's Hobby Shop
May 20, 1979
Lombard Lagoon, Lombard, Illinois

The race is a memorial event for the late John Spangler who was employed at Al's Hobby Shop. To help with the expensive hospital bills, all entry fees will be given to John's parents to help express the feelings of his friends.

3 CLASSES: Tunnels, Monos & Outriggers

For further info, contact either Bill Pistello, 542 N. Yale Ave., Villa Park, Ill. 60181, or Gary Preusse, 17W323 16th St., Oakbrook Terrace, Ill. 60181.

L.O.F.T. WEEKEND

June 2 & 3 — At the New Fort Wayne State School, Indiana

Saturday — Thermal Flyers Delight ... Registration: Open until 9:00 a.m. Pilots meeting 9:15 a.m. First launch 9:30 a.m. Entry Fee: $6.00 per class. Event: Precision Duration. Contest Director: Ray Holzheuer, 103 College, Warrenn, In. 46792

Sunday — Great Lakes R/C Soaring League Points Contest #1 ... Registration: Open until 9:00 a.m. Pilots meeting 9:15 a.m. First launch 9:30 a.m. Entry Fee: $6.00. Event: Precision Duration with landing bonus. Task duration time to be announced at pilots meeting. Contest Director: Jerry Kay, 230 S. Roosevelt, Warsaw, In. 46580.

For further information, contact one of the above Contest Directors

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takes an enormous amount of power to go around a corner with a car that has a solid axle and 18" wide racing slick tires. In order for the car to turn a corner, requires that the rear tires always break loose, no matter how fast or how slow you go around the corner. This is because the outside wheel has to travel farther than the inside wheel in a corner. The solid axle makes the wheels turn exactly the same amount, so they must break loose to turn a corner. Mark had more than enough power in his Porsche to cope with this problem.

In our R/C cars, we transfer the weight in the corners, so the inside tire is "light" and can break loose easily. This transmits most of the power to the outside wheel, which actually aids in turning the car, similar to a tank. This is all great on a high traction track, but on a slippery track, when the outside wheel starts to "steer" the car, it generally results in a "spin out."

The differential is not a "cure all," but there's no question that on slippery tracks, or when using Formula or Coupe bodies, the differential would be the only way to go. You'll notice in the drawing, the differential has two axle half shafts, two half shaft bevel gears and two bevel planetary gears. If you hold the car up in the air, hold the diff housing stationary, and turn the R.H. wheel forward, the L.H. wheel will turn backwards. In going around a corner, both wheels can turn at a different speed, without breaking loose from the track. Now this sounds like a perfect solution to making it easy for the rear wheels to turn a corner, and also to keep from scrubbing off tire tread at an alarming rate, as with solid axle cars. With the family sedan, the standard differential does work perfectly, but when we get to race cars, a whole new set of problems develop.

The **important** thing to remember about a differential is not that it allows the wheels to rotate at different rates, but that it balances the torque equally between them. If you understand this, and again, it's **very important** to understand it, then you can easily understand why the R/C cars, with diff, have great understeer. And also why, when the inside wheel becomes light, the forward speed decreases. The ideal situation, for all but the highest bite tracks, would be a limited slip diff. These are available in the 1/1 scale cars, but as yet, not for R/C cars. The alternative has been to use 40% 140 gear oil and 60% STP, on up to mixtures including light grease, in an effort to cause limited slip. This does help somewhat.

You'll also notice, from the drawing, the brake disc and gear, mount directly to the differential housing and **not** to the

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ENGINES & MUFFLERS

K & B Mfg.

6712 19R/C plane or car	32.49
6525 61 R/C w/ muffler	55.99
6535 61 R/C w/muffl & pump	71.49
7861 35 R/C	24.49
8011 40 R/C	45.99
8380 3.5 cc plane w/muffler	42.99
8382 3.5 cc SI outboard marine	59.99
8384 3.5 cc SI inboard w/muffl	43.79
9080 3.5cc SI Marine	74.99

FOX

21600 15 R/C schneurle	26.57
21698 15 R/C schneurle BB	40.57
21900 19 R/C	24.47
22500 25 R/C	24.47
22900 29 R/C	26.57
23600 36 R/C	26.57
24000 40 R/C schneurle	29.99
24100 40 R/C schneurle BB	42.99
24500 45 R/C schneurle	33.99
24600 45 R/C schneurle BB	42.99
26099 Eagle (60 R/C)	46.99
26199 Hawk (60 R/C)	53.99

FOX MUFFLERS

90212 Up to .15	4.76
90222 .19 to .36	6.36
90232 .60	7.96
90242 .15 schneurle	4.76
90252 .40 to .45 schneurle	6.36
90302 .29 to .45 tuned mufl.	14.96
90303 .60 - tuned muffler	18.71

COX

120 Golden Bee .049	9.30
150 Black Widow .049	9.75
170 Tee Dee .049	16.90
200 Tee Dee .051	16.90
210 Tee Dee .09	18.90

COX w/ THROTTLE

120-T Golden Bee .049	10.45
220-T Medallion .15	19.95
230-T Medallion .09	15.95
240-T Medallion .049	13.25
2440 Eng. tank mount 049/051	3.90

TATONE MUFFLERS

EM-4 .09 to .19	5.80
EM-5 .29 to .40	7.40
EM-6 .45 to .80	7.70
300-A For all current .049	4.95
300-B For Cox TD .051	4.95

O.S. MAX (w/muffler)

.10 R/C Schneurle	28.76
.15 R/C	31.96
.20 R/C	34.36
.25 R/C	35.96
.25 R/C Schneurle	47.96
.30 R/C	40.76
.35 R/C	43.16
.40 R/C	59.96
.40 R/C Schneurle	71.96
.60 R/C (Blackhead)	74.99
.60 R/C Schneurle	97.50

ACCESSORIES

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9504 standard launch pail	24.50
9505 heavy duty launch pail	25.75

SULLIVAN

hi-tork electric starter	24.99
deluxe hi-tork elect. starter	29.50
replacement rubber adapter	.90
aluminum drive cone	3.96

FOX GLOW PLUGS

	per doz.	ea.
R/C Short or Long	9.89	.99

MISCELLANEOUS

Tack rag	.55
Epoxy brushes 6/pkg	.89
Sandpaper - assorted	.39
Mylar sandpaper - assorted	.79
"T" pins - #16 (1 oz.)	1.79
"T" pins - #20 (1 oz.)	1.49
Foam rubber ¼x8x12	.79
Foam rubber ½x8x12	.98
Foam rubber 1x8x12	1.59
#64 Rubber bands - ¼ bx.	1.40
Coverite glaskote - ½ pint	2.39
Coverite glaskote thinner-1 pt.	2.19

TATONE

engine test stand w/tank	7.70
glow plug starter-nicad	5.40
charger for above nicad	6.35
½A tank mount	6.40

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AMBROID

1¾ oz. tube	.63
3.2 oz. tube	.99

TITEBOND

4 oz.	.98
8 oz.	1.45
16 oz. (pint)	2.45
32 oz. (quart)	3.60

HOBBYPOXY EPOXY

Formula 1-15 min. work time	1.10
Formula 2-45 min. work time	2.98
Formula 3-two can (8 oz.) set	3.25
Formula 4-5 min. work time	1.60

DEVCON EPOXY

5 min. epoxy (2½ oz.) R206	2.09
2 in 1 applicator tube R208	1.25
5 min. epoxy (9 oz.) M209	4.19

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Allstar biplane	14.99
High glider	11.99
Whizard	11.39
Dick's dream	8.99
Alpha	13.99

ANDREWS

Aarey	29.99
Harey	26.99

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Square soar	17.45
Q-Tee	15.35
Super questor	27.95
Aquila	52.50
Gere sport	23.59
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S-Tee	15.35

BRIDI

100 RCM Trainer 10	19.60
110 RCM Trainer 20	24.50
120 RCM Trainer 40	36.85
130 RCM Trainer 60	40.95
140 RCM Basic Trainer	26.80
150 RCM Sportster	26.80
160 15-500	26.80
170 Tweedy Bird 19	26.80
180 RCM Trainer 5	17.45
200 Quickest 200	17.50
210 Quickest 500	28.80
220 Classic 40	36.85
240 Super Kaos 40	37.50
250 Super Kaos 60	46.90
260 Kaos	44.90

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50 Falcon 56 MK II	29.99
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52 Jr. Falcon	10.49
55 Skylane 42	11.29
57 Skylane 62	40.99

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124 Jester II	47.78
146 Pinta	31.53

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RC 34 Skybolt	53.90
RC 35 Kougar	36.55
RC 36 Klipper	17.70
RC 37 Super Sport	16.95
RC 38 Smith Mini Plane	41.80
RC 39 Kavalier	34.65
RC 42 Kiwi	32.30
RC 43 Colt	17.70

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RC 10 Top dawg	14.99
RC 11 Headmaster	20.25
RC 13 S.E. 5a	52.45
RC 15 Contender	39.85
RC 16 P-51 mustang	52.45
RC 17 P-40 warhawk	52.45
RC 19 P-47 thunderbolt	67.15
RC 20 Freshman trainer	33.55
RC 21 Freshman corsair	69.95

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- Hand operated
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1314 Atlas Van Lines U-1	33.50
1315 Drag 'n Fly Mark II	27.95
1421 Competition Deep Vee 21	30.15

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2310 For PT-109	10.90
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2312 For Shelly Foss	40.25
2317 For Drag Fly 20 MK II	46.70
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MISC. ACCESSORIES

6 volt 4 ampere gell battery	11.99
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6 volt charger for above	8.50

ZINGER MAPLE PROPS

Dia.	Pitch	6/pkg	ea.
7	4,5,6,7	5.19	.96
7-½	4,5,6,7	5.19	.96
8	4,5,6,7	5.62	1.04
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9	4,5,6,7	5.62	1.04
10	4,5,6,7	5.99	1.12
11	5,6,6W,7,7W,7½,8	6.91	1.28

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Super Maple	6/box	ea.
9 x 6	5.25	1.00
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See our catalog listing for additional Zinger and Top Flite props.

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PIT STOP

from page 177/23

axle. The gear turns the housing, which in turn, turns both wheels forward at the same speed if both tires are getting the same amount of traction. Likewise, a good example would be one tire on dry asphalt and one tire on ice. The tire on ice could be spinning madly and the tire on the asphalt would be stationary. And yet they are both getting the same amount of torque. Interesting isn't it? □

SCALE VIEWS

from page 20/18

builders first think to look. But many don't realize the number of books available featuring 3-views, cutaways, photos and/or art work in color and black and white that can be used as a reference for building or decorating a scale model and preparing the required presentation for scale judging. There are literally thousands to choose from, with more appearing every month. Following is a survey of some new book dealers that I can recommend from having dealt with them personally and received reliable service. Their catalogs list about all available in-print aviation books and, best of all, give thumbnail descriptions of the content of each publication, sometimes showing illustrations of the cover or interior content. I think a set of book catalogs is a necessity for a proper research job.

Aero Publishers, Inc., 329 W. Aviation Road, Fallbrook, Calif. 92028. "Worlds Largest Aviation Book Publisher since 1939" is the claim and, in fact, they have so many volumes of interest to scalers that I won't take the space to list even a representative sample. So send for the free catalog of the line. (My favorites: Books by Paul Matt and Lloyd Jones.) They have some books from other publishers but mostly concentrate on their own. Aero books are also sold by the other book dealers listed here.

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Super Pacer	19.95
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B105-2 landing gear	2.98
B105-3 landing gear	3.33
B105-4 landing gear	3.85
B105-5 landing gear	4.38
B106-3 landing gear	3.50
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B106-5 landing gear	5.25
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2134 set&3gun	50.95
2129 set&2gun	50.95
2018 1 gun set	43.95
2017 set&2gun	43.95
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2016 set&1 gun	40.95
18 gun	9.57
16 gun	5.70
14 gun	4.50

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-PICA-

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FW190	52.98
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-R & S-

Vertigo II	38.95
Phoenix 6 (60 size)	38.95
Phoenix 5 (60 size)	38.95
Phoenix 5 (40 size)	31.95
F16	89.95
Mig 21	89.95
F5	89.95

-R/C KITS-

T38 Talon	66.95
Acromaster	48.95
F7F Tigercat	87.95
F100 Super Sabre	59.95
Super Hunter II 60	48.95
Super Hunter II 40	41.95
Lockheed U2	83.95
Maxi Acro Trainer	87.95
Acro Trainer	48.95
Acro Trainer 40	41.95

-ROYAL-

Pitts S2	66.95
Douglas C-47	92.95
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Komet Ply skin	39.95
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Diamont	62.95
Glasfugel 604	68.95
Magnum 12	89.95
Skybolt	69.95

-SOLUTION-

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-SONIC SYSTEMS-

3 Gear with pump	38.95
3 Gear System	31.95
Retract Mains(pr)	12.95
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Tiger Tail	59.95
Sweetater Delux	84.95
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Southern Kite	49.95

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Piper Cub (foam)	24.95
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Fokker Triplane	45.95
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Cherokee	46.95
Navajo	46.95
Corben Super-Ace	31.95
Sopwith Camel	46.95

-WING MFG.-

Drone	32.95
Love Maching	32.95

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Quadra	98.95
O.S.Max:	
15 R/C	27.95
25 R/C	31.95
25 F SR R/C	41.95
30 R/C	35.95
35 R/C	37.95
40 R/C	51.95
40 F SR R/C	63.95
60 F SR R/C	89.95
60 F SR w/pump	111.95
K&B:	
61 R/C	52.95
61 R/C W/pump	67.95
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40 R/C w/pump	53.95
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Futaba:	
4 channel w/S18	181.95
4 channel w/S16	194.95
6 channel w/S18	209.95
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7 channel	394.95
Kraft Radio's:	
KP4A	188.95
KP6A	209.95
KP5C	268.95
KP7C	368.95
Signature Series	674.95
World Engines:	
7 cha. dual stick	254.95
5 cha. dual stick	234.95
COX:	
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8054 5 channel	188.99
8031 3 channel	101.00
8020 2 channel	69.95
8021 2 channel	92.95
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11-5,11-6,11-7,11-7½	1.12
11-8	1.12

also 9-6w,10-6w,11-6w

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Fox cub style wheels:	
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5 "	6.95
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CB Associates:	
Gold transmitter tray	11.95

POSTAGE & HANDLING $2.00. C.O.D. 85¢. PERSONAL CHECKS WILL DELAY ORDER 2-3 WEEKS. HEAVY, LONG DISTANCE & OVERSIZE PARCELS EXTRA. PRICES SUBJECT TO CHANGE. NO RETURN W/OUT AUTHORIZATION.

SCALE VIEWS

from page 180/18

Armed Forces Book Co., 21 Dahlia Lane, Deer Park, New York 11729. Tony Lucca has a stock of 3,000 titles. One section is of particular interest. Tony has evidently cornered a stock of the original series of Profile Publications that are now out of print and hard to find. Most of the rare first 220 are listed as well as later editions up to 262. In most cases a Profile is enough material for a complete Sport Scale presentation as well as a good start on one for Precision Scale judging. Send $1.50 for a copy of the complete illustrated catalog.

Beachcomber Bookshop, 714 N. Euclid, Tucson, Arizona 85719. When I first bought books from Paul Gaudette about 15 years ago he was actually located near the water on Birch Bay in the Northwest. Now he has quarters in less humid surroundings though there presumably is plenty of sand to comb. His latest catalog cost 50 cents and seems to have some titles you don't see listed very often elsewhere, if at all. In addition to the new books, Paul has a large stock of out of print books. For specific wanted titles, list each on a 3 x 5 file card along with your name and address. He will try to find it for you, if it is not in his collection. He buys aviation book collections and will take books in trade. For more information, call (602) 622-2326.

Historic Aviation, 3850 Coronation Road, Eagan Minn 55122. James Horne is a long time modeler and used to operate a model shop during the 1930's, so is familiar with the needs of modelers. He carries a complete stock of aviation books and from time to time has exclusive offerings. A recent example of this is "Waco Airplanes" by Ray Brandley, a pictorial survey of the famous line of aircraft from the 1924 Waco Model 7 to the 1942 Waco VKS-7S. Each photo is accompanied by

a data table with standard specification figures along with a few interesting details like factory standard color scheme and the total number of each variant sold. Illustrated catalog of books is available free for the asking. Four pages show collections of posters, photos and full color prints that would be good for decorating a work shop or model builder's den.

Mil-Air Publishing, 11809 S. Alburtis Ave., Norwalk, Calif. 90650. We had some information on Harry "The Aviation Bookie" Miller last month in the feature on back issue magazine sources. He also has new books in stock as well as out of print books. Send him a self addressed stamped envelope when making an inquiry about an out of print book and he will reply as to its availability. His stocks are warehoused at the Compton California Airport but call either (213) 863-5028 or (213) 632-8081 before coming in person because his hours are irregular.

Milbooks, P.O. Box 92, Stanton, Calif. 90680. Another company offering all of the standard aviation titles, plus naval and military books. I was impressed by the prompt and personal attention given to a recent order. If they don't have a book that is in print, they will try to get it for you. An illustrated 44 page catalog is available free on request. The catalog has all of the "series" books, which are often the ones best suited to a modeler, listed in a special section.

World War I Aero Bookshop, Box 142, West Roxbury, Mass. 02132. This company has been in business for a long time and in addition to a big stock of new books, they also offer a line of 8 mm movie films. Lots of rarities there, Richthofen, Rickenbacker, Guynemer, from WW I, Billy Mitchell, Lindberg, movie stunt pilots from between the wars and B-17's, 8th AF, Doolittle, Luftwaffe, Kamikazes, etc., from World War II. Recent catalog also had paperback aviation titles, used books and back issue magazines. Send $1.00

for a copy of the latest edition.

Zenith Aviation Books, North Branch, Minn. 55056. Dave Arnold's operation is also going into publishing soon. At present his free catalog, called the Bookhawk, will be sent on request. Customers are kept on a miling list and receive new editions of the Zenith catalog automatically. The most recent issue has a good bargain. "The Speed Seekers," Tom Foxworth's tour-de-force on early racers, is a 5 lb. tome with 560 pages, 530 photos, 75 3-view drawings, has sold for several years at $45.00. Evidently having obtained the publisher's remaining stocks, Dave is selling this glossy "coffee table" book for $17.95 as long as the supply holds out.

Space is running out for this month, so we'll save a couple more book sources for next month, those whose specialty is used or out of print books.

Bookshelf

U.S. Army Air Force Fighters — Part One. By William Green and Gordon Swanborough. Arco Publishing Co. $4.95. Part of a series by the same authors called WW II Aircraft Fact Files, this book has 3-views, some cutaways, photos and historical data for 13 aircraft of the Curtiss, Convair and Bell companies. The views are not large, ranging from about 1/4 to 1/3 of a page on an 8" x 10½" format but they are well drawn, with major panel lines indicated. Some have several supplementary views showing the major varients of the basic type. Larger and more detailed 3-views are available elsewhere for part of the subjects but it is not easy to find

drawings of any kind for the limited production or experimental jobs featured. Have you, for example, drawings for the P-63F, XP-77, XP-81, P-40Q, XP-46, XP-55, P-60 and XP-62? I note that U.S.A.F. Fighers Part Two is now available in England so should shortly arrive here. It will include Lockheed, North American and

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SERVOS, RECEIVERS, COMPLETE FLITE PAKS REGULAR OR MICRO, ASSEMBLED OR KIT

Litco flite paks or components can be purchased assembled or in kit form. Assembled units are pretuned and ready to use with transmitter specified below. All units use Deans connectors. Servos are supplied with extra female Deans connector to simplify installation.

Litco Systems has pioneered the concept of fully assembled flite paks custom matched to various transmitters. Our servos are electrically adapted to match the transmitter specified. Please order from table below.

PLEASE CIRCLE THE MAKE OF YOUR TRANSMITTER: **KRAFT EK ROYAL FUTABA WORLD MRC RS ORBIT HEATH ACE UNICOM CANNON (PRO LINE COMPLETE FLITE PAK ONLY) SANWA CIRRUS MICROAVIONICS KRAFT KP4A**

REGULAR COMPONENTS

MICRO COMPONENTS

SERVOS
- Double sided PC boards, 544 AA IC
- Long life potentiometers
- High quality servo motors
- 4.0 lb. power, 0.5 sec transit
- 8 mA drain
- Fast, precise high resolution
- Gold plated Deans connectors

REGULAR	Size: 1.5x1.45x.73	Wt. 1.2 oz.
MICRO	Size: 1.28x1.3x.6	Wt. 0.7 oz.
MIDGET	Size: 1.12x1.43x.7	Wt. .85 oz.

RECEIVER
- Double sided PC boards
- Double tuned front end
- 1.5 μV, AGC on 4 stages
- Gold plated Deans connectors
- High selectivity and rejection
- 5 channels, 8 available

FREQUENCY: 72.08, 72.16, 72.24, 72.32, 72.40, 72.96, 75.640

REGULAR	Size: 1.9x1.7x.8	Wt. 1.5 oz.
MICRO	Size: 1.75x1.14x1.0	Wt. 1.5 oz.

BATTERY

REGULAR
- 500 mAH, vibration resistant
- Nylon D&R case
- Gold plated Deans connectors

Size: 2.2x1.25x1.25 Wt. 4 oz.

MICRO
- 225 mAH, vibration resistant
- Nylon D&R case
- Gold plated Deans connectors

Size: .85x1.45x1.45 Wt. 2 oz.

SWITCH HARNESS
- Noble high quality switch
- Deans gold plated connectors
- Nylon protective cover
- Wt. 0.4 oz. (charging connector to be supplied by user)

WRITE: We answer inquiries immediately. We ship rapidly when paid by money order or cash.

New! BANTAM MIDGET AT LOW PRICE

The newest addition to our tremendously popular 544 servo line is the Bantam Midget. It features beautifully engineered D&R mechanics and a new powerful motor. It is capable of controlling airplanes from ½A to 60 pattern. It is lighter, stronger and faster than anything in its size range. The electronics is the same as in all our 544 servos and it is the best money can buy: the newest highly advanced 544AA IC offering internally regulated power supply, dynamic braking, linear ramp timing and the need for very few external components. Parts are mounted on the most sophisticated PC board in the industry — double sided, plated inside holes, reflowed in hot oil and manufactured of epoxy glass. We use only the best pots — CTS metered deposition. The kits are simple, straightforward and easy to assemble. Our flite pak approach has been an unbelievable success and many modelers have purchased their 4th or 5th flite pak. If you have been holding back — don't — you are missing a good thing. With the dollar dropping and high inflation, prices will be going up. Flite pak prices are sums of component prices and all parts can be mixed.

ATTENTION KIT BUILDERS: REGULAR BANTAM D&R SERVO KIT STILL ONLY $17.00!

NAME

ADDRESS ZIP CODE

QUANTITY	CAT. NO.	DESCRIPTION		PRICE	TOTAL
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	S5442	Rotary Dunham servo, assembled	(For power and strength)	23.00	
	S5443	Rotary Dunham micro servo, assembled	(For size and weight)	31.00	
	S5445	Rotary D&R Bantam Midget servo, assembled	(For weight and strength)	25.00	
	R2000	Receiver regular, assembled	Frequency_____	36.00	
	R2001	Receiver micro, assembled	Frequency_____	39.00	
	B1000	Battery regular, assembled		13.00	
	B1002	Battery micro, assembled		14.00	
	H1001	Switch harness, assembled		5.00	
	S5441K	Kit of S5441 servo		17.00	
	S5442K	Kit of S5442 servo		19.00	
	S5443K	Kit of S5443 servo		27.00	
	S5445K	Kit of S5445 servo		20.00	
	R2000K	Kit of R2000 receiver	Frequency_____	30.00	
	H2010	5 male and 5 female Deans 3 pin connectors & assortment of wire		8.00	
	S2000	Trays for all regular servos and S5445, 5 pcs.		5.00	
	S2000A	Single snap on tray for S5443		1.25	
		☐ COD, Shipping, handling & insurance		2.50	
		☐ Cash, money order, bank draft, certified check, shipping, handling & insurance		1.50	
		On personal checks delay of up to 3 weeks. N.J. res. add 5% sales tax. Foreign orders add 10% of the total.		TOTAL	

Litco Systems BOX 90, EAST HANOVER, NEW JERSEY 07936

SCALE VIEWS

from page 184/18

Republic fighters. Other titles in the series that have been issued are: U.S. Navy and Marine Corps Fighters, Japanese Army Fighters Parts One and Two and Soviet Air Force Fighters.

Any series that proposes to provide, as this one seems to, a complete survey of all the fighter aircraft used in WW II is almost automatically assured a place on my bookshelf. It is a pleasure to also be able to recommend it for yours on the basis of the quality of the material presented.

Several of the book dealers listed earlier stock this series.

RCM's Assistant Editor examines the Radial Engines from Executive Engines Co., 16650 S. 104th Ave., Orland Park, Ill. 60462. These 5 cyl. and 7 cyl. engines should be of interest to collectors and scale enthusiasts.

□

ENGINE CLINIC

from page 15/10

the manufacturers of the Wankel recommend that you do not use an oversize spinner – which I take to mean a scale spinner for either the Spitfire or Bf 109E. Specifically what is the problem – a matter of engine balance or loss of torque?

I also wonder about the possibilities of joining two Wankels together to gain the equivalent of a '60' sized engine. This appears to be a planned production technique for the larger Wankels.

And, finally, are there plans available that you know of to build an operating radial engine, such as the extinct

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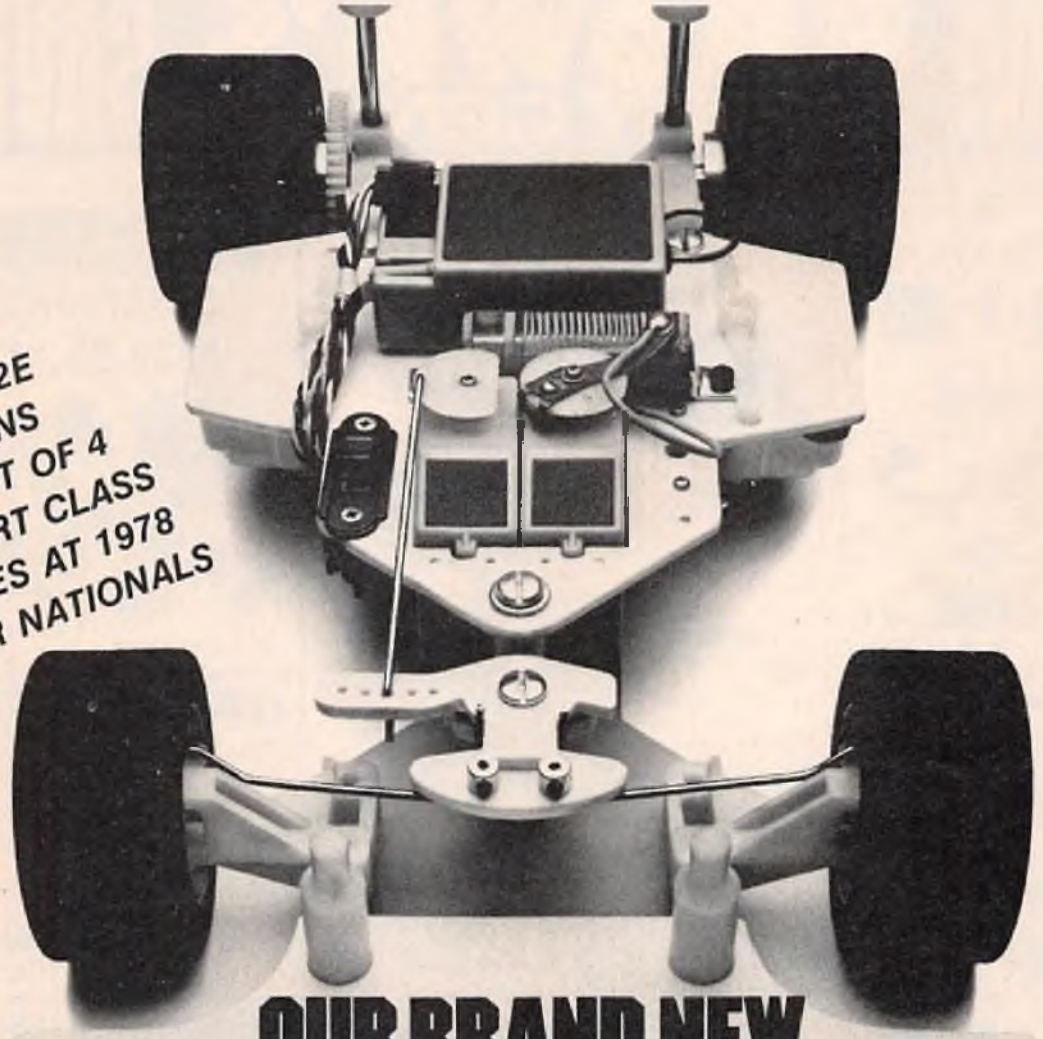

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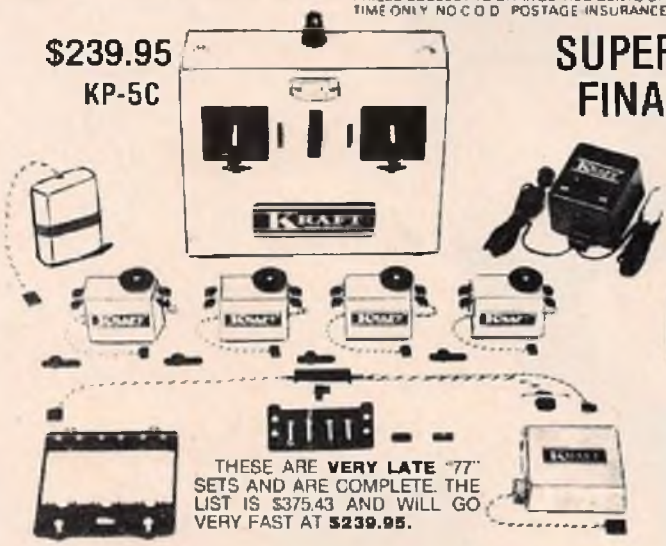

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$339.95 SEVEN CHANNEL

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Centennial 7 channel Kraft 2 Stick

List Price $515.43, and we are letting them go for only $339.95. Brand spanking new, famous Kraft guarantee, and your choice of frequency and servo. Choose the KPS 15 workhorse or smaller KPS-14.

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LIST PRICE $515.43 BHC PRICE ONLY **$339.95**

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KP-4A	299.95	194.95
KP 6A	329.95	224.95
KP 5C	375.43	239.95
KP-5CS	375.43	260.00
KP-7C	515.43	380.00
KP-7CS	515.43	380.00
KPS 14, 15 SERVOS	39.95	

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Futaba

MODEL	BHC
FP2GS	75.00
4FN4 (S-17)	180.00
4FN4 (S-16)	194.00
5FN	225.00
6FN (S-18)	210.00
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EXPERT 7 CHAN 2 STICK 5 SERVOS	465.00	271.95
EXPERT 5 CHAN 2 STICK 4 SERVOS	400.00	235.95
MULLIGAN	47.95	38.40
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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, CHAMP	39.95	31.99

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ENGINES	LIST	BHC
OS 10 FSR std	28.95	23.20
OS 10 FSR R/C	35.95	28.80
OS 15 std	32.95	26.40
OS 15 R/C	39.95	32.00
OS 20 std	35.95	28.80
OS 20 R/C	42.95	34.40
OS 25 std	37.95	30.40
OS 25 R/C	44.95	36.00
OS 25 FSR R/C	59.95	48.00
OS 25 FSR std	52.95	42.40
OS 30 std	45.95	36.80
OS 30 R/C	50.95	40.80
OS 35 R/C	53.95	43.20
OS 35 std	47.95	38.40
OS 40 R/C	74.95	60.00
OS 40 FSR R/C	89.95	72.00
OS 60 FSR R/C	129.95	104.00
OS 60 FGR B.H	99.95	80.00
OS 60 FSR R/C w/pump, carb & muff	159.95	128.00
OS WANKEL	119.95	96.00
OS 65 RSR	139.95	112.00
OS 65 RSR-MARINE	142.95	114.40
OS 60 4 CYCLE	225.00	157.50
OS 21 MARINE	64.95	52.00
OS 10 FSR R/C MARINE	42.95	34.40
OS 20 R/C MARINE	52.95	42.40
OS 40 RSR MARINE	99.95	80.00
OS 45 RSR MARINE	109.95	88.00
OS. 90 RC	225.00	157.95

SUPER TIGRE	LIST	BHC
X21 SPEED	70.00	56.00
ST 23 std	36.95	29.60
ST 23 R/C w/muff	53.95	43.20
ST 35 std	53.50	42.80
ST 46 R/C w/muff	69.95	56.00
G60 FI PYP R/C	99.95	80.00
G60 ABC PYP R/C	109.95	88.00
G60 B.H.	99.95	80.00
ST 60 FIBB R/C w/muff	79.95	64.00

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LIST $119.95 BHC $83.99

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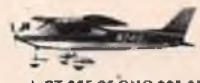

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50" SPAN—19-30 ENGINES—4 CHAN—3¾ LBS—STEERABLE NOSE GEAR—ONE PIECE FUSE SIDES—QUICK EASY CONSTRUCTION—WHEEL PANTS ALL DIE CUT—BALSA PLYWOOD—FORMED WIRE PARTS—ADD $3.00 SHIPPING—EXCESS REFUNDED

09-15 ENGINES—345" AREA—2-3 CHAN—3¾ LBS—ALL BALSA—ONE PIECE FUSE SIDES—WHEEL PANTS, ALL PARTS—DIE CUT FORMED WIRE PARTS—ADD $3.00 SHIPPING—EXCESS REFUNDED

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774-4 CHAN	279.95	197.95
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MRC AIRPLANES	LIST	BHC
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CESSNA	449.95	320.00
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FOX 35 STUNT	26.95	16.20
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#217 CONTROL	25.95	18.20
#219 CONTROL	23.95	16.80
#223 STAND	14.95	10.50
#229 ROUTER	11.95	8.40
* #245 TOOL special	39.95	24.00
* #270 TOOL special	41.95	25.20
* #271 TOOL special	51.95	31.20
* #280 TOOL special	51.95	31.20
* #281 TOOL special	61.95	37.20
* #370 TOOL special	52.95	31.80

#572

	LIST	BHC
* #371 TOOL special	62.95	37.80
* #380 TOOL special	62.95	37.80
* #381 TOOL special	72.95	42.95
#571 SHOP TOOL	74.95	52.50
#572 SHOP TOOL	94.95	66.00
#580 ARBOR SAW	99.95	70.00
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K & B ENGINES	
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#6535 61 RC W/PUMP/MUFF	LIST $125.00 BHC $87.50
#6712 19 RC CAR/BOAT/PLANE	LIST $50.00 BHC $34.95
#7860 35 UKIE	LIST $29.95 BHC $21.00
#8011 40 RC "75"	LIST $72.50 BHC $50.75
#8050 40 RC MARINE	LIST $82.50 BHC $57.75
#8350 40 RC FR W/PP	LIST $105.00 BHC $73.50
#8382 3.6cc SI OUTBOARD	LIST $99.50 BHC $69.65
#8384 3.5cc SI MARINE	LIST $69.50 BHC $48.65
#8500 4.9cc RACING F/F OR U/C	$95.00 BHC $66.50
#8600 5.8cc F/F OR U/C	$95.00 BHC $66.50
#9001 6.5 RACING	LIST $89.50 BHC $62.70
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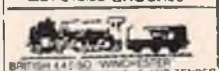

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PAK OF 4—475 MA 4.8 VOLTS
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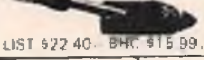

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	In Stock
MALLARD	$32.99
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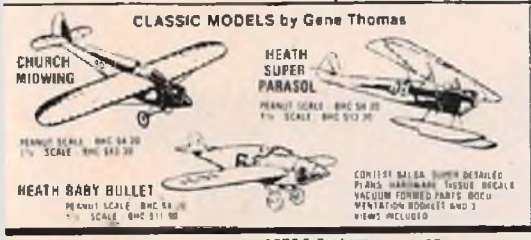
60 POWER
LIST $325.00
BHC $250.00
TRAINING GEAR
$28.00

CLASSIC MODELS by Gene Thomas



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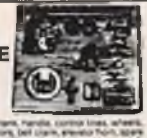

FOX ENGINES	LIST	BHC
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FOX .19	43.43	30.00

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LIST $19.95
BHC $15.99

LOWEST PRICES ANYWHERE ON ALL KITS, BOATS, ENGINES BATTERIES ADHESIVES ETC.

ACE RC	LIST	BHC
PACER	19.95	14.00
LIL STICK		3.10

ANDREWS	BHC
S-RAY	27.99
H-RAY	31.99
AERO MASTER	60.00
TRAINER MASTER	42.00
A-RAY	35.99
BIG H-RAY	39.99

ASTRO FLIGHT	LIST	BHC
ASW 17	84.95	59.50
ASW 15	59.95	42.00
RF4	44.95	31.50
BUSHMASTER	44.95	31.50
ELECTRA FLY	24.95	17.50
MONTEREY	49.98	35.00
MALIBU	29.95	21.00
MONOCOUPE	34.95	24.50
CALIFORNIAN	69.95	49.00
ELECTRA TWIN	99.95	70.00
ELECTRA FLIGHT SYSTEMS		
ASTRO 5	54.95	38.50
ASTRO 10	89.95	63.00
ASTRO 15	109.95	77.00
ASTRO 25	129.95	91.00
ASTRO .02FF	24.95	17.50
ASTRO .02RC	27.95	19.60
02 TWIN	44.95	31.50
05 TWIN	69.95	49.95
15 TWIN	145.00	101.50
25 TWIN	195.00	136.50
10 MARINE	84.95	59.50
05 MARINE	39.95	28.00
15 MARINE	119.95	84.00
25 MARINE	129.95	91.00
HI-START	34.95	24.50
H.D. HI-START	39.95	28.00
FIELD CHARGER	44.95	31.50

ASTRO FLIGHT	LIST	BHC
RAPID CHARGER	29.95	21.00
ANALYZER CHARGER	42.50	29.75
½ A STARTER	17.95	12.60
ASTRO POWER PANEL	22.95	16.10
ELECTRONIC SPEED CONTROL	59.95	42.00
MECHANICAL SPEED CONTROL	29.95	21.00

BRIDI KITS	LIST	BHC
TRAINER 5	24.95	18.75
TRAINER 10	27.95	21.00
TRAINER 20	34.95	26.25
TRAINER 40	54.95	41.25
TRAINER 60	62.95	47.25
BASIC TRAINER	39.95	30.00
15-500	39.95	30.00
TWEEDY BIRD 19	39.95	30.00
SUN FLI 4-20	29.95	22.50
QUICKEST 500	42.95	32.25
QUICKEST 200	24.95	18.75
CLASSIC 40	54.95	41.25
KAOS "S" 40	55.95	42.00
KAOS "S" 60	69.95	52.50
DIRTY BIRDY 40	59.95	45.00
DIRTY BIRDY 60	84.95	63.75
U.F.O.	129.95	97.50
P-51	134.95	101.25
QUICK CHARGER		19.00

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
ZERO	145.00	109.99
YANKEE	110.00	76.99

DUMAS	LIST	BHC
STAR CLASS 30	49.00	34.30
STAR CLASS 45	115.00	80.50
BINGO	260.00	182.00
EQUATION	172.50	120.75
ETCHELLS 22	246.00	172.20
EAST COAST 12 METER	260.00	182.00
45" GLASS STAR	188.00	131.60
HUSON 36	162.00	113.40
PROBAR	54.00	37.80
DAUNTLESS	75.00	52.50
DV-10 MAH	11.50	9.20
DV-20 PLY	31.50	22.00
DV-40 PLY	49.00	34.30
DV-60 PLY	68.00	47.60
DV-20 GLASS CF	80.00	56.00
DV-40 GLASS CF	95.00	66.50
DV-60 GLASS CF	100.00	70.00
PT 109	39.75	28.00
TUNA CLIPPER	47.00	32.90
FOSS TUG	78.50	54.95
U-76	52.50	36.75
SWAMP BUGGY, large	31.50	22.00
HOT SHOT	32.00	22.40
PAY-N-PAK	39.75	28.00
COMP DV 21	45.00	31.50
STAR (GLASS)	188.00	131.60
HOT SHOT 21 (GLASS)	70.00	49.00
AVL-1	50.00	35.00
AMERICAN ENTERPRISE	75.00	52.50
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QUICKIE 40	40.00	28.00
LIL RASCAL	25.00	17.50
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ALL DUMAS IN STOCK. HARDWARE AT 20% OFF-KITS OVER $20.00 AT 30% OFF-KITS UNDER $20.00 AT 20% OFF.

GOLDBERG	LIST	BHC
RANGER 42	24.95	19.99
FALCON 56	44.95	36.00
JR. FALCON	13.95	11.19
SKYLARK 56	49.95	40.00
JR. SKYLARK	14.95	11.99

GOLDBERG	LIST	BHC
SKYLANE 62	59.95	47.99
SKYLANE 42	15.95	12.79
SR. FALCON	59.95	47.99
ALL OTHER GOLDBERG KITS AND ACCESSORIES IN STOCK		

MIDWEST KITS	LIST	BHC
ATTACKER	42.95	30.10
SILENT SQUIRE	39.95	28.00
CESSNA CARDINAL	32.95	23.10
SUPER CHIPMONK	33.95	23.80
DAS LIL STIK	33.95	23.80
SWEET STIK	42.95	30.10
STRIKEMASTER	69.95	49.00

PROCTOR KITS	LIST	BHC
NIEUPORT	164.50	132.00
ANTIC	89.95	72.50

SIG	LIST	BHC
KADET	39.95	31.95
KOUGER	47.50	38.00
KOMANDER	44.95	35.95
KOMET	51.95	41.60
CITABRIA	64.95	51.95
KLIPPER	22.95	18.35
SUPER SPORT	21.95	17.55
P-51	62.50	50.00
CHIPMONK	64.95	51.95
J-3 CUB	44.95	35.95
CLIPPED WING CUB	44.95	35.95
SKYBOLT BIPE	69.95	55.95
CESSNA 150	74.95	60.00
RYAN STA	79.95	63.95
ZLIN AKROBAT	59.95	47.95
SMITH MINIPLANE	54.95	43.95
LIBERTY SPORT BIPE	72.50	58.00

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LIST $125.00 BHC $87.50
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TOP FLIGHT	LIST	BHC
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P-40	74.95	59.95
SE5A	74.95	59.95
P-51	74.95	59.95
CONTENDER	56.95	45.55
P-47 T-BOLT	95.95	76.75
FRESHMAN TRAINER	47.95	38.40

VK MODELS	LIST	BHC
CHEROKEE	69.95	55.00
CHEROKEE BABE	39.95	32.00
NIEUPORT	69.95	55.00
CORBEN	45.95	36.00
FOKKER TRI-PLANE	69.95	55.50
SOPWITH CAMEL	69.95	55.50

FOX ENGINES	LIST	BHC
FOX 19RC	36.95	25.90
FOX 25RC	36.95	25.90
FOX 29RC	39.95	28.00
FOX 36RC	39.95	28.00
FOX 40RC	45.95	32.20
FOX 45RC	51.95	36.40
FOX 60RC HAWK	84.95	59.50

ALL FOX U-CONTROL ENGINES IN STOCK AT 30% OFF LIST PRICE.

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6 VOLT, 4 AMP	10.39
6 VOLT, 7 AMP	12.95
6 VOLT CHARGER	9.95
12 VOLT, 4.5 AMP	23.00
12 VOLT CHARGER	7.95

ZAP	BHC
X-30 36 FL. OZ.	2.75
ZAP 18 FL. OZ.	1.30

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KITS OVER $20.00 LIST AT 30% OFF & 20% OFF IF LESS THAN $20.00

WORLD ENGINES	LIST	BHC
MISS WORLD	49.95	39.95
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BOX FLY HI-WING	29.95	23.95
BOX FLY BIPE	39.95	29.95
PIPER CUB	39.95	31.99
PIPER CHEROKEE	42.95	34.40
OLYMPIA	42.95	34.40

WEBRA-MRC	BHC
#1022 40 RC	79.89
#1020 61 RC	100.98
#1034 40 RC FI	89.98
#1024 61 FI SR	124.98
#1026 61 FI SR	129.98
#1023 40 RC MARINE	94.98
#1035 40 RC SR MARINE	104.98
#1020 61 RC MARINE	129.98
#1025 61 RC FI MARINE SR	139.98
#1026 61 RC FI MARINE SR	144.98
#1037 91 RC	139.98
#1038 91 RC MARINE	159.98
SUEVIA 2.5 H.P. ENGINE	199.98

40% OFF ON ENYA'S

40% OFF ON ENYA'S

ENYA ENGINES	LIST	BHC
ENYA .09 RC	42.98	25.80
ENYA .15 RC	48.98	29.40
ENYA .19 RC	53.98	32.40
ENYA .35 RC	62.98	37.80
ENYA .40 RC	106.98	64.20
ENYA .45 RC	106.98	64.20
ENYA .60 RC Schneurle	234.98	141.00
ENYA .60 RC BBIII	137.98	83.40

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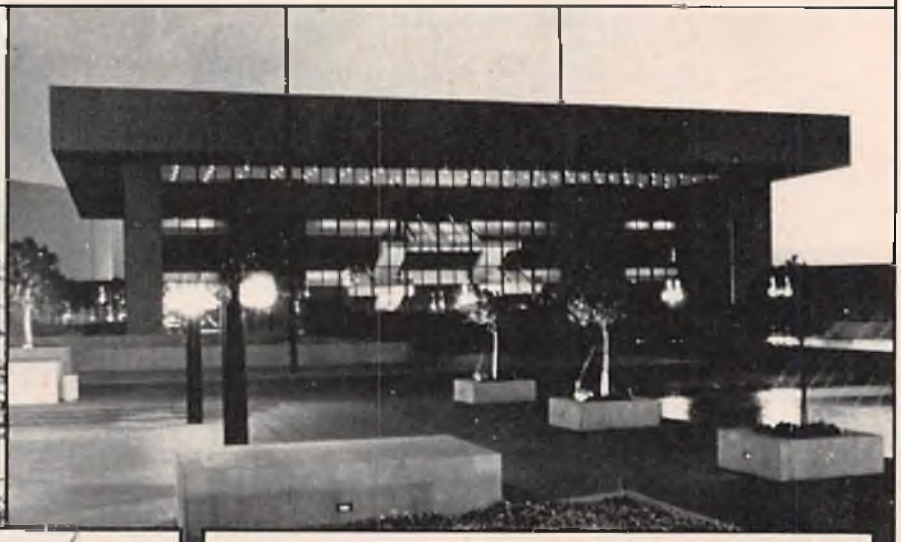

It's all happening at the Long Beach Convention Center in centrally located Long Beach . . . on the beautiful Long Beach Harbor.

ENGINE CLINIC

from page 186/10

Burgess 5 cylinder engine?

Sincerely yours,
Anthony J. Downes
Bedford, Virginia

The Wankels run a little on the hot side to begin with so adequate cooling is most important. The use of a large spinner would shut off cooling air to the engine. Even a 2" spinner would direct air away from the internal cooling fins. If a large diameter spinner is utilized then be sure you have cooling ducts that will direct air to the engine.

Joining two of the present Wankels together would be a bit of a machining and engineering problem. This is something that would have to be designed into the engine and done by the factory.

The Morton people originally offered the M-5 as a do it yourself project, however, they supplied the unmachined castings, etc. Trying to build an M-5 without these castings would be very difficult, and they have not been available for many years. Several fellows are offering copies of the original machining blue prints and instructions. The first to offer the Morton drawings was Tim Dannels who published the Model Engine Collectors Journal. For $9.00 you get 37 drawings and a 16 page instruction guide. Write Tim at 1265 Yates St., Denver, Colorado 80204.

Dear Mr. Lee:

I am building "Royals" Cessna 310 Q twin engine model airplane and they show the engines mounted on their side. I have two K & B .40's with Perry pump and carb. I would like the exhaust to go down. Can I rotate the crankcase 180° on one engine? If this is possible should I also rotate the piston and rod assembly? I don't want to change rotation of engine. Do you have another

suggestion to the problem? Thanks — awaiting your answer.

Enjoy your Engine Clinic in RCM.

A.E. Blair, Jr.
Moundsville, W.V.

There is no problem with rotating the case on the K & B .40 so that the exhaust will point down. You would not want to rotate the piston and rod assembly — this would put the exhaust baffle on the wrong side, etc. You just want to swap the front and back plates (pump in this case).

Dear Sir:

After reading the article about plastic props on large engines in the November issue of RCM, I'd like to share with the readers the dumb thing I did and you can sure bet I'll never do again.

I had just refinished and repaired my Midwest Cessna Squire and was getting it ready for a weekend of flying. I was in the driveway in front of the house and went to get a prop and all I had was a yellow 11/6 Tornado nylon prop. After reading the story about plastic props, I was somewhat leary of using it, but you do with what you got, right? I was running a Fox Eagle .60. I ran the engine full blast for a couple of minutes holding the tail to see if this one would fly apart. Well it didn't so I proceeded to adjust the engine for a smoother idle. I drilled a small hole in the side of the cowl and tried to set the idle while the engine was running. Well, everything was going fine till the tip of the screwdriver slipped off the idle screw. The prop hit the handle of the screwdriver flipping it out of my hand. The handle of the screwdriver bounced off my cheek just below my glasses, hit the house, bounced on the car then to the ground and was still spinning around while one blade departed the plane and caught me in the knee. After I shut everything off I sat on the porch step thanking God I could still see. My cheek bone was sore and red for a couple of hours. My lesson learned was don't underestimate the power of a idling Fox Eagle .60 and never use a nylon prop. You bet I'll never try adjusting idle screws like that again.

I hope you other readers who do this are more careful than I was.

Keep up the good articles in a fine magazine.

Jerry Kemp
San Clemente, California

Jerry, in a way it may have been a good thing that you accidentally stuck the screwdriver in the prop seeing as how you did not receive an injury. It may have kept you from suffering something worse. In no way should you have been trying to run an 11/6 nylon prop on a Fox .60. That size prop would probably turn in the 14,000 rpm range and would have thrown a blade sooner or later. Maybe while you were leaning over adjusting the needle valve. Think what may have happened then. □

from page 7

square inches. Not really too large, but large enough to provide a lot of lift, and yet some much needed drag. Whoa, what's all this noise about "much needed drag"? Seems as if you thought you heard someplace that you needed to reduce drag as much as possible? Well, yes and no. Drag elimination is very necessary if you are racing, or flying a pattern aircraft at nine jillion miles an hour, but we're designing an aircraft to be a sport flier, one which will get down on the ground easily, yet move about the sky in a realistic manner. Drag helps that landing. It really is much easier to land an aircraft that is a bit "dirty" than one that is so sleek and smooth that it just keeps blasting through the sky when you're trying to touch down on the runway. Next time you're on an airliner take a look at what happens when it is getting ready to land --- everything hangs out to make the aircraft more "dirty" so that it will slow down for the landing. Of course, the airline has the capability of changing its airfoil to give it a higher lift with slots on the leading edge, flaps, on the trailing edge, etc., but also the landing gear doors, struts, and wheels are hanging out, wing fences come up, and so on. So, we want an aircraft with some drag so that it will be easier to get back on the ground.

Okay, let's try 600" of wing area. Before we go any farther, how about weight. No matter what the wing area, if the total weight of the aircraft gets out of hand, and it gets too chubby, it's going to have a tough time flying. Same thing as people. It takes more work, or lift, for a man who is overweight to jump than it does for a man who is the optimum weight. Believe me, I know. So what are we going to shoot for as a target weight? Let's rely on experience for the answer. After all, this entire series is based upon experience. Not only my own, but the basis was developed from studying about thirty of the more successful aircraft designs in the early sixties, and then modifying the concepts as times have changed.

Back to weight. We speak of weight in a model aircraft as wing loading. We translate wing loading into something we can measure. In our case we measure wing loading in ounces per square foot. This means that the aircraft weight (in ounces) divided by the square feet of wing area will give us a numerical figure. The numbers that we are looking for should range from fifteen to thirty. Big spread. A wing loading of 15 ounces per square foot will be a bit light unless you're designing a large aircraft to fly on a relatively small power plant, and a 30 ounce per square foot is best left to the racing and pattern pilots who need to fly through just about any type of windy condition. Actually, the development of the modern glow engine has come about

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CUNNINGHAM ON R/C

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because of the need for a really powerful engine to carry heavier loaded aircraft through the aerobatics required of it. But more on this later. Let's let experience aim us at a wing loading of say 18 to 20 ounces per square foot. To set up a simple mathematical formula to arrive at this — it's:

$$\frac{\text{Weight (in ounces)}}{\text{Area (in sq. feet)}} = 20$$

We know the wing area of 600 square inches, and a finished wing loading of 20, so to find the optimum weight of our aircraft we boil it down like this:

$$\frac{\text{Weight}}{600 \div 144} = 20 = wt = (20)(4.167) = 83.34oz = 5.2lbs$$

This gives us a total aircraft weight, ready to fly, less fuel, of about 5¼ lbs. --- just right for a .40 engine to haul. We can even let the weight drift up to six pounds, which will result in a wing loading of 23 ounces per square foot --- not at all horrible, but a continual upward drift of weight will result in an aircraft that will not be as good a flier as we would wish. It will stall at a higher rate of speed, in other words, it needs to land faster, and will take more runway to get airborne.

With the wing loading of our dream machine set at 20 ounces/square foot, the total weight that we are shooting for would be 5¼ lbs., and the wing area set at 600 square inches. Where do we go from here? Let us take a look at the wing span as related to the wing chord. This is called aspect ratio, or very simply the span divided by the chord is the AR. How about us settling on a wing planform that has a constant chord. That is the root chord (the center of the wing) is the same length as the tip chord. This really isn't the very best all around planform for a wing, but it's pretty darn good, and a lot easier to build than a tapered wing. A tapered wing is super if someone else has figured out all of the different wing ribs, but you and I are trying to get our bird off of the drawing board and into the air sometime this year so we were going to stick to the "one rib for all" design. The math formula for finding the aspect ratio is just about as simple as was the weight formula:

$$\frac{\text{Span}}{\text{Chord}} = AR$$

But, the only thing that we know right now is that we have a total wing area of 600 square inches. How do we find a span and chord? We are going to work a bit backwards. The ratio of span to chord that is most pleasing to the eye, and

looks the most realistic, is in the range of 5.5:1 to 6:1. That is, the span is 6 times greater than the wing chord. I have designed wings as short and stubby as 3:1 and they have worked quite well, and soaring aircraft are generally above 10:1, and quite often up around 16:1. For our machine, let us settle on 6:1. We know that to find the wing area (or the area of any rectangle) the area is the product of the length times the width, so we have span x chord = area. Let us say that the letter S = span and C = chord. We also know from a bit before that S=6C, or our wing span is going to be six times the chord. Our formula of S x C = area then becomes S x C = 600 square inches. Substitute 6C for S and we get: 6C x C = 600 sq. in. or $6C^2$ = 600 or C^2 = 100. Most modern calculators have a square root button so we can find the square root of 100 by depressing the square root key and we have that C = 10 (heck, we knew that 10 x 10 = 100 anyhow, didn't we?). If the wing chord is 10" and the span is 6 times the chord, we then get a span of 60", giving a total wing area of 600 square inches. See how simple it really is. For a quicky, if we had decided upon an aspect ratio of 5:5 to 1 our formula would have been $5.5C^2$ = 600 or C^2 = 109 and C = 10.44, and the span would be 5.5 x 10.44 = 57.42". A 5:1 AR would give a chord and span of 10.95" and 54.77". Who cares if you round off the numbers, it really doesn't make any difference at all, everything is an average anyhow.

We've settled on a wing with a chord of 10" and a span of 60" giving us a total wing area of 600 square inches. Naturally, we're going to lose a bit at the rounded tips, and the part covered by the fuselage doesn't contribute to the lift of the wing --- so what. We've allowed for this by working with a bit larger total wing area. When all is said and done, perhaps our real wing area is 50 square inches less than the total. Don't write in and tell me this, I know it already. While some purists can go round in circles forever worrying about the minute details, we are designing by average and experience and let the good times roll. We'll be out flying while the other guy is still trying to get down to the gnat's eyelash.

Experience has also taught us that the elevator area in relation to the wing area should be in the neighborhood of 20 to 25%. That is if you have a wing area of 600 square inches, then the horizontal stab should be about 20% to 25% of this or from 120 square inches to 150 square inches. For the past two years I have been experimenting with slightly lifting airfoils on the horizontal stab and have decided that this is really the way to go for a sport aircraft. Most of us will

probably settle on a flat plate airfoil (a 1/4" thick piece of balsa) for the airfoil section on our sport aircraft because it's easy to build. Later in this series I will get into stab airfoils, but to get this month's business completed, let's just worry with a slab of balsa for the horizontal stab, and take a middle of the road approach and decide that the area will be 22% or, for our dream machine, a total of 132 square inches. Again, a pleasing look for a stab, and a good relation comes out with an aspect ratio of 3:1 which, by using our simple formula of before, gives us a horizontal stab with a span of 19.9" and a chord of 6.63". If you wish to taper the planform, then use the 6.63" chord as the average chord, make the root chord 1" more, or 7.63", and the tip chord 1" less, or 5.63", and you have a very pleasing looking tail. The vertical stab with a total area of 1/3 of the horizontal is just about right. The movable surfaces, the elevator and the rudder areas, are easy to set up. Make the elevator about 20% to 25% of the total horizontal stab area or, in our case, an elevator with an area of 33 sq. inches. Since the stab is about 20" long, the elevator width comes out around 1¾". The rudder area of the vertical stab can range from 1/3 to 1/2 of the total area.

Now that we are pretty far along with our dream machine, let's take a look at the fuselage. The most happy relationship, as far as looks and function, that I have found is to make the fuselage about 75% in length of the toal wing span. Naturally, you can go more or less, depending upon your own tastes, but if you stay within the range of 70% to 75% you will be quite pleased with the results. For our wing span of 60" we would then have a fuselage length of 75% or 45". This total length is measured from the back of the prop to the back of the elevator. If you look at the drawing you will see that the lengths of the parts of the fuselage are in direct relation to the total length of the fuselage. From the back of the prop to the leading edge of the wing is 20% of the fuselage length, and from the rear of the wing to the front of the elevator is about 40% of the fuselage length. Now, to digress a bit. Recently, longer nosed aircraft have been showing up, racing aircraft generally have been found to have the nose length about equal to the tail length. These aircraft groove better than the shorter nosed models, and are also much more nose heavy. If, for example, you have a short nose/long tail set-up with a rearward CG for a racer, the chances of pulling a high speed snap in a turn are much higher. The racers, as do many pattern aircraft, fly more like an arrow than do the normal sport aircraft. This can be either good or bad, mostly depending upon your skill level. For the average sport flier, stick to a nose length of 20% (with a maximum of 25%) and a

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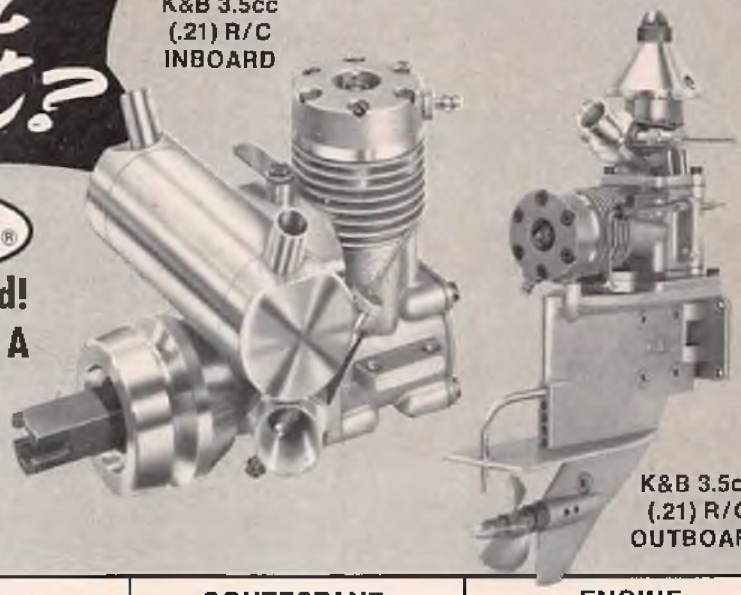

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CUNNINGHAM ON R/C

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tail length of 40% (with a minimum of 35%).

To make your aircraft pleasing looking you must decide upon the fuselage height as compared to its length. A lot depends upon the type of aircraft you're designing, but generally stick to an overall height of between 10% and 15% of the fuselage length. This is generally dictated by what looks good to you when you lay out the sketch on your drawing paper. The width can be varied quite a bit, the main criteria is to not make it too narrow. After all, we've got to cram a radio, battery, servos, and a fuel tank into the guts of the model, so don't skimp on the space. For the ship that we are constructing, a width of 3½" to 4" will look well, and allow plenty of radio room. Don't forget, the width of the fuselage sides make a difference in the amount of space that you have left to work inside.

The location of the engine becomes important to us now. If we were to draw a main reference line down the center of the aircraft, lengthwise, and assume that this line passes beneath the mounting lugs on the engine, then we would locate the wing below this line (if we're designing a low wing aircraft) and the horizontal stab slightly above this line. Lots of reasons can be expressed as to how far, and why, the wing is below, and the stab is above but, again, let experience dictate this location. Later, after you have a few successful designs under your pencil you can experiment to change the locations and see what happens. Let good old "father experience" dictate that the horizontal stab is 1" above this line and the center line of the wing chord is 3" to 3¼" below this line. This will result in a nice looking aircraft, and a good flying one. You may wish to stick in just a bit of down thrust to the engine but, for this aircraft, I'd rather set it at a zero setting to our "mean datum" line. This set-up also allows for a reasonable tank location. Muffler pressure to the tank has been one of the best ideas to come along, as this makes up for a lot of bad tank locations, and allows the engine to be set more easily on the ground for a similar run in the air. If you're not using muffler pressure, give it a try, it's really great.

Part I of this series has run on longer than usual, and a lot of the ground that I want to explore is still sitting there but we will get to it later in this series. Re-read the above, and take a look at the drawing, and do some thinking. We will get into airfoils, CG locations, landing gear placement, etc., later but if you can't wait, the drawing will show you where the average location of these should be.

Don't forget the Jumbo Fly In to be held July 21 and 22, this summer at

Thunderbird Field, just west of Fort Worth, on beautiful Lake Benbrook. See you there. □

FROM THE SHOP

from page 2

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Don Belote has served as a key member of the Exposition committee and co-chairman for 14 years. He has been interested in airplanes since he was old enough to walk. He holds a private pilot's license and, aside from free flight and RC building and flying, he restores antique full scale aircraft.

Don is a bachelor and his job as a U.S. Postal Service employee keeps him in shape and allows him to pursue his interests. Don is the man behind the scenes who spends a large part of his life seeing to the success of the Exposition.

Bob Hisey, co-chairman of the Exposition for the past 9 years, is the man on the scene. He acts as the Club's spokesman for the event. Bob also holds a private pilot's license.

Bob served as President of the Weak Signals for three terms. His major interest in RC is pylon racing, but he also flies just about anything else with wings. With over 40 years of model building experience he has built boats and airplanes, but he is really hooked on airplanes. He is a manufacturers' representative and he, and his patient wife Eileen, have two grown sons.

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TRADE-IN

This is the third month in which we have run our trade-in announcement. This is our first experience in the trade business and, if nothing else, it certainly is interesting. We are looking at some used engines that we never suspected were manufactured and some other ones that we have forgotten about. We have had very few small and 1/2A engines. We cannot give you a firm price until we see your engine. However, if you want to talk to us on the phone, we might be able to give you a general idea of the trade-in providing the engine is as you describe it. Some engines look very good on the outside but the insides are badly worn. Other engines are missing parts. Anyway, we are happy to report that we have completed about 85% of the trades that have been started.

You may have an engine that you want to trade for an R/C system or for one of the larger expensive kits. We do not take used radio control systems in on trade for other items, however. This trade-in service that we are offering is beginning to grow and when we get enough old engines to publish a listing we will do so. We have so much walk-in business that the engines get sold before they can be listed. In stock right now we have a Fox 60, an Enya 35, Fox 35, 2 or 3 OS 35s, and an old Hassed.

If there are any old-time model builders in your neighborhood, you might be able to pry some of their old engines away from them to do your trading with. If you are buying new equipment, why not put the old engine to work. It is the same as money.

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