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JULY 1978

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radio control MODELER

THE ONLY PUBLICATION FOR THE RADIO CONTROL ENTHUSIAST



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You've got the desire to be a Champion.



Dreams of conquering the skies are what makes a winning pattern flier. But even the best contest competitors know that you've also got to have the right equipment. Futaba's J-series radio control systems are just that. Pure, state-of-the-art electronics with high-performance features like full programming capability, dual mixing circuitry, roll and snap roll



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control buttons and servo reverse switching. And serious fliers can also appreciate our water and dust proof, dual ball bearing S121 servos, modular RF boards and direct servo control.

The J-series Futabas are available in 4, 5, 6 and 8 channel systems, plus a



5 channel Helicopter system. Write now for complete technical data, because the sky's not the limit any more.

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Model 8JN/\$799.95

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MODELER

EDITORIAL

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This Month's Cover

features one of San Diego, California's fairest, Miss Joni Davis, at Mission Bay Park on the outskirts of that beautiful city. The electric powered MRC/Tamiya XR-311 Military All-Terrain Vehicle with MRC 772 RC System was done in US Air Force colors by Eloy Marez. From a Pentax/Kodachrome transparency also by Eloy.

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From the Shop

DON DEWEY

Publishing a monthly magazine, like any other endeavor, has its problems and its aggravations. Occasionally we receive a letter that gives us a warm feeling and makes it all seem worthwhile. The following note from Ernest Harbin does just that.



Dear Don,

Received your letter of January 3, announcing that I had been selected as the First Place Winner in your Model of the Month Contest. I am looking forward to the February issue of RCM and also receiving the Dremel tool.

I would like to thank you and your staff for the honor. Having received two trophies for the full size aircraft and now this for the model makes it all worthwhile. This has meant more to me than a win at the NATS would.

I am close to 55, have been modeling since I was nine, am a retired Police Sgt. and have been a member of the Experimental aircraft Assoc. since 1963.

Thanks again and I enjoy every issue of RCM.

Sincerely,
Ernest D. Harbin
Flushing, Michigan

★

Walt Wilson, St. Charles, Missouri, wrote of a situation that is familiar to a lot of us:

Dear Don,

After due consideration, I thought your readers might relate to the following:

Building and flying radio controlled model airplanes is a rapidly growing adult hobby/sport. The hobby gives one an opportunity to be creative and to live some flying adventures that would otherwise only be witnessed from the spectator's vantage point or not at all. One aspect of the hobby is usually only casually brought up as an afterthought – the cost! Most of us who have been in the hobby for awhile accept the cost of modeling as part of our lifestyle. We don't want to think about what we spend and certainly don't call attention to it. The following is a breakdown of what entry into the hobby may have cost you or me.

Apr. 3: Car expenses while shopping hobby shops	\$21.50
Apr. 5: Magazine subscriptions (2)	42.00
Apr. 9: Flowers for wife to introduce subject of R/C flying	12.50
Apr. 10: Dinner at "Reubens Steakhouse" after argument	24.75
Apr. 11: New hair-do for wife after day at field in 18 mph wind	14.00
Apr. 12: "Box Fly" Kit	34.95
Apr. 13: K & B .19 engine	47.00
Apr. 14: MonoKote, epoxy, other building materials and accessories	45.35
Apr. 14: X-Acto knife and tool set	19.95
Apr. 15: Emergency room stitches for cut finger	42.00
Apr. 17: Sealectric Iron for MonoKote	20.35
Apr. 18: Friend, who claims to be expert, demonstrates Monokote application. New roll of MonoKote	9.00

Apr. 23: Kraft Radio	375.00
Apr. 23: Gallon of fuel and starting battery with leads	16.50
Apr. 25: Ran engine one hour on patio for break-in -- veterinarian fee to tranquilize dog	35.00
Apr. 25: Entertained neighbors to smooth out strained relations	12.50
Apr. 25: Fire Department fee to remove cat from tree	25.00
May 1: Join AMA	25.00
May 11: Join local R/C club	25.00
May 14: Added up costs so far – evening out at "Reuben's" after telling wife the total	22.75
May 15: Gallon of fuel	12.00
May 16: Rug hooking kit for wife so she has something to do while the master builder is in the basement	27.00
May 20: Scarf for wife to preserve hair-do at field	3.98
May 21: Went to field with family and assorted friends. No fliers around so decided to try to fly without help. Materials to repair plane and replacement carb for engine	19.50
May 27: Electric starter and battery	60.90
May 28: Went to field. Large man with white hair and moustache said he was expert flier. He flew plane to trim out. Materials to repair plane, engine and factory service for damaged radio	43.00
June 18: Went to field. Tall, redheaded, man with funny hat flew plane to trim out. Had successful flight. Flew plane for first time. Very excited. Tried snap roll. Materials to repair plane	8.75
June 21: Added up expenditures to date and told wife she had better economize. Evening at "Reuben's", flowers, and shopping spree for wife	174.50
June 25: Went to field. Tall redhead with funny hat helped again. With coaching, took off, flew, and landed plane in bean field. No damage. Redheaded expert demonstrates tailspin. Paid swimmer to retrieve remains of plane from nearby lake	10.00
July 15: Repairs to plane, engine, and factory service for dunked radio	42.50
July 23: Went to field. Redheaded expert helps again. Several succesful flights. Broken props ...	3.75
July 24: Took wife to field. Helped her fly airplane. Car expenses while shopping hobby shops for second airplane, engine, and radio for wife	19.75
TOTAL	\$1295.73

And so it goes ... Walt Wilson.

★

Al Doig, Editor of the Torrey Pines Gulls Radio Control Soaring Society Newsletter, ran this technical info written by Ken Banks.

Technical Corner Definitions

Each month my huge mailbag contains requests for definitions of some terms used in the Technical Corner.

Ailerons – Control surfaces for yawing a sailplane opposite to the direction of the intended turn.

Ballast – A device for removing fuselage bulkheads.

Canopies – A cracker, wafer or bread spread with a seasoned mixture of such appetizers as olives, meats, fish, or cheese.

Dihedral – An index of winch line tension.

to page 184

Revolutionary!

from Switzerland



High Pitch



Low Pitch



Reverse Pitch

Schneider VARIPROP

(In-Flight Variable Pitch Propeller)

\$124.50

List Price \$149.95

If you thought that digital proportional was the biggest break-through in RC airplane performance you may change your mind when you fly the Schneider Variprop!

The phenomenal performance of an in-flight variable and reversible pitch propeller is now available for RC model airplanes. On a model airplane the effects of a variable pitch prop are much more dramatic than on a full scale plane. For example, in aerobatics you can go to a low pitch and high RPM for vertical maneuvers such as loops where you want a constant airspeed through the maneuver. And, on an 8-point roll when you throttle into full power and high pitch during the Split-S entry to the roll you can achieve the extremely high speed the maneuver requires. Final approach to landing can be flown at a very slow airspeed even with a fast-idling engine when the Variprop is nearly zero pitch. And the landing roll can be shortened almost to nothing when reverse pitch is applied.

In a full scale airplane you wouldn't risk going into reverse pitch in the air, but a model airplane can perform some incredible maneuvers in the air using reverse pitch! The Schneider Variprop is 11" diameter. The spinner is 2" diameter. The nylon blades with embedded steel shanks are replaceable and are held in place to resist over 1100 lbs. of centripetal force. The servo force required to operate the pitch change mechanism is about 4 pounds — standard servo thrust.



Ball bearing collector ring and Bronze insert to fit prop shaft.



Replaceable prop blade with steel shank. Hardened steel bolt holds prop in place.



Collector ring pulled back to show pitch change cam follower.



Inside hub: Roller bearing withstands outward thrust of cam follower in which prop is locked.

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 List price \$54.95 **\$39.99**
 54" span for 4 channels, .35-.49 engine. **ADVANCED TRAINER.**



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 58 1/2" span for 4 channels for .40-.61 engines. **Advanced Trainer—CADILLAC OF BALSA KITS!**



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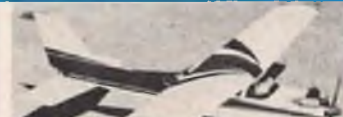
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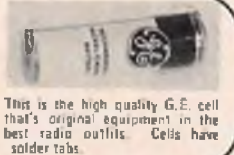
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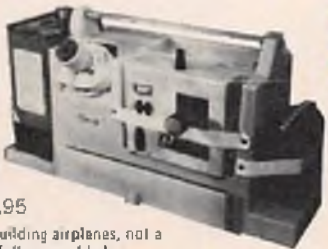
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Kwik Fly 3 - 60	\$ 65.00	\$47.45	Cutlass 40	\$ 55.00	\$43.00
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Cutlass Supreme 60	\$ 65.00	\$47.45	ME-109 40	\$ 55.00	\$43.00
Phoenix 5 - 80	\$ 65.00	\$47.45	Jet Zero 40	\$ 55.00	\$43.00
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3/4" wide, 50' long \$5.95



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(See Hobby Lobby CANADA Ad elsewhere in this magazine)

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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.

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10. Service on HL radios is performed by the same people who sell them — us!

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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.

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() I enclose check for \$ _____, plus \$1.80 handling. () Charge to my Master Charge No. _____ Expires _____
() Charge to my Visa No. _____ Expires _____. () Ship C.O.D. \$2.75 handling for C.O.D. and bank card orders.

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DREMEL
**MODEL 281
MOTO
TOOL SET**
\$36.88

List price \$61.95

Same power and speed as the much more expensive Model 381, but no speed control.

BULK Balsa Wood



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20-1/16x4x36 **\$11.11**
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10-3/16x4x36 **\$9.99**
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There are three things wrong with this wood. It will be 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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FUEL PUMP**

- OR -

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12 FOOT TELEMMASTER

-and-

**EVRA 190
ENGINE**

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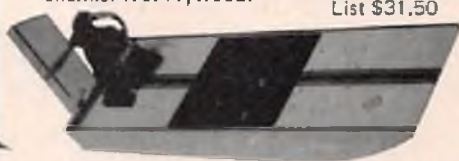
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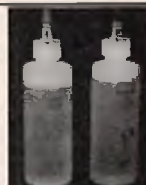
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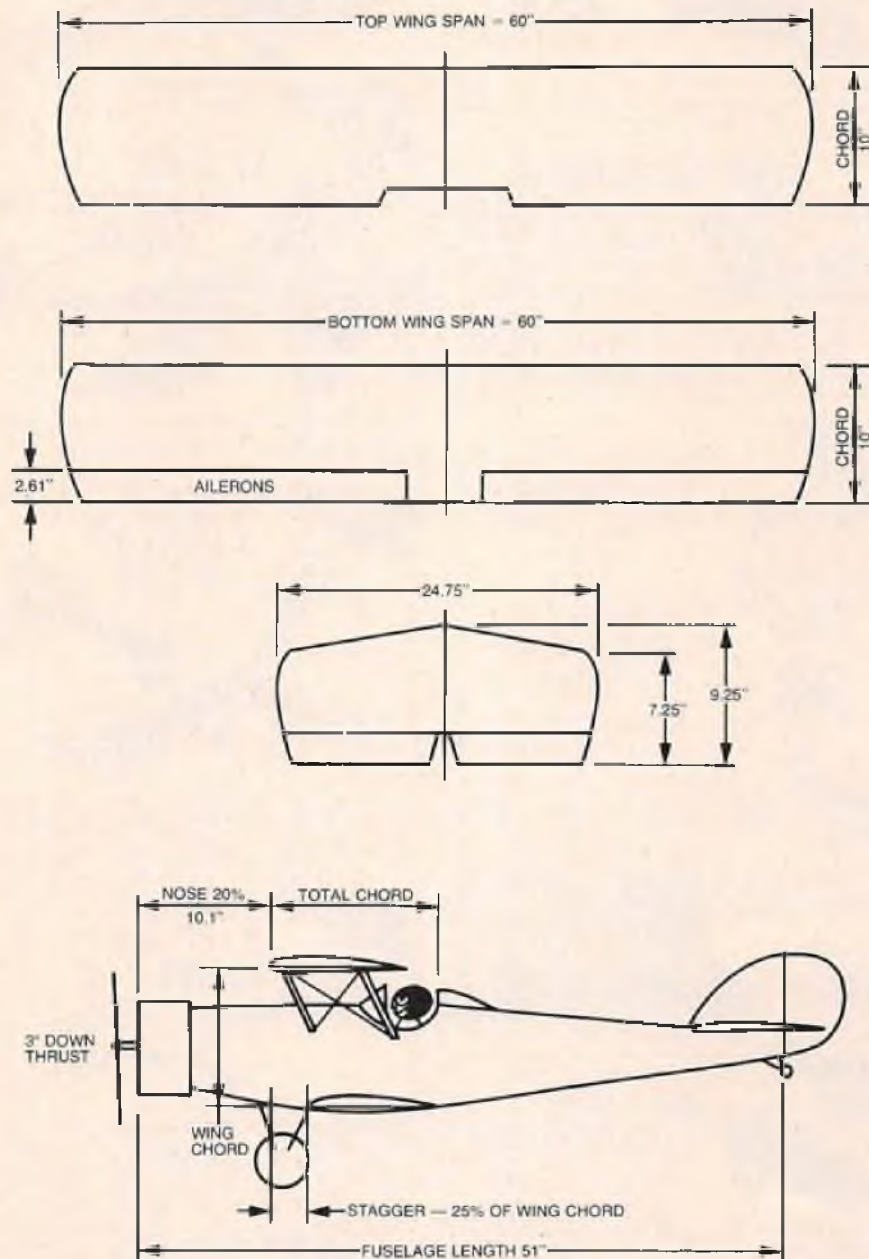
RC DESIGN MADE EASY PART III

For the past couple of months we have been talking about the design of a very basic .40 size aircraft, along with a number of random thoughts on airfoils, balance points, gear placement, and so on. This month I would like to take you down the design path for a simple biplane, and then give you a few ideas to think about in the structural design of our models.

I have been in love with biplanes most of my life. The great thing about RC is that you can recreate just about any time in aviation history through models, and I guess that the time in aero history that I like best is the age of the biplane. Something about two wings just reaches out and grabs me. When I think about aircraft that I like to design, biplanes are always in the front of my thoughts. The first biplane that I designed was a .020 powered Fokker D-VII free flight. It was lightly built, and I wish that I could say it was a great flyer, but I can't, because I could never bring myself to fly it, just hung it up in my room and admired it. RC makes the going great, because now you can have your biplane and fly it too. Let's get on with it!

Pick a size. What size biplane shall we design? In the last design series several years ago, we worked on a .40 size biplane which, if you will turn back the pages of time, comes out pretty close to the Sporty Ace (Feb. '79 RCM). We could take a look at a bigger biplane such as the Lazy Ace (Nov. '77 RCM), or a smaller one. But this time out, how about taking a look at a .61 size biplane that is larger than most of the available biplane kits of today, but a lot smaller than the Lazy Ace (1800 square inches of wing area). Let's design a biplane around 1200 square inches of wing area, with a semi-symmetrical airfoil, either lifting stab or symmetrical stab, and one that you can customize into just about anything you want. Interested? Get your mini-calculator ready, your roll of paper spread out, and a bunch of pencils sharp.

First, since we are working with a total wing area of 1200 square inches, let's design the wings. Most full size biplanes use wings of equal wing area. At times in history a lower wing of much smaller area was used, mostly for military type design, but a great proportion of WW I

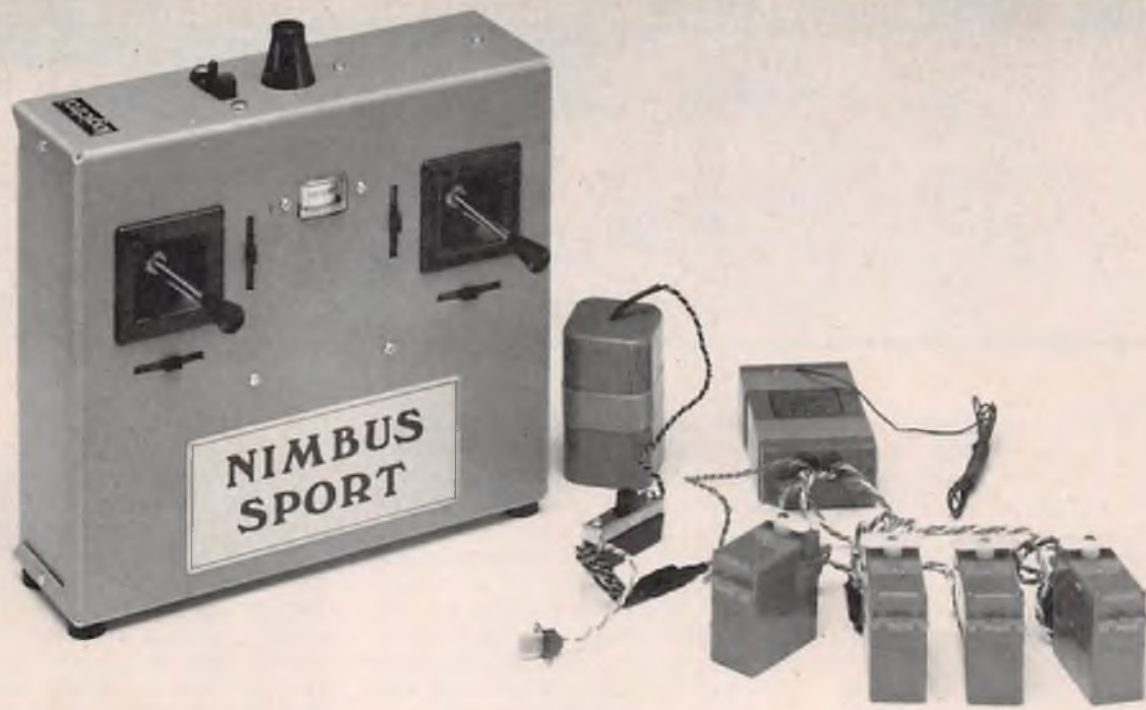


R/C DESIGN MADE EASY
PART III

aircraft, as well as sport aircraft used wings of equal area (besides, if you use the same chord length for each wing, you only have to plot one wing airfoil and set up one rib pattern). Since I'm lazy, let's stick to equal wings, top and bottom. By a fantastic mathematical method known as division, we divide our

1200 square inches of wing area by two and, presto, we have each wing with an area of 600 square inches. Look back in Part I and you will discover that the .40 size model that we were working on had 600 square inches of wing area. We can just about use the same wing outline.

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Dear Clarence,

With the advent of very high power, tuned-piped pattern engines, many fellows seem to be changing bearings faster than they change glow plugs. As a brand new pattern pilot I don't know what engine to get next, and how to best prevent going through bearings. I am currently flying a K & B .61 pumper with an OPS pipe. I want more power.

First some fellows tell me that as long as I use some castor, I won't have any problem (I use 17% Klotz, 5% Castor and 0.5% Lubricin). Others tell me to keep the nitro down (I'm using 10% but if I had a foreign engine I would go down to 5%). Keep the engine on the rich side, others say (always good advice). I have also heard, "Well, so you change bearings once or twice in the season; so does everybody else." Incidentally, I always run the engine dry at the end of the flying day and load it with sewing machine oil through the carburetor and head.

Could you please comment on this subject(s). How do you take care, for example, of a Rossi? A Webra Speed? OPS? Which one holds up better, etc.?

Finally, I would very much like to see a "How to change bearings" clinic in one of your columns (or maybe as a separate article) as soon as possible.

Keep up the good work.

Sincerely,
Abraham A. Santiago, Jr.
Redondo Beach, Calif.

99% of all bearing failure in a pattern engine is due to rust. The Nitro methane used in our model fuels is derived from Nitric acid and the main culprit when it comes to rust and corrosion in our motors. The Methanol alcohol draws water like a sponge contributing to the problem; especially when the water attracted by the alcohol mixes with the Nitro methane. Many of your synthetic oils are of an acid base and can cause rusting by themselves. Klotz, as an example, will cause considerably more rust formation in an engine than Ucon's MA 2270 or MA 731. However, Klotz is readily available and the Ucon's are not. Add to all of these rust forming ingredients, the use of mufflers and tuned pipes which increase sludge, varnish, and rust formation also, and you can understand why rusting is such a

problem.

If you were to use straight castor oil and methanol for fuel there would be far less rust problems — unless of course raw fuel was left in the engine. The addition of 5% castor oil in conjunction with Klotz will help the problem but not eliminate it. Many of your fuel manufacturers using Klotz oil add 5% castor as well. And as mentioned in last month's Engine Clinic, Klotz is now available with castor added — their new KL-100 Super two cycle racing oil.

Running the engine out dry and loading with sewing machine oil, 3-in-1, etc., will help the problem considerably. The chances are very good that you will be having far less bearing problems than many of the fellows you fly with who do not bother to do so.

As far as one make of engine holding up better than another — this is simply a matter of how the owner takes care of the particular engine. One make is no less susceptible to rusting than another.

Over the years I have covered bearing changes several times in the column. "The R/C Engine" Vol. I, Chapter XI "Engine Care and Maintenance" covers bearing removal and replacement.

Dear Mr. Lee,

My question has to do with engines, radio, and boating. In one of my hydro boats I have had massive problems, when the engine is running, with radio interference. This is an OPS engine which, of course, is an ABC engine. It has a steel drive shaft going through a bronze shaft log. Frequently when starting this engine in the Wing Ding, the throttle goes to full open and I have to shut her down before she blows up on the bank. I have suspected radio interference but I have this drive shaft set-up and this radio box in other boats and I haven't had the problem. It doesn't seem to affect the rudder servo. I guess my question is this: Is it from the drive shaft because of its idiosyncracies of length, or can it come from an ABC engine? As I say, it hasn't happened in other boats and I do not have that type of engine in other boats. Whatever the possible cause, can you suggest a remedy?

Thank you very much for any help in these matters.

Sincerely,

Donald M. Lippoth
Cape Elizabeth, Maine

In years past noise generation was always a problem. Just rubbing a screwdriver on a pushrod or the head of the engine would cause the radio to go ape. To cure the problem, all metal to metal linkages had to be eliminated, i.e., use nylon clevises on all throttle linkage, etc. However, as the years have gone by, the radio manufacturers have developed circuits to greatly improve a radio's ability to reject this type of noise. Some radios are far more tolerant in this respect than others. As a result, modelers are becoming more careless about their installations and getting away with sloppy set-ups that would never have worked in years past.

The fact that you are using an ABC engine has nothing whatsoever to do with your problem. The problem is being caused by too many metal to metal contacts vibrating in your installation. I doubt if the drive shaft is causing the problem unless it is running dry with metal rubbing against metal at some point. Use nylon clevises on all pushrods. Any point of possible noise generation should be grounded with a grounding strap joining the parts. Make sure your antenna is not touching any metal pushrods, etc.

There is always the possibility that the problem could be in your radio --- in need of tuning, etc. Have you tried giving it a range check lately? Many boaters never seem to bother doing this due to the limited distance at which they operate the boats.

Dear Sir,

I power my Lou Proctor Antic with an O. S. Max four stroke engine. I broke this engine in according to the instructions in the instruction book with a 13/5 prop. It idles good and the full rpm is also good. But when you start it, it makes a strange ticking sound while you are turning the prop to the left and to the right to prime the engine.

I first thought that it was the valves but that makes another sound. A good friend of mine owns the same plane with the same engine, but his engine has no strange noises.

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Model Boat
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Shown below is typical running hardware for powering scale boats. If you have a special need, there are many different types of hardware available to get you running (see our general catalog).



Also shown is our new line of bronze propellers. Available in 1 1/2" to 3" diameters, the 3 blade props have a 2" pitch and come in right and left hand versions. These new bronze props are a nice addition to our standard line of plastic and white metal propellers and offer you even greater flexibility in scaling your model.



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A real beauty. Dauntless is a big boat (49 1/2") and very popular kit. One of the famous commuter boats used on the Hudson River, this wood construction kit with deck hardware included has plenty of room for radio control equipment and gas or electric power with twin screws.



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This popular 36" model of the Shelley Foss tug is a plywood kit with deck hardware included. A smaller version, the Little Shelley Foss is also of plywood construction and is 24" long. Kit #1206. Both kits can be radio controlled and electric powered.



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Whether you prefer building your hull from scratch or starting with a premolded fiberglass hull, you now have the option. The deck and super structure in the fiberglass hull kit are still of plywood construction for easy detailing with deck hardware included. Scaled after the USCG or RNLIWC Lifeboat this kit makes an eye-catching display that can be radio controlled and electric powered.



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	Eng.	Wing Span	Const.
RCM Trainer .60	.60	60"	balsa
RCM Trainer .40	.40	50"	balsa
RCM Trainer .20	.20	45 1/2"	balsa
RCM Trainer .10	.09	36 3/4"	balsa
RCM Trainer .05	.049	36 3/4"	balsa
RCM Basic Trainer	.19	50"	balsa

PATTERN BRIDIKITS

Deception	.60	63"	balsa/foam
UFO	.60	64 1/2"	glass/foam
Dirty Birdy	.60	64"	glass/foam
Dirty Birdy	.60	64"	balsa
Super Kaos	.60	58 1/2"	balsa
Kaos	.60	58 1/2"	balsa

STAND-OFF SCALE BRIDIKITS

	Eng.	Wing Span	Const.
Brown Racer	.60	59"	glass/foam
Sirius	.60	64"	glass/foam
Chipmunk	.60	58"	glass/foam
AT-6	.60-.81	68"	glass/foam
P-51	.60	64 3/4"	glass/foam
T-28	.60	66"	glass/foam
Spitfire*	.60	64"	glass/foam
Tiger Cat*	T/.40	65"	glass/foam
Shrike	T/.40	79 1/2"	glass/foam
Waco*	.60	62"	glass/foam
Kraft Super Fli	.60	60 1/2"	balsa/foam

SAILPLANES

Soar Birdy	78"	balsa
Big Birdy		balsa

SPORT FLYER BRIDIKITS

	Eng.	Wing Span	Const.
RCM Sportster	.19	50"	balsa
Tweedy Bird	.19	48 3/4"	balsa
15-500	.40	51"	balsa
Quickest 500	.40	50 3/4"	balsa
Quickest 200	.051	31 1/4"	balsa
Sun Fly 4-20	.19	48 3/4"	balsa
Super Kaos	.40	52"	balsa
Dirty Birdy	.40	58"	balsa

BOATS

Chubasco	.40-.60	glass
Chubasco	.21 I/O	glass

* Available late '79

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from page 10

The next thing I did was to dismantle the whole engine and I found a bad bearing. This was the one that is in the crankcase itself. I put a new one in it but the ticking was still there. Now I want to ask you if this is normal or not.

Thanking you very much, in advance, for your answer.

*Yours sincerely,
Jasperse
The Netherlands*

Very seldom will you be able to hear bad crankshaft bearings. If they're extremely loose you will often hear a clicking noise with the engine running at idle. But unless some of the balls are cracked, the retainer broken, etc., you will not hear them as you turn the engine over by hand. About the only parts that can cause a clicking when turning the engine over by hand would be a badly worn wrist pin, i.e., the wrist pin itself, or the wrist pin holes in the piston or upper end of the con-rod. The other part that can cause a clicking when turning over by hand is the piston if it is fit too loose. On the upstroke, the piston is cocked to one side of the sleeve. As it passes top center, compression causes it to snap to the opposite wall making the click noise. This is more commonly called "piston slap" in full size internal combustion engines. Generally it does not hurt anything other than being a cause for concern when hearing the noise. At operating temperature the piston expands closing down the clearance. If you have a means of measuring the diameter of the piston and inside diameter of the sleeve (micrometer and telescope gauge), you will probably find the piston is over .003" smaller than the sleeve. Pistons will start to click if there is more than .003" (not always though, since alignment of the parts also play a part). But if the piston is .004" or smaller, it is the cause of the clicking and should be replaced. This is assuming, naturally, that the piston is not hitting the head, the wrist pin not broken, etc.

Dear Sir,

Your column has helped me and, in turn, I have been able to help others with engine problems. Your last column stated there should be an .030 end gap on the rings.

What should the ring end gap be on a Fox Eagle .60 "cowled" (Top Flite P40)? I plan to buy a pumped K & B.

*Thank you for your time and trouble.
Howard L. Carpenter
Howell, N.J.*

Howard, I think that you may have misunderstood the .030" ring gap bit. This was in relation to an uncompressed ring — indicating only that the ring had spring tension and had not collapsed. Whether a Fox, Merco, K & B, etc.,

would not matter, let alone what type of aircraft the engine was going to be used in. An installed ring, i.e., on the piston and in the sleeve, should have an end gap of about .006"- .008". Again, the make of engine does not matter. A cool running engine would be best with .006" and a hot running engine with .008".

Clarence Lee,

I read your column every month. I need to know how to de-tune a "normal," (ST Bluehead, K & B, Max) non-Schnuerle .60 so that it will turn larger props slower, for my 9' span Taylorcraft.

Will putting a smaller carb on, or reducing the throat diameter of the stock carb be the answer, or do I need to increase the length of the intake venturi also?

Do I still run some Nitro (10%) or do I use FAI type?

I don't want to overheat and ruin a good engine by lugging it down and this longer, smaller intake sure helps low end torque on larger (motorcycle) two cycle engines. Will it work with Glo?

Print the answer soon, I want to go flying.

*Thanks,
Jerry Farr
Abilene, Texas*

"De-tuning" a model aircraft engine is something that has to be pretty much built-in at the factory. It is a matter of port timing and pretty difficult to alter after initial manufacture. Opening up and enlarging the ports for racing purposes is one thing but to de-tune you have to go the opposite and adding metal is pretty hard to do. Sometimes dropping the sleeve in the case .015" will help low end torque. Also slightly lower compression. However, crankshaft timing would also need retarding and there is no practical way of doing this.

Going to FAI fuel is not going to help the power any. You want to stay with 10%-12% nitro. Lengthening the intake is not going to buy you any low end torque in a model engine. It will often help fuel economy and fuel draw ability. The circumstances are a bit different than with a motorcycle engine.

You will be best off using the engine as it comes from the manufacturer. Any modifications you might make to increase low end torque would probably result in just the opposite.

Dear Mr. Lee,

I need some advice on Fox .19 R/C engines. The carburetor is too tricky to get reliable operation at all throttle settings. There seems to be too much interaction of the high speed needle valve and the low speed needle valve. Until I tried one (a Fox .19) I didn't believe they were that good. On the ground I can get 15,000 with a 7/5 power prop. Now that's pretty good for a .19. It really hauls a small (400 sq. in.),

light (3 lbs.), thin winged (12%) plane around. But, if the top end is really working, the idle isn't. So, for the help I need.

(1) Does anyone make an adapter so that another make of carburetor can be used on the Fox .19? Say, for instance, a Perry carb?

(2) Any hints on adjusting the Fox carb so that you have high speed and idle? Following the directions that came with the motor, to a tee, just isn't the answer.

*Thank you,
Owen F. Sprague
N. Chile, N.Y.*

Any of your smaller displacement engines are going to be a bit marginal when it comes to idle and they cannot be expected to tick over the way a .60 does. Small engines run cooler to begin with and one drop of fuel that would not effect a .60 can flood a .19. You did not say what you are using for fuel or make of glow plug. You should be using a fuel with at least 15% nitro and either the Fox idle bar or K & B idle bar plug.

Actually, Owen, you are trying to have your cake and eat it too when it comes to top end. 15,000 is turning the engine a bit high on the ground and still expect to have an idle. A good idle is dependent on flywheel action and you have very little with a 7/5 prop. You would be better off using an 8/5 or 9/4. The 9/4 being the best for idle. You are never going to get a good low speed idle with the 7/5.

To my knowledge no one makes an adapter to install a Perry carburetor on your Fox .19. This would be a way of helping to improve the idle considerably but you would have to install a .19 size Perry with epoxy.

Dear Mr. Lee,

I have enjoyed reading your column for many years. You have taught me much about the care and feeding of model airplane engines and the several times I wrote you about a particular problem, you answered promptly and were very helpful.

The reason I am writing this time, however, is not to ask for your assistance but to offer some experiences I've had with four-bladed propellers.

In your column in the May issue you said to a gentleman who wanted to use a four-bladed prop on a Jemco Corsair that no .60 to .80 engine was powerful enough to swing a 12/5 four-blade prop. In my experience it was not only possible but practical.

When I was stationed in Vietnam in 1971, at Saigon we had a moderately active R/C club. We had an agreement with the air field authorities, a very congenial Major in the Vietnamese Air Force, to fly our models from an active taxiway at Tan Sohn Nut Air Base on Sundays. A friend and I, being the most

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How do you answer a letter like this?

Dear Ken,
 I'm confused - I'm designing a .5" to the foot Lockheed Constellation for four Astro .05 motors. This works out to a wing span of 61.5". Root chord 10.1 tip 5.0. I'm concerned about the proper airfoil that will give me the least chance of tip stall. I plan to use a NACA 2416 at the root. The Connie had a thick wing. Now should the tip be a 2418 or 2414? Hal DeBolt discussing progressive airfoils in November 78 R/C Sportsman says a root of 15% and a tip of 12% would be a good choice. In the Feb. '79 Model Aviation in Scale by Bob and Dolly Wischer, they say with a 13% root section the tip should be 14% or 15%. Somebody help me.

Yours truly,
 Ollie Bakker
 San Jose, Calif.

The first thing I did was to read — or rather, re-read — the articles which Ollie quoted.

It's true. Hal DeBolt says, "A more practical application would be to use something like the 65015 at the root and the 65012 at the tip, better to stay in the same family of airfoils as it supplies a smoother transition." (R/C Sportsman, November 1978, p. 44.)

Bob and Dolly Wischer, in their column on R/C Scale, in the February 1979 issue of Model Aviation, on page 25, say, "Another method which has minimum effect on scale appearance is to increase the wing thickness at the tip of a tapered wing. If the root airfoil has a thickness 13% of the chord, the tip thickness is made 14% or 15%. This change in percentage produces a wing that will stall first at the root with the tips maintaining stability."

It's a touchy question, Ollie. You're asking me, "Who do I agree with? Hal DeBolt or the Wischers?"

Now I'm not one to back away from an argument, but I'm also willing to listen to both sides before finally taking a position. Witness the old continuing argument about downwind turns, which we virtually beat to death in this column a year or two ago. Remember? I quoted expert after expert --- and after it was all over, I expressed my own personal

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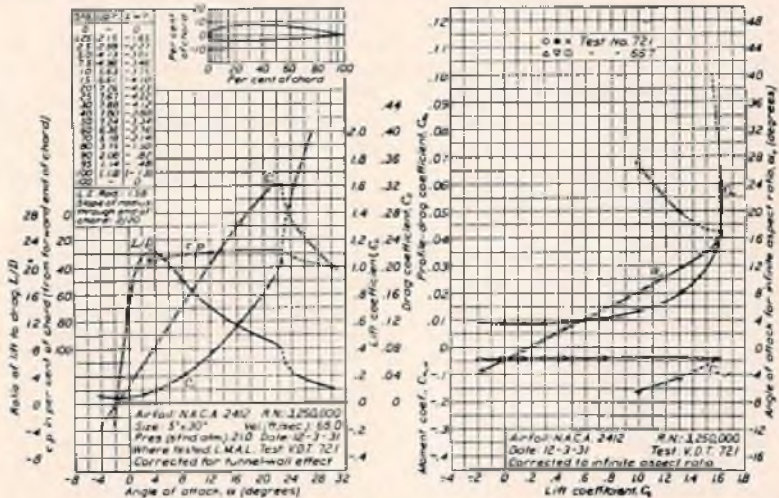


FIGURE 11 - NACA 2416 Airfoil

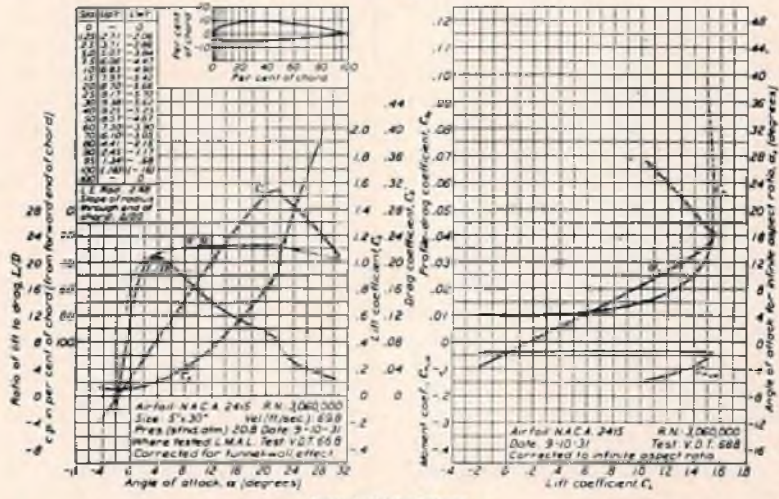


FIGURE 12 - NACA 2415 Airfoil

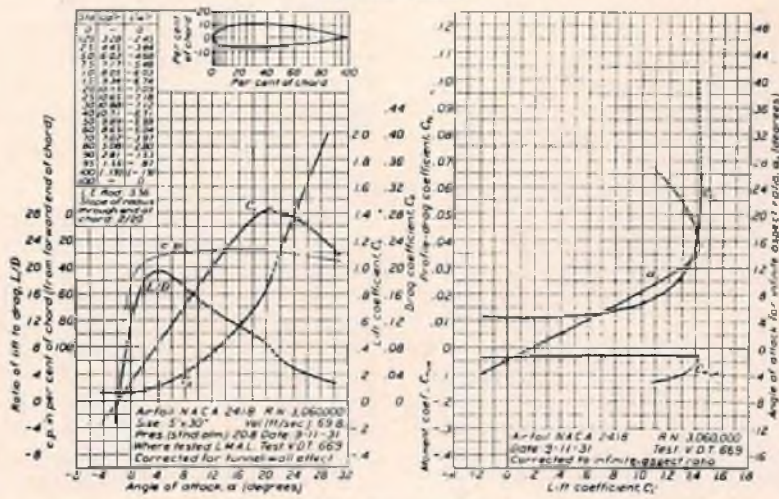


FIGURE 13 - NACA 2418 Airfoil



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?

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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.

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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.

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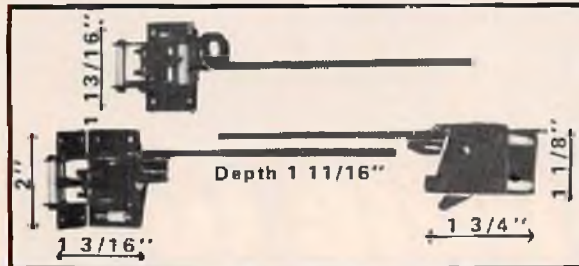
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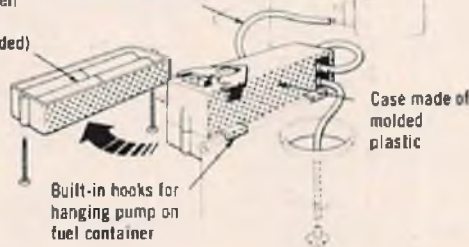
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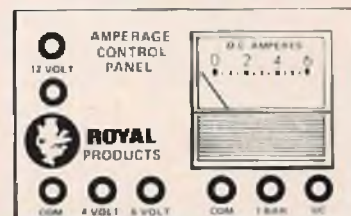
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SUNDAY FLIER

from page 16

belief that the downwind turn syndrome was just that --- a syndrome, unfounded in basic rules of space physics, and "a turn is a turn is a turn," which, properly executed, was unaffected by the direction of the wind. (Don't bother to bring up the issue again, all you experts. The subject is closed. Well--- unless you can provide **absolutely** incontrovertible evidence that I'm wrong.)

Now this question of tip thickness compared to root thickness is well worth discussion. There are some very convincing arguments for both approaches --- thinner sections at the tip than the root, and the opposite, thicker sections at the tip than the root.

At this time, I'm not going to say which is right. Or rather, which I **think** is right.

I'm going to ask all of you experts to tell me what **you** think is right. I'll publish all letters which present cogent arguments for each case. And, after the issue has been thoroughly aired, I'll try to summarize the results.

Don't be surprised if, after the returns are in, there is a valid case for both viewpoints. Keep an open mind.

But meanwhile, Ollie, that doesn't solve your problem on what to do with your Constellation design. Here are some facts:

The NACA Report #460 (p. 16) published in '33, shows the following:

Admittedly, these curves are at Reynolds Numbers approximating 3,000,000, and your model will be in a much lower regime --- about one tenth of the above. But the comparative results will be similar. What are they?

Note that the NACA 2415 stalls at an angle of attack of 22 degrees, the NACA

2418 at 20 degrees, and the NACA 2412 at angle of attack of 22½ degrees. Does that tell you something? Like, maybe you should go to the thinner section at the tip?

Possibly. But then again --- look at the stall characteristic. After the stall has occurred, and the wing is at the angle of attack of 24 degrees, the NACA 2412 is all through and dropping rapidly in lift. On the other hand, the 2418, although stalled and losing lift, is still flying, and hasn't lost the same comparative amount of lift as has the NACA 2415. So what does that tell you?

Damfino, Ollie. And I'll wait until I get all the expert opinions before trying to render a judgement.

But, since you need some kind of an answer so you can go ahead with your model, here's a suggestion. First, you're building a model of a transport design ---

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OTHER OPTIONS

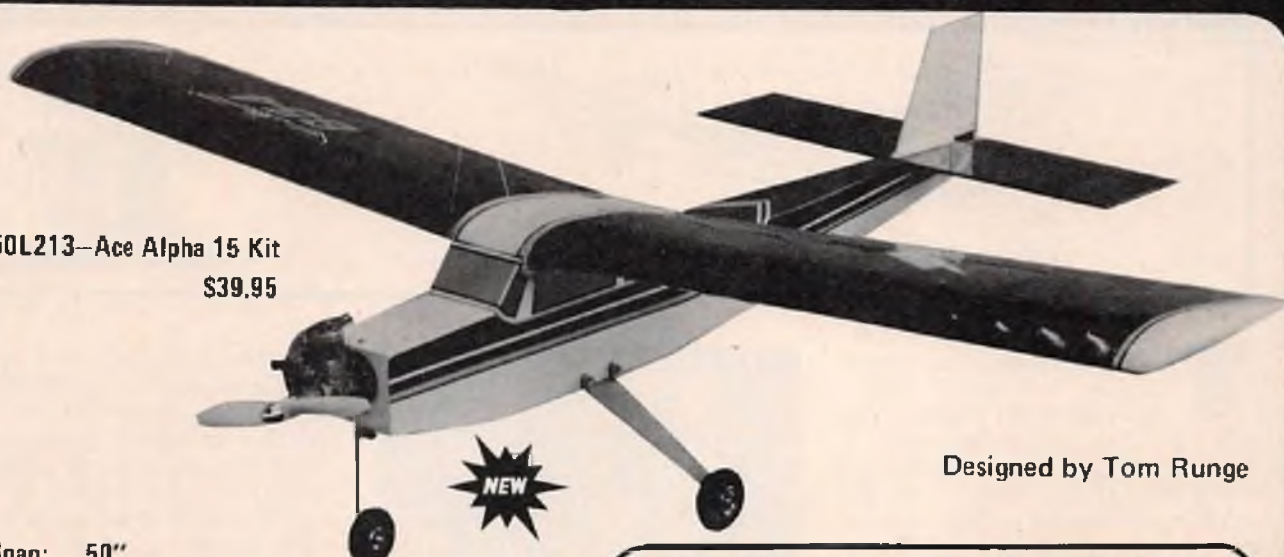
CUSTOM ASSEMBLY- Any of these Three Channel Systems are available completely assembled, tuned, and tested for \$35 additional--to order, add a "C" suffix to the catalog number. (Ex. 10G30MC, \$164.95)

TRANSMITTER NI-CDS- Any of the systems are also available with transmitter ni-cds and charger for \$22 additional (\$27 additional if it is an assembled unit.)--to order, add a "N" suffix to the catalog number. (Ex. 10G30RN, \$146.95)

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Functions: Three or Four Channels

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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.

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BOX 511B, HIGGINSVILLE, MO. 64037



The ever increasing popularity of the large power ships, Telemaster and Quarter Scale type, has opened up a new source of launching. These large airplanes with their prop drives, slow flying speeds, lots of lift and very stable in the air, makes them an ideal launch device using the aero-tow. Now, this is not new by any means, but just another type of launching for the modeler to explore if he has never done this type of flying.

In fact, it is getting so popular that Gordon Pearson, President of the League of Silent Flight, is thinking very seriously of making an event of aero-towing for competition.

Years back I built a large "Porterfield," a .60 powered taildragger airplane, large barn door type ailerons and large control surfaces. This was the airplane we used for sailplane towing. My long time flying companion, Lee Lowery, and I made many flights and did lots of experimentation on aero-towing. We had many failures, smashed sailplanes, and runaway power ships, but in the end we got our act together and had many enjoyable flights with no problems.

What I am going to pass on is some do's and don'ts so that if you want to enjoy this spectrum of sailplaning, the attrition rate of your flying machine should be zero.

The pilot competency for the powered ship and sailplane should be high. The first five seconds to a minute is the most critical portion and it takes experience and pin point precision reaction.

There are two types of tows, high tow and low tow. The low tow is where the tow line attaches to the underside of the power ship. This proved to be disastrous --- broken props, poor ground control, and elevator fouling problems. The high tow proved to be best. Not only did it improve ground control but there was no fouling of the empennage.

We found out that **both** the power ship and the sailplane have to be able to release from the tow line. This differs from the real thing because the full size tow plane has a real or drum to haul in the tow cable after releasing the sailplane. Through experimentation we found out that the best location for the tow hook was centered on top of the fuselage 1" behind the trailing edge of



Dave Lloyd, on the right, shows off the fine quality of the fiberglass fuselage used in the Windspiel models. The Jantar fuselage is hanging on the back wall, big huh!



Bill Watson shows off his construction on his indoor electric. He changes power pod and it becomes a CO² powered glider.

the wing. The release mechanism is very simple --- a captured sailplane tow hook. Two good ones are available --- the E.K. or N.A.M.E. --- and can be mounted on top of the tow plane fuselage. Release can be achieved from a low throttle setting or the fifth servo if you have one.

The tow line should be of the braided type. It needs to be very elastic, yet strong and firm, and 60' in length with a ring on both ends and a colored flag on the sailplane end. Attachment of the tow line on the sailplane should be 2" from the sailplane nose on the bottom. A shot pin method is best here and release would come from full up elevator momentarily, or the third servo if you have room.

Now comes the actual take-off that

requires full coordination and concentration of both pilots. When the tow plane is ready, and the tow line attached, stretch out the tow line and attach it to the sailplane. Don't use a snatch tow --- start out with the tow line stretched out to its full length.

Line up into the breeze --- no frontal obstructions because you will be making a long low straight out take-off. The sailplane will break ground and become airborne very quickly, generally in a matter of a few feet. Make sure the sailplane pilot is ready for this because he must keep a true heading behind the tow plane. No place for side ways zoomies here. If the sailplane does sideways gyrations, the pilot of the tow plane will start a zig-zag take-off and probably over-control.

Once the sailplane is airborne, keep it on a level flight 5 to 6 feet high. Let the tow plane continue down the runway to pick up his ground speed so he can take-off. Once the tow plane breaks ground, keep it on a stall-free angle and attain altitude. While all this is going on, each pilot has to make his decision to continue the flight or abort. This last task takes about five to ten seconds of actual time so split second decisions have to be made.

Keep the sailplane on a high tow position so you won't foul the rudder. Follow the path of the tow plane; the tow plane must make slow flat turns.

Once you have attained the release altitude, release the sailplane first, the tow plane should ease off on the throttle and fall away. There is no reason for the tow plane to release the tow line at this altitude; make a low pass over the field then release. The rag tied to the sailplane end will produce enough drag to pull it free from tow plane. Don't land the tow plane with the tow line trailing, it can foul and snag on landing. Believe me, it can happen --- it did.

Where this launch system is fun is at the club level; simple rules for time or altitude can be set. Once you have tried it I'm sure the imaginative mind of sailplaners will come up with something. Let me know your ideas or methods on aero-tow.

■ ■ ■

Dave Lloyd of Daves Custom Models, Glendale, California, has taken on the

to page 174



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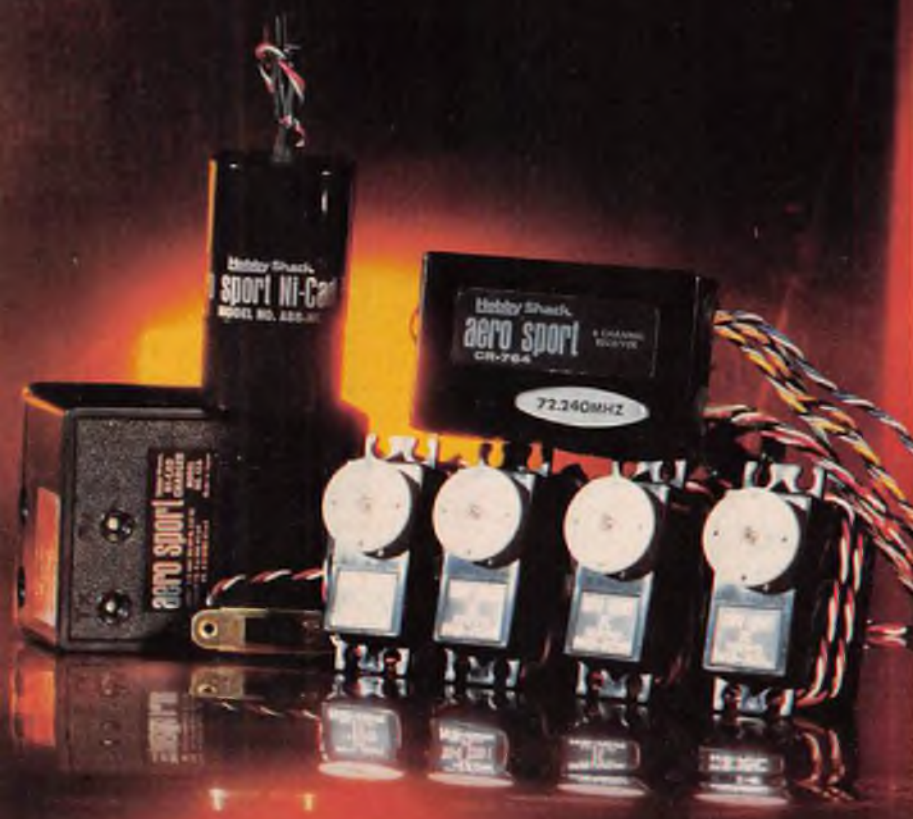
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When you select an Aero Sport system you are getting quality, dependability, up to date engineering design and back-up service & warranty. That is the reason we have always sold so many radio systems each year, and know we have the best for 1979.

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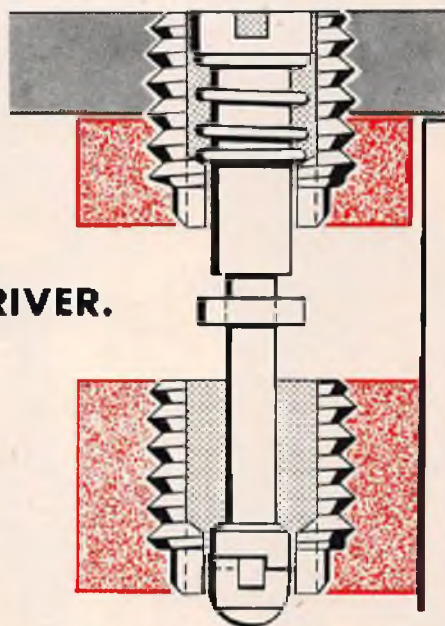
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THEY LOOK AND WORK JUST LIKE THE REAL THING!

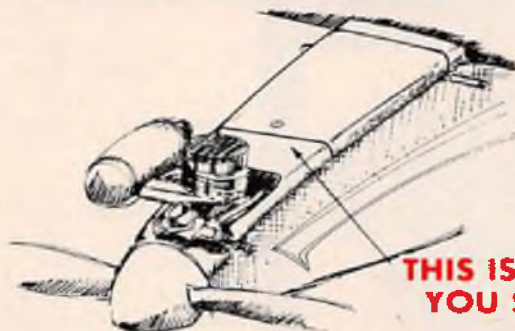


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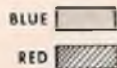
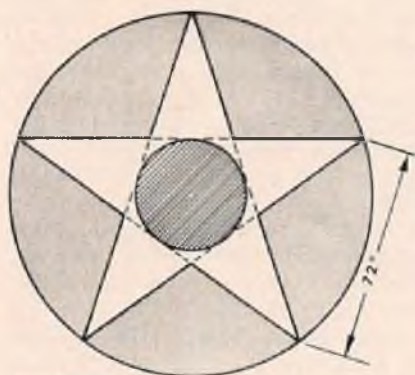
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INSIGNIA BY THE NUMBERS — II

used to live adjacent to the airport on which the annual fly-in of the Antique Airplane Association was held and was an early member of the group. So, over the years, I got to see a number of military decorated airplanes. The most common error in the paint jobs seemed to be the layout of the star insignia used as the U.S. national markings from 1919 to 1942. The red spot in the middle of the star is not supposed to touch the angles of the star outline. Since I've also seen the mistake on models and on decal sheets, here is the correct layout. (Of course, if you are modeling one of those full size aircraft that were marked incorrectly, you'll have to repeat the mistaken layout --- the inaccuracy will be necessary for accuracy!)



OR USE DIVIDERS TO LOCATE 5 EQUALLY SPACED POINTS AROUND THE CIRCUMFERENCE

Soon after Pearl Harbor it was realized that the red spot could all too easily be mistaken for the Japanese red circle insignia. So, in May 1942, the spot was removed and only the white star and blue circle appeared on U.S. aircraft. In July 1943, because of visibility problems, the "bar" background was added. See last month's Scale Views for a diagram of the star and bar.

ENGINES FOR SCALE

There's something to be said for the brute power produced by the latest Schneurle-ported 2-cycle engines. But nothing printable can be said for their "ear piercing, neighborhood riot inciting,

banshee-like" whine. The only place that comes near to being a realistic sound is in a ducted fan jet type. Lately more 4-cycle types have been appearing. When you've been around scale models using them for power, an appreciation quickly develops for the quiet and purposeful purr that emits from their stack. Since they are so much less noisy than an equivalent size 2-stroke, maybe we should change the rules and exempt them from the muffler requirements so as to encourage their use in this era of flying fields being lost because of sound pollution.

Thanks to friend Paul Johnson, Scale Views gets to see the latest in off-beat and out-of-the-rut engines. He is always at the head of the waiting list when an unusual engine is to be produced and sometimes ahead of the list. He brought down a couple of new 4-strokes the other day and we froze our fingers running them despite the calendar claiming that spring was here.



A static picture and description of the Diamant 10/4T appeared in last month's column. Here you can see it on the block, running along smoothly on a Top Flite 12/5 prop with 7,600 rpm indicated on the Royal Pro-Tach. Not a dynamo of power of course, but it has a lower noise level and a less nerve wracking note than a 2-stroke .35 or .40. Polk's, 314 Fifth Ave., New York, NY 10001, import the Diamant.

The other little gem, also in the latest "square look" styling, is the new Kalt FC-1 .45 cu. in. 4-cycle. Attractively satin finished, it seems very well made. The manufacturers recommend standard model glow fuel of 10% or 15% nitro content. A special fuel filter is supplied and must be used. Cold type

glow plugs are not recommended because the ignition takes place only every other stroke. A Kalt HP plug is provided but other RC type plugs can be substituted. Break-in time is 30 minutes, after which a valve clearance adjustment is called for. This is a simple process that will have to be done periodically. The maintenance instructions say the "E" ring valve spring retainers should be replaced every 5 running hours. Extra "E" rings are supplied with the engine. Stroke is 19 mm (3/4") and bore 22.3 (7/8"), weight is 18 oz.



After the break-in period, the manufacturer states the speed on an 11/6 prop will be "around 8,500 rpm." We found this claim to be correct, as you will note in the picture, with the tack indicating 8,450 rpm. Practical range is 2,500 to 9,250 rpm. The engine starts easily and runs smoothly. Made by Japan's Kalt-Sanyo Ltd., it is available on a direct-only basis from International Specialties, 2310 Cimarron Rd., Las Vegas, NV 89117. That's Ed Morgan, President of the Quarter Scale Association of America, also known as the Head Monster Basher. Sorry Ed, I have to report that the Kalt, though a nice engine, will never get a 1/4 Scale off the ground.

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services or individual manufacturers are great source material for scale building. The pilot's handbooks usually have pictures of the instrument panel and cockpit sides, and often have much other detail. Maintenance handbooks show things like radio, radar and rescue installations, exterior access panels, instructions stenciled on the skin, close-up photos or line drawings of the landing gear, antennas and other bits. Structural repair manuals have valuable coverage of skin panels, fillets and general construction. Illustrated parts catalogs sometimes show most of the airplane, piece by piece. Just as there are collectors of old magazines and books, there are collectors of tech manuals. I know of one who has hundreds, including rare experimental types. I only have 15 originals of World War II era and kick myself when I think that I helped throw the entire tech manual library of the 49th Bomb Wing on a bonfire when we departed Foggia in 1945, saving only one, for an RC target drone!

Since originals are scarce, the companies that make copies of tech manuals available for the use of antique, replica and warbird airplane restorers are useful. Here are some details:

Air Service Caravan Co., Municipal Airport, New Bedford, Mass. 02747. The manuals are copied on a high quality Xerox 720 copy machine and prices are thus roughly based on the page count, so large manuals can get expensive. Though they do a reasonable job of photo reproduction, be aware that the results do not quite measure up to the originals or photo-offset printed versions of the originals. Line drawings and print reproduce just about perfectly. 60 page catalog is \$2.00.

Here are a few samples of the rarer airplanes in their catalog: YFM, P-26, P-12, JN-4, P-6E, J-2F, AF-2, L-6, AM-1, P-70, FR-1, OS2U, etc. All of the standard military types of WW II and later are listed, some English military, plus many civilian examples. In a few cases, original manuals are available. Realizing the value of their collection to historians and model builders, they have produced a special series of off-set printed and bound manual reproductions. These have been abridged slightly --- a few obscure parts having been dropped out. This list includes all of the major WW II aircraft, plus some rarer birds like the F-82, P-61, Jenny, Ford Tri-motor, and Northrop flying wings. Prices range from \$2.95 to \$9.00.

Essco, Shawnee Airways, Akron Municipal Airport, Akron, Ohio 44306. This concern has just about the same number of manuals, on about the same airplanes, with the attraction of a free 64 page catalog. They do not have the line of special printed manuals nor quite as

many rare birds represented. If you are interested in the subject, I'd get both catalogs.

One caution should be kept in mind. Some early manuals were very shy of illustrations, some parts lists are not illustrated. If there is any doubt in your mind about whether the material you need is in the particular manual, I'd call and ask for a summary of contents over the phone before ordering.

MAILCALL

Here's an excerpt from a letter from Bob Krous of Huntsburg, Ohio: "I would like to build a scale replica of the P-51 B/C Mustang, but I don't know where to obtain authentic plans. I would also like to construct a scale Hamilton Standard propeller that was used on this model. Can you help me find out how to obtain this information? It will be an R/C model, scale to be around 2" = 1'."

Normally I answer questions about sources of plans by a personal letter reply. I'm putting this one in the column for two reasons. First, the Mustang is undoubtedly the most popular single design among modelers and I have a definite opinion about which is the best material for them to use when designing or building a Mustang. Back in March 1972, the English magazine Scale Models published a complete coverage of the Mustang series B, C and D. Reflecting editor Ron Moulton's long time scale interest, an extensive research effort produced an excellent set of drawings by Pat Lloyd showing plenty of detail, a bottom view, various canopy shapes used, drop tanks, etc. Accompanying is a historical feature by Bob Jones showing instrument panel and cockpit views with color notes on camouflage and markings. Though there are other supplementary articles or books that would be useful for producing an ultimate and definitive Mustang model, you can't do any better than this in easily available plans for your design base. You don't have to look for a copy of the magazine, since a reprint of the article and plans are available in the Aeromodeler plans series. These fine plans, reflecting the uniquely English approach to scale models, are available in this country from Bob Holman Plans, Box 741, San Bernardino, CA 92402. The number for the Mustang is 2766 and includes an enlargement of the 3-views to 1/24th size. Price is \$4.40 plus \$1.00 postage.

One of the details on the Lloyd plans is a drawing of the prop showing the different configurations used, so this should help to fulfill Bob's request for prop drawings in this particular case. But all too often the data available on the prop is limited and may not even be shown at all on a 3-view. Which brings me to my second reason for putting in his letter. If any Scale Views reader has any

to page 166

R/C Accessories engineered for Performance

ENIM

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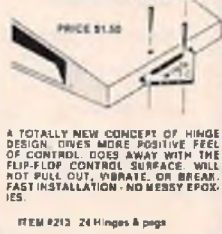
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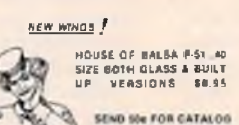
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RCM PRODUCT TEST

Bud Nosen Models CITABRIA



One of the more interesting aspects of Quarter Scale is its appeal to the pilot, or ex-pilot, who would like to build a replica of the craft which he learned to fly. A model that flies exactly like its full size predecessor, one with which he can be completely at ease and, when it comes to finish, he can refer to his log book for the numbers. And, of course, he can remember the many times he approached the plane for pre-flight and lessons --- how could he forget the color scheme and way it was decorated?

Do they fly full scale? You can bet they do. For instance, you have decided to come around before you fly out of sight so you crank in some aileron and she banks to the left but keeps right on in a straight line. You weren't paying attention when the instructions indicated you must add a proportional amount of left rudder for turns. Just like the big ones, huh?

The Citabria flew beautifully. On the first test flight, she was lined up on the runway, the OS .80 was ticking over in a smooth idle and then, just in case, she was given full throttle. Down the runway she went in a perfectly straight line and, in what seemed only a few feet, she seemed to leap into the air. Almost immediately the throttle was retarded to 1/3 power and held there for a swing around the field. This would give a chance to check the trim and allow us to become familiar with the flight characteristics of the plane. Trim was not needed, everything was right the first time. About the only difficulty was learning again to use the rudder while making the landing approach which, with a little jockeying, wasn't perfect but it was an acceptable landing. In the second test, the throttle was advanced to about 3/4 full and she was held on the runway longer so the take-off would be more realistic. It was --- and a sight to behold. During the flight, a loop was tried with 1/3 throttle with absolutely no problems.

Since the Citabria is so large, the wings and struts must be installed at the field unless you happen to drive a van or larger. We "Almost Senior Citizens" suggest you purchase an automotive type creeper so you can get around while making under-wing strut adjustments.

to page 166

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

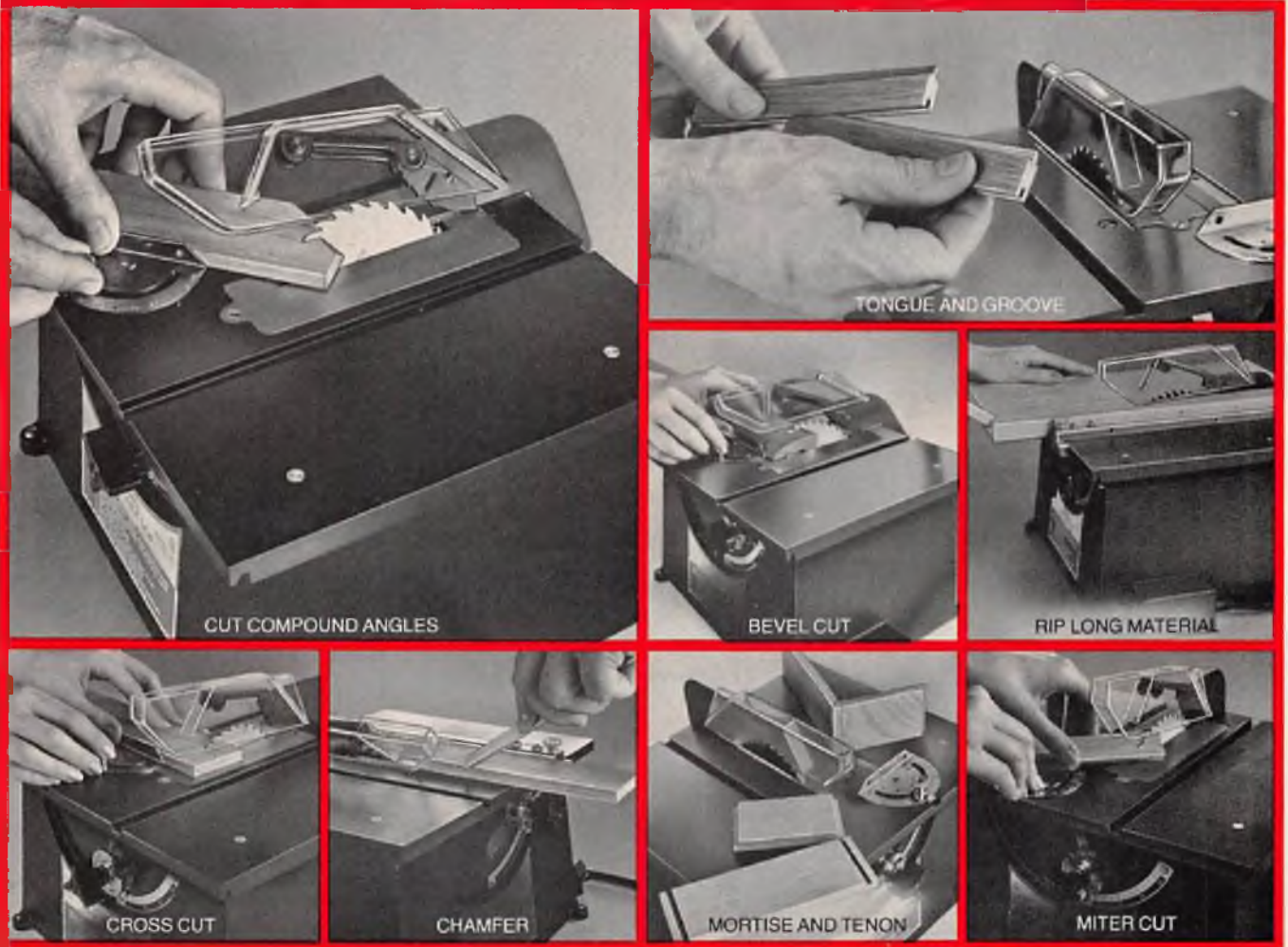
SPECIFICATIONS

Name	CITABRIA
Aircraft Type	High Wing Monoplane
Manufactured By	Bud Nosen Models P.O. Box 105 Two Harbors, Minnesota 55616
Mfg. Suggested Retail Price	\$99.95
Available From	Both Mfg. & Retail
Mfg. Recommended Usage	Sport & Stand-Off Scale
Wing Span	195 1/4 Inches
Wing Chord	15 Inches
Total Wing Area	1550 Square Inches
Fuselage Length	62 3/4 Inches
Radio Compartment Dimensions	(L) 15" x (W) 7" x (H) 6"
Wing Location	High Wing
Airfoil	Flat Bottom
Wing Planform	Constant Chord
Dihedral (each tip)	2 Inches
Stabilizer Span	31 1/2 Inches
Stabilizer Chord (incl. elev.)	8 Inches
Total Stab Area	500 Square Inches
Stab Airfoil Section	Flat Bottom
Stabilizer Location	Top Of Fuselage
Vertical Fin Height	9 1/2 Inches
Vertical Fin Width (incl. rud.)	12 Inches
Mfg. Rec. Engine Range	.60-.80 cu. in.
Recommended Fuel Tank Size	12-14 Oz.
Landing Gear	Conventional
Recommended No. Of Channels	4
Recommended Control Functions	Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:	
Fuselage	Balsa, Ply & Spruce
Wing	Balsa & Spruce
Tail Surfaces	Not Given
Hardware Included In Kit	See text
Plan Size	78" x 30" (2 sheets)
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (2 pages)
Construction Photos	No
Kit Includes	Die-Cut & Shaped Parts
Mfg. Rec. Flying Weight	No Recommendations
Wing loading based on rec. flying wt.	No Recommendations

RCM PROTOTYPE

Weight, Ready To Fly	216 Ounces
Wing Loading	20 Oz./Sq. Ft.
Covering & finishing materials used	See Text
Engine Make & Disp.	OS .80
Muffler Used	OS
Radio Used	Kraft Sport KPS 15
Tank Size Used	12 Oz.

Give wings to your ideas faster.



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Model 580
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LEFT: QSAA Secretary, Pat Bunker, presents the RCM Best of Show Trophy to Bruce Lund for his detailed Curtiss Junior at the Second Annual Las Vegas Quarter Scale Fly-In last October. BELOW: Photo taken in about 1934 of a Curtiss Junior with Bruce Lund on his mother's lap at age 2.

Get off the beaten path with this quarter scale, 11 1/2 inch model that has personality!

1/4 SCALE

By Bruce R. Lund

CURTISS JUNIOR





Wing strut attachment to wing – note servo access hatch.



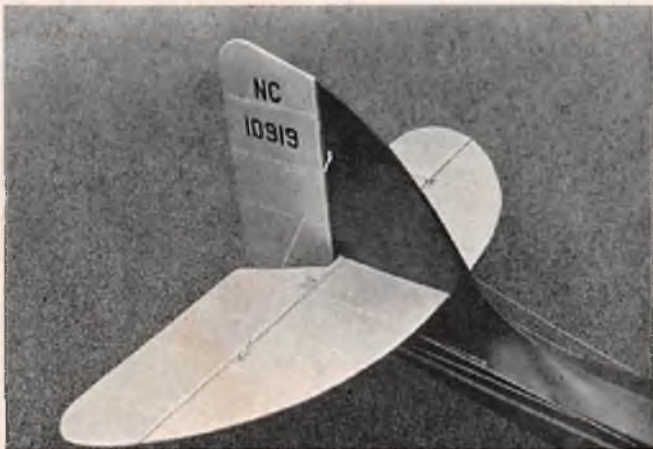
Landing gear and strut attachment



Rear view of cabane struts.



Engine nacelle with wings removed.



Tail assembly – note rib stitching and functional control cables and flying wires.



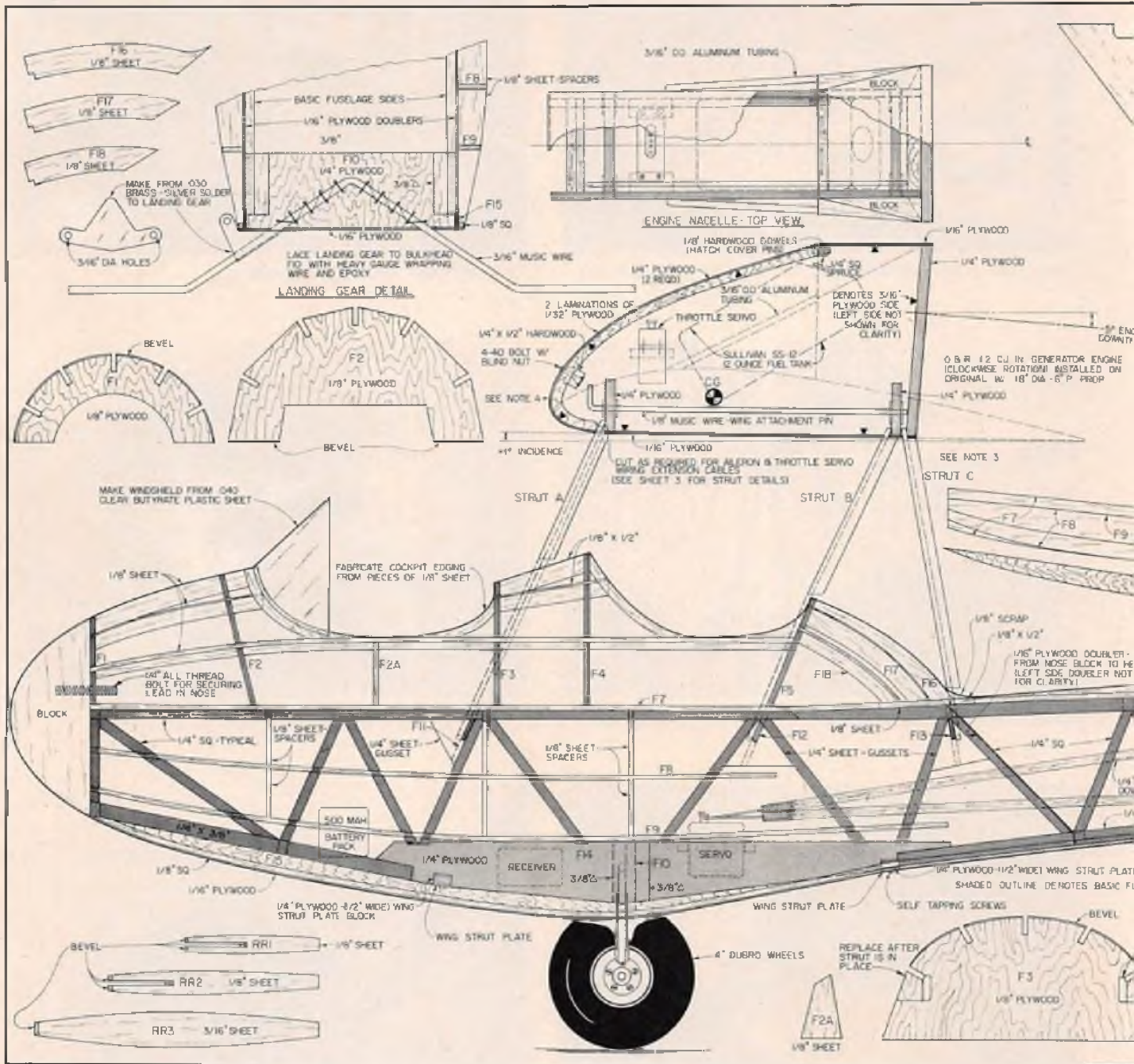
Note 3 1/2 lb. lead bolted to nose block behind instrument panel.

framework was complete. The plane looks ready for covering, but much work remained. Time was lost trying to decide how to run the functional control cables from the tail to the servos --- more time on what engine to use. Where can I find a left hand prop? Will I have to carve one myself? No way to fit a prop drive into the small nacelle and keep the propeller in

its proper place. A Webra .60 will fit, but I doubt that it will fly a plane projected to weigh 16-19 lbs. How about that old O & R Generator that was put up for "some day"? It's heavy, but maybe with some work it can be made to do the job.

Stripping the engine down we discarded the cooling shroud, generator, and fuel tank, and turned the

flywheel to remove the cooling fins. Along the way, we decided to mount the prop on the flywheel. This was the strongest end of the double ended crankshaft. This was too easy. Watch out for Murphy's Law --- here it comes --- engine rotation is clockwise. Well, it was a good try, but Murphy loses this round. If we put a conventional prop on the



engine backwards and run it clockwise (looking at the shaft end), we have a store bought pusher prop.

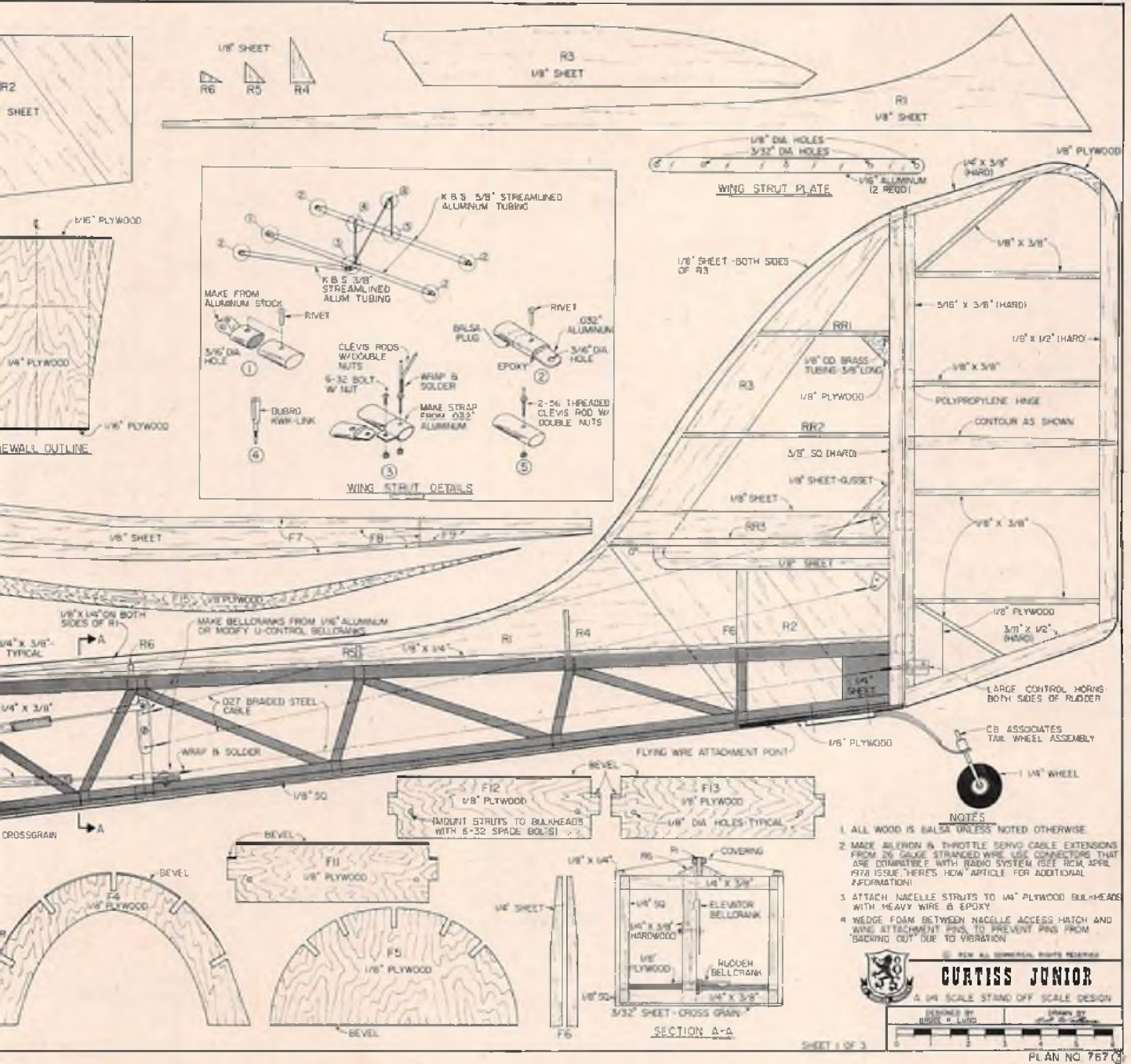
On advice from a friend who had run this type engine in an R/C boat some years ago, we removed the carburetor/fuel pump and installed an Octura carburetor that he supplied from his junk box.

It is now the first of September. The basic airframe is being covered. Should I stitch the ribs for good scale appearance, or should I just forget

them? Deciding that 3000 stitches was too much to do for real, but the airplane was looking too good now not to have stitches, I developed a good method of simulating them. It only took a couple of evenings.

Finally ready for the test flight September 16. The contest is 12 days away counting the four days travel time. The biggest unknown is the possibility of radio interference from the engine magneto. Cranked it up and everything seemed okay. After a very long take-off

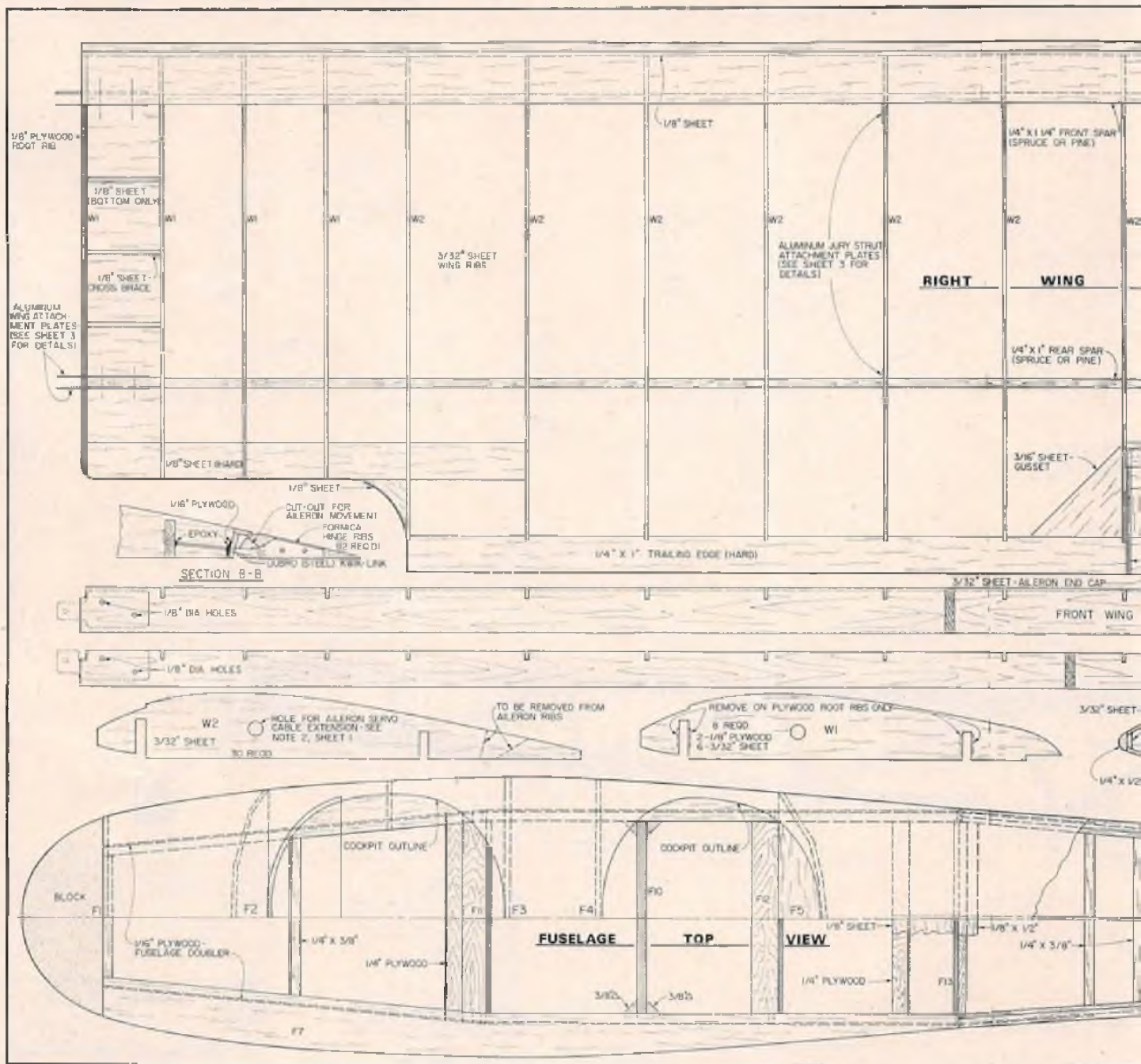
run, the Curtiss lifted off. I should have aborted the take-off for lack of power, but it was too late now. Finally got it to climb to about 10 feet after flying 100 yards. It started drifting left. Knowing now that I would never gain enough altitude to make it around the field, I touched right aileron and the plane answered with an immediate stall. The nose and right wing tip hit the ground with a big cloud of dust. Well there goes the Las Vegas vacation and contest. Running up to the crash site I expected



to see lots of little pieces all over the field. Where were they? I know, still inside the Ceconite covering. This wouldn't be the first time I picked up a dacron bag full of small balsa parts. But no!!! There were no small pieces, just pieces that resembled wings, tail and fuselage. What!!! This can't be after a crash like that. Only the cabane struts came loose from the firewall and tore the fabric at the fuselage. Also a broken prop and two bent wing struts. Las Vegas was still in sight. By Sunday night

you couldn't tell there had been a mishap. Now to find out why the 1.2 cubic inch engine was not capable of flying a plane that only weighed 15½ lbs. Putting a tachometer on the engine, it would only turn 5000 rpm. Not enough. Run it again, this time I am able to get it up to 5400 rpm. Why more rpm? Nothing was done to it. Run it again. This time 5800 rpm. Hey! Maybe it just wasn't broken-in. Let's go fly. Saturday, September 23rd — take-off

run was still long, but the plane was climbing. Make gentle turns — watch out for that stall. Each lap around the field the engine came on stronger. After about five minutes I realized that the Junior would fly hands-off. It now had enough power to make tight turns without fear of a stall. Say, this plane flies just great. Its speed is so realistic. Just what I wanted. Throttling back and turning on final was a real thrill. That 10' wing was easy to keep level and everything was looking great, 20', 10', 5',



1'. Whumpf! I was so excited over the successful flight that I forgot to flair for landing. No damage though, it's a very strong bird. The next morning we packed up and headed for Las Vegas.

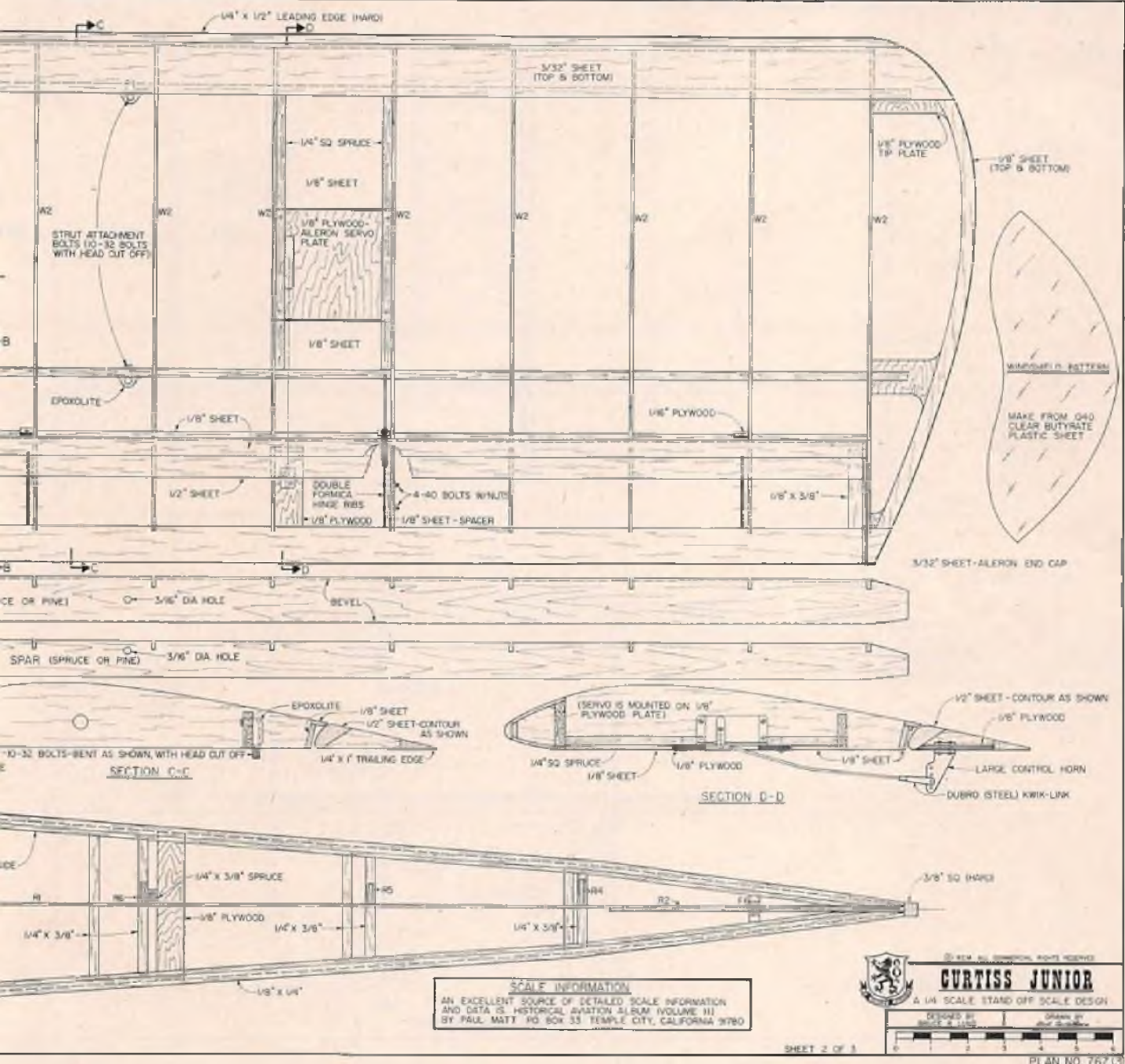
CONSTRUCTION

Construction is very straightforward. I will not bore you with glue part A to part B, etc. However, I will describe to you some of the more complex areas of construction.

Fuselage: Two stick sides are made and joined together with crossbracing.

Be sure to keep your alignment. Add the formers supporting the cabane struts and the landing gear before placing the 1/16" plywood doubler on each side of the nose. Now you can add F-15 to the bottom and glue the 1/16" plywood bottom sheeting in place. Note that the bottom is 1/16" plywood ahead of the rear wing strut and 3/32" balsa behind. Cabane struts and engine nacelle can now be added. Alignment is checked with the bottom of the nacelle. The cabane struts are laced to the nacelle

crossbracing with steel wire and then soaked with epoxy. The nose block and top formers can now be glued in place. Add the stringers and block in around the cockpits. Cut out everything from these blocks that doesn't look right and soon you will have your cockpits framed. The vertical fin can now be set into place. Servo control cables will penetrate the fuselage covering near the tail. I placed small nylon tubing flush with the fuselage covering. This could be seen through the covering before



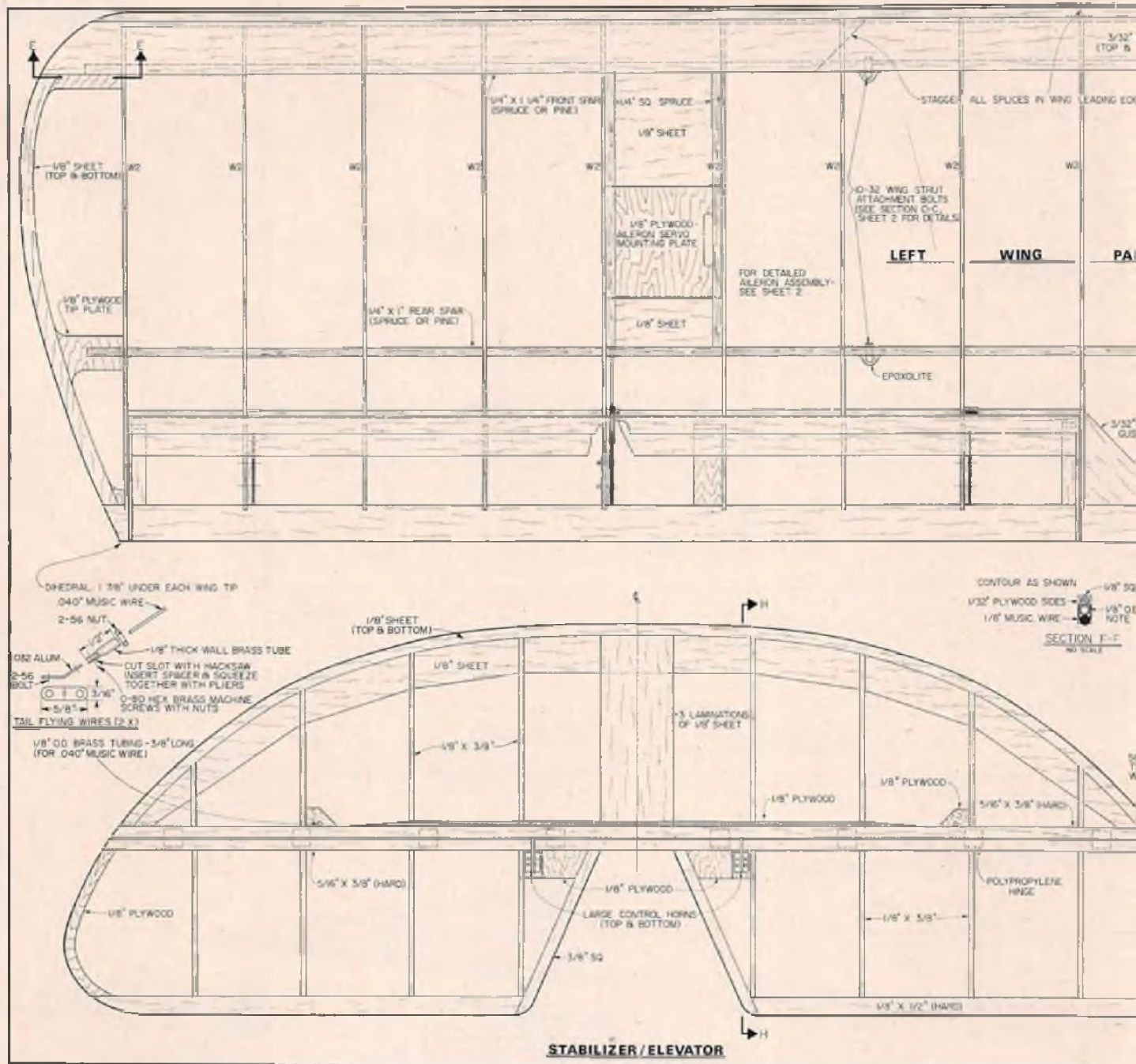
painting. The holes were made in the fabric just before the color was added. The two front cabanes were streamlined with spruce and plywood after servo wires were placed through 1/8" brass tubing. These servo wires were for throttle and ailerons, both in the engine nacelle.

Tail: Nothing special here. Be sure to make provisions for flying wires. Do not use elastic cord. These wires are functional and are as necessary on this model as they were on the full size

aircraft. Use 3/64" music wire with metal fittings bolted in place. Do not secure the horizontal stabilizer to the fuselage until the stab and vertical fin are covered.

Wing: Spars are cut from spruce or pine and ribs from 3/32" balsa. Note that the root rib is 1/8" plywood as is the tip bow. Aileron hinges are placed low to benefit from what is called "Frise Ailerons." You will note that as the aileron deflects up, its leading edge deflects down. This leading edge then produces drag and allows the outboard

wing, without this drag, to move ahead of the inboard wing during a turn. If you get it just right the model will make coordinated turns with ease. Both "Doc" Edwards and Jerry Nelson were impressed with the smooth coordinated turns that the Curtiss made when I let them fly it during the Las Vegas contest. Aileron servos are mounted outboard in each wing panel. They are connected via 30" pigtails to connectors in the engine nacelle and then about another 16" down through the front cabane strut

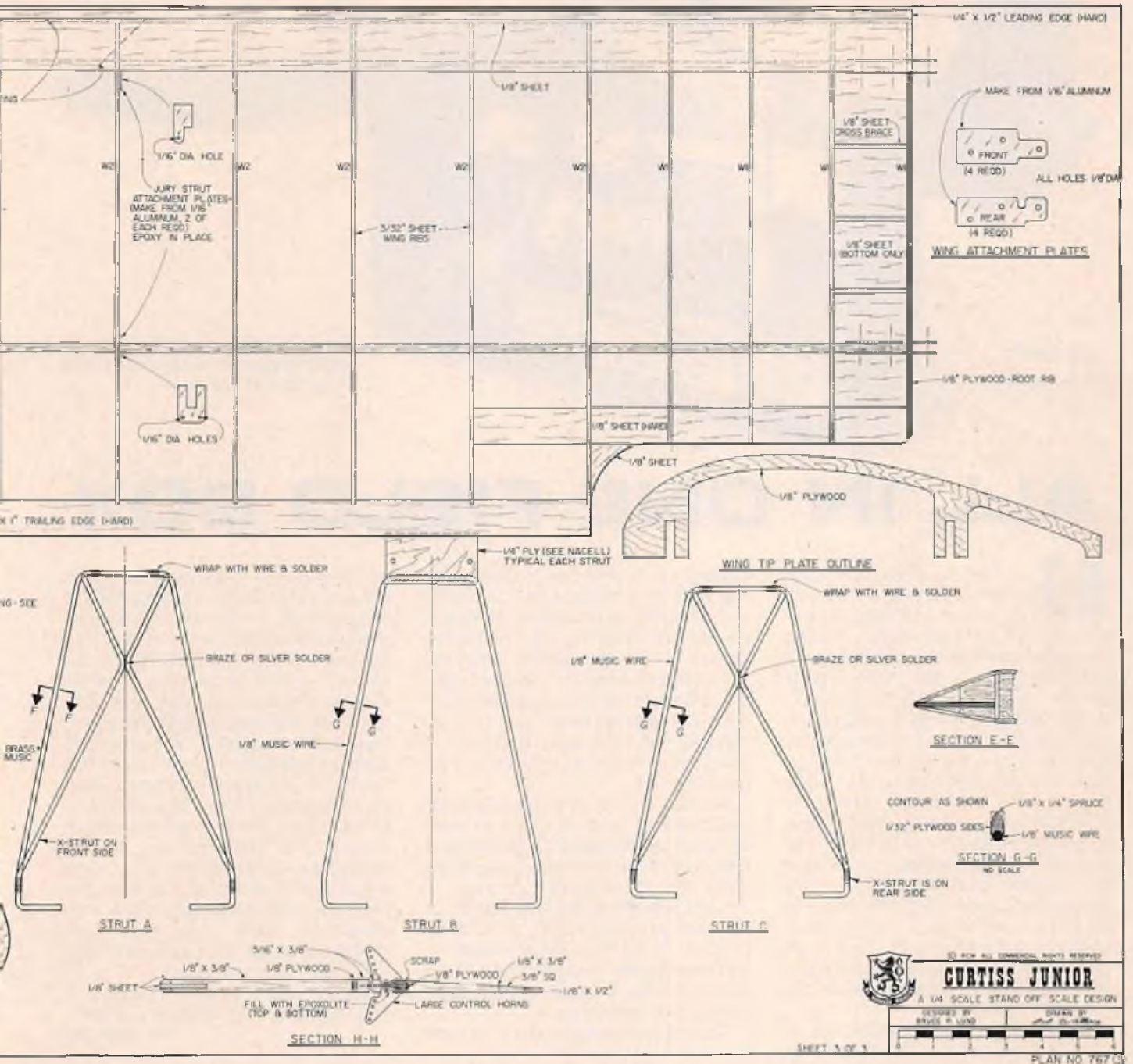


to the receiver. This long length has presented no problems to date. Wing struts are mounted to the spars by using long screws bent into an "L" shape and epoxied into place. Remember, these struts are functional and must support the entire weight of the model. K & S streamlined tubing was used with fittings riveted in place on each end. The jury struts are Kwik Links attaching to plates on the spars. The wings are attached to the engine nacelle with mounting plates very similar to full size aircraft. These

plates are bolted to the spats. Two 1/8" music wire pins secure the wings to the nacelle.

Covering and Finish: Stay away from the super gloss finishes. These old airplanes were not made that way. Back in those days they used linen for fabric and finished it with dope. I chose to cover my Curtiss with Ceconite. This is a heat shrink dacron fabric that is used on full size aircraft. I used 1.8 oz./sq. yd. fabric that is made for sailplanes. It seals fast with just a couple of coats of clear.

Two coats of color were sprayed on followed by a coat of clear after the N numbers were added. Rib stitching was simulated by stretching heavy thread from the root to the tip. While held in place with masking tape a drop of dope was placed on each rib. After drying overnight the thread was cut with small scissors leaving a small piece stuck to each rib. 3/8" wide strips of fabric were doped over this stitching and the job was done. The tail was done in a similar manner. The fuselage was covered with



as few seams as possible. First cover the bottom. Next, the vertical fin and turtle deck with a seam down the centerline of the model. Now cover the sides and up around the cockpit to the centerline. The area just behind the rear cockpit will be the most difficult but the heat shrink fabric works great in an area like this.

Miscellaneous Detail: The engine used was an Ohlsson & Rice 1.2 cu. in. Generator. It turns a Top Flite 20/8 about 6000 rpm. A 12 oz. fuel tank gives 15 to

20 minute flights. Having the engine so far behind the C.G. requires ballast to be added to the nose. 3 1/2 lbs. of lead was bolted to the backside of the nose block. This brought the flying weight up to 15 1/2 lbs. I am real pleased with the weight of this airplane. Quarter Scale planes can be built light while keeping them strong. Keep in mind that the heavier a plane is built, the stronger it must be built. You never heard Boeing Engineers say, "Don't worry about the weight," while building the 747. □





By
Robert
Lansdale,
Jr.

Completed all-in-one field box
holding author's Long John (RCM
Plan No. 691, \$5.00).

ALL IN ONE FIELD BOX

How often have you arrived at the local flying site, minus fuel, starter or even the fuselage of your R/C model? Borrowing a missing item may be all right now and then, but it is far better to "prep" in an orderly fashion and arrive "ready for action."

This field box will go a long way in getting your act together. It has room for everything but the kitchen sink, so there's no excuse for acting the part of the absent-minded professor! Incorporating an aircraft cradle, easy access starter and handy tool shelf, this field box can do wonders for your ego (an important part of getting the day's flying off to a good start). This field box fits in most any car trunk and the all-up weight is about 30 pounds. Best of all, the cost is a mere \$8.00 or less (far less if your workshop contains some of the required material).

Depending on the particular type of

models you fly, feel free to modify it to suit your personal taste, but be sure to use materials of equivalent strength if you do substitute. Do not change the location of the fuel or battery — they are in the center to keep the "balance" right. Any old broom handle can be used, but if it has a weathered finish, give it the old sandpaper/elbow grease treatment to avoid the possibility of splinters in your hand later on.

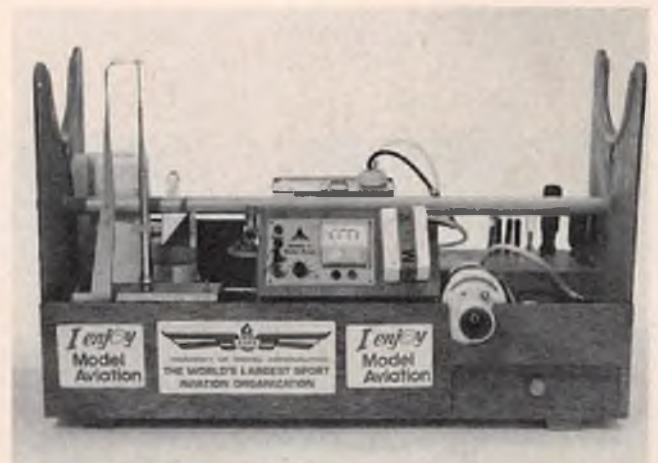
Note on the full size plan that small sketches (A and B; also drawer assembly detail) clarify the construction sequence. If you so choose, you can cut parts slightly oversize and sand to finished size with a belt-type sander (or file and sanding block). It is best, however, to cut the parts accurately — less time wasted. And you'll be a better model-builder in establishing good construction techniques.

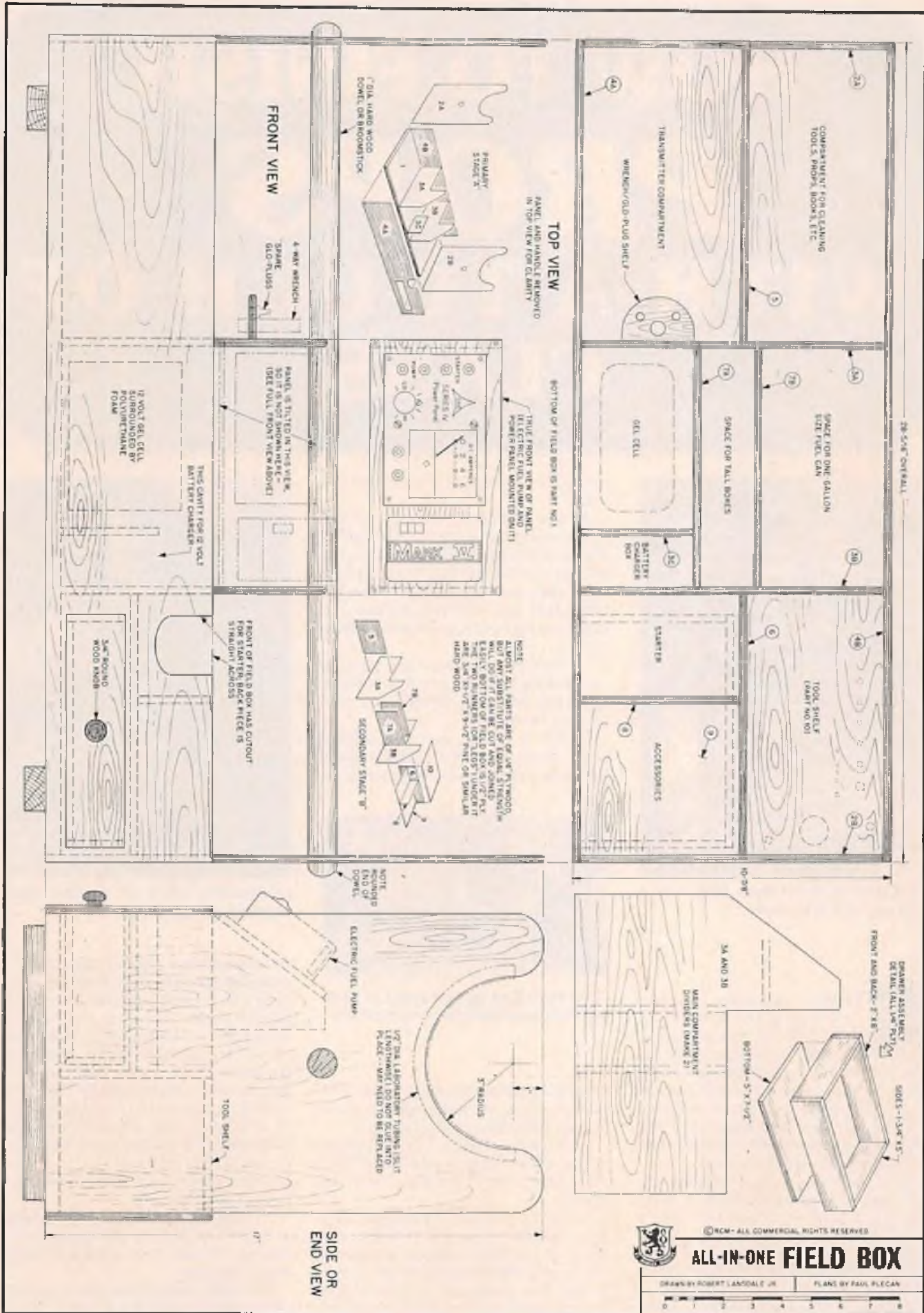
First cut out the bottom (Part 1) to size

of 1/2" plywood. Then jig-saw the ends (2A and 2B) to shape. Take a glance at sketch A now . . . the main compartment dividers (3A and 3B), plus the small Part 3C and the front and back panels (4A and 4B) should all be cut out before initiating any assembly work. Now, glue the ends to the bottom, using 5/8" or 3/4" brads or finishing nails for extra strength. Carefully measure and mark the position (on Part 1, the bottom) of Parts 3A and 3B. Glue both in place. Take the time to see that all parts that have been assembled at this stage have all their edges flush, front and back. If not, sand any projecting sections until "true," so that the front and back panels fit accurately. Glued joints are much stronger when the mating pieces fit well, so give it your "best shot."

By now you may have noticed that Parts 2A/2B and 3A/3B are duplicates.

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ALL-IN-ONE FIELD BOX

DRAWN BY ROBERT LANDALE, JR. PLANS BY PAUL FLECAN



HOW TO FINISH PROPS WITH A TOUCH OF CLASS

By Charlie Viosca

Photos By Denise Viosca



(1) Cleaning finish from prop with a rag and K & B thinner.

Simulated laminated wooden propellers are a sight to behold. To fly with one might be termed foolish, but that isn't really so. Let me take you through the necessary steps for you to turn out beautiful props to fly. Of course, you would probably want to use them on a plane, one that you know is reliable and one with which you don't break too many props.

Let's start with a list of supplies you will need. (I suggest you make at least six at one time — it's just as easy as one): Props of your choice; rags; small amount of red and yellow dope and the dope thinner; olive paint; gold paint; K & B clear gloss epoxy paint and hardener; K & B epoxy thinner; small paint brush; sheet of prop decals;

sandpaper — medium and fine; and soft pencil.

At the beginning of each of the following steps is a box to check off as you go so that you can keep track of your process. Read these instructions completely before actual work. This will familiarize you with the process and make you aware of special items pointed out.

Take the props you have selected and remove the finish with K & B thinner and a rag. Be sure to get all of the finish off (see Photo #1).

With a Dremel tool and sanding drum, dress up all of the square areas left by the prop machine (Photo #2). Be



(2) Dressing up square areas of prop with a Dremel tool and sanding drum.

sure not to remove too much material — remember you are just rounding off the square areas around the prop hub.

Place the prop on a prop balancer to see which blade is heaviest (Photo #3). Continue to balance prop as follows:

Take the medium sandpaper and sand the entire prop. Get it smooth and round off the leading edges. Shape the tips to your satisfaction and then switch to the fine sandpaper to get a nice smooth finish on the prop. You'll be surprised how little sanding is



(3) Checking prop for balance after shaping and sanding.

necessary, since it doesn't take much to make hardwood smooth. Keep checking to be sure the prop is balanced when you are finished. If you do not have a balancer, I recommend that you consider the High Point Products Balancer. This is one fine piece of equipment. I must mention that you should always balance any prop that you fly with, since I have never found one prop right out of the box that is balanced (I understand there are some pre-balanced props on the market, but I haven't used any yet).

Wipe off all of the sanding dust with a clean rag slightly dampened with thinner. This will remove the dust better than a dry rag.

All wood props had a metal leading edge starting a little more than half way out from the hub towards the tip. This

was to prevent abrasion of the wood caused by dirt and rocks. Real propeller tips were covered with canvas about one third in from the tip to make the thin wood stronger.

Draw the metal leading edge outline with the soft pencil. If you wish, you can make a thick paper template to get both tips the same (see Photo #4 for this step and the next).



(4) Leading edges, canvas tips and laminations being drawn in.

Draw a line where the simulated canvas ends. Remember, the metal leading edges and canvas tips are on both the front and back of the prop.

Lay the props on a table (1 at a time) and draw in the laminations with the soft pencil (Photo #4). You should make four laminations (which will be three lines). Lay the pencil on the table ninety degrees to the prop with the point touching the hub and move it out towards the tip. Do both front sides, turn the prop over and do both back sides. It is important to point out that you do not want perfect sharp lines as the laminations on a real prop are not perfect either. After making the first line, insert a spacer (such as a piece of 1/8" balsa sheet) and draw the second line. Do this step over for as many times as you need laminations.

You are now ready to stain the laminations. Pour some dope thinner in a jar — about a thimbleful will do. Dip a small paint brush into some yellow dope and rinse in the thinner to make your yellow stain (careful, not too dark). Use this to stain one of the laminations drawn on the prop (Photo #5).



(5) Staining the laminations.

Add some red dope to make a pale orange color and stain two laminations. Skip one lamination in-between the two orange ones.

Make a little red stain and stain the final lamination. Be sure to make your

stains light — you only want each lamination to be slightly different in color than the one next to it. When real wood props are made, each of the boards glued together to make the prop are slightly different. My reason for using the stain made from thinner is because it dries in a few minutes so you do not have to wait very long.

With your brush, apply the gold paint to the leading edge you have drawn in (Photo #6). It is important to



(6) Applying gold paint to the leading edge.

use a gold paint that will not run, particularly if you paint your clear epoxy finish coats by hand. I definitely recommend that you spray your finishing coats if possible.

When the gold is dry, go over the paint with your soft pencil to mark the divisions (as seen in Photo #7) and



(7) Drawing in divisions in metal leading edges and applying dots to simulate screws.

make dots to simulate the screws.

Paint the olive drab canvas tips. Let the paint dry overnight (Photo #8).



(8) Painting canvas tips.

You are ready to apply one coat of K & B clear gloss epoxy paint and let dry.

Apply the manufacturer's brand name decals. Let the decals dry thoroughly. They should be placed approximately half way between the hub and the tip. To be correctly installed, the decals are applied on the front of the prop blades and the top of the decal should be towards the leading edge of the prop (Photo #9).



(9) Applying manufacturer's brand name decals.

Paint at least two more coats of clear gloss epoxy being sure to let the first dry before applying the second. You shouldn't have to sand between each coat. Three coats should suffice.

The trick is to balance the prop while applying the last coat. Since you started with a balanced prop, it will be easy to check and apply a small amount of clear to the rear of the light blade. Keep checking and applying until it is balanced wet. **Caution:** It shouldn't take much to bring it into balance, but if it does, I would recommend letting it dry before applying too much, otherwise you will have runs and you don't want this.

I found the High Point Products Balancer handy when spraying the final balance coat with the prop installed on the balancer and leave it to dry.

You should now be the proud owner of some beautiful scale-looking props with which to fly. I guarantee your friends will ask where you got them.



(10) Top to bottom. Out of the box. Shaped, sanded and balanced. Metal leading edges and canvas tips. Laminations drawn in. Canvas painted. Gold leading edges and coat of clear K & B clear epoxy paint. Decal and two more coats clear.

A Club Pattern Contest For Pilots And Judges Of All Skill Levels

By Stan Clark

Part I

Here's how one club met the challenge of getting more people flying, improving flying skills, training judges, handicapping all skill levels to obtain competitive flying, giving new pilots the experience of competition without undue pressure, and having some fun. Something for your club? Read on.

Background:

I first saw RC pattern competition at the 1976 Nats. The professional style and appearance of the pilots, planes, and judges was impressive, but, even more so, was seeing how the maneuvers should really be done. At the time I had recently managed to solo my Fledgling and was in the process of trying to figure out what to do with the elevator while attempting a roll. After the Nats, I was determined to master those snappy looking Split-S turns at the end of each pass. Seeing something done right is a great learning incentive; I remember as a boy (before the days of TV) coming home from a major league baseball game just bursting to get out on the field.

How to learn to fly like they did at Dayton? We all know the answer: practice, money, practice, time, and more practice. For almost all of us this isn't possible and won't happen, but wouldn't it be nice to see some improvement. I think the world of RC

flying is much like golf, where there are a relative handful of professionals, a number of amateurs, and all the rest of us. However, in golf you can keep score, get a handicap, and measure improvement even when playing alone. What's all this got to do with flying? Well, RC flying has its pros (Masters class), its good amateurs (those Novice and advanced guys at the Nats), and then you and me. Psychologically, there is a bigger gap between the beginner and the good amateur than there is between the good amateur and the professional; look at the equipment being used at the Nats (retracts, tuned pipes, and roll buttons). Only a small percentage of flyers expect to compete at the national level, but many more would like to improve. How to do it at the club level is the subject of this article.

Mountaineer RC Club:

The Mountaineer RC Club of Charleston, West Virginia, is probably typical of many clubs in that our membership of about 40 covers a wide range of skill levels. We have:

(1) A half-dozen pilots who are good enough to enter most regional pattern contests at the Novice level.

(2) Another half-dozen who are comfortable with four channels but with no competitive experience outside of club events.

(3) Several members who have soloed but never moved on to ailerons, rolls, and spins. Their objective remains to get the plane back in one piece (don't we all sometimes).

(4) A number of newcomers at various stages of getting into this sport.

(5) The others who are more or less inactive.

Objectives:

With competition in West Virginia somewhere between nil and never, how can such a club make mutual progress in learning to fly better? A contest was held in 1977 to meet the following objectives:

(1) Get more people flying.

(2) Improve the skills of everyone.

(3) Teach newcomers and oldtimers alike something about judging.

(4) Achieve competitive flying between the best club pilot and the newcomer.

(5) Provide competitive experience without the kind of pressure that only brings out the worst in us.

Two difficulties face the inexperienced pilot and judge. First, the difference between a "6" and a "4" performance for a given maneuver is not quantitative. One execution is better than the other, but how do you translate flying errors into a scale of 0 to 10? "Experience and a total impression of the execution" sounds nice, but it doesn't give us anything to get our teeth into. A second difficulty is that while each maneuver is mastered individually it is only performed as part of the pattern. With ten maneuvers in the Novice

pattern, the skill requirements for the pilot and the judge are several times greater than they would be for a single maneuver. This difficulty is being recognized; for example, see the description of the Star Novice Pattern by M. Buck Peck (Competition Newsletter, *Model Aviation*, March 1978), in which the pilot may eliminate any two maneuvers. This contest attempts to address these two difficulties.

CONTEST DETAILS

Novel Features:

(1) Only one maneuver is flown, not the entire pattern.

(2) Pilots of different skill levels are handicapped by the maneuver required, and all fly as one class.

(3) Instructors can assist beginning pilots.

(4) Each maneuver is defined by selected elements.

(5) Detailed score sheets are based on the elements.

Format:

One **basic maneuver** is flown each week for six weeks. Pilots are classified into four **levels**, each of which performs a **specific maneuver** (a variation of the basic maneuver). Specific maneuvers are selected so all four levels compete evenly against each other. The maneuvers progress logically from week to week, leading the new pilots through a learning sequence. Each maneuver is defined by elements, and a detailed score sheet makes judging more quantitative. Two or three repetitions are flown (on the same flight) to increase flying time without extending contest time. A demonstration flight is made prior to starting each week's contest, for pilot understanding and judging practice.

Rules:

(1) No restrictions on the airplane; same plane may be flown by more than one contestant.

(2) A reasonable time allowed to get a plane airborne.

(3) Level I pilots (beginners) may have an instructor make the take-off and landing, gain altitude, and help with the trimming. The instructor may also call out the maneuver's beginning and completion. The pilot must make at least a 90° turn by himself before starting any maneuver.

(4) At least one judge from every pilot level.

Basic Maneuvers:

(1) Straight Flight.

(2) Rectangular Approach and Landing.

(3) Turns.

(4) Loops.

(5) Rolls.

(6) Combination of Loops and Rolls.

Handicapping:

All club members were placed in one of four levels:

(1) Level I — Not yet completed three solo flights.

FIGURE 1
MANEUVERS

Week Basic No.	Maneuver	Specific Maneuvers			
		Level I	Level II	Level III	Level IV
1	Straight Flight	Straight flight out and back (turn not scored)	Straight flight out, procedure turn, and straight flight back <i>Novice Maneuver</i>	Inverted straight flight out and back (turn not scored)	Inverted straight flight out, procedure turn, and straight flight back
2	Rectangular Approach and Landing	Rectangular approach (no landing)	Rectangular approach and landing (maneuver complete at touchdown)	Rectangular approach and landing <i>Novice Maneuver</i>	Rectangular approach, touch and go, another approach and landing
3	Turns	Figure 8 <i>Scale Maneuver</i>	Two Figure 8's	Stall turn <i>Novice Maneuver</i>	Inverted stall turn
4	Loops	One inside loop	Three inside loops <i>Novice Maneuver</i>	One outside loop <i>Novice Maneuver</i>	Three outside loops <i>Advanced Maneuver</i>
5	Rolls	Take-off (1) <i>Novice Maneuver</i>	One roll	Two-point roll <i>Novice Maneuver</i>	Slow roll <i>Advanced Maneuver</i>
6	Comb. of loops and rolls	Three inside loops (1) <i>Novice Maneuver</i>	Immelman turn <i>Novice Maneuver</i>	Cuban 8 <i>Advanced Maneuver</i>	Three Cuban 8's

Note: (1) Level I pilot not expected to be able to do a roll.

Level II — Soloed, but not capable of inverted flight or rolls. Probably using 3 channels.

Level III — Can execute Novice Pattern, but has not entered competition outside the club. Should be using ailerons.

Level IV — Some outside competitive experience; capable of safely attempting any maneuver.

Each level should have about the same number of pilots; other clubs may want to use different definitions or a different number of levels. We had at least six pilots in each category.

Specific Maneuvers:

With the pilots handicapped and the basic maneuvers picked, the next step was to select the specific maneuvers for each level. These are given in Figure 1, with all standard pattern maneuvers highlighted. The intent was that a pilot performing well (up to his skill level) would receive a score similar to that obtained by another pilot in another level also performing up to his capability. (The use of the male pronoun to describe pilots and judges doesn't imply that females can't and don't, it is just to avoid saying he/she every time.) The criteria were:

(1) A judgement of equal degree of difficulty, relative to the skill and experience of each level.

(2) Similarity between maneuvers (common elements) for a given week and from one week to the next.

(3) Maximum utilization of standard Novice, Scale, and Advanced

maneuvers.

Elements:

Each specific maneuver was defined by selected elements to help both the pilot and the judge visualize it better. The AMA RC Pattern Judges Guide provided the basis, modified as little as possible.

FIGURE 2

Elements for Specific Maneuvers — Week No. 1 Straight Flight

Straight Flight Out

1. Parallel to runway
2. Constant altitude
3. Constant heading
4. 300 foot duration
5. Starts in front of judges

Procedure Turn

6. First turn 90°
7. Second turn 270°
8. Constant altitude
9. Smooth and circular turns
10. Heading back on same line

Straight Flight Back

11. Parallel to runway
12. Constant altitude
13. Constant heading
14. 300 foot duration
15. Finishes in front of judges

Level I — Straight Flight Out and Straight Flight Back, turn not judged.

Level II — Entire maneuver.

Level III — Same as Level I, but inverted.

Level IV — Same as Level II, but inverted.

Maximum raw score for each attempt is:

- 10 points for Levels I and III
- 15 points for Levels II and IV

A list of the elements for the first week's specific maneuvers is given in Figure 2.

Next month we will cover the elements for weeks 2 to 6, the scoring (with example score sheets), and get into the fun part — how the contest actually went. □



TENSILON

Here is the .40 powered
aerobatic machine to beat the
nitro shortage while practicing
for your pattern competition.

LEFT: Showing off Duane's .40 size pattern Tensilon is Kathy Hurbis of Ann Arbor, a student at the University of Michigan.

By Duane Gall

A fellow in our club once entered a beat-up Fledgling in a pattern contest. He dubbed it "Castor Oil" just for the occasion, bragging that it would "make a lot of Phoenix flyers sick." And he did manage to place with it, thus proving two things: first, that anything is possible here in America; and second, that it's not what you fly that counts, but how you fly it. Practice is all-important, whether you're competing on a national level or just trying to hit the ground wheels first. The airplane presented here was designed to get you through many hours of practice on minimum fuel, and --- when you're ready --- to compete on a nearly equal footing with the bigger ships. I would have called it Compensator, but somebody already used that one, so I have named it after the drug Tensilon, the antidote to curare. And it flies even better than a beat-up Fledgling.

"Fine," you say, "but what about all the other .40 size airplanes on the market? Why shouldn't I just buy a Kaos 40 or a Curare 40?" Well, go ahead! But if you expect these airplanes to perform properly, be prepared to get a new Schnuerle ported engine, maybe with a tuned pipe, and a bigger fuel tank to match. The Tensilon was designed to fly with a standard .40 such as you may have sitting around the basement. It is smaller and lighter than the others, and has a few notable features to make it more efficient. If you want to know what those features are, read on; otherwise just send for the plans and make Dewey happy.

Design Philosophy

Maybe I should explain that I'm not really a pattern flyer at all, since my first love is racing. Nothing irritates me more than an airplane that dawdles around Point A when it should be kicking for Point B. And, if you hadn't heard, speed is important to an aerobatic ship because it makes deviations less apparent. (The current folly of tuned pipes and fuel pumps is an attempt to squeeze the last smidgen of speed out of those big majestic .60 ships.) So Tensilon relies on speed for smoothness. The airfoil is a 15%, sort-of-laminar section with a sharp leading edge, instead of the usual blunt, 17-18%, Kaos-type section. Now I know Mr. Bridi sat up nights developing that blunt airfoil just so the airplane would

have a nice constant speed in the maneuvers. Well, mine gives constant speed too, it's just a little faster. And if you're worried about that sharp leading edge causing a "vicious stall," relax. Wing loading and balance are far more important than leading edge radius, as any pylon flyer will tell you. If you're afraid of tip stalling, just sand the outer 6" or so to a slightly larger radius. Voila! Gentle like unto a newborn lamb.

Now in my vast experience of one season of pattern flying, I've noticed that it's always windy at contests. This is no doubt due to the large vacuum created by competitors extolling the virtues of their latest handy device, or swapping tales of past glory. In any case, the wind --- or, more properly, turbulence --- tends to upset the smooth flight of an airplane. Many flyers make a habit of building heavy, massive airplanes to minimize the effect of turbulence. This is good thinking as far as it goes, but as Pappy DeBolt points out, even commercial jets will get tossed around. Since a model doesn't weigh as much as a 727, or shouldn't, anyway, there's no way we can eliminate the bumps through massiveness alone. Remember, we still have to take-off,

About The Author

Duane Gall is 22 and a student of graphic design at the University of Michigan. He has been involved in R/C modeling for eight years, including three years as a competitor in Quarter Midget Pylon. He is presently employed at Rider's Hobby Shop in Ann Arbor, Michigan. This is his second published design.

climb, and maneuver using that little bitty engine. I believe that wing loading is the important factor here, and that a small wing is as good as another pound of lead. Tensilon has about 10% less wing area than standard .40 ships. This makes it better in the wind, with the added bonus that it doesn't mess around on landing --- nothing scary, mind you, just a noticeable absence of "float." You, too, can get it in the circle.

Another factor that affects performance is the tail moment. This has to do with periods of oscillation and certain prehistoric fungi, which we needn't go into here. Let's just say that longer is better, and that Tensilon has just a tad less than the big Phoenix 6.

The wing construction is slightly unusual. It is a normal foam core, but planked with leading edge sheeting and capstrips as one would plank a conventional wood structure. There is no spar or dihedral brace except for the landing gear blocks, which are bound together by the center fiberglass tape. This construction is actually lighter than a built-up structure, and has proved quite successful on racers and pattern planes alike. Besides being lighter, this

method also allows adjustment of the wing after it is built, in case (Heaven forbid!) you should have a warp. Just twist the wing slightly in the desired direction while reheating the MonoKote. Be sure to use enough heat so the stuff doesn't sag a week later. There is a point, just below the melting point, where it will stabilize.

I chose the taildragger landing gear arrangement because it is aerodynamically cleaner than tricycle gear. Use skinny wheels and it's almost like having retracts. Lots of people will tell you that taildraggers are harder to handle but I think that's wrong. Properly set up, a taildragger is as docile as a trike and maybe more so. The things to look for are:

(1) Proper ground attitude. The wing should be **slightly** positive (pointed up). Bend the tailskid up or down so that in a normal landing it touches down at the same time as the mains. This will prevent porpoising.

(2) Main gear location. Bend the struts forward or backward until the plane will just remain stable when tilted onto its nose. This way the plane will transition well on a fast landing or touch-and-go. Ideally, it should not change altitude at all when it touches down. The gear may have to be bent back for flying off pavement.

(3) Slight toe-in. The front edges of the wheels should be pointing inward slightly. Don't ask me why, but this helps smooth things out too.

Generally, what I wanted was a simple but pretty airplane that would do high quality aerobatics with a normal, ordinary .40 engine. I think Tensilon fills the bill admirably. To build it, read on.

Building

The thing is only a little more complicated than a Quickie 500, so you should be able to figure everything out from the plans --- if not, write me a nasty letter. If you've never built a foam wing before, I would refer you to RCM's excellent book on the subject, in the RCM Anthology Library. Do use a good contact cement, such as Sorghum, for the wing. Horse glue don't make it on fast airplanes. I also recommend the use of a fuselage jig if you can get one. A straight fuselage is one of life's little pleasures that no one should have to do without.

The fuselage is designed around the Wing Manufacturing sport style canopy. This canopy makes an ordinary "box" fuselage into something really special, and with very little extra effort. My procedure is as follows:

(1) Build the fuselage completely up to the top deck, and round the corners as desired.

(2) Trial fit the canopy; add the dorsal fin but don't final-shape it yet. Trim the plastic flashing from both parts of the canopy.

(3) Paint the inner part of the canopy

(the piece with the dash and headrest molded in). Add the pilot, and instruments if desired.

(4) Tack the inside part to the outer (clear) part using Zap or 5-minute epoxy. Once this is done, mask off all of the assembly except the lower 1/4" or so with masking tape.

(5) Tack the assembly to the fuselage using 5-minute epoxy.

TENSILON

Designed By : Duane Gall

TYPE AIRCRAFT

Pattern/Sport

WINGSPAN

51 Inches

WING CHORD

Root 10" Tip 8"

TOTAL WING AREA

450 Square Inches

WING LOCATION

Low Wing

AIRFOIL

15% Symmetrical

WING PLANFORM

Swept L.E.

DIHEDRAL, EACH TIP

1/2 Inch

O.A. FUSELAGE LENGTH

47 Inches

RADIO COMPARTMENT AREA

(L) 10" x (W) 2 1/2" x (H) 2 1/2"

STABILIZER SPAN

20 1/2 Inches

STABILIZER CHORD (Incl. elev.)

5 1/2 Inches

STABILIZER AREA

100 Square Inches

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

8 3/4 Inches

VERTICAL FIN WIDTH (Incl. rud.)

5 1/2 Inches

REC. ENGINE SIZE

.40 Cu. In.

REC. FUEL TANK SIZE

11 Ounce

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

4

CONTROL FUNCTIONS

Rud., Elev., Throt., Ail.

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage Balsa & Ply

Wing Foam & Balsa

Empennage Balsa

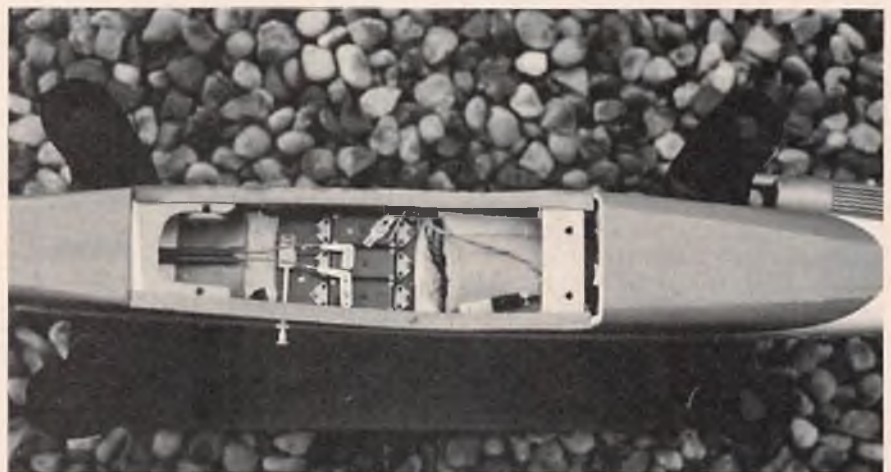
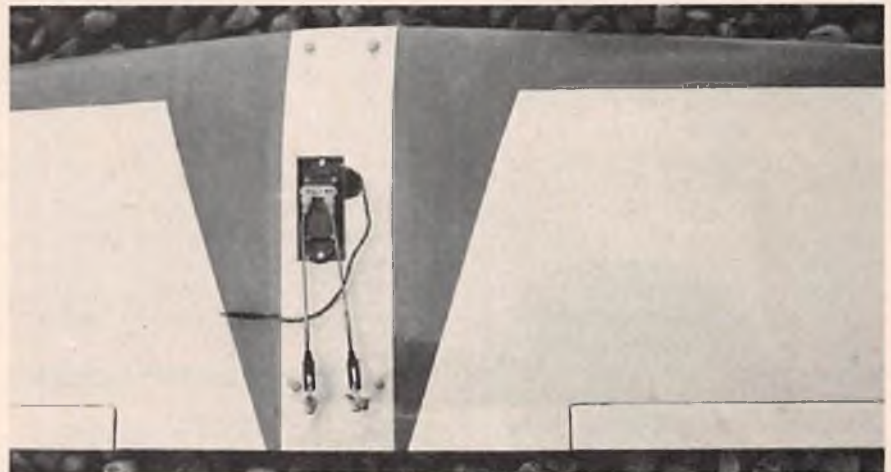
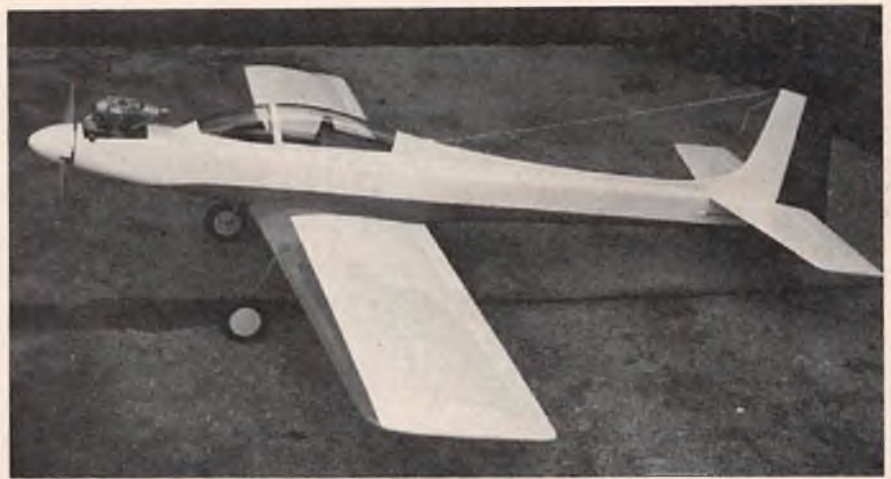
Weight Ready-To-Fly 64-80 Ounces

Wing Loading 22 Oz./Sq. Ft.

(6) Make a strong fillet around the canopy assembly using Epoxolite or a mixture of slow-setting epoxy and micro-balloon filler. Get this as smooth and uniform as you can, using a little water on your fingers to smooth it down.

(7) After the Epoxolite fillet has hardened, paint over it with a light coat of spackling paste (Dap is a good brand).

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ELIMINATING VIBRATION

PART I

By Ray Hostetler

This article is intended to consistently solve the vibration problems as we helicopter pilots face. To get a helicopter to run smoothly is an elimination of variables. Is the main shaft straight? Blades balanced? Lead-lag correct? The problem is that we're often told to "balance the blades" or "set the lead-lag," but how? If we're not sure that the blades are balanced the way they should be, an uncontrolled variable comes into play that makes it very difficult if not impossible to locate the source of vibration. When we set the helicopter up, we can assure ourselves of a smooth running machine by going through the procedures described herein.

Check to see that the main shaft is perfectly true before installing it in the helicopter. Take the bearings that hold the shaft in the chopper and set them on the table with the shaft in position as shown in Figure 1. Set some solid object under or beside the shaft for a reference point. Hold the bearings down with weights or with your hand, watching the gap between the shaft tip and the reference point. The gap should be as small as possible, and have a light behind it so that you can see the gap clearly. It is okay to have the shaft slightly touching the reference object. If the shaft isn't straight, at some time during one revolution of it you'll be able to see a gap between the shaft and the reference object, or feel the shaft rub against it. If the shaft is bent at all, even a touch, you must straighten it out, or buy a new shaft. Your main shaft must be true. If it shakes, the main shaft isn't the problem.

If the tail rotor shaft is bent or even looks like it might be bent, throw it out. These are very difficult to straighten since they are so small and so soft (usually). This shaft must also be perfectly straight.

At times, you can get vibration in tail rotor drive shafts. Make sure it is not allowed to flex and whip. In a Jet Ranger, construct a plywood former that runs from side to side in the fuselage between the transmission box and Form 10. Use a grommet to make the shaft housing removable so the transmission may be easily removed for service (Fig. 2). When the transmission is reinstalled in the helicopter, push the drive shaft housing with the grommet back into the "u" cut-out. It should be a pressure fit,

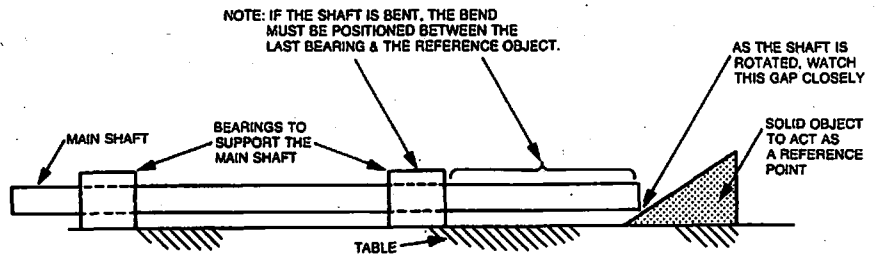


FIGURE 1
CHECKING THE MAIN SHAFT FOR STRAIGHTNESS

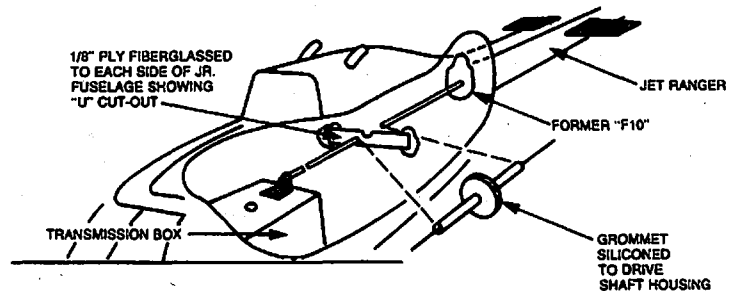


FIGURE 2
ELIMINATING DRIVE SHAFT FLEX IN A JET RANGER

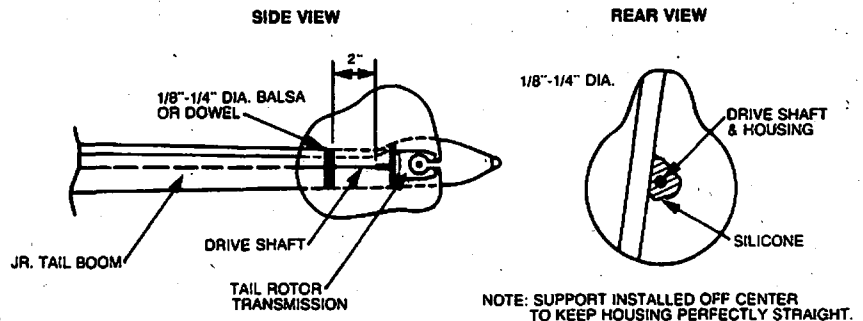


FIGURE 3
ELIMINATING DRIVE SHAFT FLEX IN A JET RANGER

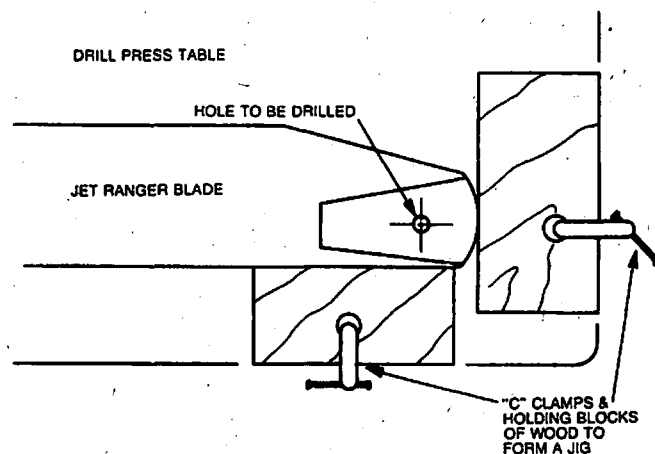


FIGURE 4
JET RANGER BLADE IN PLACE ON DRILL PRESS TABLE

IN THE R/C HELICOPTER

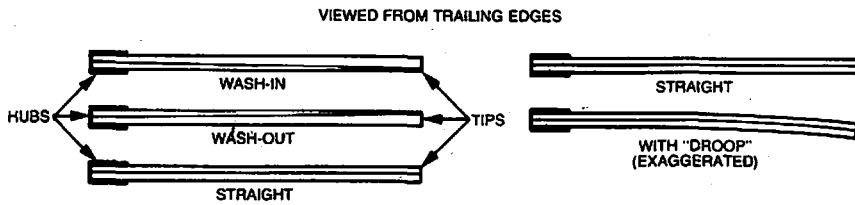


FIGURE 5
WASH-IN, WASH-OUT, STRAIGHT BLADE & BLADE "DROOP"

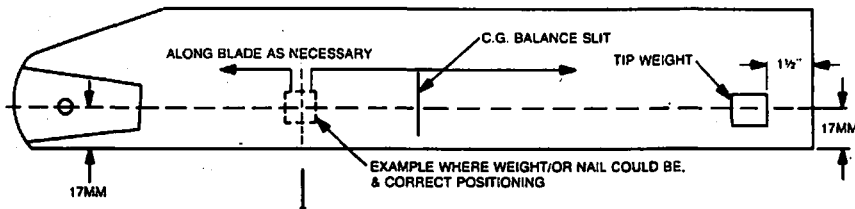


FIGURE 6
STATIC BALANCE DETAILS OF MAIN ROTOR

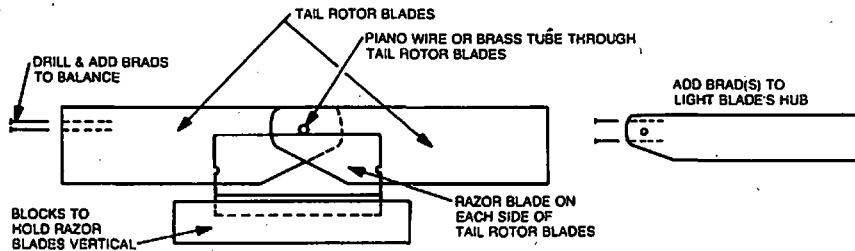


FIGURE 7
TAIL ROTOR BALANCING DETAIL

and the grommet should be siliconed to the housing. Back at the Jet Ranger's tail, approximately 2" before the tail rotor transmission, position another piece of wood and secure the housing to this, too. One of the easiest ways to do this is to drill a hole in the bottom of the boom, 1/8" to 1/4" in diameter, and push a dowel rod or a hard piece of balsa wood in the hole. Epoxy the top of the wood before sticking it in. The hole should be drilled off center to leave the shaft perfectly straight, i.e., the wood should be just to the side of the drive shaft tube. After the wood is securely fastened, take a 12" stick and put silicone on the end of it. Reach through the tail transmission hole and silicone the shaft housing to the wood. Before this dries it is mandatory to screw the tail transmission back into the tail so the shaft and housing are in proper line (Fig. 3). The Jet Ranger is the most common site of this problem. All other choppers are satisfactory to my knowledge.

Engines have a certain amount of unavoidable vibration, such as making the chopper's boom feel "alive," but

engines should not create a visible shake in the machine. If you own a Heli-Boy, you must make absolutely sure the clutch is tightened properly, to assure that the clutch shaft runs true. We do this as Walt Schoonard suggests: Mount the engine, fan, and clutch as an assembled unit in a vise. Get a reference point at the end of the shaft like we talked about earlier and, with the glow plug removed from the engine, rotate the shaft while checking the reference point gap. Vary the tension of the screws that hold the clutch to the fan, or use very thin brass shims to eliminate all "wobble" at the tip of the shaft.

A Jet Ranger is fairly immune to vibration problems here since the transmission is mounted on shock absorbers, and the motor connects to the clutch via a belt. The fan should be checked for balance, although I have never had a stock fan affect the helicopter.

The main rotor blades are the most crucial part of the helicopter. These must be exactly the same in all parameters. They must be the exact same length.

They must have the mounting holes drilled exactly the same distance from the end of the blade and exactly the same distance back from the leading edge! Heli-Boy blades are pre-drilled, so you don't have a problem. On a Jet Ranger, make a jig to assure that the blades are drilled in identical positions. Drill the holes with a drill press! (Fig. 4) The blades must also be the same thickness (alright on kit blades, only applies to home-made blades), and they must be straight, or at least "droop" at the same place, which means that the wood flexes in each blade at the same place, and the consistency between blades is uniform. If one blade is straight and the other droops, look for another set (Fig. 5).

Sight each blade from the trailing edge. Make sure the blades don't have wash-out or wash-in (Fig. 5). It is easy to build a set of crooked Jet Ranger blades since they must be assembled. The inside and outside of each blade must be fully symmetrical. If one end is semi-symmetrical, the blade has wash-in or wash-out, and could generate problems later on when we track the blades. The hardwood leading edges must also be straight. If they are bowed, the balsa trailing edge will follow suit. I like to glue the middle of the blade with Titebond, assemble it, and then Hot Stuff the tips as I hold them symmetrical. The blade is weighted if it is necessary to make it straight, then left to dry overnight.

The balance as well as the weight of the blade is critical. For illustration purposes, if two blades weigh the same, but one has the weight at the tip while the other has the weight in the hub, the blades are unbalanced and will produce vibration! There are two kinds of balance, static and dynamic. The static balance of the blades may be acceptable, but the dynamic balance may be off enough to cause vibration. We will statically balance the blades now, dynamically balance them later.

The Kavan method of balancing will be used with some changes. Rotor blades must be weighed and balanced two times, once before finishing and once after they are finished; just before they are bolted to the helicopter.

Weigh both blades with a good balance. I use an Ohaus, 311 gm. capacity. (Write Ohaus Scale Corp., Florham Park, NJ) This scale gives weights to the hundredths of a gm.

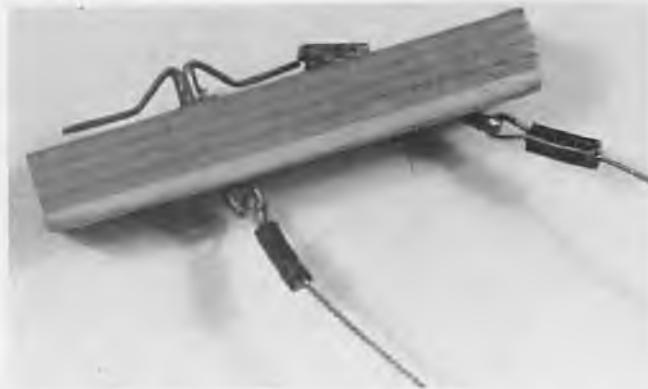
Find the light blade and mark it as such after checking both blades on the balance. The heavy blade is usually not worked on. Clamp a razor blade in a vise

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HERE'S HOW



Typical cotter key flying wire anchor through wing spar. Note way the legs are bent over brass tubing. A tight bend is essential for a successful installation.



Cotter key head can be bent any way to satisfy most installations. Note A-3 sleeve crimped to form loop in fishing leader flying wire.

As I predicted some months back, the RC industry would in time catch up with the demand for new accessories created by the big is beautiful trend. Actually, they are still working away at it; however, it is interesting to look over the ads in RCM and other publications, and take note of those aimed directly at this increasing tenor. Some of the larger manufacturers feel there is a place in the market for their product and test it gingerly with one or two items. Others jump in with both feet, adopting a sink or swim attitude, hoping to be the first with the most and best product. And, what about all those large engines and prop drives now available. The whole movement is absolutely fantastic!

I think Dick Phillips, my co-associate editor (Big is Beautiful) in this magazine, is doing a magnificent job of keeping you abreast reporting the latest available products, plans and ideas with regard to the larger models. The man is an absolute wealth of information and is well on top of his column as RCM's sounding board. No doubt, Dick is up to his neck in this as he lives and breathes every aspect of this new found side of RC'ing.

Now that the biggies are really here to stay, no doubt some of you will try your hand at one. The first thing you will notice is that the construction technique has somewhat changed. The big guys must be built stronger simply because they weigh more. The use of pine and



Flying wire anchor on left side uses no cotter key. Wire is brought through brass tube and secured on far side with A-3 sleeve. Use washer between sleeve and tubing.

plywood, as well as aluminum, are replacing balsa in many cases although balsa is still used in combination with pine and spruce. Fuselage and wing structure must be stressed to better withstand the heavier imposed air loads. And, on scale models, struts and flying wires become functional instead of decoration.

In a never ending search for a better way, Bob Martin of Kenner, Louisiana, submitted this excellent idea for flying wire anchors using a plain cotter key. Many of you out there have had need for an idea such as Bob's, I'm sure. Especially with the recent wave of popularity in biplanes. The sketch shows

a typical installation through a conventional spruce wing spar. Here's how Bob does it: Drill a 3/32" dia. hole at the point chosen for the anchor. Using 1/16" I.D. (3/32" O.D.) brass tubing, cut a piece 1/8" longer than the thickness of the spar (and any sheeting covering it). Press the tubing into the hole flush with the outer surface leaving the 1/8" sticking up above the spar inside the wing. Hot Stuff the tube in place. After all the anchor points have been located with tubing in place, it is time for covering the wing. Be sure to cover the side of the wing the flying wires attach to first. In the

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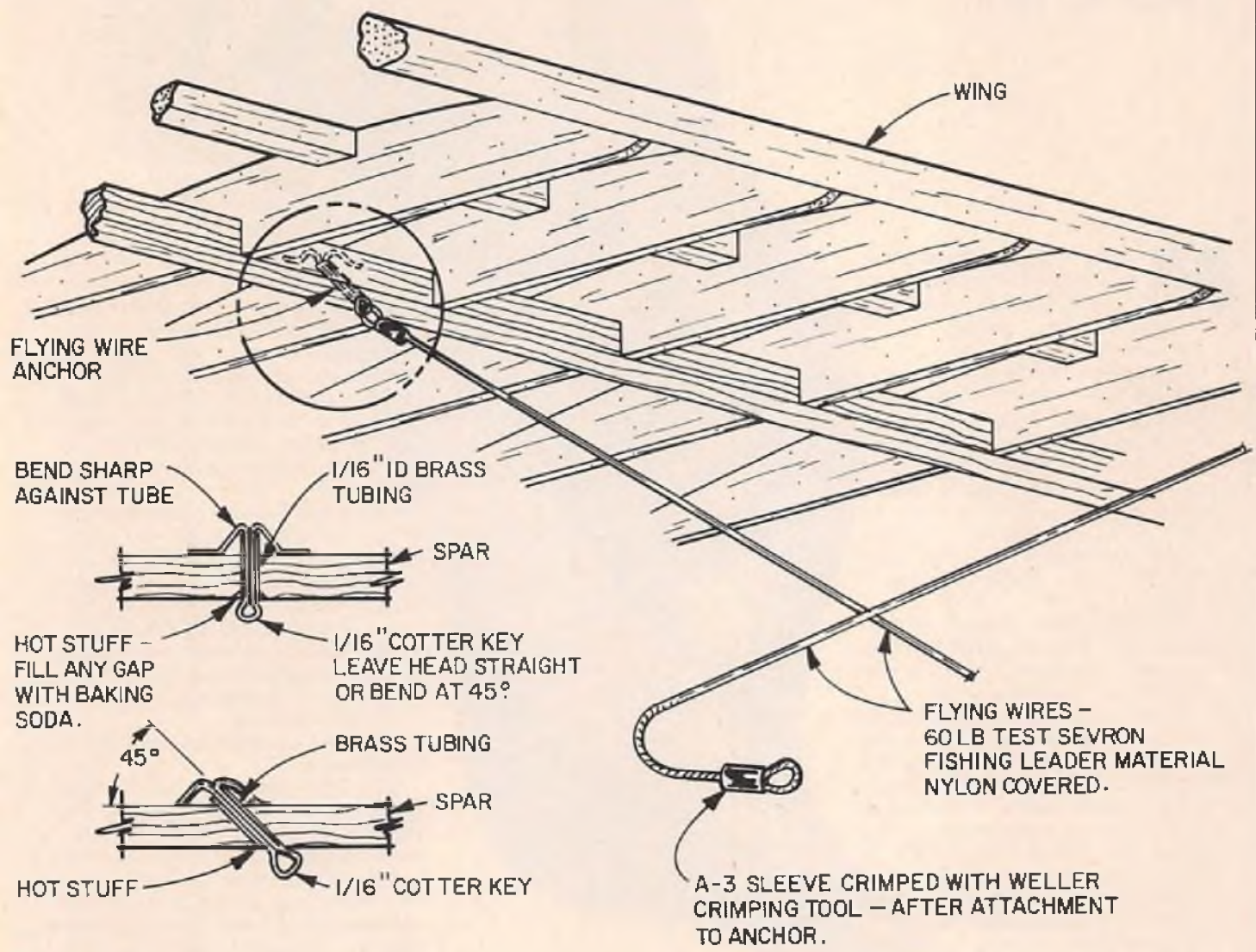


Simple to build turnbuckle will do the job. Easy on the pocketbook too. Would look great on most vintage aircraft.



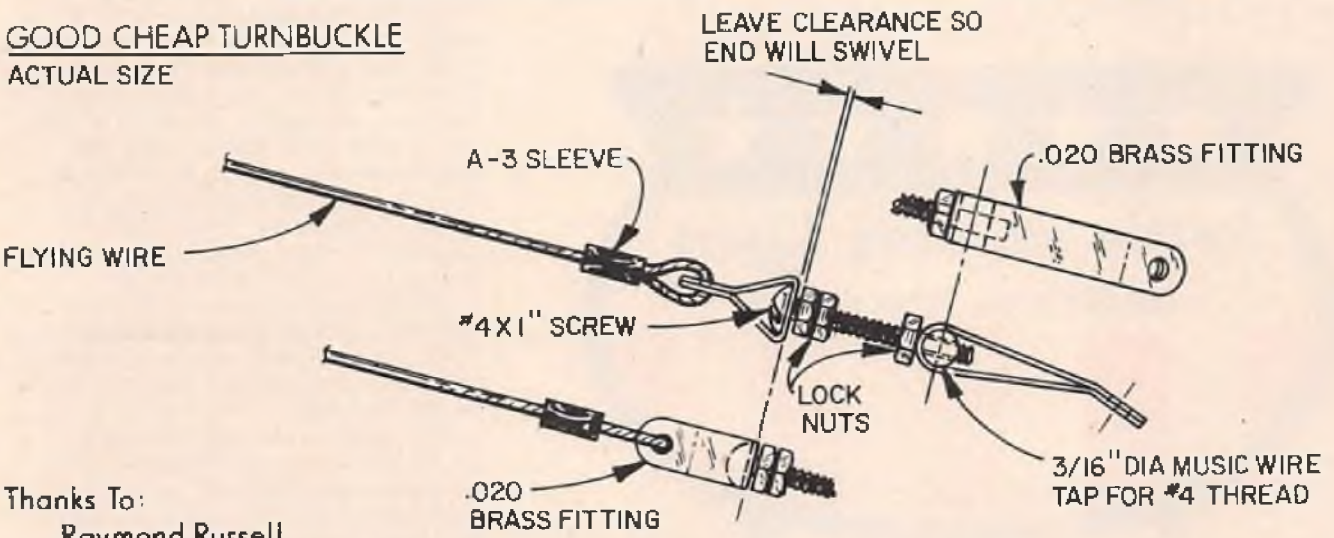
Turnbuckle parts spread out. Flying wire fitting is bent around head of machine screw. Anchor fitting is bent around 3/16" dia. music wire. No problem with special threads in this design.

FLYING WIRE ANCHORS



Thanks To:
Bob Martin
Kenner, LA

GOOD CHEAP TURNBUCKLE
ACTUAL SIZE



Thanks To:
Raymond Russell
Elkhart, Indiana

THE FEARLESS MODELERS
FROM WISCONSIN HAVE AN
EXCITING NEW R/C EVENT. GET
A BUDDY AND TRY IT.

Mention the word "combat" to the old pro and you're likely to get a stern lecture on the perils of flying radio control combat.


"Poppycock."

Follow a few simple rules and your radio will last forever. The secret is to stick to the smaller engines. Vibration — that's what kills radios. Sure, you can follow your manufacturer's instructions and wrap 2" of foam around the receiver in your .60 powered bomb. Now will someone please tell me how many models are designed with that much room for foam? (My Pitt's Special, maybe.)

The Kettle Moraine Flyers of Hartford, Wisconsin, have been flying R/C combat for more than four years, and I want to tell you — we are having a ball.

Imagine. King Kombat can be built for less than \$10.00 worth of materials. Not only that — after the parts are cut out, King Kombat can be assembled in four or five hours. I doubt if you could do much better with a control line combat plane. Use one of the new 3.5 cc engines and you will fly circles around most higher powered models. (Ask Dan Sheridan from the Appleton Club.)

Now, let's talk about all those radio problems. Two servos with dead spots, four antenna wires clipped off in combat, and one battery pack lost in high grass after a mid-air. That is the extent of radio damage on my S & O radio equipment.



KING KOMBAT
COMBAT — THE NEXT RC CHALLENGE
By Chuck Salkowski

Ask Brother Bill of S & O Products who does the repair work on my equipment. Imagine, not one broken crystal, not one broken wire and I can't even begin to count the number of mid-air and crashes this includes. We don't even need a fancy flying field. High grass is an ideal landing strip. Even without mufflers, we have not heard from our favorite "noise complainer" for over three years.

Now I didn't mean to say that you should throw all caution to the winds even with small engines. My radio is protected by plywood on top and bottom. My connectors are always taped, not only to prevent pulling apart, but also to keep the wires from bending at the plug. My radio equipment is also sent into the manufacturer periodically for routine tuning and inspection.

And now I would like to tell you about Black Beauty.

Black Beauty was my favorite. I have a name for all my combat ships — the better to intimidate my opponents with. Black Beauty was one of those that seemed to blend in with my personality. You might say it had character. It seemed that all I ever had to do was think of a maneuver, or point of strategy, during a combat sequence and Black Beauty would respond without my even being aware that my hands were moving the transmitter sticks. Most of my "kills" during the 1976 season were with this plane.

My next combat ship (The White Knight) turned out to be a dog. It never seemed to do anything I wanted it to. It had a mind of its own. It has a wing sheared off right now, but I don't think I'll repair it. So far my latest creation (The Silver Fox) looks like it's going to be a good bird. At least it gained a 30 point kill against Dirty Dick on its first flight.

But this is supposed to be an article about R/C combat. By now you should be fully aware of how totally involved we are in this fascinating area of radio control modeling.

R/C combat is exciting, challenging, an excellent tension reliever, and promotes a keen sense of competitive spirit. I admit that I still have a soft spot for pattern flying. I still have my "Dirty





Birdy." A tremendous amount of skill is required in order to get those maneuvers down pat enough to impress those judges. Practice each maneuver over and over and over. (It also helps to be a "nice guy.") Those who are patient and don't get bored and have a lot of money to buy fuel generally go on to be top competitors.

R/C pylon is nice — you don't have to be a nice guy, or use an anti-perspirant, and you can still win if you have a faster plane.

I don't really mean to knock pattern or pylon. I may still take my Dirty Birdy out of mothballs if I can ever get enough money together to buy a souped up Schnuerle with tuned pipe and whatever else it takes to compete these days. I must admit that I have made some good friends while traveling the pattern circuit. I especially treasure the many trips with Bud Weber, of Waukesha, Wisconsin, who has enjoyed some success in the Master's Class and has been a source of inspiration for me.

But as of now I'm hooked on R/C combat. I need a good plane for combat, but I don't have to necessarily be the fastest or most maneuverable. Good ol' Yankee ingenuity. One on one. Isn't this the American way to compete?

My best asset is to find a weakness in my opponent and then go in for the kill. And please don't call it "luck." We are all aware of the distance perception problem in radio control. But believe me, after four years of steady competition, we have developed a keen sense of distance. Each pass we make is most always a near miss or a kill. In 1976, we kept records of our local competition.

KING KOMBAT

Designed By : Chuck Salkowski

TYPE AIRCRAFT

R/C Combat

WINGSPAN

40 1/2 Inches

WING CHORD

12 Inches

TOTAL WING AREA

480 Square Inches

AIRFOIL

Symmetrical

WING PLANFORM

Constant Chord

DIHEDRAL, EACH TIP

None

RADIO COMPARTMENT AREA

(L) 3" x (W) 7 3/4" x (H) 1 1/2"

VERTICAL FIN HEIGHT

4 Inches

VERTICAL FIN WIDTH (Incl. rud.)

7 1/2"

REC. ENGINE SIZE

.19 or 3.5cc

FUEL TANK SIZE

4 Ounce

LANDING GEAR

None

REC. NO. OF CHANNELS

3

CONTROL FUNCTIONS

Eng. & Elevons

BASIC MATERIALS USED IN CONSTRUCTION

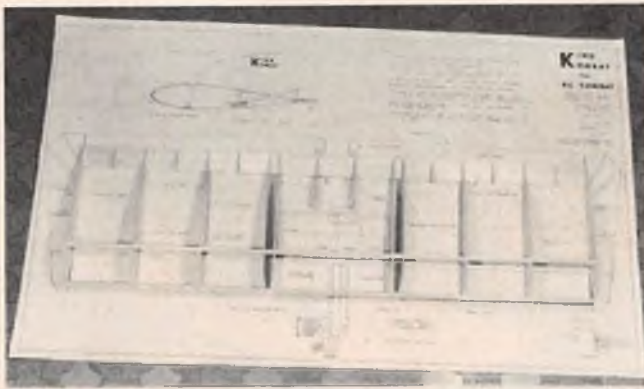
Wing	Balsa
Wt. Ready-To-Fly	32-40 Ounces
Wing Loading	12 Oz./Sq. Ft.

Only one out of five matches were flown without a kill or drag-off points. A total of 608 matches were flown between the three of us, totalling 7,353 points by our scoring system. Many times the kill occurred within seconds after the match initiated.

Let me introduce the members of our Kettle Moraine Flyers Combat Team. You may have come across my name (Salkowski) before, but most probably it was my brother Bill, of S & O Products, who has also been successful on the R/C pattern circuit.

If you have ever done any hunting or trapshooting, you no doubt have come in contact with, or at least heard about, the Lee Reloading equipment. This and other fine products were conceived and are now manufactured by Dick Lee, who probably has done more than anyone with our current combat design. Dick has an obsession for keeping things simple. It was he who modified the R/C guillotine by removing the tail booms and elevator and replacing them with elevons. We laughed at Dick when he first came out with his "flying board," but he soon made believers out of us.

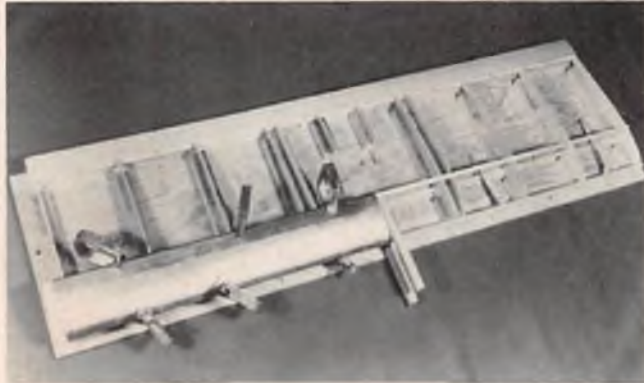
Don Weber eventually sensed the enjoyment that Dick and I were having and it wasn't long before he too was hooked. I helped Don get started in R/C a number of years ago. He was one of those that was all thumbs and you would never have believed he would become coordinated enough to fly radio control. But he stuck with it, and he now can compete with the best as one of our fiercest competitors. His chatter and antics add to our enjoyment of the sport. Don is an electrical troubleshooter for



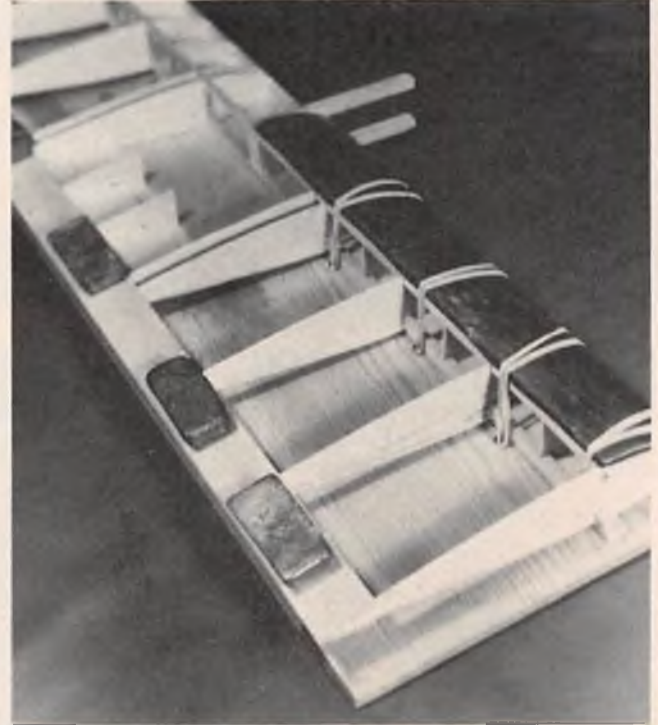
Initial construction - very simple - conventional.



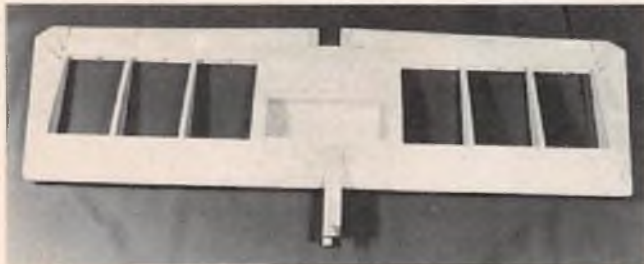
Note that the only area of moderate complexity is cutting out ribs in pre-assembly preparation.



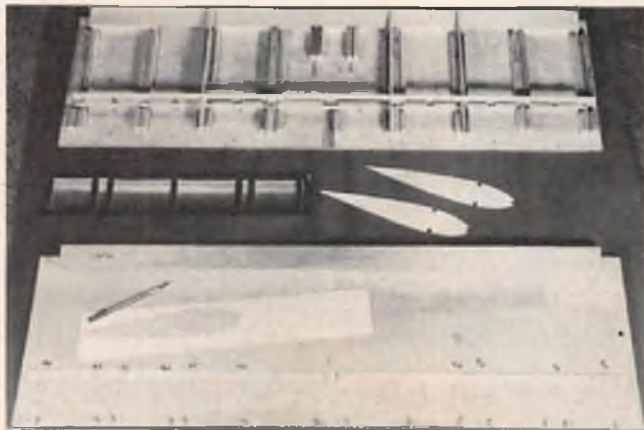
Using jig to construct bottom side of wing.



Using 2nd jig to build top side of wing. Aluminum form eliminates need for many pins when planking leading edge.



Ready for covering. Ailerons temporarily installed here but will be painted separate along with fins, motor mount and hatch cover.



Building fixtures. Aluminum rib template has protruding punch marks to hold template in place while cutting out ribs. Note sponge weather stripping on aluminum leading edge form template. Holds planking tightly in place against ribs and spars until glue dries.





John Lee (Dick's son) helps with rib cutting. Ping pong table provides room for mass production.



Completed "Silver Fox" with Du-Bro mixer. Works well but has some drawbacks. Fuel tank mounted in leading edge of wing.

the A.O. Smith Corp. in Milwaukee.

Several other members of the Kettle Moraine Flyers are building combat ships and intend to join the team.

Several combat contests have been held in the Wisconsin area in the past few years but so far have been low key and of a fun fly nature. A few flyers from other clubs have expressed genuine interest and feel that they are very competitive. These include Dan Sheridan from the Appleton club, John Lusk from the Madison area, and George Bal and Clarence Neuthal from the Green Bay club.

We got started about 5 years ago when Ken Kreschek, one of our club members, bought an R/C Guillotine as a matter of interest. Ken was always impressed with any model with low wing loading. We only tried flying it once and frankly, it scared the heck out of us. Then Dick put one together. Was that first flight ever wild! After a few crashes, he finally got it going. Then he wanted to find somebody to pick a fight with. So he bought me a kit in hopes of some competition.

I'll never forget our first attempt at combat. Both Dick and I are by nature aggressive flyers and we went after each other with a passion. We became so completely drained after those first few matches that we had to pause between each match in order to collect ourselves. It wasn't long before we were completely hooked on R/C combat and from that point on, we started many modifications to try and get that extra edge.

Dick tried a smaller wing and also thinner wing tips to get more speed, but found that he lost too much in maneuverability. Our wings at this time are able to climb straight up and make close to a 12 foot diameter loop without slowing or stalling. Dick has modified the airfoil slightly by moving the high point to the rear. In this way, he feels that the CG can be moved toward the rear and he

claims to get a little better maneuverability.

I won't go through much construction detail. After all, you only have a wing to build and only one set of control surfaces. You don't have to worry about setting your plane on the pool table to carefully align tail and wing surfaces. As a matter of fact, all you really need is a template for the wing ribs and some indication as to how far to spread them apart. From that point on, you can use any building technique that you like.

Start by pinning the lower main spar and bottom trailing edge sheet in place on the plans. Glue the ribs in place. Add the top and leading edge spars. The motor mounts are pre-assembled with the 1/2" balsa spacer between the hardwood mounts. Glue the partial ribs to each side. Notch the balsa filler to match the partial ribs. Fit entire assembly in place on the plans and glue. Add planking, capstrips and wingtips. Shape the motor mount stiffener to fit over the leading edge of the wing and glue it in place. Complete the hatch compartment. Don't forget the holes for the antenna leadout. (I forgot this once or twice and believe me, it's rather difficult to poke holes through wing ribs after the plane is covered.) We use MonoKote, although we have used Solarfilm, Coverite, and even silk and dope very successfully. Don covers the open area only and uses a resin or epoxy filler on other surfaces to save costs.

Cut 3/16" wide slots in the covering and epoxy the vertical fins in place. Dick uses one fin in the center, but somehow working linkage around a center fin doesn't appeal to me. Don uses wing tip plates in place of vertical fins. He claims much more stability during launching with very little loss of high end performance. I use an aluminum template for cutting out wing ribs and then I have a building fixture, which is merely a sheet of 3/8" plywood with

wooden blocks glued in place to position the wing ribs. The trailing edge is also blocked up. I build the entire bottom side of the wing in this jig.

I have a separate jig to build the top side of the wing. I use an aluminum form with sponge weather stripping to hold the leading edge planking in place for gluing. This is held to the wing jig with rubber bands. This reduces building time considerably and I end up with an absolute straight wing, which we find is important if you want the plane to do perfect loops instead of corkscrews. This also comes in handy when a portion of the wing must be rebuilt after a mid-air or other damage. Only the required portion of the wing is built in the jig and is conveniently attached to the original place with perfect alignment.

By no means do we consider the EK mixer to be the ultimate flaperon control. Dick and Don both swear by the sliding servo method. My latest bird uses the new Du-Bro mixer. So far it works quite well, although the output wheel protrudes through the hatch cover and I pray that I don't get fuel in the servos or radio compartment.

The CG is of extreme importance for best performance. The engine is mounted last to obtain a desired CG. For all around performance, I would recommend that the CG be located at the forward edge of the main spar. A .15 size engine works very well and might be better for those with a little slower reflexes. Of course, if you want a real bomb, use the new 3.5 cc K & B engine, but you'd better be ready for some pretty wild flying. If you really want a challenge try to fly without a vertical fin or wing tip plates. Dick tried this once and actually kept the plane in the air for a short period of time, although it was like trying to drive on a sheet of ice.

For safety sake, please use some sort of fuel shut-off. Aside from the safety factor, you might prevent extreme damage after a mid-air. Don uses a fuel

pinch-off arrangement which is tied to his elevator horn, which actuates on full down and right elevon. I suffer the extra weight of a third servo. I have fabricated a special needle valve with a flat that wipes past the spray bar hold, giving a combined mixture control and fuel shut-off arrangement. Of course the standard R/C carburetor can be used and as a matter of fact, I prefer it with the 3.5 cc K & B engine. We use an 8/6 tornado prop for best all around performance. A wood prop gives slightly better performance, however, it's very difficult to keep them from breaking when landing. I may trim as much as 1/4" off of each blade tip if my plane ends up a little heavier, or if my engine isn't pulling as well as it should.

With minimum control surface movement, King Kombar is very docile and has a very gentle glide with its low wing loading and dead stick landings are a cinch. Try to keep the plane as light as possible since good climb-out is necessary for effective combat. I believe one of Dick's planes ended up at about 23 ounces total flying weight. I tend to be a little glue crazy. Most of my birds end up close to 2 pounds.

Use someone else to hand launch your bird the first time you try to fly. Get the model as high as possible to practice. Don't worry about being upside down. Keep turning and moving the transmitter sticks and soon you won't even think about which end is up. Become thoroughly familiar with your ship before attempting combat.

Okay, so you've mastered your first flight jitters and you are now ready to take on all challengers. So you strut up and down the flight line trying to pick a fight. And at the same time trying to instill the fear of the Red Baron to intimidate a likely opponent. I like to use chrome MonoKote in hopes that its flashing in the sunlight will instill fear in a likely opponent. Although it doesn't appear to scare Don and Dick very much.

When you finally find a challenger, you are on your own. You will have to develop your own attack and evasive maneuvers. I could write an entire book on the tactics that the three of us have developed over the past years. Your strategy will depend largely on the skill tactics of your opponent. If I have any edge in speed, I like to stay on an opponent's tail and stay there relentlessly. I also like to stay close to the ground. If my opponent goes too high, I may do Figure Eights close to the ground to try and draw him down. If I am slower, I may fly high hoping to get a few good diving shots. Sometimes if I am slower, I will fly very close to the ground and pull up suddenly when my opponent passes over me. You must learn your opponent's style of flying. Soon you will learn to anticipate where he will be at any given time, so you can be there ahead of him. It is very desirable, of

course, to be able to make sharper turns than your opponent without loss of air speed. You then have a decided advantage when the two of you are locked in those steady looping maneuvers. Here again climb-out is very important to be able to jockey for an ideal position. It is very desirable to look for common moves that your opponent makes. If this thing ever gets going nationally, look for top flyers to have a book on opponents just like a major league pitcher might study opposing batters — or for that matter — professional football league quarterbacks — noting weaknesses in an opposing defense.

Everyone has a certain style of flying. Watch any sport or pattern flyer and you might find up to five moves that he makes constantly. Remember, you are trying to concentrate on two planes at the same time. You end up "sensing" where your opponent is. Of course good peripheral vision is a definite asset. I hope former basketball star, Oscar Robertson, doesn't get interested. They say he has eyes sticking out of the sides of his head.

Flying out of the sun is a favorite move of Dick's. Flying behind your opponent's back is another move we use to keep an opponent from concentrating on both planes. Dick will wander over the entire flying field in order to get a better field of vision.

Dick, Don, and myself know all the moves that each other makes and we have evolved much in trying to guess what move the other will make. If we guess right we end up with a good shot and a possible kill. You must change your moves constantly to throw your opponent off. Pattern flyers make ideal opponents. Their majestic precision turns make excellent targets. As a matter of fact, we invited brother Bill to try his hand about two years ago, and he made a very formidable target. We had fun, but I don't think he enjoyed it very much — this year he refused to participate.

From my own pattern flying days, Dick and Don both noted that I inherently made smooth left turns. This gave them many extra passes since they would anticipate ahead of time as to where my plane would be and react accordingly. I lost a few points until I figured out what was going on. The three of us now try to confuse the other by periodically feinting in one direction and then going in the other.

I should make a few comments about our rules, which are displayed elsewhere. This, along with radio manufacturers' discontent, has probably been the largest deterrent to the promotion of R/C combat. We don't claim to have all the answers, but after four years of intensive R/C combat we feel qualified to make a darn good beginning.

We do insist that 3.5 cc maximum engine displacement is as high as we care to go. Safety and cost are primary factors, but consider this: high powered planes tend to be flown farther away where distance perception is next to impossible. Leader and streamer lengths are very important considerations. Too short, and cuts or kills are harder to get. Too long, and you cut your own streamer or you get too many dragoffs. Our 40 feet of leader and 20 feet of streamer has proved to be the most successful between Dick, Don and myself. We feel that an R/C type contest should be very fast moving with little sympathy for those who can't get their engines started. This is why we suggest an "air raid," whereby someone else is allowed to take the place of a contestant who can't get airborne. This allows more total rounds to be flown, since the pilot who did get airborne does not have to be rescheduled. By all means, this is an optional rule and may not be necessary with less than 10 contestants.

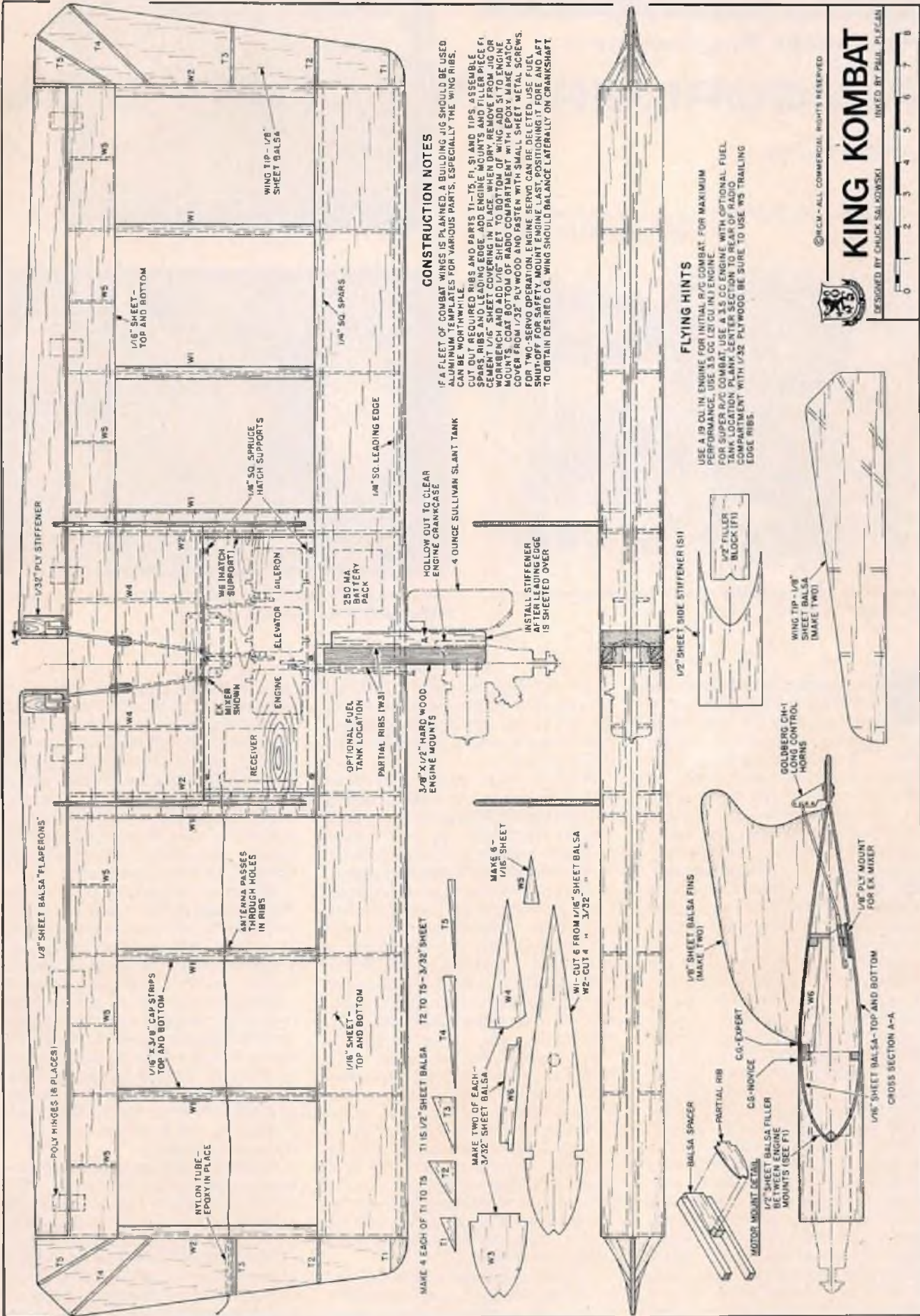
The match is over after a kill or dragoff. If I cut someone's streamer I would be reluctant to hang around with a big fat streamer behind me while my opponent only has a small chunk of streamer for me to shoot at.

Our scoring has been revised many times but we are now confident of our present schedule. The hardest and most satisfying kill is only realized on the end 10 foot length of an opponent's streamer. In most cases, this only happens with a direct prop cut. This then should be worth the highest amount of points (30). In our local competition, only about 10 percent of the total cuts are direct prop cuts. If a wing panel catches a streamer, it usually breaks at the leader knot. This is certainly worth somewhat less than a direct prop cut (20). A high percentage of kills were wing panel cuts during our 1976 season. We only allow 10 points when a leader string is cut. This is to discourage flying close to an opponent's plane.

Dragoff points (4) are scaled way down since no particular combat skill can be attributed to either pilot. It's like pulling on a wishbone to see who will end up with the better part of the two streamers. Why do we award points to a contestant who has been killed? Simple. There will always be those who will fly a mile high to avoid being cut. Those who mix it up and are aggressive at times will get their own tails cut. Why shouldn't there be some compensation for the guy who mixes it up? Some contests have tried to award points for aggressiveness. But here again, you get involved with that old judgment factor.

Some contests award points to those who can land closest to a spot. This then makes it possible for a contestant to fly a mile high to avoid being cut, but still win a contest by being an expert at spot

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KING KOMBAT

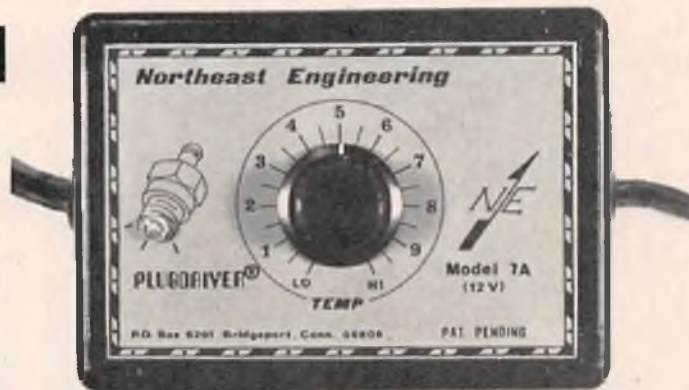
DESIGNED BY CHUCK SALKOWSKI
INKED BY PAUL PLESZAK

PLAN NO. 769

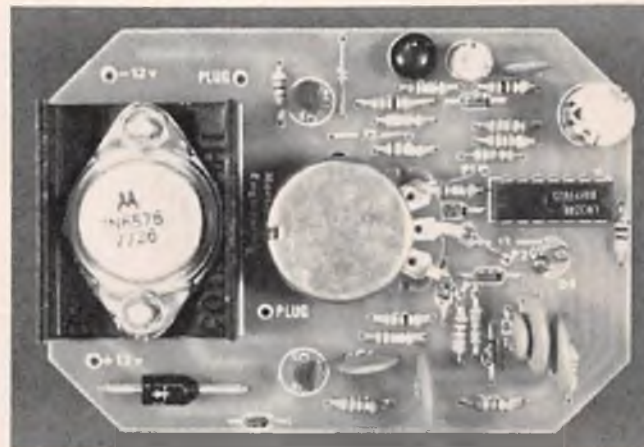
Northeast Engineering's **PLUGDRIVER**

By Eloy Marez

Northeast Engineering Plugdriver, available as a kit as well as a factory assembled version.



The works: a most complete kit with everything needed for building and testing.



The component side of the board; uncluttered, easy to understand and assemble.

You wouldn't think that little coil of wire in the middle of a glow plug would be the subject of so much discussion and research, but it is extremely important to engine operation and more critical than might appear. It can't be too hot or too cold, too thin or too thick, too long or too short, etc., etc. And there is no such thing as a glow plug for all purposes, different engines and different applications require different plugs. All in all, the makers have done well by us. They have given us plugs that operate well at extremely high engine speeds and pressures, while still managing to keep the fires lit at low rpm's and rich mixtures. They are precisely made, while still being inexpensive for the amount of work involved in their production and considering the price of the platinum which constitutes 70% to 90% of the coil. At this writing, platinum sells for \$400.00 per ounce. That's right, it is \$400.00, not \$40.00, and it is an ounce, not pound!

Though not quite as much effort has been expended on lighting the coil, it too is important and is being done with everything from dry and wet cells to ni-cds and the new gelled electrolyte batteries. Often, the battery in use is of a voltage higher than the plug can stand, and various and sundry ways have evolved to drop it down to the 1½ or 2 volts required. This voltage is all

important and can add or detract immensely to or from the enjoyment of our hobby. Too little and the engine is hard to start; too much and the life of the plug is reduced.

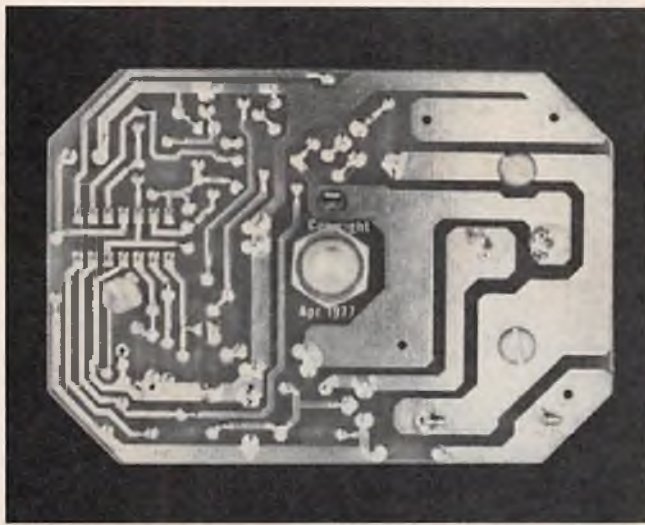
When battery powered engine starters came along, and we all added a 12 volt motorcycle battery to our ground support equipment, we also started looking for a way to light the plug from it. Simple devices like a dropping resistor can be used with some disadvantages, such as inefficiency. The electronic industry soon came to the rescue, with the development of the glowdriver, a device that is powered by our 12 volt battery and, in turn, furnishes the proper voltage and current to the plug. Circuitry was soon developed that, in addition to lighting the plug, also senses its resistance as affected by the coil's temperature, and will adjust the current being applied to the best value for proper plug operation. For example, we all know that with a simple battery on the plug and a well flooded engine, the plug goes out completely. If powered by a plugdriver of proper design under the same conditions, the current through the plug is automatically increased until the flood is dissipated, then dropped down to the normal value.

The glowdriver type of device does not actually drop the 12 volts down to 1½ or so. It applies almost all of the battery

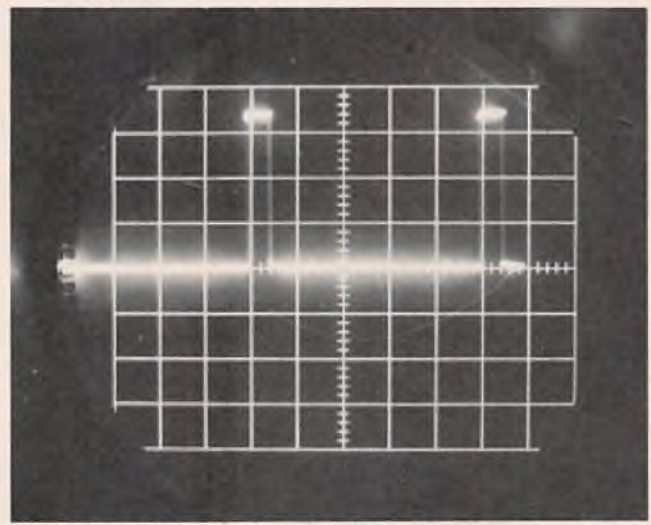
voltage to the plug, but it does so in extremely short bursts of current, as controlled by a pre-set or variable adjustment and as demanded by the plug's condition. These power pulses come too close together to allow the plug element to cool between pulses, and the total average power that the plug is actually receiving will calculate into the same amount as that received by a plug powered full time with 1¼ volts.

Glowdriver design is not a simple thing, though some standard circuitry can be used, as is the case with almost everything electronic. They can be too simple; for awhile there was one on the market that had just the barest of necessities and which, when the 12 volt battery was dragged down as happens when the electric starter is trying to turn over a flooded engine, would be fooled into "seeing" a worse flooded condition than actually existed and would hit the plug with enough current to burn it out. Fortunately, this particular driver is no longer being made.

Except for that one, my experience with glowdrivers has been good, and I recommend them highly. They are especially useful with the smaller engines which can often be hard to start. For one season, I raced Half-A's, which I always have trouble starting on a battery. With the glowdriver, I was so sure of a start that I would wait for the



Foil view of the printed circuit board. Wide lands and wide spacing, easy to work on.



Scope trace of output into bulb. Scope settings are 2 ms per division, 24 volt full scale.

others to get started before starting to crank.

Which brings us to Northeast Engineering's glowdriver, or "Plugdriver" as they prefer to call theirs. I actually tested two, one a factory assembled model, and a kit; the latter to evaluate the kit instructions and whether the kit model would perform as well as the one assembled by the factory experts.

Now, one of the decisions a manufacturer of glowdrivers has to make is whether to make a variable or pre-set type of driver. The consideration comes about because a slight resistance difference exists between glow plug types, depending on their intended use such as engine size, idle versus non-idle, etc. So a set of circuit values that might be optimum for one plug might not even light another and burn out yet another type. An average value that will work with all can apparently be arrived at, and has been achieved by some glowdriver makers, however, Northeast Engineering has opted to make theirs externally variable. The detailed instructions cover how to arrive at the best setting for your particular combination.

It is a simple matter --- you turn the knob until the degree of glow that you want is reached. A good comparison can be the same plug lit with a fresh 1½ volt battery. This is a one time test for any particular plug; all others of the same brand and type will then use the same setting. You'll only have to change when going to another brand and type. This requires one more item on the pre-flight checklist for those of us who might fly a Half-A, a QM racer, and a pattern or stunt plane during the same session. You soon learn to check it the same as you check your trims before every take-off. You do check your trims, don't you?

The test of any electronic kit is largely a review of the instructions and the ones furnished by Northeast Engineering are as complete and thorough as any I have worked from before. They include some basic information about tools, soldering, component identification and mounting, and a parts check list which should be studied carefully, especially if you are new to this sort of thing. The step by step procedure is clear and easy to follow, and there is no reason why a completely electronically experienced person cannot successfully assemble one.

Our only reminder is that soldering is all important. Use a small iron of no more than 30 watts, with a tip made for printed circuit work. Read and follow the instructions on soldering and you'll be okay.

The kit version worked right off the workbench, and with no deviation from the factory assembled model. In testing the output into the bulb furnished and to be discussed later, I found the applied voltage to be 11.5, at 1.5 milliseconds maximum pulse length, with a 10 ms

interval between power pulses. The average applied voltage thus comes to 1.72 volts; or less depending on your setting. Using a variable resistor as a load, and looking at the output of the driver on a scope, it is possible to see the pulse length vary as the resistance is varied to simulate changing plug conditions.

Physically, the Northeast Engineering Plugdriver is well engineered and built. The case itself is rugged, all components are top grade and the printed circuit board is of 1/16" epoxy glass of high quality and cleanly etched. The driver is compact, being only 2¾" x 4" with a 2¾" x 5" mounting base. The weight is an insignificant eight ounces.

The NE Plugdriver comes with an 18" wire for the battery connection and a 36" length for the glow plug end. Clips are furnished for the connection to the battery, which must be made to the proper polarity. There is protection built in so that no damage will occur if the

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Testing the driver, using the automotive bulb furnished for a load. Saves plug if problem exists.



Preview 25TH TOLEDO EXPO

RCM will present full coverage of this Silver Anniversary Show in our August 1979 issue



Best of Show trophy was awarded to James Funduk by Bob Hisey, Toledo Expo Co-Director (L) and Patricia Crews, RCM Executive Editor.



This Lockheed P-38L captured the 24 carat gold & sterling silver Best of Show award and the silver service 1st Place Military Scale award for James Funduk.



Warren Tiahart was Second Place trophy winner in the MonoKote covering category.



This is only half of the gorgeous silver service awards presented at the Silver Anniversary Expo.





Toledo Radio Control Exposition

This past winter I took the longest vacation from flying RC models since I came to California. I went almost three months without flying. Unfortunately, I didn't do any building or much of anything to do with modeling. In California we have a different kind of problem. When you can pursue your hobby all year round it becomes difficult to stay enthused. My dad loved to golf so I was always trying to convince him to move west so he could golf all year round. He said no, that the winter layoff made him look forward to spring even more. I'm sure modelers in the midwest and east would agree.

So anyway, I decided to try to get out of the doldrums by taking in Toledo's Twenty Fifth Annual show of shows. If that doesn't pick up your enthusiasm, nothing will. In the first booth I got to, after passing some guys in uniform who were recruiting for the Air Force or something, was George Albright and his Utopia. I always did like the looks of the Utopia, and then when I saw the way it was put together, at least 100 hours, the way I work, and a lot straighter, it kind of makes you want to get your hands on one.

For the Scale guys, Byron Originals' Big Pitts had to be a turn on.



The 2 + 2 Super Drives by Cass Engineering have nothing to do with electronics but they gave Jim Oddino a big turn on.

And Cass Engineering's 2 + 2 Super Drive which allows you to drive one big prop with either two sixties or two forties would be just the thing to drop in the nose.

Dave Platt's ME-109 looks like a winner in Scale and Giezendanner's new Heavy Duty Retracts would be the finishing touch. There were many other



Heavy duty electric retracts are available from Giezendanner USA.

planes from Bridi, Violet, Southern RC and many more that made you want to go home and start cutting chips. But I should let someone else talk about all those goodies and concentrate on the electronic stuff. (Ed's Note: We will, Jim, have full coverage on the Toledo Expo in our August issue.)

Amongst the RC manufacturers, the big news of the show was provided by the guys from Signetics who were passing out samples of the NE 5044, 5045, and 5046 encoder and decoders. At least one guy said he would have it breadboarded by Sunday night. I had previously received a couple of the NE 5044 encoders and built up a transmitter. In the tests I've run to date it looks very good. More on that later. The public probably won't see these chips incorporated in systems until late this year or early next year. While I expect the performance to be better than anything presently on the market, the big advantage will be to the manufacturer who will have lower costs in assembly and printed circuit boards.

Kraft Systems was showing their FM module which can be used in both the 7C and Signature series system transmitters. You need a completely different receiver. I've been flying one of these systems in my Curare for the last month and it seems to be doing very well. I had a little trouble getting used to the soft sticks but now feel pretty comfortable with them. They have very positive neutrals which is a must for pattern flying. Kraft also had a non-linear control circuit to give less sensitivity around neutral. When we get a chance to evaluate this feature we'll give you a report.

I spent a lot of time talking to Butch Lanterman who does the engineering for

World Engines. Butch had shown a new receiver at Toledo two years ago. I knew he had used a balanced mixer front end but never got into any details before. One surprise is that the receiver has no AGC. This was accomplished by using I.F. transistors with a large dynamic range. He also found that the S042 balanced mixer took some special biasing and special crystals for best results. This is the same front end that most of the FM receivers are using. Bob Novak of Novak Electronics was also showing a new receiver using this integrated circuit. He had gone a step further and came up with an integrated circuit for the I.F. amplifier too, so he had an all integrated circuit receiver to go with his popular servos. I suspect we'll see a transmitter soon. Both Butch and Bob were campaigning for using an external bridge with the NE544 servo amp. Apparently the higher currents that go with low resistance motors (8 Ω) cause some instability problems. With the external bridge Butch said he could reduce the dead band to one microsecond and still have a stable (no jitter) servo. I've always used 10 or 12 Ω motors and usually go for a five microsecond deadband and I've never seen any problems. If you are trying to get more power for big airplanes with low resistance motors, sounds like you ought to consider the external bridge. We've had many good reports on the Royal Chevron servo that uses this approach.

We also talked about many things that are just around the corner if the FCC ever lets us use other forms of modulation. It sure would be fun to play with this stuff all day.

In the Novak booth we also talked to Ken Jesser of Aeromodel Electronics Company. Ken has been in the sales and service business but is also working on some other products. He has built a digital pulse meter which plugs into the receiver in place of a servo and reads out pulse width. He sent me one some time ago and I've been using it constantly. If you are trying to set up a roll button or throw on your ailerons for instance, you measure the pulse width and then fly. If it is too slow or too fast you can adjust it by some exact amount and determine the effect. By keeping data, you can always come back to exactly

what you want. Say you have two airplanes and one transmitter; you can set all your rates, buttons, etc., for one, record all the data and put that plane away. Adjust the transmitter for plane number two and fly till you get tired or heaven forbid, crash. Then get out your data sheet, adjust your transmitter back to exactly where you were with plane number one and not waste any flights setting it up.

I added another digit to the one Ken sent me so I can use it for evaluating circuits. It will read out a one microsecond change. I suggested adding a simple RF detector and decoder which would allow you to just set the meter next to your transmitter rather than plugging into the receiver. Add a rotary switch and you could look at each channel one at a time. Ken said he had already done that too. Look for an upcoming construction article on this very useful device in RCM.

Well we finally got a look at some Giezendanner pot wipers in Dick Penrod's Giezendanner USA booth. He also had some electric retract systems that really look good. The heavy duty jobs will lift four inch wheels on ten inch long 3/16" diameter struts. If a gear gets stuck a slip clutch prevents damage and keeps the current drain down to an acceptable level. An amplifier is available that allows either external batteries or use of the receiver pack.

By the way when I got home, there were more Giezendanner pot wipers waiting, courtesy of Proline Electronics, so you've got a couple of places to get them.

Proline was showing a new ball bearing servo that looked good. Jerry Bonzo said they were also fooling with a new servo amp that would use either positive or negative input pulses. It's not ready yet however.



Futaba's new "J" series has a multitude of desirable features. As many as 20 programmable settings are available to improve your pattern performance. Transmitter shown on left is version for helicopters.

Futaba was showing their new J Series which will replace the contest seven. At \$799.95 I'm sure it is aimed at the serious contest pilot. It includes servo reversing switching in the transmitter, two way mixing, roll buttons, snap roll buttons, and 3 non-linear servo controls. Very nice looking packaging.

Probably the nicest feature is the ability to independently adjust up and down, left and right, etc. Interestingly enough Steve Helms tells me Futaba has put the NPN driver transistors in the servo amp chip. Many people in the U.S. figured their separate IC with the output transistors was the way to go. I guess Futaba didn't think so.

Cox had a new top of the line system at Toledo. We have seen a few of these in Southern California. They feature a much improved gimbal system very similar to Futaba's. A new small Cox servo also looked very good.



The new Super-Micro servo from Cannon is shown full size. This is the smallest commercially produced servo to date.

Bill Cannon has done it again with a servo so small that . . . well I saw a couple being worn on lapels. I'm sure Cannon will continue to keep the small plane guys happy.

There were a couple of new \$99.00 power panels that claimed to do everything from lighting your glow plug to charging your batteries. It will be interesting to see how many guys will put out \$99 for a power panel. If we get a chance to evaluate these in the future, we'll give a report.

I kind of like the de-centralized approach. The CD glowdriver is a self-contained unit that is really handy at contests. You don't have to drag your whole flight box with motorcycle battery out to the starting line. They have followed that up with a starter pack that attaches directly to your engine starter. No more heavy leads to get in the prop or to store. Southern RC Products has had one of these for years. A very desirable set-up.



Valair, a new radio manufacturer, introduced their systems at Toledo. They offer an unusual unconditional guarantee.

No Toledo show can go by without at least one new radio system. This year it

is Valair. The system appears similar to Cannon equipment, but the big news is the unconditional guarantee. If you're not completely satisfied, just send it back.



A programmable micro-computer is only one of many features incorporated in the Werner radio, to be imported by Aristocraft.

Aristocraft was showing a system made by Werner in Spain. Werner is a big TV manufacturer and apparently someone in the family is interested in RC. The result is a transmitter that wins the battle of the switches. Under the now almost standard slide cover were sixty-four switches. This is in addition to the ten on the face and top of the transmitter. It claimed to use a micro computer. Many of the switches are used to set rates. Instead of using a pot for each channel, switches are used to command 5/4, 3/4 or 1/2 the throw. Switches are also used for changing servo direction linear, strong logarithmic, gentle logarithmic or exponential response. Interestingly two of those definitions by Werner cause the system to be more sensitive around neutral.

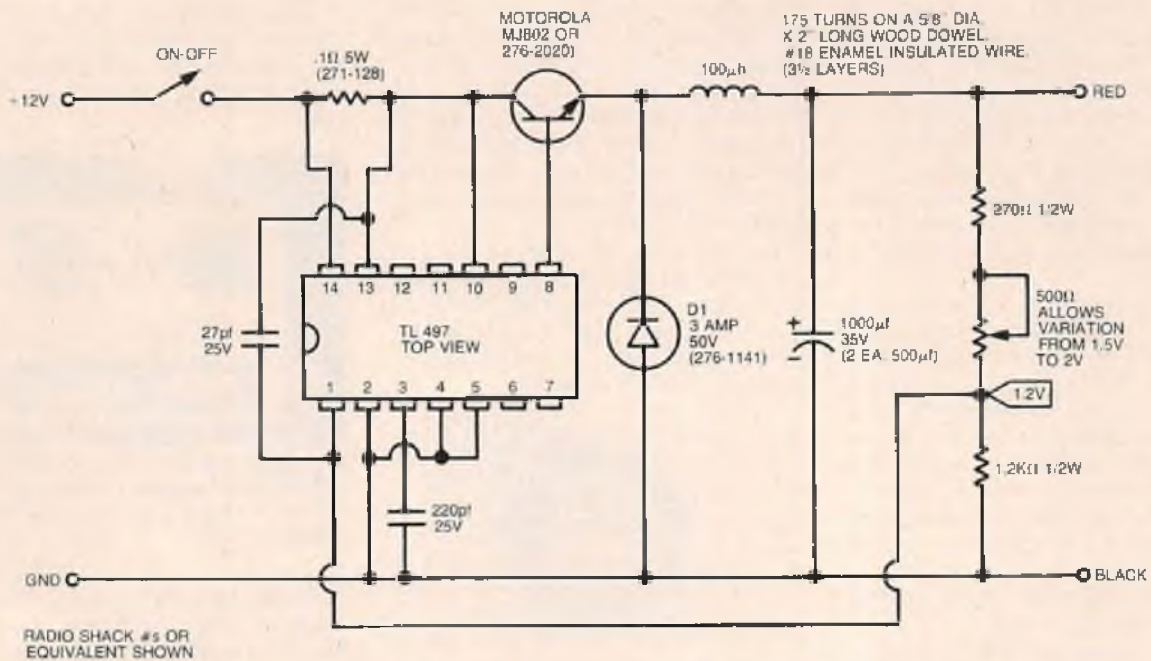
Well let's see, what else was interesting? Simcoe had an electric throttle for boats that is designed to cut power consumption. They also showed strobe type flashers as did Strob-F-Light. In fact SFL is putting me to work (they gave me a kit to build). I'll let you know how it works. I was impressed by the one in the booth which put out quite a bit of light. They also market an audio direction finder to help you locate downed models.

Pegasus Electronics offers an electronic switch that will switch anything up to 2.5 amps and a plane saver designed to put you in low throttle if your transmitter signal is lost.

All in all it was a very enjoyable weekend and it really did the trick as far as picking up my enthusiasm. If you didn't make Toledo, I strongly suggest you get to the trade show in your section of the country.

Switching Regulator Glow Plug Driver

This ought to be a good one for the guys who like to put circuits together. Sometime ago a reader suggested



SWITCH GLOW DRIVER

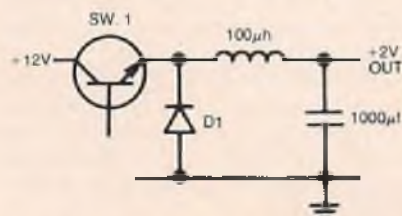
using the switching regulator principle for use as a glow driver. We said it was a sound approach and asked that our readers send in the results of their efforts if they came up with anything. I wanted to breadboard this circuit myself but haven't had a chance. It looks pretty straightforward though and shouldn't give much trouble. So have at it.

Dear Mr. Oddino,

Your column mentioned the design of a glow driver for use in starting engines. In the last year I built two of these for myself and a friend.

I will write up a construction description of this design. I expect the article would not be very long nor complex since once the basic calculations are made to determine the pulse rep rate, the peak pulse current, the max output current and the required output voltage, the construction is easy.

Texas Instruments has made a switching regulator I.C. which needs only a dozen external parts to make a 1.5 - 2v adjustable 0 - 3 amp 50 - 120 mv ripple 12v DC to DC power converter. In block diagram form, it is like this:



sw₁ is closed until 5 amps builds up in L₁ and is then opened. Since the current in the inductor will not stop due to the energy stored in its magnetic field, it pulls current from D₁ and C₁ until it loses its magnetic field. Since the diode D₁

will not let the current reverse, the energy is now stored in the capacitor. The capacitor will then deliver the energy to the load and its voltage will decay. When the voltage has decayed below a threshold value, 50 mv below what you want, then the switch is again closed and the cycle starts over again.

The design can limit the short circuit current if the switch is only allowed to close at a maximum frequency so the inductor never saturates. The device by Texas Instruments is a TL 497 and contains the voltage comparator to test the output voltage against its own internal 1.2v reference. Therefore we add two fixed resistors (R₁ and R₂) and one variable resistor (R₃) to the output to divide the output down to 1.2 volts. The TL 497 also senses the current building up in the inductor by using a power resistor of .1Ω (R₄). The switch is a NPN power transistor which is driven by the IC directly.

The diode D₁ is selected to be capable of taking enough steady state current for the glow plug.

Further details will follow when I get an additional set of parts to photograph as it is constructed.

Yours truly,
Charles O. Bush
Bremerton, Washington

To help you understand the flow of current through an inductor, consider trying to put energy in a big flywheel. When you first start trying to move the flywheel it resists, but once you get it going, it resists stopping. The inductor acts the same way. It acts like inertia. Current will be low at the start and then continue to flow after the switch is opened just like a flywheel continues to rotate after the input energy is removed. By the way, switching regulators can be

used to step-up voltage as well as step-down. You could design a glow driver to provide the same output to the plug from a one cell nicad battery as from a 12 volt motorcycle battery.

While we're on the subject of inductors, let us talk about the inductors or chokes that have been recommended in long servo cables. We've had a couple of letters on this subject. The idea is to provide something in the circuit which will permit the flow of DC current to the servo with as little voltage drop as possible. At the same time we want to prevent the flow of radio frequency current which might get into our receivers. By choosing the right inductance for a given frequency you can make the inductor look like a very high resistance to RF while maintaining a very low DC resistance. Because we work at such high frequencies, the inductance value is not critical.

Want To Build Your Own RC System?

Dear Mr. Oddino,

The reason for this letter is to relate to you and your readers the results of an exercise in radio control system design that I undertook from January 1978 to February 1979.

I have a B.S. in Electrical Engineering and have been working for a design and development group in R.F. and microwave test and measurement equipment for about two years. Consequently I have at my disposal numerous pieces of equipment; including spectrum analysers, network analysers, sweepers, scopes and a timeshared computer complete with an R.F. circuit design program. With all of

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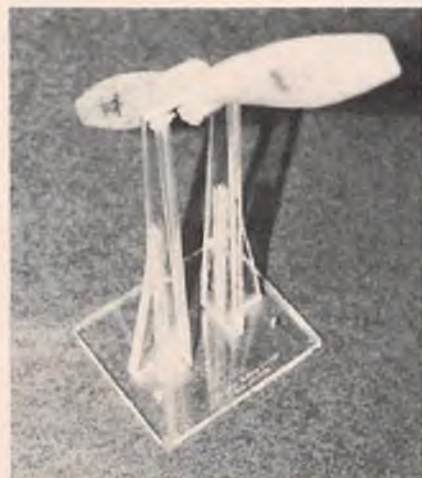
BIG is Beautiful



BY DICK PHILLIPS



Every once in a while, some accessory comes along that, at first glance, looks like it is designed to be an added expense with minimal benefit. When I first saw the Du-Bro Hinging Kit, I felt like that about it. I have since bought and used one and must admit that my first impression was wrong. It's a good tool and well worth having in your arsenal. Another one came to me not too long ago which created the same first impression. It's a prop balancer and a good one. It's made of one of the clear plastics by Wee Seven Enterprises, 116 Flavelle Rd., S.E. Calgary, Alberta, Canada T2H 1E7. John Stier who is Wee Seven Enterprises also tells me he is prepared to custom build almost anything you want out of this clear plastic. Contact him for a quote of your requirements.



Wee Seven prop balancer sells for \$25.00 and could be engraved as a trophy. It will handle props to just under 26".

As I mentioned, I thought, when I first saw the prop balancer, that it was a bit of a gimmick. I checked several large props I had previously balanced with my little hand held balance and this one does it better! The top of the two columns are fitted with a total of four small ball bearings which are about as frictionless as you are going to find. I checked one of my so-called 'balanced' props 20 times and where it settled each of the 20 times was within 1" of the same



Bearings on Wee Seven Prop balancer on which prop center rests, bearings are 5/16" in diameter. Four of these support prop shaft while balancing.

place. Pretty accurate, I think.

Something else that I don't think John had considered when he developed the balancer is that it would make one heck of a useful trophy for presentation as well. One with a usable purpose in addition to it's obvious aesthetic appeal. It could be engraved right on the clear base and would undoubtedly make a worthwhile addition to a modeler's stable of "tools."

The larger models have now gained another inch or so in status with the recent acceptance by MAAC (Canada's equivalent to AMA) of raising the competitive weight limit in scale to 30 pounds effective in 1980. I'm personally delighted to hear this, as it was getting a bit tough to build a big bird strong enough and still stay under the previous weight limit of 20 pounds. Without that restriction, it will be possible to build proper strength into a model and fly it in competition in Canada.

Not only that, but MAAC's insurance company has recently increased the permissible weight of models to 25 kilograms. That's up around 55 pounds for those of you not yet converted to metric weights.

Hey, if you ever had any doubts about the international circulation which RCM enjoys, hear this. I had a letter recently from Angelo Solito de Solis of Oslo, Norway. Angelo is building a Bud Nosen Mr. Mulligan and asked for some advice as to location of radio and a few other

details. As I am building the same thing (although mine uses none of the actual kit material) I was in a position to give him some pretty specific information. Anyway, I thought you might be interested to know that RCM (and Bud Nosen, obviously) are pretty widely circulated! I have asked Angelo to keep me in touch with his progress and to let me know how he makes out flying the Mulligan.

I mentioned a few issues ago the fun I was having trying to solder aluminum tubing, with the possibility of trying to build a fuselage using the tubing, much as is the case with full scale. Since that time I have had a very interesting and informative letter from Bob Florence of 16552 SE 28th, Bellevue, Washington. Bob has been doing some brazing of tubing recently and has come up with some of the answers to the problems I was having.

First, Bob says you can't just use Oxy/Acetylene for welding the small tubing we use. He does admit that he expects to get argument on this point, but has yet to see it done successfully.

Bob suggests the use of a standard propane torch, using the large nozzle that these come fitted with. Bob uses a kit from Sears Roebuck which provides both flux and rod for about \$2.25. This information took Bob over a month of experimentation with various rod and flux combinations.

The principal problem with the process is that the metal being brazed and the rod material have melting points within about 5 degrees of one another. The time available to react to the actual disappearance of the metal tubing is less than a second and, by the time you realize it is going to go, it is already gone!

Bob suggests setting up the propane flame so that the main flame is no more than 2" in length and the secondary flame surrounding it to be approximately 1/4" in length. Use the flame by holding it 2" to 3" away from the point to be brazed and keep the flame in **constant** motion about 2" around the area to be brazed.

The tubing being brazed should be placed on a section of fire brick, and then be heat sunked with a steel bar to bleed

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RCM PRODUCT TEST

**Cox Hobbies
TRADE WINDS**



SPECIFICATIONS

Name	TRADE WINDS
Boat Type	Sailboat
Manufactured By	Cox Hobbies 1505 East Warner Ave. Santa Ana, California 92702
Mfg. Suggested Retail Price	\$169.95
Available From	Mfg. & Retail Outlets
Mfg. Recommended Usage	RC Sailing
Hull	35.9" Long — 10" Beam
Mast Height	48 Inches
Overall Height	60.1 Inches
Radio Compartment Dimensions	Ample
Recommended No. of Channels	1 (See Text)
Recommended Control Functions	Rudder (See Text)
Basic Materials Used In Construction:	
Hull & Deck	Pre-formed Foam
Sails	Lightweight Rip-Stop Nylon
Mast & Booms	Aluminum
Keel & Rudder	Pre-formed white ABS Plastic
Sail Area	590.5 Square Inches
Hardware Included In Kit	Everything necessary
Plan Size	None
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (14 pages)
Construction Photos	36 Photos
Kit Includes	Everything except ballast & electronics
Mfg. Sailing Weight	154 Oz. (incl. ballast & electronics)

RCM PROTOTYPE

Weight, Ready To Sail	154 Oz.
Covering & finishing materials used	Boat completely finished
Engine Make & Disp.	NA
Muffler Used	NA
Radio Used	Cox/Sanya 2 channel
Tank Size Used	NA

Trade Winds is a 36/600 Class R/C sailboat, manufactured and distributed by Cox Hobbies, Inc., 1505 East Warner Ave., Santa Ana, California 92702, and is available from them as well as retail dealers everywhere. Before we dig into the kit, we'd better explain the class rating that Trade Winds carries. For the 36/600 Class, hull length may not exceed 36," and sail area may not exceed 600 square inches. So, if you want to get into sailboat competition, or even if you are already involved in it, Trade Winds could be just the boat you've been looking for. On the other hand, if you don't care for racing, you might be interested in the hours of easy pleasure to be gained from the kind of

graceful, silent sailing that is at your fingertips when you slide this beauty into some quiet pond, lake, or lagoon.

Trade Winds comes packaged in a beautiful sky blue carton that has a picture of the boat in full sail on top of the box, while all around the sides and both ends are color photos of its various features. Lifting the cover revealed the Trade Winds hull beautifully packaged with styrofoam saddles at bow and stern. Lifting her out, we were immediately impressed with two things. First was the light weight of the molded foam hull, and second, the finish and color. The hull is fire engine red, and the deck (already joined to the hull) is a sort of tan, wood color,

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RCM PRODUCT TEST

Sig Mfg. KAVALIER



The Sig. Manufacturing Co., recently introduced an "Intermediate Trainer" called the Kavalier. At first glance, the Kavalier looks like just another model airplane but don't let that fool you because after you have built and flown one you will agree with me that it's probably the best 40 size plane you have ever owned.

Now that I have spouted off about how good the Kavalier is, maybe I better explain myself. One of the first things I evaluate in a kit is the plan and the accompanying instructions. Sig has intended that a newcomer could take the kit home and, following the enclosed instructions, successfully build this airplane. I'd say they have, in fact, achieved their aim. There are many pictures along with cut-away drawings that, when combined with the keyed written word, make it nearly impossible to have a problem.

A very complete hardware package was included with the kit: Aluminum motor mounts, nylon nose gear bearing and steering arm, nylon control horns, molded control hinges, formed aluminum landing gear, 5/32" wire nose gear, control clevises, and various nuts and bolts as required.

One thing I do before I start building a kit is read the instructions completely and study the plans, then it's time to glue wood. The manual starts with the wing construction so I started the wing on one building board and then skipped ahead in the manual to page 12 where the fuselage construction starts so that I could also be working on my second building board.

The wing is very easy to build but don't try to build it your old way! Claude McCullough has designed the wing with "Wash Out" in it so read and follow the plans and you will be really pleased. I think there is only one decision you have to make in building the wing --- if you plan to bolt it on or use rubber bands --- there are a few different building steps determined by your choice.

While the wing was coming along nicely, I was busy on the fuselage. A unique feature of the fuselage is the use of "print-wood" for the sides, which I felt made the job go along faster. My only caution would be that you follow the

to page 112

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

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

SPECIFICATIONS

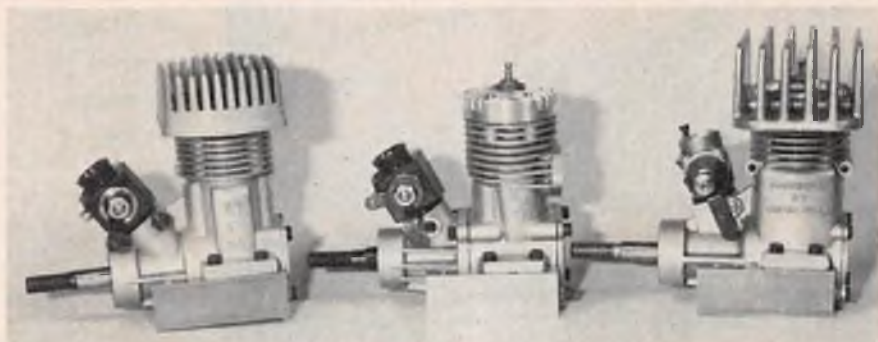
Name	KAVALIER
Aircraft Type	Intermediate Trainer
Manufactured By	Sig Mfg. Montezuma, Iowa 50171
Mfg. Suggested Retail Price	\$44.95
Available From	Both Mfg. & Retail Outlets
Mfg. Recommended Usage	General Sport
Wing Span	56 Inches
Wing Chord	10½" (Avg.)
Total Wing Area	588 Square Inches
Fuselage Length	45 Inches
Radio Compartment Dimensions	(L) 11" x (W) 3" x (H) 3¼"
Wing Location	Shoulder Wing
Airfoil	Semi-Symmetrical
Wing Planform	Double Taper
Dihedral (each tip)	1¾"
Stabilizer Span	22 Inches
Stabilizer Chord (incl. elev.)	6¼" (Avg.)
Total Stab Area	137½ Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Mid-Fuselage
Vertical Fin Height	7 Inches
Vertical Fin Width (incl. rud.)	7" (Avg.)
Mfg. Rec. Engine Range	29-40 cu. in.
Recommended Fuel Tank Size	10 Ounce
Landing Gear	Tricycle
Recommended No. Of Channels	4
Recommended Control Functions	Rud., Elev., Throt., All.
Basic Materials Used In Construction:	
Fuselage	Balsa, Ply & Hardwood
Wing	Balsa & Ply
Tail Surfaces	Balsa
Hardware Included In Kit	See text
Plan Size	37" x 50" (1 sheet)
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (32 pages)
Construction Photos	Yes
Kit Includes	Printed & Die-Cut parts
Mfg. Rec. Flying Weight	80 Oz.
Wing loading based on rec. flying wt.	19.56 Oz./Sq. Ft.

RCM PROTOTYPE

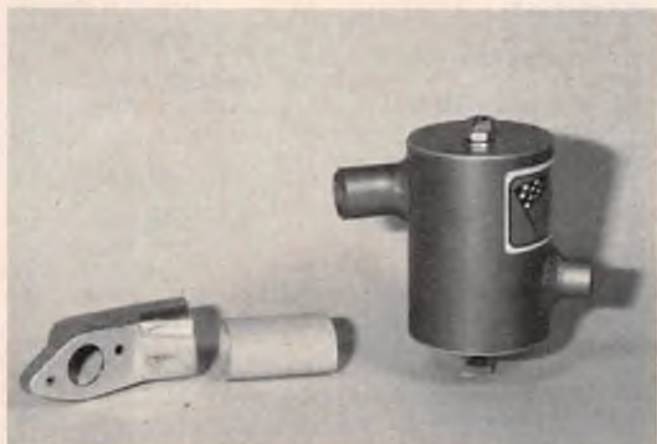
Weight, Ready To Fly	80 Ounces
Wing Loading	19.56 Oz./Sq. Ft.
Covering & finishing materials used	See text
Engine Make & Disp.	K & B .40
Muffler Used	Du-Bro Muff-L-Alre
Radio Used	Kraft 7 channel
Tank Size Used	10 Oz.



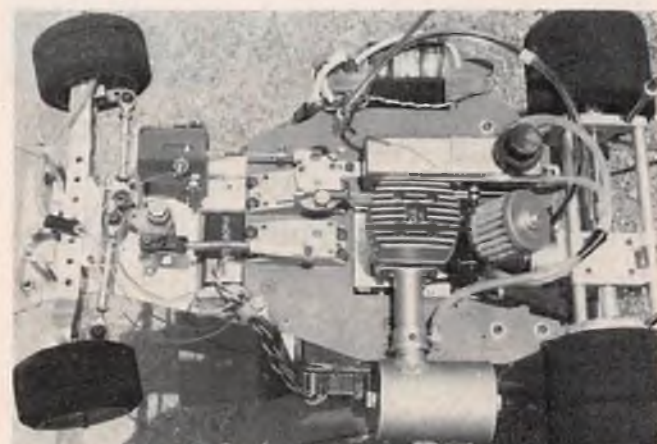
After seeing the Europeans run at the 1979 Florida Winternationals, with their OPS engines, we decided to take another look at the OPS. In talking with Dave Preston, Phil Booth, Phil Greeno and Wally Bailey, they were 100% sold on the OPS engine. They said the engine was super reliable, and that OPS had changed the port and crank timing and the crankcase ports, so that the engine was now putting out a lot more horsepower. In watching them run and running with them, they were indeed running a lot faster than the last time we to page 99



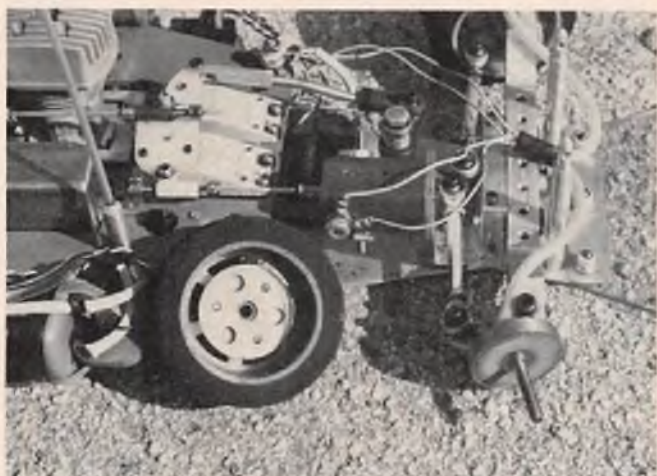
The latest OPS 21 engine is getting much closer to the performance of the leader, the K & B 21. And Super Tigre is coming out with a totally brand new rear exhaust engine, replacing this side exhaust engine.



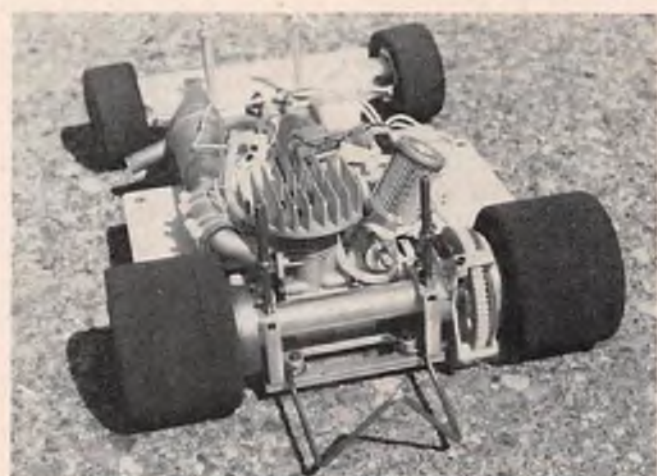
With the 1979 ROAR rules now requiring quieter mufflers, McCoy's new can type muffler is becoming very popular. Shown is the rear mounted model for K & B 21. Besides being quieter, it also gives more power than the 1978 mufflers.



Charlie Green, from Indianapolis, brought this car to the Florida Winternationals. Charlie's scratch-built creation features in-line mounted OPS engine with electric disc brakes.



Charlie's electric brakes have a floating steel disc inside the wheels, which are pulled towards an electro-magnet mounted on the axle.



Jack Jacobs built a 4 wheel electric disc brake car with a differential that acts like a differential on coasting, but goes to full lock-up on acceleration. He built all this in two weeks, including a new engine.

DREMEL 4" TABLE SAW

By Ben Strasser



I'm still the same gimmic/new tool oriented modeler that I've always been. Bring out a new tool or machine that is supposed to make the job of building an R/C powered plane or sailplane go quicker, easier, or at least make it more fun, and I'm fair game for the hobby shops. And, as I've mentioned in other articles, some of my purchases find their way to our club auctions either because they didn't work out as I had hoped or they were replaced by a later, better version. This time I'm commenting about a great decision I made to purchase Dremel's newly available table saw. No auctions for this one. Sorry friends.

Needless to say, when the ads for Dremel's 4" Table Saw started appearing, I started bugging the local hobby shop anxious to look it over. Since I already had another smaller table saw, my more sensible side (known as my Wife to my friends) suggested that I give it a careful check-out before I spent the money. However, because this machine carried the Dremel name, I felt that it should really be something special. And I was right.

When the unit arrived at the hobby shop I got there in time to help the owner open the box. (He kept getting in my way.) My first impression was that this one really looks like a machine designed to do the job. Since I have all but gotten speared by balsa strips thrown back at me from my present saw, I was pleased to find that Dremel's unit has anti-kickback spurs to keep that from happening. In addition to the blade guard, the switch set-up is also a great safety feature. Located along the base

about as far from the blade as possible you have to pull out the switch to turn it on and push it in to turn it off. In a moment for quick action you have only to reach down and hit it and it's off. And if you have young ones around the house, a hole is provided for a small padlock so you can lock the switch in the off position. The base is good and sturdy and just heavy enough to stay where you put it when sawing, yet light enough that you can easily lift it from its storage place to your workbench when you need it.

I was also pleased to find an owner's



manual inside the box. For someone like myself who has never owned a full size table saw and who has a healthy respect for that spinning saw blade, this booklet was most welcome. Complete with safety recommendations and cautions, it also includes instructions about how to use the rip fence, miter gauge, how to tilt the blade for angle cuts and to do special tricks like making blind cuts, rabbets, and tongue and groove joints. Sure looked great. Out came the checkbook and home went the saw.

When I got the unit home, put the rubber bushings on the feet, set it on a sturdy table and turned it on, my education began. Following the step by step instructions I began learning how to use it. Much to my surprise, it cut 1/16" through 3/4" thick balsa (I didn't have any other balsa around to experiment

with at the time) like butter with nice clean cuts. Unlike my other saw that comes to a halt when cutting 1/4" plywood, this one slows only slightly. In no time I had reduced several sheets and strips of balsa and ply to lots of little pieces and a heap of sawdust. Knobs on the front of the unit make raising and lowering the blade and accurately tilting it up to 45° easy and convenient. No reaching over the blade, turning the unit upside down, or getting out a wrench to do the job.

To put the saw to the real test I was confronted with the construction of Hobby Lobby's awesome aircraft — the 12' Telemaster. Finished and flown several weeks ago, I'm convinced that I'd still be cutting the spar webbing if it weren't for the Dremel machine. In addition to using it to cut all of those sticks for the construction of the fuselage to the proper length and angle, the saw made cutting scarf joints, pre-shaping the wing, elevator, and rudder leading edge stock and such, a simple minute or two job. And the optional sawdust bag I purchased after sweeping up the floor, tables, shelves, and workbench a few times while learning to use the unit helps keep much of the sawdust where you want it.

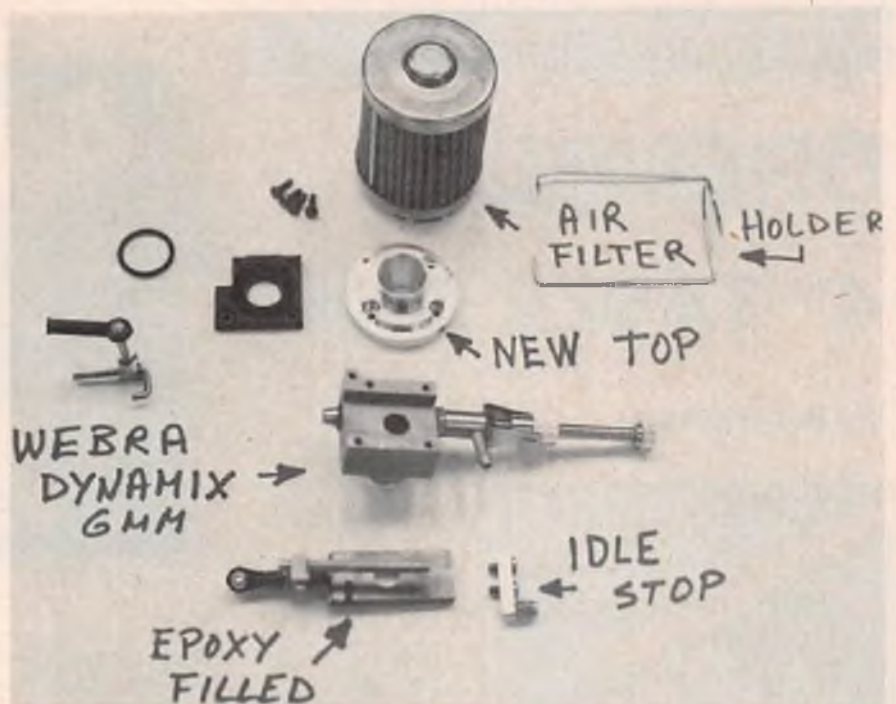
Measuring 13" x 12" x 9", the little giant will make angled cuts with the blade tilted in stock up to 3/4" and perpendicular cuts in stock up to 1"

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THE ULTIMATE CARBURETOR FOR R/C CARS — Fuel Injection?

By Carlos Priemer



Exploded view of slide valve carb. Also shown are discarded carb top (original) and linkage, as used in aircraft.

During this past year we have organized a 1/8 Scale Radio Control Gas Car Club at El Paso, Texas. In the process of learning, from the ground up, the Building - Maintaining - Driving of these exciting and competitive vehicles, we had tried a variety of carburetors such as Perry .19 (as on Stock K & B .21), Perry 6 and 7mm (such as on OPS .21), Delta 40 and 80 slide valve, etc. In this particular case, our goal here at Hal's Hobby Shop (where we modify numerous engines for clients) was to obtain: Reliable low idle, as lean and close as possible to two cycle mid-range and top speed without overheating. The idle was necessary to avoid costly flame-outs at race start. The two cycle mid-range would give immediate, more positive, higher output to handle the slow medium speed

chicanes and obviously the top speed needs no discussion.

After observing that all previous attempts left a lot to be desired, and being quite familiar with the superior carburetion obtained in R/C pattern aircraft using the Webra Dynamix or OPS slide valve carburetors with their almost perfect two cycle idle (mid-range and top speed), we reached into our stock for a 6mm Webra Dynamix intended for a .40 engine. We chose it over the OPS as we felt it would be less apt to jam with dirt.

The carb was modified as follows:

- (1) Main body was turned down in order to fit the stock OPS .21 throat.
- (2) The plastic top was replaced with an aluminum "Full Circle" unit that would accommodate a Fram air filter with a proper seal. A piano wire fastener was

included in order to hold in the air filter.

(3) The slide was modified by filling the throttle control slot in with epoxy to avoid dirt ingestion and binding.

(4) As means of operating the slide, a Rocket City "Missing Link" was attached to the slide threaded shaft that controls the low speed jet setting. We also incorporated a mechanical stop on the opposite side in order to control idle speed via a screw that is locked by a small piece of silicone fuel tubing.

The test vehicle, owned and operated by Hal's, is an Associated 100-200, with stock OPS .21, Globee R/C long plug, MRP teflon clutch (12 tooth) using 5% cool power fuel, all controlled by Futaba radio.

The engine started easily and high speed was quickly adjusted with the

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Snoopy #3. 1st Place A Main, January 21, 1979.



Webra Automix slide valve installation.

RCM PRODUCT TEST

Air Flair Mfg. HOT DOGGER



The Hot Dogger is a trainer/fun fly type aircraft that is produced by Air Flair Mfg. Co., Box 11702, Kansas City, Missouri. It is designed to be powered by engines of .40 to .60 cubic inches of displacement.

The Hot Dogger is a very complete, well engineered kit that features rapid assembly. While listed at a price of \$79.95, it is being offered at this time for the special introductory price of \$69.95.

The plan sheet is a partial one. By this we mean that overall views of the various component parts are not shown, as they are not needed for assembly. What is shown adequately covers all aspects of construction. Accompanying the plan sheet is a 17 page instruction booklet which has two pages of construction photos. The first statement in the booklet is that the Hot Dogger "was designed with the beginner in mind, yet it could also be used as a fun fly type aircraft." We, therefore, attempted to assess the assembly instructions as a beginner might view them.

The instruction booklet in most areas is detailed and complete. One segment that, in our opinion, should have included additional information was the portion dealing with the radio equipment installation. Only one paragraph is devoted to this assembly phase and it simply refers the builder to three photos of typical servo installations, to follow the radio system manufacturer's instructions, and to seek help from his/her local dealer or an experienced RC'er. It is our feeling that a beginner needs more informative assistance included with the kit in order to achieve a good radio installation. In this reviewer's opinion, a poor radio installation is one of the most common pitfalls of the beginner.

We would hasten to add that the RC'er who has built a kit or two, will not have any difficulty in assembling A Hot Dogger.

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

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

SPECIFICATIONS

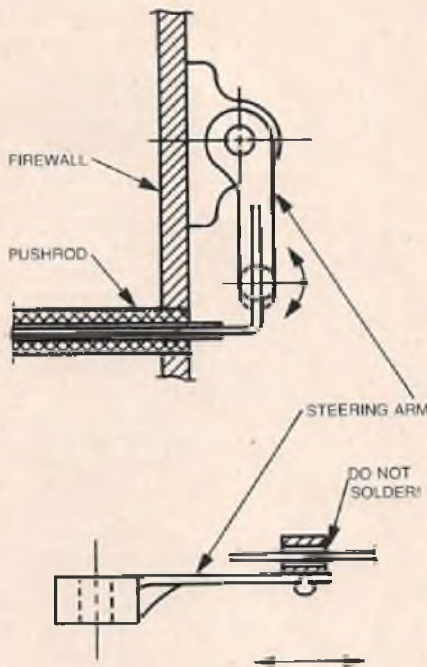
Name	HOT DOGGER
Aircraft Type	Trainer/Sport
Manufactured By	Air Flair Mfg. Co. P.O. Box 11702 Kansas City, Missouri 64138
Mfg. Suggested Retail Price	\$79.95 (Introductory price: \$69.95)
Available From	Mfg. & Retail Outlets
Mfg. Recommended Usage	General Sport Aircraft
Wing Span	57 Inches
Wing Chord	10 3/4 Inches
Total Wing Area	612 Square Inches
Fuselage Length	46 Inches
Radio Compartment Dimensions	(L) 10" x (W) 3 1/4" x (H) 3 1/2"
Wing Location	Shoulder Wing
Airfoil	Semi-Symmetrical
Wing Planform	Constant Chord
Dihedral (each tip)	2 1/2 Inches
Stabilizer Span	20 Inches
Stabilizer Chord (incl. elev.)	6 1/2 Inches
Total Stab Area	130 Square Inches
Stab Airfoil Section	Flat
Stabilizer Location	Top of Fuselage
Vertical Fin Height	6 3/4 Inches
Vertical Fin Width (incl. rud.)	6" (Avg.)
Mfg. Rec. Engine Range	.40-.60 Cu. In.
Recommended Fuel Tank Size	8-12 Oz.
Landing Gear	Tricycle
Recommended No. of Channels	4
Recommended Control Functions	Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:	
Fuselage	Fibreglass
Wing	Foam, Balsa & Ply
Tail Surfaces	Balsa
Hardware Incl. In Kit	See Text
Plan Size	24" x 36" (1 sheet)
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (17 pages)
Construction Photos	Yes
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	88-104 Oz.
Wing loading based on rec. flying wt.	20.7-24.5 Oz./Sq. Ft.

RCM PROTOTYPE

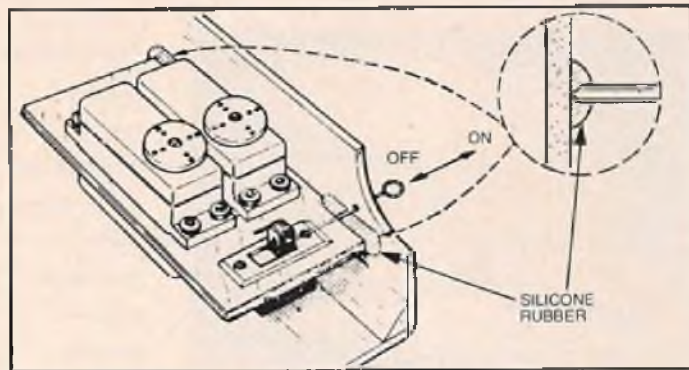
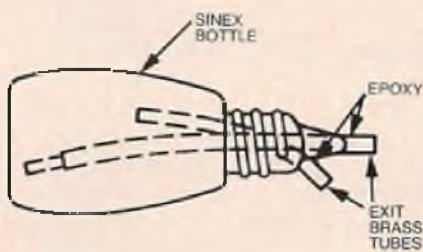
Weight, Ready To Fly	84 Ounces
Wing Loading	19.76 Oz./Sq. Ft.
Covering & finishing materials used	See Text
Engine Make & Disp.	Merco .60
Muffler Used	Kavan
Radio Used	Westport Int'l Varian
Tank Size Used	10 Oz.

FOR WHAT IT'S WORTH

Stanislav Weber of Kdyne, Czechoslovakia, had some difficulties with his nose wheel hook-up. The problem involved a steering arm and bracket mounted on the front side of the firewall. The area in which Stanislav was able to exit his nose wheel pushrod would not line up with the steering arm. Shown in the accompanying sketch, his solution has worked very well. Not having room for a Kwik-Link; a Du-Bro, Goldberg, Rocket City or Logictrol connector or retainer was used. The only pre-caution — make sure there is no binding in your pushrod and the slip fit in the connector.

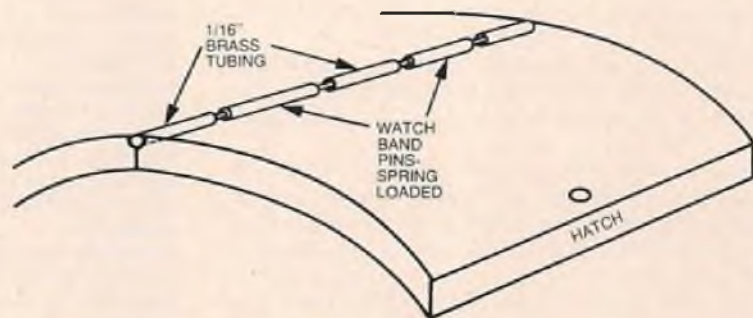


Having built a small model of a Curtiss "Jenny" R/C, H.H. Rice of Staten Island, New York, was left with little room for the fuel tank. All commercial tanks were too large. Looking around, Mr. Rice spotted a Sinex bottle. By adding the brass exit tubes, which are epoxied in place and a brass feed line weight for pick-up, he has a custom fuel tank to fit the aircraft. See accompanying sketch.



To absorb vibration when using a plywood servo tray instead of the plastic tray that came with the radio, an effective mounting method is with the use of silicone rubber. Bevel the edges of the plywood tray and apply the silicone rubber as shown. This idea was presented in the Radio Control Technique magazine published in Japan.

To make a neat flush hatch hinge, Bill Morrison of Owen Sound, Ontario, Canada, uses two spring loaded watch band pins and 1/16" brass tubing. As per the sketch, the brass tubing is set into the fuselage flush using cyanocrylate adhesive and the spring pins are attached to the hatch.



It's surprising how sometimes the solving of a problem in one area can generate the solution to another problem related to modeling. The following is such an example by Tom Obringer. Tom is a member of the Chesapeake Bay Radio Control Club of Maryland. This was reprinted from the club newsletter "Crab Rag."

During the past winter my 6 year old son came to me (he was very upset) and asked if I could tape or glue the ribs in his vinyl plastic crayon bag. Close examination of the bag ruled out the use of tapes or glue. Remembering that a few days earlier my wife had been using her "Seal A Meal" to seal leftovers in a

plastic bag, I decided to give it a try on the crayon bag and, presto, one repaired crayon bag and one happy boy.

During the repair the gears started to turn and out came an idea to use this method to make custom-made plastic bags for battery packs and receivers. The first attempts proved successful except for the opening left in the end into which the battery or receiver was to be inserted. This last opening proved very difficult to seal and, once sealed, the bag would have to be destroyed to re-open it.

I then tried a Ziploc storage bag with the plastic zipper at the top. To make the bag, place the component to be enclosed in the bag. On the bag mark the locations to be cut. Mark the bag so that it will be oversized. Next cut out the pre-marked bag which should have the

plastic zipper at the top, and one side which is already sealed. Next place the open side in the Seal-A-Meal sealer and seal this side. A little hint here: the thicker the plastic bag, the longer the heat must be applied, so experiment with different gauges of plastic to determine the amount of time required to make a seam. Now seal the bottom of the bag. At this point your custom made bag should be sealed on the two sides and the bottom with the plastic zipper at the top. Now place the component in the bag and check for fit. The bag should be too big since we cut it oversized. It's a simple matter now to reseal the sides or the bottom, moving in a little at a time,

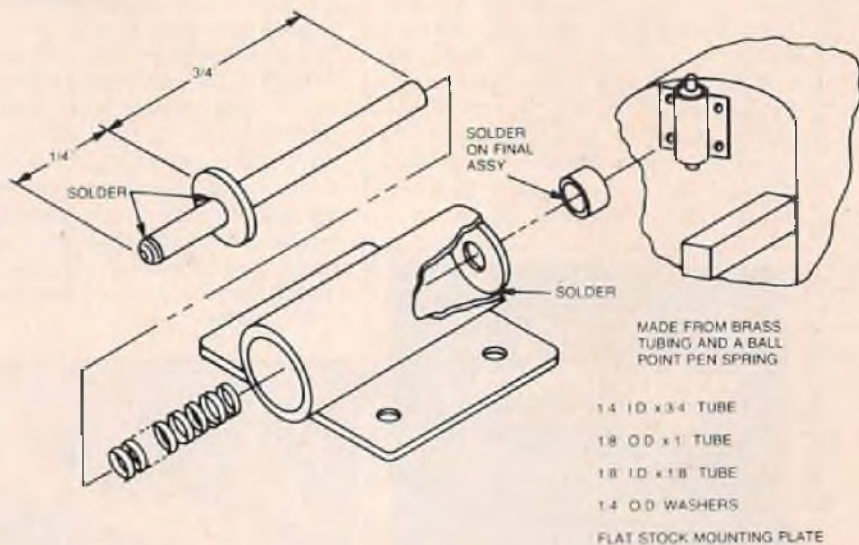
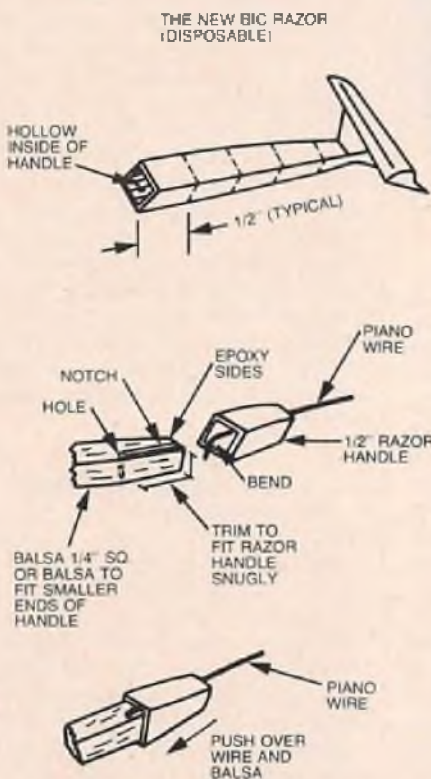
FOR WHAT IT'S WORTH

until a perfect fit is achieved. Now trim the excess from all the seams you have made and also the zipper end. Leave about an eighth inch of plastic beyond the seam. Do not cut any closer to the seam than this because it will weaken it.

Now slip the component into the custom bag so that the wires from the battery, receiver, etc., are at the end with the zipper. Engage the zipper at both ends pushing towards the center making the zipper tight on both sides of the protruding wires. The only problem left is to seal the area where the wires come through the zipper. I'm considering using tub seal here which will also lock the zipper in this area. One note: if you are enclosing your receiver, do not pass the antenna wire out the same place the servo wires exit. Make another hole in the bag for the antenna away from the servo wires.

There you have it, a custom fitted, fuel proof plastic enclosure.

The new disposable Bic razor can be used as clamps for your balsa and wire pushrods. As shown in the first sketch, cut the handle on the dotted line shown and you will have four pieces. This leaves you two each for pushing over piano wire used on balsa torque or pushrods per sketch two. The suggestion was sent in by Michael Saponara of Flushing, New York.



From Charles Bush of Bremerton, Washington, comes this idea of a unique way of attaching a cowl or hatch cover without the unsightly screws or rubber bands. The catch is made entirely of scrap pieces of brass tubing, washers, small pieces of flat stock and a ball point pen spring. The accompanying sketch is self explanatory.

Get a carpenter's chalk line and some pins. Pin the chalk line at one end of the line you need, and then align the line, put it down on the surface, pull tight, and then snap the line. It leaves some dust which can be brushed away but also a nice clean straight line.

For a neat, no-show hinge area when using any of the plastic coverings and one that is fairly simple, try this method as suggested by Frank Fanelli of Franklin, New Jersey.

- (1) Slot for your hinge as usual.
- (2) Cut thin strips of covering material and apply over trailing edges of wings and leading edges of control surfaces.
- (3) Slice covering over slots, insert hinges, and line up the whole mess to insure free movement.
- (4) This is the heart of the method and another use for the cyanoacrylate adhesives. Drill holes (at least two) using a #45 bit or equivalent in the hinge areas making sure that you go through the nylon hinge material. To hold the hinges fast (and they won't fail) put a drop of Hot Stuff or Zap into each hole you've drilled top and bottom. The flashing formed in the nylon from the drilling acts as an anchor and the roughened face of the hinge helps the cyanoacrylate adhere to the balsa.
- (5) If you're impatient you don't even have to fill the holes and can proceed to finish covering your pride and joy.

Frank also has a solution to drawing a straight line over compound surfaces. If you've ever come up against the problem of having to draw a straight line around a fuselage or on a diagonal across the camber of a wing for the purpose of masking or cutting, try this:

Almost every flier has had to rinse small parts (carb, engine, etc.) at one time or another. Did you know that you have the equipment for jet washing those parts? Using your electric fuel pump and isopropyl alcohol (or fuel, if you must), fill a small bowl or large cup with the solvent. Fashion a length of copper tubing to hang on the bowl's rim. Make sure that one end of the copper tubing is well below the liquid's surface and attach the other end to the pump intake hose. To the discharge hose, insert a short length of copper tubing, which may be full bore or modified to give a fan or fine stream. Holding the discharge hose, so you don't get a bath, activate the pump and rinse out all that crud from those nooks and crannies. To conserve on solvent, use a Coleman #0 felt filter funnel, to remove contamination. For jittery persons who can't pour straight, the pump can be used to circulate the solvent through the filter. This suggestion was submitted by Wayne W. Allan of Greenville, Pennsylvania. □

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

showcase '79

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HOBBY SHACK 1979 MODELER'S CATALOG

It's still a wee bit early to be talking, or even thinking about Christmas, but the new 1979 Hobby Shack catalog sure brings to mind a Christmas catalog of modeler's goodies. This 8½" x 11", 192 page profusely illustrated volume lists almost everything that you would care to find under the tree, from multi-channel R/C systems and many ARF and kit models down to the many small hardware items so important. The first half or so lists those many items imported by, manufactured by, or manufactured for Hobby Shack. These include names such as Pilot, Saito, and Aero-Sport. Long established as reliable and quality conscious manufacturers whose products are not otherwise seen or available in the U.S. The rest of the catalog includes the many products of well known American companies such as Sure Flite, Goldberg Models, Top Flite, Dremel, etc. There are sections devoted to the airplane enthusiast; the boat fan; and the R/C car driver. There are pages of tools, engines, and accessories of all types. Everything is described in detail, and there are photos of even such everyday things as "T" pins. Lots of really inspiring color photographs are included, especially helpful during decision time as you are trying to decide on which one of the many appealing models you prefer. The catalog describes all the many related

Hobby Shack services, such as phone-in credit card orders, special military overseas orders, C.O.D., etc. We like the guarantee, stated on the inside front cover, which allows you to return most unused items without prior permission for full credit or return. The 1979 catalog is \$3.00, or free with any order, and is recommended as a valuable ordering or reference guide, no matter how much experience you may have. Available from Hobby Shack, 18480 Bandilier Circle, Fountain Valley, Calif. 92708.



SPORT BOAT AND ELECTRIC DRIVE

Many of you won't know this, but A.R.F. also means Almost Ready to Float! Which describes perfectly Radio Controlled Models (RAM), new O Bee 30 Stand-Off Scale Sport Trainer for 15 to 21 outboard engines, and any two channel radio. The O Bee 30 is constructed with only 5 structural parts, all received molded and trimmed. It includes a molded radio mounting box, which can be completely waterproofed for 100% protection of your R/C system. The proven tri-hull design is precision molded from high impact, vibration absorbing plastic which is impervious not only to water, but to all fuels and lubricants. Length overall is 30" and the price is only \$39.95. And for those of you who prefer the convenience of electric

power, RAM has a conversion kit to mate the Astro Flight 25 electric motor to the K & B outboard drive unit. This conversion requires absolutely no modification to either unit, and takes only minutes to complete. It is all metal, light weight, and rugged and includes a plastic semi-scale Mercury engine cover for realism. With complete instructions, and detailed cutaway drawings, the RAM Electro Mate is priced at \$24.95. Look first at your nearest R/C boat supplier, or inquire from RAM, 3631 N. Kedvale Ave., Chicago, IL 60641.



BUCKER JUNGMEISTER

A fiberglass fuselage for Dave Platt's and RCM's Bucker Jungmeister (September 1978) is now available from Bob Palmer's Models, 9161 Morehart Ave, Arleta, CA 91331, (213) 767-6734. This is a highly detailed fuselage, to include rivets on the fillets, stringers and ribs, doors, cable outlets, and simulated fabric covering. It is individually fabricated from epoxy resin, and weighs only 28 ounces. A cowl is also available, and furnished, and the fuselage can be ordered with a reinforced front end for use with one of the industrial type engines. The fuselage and cowl, with maple blocks for gear and wing mounts, is \$79.50. The cowl only, for use with a wood fuselage, is \$18.00, and the reinforced fuselage requires an additional \$5.00. These prices are less shipping, inquire from Bob about shipping costs to your location. Plans for the Jungmeister are available from RCM Plans Service, at \$12.50 (#738). Our Windancer Adhesive Backed Templates #738T are \$5.25. Full ordering instructions are to be found in the rear of every issue.

MRC-WEBRA .91 SCHNEURLE ENGINE

The already popular and successful MRC-Webra .91 cu. in. Schneurle ported engine, as used by 18 out of 28 flyers at the 1978 Las Vegas Tournament of Champions is now available in a new version. It features the famous slide valve Dynamix carburetor which provides higher rpm, more linear response, and a smoother transition throughout the mid-range settings. This new carb does not need a venturi,



therefore the incoming airflow is not restricted and the results are more efficiency at all speeds. Muffler pressure is necessary and recommended. As in all cases, the prop should be matched to the airplane/engine combination, however, a 14/6 is recommended as a starting point. In some cases, a larger diameter smaller pitch prop has been reported as more successful. A tuned pipe will increase the operating efficiency and raise the rpm even more. This is a true model airplane engine, using a standard glow plug and 5% nitro methane fuel. It is extremely smooth running with minimum vibration. The new Dynamix carb is available separately to retrofit older engines of this type. For additional information, see your dealer, or write Model Rectifier Corp. (MRC), 2500 Woodbridge Ave., Edison, NJ 08817.



"TOTZ-ALL" FIELD BOX

Something to get it all together in, the "Totz-All" is being produced both as a kit and in an assembled version, by Master Kits, 6 Fox Rd., Plainville, CT 06062. This modular field box is constructed of cabinet grade plywood throughout, and measures 8 x 16 x 8½" high at the base, and the smaller top section is 7 x 7¼ x 6¾" high. This is a convenient size in which you can pack and carry all essentials, as shown, and a good supply of spares. The kit version of the Totz-All includes all precision cut pieces,

rabbeted and dadoed as necessary, and a complete hardware package. With instructions and blow-apart drawings, assembly time is kept to a minimum. Kit price is \$39.95; the assembled version finished in polyurethane is \$59.95. Direct orders should include shipping costs, therefore you should check your local shop first. All items shown with the Totz-All are shown for reference only and are not included with it.



CESSNA AGWAGON

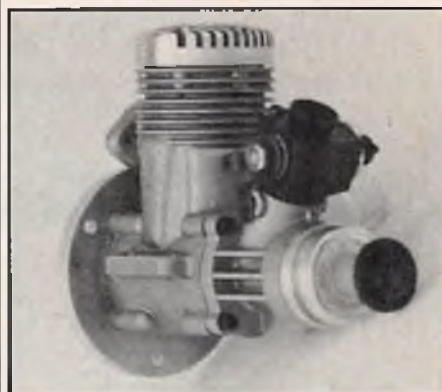
Anyone who ever designed and built a scale model will tell you that such a project is not for the impatient. And that to do it properly will require more time for research than for actual construction. Recognizing this, Repla-Tech Int'l has seen fit to make life easier for the builder who doesn't have this kind of time but still prefers to build something not too common and not from a kit. Repla-Tech offers a unique service which will carry you from the basic plans right on through to judging time, in selected steps of your choice. It offers basic full size plans; a booklet of building instructions; a sketch book of scale data; a 17 x 22 authentic three view drawing of the prototype; a photo package of color and black and white prints of both the prototype and the model. And lastly, Repla-Tech makes available molded plastic parts as necessary to complete the model. You can obtain any part, or all of the above, as required. Currently, the list includes a 48" Cessna Agwagon for .19 to .40 engines and a 51" Zlin Z-50L for .35 to .60 power. Some others are planned and will be announced as soon as available. A complete catalog is available which lists many other ship and aircraft scale drawings for \$1.00, direct from Repla-Tech Int'l, 48500 McKenzie Hwy., Vida, OR 97488.



MARIX MT-100 NEEDLE NOSE TUNNEL HULL

Described as the first needle nose tunnel hull on the market, the Marix MT-100 R/C outboard boat just recently made its debut. The MT-100 is an almost

ready to float boat, comes with hull and deck assembled and painted in various color combinations. It requires only that the engine, gas tank, and radio system be installed. It is designed for the K & B 3.5cc outboard engine, and features a removeable canopy and cowling. Performance-wise, the MT-100 is claimed to be competitive in its class, though still being tame enough for the beginner who is looking for an easy to build boat that is also fun to drive. The Marix MT-100 is 29" long, 13" wide, and is priced at \$66.95. For complete information on this and a number of other R/C and display model boat kits, inquire directly from Marix, 14251 Shoredale Lane, Dallas, TX 75234. (214) 247-7868.



E-Z MOUNT

A simple solution to the engine mounting problem is being offered by Bill Evans Air/Craft. It is called an E-Z Mount, and can certainly be described as simplicity at its best. The E-Z Mount is a thick machined aluminum plate which is attached to the engine back plate using the back plate screws, and in turn is attached to the firewall with three screws. It is ready to use, requires no drilling or tapping, saves cowl space, and is claimed to reduce vibration. The time involved for the whole operation will be less than with other systems. The E-Z Mount is now available for the K & B .35, .40 and the 6.5cc front rotor engines, with other models to be introduced soon. The price is \$3.79, at your local dealer's or direct from Bill Evans Air/Craft, 19216 Calvert St., Reseda, CA 91335.



SVENSON'S FIESELER FII56-C "STORCH"

A 1/6th scale model of the famous

to page 82

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3 1/2"	7.49	5.79
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OUR CATALOG COMING THIS SUMMER

SHOWCASE '79

from page 79/78

German WWII observation plane, the Fieseler Fi156-C "Storch" designed for .60 power, is now available from Svenson Models, 4941 Seaford Circle, Irvine, CA 92714, (714) 552-1266. In this scale, the model spans 7 3/4", and is claimed to have the STOL and flying characteristics of the full sized original. The kit includes many prefabricated balsa and hardwood parts, formed windshield and rear canopy with bubble, metal engine cowling parts, steerable tailwheel unit, preformed brass wing

struts, wheels, fuel tank, special hinges, and many other formed and finished parts. This model features such interesting details as fully operational landing flaps, and wings that easily disassemble for transporting. The kit includes fully detailed plans and instructions, and even a 23" x 30" two color poster of a full size wartime "Storch" in flight. The price of this most complete kit is \$275, from your local shop, or direct from Svenson Models who will also provide you with any other information you may care to know.

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SHOWCASE '79

from page 82/78

sure 33" in length, and is available in a wood hull version, Kit No. 1203 at \$57.50. For those of you who prefer to spend more time on detailing and less on the hull, a fiberglass hull version, No. 1212, priced at \$100.00. Realistic enough for display purposes, this new lifeboat can also be built as a radio controlled operating model with the addition of Dumas Hardware Kit No. 2311, \$52.50. Engines and radio are not included. Available at your local hobby shop; if direct orders are necessary, it is requested that you include 10% for postage and handling. From Dumas Products Inc., 909 E. 17th St., Tucson, AZ 85719. A complete illustrated catalog of all Dumas boat kits and hardware is available for \$1.00.

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to page 88

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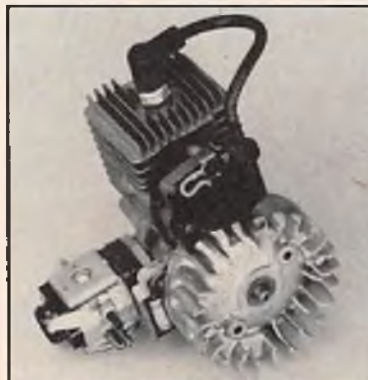
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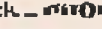
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from page 84/78

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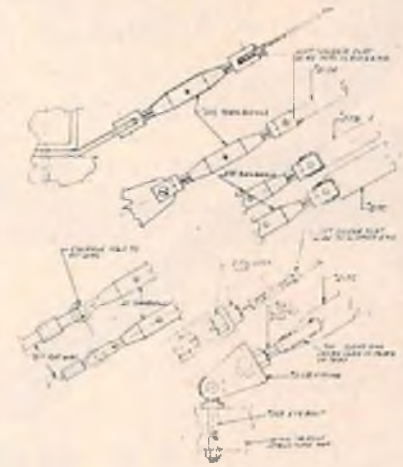
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Once you get past all the distractions, you'll find a Balsa USA Inc., "Breazy" Sailplane, which is but one of the many kits available from this Wisconsin company. Like all the rest, this one is all balsa, no foam, and features fall-out die-cut or machine cut parts, rolled full size plans, hardware and many accessories. The Breazy spans 99", with a 10" chord for a total of 900 square inches of area, and is priced at only \$20.99. For only 25¢, a complete catalog listing all of Balsa USA's sailplane and power kits, balsa, plywood, and other supplies can be yours. Write them at P.O. Box 164, Marinette, WI 54143.



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A new accessory set for the ever popular Dremel Moto-Tools has just been announced, further increasing the versatility of these tools. It is a router attachment, complete with two router bits, which can be used to dado, rabbet, and chamfer, all techniques useful to the model hobbyist. This set, which turns

to page 92

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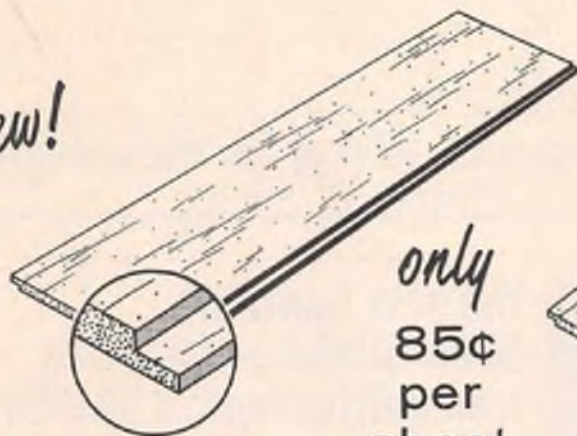
Sig's Solution To The



foam-Wing Skin Problem . . .

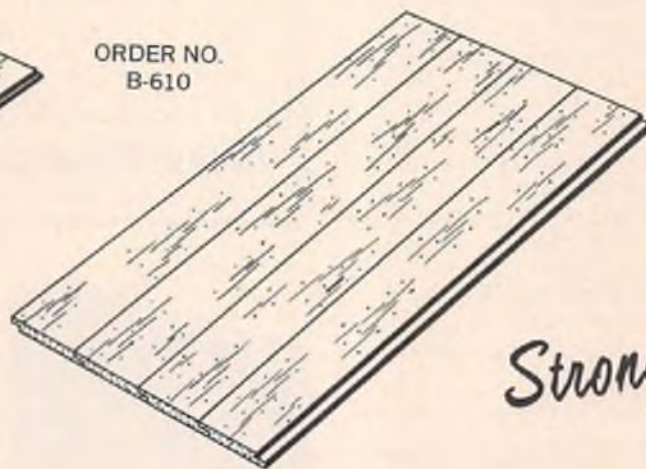
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*only
85¢
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ANY WIDTH WING SKIN CAN BE MADE BY RUNNING A NARROW BEAD OF SIG-MENT ALONG THE 3/16" FACE OF THE STEP AND THEN PLACING THE MATCHING STEP OF THE NEXT SHEET FIRMLY IN PLACE. HOLD WITH THREE OR FOUR PINS FOR A FEW MINUTES UNTIL THE SIG-MENT IS DRY. REPEAT THE PROCESS UNTIL YOU HAVE THE NECESSARY WIDTH. SAND THE JOINTS LIGHTLY UNTIL BOTH SURFACES ARE FLUSH.

WITH THE LAPPED JOINT IT IS EASY TO GLUE THE SHEETS TOGETHER AND THE RESULTING JOINT IS MANY TIMES STRONGER THAN A BUTT JOINT. THE WING SKIN STAYS FLAT ON THE FOAM, RESISTING THE TENDENCY TO LIFT AT THE SEAMS.

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"THE MODEL BUILDER'S WISHBOOK." Every modeling workshop needs a copy of the latest Sig Catalog. The complete line of Sig kits, accessories and supplies is shown, plus practically all other major companies products. Use it as a handy reference tool while designing or building a model. Featured are some helpful hints about construction, painting and other subjects by the Sig Factory Fliers. Get a copy at your friendly local Sig dealer or send \$2.00 to Sig.

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Injection Molded Cowling for Kavalier

SALES OF OUR NEW AILERON TRAINER HAVE BEEN AT SUCH A HIGH RATE THAT WE WERE ABLE TO INVEST IN THE EXPENSIVE TOOLING NECESSARY FOR THIS IMPROVED COWLING. IT IS STRONGER, HAS EVEN WALL THICKNESS AND COMES WITH THE FRONT HOLE ALREADY CUT OUT. WE ARE SHIPPING THE KIT WITH THIS COWL INCLUDED AT NO INCREASE IN THE KIT PRICE.



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Includes New Cowl

SAME PRICE

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SIG BATTLES THE FUEL CRISIS!

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5.0% Nitro

Pint	\$2.85
Quart	\$4.95
Gallon	\$16.75

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COMPARABLE SAVINGS FOR USERS OF 15% 25% AND 35% RACING FUEL.

SEE YOUR SIG DEALER FOR INFLATION-FIGHTING CHAMPION FUEL

from page 88/78

your Moto-Tool into a precise mini-router, includes the router attachment, a 3/16" straight bit, and a 1/4" V-groove bit. The router attachment includes a removeable edge guide for free hand routing on large work, calibrated depth control, and a maximum 3/8" adjustable depth. The Deluxe Router Attachment Set, No. 228 is priced at \$18.95, at your local dealer. For more information, write to Dremel, Division of Emerson Electric Co., 4915 21st St., Racine, WI 53406.

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Fit. WEBRA .91 • OS .90
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to page 94

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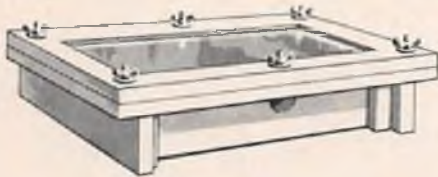


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Vacuum former for plastics—Easy to make your own cowls, wheel pants, canopies, etc.—Works with home oven and hose type vacuum cleaner.

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ABS Plastic Sheets for the Formicator—
All sheets 8½" x 17"—Packs Only

THICKNESS	PCS. PER PACK	PACK PRICE
.020 (1/50")	30	\$13.00
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Assortment Pack (see below)		13.00

Assortment Pack contains: 6-.020/ 4-.030/ 3-.045/ 2-.060/ and 1-.090 sheets. Any pack \$12.00 when ordered with the Formicator. ALL ABS is white only.

Over 3½ lbs. per pack

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Trouble getting it together?

Stik-it! is an adhesive that's moldable, reusable, fuelproof—a million and one uses for field and bench. Won't let go until you want it to. Residue easily removable with lighter fluid.



\$2.00 per two foot roll
(A lifetime supply!)



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Hydraulic unit converts air driven retracts to hydraulic operation. Adjustable to give realistic retract speeds—stops gear "sag-out" and landing collapse. Use one for two wheel ships, two for three wheel type planes.

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(Complete instructions for mixing and use)

At Your Dealers, or Order Direct From



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control rods. With its white gel coat exterior the fuselage is completely fuel proof except for the engine mount and firewall located in the engine compartment, and may be used without any additional exterior finishing, if desired.

We used Corefilm to apply the balsa wing skins to the foam cores. Corefilm is a new product, distributed by Bill Evans Aircraft, 19216 Calvert Street, Reseda, California 91335. Corefilm is a double coated tape that is applied to the foam core and then the backing strips are removed from the tape strips, and the sheet balsa skin is laid in place. The result is a fast, no mess or smell, form of wing skin application. We applied a piece of Corefilm to a piece of scrap foam and laid a piece of balsa sheet on it, and then tried to separate the wood and foam. It would appear from the way the foam pulled apart (with the wood and tape), that Corefilm produces a very good bond.

By using Corefilm tape, quick cure type glues for construction, and film covering for the wing and tail surfaces, the Hot Dogger can easily be built in little more than a day or in several evenings.

The tail assembly is attached to the fuselage with self-tapping screws and plywood strips. The fuselage has hardwood blocks installed internally to accept the screws. This method greatly simplifies repair or replacement of the tail assembly, should it be damaged. We mounted the tail assembly on our test aircraft in a permanent manner. This was simply a personal preference and not in any way a criticism of the manufacturer's indicated method.

The hardware package is very complete and of top quality components. For example, the main aluminum landing gear is a Halico gear, complete with wheel axle bolts.

We elected to install a Merco .60 R/C engine, equipped with a Kavan muffler and a ten ounce fuel tank.

The radio employed was Westport International's Variant system.

Our test aircraft was finished with Econocote film covering on the wing and tail surfaces and we trimmed the fuselage (and fuel proofed the engine compartment) with K & B Super Poxy. We left the major portion of the fuselage with its white gel coat finish showing.

Our ready to fly Hot Dogger (less fuel) weighed in at 84 ounces.

Flying the Hot Dogger proved to be a most pleasurable experience in every respect. Its ground handling capability is excellent and take-offs are easily accomplished. By using a .60 size engine for power, the Hot Dogger literally "dashes" down the runway and "leaps" into the air. It is an aircraft that would, as the manufacturer claims, fly very well with a .40 size engine. The installation of a .60 size engine

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struts, and spans 45". The flying weight is 4 to 4½ pounds, and uses any .25 to .35 engine for power. Construction techniques are such that a building jig is not required, at no sacrifice of accuracy. It is Quarter Scale; certainly a small and less expensive way of getting into this phase of the R/C hobby. Only \$52.50, at your dealer, or direct. □

from page 75

... Our concern is directed solely at the beginner who selects the Hot Dogger as his first kit.

The Hot Dogger foam core wing is semi-symmetrical, with balsa leading and trailing edges, tips and sheeting. Strip type balsa ailerons are employed. The tail surfaces are pre-cut from 1/4" sheet balsa.

The fuselage is fiberglass with a white gel coat exterior. All required bulkheads, reinforcing and mounting blocks, engine mount, and the nose gear plate are installed by the manufacturer. The fuselage is "out of the box", virtually completed. The firewall is even drilled for the fuel lines, throttle, and nose gear

Hobby Shack

SAITO

FA-30 ABC 4-CYCLE GLOW ENGINE

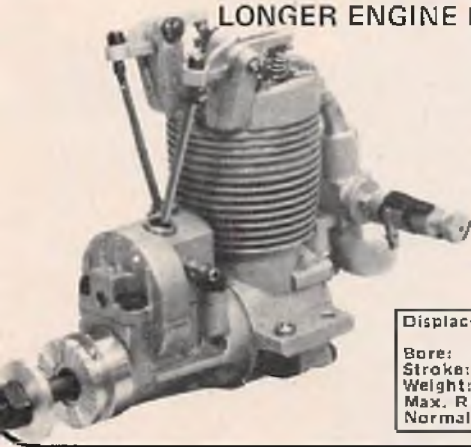
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ECONOMY: Will run 5 minutes @ 10,000 RPM (10x6) on .8 oz. fuel.

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Displacement:	.30 cu.in. (5.0 cc)
Bore:	19.3mm
Stroke:	17mm
Weight:	11.45 oz.
Max. RPM:	12,000 (9x4)
Normal RPM:	11,000 (10x4)

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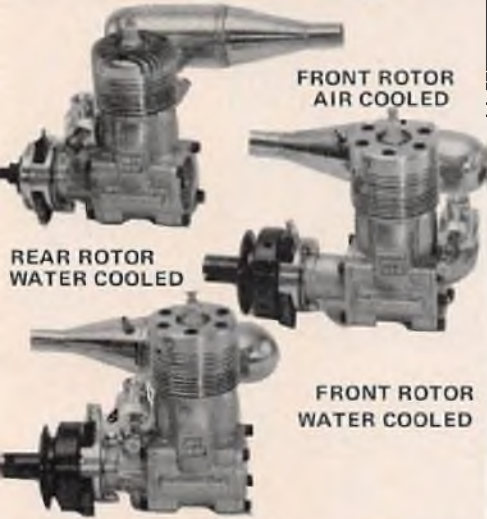
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YOU GET: Engine, Carburetor, Muffler, Coil, Condenser, Spark plug, Plug cap, 10K ohm resistor, Connector, Shrink tube, High tension wire, Fuel tube & Tools.

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X-11 R/C SCHUERLE

The X-11 is a delightful small engine with a throttle that features cam action on the throttle drum which leans out the mixture at low speed. Lapped Schnuerle piston and cylinder assemblies. Blue anodized aluminum head. Timing gives both good power and easy starting. An excellent engine for either beginner or expert. (Catalog No. 15185)



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This engine evolved from the original X-21 series side exhaust engines. It is twin ball bearing and is Schnuerle ported. Mr. "G" (Garofali) invented a new head design that includes about half the cylinder fins. This permits disassembly of the wrist pin with the head and sleeve removed. This is a ringed engine and will break-in a little sooner than, say, its sister engine - the lapped G.21/23. The piston is of low expansion cast aluminum. (Catalog No. 16195)

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HOT DOGGER

from page 94/75

produced an aircraft of very impressive performance --- a real "Hot Dogger" as it is so aptly named.

No unusual or bad in-flight characteristics were in evidence. Landings are also easily performed as the Hot Dogger's slow speed handling is very good and quite predictable. It is capable of executing all of the usual pattern maneuvers.

In summary, the Hot Dogger is a fine kit that can be assembled very rapidly, and it flies very well. For the R/C'er who enjoys flying more than building (or has limited building time), the Hot Dogger should hold particular appeal. Other than a few minor information deficiencies in the instruction booklet, that could pose problems for a beginner, we would not fault the Hot Dogger in any way. It's a kit that the sport flyer would do well to seriously consider. □

THE ULTIMATE CARB

from page 74

main needle valve. The lower speed mixture is controlled by the "Jet Bar" attached to the slide. We had to "lean it out" from its original position by almost 1/8" (probably due to smaller displacement). On the very first lap, the improvement was so very obvious and within a few laps the carb was set and the car had become "vicious." Its idle, immediate throttle and power response and an incredible top speed whine made me feel I had --- how do you describe perfect carburetion? --- oh yes, **Fuel Injection!**

We have since run the car each weekend. The carb either needs **no adjustment** or is **so easy** to adjust (a piece of sponge rubber was included around the sliding tubular "jet" as dirt protection). The performance at all speeds was improved. At mid-range there is no four cycling or loading up and corners with power modulation are much easier and, consequently, faster. Last, but not least, fuel mileage has improved. Now I have to live up to a new challenge, to learn to drive this hotter set up to its new potential.

I would like to thank my good friend, Charlie Hansen, for having patiently made the necessary machining (lathe) modifications that made this project successful. Watch out Arturo Carbonell.

Article and photos by Carlos Priemer, owner-operator of Hal's Hobby Shop in El Paso, Texas. Driver of "Snoopy" #3. For anyone with questions on the above, please contact me at (915) 755-1914. □

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DREMEL TABLE SAW

from page 73

thick. At a weight of less than 10 lbs., the 10" x 12" non-glare work table has a 4" wide work area in front of the blade that makes setting up the job to be cut go easy. It is powered by a 2.2 amp, 115 volt, 60 Hz, AC, UL listed 9800 rpm motor with ball and sleeve bearings.

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PIT STOP

from page 72

saw them run. Our K & B's were still faster and had more torque, but the engines were now a lot closer in performance. We were running 20 to 30% nitro with castor oil, and they were running 50% nitro with a special synthetic oil.

As far as reliability goes, when the K & B or OPS is run with the stock size Perry 21 carb, I don't know if it's possible to wear them out. I ran the K & B 21, with a Perry 21 carb, in our So. Calif. Super Stock Series for a year, and I swear it got faster every time I ran it. The next year I put a Perry pumper carb on it and it was one of the fastest engines I've ever had. We used it for 2 more full racing seasons before it finally lost a rod. Yes, it did finally lose a rod. You're probably wondering how I could let it run to the point that the rod could wear enough to break. Well, I found with the ABC type engines, that once I had one running good, it was best not to take it apart again. I know this doesn't sound like very good preventative maintenance. Actually, it's exactly opposite of good preventative maintenance. To just simply run an engine till it blows, is not going to appeal to anyone, and certainly not to me. But it seems to be the lesser of two evils.

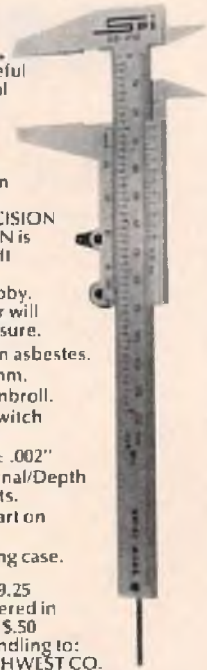
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the cases first) or it blows. Naturally, an engine that's been run a couple of seasons, I wouldn't trust in a big race. I would use it in a smaller club race and use a fresher engine in a big race. By the way, I don't want to make it sound like I'm blowing rods like popcorn. Actually, I've only blown one rod in a K & B — so I certainly am not complaining about reliability.

In Florida, percentage wise, there were as many OPS engines blown as K & B. In talking with Phil Booth about this, he said they were revving their OPS engines much higher than they ever had before, in an effort to keep up with us. This would account for some of their blown engines. They also run a synthetic oil, which I know gives the engines more power, but in revving the engines higher, maybe it makes the lubricating qualities of their synthetic oil marginal? And then of course, you've probably heard the Delta Team set a 24 hour — that's right — 24 hour Can Am Class endurance record in Florida a couple months ago! They used an OPS engine. One OPS engine, that is, for 24 hours!! And synthetic base fuel. Which all goes to prove what I said earlier: If you run the engines within their design limits, they'll last an incredibly long time. If you hop them up, increase the nitro and RPM, you can't expect them to last forever.

To give you a more accurate comparison between the K & B 21 and the latest version OPS 21 car engine, we took one of each of these engines out of stock and broke them in for 20 minutes on the bench. We used Perry 60 carbs on both engines and K & B 1000 castor oil fuel. As you can see by the chart, the K & B had a little more torque and horsepower than the OPS. The difference isn't a great deal and I doubt that a race would be decided on that slim a margin. However, just as OPS has improved their engine, we hear fairly authentic rumors that K & B is also ready to release a new improved version of the K & B 21. And Super Tigre, who has been chasing the K & B and OPS's around for 2 years, has designed a completely new Super Tigre X21 car engine. This ST engine has a rear exhaust like the K & B 21. I have one of these engines on the way and I'll give you a report on it shortly.

Engine	9-4	8-4	7-4
K & B 21	14,400	18,900	22,300
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Perry 60 carbs and K & B 1000 fuel.			

While in Florida, we saw a very interesting car built by Charlie Green of Indianapolis. The whole car was scratch-built from one end to the other. Charlie started with an OPS engine, mounting it in-line and driving through a gearbox to the rear end. That was fairly standard, but what was new was electrically actuated disc brakes. There

was one disc on each front wheel and a third one on the driveshaft. The brakes were actuated by electro magnets. The throttle/brake servo moved linkage going to a voltage regulator which then energized the electro magnets at the floating steel discs. The amount of brake pressure could be controlled through the voltage regulator. Due to mechanical difficulties, Charlie ended up racing a Delta kit car, but he deserves a great deal of credit for his ingenuity.

Jack Jacobs also saw Charlie's car. Jack is a scratch-builder "Extrordinair" from Detroit. I haven't seen any better. But due to those "mechanical difficulties," such as Charlie experienced, Jack has been running a kit car lately and doing quite well. He qualified in 3rd Place in the "A" Main in Florida, with his AMPS differential equipped RC300 car. But after seeing Charlie's car, Jack couldn't wait to get home and do a little fiddling. Within 2 weeks he was done. First, he made a variation of a differential. I might mention that Jack had been running his own differentials with limited slip features 4 years ago on his scratch-built cars. But this new differential was quite different. It was designed to have full differential effect on coasting and braking, but go to full lockup on acceleration. And it was only 3/4" in diameter.

As if the differential wasn't enough of a challenge, Jack added 4 wheel electrically actuated disc brakes. You can appreciate the problem more if you realize the rear brakes must go on the axles and not the differential housing. It really makes the R.H. disc mounting interesting, with the gear in the way. As if all this wasn't enough, he also had to build a new engine because his blew 10 laps into the "A" Main!

Now, how would you have liked to work your heart out for 2 weeks, got your masterpiece done and looked out the window and saw 2 feet of snow? Hurt!! More snow predicted. Total frustration. What to do. My phone rings way out here in sunny So. California and Jack says, "Gene, I got this new car that's got all this neat new stuff on it, but I also got two feet of snow. How would you like to test it for me?" Would I? Wow!!

Jack sent the car and we went out to Thorp's to run it. The engine fired right up with no problems. I put it on the track and proceeded driving, but the car had way too much brakes. Jack had no idea how efficient his brakes were. He was afraid there wouldn't be enough brakes, so there was no adjustment on them. But I simply removed the front discs and went to rear only brakes. The brakes were still too strong, but if I didn't stay on them too long, the car was driveable. Unfortunately, because the brakes were too strong, I couldn't tell what effect the differential had on the steering while braking. When I accelerated, the

to page 112



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100% INCREASE! We've just doubled our TOLL FREE phone line capacity, and expanded our staff to serve you even better. Your telephone is your own personal "hot line" to the largest and finest R/C inventory in the United States — it's fast, easy, and free of charge.

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\$\$ SUPER SPECIALS OF THE MONTH \$\$

The following Tower Hobbies pages represent super savings for you on hundreds of popular items; specially selected for you from our huge, several thousand item inventory. This page gives you complete information on how to place your order with Tower Hobbies, and how to obtain any other information that you may need relative to that important purchasing decision.

The special stock numbers must be used for the super special prices to be honored. Tower will do everything possible to keep all special items in stock throughout the special; however, if necessary, Tower reserves the right to cancel and/or place limits on any or all items. For your convenience, Tower will accept backorders for only those items which we will be able to deliver within a reasonable amount of time. All of our super special prices are subject to change if the manufacturers retail prices change during the sale period.

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Ordering your modeling supplies from Tower Hobbies is just as fun and easy as sitting in your favorite lounge chair. You'll never have to worry about fighting a crowd, and when you deal with Tower Hobbies you're always assured of getting low, low sale prices, the best selection, and the best help and advice that you can possibly get ANYWHERE in the world. There are two easy ways to order:

BY TOLL FREE PHONES

When you place your order over the phone we will ship it to you C.O.D., and you pay for it when it's delivered to your door.

When you phone in your order, please have the stock numbers written down ready to give to the order taker.

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ILLINOIS RESIDENTS ONLY

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

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If you have a Tower order form, please use it. If not, then just use any piece of paper or stationery. Write down all of the items that you want along with their special stock numbers and prices. Total them up (Illinois residents add 5% sales tax) and add \$2.00 for postage, handling, and full insurance, to obtain the grand total. Obtain a money order, certified check, bank check, or write a personal check for the grand total amount (personal checks may be delayed to allow for clearance). Foreign orders add \$10.00 (excess will be refunded with order). Date of postmark determines special period eligibility. Send your order along with full payment to:

**TOWER HOBBIES
P.O. BOX 778
CHAMPAIGN, ILLINOIS 61820**

HOW TO GET INFORMATION FROM TOWER

The following list gives our other phone numbers and a brief description of why and when to call them. Please write these down for future reference, or just save this page.

217-384-1010: This number can be used by anyone from anywhere in the world to PLACE AN ORDER with our phone sales staff. Primary usage comes from foreign customers or from Alaska, Hawaii or Puerto Rico, however, anyone can use it.

217-384-1097: This number is a HOT LINE direct to the desk of Bill Baxter, who is our resident RC expert. If you have a technical question or a problem you need help with then call Bill on this number. It is answered on Monday through Friday from 9:00 A.M. to 5:00 P.M. only.

217-384-7217: This number is a HOT LINE direct to our main office. If you should have a question about an order such as when it was shipped, then call this number. Our office staff will immediately look up whatever you need to know and give you an instant answer to your question or problem, Monday through Friday, 9:00 A.M. to 5:00 P.M. only.

REMEMBER, THESE ARE ONLY A FEW OF THE SEVERAL THOUSAND DIFFERENT ITEMS THAT TOWER HOBBIES STOCKS. IF YOU NEED AN ITEM THAT DOESN'T APPEAR IN THIS ISSUE, GIVE US A CALL TO SEE IF WE HAVE IT; CHANCES ARE GOOD THAT WE DO. BY ALL MEANS COMPARE OUR PRICES BEFORE YOU BUY ELSEWHERE; YOU'LL BE DOLLARS AHEAD!!

TOWER HAS EVERYTHING!

You can count on Tower for all of your day to day modeling needs, as well as a one stop source of full information. Think of Tower the next time . . .

- ... You need new product information
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ORDERING INFORMATION GUIDE



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These specials are good until the 15th of the month of this issue, only. All special prices are subject to change if retail prices change during sale period.

TOWER SIX CHANNEL — \$139.95!

NOW YOU CAN OWN A TOP QUALITY TOWER HOBBIES SIX CHANNEL SYSTEM WITH KPS-14II SERVOS FOR AS LOW AS \$139.95! PERFECT FOR PEOPLE WHO WANT A 2 OR 3 CHANNEL SYSTEM NOW AND WANT TO ADD MORE FUNCTIONS TO THEIR SYSTEM IN THE FUTURE!

TOWER HOBBIES SIX CHANNEL W/2 KPS-14II SERVOS	\$139.95	RCM293
TOWER HOBBIES SIX CHANNEL W/3 KPS-14II SERVOS	169.95	RCM294
TOWER HOBBIES SIX CHANNEL W/4 KPS-14II SERVOS	199.95	RCM295
TOWER HOBBIES KPS-14II SERVO	30.00	RCM206

THIS SPECIAL IS NOT RETROACTIVE

EVERYTHING YOU WANT!

TOWER IS DEDICATED TO OFFERING YOU THE VERY BEST VALUE AND SERVICE THAT IS POSSIBLE! IN KEEPING WITH THIS PHILOSOPHY, WE HAVE RESEARCHED THE INDUSTRY WITH PAIN-TAKING CARE TO FIND OUT EXACTLY WHAT YOU WANT IN A RADIO CONTROL SYSTEM.

YOU WANT QUALITY! That's why we took our Radio Control System Formulas exclusively to Kraft Systems, Inc., of California to be manufactured to our exact specifications. Kraft quality is absolutely unparalleled by anyone else in the world. Kraft's outstanding success is attributed to their experience, high standards for materials and production, and quality control systems. Kraft means quality in every detail. For example, our rugged servos are made of tough ABS plastic which helps them live longer. Our sockets are gold plated beryllium copper, crimp connected to machine-cut and stripped wire to assure you reliable conductivity. The plastic plug body extends over the wiring insulation to prevent stress at the junction between the pin and the wire. Not only is this wiring method inherently more reliable than soldered connections, it also insures uniform quality. Tower Hobbies is the most reputable RC distributor in the business. Tower Hobbies and Kraft Systems make an unbeatable combination! Just ask any one of the thousands of modelers who own one of our fine digital proportional radio control systems!

YOU WANT VALUE! Tower Hobbies radios give you absolutely the maximum amount of radio for the least amount of money -- and that's value! There is nothing cheap about a Tower radio. The design is the latest, the manufacturer is the finest, the quality is peerless, and the service is second to none. So how then can the price be the lowest in the industry? Simple. Tower's tremendous buying power allows us to create economies due to volume -- and there are no middlemen between us and the manufacturer to artificially jack up the price. You're paying the bottom dollar price for the top of the line product.

YOU WANT PRECISE, TOTAL CONTROL! All of our receivers have double tuned R.F. sections to minimize harmonic type interference and all have special noise rejection circuitry permitting their operation even under the most adverse conditions. Both Tower systems feature a dual function meter that allows you to check RF and absolute battery voltage. This allows you to monitor your flying time and to check for possible cell malfunction. This deluxe feature is usually found only on systems in the \$500.00 price range. All of our servos use an integrated circuit amplifier to produce centering and tracking accuracy better than 1/2%, virtually zero drift with changes in temperature and voltage, uniform duty cycle in both directions, smoothness, and excellent damping characteristics. The reference potentiometer element is driven directly from the output drive. This is extremely important for servo accuracy! Our control sticks give you a true, accurate feel for precision flying, and the popular closed gimbal configuration protects the transmitter from the elements for a longer life. We were thinking about your desire for precise, total control when we designed our powerful, yet light weight airborne systems! This gives you greater maneuverability, and faster climbing, acceleration, and top speed.

YOU WANT PRESTIGE! Radio control Modelers represent an artistic breed of people who demand quality detailing, and can appreciate the most subtle esthetic appeals. Tower radios were designed with this in mind, of course. There is just something very elegant about that rich ivory color accented with black trim pieces. That's in keeping with the total quality feel of Tower radios -- that first class feeling. With Tower Hobbies radio control systems you go first class in quality, performance, and appearance. When you show up at the field with a Tower radio, everyone will know that you're a person who demands only the finest value. Your choice of a Tower radio shows you're a smart shopper!

YOU WANT FLEXIBILITY! Tower radios will give you the widest range of applications and the greatest performance that you could possibly ask for. The top of the line Tower 6 channel system is perfect for all radio control applications from 1/8A to pattern ships. The top of the line Tower 3 channel system is perfect for small aircraft, gliders, boats, and cars; light weight, yet very rugged. The Tower 6 and Tower 3 components are fully compatible with the previous Tower 5 model as well as the entire line of Kraft Systems radios (except for the "A" Series). This gives you the greatest accessory and feature availability in the industry -- interchangeable flight packs, servos, trays, output arms, or almost anything else from the Kraft line-up of outstanding products.

YOU WANT ASSURANCE! Even in consideration of the meticulous care that goes into every Tower radio, you know that nothing on Earth is truly perfect. Our Tower radio control systems are warranted against defects in materials and workmanship for 180 days from the date of purchase. There are six Tower Hobbies Service Centers across the United States authorized to perform warranty repair work. If you should need repair work after the warranty period, any one of dozens of Authorized Kraft Service Centers can perform such work for you.

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

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WOW!
LOOK AT THIS!

TOWER SIX CHANNEL RADIO

\$139.95

WITH 2 KPS-14II SERVOS



TOWER SIX CHANNEL SYSTEM - The Tower 6 channel transmitter comes in the popular 2 stick closed gimbal configuration. Standard equipment includes a fully proportional fifth channel; toggle switch sixth channel; choice of 2, 3, or 4 KPS-14II servos, or 4 KPS-15II servos; lightweight slimline high range receiver which is very convenient to install; nicad transmitter battery pack; powerful 550 MAH nicad receiver battery pack; charger; switch harness with external receptacle for charging convenience; servo trays; full servo accessories, and a dual function meter that indicates both RF and absolute battery voltage. The Tower 6 channel system has an airborne pack weight of only 11.9 ounces with 4 KPS-14II servos, and 13.5 ounces with 4 KPS-15II servos.
WITH 4 KPS-15II SERVOS - NOW ONLY \$209.95 - STOCK NO. RCM121

ABSOLUTELY THE BEST
RADIO VALUES IN THE
INDUSTRY!

GET A TRANSMITTER NICAD
BATTERY NOW AND MAKE
YOUR TOWER HOBBIES 3 CHANNEL
ALL NICAD! ONLY \$14.98!
STOCK No. RCM203



TOWER THREE CHANNEL SYSTEM - The Tower 3 channel transmitter comes in the popular single stick closed gimbal configuration. Standard equipment includes a fully proportional third channel, two KPS-14 servos, lightweight slimline high range receiver which is very convenient to install, powerful 450 MAH nicad receiver battery pack, charger, switch harness with external receptacle for charging convenience, servo accessories, and a dual function meter that indicates both RF and absolute battery voltage. The dry cell transmitter (battery not included) can easily be converted to nicad operation by adding a nicad pack. The Tower 3 channel system has an airborne pack weight of only 7.9 ounces.
STOCK No. RCM204 **RETAIL \$210.00** **NOW ONLY \$119.95**

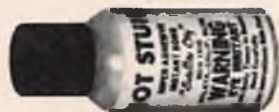


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HOT STUFF 40% OFF



Hot Stuff is an instant bonding cyanoacrylate super adhesive that is a must for modelers. Stock up now at this super price. .5 oz.

RETAIL NOW ONLY \$2.38
\$3.95 RCM007

TOWER HOBBIES 48% OFF
R/C LONG GLOW PLUGS

These excellent glow plugs feature an idle bar. Made by the world's finest plug manufacturer especially for Tower. 6 plugs per package. The best buy anywhere!



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\$8.94 RCM002

COX READY TO FLY SPORTAVIA 34% OFF
THE PERFECT TRAINER



This ready-to-fly foam design has been acclaimed by many flyers to be undoubtedly the best trainer ever for the first-flight beginner. Its 70" span, slow flight, and unbelievable stability make it a beginner's dream. It comes complete with a Cox .049 engine and all hardware installed. Molded cavities inside the fuselage are designed so the Sanwa No. 8020 2 channel radio drops right into place. With very little change any 2 channel works great. Factory finished in gleaming white with pressure sensitive decals. No building required. Be in the air in less than 1 hour. Radio not included.

RETAIL \$89.95 NOW ONLY \$59.48 RCM014

STERLING 39% OFF
1/2 A CORSAIR

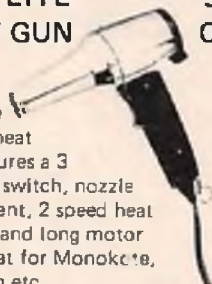


This all balsa 36" span kit features special hardware and decal sheet. Requires a .049-.10 engine and a 2 channel radio.

RETAIL NOW ONLY \$19.48
\$31.95 RCM003

TOP FLITE 33% OFF
HEAT GUN

This fine quality heat gun features a 3 position switch, nozzle attachment, 2 speed heat control, and long motor life. Great for Monokote, Solarfilm etc.



RETAIL NOW ONLY \$19.98
\$29.95 RCM005

COX/SANWA No. 8020 2 CHANNEL RADIO

30% OFF



This 2 channel favorite comes with 2 micro servos which will fit into the smallest airplanes, gliders, cars, or boats. It is designed to drop right into the Sportavia and Centurion. 12 pencil batteries are required.

RETAIL NOW ONLY \$69.98
\$99.95 RCM105

FUTABA FP-2GS 2 CHAN. RADIO

30% OFF



This is the least expensive 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 11 pencil batteries.

RETAIL NOW ONLY \$69.98
\$99.95 RCM091

DUMAS 35% OFF
HOT SHOT 21



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 NOW ONLY \$45.48
\$70.00 RCM008

K&B .21 40% OFF
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This water cooled 3.5cc competition engine is the ultimate in outboard engines. It offers the superior control characteristics of outboard drive.



RETAIL NOW ONLY \$63.98
\$107.00 RCM152

COX READY TO FLY CESSNA CENTURION

35% 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

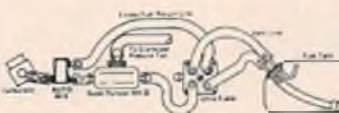
K&B .61 RC 40% OFF
W/MUFFLER No. 6525



Features a new crankshaft that eliminates the necessity of enlarging the hole in propellers. A top performing pattern engine that competes with the best.

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This device actually reads fuel pump delivery and engine fuel requirements and routes excess fuel back to the tank via the overflow line. Works on all displacement type fuel pumps.

RETAIL NOW ONLY \$7.48
\$9.95 RCM255

DU-BRO KWIK FILL FUEL PUMP

36% OFF



RETAIL \$10.95
NOW ONLY \$6.98
RCM010

HOUSE OF BALSA 31% OFF
P.51D (.29-.40)



This outstanding all balsa sport, stand-off scale ship is beautiful. 49" span. Requires a .29-.40 size engine and a 4 channel radio.

RETAIL NOW ONLY \$44.98
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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 NOW ONLY \$13.98
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**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.

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

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Develops 2 horsepower! An engine suitable for large models with its scale-like sound and realistic performance. Comes with muffler, mount, and Tillitson pump/carb.

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



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

RETAIL NOW ONLY \$3.98
\$6.25 RCM018

**DREMEL 572
MOTO SHOP** **36% OFF**



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

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**GOLDBERG
FALCON 56 MK II** **40% OFF**



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

RETAIL NOW ONLY \$28.78
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**K&B .40 RC ENGINE
No. 8011** **40% OFF**




THE MOST POPULAR RC ENGINE EVER MADE!!

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

RETAIL NOW ONLY \$43.48
\$72.50 RCM009

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

RETAIL NOW ONLY \$46.98
\$59.95 RCM023

RCMD24 9.6 volt
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!

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\$49.95 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 NOW ONLY \$23.98
\$38.95 RCM026

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

RETAIL NOW ONLY \$27.28
\$41.95 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 NOW ONLY \$79.98
\$99.95 RCM027

Bolink kit for above car - must be assembled. BEX-155.

RETAIL NOW ONLY \$59.98
\$79.95 RCM280

**CRAFT-AIR
FIELD BOX** **33% OFF**



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

RETAIL NOW ONLY \$19.98
\$29.95 RCM028

**CRAFT-AIR
HI-START
HEAVY DUTY** **38% OFF**



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

RETAIL NOW ONLY \$32.98
\$52.95 RCM029

**CRAFT-AIR
DRIFTER II** **30% OFF**



Would you believe? A competition sailplane for only \$13.98! It isn't just a trainer, it's a contest winner! 71 1/2" span. Uses a 2 channel radio.

RETAIL NOW ONLY \$13.98
\$19.95 RCM214

**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 NOW ONLY \$19.98
\$29.95 RCM031



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**FOX .40 RC
SCHNEURLE** 40%
OFF



No.24000

The economical Fox .40 RC Schneurle features a restyled exterior, steel thrust washer, improved carb suction, and lightweight pistons. Very good power!

RETAIL NOW ONLY \$27.58
\$45.95 RCM136

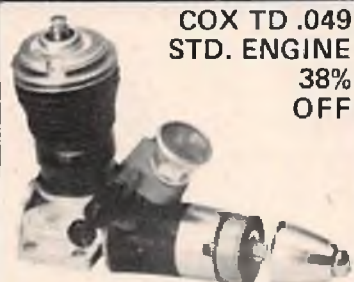
**BRIDI RCM
TRAINER 40** 32%
OFF



This popular all balsa trainer has a 52" span. Requires a .35 to .49 size engine and a 4 ch. radio. A high quality kit!

RETAIL NOW ONLY \$37.38
\$54.95 RCM034

**COX TD .049
STD. ENGINE** 38%
OFF



A super hot 1/8A engine ideal for free flight, control line, 1/8A RC, and more.

RETAIL NOW ONLY \$15.48
\$24.95 RCM035

**PEERLESS
POP BUGGY** 37%
OFF



Designed for a .15-.21 size engine and a 2 ch. radio. 19" length. Body is made of tough ABS plastic. Built-in pull cord starter.

RETAIL NOW ONLY \$87.98
\$140.00 RCM281

**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 NOW ONLY \$11.98
\$23.95 RCM037

**AFI
6 & 12 VOLT
BATTERY
CHARGER**

This high quality charger is designed to charge 6 or 12 volt wet or gel cell batteries. It works very well with the battery at left. Charges overnight from a 110 volt wall outlet. It's safe and easy to use. These chargers are tested twice before they leave the factory.

RETAIL NOW ONLY \$6.98
\$13.95 RCM038

**SCHLUTER
HELI-BOY**



The best RC helicopter ever made! Requires a .60 size engine and a 4 ch. radio. Collective pitch is standard. Features no-belt starting. Can be started with a Sullivan Electric Starter and a starter extension.

CALL FOR PRICE!

**ANDREWS
AEROMASTER** 35%
OFF



The world's most popular RC biplane! This balsa kit has a 52 1/2" span. Uses a .60-.78 size engine and a 4 channel radio.

RETAIL NOW ONLY \$51.98
\$79.95 RCM065

**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 NOW ONLY \$22.48
\$34.95 RCM033

**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 NOW ONLY \$74.98
\$125.00 RCM042

**BRIDI RCM
TRAINER 60** 32%
OFF



This popular all balsa trainer has a 58" span. Requires a .40 to .60 size engine and a 4 ch. radio. It makes a great trainer.

RETAIL NOW ONLY \$42.78
\$62.95 RCM043

**FOX .45 RC
BALL-BEARING
SCHNEURLE
NO.24600** 40%
OFF



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 NOW ONLY \$38.98
\$64.95 RCM044

**HB .61 RC PDP
No.6300** 30%
OFF



This powerful, high quality ball bearing engine comes with a Perry carb and features Perry Directional Porting for increased power.

RETAIL NOW ONLY \$83.48
\$119.26 RCM143

**SIG KADET
WITH AILERONS** 28%
OFF



The Kadet is an excellent trainer! This balsa kit has been improved to include ailerons! 57" span. Requires a 3-4 ch. radio and a .19-.35 size engine. Easy to follow plans and accessories included.

RETAIL NOW ONLY \$28.78
\$39.95 RCM256

**LANIER
COMET II** 36%
OFF



This popular trainer comes almost-ready-to-fly. 63" span. Designed for a 4 ch. radio and a .50-.61 engine. The Comet II makes a great trainer!

RETAIL NOW ONLY \$39.98
\$62.50 RCM047

**ASSOCIATED
RC 200 KIT** 39%
OFF



See Tower Hobbies Catalog P.118 for available bodies. 22" body length. Features ball bearings for rear axle & clutch, glass chassis, disc brakes. Kit comes complete less engine, body, & radio. Best gas car anywhere!

RETAIL NOW ONLY \$119.98
\$195.00 RCM048

HOBBIES

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(217) 384-1010

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CONTINENTAL UNITED STATES TOLL FREE: 800-637-7686

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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 NOW ONLY \$62.98
\$105.00 RCM049

**ASSOCIATED RC 12E
ELECTRIC CAR KIT** **30%
OFF**



No. 3012
This is the 1/12 scale electric race car that was the winner of the first 4 places at the 1977 ROAR Nationals! Motor and radio (requires a 2 ch. radio) are not included. Fiberglass chassis.
RETAIL NOW ONLY \$69.98
\$102.00 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 NOW ONLY \$58.48
\$89.95 RCM051

**JENSEN DAS
UGLY STICK** **35%
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 NOW ONLY \$44.98
\$69.50 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 NOW ONLY \$45.48
\$64.98 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 NOW ONLY \$27.98
\$42.95 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 NOW ONLY \$39.98
\$59.95 RCM055

**DREMEL 580
TABLE SAW** **40%
OFF**



Multi-purpose table saw especially designed for hobbyists. Rips, cross cuts, miters, straight cuts, dadoes.
RETAIL NOW ONLY \$59.98
\$99.95 RCM056

CUTS
UP TO
1"
THICK-
NESS!

**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 NOW ONLY \$21.38
\$32.95 RCM057

**STERLING
PUDDLE
JUMPER MK II** **35%
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 NOW ONLY \$27.28
\$41.95 RCM058

**LATRAX CORVETTE
W/RADIO** **28%
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 NOW ONLY \$114.98
\$159.95 RCM244

**O.S. MAX .60 FSR
RC W/ MUFFLER** **32%
OFF**



This is a front rotor, Schneurler ported ball bearing RC engine that comes complete with a muffler. O.S. Max is known for high quality!
RETAIL NOW ONLY \$88.98
\$129.95 RCM243

**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 NOW ONLY \$12.98
\$19.95 RCM041

**STAFFORD TWIN
COMANCHE** **30%
OFF**



This museum scale twin is always in high demand. 72" span. Requires two .40 size engines and a 4-6 ch. radio. This balsa kit includes precision molded fittings.
RETAIL NOW ONLY \$97.98
\$139.95 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 NOW ONLY \$22.38
\$35.00 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, hobby-craft saw, spokeshave, balsa stripper, pin vise, screwdriver, asstd. drill bits. Comes in a large fitted wood chest.
RETAIL NOW ONLY \$20.98
\$29.95 RCM004

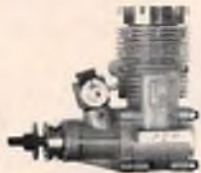


TOWER

P.O. BOX 778
CHAMPAIGN, ILLINOIS 61820

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HB .40 RC PDP 29%
No. 4200 OFF



This powerful, high quality ball bearing engine comes with a Perry Carb and features Perry Directional Porting for increased power (HB .61 RC PDP pictured).

RETAIL NOW ONLY \$59.98
\$84.34 RCM142

ZINGER 35%
WOOD OFF
PROPS



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

10X6 WOOD PROPS(6)
RETAIL NOW ONLY \$5.48
\$8.40 RCM021

11X7 WOOD PROPS(6)
RETAIL NOW ONLY \$6.28
\$9.60 RCM022

FOX 1.2 CU. IN. 30%
OPPOSED TWIN 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 NOW ONLY \$174.98
\$250.00 RCM234

TOP FLITE 40%
F4U-1A CORSAIR 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 NOW ONLY \$59.98
\$99.95 RCM277

PICA 33%
CESSNA OFF



NEW!! This balsa scale ship makes an ideal scale trainer with a .40 size engine, & with a .60, it's great for aerobatics. 72" span. Requires a 4-5 ch. radio. Hardware, molded parts, & plans included.

RETAIL NOW ONLY \$59.98
\$89.95 RCM254

MRC RTF 27%
HAWK TRAINER 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 NOW ONLY \$73.48
\$99.95 RCM069

MRC FMC 20%
COMBAT VEHICLE 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 NOW ONLY \$59.98
\$74.98 RCM070

ROBERT SUPER 40%
PUMPER MKII OFF



This "in-line" fuel pump is a simple, easy, and reliable way to pressurize any engine. Fits into fuel line.

RETAIL NOW ONLY \$10.78
\$17.95 RCM227

MRC LEOPARD 20%
ELECTRIC TANK 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 NOW ONLY \$139.98
\$174.98 RCM072

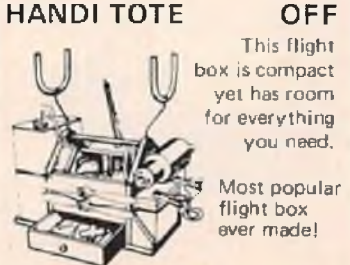
COX 30%
READY TO FLY OFF
CUB TRAINER



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 28 3/4" wingspan.

RETAIL NOW ONLY \$69.98
\$99.95 RCM233

GOLDBERG 30%
HANDI TOTE OFF



This flight box is compact yet has room for everything you need.

Most popular flight box ever made!

RETAIL NOW ONLY \$11.88
\$16.95 RCM006

PICA WACO 33%
BIPLANE 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 NOW ONLY \$53.58
\$79.95 RCM165

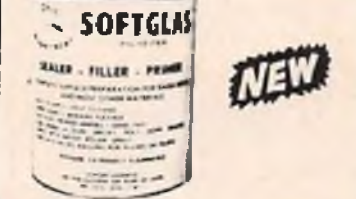
MRC MARTINI 30%
PORSCHE OFF



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 NOW ONLY \$47.58
\$67.98 RCM073

SOFTGLAS 22%
PRIMER 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 NOW ONLY \$6.98
\$8.95 RCM077

MIDWEST 40%
SWEET STIK 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 NOW ONLY \$25.78
\$42.95 RCM078

GOLDBERG 40%
SR. FALCON 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 NOW ONLY \$38.98
\$64.95 RCM079

HOBBIES

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*Radio
Sale!*

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	42.95	29.98	RCM273

MODEL	RETAIL	NOW ONLY	STOCK NUMBER
FUTABA FUTABA FUTABA FUTABA FUTABA			
FP-2GS	109.95	69.98	RCM091
FP-2F w/S-7's	149.95	98.98	RCM092
FP-2F w/S-18's or S-22's	134.95	86.98	RCM274
FP-2E w/S-7's	149.95	98.98	RCM093
FP-2E w/S-22's	134.95	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-3FN w/S-18's or S-22's	219.95	139.98	RCM095
FP-4FN w/S-18's	289.95	179.98	RCM096
FP-4FN w/S-16's	319.95	199.98	RCM097
FP-5FN w/S-18's	319.95	204.98	RCM276
FP-5FN w/S-16's	359.95	222.98	RCM098
FP-6FN w/S-18's	339.95	209.98	RCM099
FP-6FN w/S-16's	369.95	234.98	RCM100
S-16 Servo	39.95	29.98	RCM103
S-7 Servo	39.95	29.98	RCM104

MODEL	RETAIL	NOW ONLY	STOCK NUMBER
MRC MRC MRC MRC MRC MRC MRC MRC			
MRC 2 Ch. No.772	119.95	80.98	RCM282
MRC 5 Ch. No.765	349.95	199.98	RCM283
MRC 5 Ch. No.775	379.95	239.98	RCM225
SANWA SANWA SANWA SANWA SANWA SANWA			
No.8020 2 Channel	99.95	69.98	RCM105

STOCK NUMBER	DESCRIPTION	RETAIL	NOW ONLY
RCM107	Airtronics Aquila	\$74.95	\$52.48
RCM030	Airtronics Olympic II	49.95	34.98
RCM251	Badger 200-1 Air-Brush Kit	32.95	21.38
RCM286	Bridi Deception	89.95	61.18
RCM209	Bridi Dirty Birdy 40 - wood	59.95	40.78
RCM114	Bridi Dirty Birdy 60 - wood	84.95	57.78
RCM210	Bridi Dirty Birdy 60 - glass	124.95	89.98
RCM115	Bridi Sun Fly 4-20	29.95	20.38
RCM116	Bridi Super Kaos 40	55.95	37.98
RCM118	Bridi Super Kaos 60	89.95	47.58
RCM061	Bridi UFO	129.95	93.58
RCM124	Coverite Balsarite	3.20	1.98
RCM125	Cox Electric Ferrari	119.95	83.98
RCM126	Cox Tee Dee .051	24.95	15.48
RCM128	Craft-Air Butterfly II	49.95	32.48
RCM212	Craft-Air SD-100 Glider	59.95	35.98
RCM129	Craft-Air Windrifter w/Spoiler	49.95	29.98
RCM291	1/2 Scale Custom Retracts - mains	CALL FOR PRICE	
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	50.00	32.48
RCM219	Dumas Hot Shot - wood	32.00	20.78
RCM236	Edson Adjustable Motor Mount	6.95	5.58
RCM132	Fox .15 RC Schnaurle	37.95	22.78
RCM133	Fox .19 RC	36.95	22.18
RCM135	Fox .36 RC	39.95	23.98
RCM137	Fox .45 RC Schnaurle	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	34.95	23.98
	HB Engines	Call For Low Price	
RCM144	Hobbyxoxy Formula 2 Epoxy	4.25	2.98
RCM287	House of Balsa .40 P-51D - glass	109.95	79.98
	Jemco Kits	25 - 30% Off Retail	
RCM151	K&B .40 RC Sport Marine	82.50	49.48
RCM153	K&B .21 Inboard	74.00	44.58
RCM292	K&B No. 9120 .40 RR RE Form I	92.00	54.98
RCM239	L&L On-Board Ignition System	19.95	13.98
RCM223	Lanier Jester II	73.50	45.58
RCM156	Mark's Bushwacker w/accessories	52.95	31.78
RCM157	Man Trainer (.15 -.25)	31.95	22.38
	Manokote Reg & Trans 6' rolls	9.00	4.98
RCM242	OPS .60 RC Marina w/Tuned Pipe	189.00	139.98
	O.S. Max & Supertigre Engines	Call For Prices	
RCM013	Pacer Zap .36 oz	3.50	1.98
RCM288	Powr-mite H.D. Electric Sander	34.95	26.98
RCM284	Rhom 2 Gear Retracts - mains	87.00	56.58
RCM285	Rhom 3 Gear Retracts - firewall	125.00	79.98
RCM227	Robert Super Pumper MK II	17.95	10.78
RCM166	Robert Wing Incidence Meter	15.95	10.98
RCM290	Royal Photocell Tachometer	39.95	33.98
RCM168	Sealector Custom Iron	28.35	19.98
RCM257	Sig Cougar	47.50	34.18
RCM289	Sig Piper J-3 Cub	44.95	32.38
RCM258	Sig Smith Miniplane	54.95	39.58
RCM171	Skyglas Cureare	70.00	45.48
RCM169	Skyglas Phoenix 5	55.00	36.98
RCM170	Skyglas Phoenix 6	70.00	45.48
RCM172	Skyglas Vertigo II	70.00	45.48
RCM173	Silmline Muffler for K&B .36-.40	9.95	5.98
	Solarfilm - Reg. Colors	7.98	3.98
RCM174	Sonic GR-3A Retract System	55.90	36.38
RCM177	Southern RC Compensator - glass	89.95	58.48
RCM179	Soniconics 12 v. Fuel Pump	15.95	11.98
RCM180	Starling Fledgling	41.95	26.48
RCM183	Sureflite Foam Skylane 182	39.95	25.98
RCM184	Sureflite Foam J-3 Cub	39.95	25.98
RCM185	Sureflite Spitfire - foam	39.95	25.98
RCM231	L.R. Taylor Multi-Charger	24.95	19.98
RCM188	Top Flite Freshman Trainer	47.95	29.18
RCM229	Top Flite Contender	56.95	34.18
RCM189	Top Flite P-51 Mustang	74.95	44.98
RCM190	Top Flite P-40 Warhawk	74.95	44.98
RCM186	Top Flite 10x6 (12) Super Maple	16.20	10.58
RCM187	Top Flite 11x7 (12) Super Maple	18.60	11.98
RCM230	Tower No. 11 Knife Blades (5)	.80	.48
RCM191	Tower 12 v. Gel-Cell	26.95	18.98
RCM201	Wing Love Machine	49.95	27.98

B. D. HOBBY WAREHOUSE

1128 ORCHARD AVE. · Louisville, KY. 40213 · (502) 966-2313

2 Channel Single stick	List Price	Our Price	Channels	Servos
Cox 8022	139.95	95	2	no
Logictrol Nimbus	141.75	103	2	no
2 Channel Dual stick				
Cox 8020	99.95	70	2	no
Futaba FP-2GS	109.95	77	2	no
Futaba FP-2E	149.95	100	2	no
Futaba FP-2E 518	134.95	91	2	no
MRC 772	119.95	84	2	no
2 Channel Wheel				
Cox 8021	139.95	93	2	no
Futaba FP-2F	149.95	100	2	no
Futaba FP-2F 518	134.95	91	2	no
3 Channel Single stick				
Cox 8031	159.95	104	2	no
Futaba FP-3S	169.95	113	2	no
Futaba FP-3S 518	144.95	97	2	no
Logictrol LRB-3	166.95	105	2	no
Logictrol Ranger	187.95	119	2	no
3 Channel Dual stick				
Futaba FP-3FN	219.95	145	2	yes
4 Channel				
Cox 8040	259.95	189	4	yes
Cox 8044	279.95	178	4	yes
Cox 8048	449.95	285	4	yes
Futaba FP-4s	319.95	203	4	yes
Futaba FP-4FN 518	289.95	188	4	yes
Logictrol Nimbus	324.50	197	4	yes
MRC 774	279.95	189	4	yes
5 Channel Dual stick				
Cox 8054	299.95	190	4	yes
Futaba FP-5FN	359.95	225	4	yes
Logictrol LRB 2-5	295.25	188	4	exactly
Logictrol Champion	388.50	237	4	yes
MRC 775	279.95	251	4	yes
5 Channel Single stick				
Logictrol LRB 1-5	325.50	207	4	exactly
6 Channel				
Cox 8060	369.95	230	4	yes
Cox 8068	479.95	305	4	yes
Futaba FP-6FN	369.95	234	4	yes
Futaba FP-6FN 518	339.95	216	4	yes
7 Channel Dual stick				
Futaba FP-7G	579.95	385	4	yes
Logictrol Super Pro	440.95	268	4	yes
7 Channel Single stick				
Logictrol Super Pro	463.00	284	4	yes

AIRTRONICS KITS

	List Price	Our Price
Aero-Star	89.95	63.00
Aquila	74.95	52.50
Aquila Grande	129.95	91.00
Gere Sport	39.95	28.00
Olympic II	49.95	35.00
Q-Tee	21.95	15.40
S-Tee	21.95	15.40
Super Questor	39.95	28.00

COX

	List Price	Our Price
T D .049	25.00	15.00
T D .051	25.00	15.00
Med .049	17.00	10.20
Q R C .049	15.00	9.00
Golden Bee .049 R C	15.00	8.50

CRAFT AIRE

	List Price	Our Price
Drifter II	19.95	14.00
Viking	79.95	56.00
Butterfly II	49.95	35.00
Windrifter	47.95	33.60

GUILLOWS KITS

	List Price	Our Price
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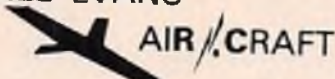
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PIT STOP

from page 101/72

differential did indeed lock up, and then the car felt like a solid axle car. I no sooner got home, than Jack called. I gave him a full report on how the car acted and he said, "Send the car back fast! The snow's melting and I've found a voltage regulator for the brakes and I've just finished building a new limited slip diff!" And so it goes!!

KAVALIER

from page 71

construction steps in order! Oh, I almost forgot, you also have to follow your decision made with the wing, whether it's bolt on or rubber banded. All the steps are covered so just be sure to build in the correct construction for your choice. Mine was a bolted on wing.

The tail group is very straightforward. The stab is "built-up" in order to save some weight and provide a straighter surface. The fin is solid and can be mounted in any of three methods — your choice.

Now that all the construction is complete, it's time for the finishing process to begin. I used Sig silk with Sig dope. The manual suggests, and I agree, that individual parts be covered before final assembly begins.

You will notice by the picture that I did not put a canopy on this one. The first one had a canopy and pilot and one of the comments I heard several times was that it probably took too much time to build the Kavalier over one of the "Ugly" shoulder wing airplanes that are very common at most flying fields. I personally don't see much difference in construction time but take your choice — I think the Kavalier looks nice either way but I prefer the canopy version.

Well, after all the building and finishing, it's time to finalize equipment installation. I used a new Kraft 7 channel radio for guidance and a K & B .40 FR for power. Both products compliment a super model. I might mention that our K & B .40 makes the Kavalier an exciting performer, so if you are rather new, you better plan to throttle back some or you might find yourself in rare air.

Proof of the building is the flying — if you have followed all the instructions, you will be rewarded by an outstanding craft in the air. Slow speed flight is a thing of beauty with no tendency for tip stall. High speed flight is smooth and very similar to pattern aircraft flight. All in all, I can't say enough good about the aircraft.

Sig Mfg. Co. has again provided the modeling public with an outstanding product at a reasonable price for which they are to be congratulated.



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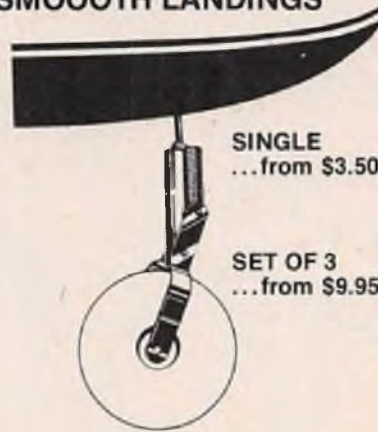
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TRADE WINDS

from page 70

... complete with planking lines, cockpit and cabin openings, chain plates (for the attachment of the forestay, backstay, and shroud lines) and the mast step. After lifting out the hull-deck, we turned our attention to the rest of the package. And what a package! The molded foam cabin and cockpit proved to be perfect

fits, and were already painted white with the same exceptional finish we had found on the hull. More digging brought out the two-piece mast, the main boom, and the jib boom. All of these are of aluminum, and we feel we'd be remiss if we didn't spend a little time telling you about them, with special emphasis on the mast. It would have been very easy to have used ordinary aluminum tubing and let it go at that, but Cox chose to do it right by developing a special extrusion that is almost exactly like the masts used on full scale boats. In cross section it is a tear drop, or streamline shape, with an internal cross brace, and is slotted on the aft or trailing edge so as to accept the

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to page 116

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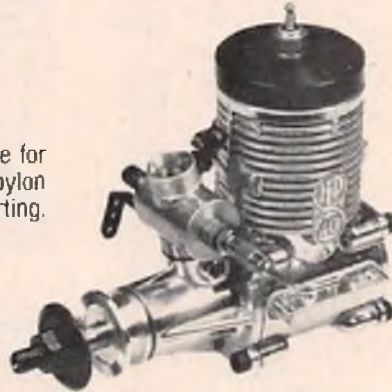
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TRADE WINDS

from page 114/70

caps, and present a very attractive and scale-like appearance.

Sails were packaged in separate plastic envelopes and these sails, like the mast and booms, proved to be of exceptional quality. Taking them one at a time, we'll start with the main. We found it to be of white, lightweight rip stop nylon, reinforced at all three corners, eyelets in each corner, three sewn-in battens, and an already installed main halyard. The jib was of identical construction except for being

slightly smaller, of course, and was a beautiful cream yellow color. If you think all this sounds like Trade Winds is a very complete kit, we are here to tell you, you are so right. But there is more. For example, there is a pre-molded tray that accepts your rudder servo, receiver, and battery. Double sided foam tape is furnished that insures a solid installation of the tray to the hull interior. Just to take the whole thing a step further, identification lines are molded on the interior of the hull so that proper alignment will be assured. The rudder is of a hard finished white plastic (it looked like ABS to us), as is the keel. The rudder is held in position by the rudder horn (included), and the keel is held by two

keel bolts and wing nuts (also included). As you can see, you don't really build this boat, you sort of assemble it. We say "sort of" because so much of it has already been pre-assembled at the factory. Included in the kit was material to build a hardwood cradle which can be used as a building stand while assembling Trade Winds. We later found it to be almost essential when going sailing as it allows the boat to be set down in a proper upright position while bolting (or unbolting) the keel and rudder.

Aside from having to furnish your own radio, the only other thing that is not included in the kit is ballast. The manual suggests a tad over 5 pounds of #8 or #9 lead shot which is introduced into the keel by way of a flat, slotted plastic plug located in the top flat part of this unit. We suggest you locate someone who reloads his own shotgun ammo and buy your five or so pounds of #8 or #9 lead shot from him. Otherwise you'll find, as we did, that gun stores, and sporting good stores sell it in twenty five pound sacks only!

To guide us in the assembly, and sailing of Trade Winds, we found the 14 page Owner's Manual to be extremely valuable and well done. Including the one of the finished boat on the cover, there are 36 clear, concise, and very instructive photos in the manual. Also included are line drawings that not only assist in the assembly, but also include some very good pointers on sailing. Written instructions are, like all the rest of this kit exceptional. Subjects covered in the manual range from assembly of the hardwood cradle, radio installation, keel installation, assembly of standing rigging (mast, sails, and shrouds), and tuning Trade Winds for sailing. There is even a glossary of nautical terms in the back of the manual, to keep you on course. And just to put the frosting on the cake, Cox has printed on the cover of the manual, in large bold type, Their Action Hot Line telephone number which can be called toll free from anywhere in the continental U.S.A. if you need advice or help!

We installed our Cox/Sanwa #802102 (\$139.95) two channel system which was expressly designed for boats and cars, and has a steering wheel that actuates the rudder servo. We also installed a Cox/Sanwa Sail Winch (cat. #803810, \$59.95), and controlled it with the spring loaded throttle lever located on the right side of our 802102 transmitter. The jib and mainsail are designed to work together as a team, converting the energy of the wind into forward motion of the boat and, because of this, the two sails must be trimmed to work as one. Basically, all this means is that both sails should remain parallel to each other at all sail settings, forming a sort of slot between them. The more swiftly the wind moves through this slot,

the more leeward pressure is reduced which, in turn, increases the pull on the windward side of the sails. Using our Cox/Sanwa Sail Winch allowed us to adjust the sails and maintain their parallel position to each other . . . and do it all from shore! The one time when the slot effect is not necessary is when running before the wind, i.e., downwind. We found that, through the use of the sail winch, after we allowed the booms to ease all the way out, we could give the wheel a little nudge and as soon as the jib swung over to the opposite side, straighten the rudder and allow the boat to run dead before the wind "wing and wing" . . . the jib boomed out on one side, and the main on the other. Trade Winds proved to be a real pleasure regardless of wind conditions. The first time we tried her, there wasn't enough wind blowing to even be sure of its direction and, yet, we still managed to make good enough headway to have an enjoyable sail. The next time out the wind was great . . . and so was our boat. While driving close hauled (as close up into the wind as possible), we pulled in the sails with the winch, got the rail down, and went like a bomb! Beautiful! With the combination of rudder control and sail winch, we found sailing easy and a real pleasure. We also tried Trade Winds with rudder control only and, although we missed the downwind advantage the sail winch would have given, we were still able to move about in fine style, with complete control at all times.

So there you are, all you airplane types, wondering whether or not to come down out of the wild blue and try sailing. Perhaps you're even wondering if you **can** sail. Well, wonder no more. This was our first encounter with R/C sailboats, and we found it easy and fun. As a matter of fact, we found we could hand over the transmitter to a total novice with complete confidence in their ability to control our boat. Our biggest problem always came when we wanted it back!

Trade Winds is truly a worthy addition to our hobby of radio control, and Cox Hobbies are to be congratulated on another fine quality product. With its easy assembly, and ease of handling, Trade Winds is instant fun . . . just add water! □

BIG IS BEAUTIFUL

from page 69

off the excessive heat that can melt it. The material will still get hot enough, the heat sink will prevent it from melting only. The flux will indicate when the rod is going to run. The flux when applied is a sort of drippy paste, then, as the heat is applied, it dries out. As the heat

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continues and intensifies, it will turn liquid again and that's when the rod is applied. It will run like water. At that point, get the heat out of there as quickly as possible. Any continuation of the heat and the base metal will run and you've wasted your time.

As in any work of this sort, the metal being joined must be perfectly clean prior to the work beginning and it must be cleaned after the joint has been made. Bob says it will take a few tries to get it right but, once you catch on to the knack, you'll be able to duplicate the method 24 out of 25 tries. (Just make sure that 25th one is where it won't do any harm!)

I must admit he seems to be correct in

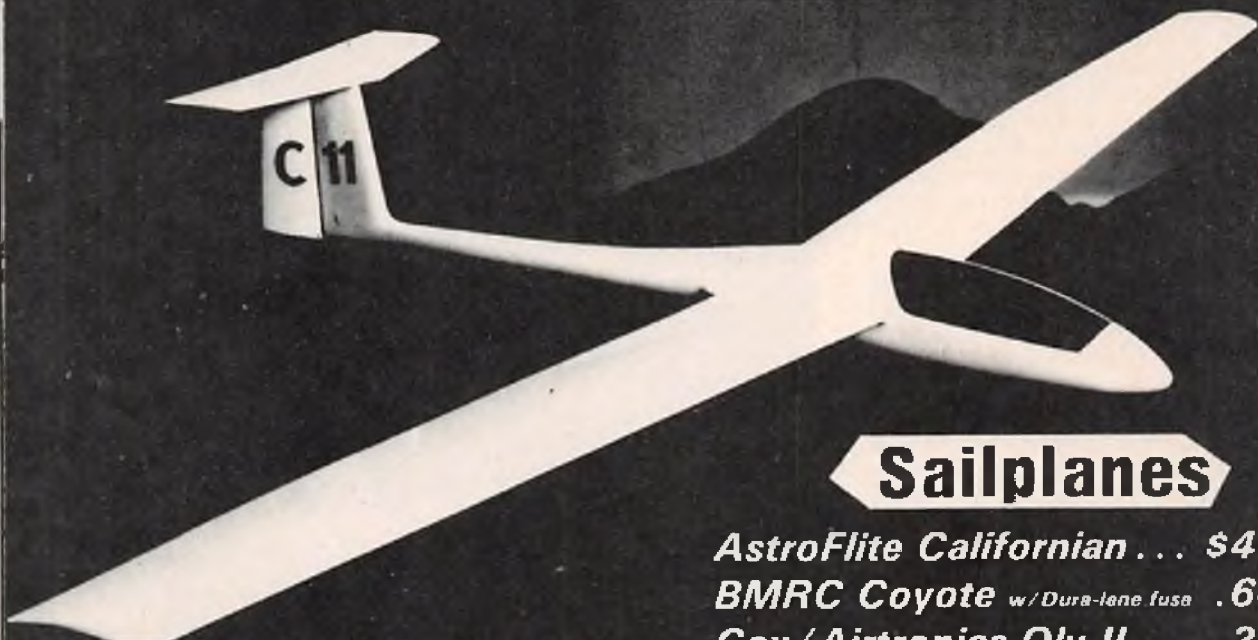
his method, as it works for me, I haven't quite gotten to the point of being able to get 24 out of 25 yet, but I'm working on it.



Regular readers will recognize the name of Dario Brisighella as the guy who does the balance job on the Quadra flywheels. He is also well known in the East for the kind of building he does. He has launched a new project for himself — a PT-19 — and has sent me a few pictures I'd like to share with you. The fuselage presently weighs in at 16 pounds. Dario estimates the weight of the completed model at around 24 to 26 pounds, which should fly well. The white area forward is foam from which Dario

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BIG IS BEAUTIFUL

from page 117/69

uses to form the fiberglass cowl. The foam will be dissolved out with solvent after completion of the cowl. The advantage is that the foam is readily worked with a sharp knife and sandpaper to the required shape. (Messy, but easy to do!)



Dario Brisighella and his quarter scale PT-19. Model was partly done at the time of photo and was being shown in a mall show. White area up front is being prepared for construction of glass cowl.

Dario will have a plan available to anyone interested at some date in the future and the availability and the cost will be detailed here at that time.

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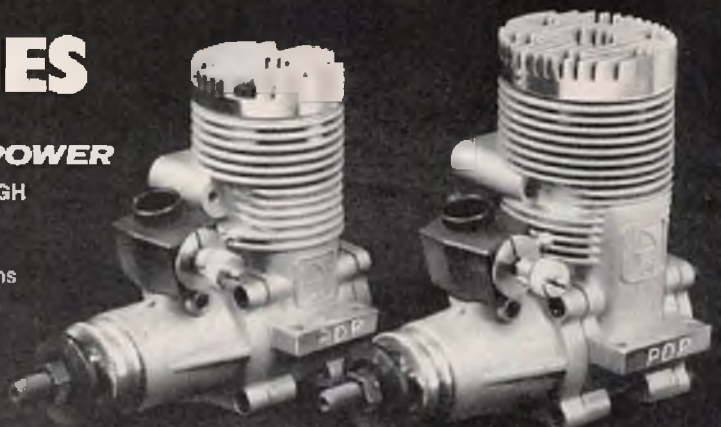
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BIG IS BEAUTIFUL

from page 120/69

The other photos are the left stab and elevator, and the landing gear. One look at that gear and you can appreciate why he has such a reputation for quality building! Now that's the type of work that manages high static scores, let there be no doubt. It's enough to make us 'hackers' curl up and quit building.



Scale gear for Dario Brisighella's PT-19. Ship is in quarter scale and workmanship is in the jewelry class.



Left elevator, stab and hinging on Dario Brisighella's PT-19. Note trim tab.

I recently got some samples of JP Products scale instruments in several different scales. My main interest was in those at 3" to the foot, naturally.

They come in two different styles --- one a fluorescent green as so many modern instruments are, and a set in white. Each of the two sets contain 35 different instruments (some duplicates, of course) and mounting instructions are printed on the back of the package.

They are printed on a matte surface which seems to cut down on their sharpness a bit, although I must admit I was looking at them with a 10 power jeweler's loupe, and that's not really fair. (Any judge caught doing so should be back-handed smartly across the mouth!) Prices are \$1.50 for the white and \$1.75 for the green.

JP Products, Rt. 3, Harrisburg, Illinois 62946, also make a Jet Instrument package in 1 1/2" and 2" to the foot at \$1.00 each. A helicopter and a WW II Military package in 1 3/4" to the foot at \$1.25 and \$1.00, respectively.

In addition, they produce a placard assortment which includes a section of chart, a plastic (paper) computer, compass deviation card, and various

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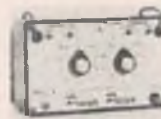


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Predict available flight time from receiver & transmitter NiCads. Use on 4 to 8 cell.



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L. R. Taylor

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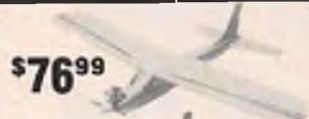


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Circle number 63 in Readers Service for FREE Hobby Market Price List

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\$160.00 K&B #9100 for ducted fan	\$ 96.00
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\$ 43.23 HB .15 w/muffler	\$ 30.25
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\$ 56.00 HB .25 w/muffler	\$ 39.20
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*Please check availability of OPS engines



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72 INCH WING SPAN

\$19.95

Wing Span 72 in.
Wing Area 563 sq. in.
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BIG IS BEAUTIFUL

from page 122/69

placards found in aircraft. These could be used in almost any scale without fear of their looking out of place. A similar package of 19 radios (both at \$1.50 each) could be used in the same way to dress up your cockpit or cabin area. All

items in these two packs are identified on the rear of the package for the benefit of those among us who are not right up to date on which is what.



I had a call from Bob Hutton of EWH recently and Bob advises they will have a 1.6 cubic inch engine on the market later this year. This is also a Homelite engine and one that Homelite has been marketing for some time on their weed

whip type of appliance. The engine burns gas/oil mixed, is throttleable and is a bit smaller and lower in power than their current Super Hustler engine.

I'm sure this size will receive pretty wide acceptance as many fliers are not quite ready to make the jump into 1/4 or 1/3 Scale and wish for something a little less imposing as a first effort. I have seen the engine in use on the weed whip
to page 130

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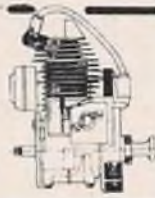


21 R/C (3.5 cc)

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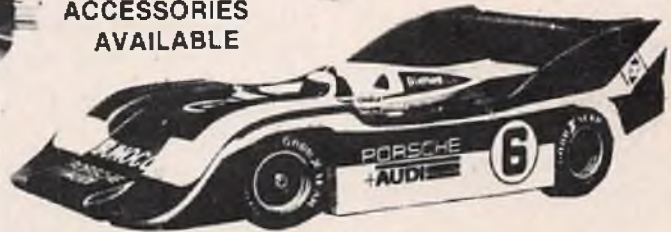
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- 555% sq in Wing Area
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MARK'S MODELS

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MiG-15

Wing Span - 57"
 Length - 55"
 Ready-to-fly weight - 8½ lbs.
 Wing area - 600 sq. inches

One of the most exciting aspects of this new addition to the Byron Originals line is the ducted fan unit provided as standard equipment with each MiG-15 kit. We named it the Byro-Jet for obvious reasons. Extensive development and testing has yielded the first lightweight yet rugged fan unit (11 oz.) that doesn't need exotic engines, high nitro fuel and complicated starting procedures to get the job done. How does a Schnuerle .60, low nitro fuel and easy starting engine sound instead?

Destined to change the image of ducted fan flight!

The new MiG-15 and its revolutionary ducted fan from Byron Originals is sure to change opinions of ducted fan design and performance the world over.

The only practical ducted fan that:

- Allows grass strip take-offs
- Offers fast and easy starting without removal and replacement of hatches.
- Eliminates complicated belt-start procedures.
- Readily accepts most standard .60 engines.
- Does **not** require high nitro fuel.
- Utilizes a more efficient push type propulsion system.
- Arrives factory-installed as standard equipment.
- Produces up to 8½ lbs. of static thrust with Schnuerle .60 and low nitro fuel.

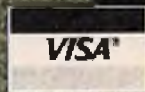


Further proof of the MiG's practical design is evident in the ease of accessing radio gear, engine, and fan unit. All control surfaces utilize center point hinging. Starting is quick and easy. Sullivan starter extension included in kit.

FACTORY DIRECT PRICE

\$168.00

Plus \$8.00 shipping charges to any address in U.S. Items shipped by United Parcel Service.



To order, use the handy order form on this brochure or call Ginny at (712) 364-3165. Optional epoxy/fiberglass kit for glassing wings and tail components available for \$22.50. Kit shipped via United Parcel Service.

Send me _____ MiG-15 kit(s) at \$168.00 ea. plus \$8.00 shipping.

Send me _____ Fiberglass Covering Kit at \$22.50 ea. plus \$2.50 shipping.

(Iowa residents add 3% sales tax.)

Name _____

Address _____

City _____ State _____ Zip _____

I have enclosed Check or Money Order for \$ _____

Visa# _____ Expires _____

Master Charge# _____ Expires _____

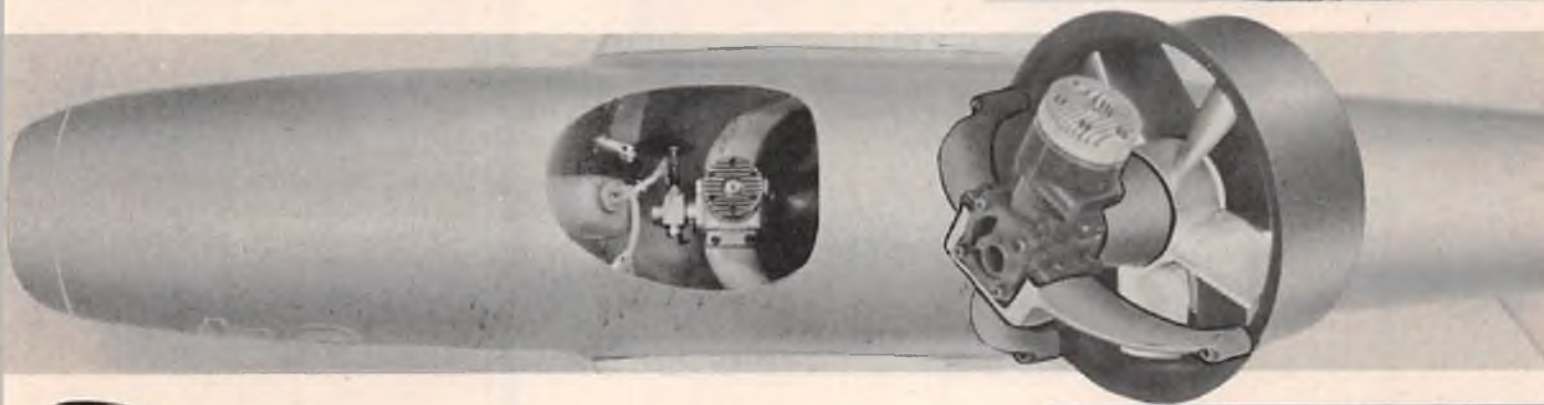
For overseas inquiries contact EXPORTATIONS LTD. 17835 Sky Park Circle, Suite Irvine, CA 92714, USA

Prices subject to change without notice
 Send to Byron Originals, P.O. Box 279, Ida Grove, Ia. 51445

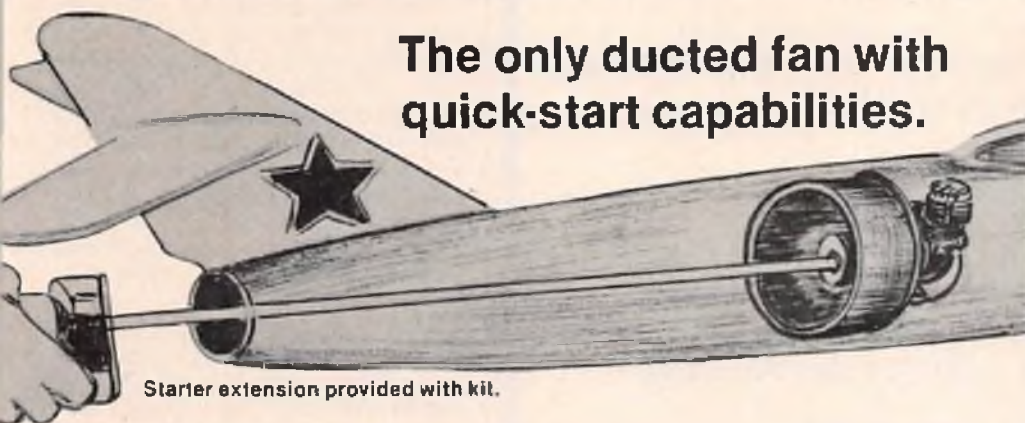
With factory-installed

BYRON ORIGINALS
Byrojet
PATENT PENDING

Easy access to radio and engine!



The only ducted fan with
quick-start capabilities.

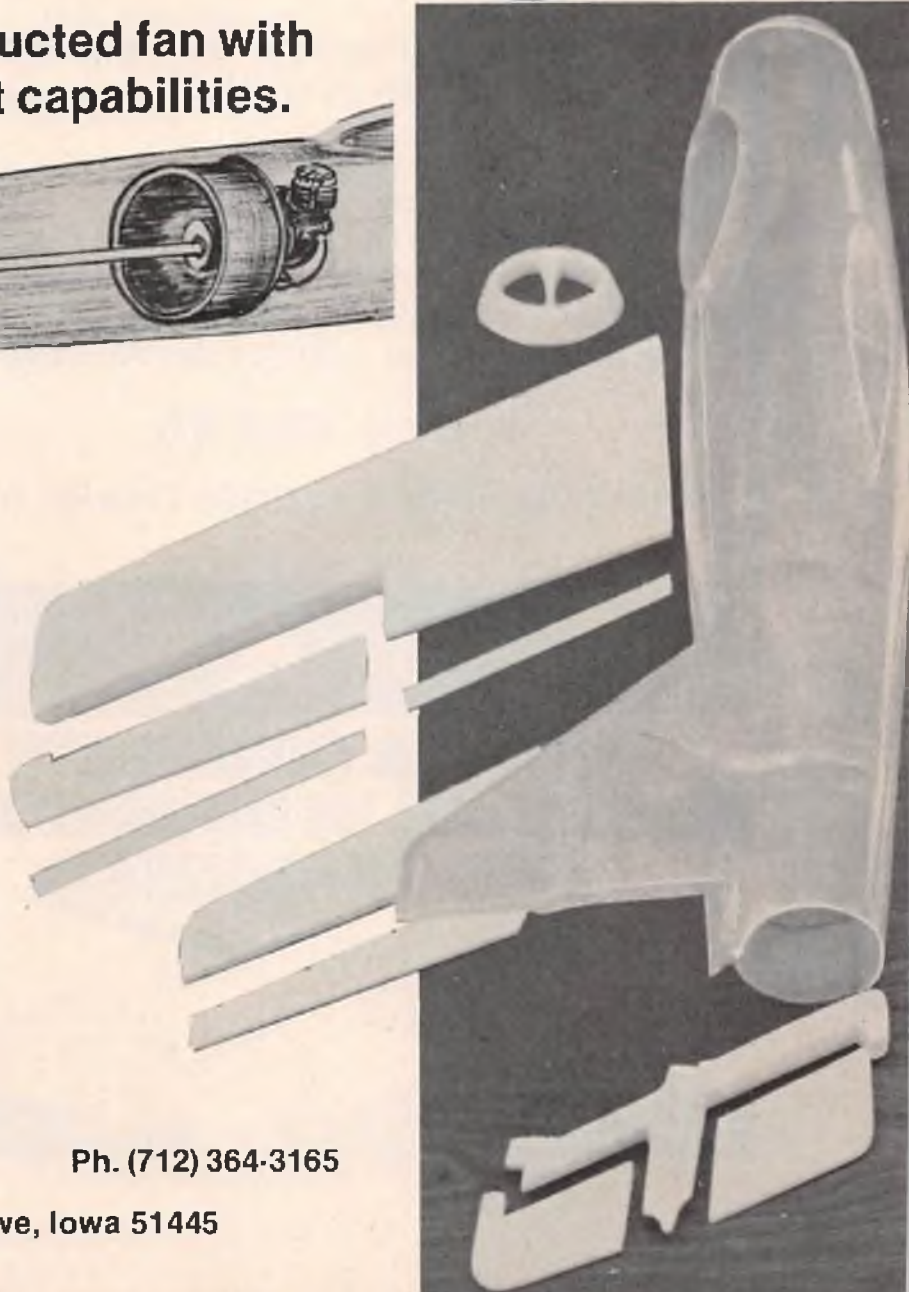


Starter extension provided with kit.

Quick assembly and scale accuracy

Unlike other quick-build kits that often sacrifice authentic details for fast assembly, Byron Originals has kept both authenticity and simplicity high on the priority list. All die-cut wood parts and 11 foam components needed for completion are designed with quick assembly, scale accuracy and minimized weight in mind. All foam modules made of lightweight yet impact resistant injection molded polystyrene.

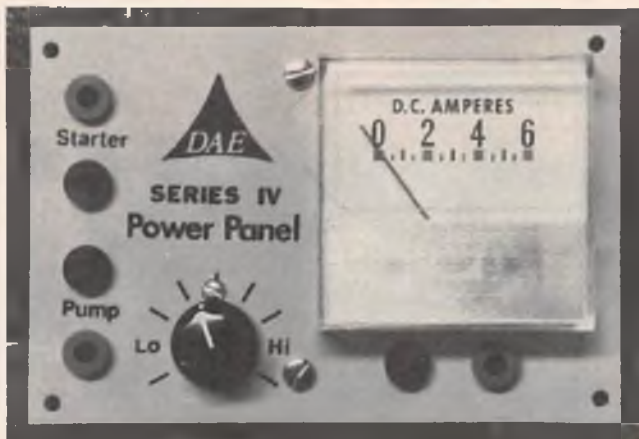
Fuselage consists of hand-laid fiberglass and arrives with fan unit, thrust tube, radio compartment and push rods already installed. All control surfaces utilize center point hinging, requiring only standard servos. Every last item, less radio, engine and final paint are included in kit. All decals and color scheme templates included. No shaping or carving required. No guesswork involved. Only quick, accurate and enjoyable building and flying.



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BIG IS BEAUTIFUL

from page 126/69

and was intrigued by it for use on a couple of smaller Biggies running around in the back of my mind. The 2 cubic inch engines (and larger) are a bit overwhelming when first seen and the 1.6 will go a long way to filling the gap between the large glow engines and the gasoline engines currently on the market.



L & L Electronics currently has an electronic ignition kit available for the modeler as well. They indicate that lower idle settings are possible (due to the hotter spark available), smoother operation (as indicated above), along with better throttle response. Points and plugs last longer.

L & L also produce an on-board ignition system for glow engines similar to the gasoline engine model which weighs 8 oz. and sells for \$19.95.

The battery charger for the battery used in both of these systems is an accessory and is also available from L & L. The batteries used, by the way, are sealed lead acid cells and put out 2 volts so the charger is a necessity. The charger reduces charge rate automatically to prevent dangerous overcharging, but you should not seriously overcharge these cells. Cost of the electronic ignition is \$24.95 and the charger sells for \$14.95.

While I have one of these units, I have not yet had the opportunity to use it (still up to here in snow!) so can't say what current drain might be expected and, therefore what flight time would be available from a maximum charge requirement of five hours.

L & L's product line also includes a liquid crystal digital Tachometer. Pick-up is optical and single range covers 30 to 90,000 rpm. (That should cover anything we'll run into for the foreseeable future!) Contact your local hobby retailer or write L & L Electronics, P.O. Box 13434, Albuquerque, New Mexico 87192.



So much going on and being built that I have run over length again, second month I've done it this year. More next month. Big is getting more beautiful all the time!



Late Flash: I had a chat by phone with the boys at L & L and their ignition system has a drain of about .75 amp at the actual time the plug is being fired. (At 6000 to 8000 rpm — that's as much as saying all the time!) They recommend not running longer than about 3 hours between charges to the battery which drives the ignition, charge time amounts to approximately five hours to full charge. □

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Piece O' Cake

a new TOM WILLIAMS design

A PIECE O' CAKE ^(easy) TO BUILD

A PIECE O' CAKE ^(easy) TO FLY

- ...a trainer
- ...uncomplicated to build
- ...simple, detailed instructions
- ...step by step construction photos
- ...flies slow-w-w-w-w-w
- ...crash resistant

- ...easy on the pocket book
- ...needs only
 - 1/2 A engine
 - 2 channel radio
 - wheels
 - glue and covering

Specifications

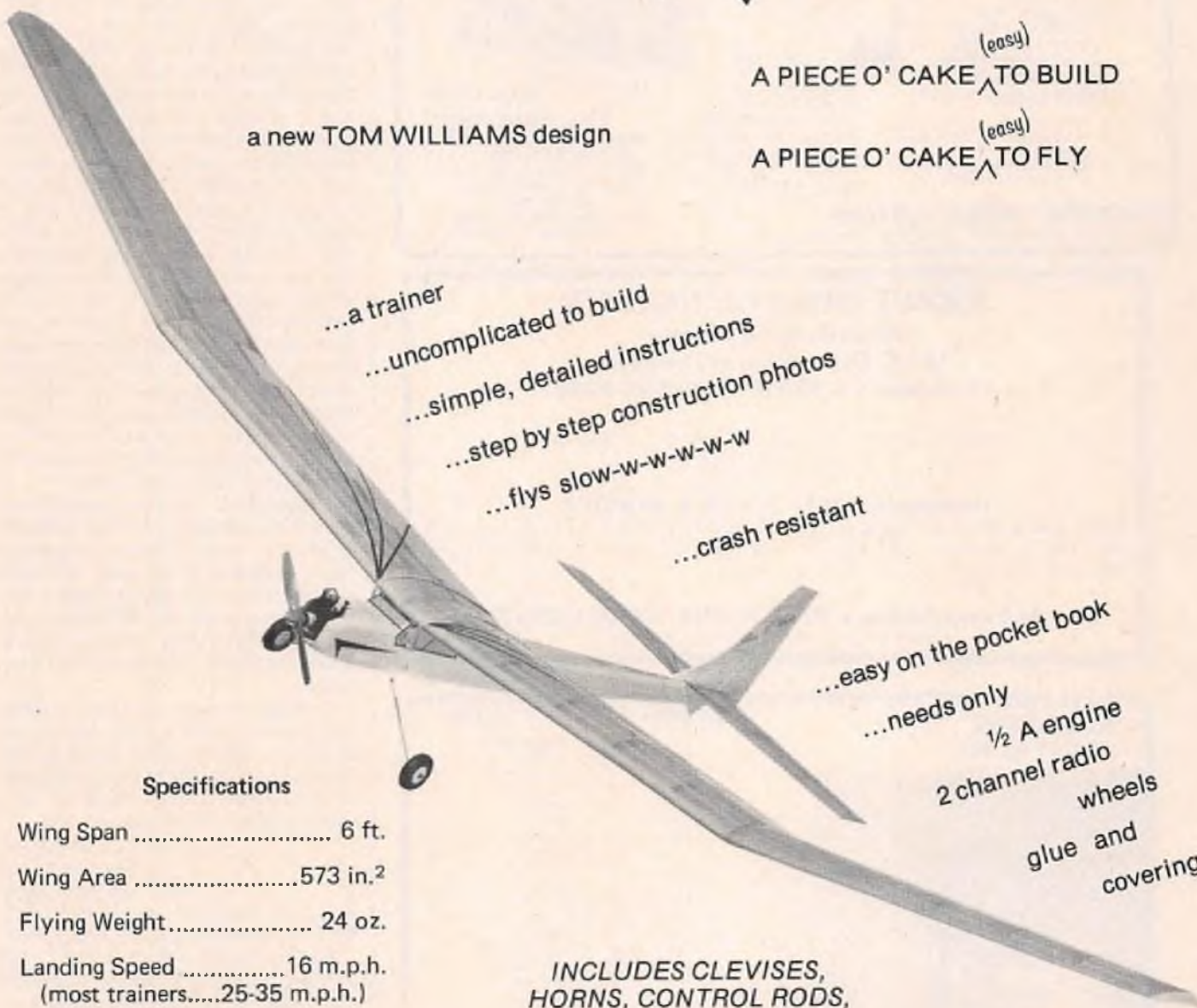
- Wing Span 6 ft.
- Wing Area 573 in.²
- Flying Weight 24 oz.
- Landing Speed 16 m.p.h.
(most trainers.....25-35 m.p.h.)
- Wing Loading 6 oz./ft.²
- Engine049 reed valve
- Airfoil 12% flat bottom

INCLUDES CLEVISES,
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from page 68/66

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| | | Micro-Avonics | Westport Int. |
| | | Millcott | World Engines |
| | | MRC | |

NEGATIVE
 ProLine



EMS-15II

Thrust: 29 oz.-in.
 Weight: 1.8 oz. (51g)
 Transit Time: 0.5 sec./100°
 Size (in.): 1.50H x 0.92W x 2.13L
 Outputs: rotary wheel & arm
 Colors: Gold, Ivory, Grey

Price: \$32.95

- EMS-15II & 14II utilize the CTS pot with Graetzdiener Carbon Buffer Wipers
- EMS Bantam Midget utilize the Clarostat conductive plastic pot.

EMS-14II

Thrust: 17 oz.-in.
 Weight: 1.4 oz. (40g)
 Transit Time: 0.5 sec./100°
 Size (in.): 1.50H x 0.76W x 2.01L
 Outputs: rotary wheel & arm
 Colors: Gold, Ivory, Grey

Price: \$32.95

Price: \$29.95

EMS Bantam Midget

Thrust: 21oz/in. Wt: 0.846oz. (24g)
 Transit Time: 0.3 sec./100°
 Size (in.): 1.125H x 0.7W x 1.43L
 Outputs: rotary wheel, long arm, adjustable arm.

Colors: Gold, Ivory, Orange, Red, Royal Blue, Yellow, White, Black

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this equipment staring at me, combined with my love of RC modeling and an empty wallet I decided to undertake the task of designing, testing and building a 4 channel RC system. Easy, I thought! Well, I must admit the encoder and decoder/servo amps were. However, to get a transmitter/receiver pair with acceptable sensitivity and noise and interference rejection not only working and certified by the FCC, but on a PIC board that will fit in a reasonably sized box is a very time consuming job. Combine this with the fact that I had to buy servo mechanics, stick assemblies, and a transmitter box which totalled \$125.00 it is easy to see why after a years worth of weekends and lunch hours, I finally came to the realization that you should leave to the experts what they do best. The RC system manufacturers have been in the business for years and making money at it to boot. I really feel that I could never design a working system any cheaper or more reliable than what is currently on the market. My only regret is that I was pig headed enough to require a year to come to this conclusion!

I would like to take this opportunity to thank Mike Gilbertson of Kraft Systems for his help in my receiver design and Hans Stellbrecht of Signetics who sent me samples of the NE544 servo amp. Both of these guys, as well as everyone I talked with in the business were always willing to offer all the help they could.

So there you have it, I hope this letter can prevent others from having to repeat my efforts just to come to the same conclusion. By the way, if anyone is interested I still have all the schematics left of my final design.

Sincerely,
 Ray Swanson
 San Francisco, Calif.

P.S. I still don't own a working system but I am saving my money to buy one!

Ray's message is worth an awful lot of time and money to anyone who reads it and learns from it. You can say the same thing about fixing your car or plumbing or a million other things in life. From a financial standpoint you are almost always better off doing what you do best and paying someone else to do his thing. If you like to work on cars, you better have one to drive when you need it and one to fool with. I suggest the same approach to those interested in working on RC systems. Buy the best system you can afford and enjoy flying it. Determine which part, if any, you are not

OUR PRICES ARE DIVINE GIVE US A CALL!



RADIOS

KRAFT	LIST	HWI	MARK'S MODELS
KP-2A	129.95	87.77	Wanderer 72"
KP-2A5	129.95	87.77	Wanderer 99"
KP-2AW	129.95	87.77	Bird of Time
KP4A	299.95	187.77	JEMCO
KP6A	329.95	213.77	P-51
KP3C	219.95	168.77	Corsair
KP5C & CS	375.43	267.77	190 D9
KP7C & CS	515.43	367.77	AT-6
PRO-LINE			Helicar
PL 5-C III	324.75	224.87	PT 19
PL 5CS III	324.75	224.87	109G
PL 7-O	597.33	407.77	BRIDI
PL 7-S	597.33	407.77	RCM Trainer 40
PL7-O-C	723.70	488.77	RCM Trainer 60
PL 7-S-C	723.70	488.77	RCM 15-500
EK LOGITROL			Super Kaos 40
LRB2-5	799.99	197.77	Super Kaos 60
Champion 2-5	388.49	247.77	Saar Birdi
Super Pro 2-7	440.99	297.77	Super Fil

KITS

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100% satisfied with. Servos, gimbals, receiver, etc., concentrate on just one portion of the system and use the one you bought for a standard of comparison. If you can improve something, great. Hopefully you will share it with our readers. If it is a giant step you might want to market it commercially, but before you do, go back and read Ray's letter again. I'll be the first to agree that nothing on the market is perfect and I know someone will improve on every aspect of our present RC systems. But, believe me, it takes a lot of work and it is awful hard to justify unless you are already in the business. But if you think you can do better, go get 'em.

Product Evaluation

I've had some requests to comment on the Ace Digipace Battery Cycler. I hadn't seen one but was interested so I dropped Ace a line, and they were kind enough to send a unit for evaluation. I'll try to give a full report next month, in as much as I haven't had a chance to really check it all over. I have used it and have done some preliminary checks which indicate it is a very accurate instrument.

The point of all this is to ask for suggestions on other items such as this. If you want an independent evaluation of some product drop us a line and I might suggest that you also drop a line to the manufacturer. I keep telling these guys it is a good way to get some free advertising, and I believe the public would like to hear more than the usual stuff that appears in ads.

Till next month, keep 'em flying! □

PLUGDRIVER

from page 63/62

connections are reversed; the driver simply will not work.

On the glow plug end, polarity is not important. I would recommend cutting off some of the 36" lead, and installing one end of a "Molex" two conductor plug, such as Radio Shack #274-222. This gives you the opportunity to plug in different cables with different glow plug connectors as required. I like to have one around with a Du-Bro push-on connector, and another one with the Cox device needed for the Half-A glowheads. If you prefer alligator clips, by all means make another jumper with those on the end. Use solder connections wherever possible for maximum dependability and to eliminate any voltage drop in the connections.

A fine touch that I was impressed by is the inclusion of a 12 volt auto type bulb to be used during the testing of your kit

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driver, just in case . . . The bulb is used in place of a higher priced glow plug and since it loads the driver as would the glow plug, is an excellent indicator of proper operation. With the driver in full low, the bulb should be off. Turning the control will light the bulb, and increase the glow until maximum is reached, at which time the bulb is glowing steadily but not too bright to look at directly.

Another thing I liked is the trouble

shooting section, furnished in case you do make an error or if something goes wrong later. Somewhat unusual for electronic devices, this one even comes with a schematic diagram, for those of you who can understand them and are interested in just what is going on inside that black box.

Unusual also is that you get a "Satisfaction Guarantee"; you get three weeks to try it and if you don't like it, you

can return it for a full refund. After that period, there is a one year parts and repair warranty honored in all cases except where abuse or alteration are evident. All parts and normal service are available if the need arises.

The Northeast Engineering Plugdriver is priced at \$34.95 for the assembled unit, and \$28.50 for the kit, at your dealers or direct from Northeast to page 138

THE WING JIG II - PRICE: \$34.50



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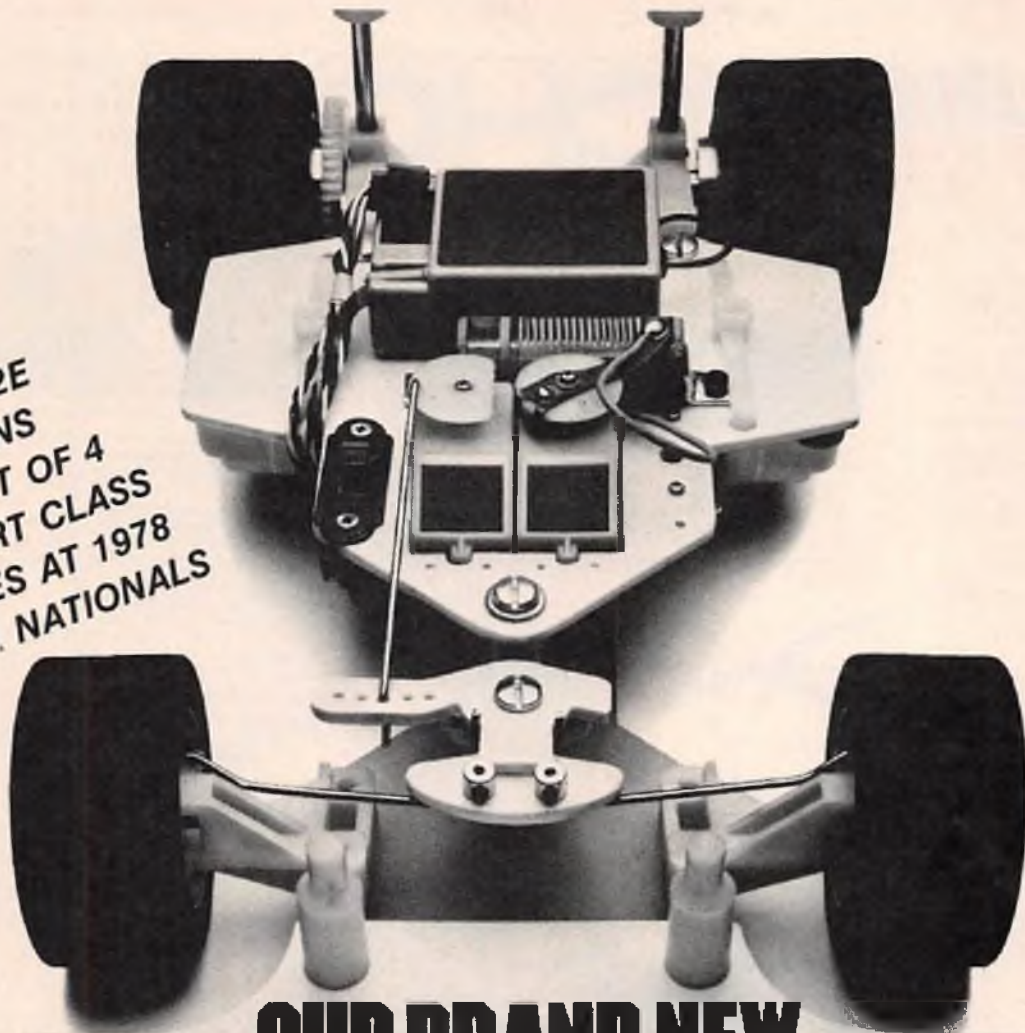
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PLUGDRIVER

from page 134/62

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In general, we consider a glowdriver to be a worthwhile and useful addition to any serious modeler's support equipment. In particular, we consider the Northeast Engineering Plugdriver to be of excellent and modern design and manufacture, and to be more than just fairly priced at today's prices. □

KING KOMBAT

from page 60/56

landings. No thanks.

I suppose we could award points for "bumps" but I really feel that this puts extra pressure on the judge. His eyes must be firmly fixed on the action. Also, if you would ever hear Dick or Don yell "bump!" when they aren't even close you would know what I mean.

I'm afraid I have no magic formula for avoiding "mid-air's." Slower flying planes obviously help, but some competitive spirit is lost. This then is another reason for keeping planes and engines small and simple. Mid-air's are a part of the game and this philosophy must also hold true for control line combat. I don't like to see any kind of R/C damage, but I would much rather have a mid-air while flying R/C combat than stand sadly over a beautifully constructed scale job that took six months to build and now lays there in a thousand pieces due to some malfunction or pilot error (vibration, you know).

Most of our combat sessions end with a pizza and a pitcher of beer at our favorite pub, where the day's battles are re-fought (usually with some added spice) and relished a second time. Nor does it end here. All three of us have admitted that we have gone through the entire sequence a third time while trying to sleep at night.

Even if one of us loses a plane, we thoroughly enjoy watching the other two fight. This is where we really study each others' tactics and moves. During the '77 season we discontinued keeping score in our local competition. We found we can relish our individual achievements and we all come out winners.

We are considering a few rule changes, although not finalized as yet. We may go to 10 foot streamers instead of 20. We find this caused less litter and is less cumbersome to control in the pit

to page 140

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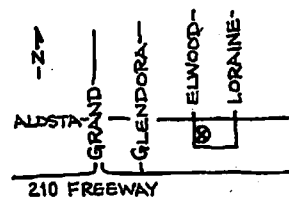
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KING KOMBAT

from page 138/56

area. We are also considering reducing or even eliminating points for leader string cuts to discourage flying too close to an opponent's plane.

Many memories linger over the past years of combat. Like the day Dick's hatch cover fell off. This normally wouldn't be so bad, except his receiver wasn't fastened securely and it, too, fell out. To make matters worse, the receiver fell in the roadway leading off of our flying field and was almost run over by Dick's car as he went to retrieve the plane. The story does have a happy ending, however. The plane was found in a cornfield, unharmed. The receiver was re-installed, a new hatchcover fabricated out of a piece of plastic, and von Richtoffen Lee was back on the combat trails again.

And then there was the time Don got his planes mixed and began trying to fly my plane thinking it was his. You never saw so many confused bystanders as he uttered the often muttered phrase, "I ain't got it," although his own plane had already crashed. I have the distinguished honor of launching Dick's plane upside down (now why would anyone install a switch on the bottom of a plane?).

There is no doubt that we are in R/C combat to stay. I asked brother Bill this question once: "Who do you think is enjoying radio control flying more, you or I?" All I got was a turned up eyebrow, but there was no doubt in my mind he knows that we have found our niche, or corner, in R/C. Certainly R/C combat far exceeds most of the other activities that I have enjoyed throughout most of my life. Well maybe with one exception — that would be being with my lovely wife, Grace, who has to put up with this thing week after week without complaint. (Well not much anyway.)

We would like the opportunity to share our new found experience with anyone interested. I suppose it will take a specific type of individual. If it means anything, the three of us are the type who lit the tails of our 10 cent rubber band models (as youngsters) and then flung them out of the attic window. There will always be those who consider that this activity (R/C combat) is just as reckless and not at all proper for "nice guys." I suppose this again is another reason for keeping plane and engine as small as possible. At least this might keep the club goof-off from going through his antics with some high powered 8 pound .60 model.

You certainly don't have to be an expert to fly R/C combat. Of course the beginner must start with a conventional type plane. But when you can take-off and land any plane without crashing,

and you have a definite feel for left and right, baby, you are ready for R/C combat. My number two son, Paul, 14, started on a Sweet Slick and picked it up quite fast. I started helping him through the beginner pattern and he did very well here too. Then we put together a Dirty Birdy .40. Then with my Dirty Birdy we were going to burn up the contest trail. But, alas, an unfortunate incident (crash) put an end to that. I let him try my combat plane and he picked it up right away, and even took Third Place at the Calumet Combat Contest last year (1977).

So, if you're the type who likes a good one on one fight and doesn't particularly care for the idea of trying to impress some judge, then R/C combat is for you. If you ever get up to Hartford, Wisconsin, stop in and join us for an afternoon of combat, followed by a pizza and a pitcher of beer and some armchair combat. Let us know if you would like some competition at your own club. Heck, we'll go anywhere for a good fight under the right conditions. Hey, how about team competition? I can see it all now ... "Top East Coast R/C Combat Team Meets Top West Coast Team To Determine National Supremacy."

I suppose it sounds like we're boasting a little and I suppose someday some young snip with fine tuned piano string reflexes will challenge us old guys and clip our tails good. Maybe this same kid will become the Wyatt Earp of R/C combat. Well okay, I'll manage him and set up some challenge matches and do a little hustling.

But before these hands of mine become too old and shakey, I still have a score to settle with Dirty Dick and I hope he's ready, because Black Beauty II is almost ready to go.

But then I'm gonna sit back and watch, because believe me, watching R/C combat is almost as much fun as actually flying. And when that world championship match takes place, believe me, I'm gonna be there. And if I can't be part of it I'll be right there in the front row watching.

And it's gonna be beautiful. □

HERE'S HOW

from page 54

case of a bipe, it's the bottom of the top wing and the top of the bottom wing usually. After covering this far, insert a 1/16" cotter key into each of the brass tubes all the way to the eye. Bend the two legs over the tubing inside the wing. Bend them short against the tubing and down to the spar as shown in the sketch and photos. The short bend at this point is the secret to success in this installation. Many different arrangements of the cotter eye can be



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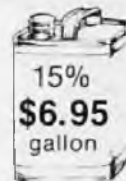
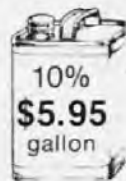
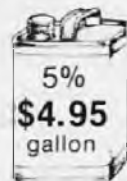
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made by turning or bending the head. Bob uses 60 lb. test Sevron fishing leader material covered with nylon for flying wires. The A-3 sleeve mentioned is fishing equipment and can be purchased at most sport shops. Do not use pliers when bending the cotter keys as the marks will set up stress points and may cause the key to break under load.

The turnbuckle idea shown was passed along to me by Ray Russell of Elkhart, Indiana. Actually Ray's idea is not new. Way back in 1929 the Mead home-built primary glider sported this very same turnbuckle. Ray simply cut it down to our size for model use. So, it is authentic and functional just like its counterpart. Incidentally, the home-built primary glider of '29 used music wire for struts instead of cables.

The drawing is self explanatory and you should encounter little difficulty reproducing Ray's turnbuckle. Run the two nuts up close to the fitting allowing for some clearance so that the fitting itself can swivel. Lock them together securely. Adjustment is made by using the hex on the double lock nuts to run the screw thread in and out of the tapped hole in the 3/16" diameter music wire. Once the turnbuckle is adjusted, lock the single nut thread against the thread in the music wire. Different mounting end configurations can be made to suit your particular design. □

ELIMINATING VIBRATION

from page 53/52

with the sharp side up. Take the heavy blade and lay it on the razor blade with the leading edge parallel to the table. Move the blade back and forth on the razor blade until it balances. The rotor blade will never really stay balanced; it will slowly drop to one side or the other. A breath of air on one tip should cause it to be pushed down. Now put pressure on the rotor blade so the razor blade cuts a small but precise slit in it. Rub the slot with a pencil lead so it is visible. Take a bolt or dowel rod and push this into the blade hole where the blade will be anchored to the blade holder. If you have a Heli-Boy, use any hole, but use the same hole on both blades. With a ruler divided into 1/32, measure from the bolt to the slit where the heavy blade balanced. Record this figure to the 32nd of an inch! Transfer this measurement to the light blade. Using a razor blade, push it into this marked point, perpendicular to the blade's leading edge, and make a slit. We now have the exact C.G. location for both blades.

Position the light blade on the scale and add lead or brads as necessary to bring the weight of the light blade to exactly that of the heavy blade. Re-weigh the heavy blade. Re-weigh

the light blade with weights. Make sure that your blades are the same weight to within 5/100 of a gm ---closer if possible! Place the light blade on the razor blade. You can look at the underside of the blade as you position it on the razor blade to get it close to your "pre-cut" slit. Slowly slide the rotor blade back and forth until you can feel it drop into the pre-cut slit. The rotor blade will probably drop to one side when left free. Take the weight you used to bring the light blade to the same weight as the heavy blade, and place it towards the tip or hub as necessary to balance it perfectly on the razor blade. Mark this location precisely. If you have a sizeable hunk of lead, you must now implant this into the blade at this point. (That's why we do this just before and after covering and finishing.) Center this lead over the mark you made and over the distance back from the leading edge that your hub hole is drilled (Fig.6). If tip weights have been called for, they must also be centered on this same line.

Using a Moto-Tool, make a hole in the bottom of the blade and epoxy your lead in it. It is a good idea to try to allow for the weight of the epoxy. Now cover/or finish your rotor blades.

When this procedure is done with your finished blades, you should only need a brad or a small nail to bring the weight to page 144

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ELIMINATING VIBRATION

from page 142/52

and C.G. to the exact points. Please note that the C.G. will be completely different after the blades are finished, and the light blade may now be the heavy blade! This means that when you're weighing the finished blades, you're actually starting all over again, but this time you know you're only a brad or two away from having a perfect set.

Now that you've come this far with the finished blades, assuming that you have the **location** of the nail to make the C.G. the same, and the **weight** of the nail to make the light blade identical to the heavy blade, drill a small hole in the leading edge of the blade, and push or tap the nail into the hole. No epoxy is needed, just make it a push fit. I stop here, but you can finish over this hole if you want to.

If, during the initial weigh, you find that you place the weight at the far tip (or hub) and the blade still doesn't balance, you must add "x" **more** weight until the blade balances on the C.G. This "x"

amount of weight must also be added to the heavy blade, directly over its C.G. This maintains equal weights in both blades.

If you have closely followed all of the steps describing the blades, each is now perfectly identical to the other.

Take your tail rotor blades, push them onto a brass tube or piano wire, and lay the piano wire over the razor blades as shown in Fig. 7. Temporarily Hot Stuff the blades to the wire to keep them level with each other. Epoxy brads in the light tip to bring the blades level. (Drill holes in the blade so the brads are a push fit.) Again, the heavy blade is the standard. Weigh it, then weigh the light blade and add brads to bring its weight equal to the heavy blade. These blades should weigh within 3/100 of a gm. of each other. Now insert the brad(s) you used to bring the light blade equal to the heavy blade into the **light blade's hub** (Fig. 7). Now your tail rotor blades are correctly balanced, and another variable has been eliminated in the quest for a perfectly smooth helicopter.

In Part II we will cover the static set up. □

TENSILON

from page 50/48

Fill in the junction where the canopy meets the dorsal fin. Carve the contours of the dorsal fin then finish sand everything down with #400 sandpaper.

The canopy framework and fillet can be painted with R & S Perfect Paint after the rest of the fuselage has been MonoKoted. Yes, R & S will stick to MonoKote --- and if you need extra peace of mind about it, try dulling the MonoKote with fine steel wool before you paint. I've found that white, dark blue, orange, and black, match quite well between the two brands. Other colors may work too --- try it and see.

The front end builds up quite simply if you follow the proper sequence. Read through completely before you start. Here goes:

to page 146

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Actual photo of model built from kit using straight wing option.



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TENSILON
from page 144/48

After the firewall, Former F1 and top sheeting are installed and **straight**, align the engine mount to the firewall and drill all necessary holes for the mount, fuel lines, and throttle pushrod. Install blind nuts for the mount. Fuel proof the inside of the tank compartment with epoxy and install the tank. Don't add the bottom sheeting yet. Trim off the excess wood ahead of the firewall and sand the area flat. Fuel proof the firewall with epoxy, then bolt on the engine mount. (Coat the back of the mount with a light film of oil so it doesn't stick permanently.) Figure out how far your engine will extend and cut a bunch of soft balsa blocks and triangle stock to this approximate length. Bolt the engine to the mount and start gluing blocks around it (but not to it). Just before the engine disappears under all those blocks, rescue it and set it nearby. Now sand the bottom of the fuselage flat to accept the bottom sheeting and epoxy this on also.

When it's dry, sand the front flat to accept the plywood nose ring. Keep slipping the engine in there to check the length. It's best if you have the spinner backplate handy too, to gauge the spinner clearance. The backplate should clear the nose ring by about 1/32". When you get the clearance right, bolt in the engine, slap some glue on the nose ring, and slide the nose ring and spinner backplate onto the crank. Center the nose ring in relation to the backplate and pin it until the glue dries. Behold! All is aligned.

Finally, remove the engine and mount, fuel proof the inside of the engine compartment, and carve all those blocks down to meet the nose ring. Whew.

To align the wing and stabilizer perfectly and painlessly:

- (1) Install, but do not drill, the wing hold-down blocks in the fuselage.
- (2) Place the wing in the saddle. Use a length of thread to check that the wingtips are equidistant from the fuselage. Now measure from the wingtips back to the tail, again using a length of thread to ensure that both sides are equal.
- (3) Once everything is kosher, tape the wing firmly to the fuselage.
- (4) Drill one of the bolt holes through the wing and the hold-down blocks, using an undersize drill (so you've got something left to tap threads into). Remove the wing. Enlarge the hole in the wing to clear the hold-down bolt, and tap the hole in the hold-down block to the right thread size.
- (5) Replace the wing on the fuselage, install the one bolt, and re-align as in Step 2.

to page 150

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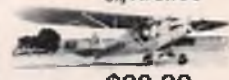


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TENSILON

from page 146/48

(6) Repeat Steps 4 and 5 with a second bolt. Once two bolts are installed, and the wing is still aligned, you can do the last two at the same time.

(7) Bolt the wing firmly in place using all four bolts. Sand the place where the stab goes until the stab will sit exactly level relative to the wing. Pin it in place temporarily. Now, using thread again, measure from the stab tips to a point at the center of the fuselage and ahead of the stab (the wing trailing edge will do). Indicate proper alignment with pencil marks.

(8) Epoxy the stab in place, eyeballing carefully as the glue sets to make sure it stays straight. If your luck is anything like mine, the airplane will fall on the floor at this point and you can do the whole sequence again.

The use of four bolts to attach the wing, instead of two bolts and two dowels, saves an awful lot of trial fitting, gluing, and swearing. In addition, it permits fine adjustment in getting the wing exactly level on the fuselage.

Okay, you get one more handy hint. If you do put MonoKote on this beast, which I recommend, you may become bewildered by the hinge gaps. There's no problem if you simply pre-cover the

edges of the surfaces with 1/4" strips of material, before gluing in the hinges. Not only does this eliminate a lot of hassle, but it also makes it that much easier to pin your hinges. After the hinges have been tack glued in, just drill a 1/16" hole through each side of each hinge, stuff in a round toothpick, and Zap it in place. Trim the ends with a nail clipper or small saw blade, then sand flush. After covering, there's no way to tell that they are there except by the smile of well-being and security on your face.

Flying

As the Galloping Gourmet once said, the proof of the pudding is in the tasting.

to page 154

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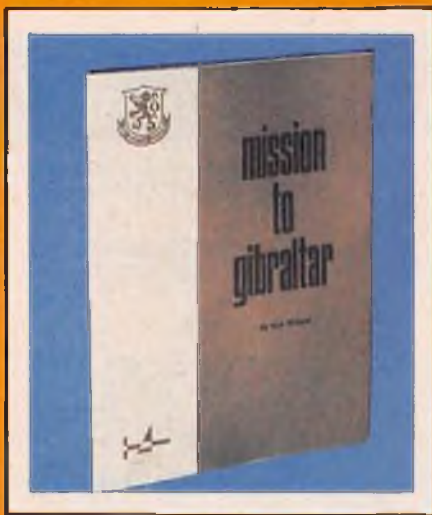
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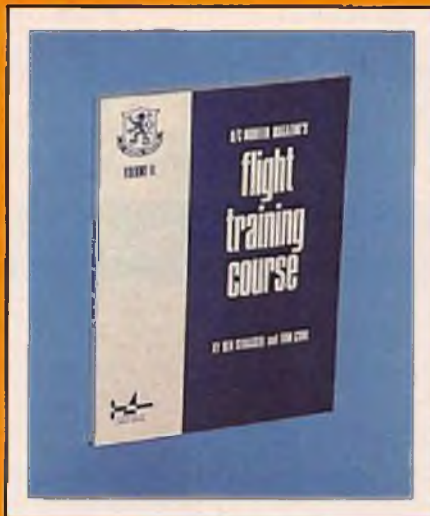
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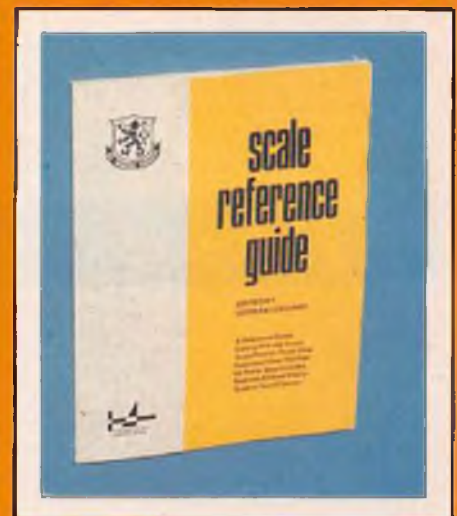
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TENSILON

from page 150/48

The prototype Tensilon has been nothing less than scrumptious. After some initial tweaking with aileron trim and a dash of tail weight, I found myself taking it through slow rolls, point rolls and horizontal eights until the tank ran dry. This is what I had in mind at the outset, so to that extent the design is successful.

I found that it's important to have the ship trimmed with the ailerons dead neutral. If you're carrying any trim deflection at all, it will show up in the loops. The problem is not unique to this airplane, though it was quite noticeable in the prototype. I cured it by warping the wings in the required direction (see above) until the ailerons could be set at exact center. Lateral balance is another factor which affects the loops. If it doesn't loop straight, add a small amount of weight to one wingtip and see what happens.

Propellers make a difference too. The Tensilon seems to like a 9/7 better than a 10/6, which makes sense because of its low-drag design. With the 9/7 it will get "on the step" and stay there after only a slight dive. Watching it come out of a big Split-S is a beautiful sight reminiscent of certain scenes from "Twelve O'Clock High." Who needs pipes? Hee hee. I might add that the prop is probably the second most important aerodynamic factor affecting an airplane's performance, after the wing itself. In fact, it is a wing, and it is actually traveling faster than the big one behind it. Instead of buying bigger engines or pipes or hotter fuel, you might consider obtaining a pitch gauge and learning to use it. It's a better investment in the long run --- and consider the "psych" value of showing up at the contests with all the stations marked on your prop blades.

To me, an airplane should be small enough to go fast, straight enough to do

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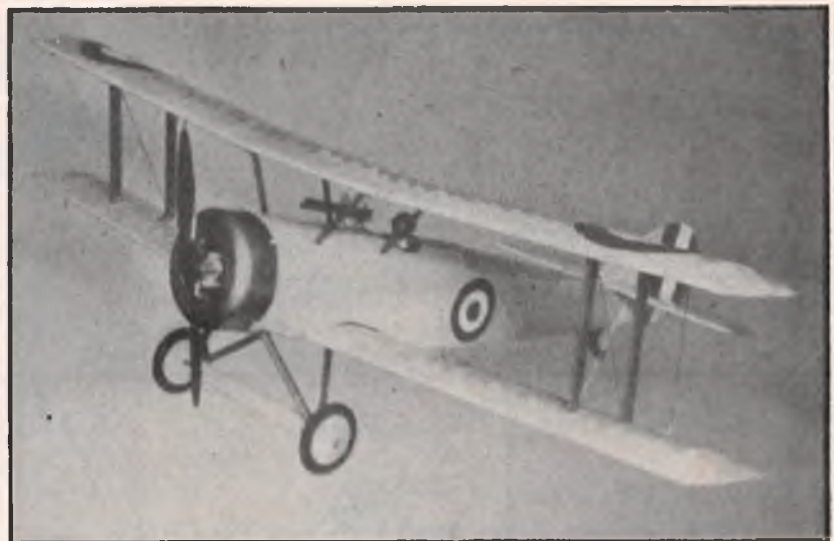
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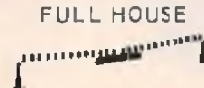
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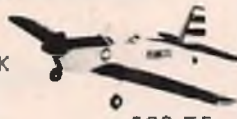
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TENSIONLON

from page 154/48

perfect maneuvers, simple enough to hang together flight after flight, and pretty enough to make the rest worthwhile. Above all, it should present a minimum of hassle to interfere with your flying pleasure. The Tensionlon has been all this to me, and I sincerely hope you enjoy it as much and I have. □

ALL IN ONE FIELD BOX

from page 42



However, in the case of the front/rear panels (4A and 4B) note that while the overall dimensions match, the front panel has a notch on top for the starter and a rectangular hole where the small drawer will fit. Now that you have been informed as to the importance of good-fitting parts, proceed with the assembly. You should be ready to "graduate" from the stage indicated in A.

Stage B is primarily the installation of dividers and getting the whole thing partitioned off to suit your needs. Installing the handle should be put off until these items are taken care of; otherwise it will only get in your way. A good look at B will give you an idea of how it all goes together. While the use of a table saw cannot be over-emphasized, it is quite important to see that most all, if not all, parts are cut with 90° right angle corners. This insures square and true assembly and will be very evident when you assemble parts 5, 6, 7A, 7B, 8, 9, and 10.

Be sure to "try-fit" parts before smearing glue on, to avoid embarrassment. Note that shelf 9 keeps things from dropping into the drawer below. With the aid of divider 8, the starter can be kept separated from the other accessories. The number and size of holes to drill in the tool shelf (Part 10) is up to you. The plans show an "average" set-up. The pine (or other hardwood) runners can now be attached to the bottom. You may have noticed that no attempt has been made to recommend any particular glue, but it should be remembered that this field box will (sooner or later) be inadvertently left out in a brief shower. So some degree of weatherproofing will be desired. Inexpensive "white" glues are a no-no. In general, the price you pay will be a rough indication of the quality of glue you are getting. The best route to go is real

to page 162



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E CHARGERS: Ask your model dealer about special combination offers on matching chargers—2.5 VDC for the Fire Plug and 4.5 VDC for the Stinger—at big savings.

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6000 Fernview Ave., Cincinnati, Ohio 45212

ALL IN ONE FIELD BOX

from page 160/42

aircraft or marine grade glue. Both are meant to withstand extreme humidity and exposure without degrading their holding power.

From here on in, you are "on your own." It is worth mentioning that the drawer should be a loose enough sliding fit so that the addition of several coats of finish will still allow it to slide smoothly. And don't forget the little holder for a four-way wrench and spare glo-plugs. Finally, the handle can be slid into place and glued. I might mention that I personally chose to use hot glue. As to whether you choose to invest in a good glue gun is up to you. I find it a fast way to go, once you adapt to the system.

All exposed edges should be sanded so that sharp corners do not protrude, lessening the chances of nicking and splintering. As to the real "finish" --- it's up to you and your willingness to go the "elbow grease" route. Sanding takes time and effort. So does painting, be it sprayed or brush-applied. Conversely, if you used scraps or junky-looking ingredients, you'll want to hide it with pigmented paint. Whatever you do, don't forget to make it waterproof, which means a varnish, lacquer or urethane finish. If you used a nice veneer plywood for most of your field box, you might consider staining it. But a clear lacquer, urethane or varnish alone, will do the job.

The aircraft cradle can be lined with good laboratory grade tubing (1/2" diameter fits fine). Slit it with small nail scissors and press into place. I chose not to glue it, as sooner or later it will need replacement and that will be simpler then. The power panel and electric fuel pump might vary from those shown, so that has not been detailed. Mount the units on the 1/4" ply panel (shown between the top and front views) and then mount the whole assembly to parts 3A and 3B with servo screws. The transmitter compartment can be lined with thin airfoam or sheet cork --- it depends on how much you want to "baby" your transmitter. What? Velvet? Well... if desired, you can attach sheet cork to the bottom of the two runners or "legs" of the unit. It depends on where you anticipate putting your field box at times. And whether you care about the finish of the hood of your car or table top.

Something you might not want to overlook is keeping a written record of items borrowed or loaned out. A record book space has been provided. You might want to log the number of flights or write down the observed performance of specific fuels, props, etc. Last, but not least, get a few RCM decals to decorate your field box. Enjoy! □

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Skyright - 6

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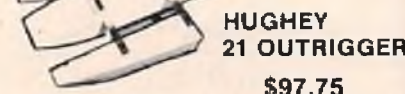


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- 0 cable 1.00 per ft.
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 - 6 cable for 10-61 engines 1.50 per ft.
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- any other available items. Call.

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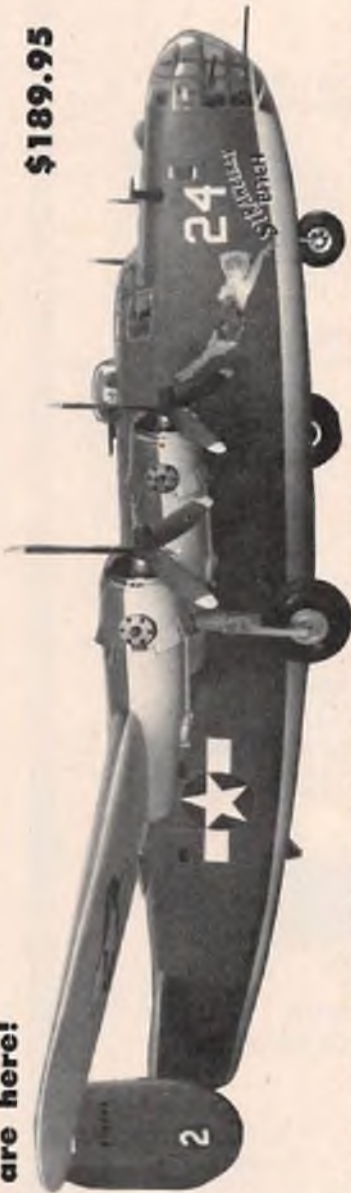
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CITABRIA

from page 30

In regard to the kit, and in light of previous reports, we feel a few well chosen words of praise are due Bud Nosen. While building the Citabria, a friend was simultaneously building a Champ and these feelings are mutual. For the under \$100.00 purchase price, these kits are excellent. We are aware that, to hold the price within reason in these days of runaway inflation, every piece cannot be hand selected and sometimes a too soft or too hard piece is going to find its way into the kit. It takes time to hand select a kit and time is lots of money so a compromise is necessary. Besides, if you are building something this size and this complicated you should, by now, have a fairly extensive scrap balsa drawer and can fabricate a substitute which will meet your specification.

We purposely tried to use each and every part in the kit and had to reproduce only two minor parts. All of the ply pieces were much better quality than had been previously reported. We did replace the bottom 1/4" square balsa stringers with spruce and added a few gussets in the landing gear area for strength. We feel that if the builder chooses his balsa stringers wisely and uses the hardest 1/4" square ones, the spruce stringers will be unnecessary and a very strong fuselage will result.

Upon completion, we covered our Citabria with red and white Super MonoKote using Pactra Formula U Polyurethane to paint the cowl and wheel pants.

The plans are generally clear and little difficulty was encountered in building. The two mimeographed sheets included, which have some instructions, were mainly intended to bring previously encountered difficulties to your attention and not to act as a building manual. It is important, therefore, that you have a fair amount of expertise before you tackle one of these kits or at least have an expert builder with whom you can consult. It is an excellent kit, simple, strong and well engineered, so put your mind at ease and pick up the challenge --- the result will be more than rewarding. □

SCALE VIEWS

from page 28/27

knowledge of the existence of what might be called prop 3-views, please write and tell the rest of us. It occurs to me that after 40 years of collecting scale material, I have little or nothing that would be of help in doing a super detailed and perfectly shaped propeller.

to page 168

MAMMOTH STINSON VOYAGER

ONE QUARTER SCALE

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Wing Span 101.75" Length 73.75"
Designed For Quadra Engine
Approximately 20 lbs. Finished Weight
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THE EXCITING 1.2 cid KENDEL TWIN



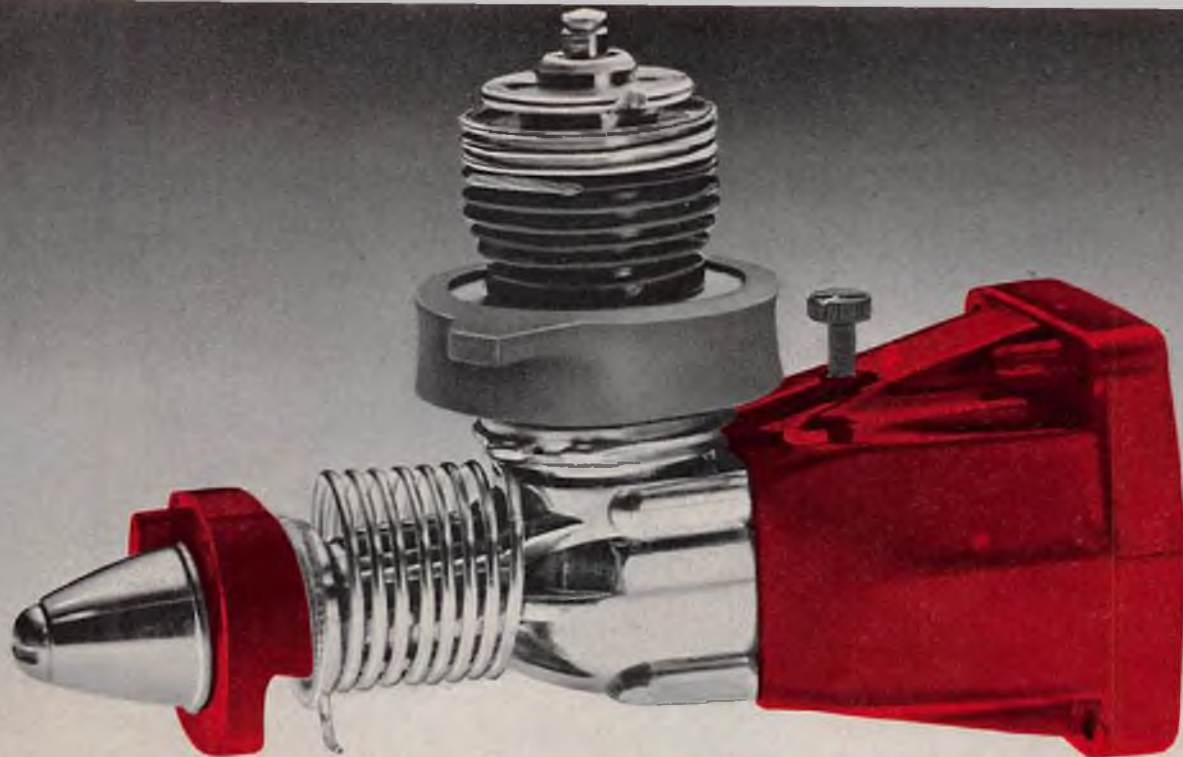
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SCALE VIEWS

from page 166/27

IT'S A SNAP

These new gimmicks by Gemini Models, 311 Lakeview Ave., Clifton, NJ 07011, called Jones Snap-On Wing Mounts look like a good item for scale

builders. They eliminate rubber bands and nylon bolts for wing attachment, all to the good as far as realistic appearance goes. The works are formed by a pair of spring loaded pins that are mounted in the front of the wing. A pair of wooden dowels are mounted in the back of the wing. To mount the wing, the front dowel pins are inserted in the matching holes in the fuselage, the wing

is pushed forward until the rear dowels can be dropped down and mated with their holes. The spring load then pushes the rear dowels into place. The wing can easily be removed by reversing the process. The beauty of the whole arrangement is that an impact will force the wing forward and allow it to pop off the fuselage.

There remains one slightly



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EWH Specialties SUPER HUSTLER power by HOMELITE



SUPER HUSTLER SPECIFICATIONS

	SAE	METRIC
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Bore x Stroke	1.5625 x 1.375 in.	39.69 x 34.92 mm
Weight	104 oz.	2.95 Kg
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Fuel	20 to 1 Regular Gas/Oil Mix	

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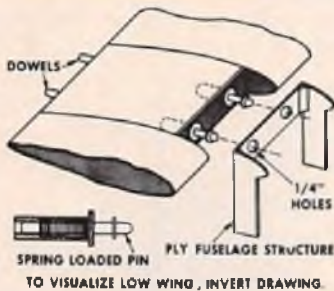
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bothersome problem as far as a scale model goes --- a gap remaining in the structure the length of the stroke travel of the pins. But I see no big obstacle here, since a spring loaded panel or door can be incorporated either into the wing or the fuselage to pull down and cover the gap after the wing snaps into place. It might very well add to the scale effect if some of the scale panel lines are utilized

here and, at any rate, even a slightly non-scale panel, particularly on a Sport Scale, will be more desirable than exposed wing bolts. Also, it is possible, on some types, that the shape of the fuselage or wing might better adapt to having the pins and associated gap on the back instead of the front. You would, of course, lose the pop-off feature, but that can be dispensed with. After all

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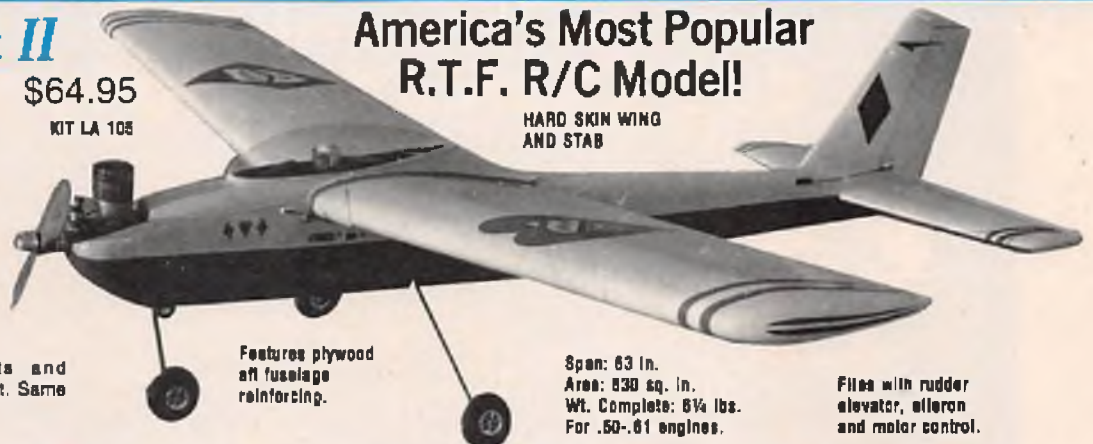
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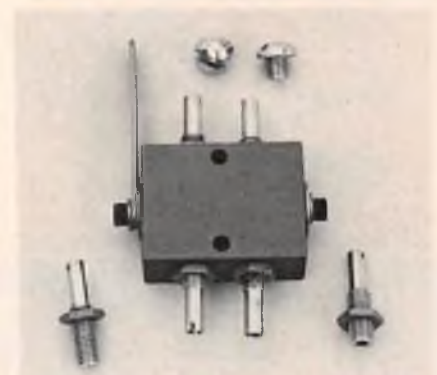


The Jones Snap-On Wing Mounts sell for \$8.95 for the pair and, if not available at your local hobby dealer, can be ordered direct.

SMOKE STACK

The increasing use of smoke devices by full-scale air show pilots to highlight their performances suggests that aerobatic type models could go for scale operations points with a smoke trail. Some of the AMA Air Show Teams already make use of smoke in their model demonstrations as a crowd pleaser. They have used fireworks cartridges, like the Superior brand, but the inability to turn them on and off has

led to experiments with homemade manifold injectors. One of the



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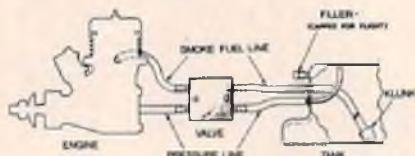
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contestants at the 1978 Sig IMAC Championships for aerobatic scales used a smoke trail on his Skybolt, which certainly added to the realism of his stunt pattern and I expect we will be seeing it done more often in International Miniature Aerobatic Club contests.

Harry Higley has made the whole thing a lot easier with his new accessory called "Harry's Smoker." As you can see in the picture, a servo operated on-off valve is the heart of the system. Pressure taken from a crankcase tap fitting forces kerosene or diesel fuel from the smoker tank to the muffler stack just outside the engine exhaust. The closer

the smoker fuel is deposited to the engine the better, since the higher the temperature, the more it smokes. It also works best at high throttle because of the higher temperature. Both the pressure and fuel feed lines are controlled by the valve so cut-off and resumption of smoke are instantaneous. Maybe you could manage smoke writing on a calm day!

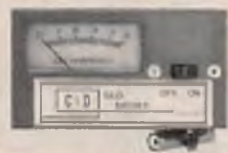


He recommends a smoker tank about one half the size of the engine tank. Because of the pressurization it can be mounted anywhere in the model that is convenient, though provision must be made for closing off the tank after it has been filled. It comes with a pressure tap fitting for the crankcase and an attachment fitting for the exhaust manifold. The two screws in the picture are for plugging the threaded holes when use of the engine without a smoke attachment is desired. Distributed by Harry Higley and Sons, 433 Arquilla Dr., Glenwood, IL 60425, the smoker sells for \$19.95.

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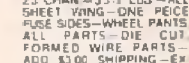
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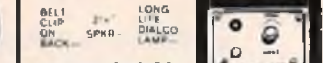
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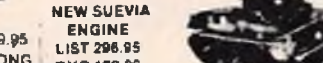
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SOARING

from page 22

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■ ■ ■

Bill Watson of Southern California, shows off his electric powered indoor record attempting airplane. With a wing loading of 3.97 oz./ft.² it is just under the 4 oz./ft.² for indoor records attempts. Bill kept it airborne for 12 minutes, 50 seconds, on a Figure 8 course. It weighs in with power at 31 ounces, and has 7.8 ft.² of wing. Note the hollow rib construction, reflex under-camber and thick wing section.

■ ■ ■

Last month I mentioned the L.S.F. International Tournament to be held July 24 to 26 at Lewis College, Lockport, Illinois. I forgot to tell you the fantastic list of trophies Gordon has planned.

Trophies will be awarded to Grand Champion through 10 places, high point score, regardless of class, excluding scale. Plus first through third place per task per class for all classes. This amounts to six awards per class plus 10 high points awards, plus one perpetual award for high point scorer. That turns out to be 47 awards plus one for best original design, and one best technical achievement. A grand total of 49 awards to be earned by somewhere around 150 contestants. As Gordon says, "That ain't all bad."

Good Luck — Good Lift. □

SUNDAY FLIER

from page 19/16

not intended for aerobatics --- and you want to avoid tip stall. My suggestion is to build it with a straight NACA 2416 section from root to tip, and wash-out the incidence at the tip by three degrees. That way, you'll reduce the possibility of tip stall, and yet have sufficient thickness in the wing section at the tip to withstand undue structural strain due to bad landings where the wingtip hits the ground before the main gear.

It's been known to happen, Ollie.

And all you experts. Please tell me what you think. I really want to know ---

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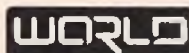


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and so do all the Sunday fliers.

This next letter, from Ralph Cramer, brings up a point which has been covered before, as he surmises. But perhaps it's time to review the situation. Ralph writes:

Dear Ken,

I have a question that no one in my club can answer and I hope you can.

When flying my Headmaster inverted - right stick gives a right turn and left stick - left turn.

Now you know that, inverted, the rudder goes left with right stick so how come the plane turns right?

I also have an RCM Basic Biplane with ailerons so one day I thought I'd try rudder while inverted. You're right. Right stick gave left turn. Ken, you might have covered this question in your column, but I don't remember reading it. All my three channel planes behave the same way, inverted.

Any tips why my Headmaster won't turn with strip ailerons?

Just Curious
Ralph Cramer

N. Babylon, New York

Let's take a look at the forces which result when left rudder is applied and the airplane is flying right side up.

First, look at Figure 1. With neutral rudder, assuming the airplane is properly trimmed, the plane is flying straight ahead and both wings are lifting equally.



FIGURE 1
UPRIGHT (NEUTRAL RUDDER)

When left rudder is applied, the air pushing against the rudder creates a force which moves the tail to the right, initiating a skidding turn. Now some people believe that the fact that the right wing is moving faster through the air causes it to have increased lift --- and to a certain extent that is true, but it is not significant, as we will see later. What is significant is that the plane, skidding forward, now has a higher angle of attack to the oncoming air with the right wing panel than is the case with the left wing panel. It is this higher angle of attack that increases the lift on the right wing, decrease it on the left wing, and thus creates a rolling bank to the left which, in turn, causes the airplane to turn left. With no dihedral angle, this



FIGURE 2
UPRIGHT (LEFT RUDDER)

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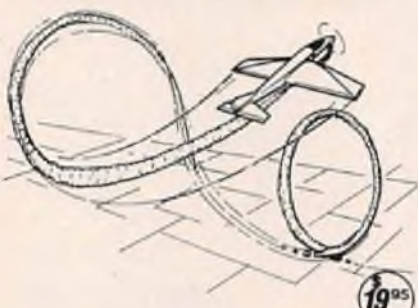


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action does not occur (except on some high wing monoplanes which have enough side area to the fuselage to blank the left wing and make it drop slightly).

Now let's look at that same wing, flying inverted. With neutral rudder, it flies straight ahead --- although it's true that it is unstable laterally and has to be constantly controlled.



FIGURE 3
INVERTED (NEUTRAL RUDDER)

Once again, apply left rudder. As you say, Ralph, when the plane is upside down and left rudder is applied, it actually creates a force to the left, rather than to the right, and you might think that would cause the plane to turn right. Here's why it doesn't:



FIGURE 4
INVERTED (LEFT RUDDER)

The airplane, flying upside down, now has anhedral in the wing (upside down dihedral, if you prefer). When the tail is moved to the left, a skidding turn starts. This causes the right wing panel to present a greater angle of attack to the oncoming air than the left wing and, once again, the greater lift on the right wing causes a rolling bank to the left. True --- your plane is skidding to the right, and banking to the left, but the banking force prevails, and a left turn results.

And there you have the reason why left rudder makes the airplane go left when it's right side up or upside down.

Finally, as for the reason your Headmaster won't turn with strip ailerons, there probably are two reasons, and the amount of contributing effort depends on the way you built the plane.

The Headmaster was designed for three channel flying --- rudder, elevator, and engine control. The dihedral angle in the wing was established specifically for rudder control. When ailerons are added, their effectiveness is reduced by the dihedral. In addition, you probably had them set up so the amount of down travel was the same as up. Thus, with the down aileron causing more drag than the opposite up aileron, the aileron action fights against itself. So, if you want to fly your Headmaster --- or any airplane for that matter, using aileron control, take out the dihedral angle --- oh, maybe leave in a degree or so, so the wing won't look like it's drooping. Also,

to page 178

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SUNDAY FLIER

from page 176/16

for improved aileron control, set up the linkage from the servo so you get more up travel than down travel. And, finally, close the aileron hinge line so air can't flow through and decrease the effectiveness of the surfaces.

Holy mackerel! I just realized that I've been pontificating on aerodynamics for the whole allotted space for us Sunday fliers!

Oh well. It won't hurt you too much if you know what's going on up there with your model. Just remember. Fly it.

Don't let it fly you. □

ENGINE CLINIC

from page 15/10

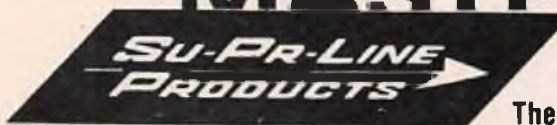
experienced RC'ers in the club, constructed a Top Flite P-51 Mustang and P-40 Warhawk which we used in demonstrations of aerial combat (another interesting story) that thrilled many Vietnamese soldiers.

To make my P-51 more realistic I constructed a four-bladed prop using two Top Flite 12/16 power props. I simply dove-tailed the hubs together by cutting a groove in each, cutting away half the thickness of each blade hub and securing the joint with Hobbypoxy II. Happiness --- an instant, genuine,

four-bladed propeller. A friend's Heath tac, however, showed that the S.T. 51 tuned this prop at about 6500 rpm - too slow! So back to the bench where I carefully removed about 1/8" of material off the trailing edge of each blade then narrowed the new trailing edge back to a sharp angle. This effectively reduced the pitch and lowered the blade area. After this the prop was carefully balanced and a second check with the tac showed over 9,000 rpm. Not bad for a Super Tigre 51, huh?

The four-bladed prop on the P-51 gave me many enjoyable flights with little noticeable difference in airplane performance and no overheating as far

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as I know. The P-51 met with an untimely accident later that year in a mid-air collision with the P-40 Warhawk but the engine has been used in three other aircraft and is still in good working order. In the P-51 it was always flown fully cowled and mostly at temperatures above 90°F. There was one curious side effect of the big prop and that was the higher gyroscopic precession which caused the plane to have a slight yawing action in turns.

I hope this letter will encourage others to experiment with four-blades --- they aren't all that impractical.

Bob Bush
Vandalia, Ohio

Thanks for sharing your experience with us Bob. I am sure many of the scale builders will appreciate the information.

That wraps it up for another month, gang. Keep the letters and ideas coming in. But put them in writing — **no phone calls!** □

CUNNINGHAM ON R/C

from page 8

A biplane just doesn't look right with short stubby wings. An aspect ratio (span divided by chord) of 6:1 looks a lot better than one of 5:1, so let's use a 6:1 ratio.

Since we have gone into this earlier, we won't tie up the space now by telling you how to find it, just look at the formula for determining the wing span and chord for a given area and aspect ratio.

$$\text{Chord} = \frac{\sqrt{\text{Area}}}{\text{Aspect Ratio}} = \frac{\sqrt{600}}{6} = \sqrt{100} = 10''$$

$$\text{Span} = 6 \times 10'' = 60$$

Which results in a wing with a span of 60" and a chord of 10". Each wing then having 600 square inches of wing area. While we're talking about areas, let's take a look at the horizontal stab. Back in

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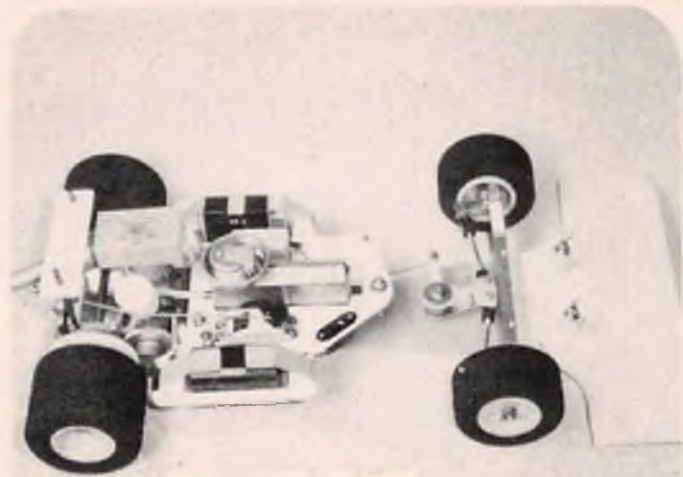
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May we were working on a stab area that had from 20% of the wing area to 25% of the wing area, but we were then designing a monoplane. Since we are working on a biplane, our figures are a little bit different. Somewhere in the past, designers of full size biplanes determined that the lower wing did not do as much work in carrying the weight of the aircraft as did the top wing, and that the total of the two wings actually worked out to something close to 80% as effective as if the wings were one large monoplane wing. With this in mind, we can see that the horizontal stab does not need to be quite as large as the total wing area. I have found that a horizontal stab area of 17% of the total biplane wing area works just great. You can use more area if you wish, and perhaps less area, but benefit from my experience, and give 17% a try. This percentage then gives us a stab area of 204 square inches.

The ratio of span to chord that we used earlier for our monoplane works just as well for a biplane. If you don't have the past issue, then for our purpose use an aspect ratio of 3:1 for the horizontal stab. Plugging in the old mini-calculator gives us a span of 24.75" and a chord of 8.25". If you wish a tapered planform for your design, then use the average chord of 8.25" and let the center chord be larger, and the tip chord be smaller. For example, add 1" for the center chord, making it 9.25" and deduct 1" for the tip, making it 7.25" and you have a taper. You can make the difference even greater for more taper if you like.

Now, you have the wings and horizontal stab, and we can move along to the fuselage and rudder --- but wait, we forgot how much aileron to use in the wings and, for that matter, how much elevator. Let's get rid of the elevator easily --- use 25% of the the total stab

area for the elevator. If we use too small of an area for the elevator, the control movement has to be greater, thus making a more "jumpy" flying aircraft. Too large of an elevator puts too much load upon the servo. Use more or less if you like, but use 25% as an average.

Back to the aileron area. Last month, we decided that 12% of the wing area was a good aileron area. This holds true for our biplane design, but now we need to remember that we are working with the total wing area. In this case we are using 1200 square inches of total wing area, and 12% of this gives us a total aileron area of 144 square inches. Some full size biplanes used ailerons in only the top wing, some in both wings, and some in only the lower wing. It's your choice, top, bottom, or both. If you use similar size wings for both the top and bottom, then the ailerons should be the same size in both the top and bottom wings. Taking

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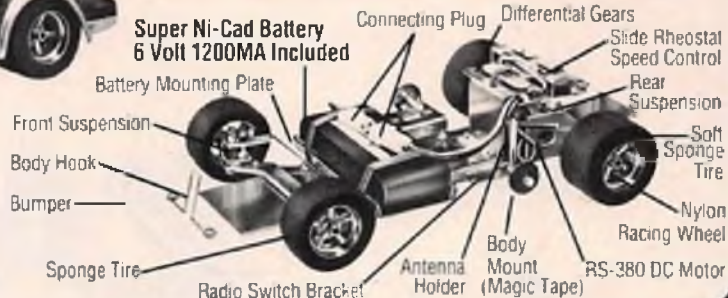
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the lazy man's approach, let's use ailerons in only the bottom wing. This means that the lower wing will have quite a bit of its area given over to aileron area. To get this much aileron into one wing generally dictates strip ailerons. With a span of 60", leaving out about 5" lost at the center section, we have a total aileron span for the lower wing of 55". Dividing the aileron area of 144" by the aileron span of 55" gives us an aileron chord of 2.61". If you want the ailerons to be in both wings, then use the same figures, but simply use the aileron chord by 1/2 of the aileron span of 55" for both the top and bottom wing. In other words, since you have four wing panels, put 1/4 of the aileron area in each panel, or ailerons of 2.61" x 13.75" for each wing panel.

Got you confused? Well, read the whole thing one more time, and then grab your pencil, draw out a couple of

wings, and you will see what I'm talking about. Before we leave areas, let's use about 1/3 of the total horizontal stab area for the vertical stab area, and about 40% of this area for the rudder area. If you want to vary the vertical stab area, then go down in size rather than up. If you get this surface too large, you will inhibit the actions of the aircraft if you wish to bash about the sky in the usual bipe method. Remember, the early biplanes of WW I had very small vertical stabs, and were very prone to death dealing spins. Later designs used more vertical stab area and, thus, could control the spins, and developed it as a defensive maneuver — too large, and they couldn't spin. Start with 1/3 of the area and let your pencil do the work.


Now, we come to the fuselage — the thing that ties everything else together. The fuselage is important for many reasons: (1) it really develops the

"look" of your model, (2) it has to hold everything in the correct location, and (3) it has to be designed strong enough to keep everything in its correct location.

Getting the correct length for a fuselage to wing relation is pretty much one of good looks. If we use our monoplane thoughts of a couple of months ago, we came up with a fuselage length of 75% of the wing span. This is great for a monoplane but, in working with a bipe, we are working with two wings, much more area, and the fuselage that we developed for the monoplane is simply too small for our biplanes. A better ratio for a bipe layout is to use a fuselage length of 85% of the wing span if we're using wings of 6:1 ratio, and a length of 95% if we're using wings of 5:1 ratio. Try it, you will see that this will work pretty well, giving you a fuselage that looks right for the wings that you have designed. With the same

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ratios in mind, the shorter wings to the chord ratio, the greater the fuselage length ratio should be. And the longer the wing to chord ratio, the smaller the fuselage length ratio. If you don't see it, draw a few lines to scale on a piece of paper and you will then see how it all works out. For our bird design, let's use a fuselage length of 85% of the wing span.

By fuselage length, I mean from the back of the prop to the elevator hinge line. With a span of 60", 85% fuselage length then becomes 51".

To find the wing location, we first have to talk about wing stagger. Back in antiquity, the designers of full scale aircraft decided that they flew better with

a positive stagger (leading edge of the top wing ahead of the leading edge of the lower wing) from 1/4 of one wing chord to 1/2 of one wing chord. I like the 1/4 stagger for model use. You can stack them on top of each other. Use a positive stagger, or a negative stagger like the stagger wing Beech and the Hyper Biplane — it's up to you. But, for our consideration, we have to settle on something, so let's settle on 1/4 stagger. This then puts the leading edge of the top wing 2.4" ahead of the leading edge of the bottom wing. To locate the CG, treat the wing as one wing, from the leading edge of the top wing to the trailing edge of the bottom wing. In our

case, this is 12" and a CG location of 30% is then 30% of 12", or the balance point is 3.6" back from the leading edge of the top wing.

Back to the fuselage, now that we have all of this decided. We have a fuselage length of 51", and if we use a nose length (from the back of the prop to the leading edge of the top wing) of 20%, we have a snoot length of 10.2". We now have a fuselage of 51", a nose length of 10.2", a total wing chord of 12", and a tail length to the elevator hinge line of 28.8".

How far apart are the wings? Darn good question. Again, looking back in time, we find that full scale design hit to page 184

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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.



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Freddy M. Glagens
Paramaribo, Suriname, South America

A Blue Angel 40 pattern aircraft built from a MK kit has a span of 54", length 46 1/2", and weighs 2000 grams. Power is an OS 40 FSR. A Kraft 4 channel radio is used and the model is covered with Super MonoKote. Bridi striping tape was used for trim. Performance is described as fast.



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Formula 1

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upon a separation distance of from one chord length to 1.5 chord lengths. For us, this means that the top of the bottom wing should be about 10" from the bottom of the top wing I have shortened this just a bit and have found that a chord length between wing average chord lines works pretty well. For greater stability you can use more separation, but don't use less. Several early aviators were killed test flying biplane designs that placed the wings too close together. Funny things happen to the air trapped between the two wings. The wings tend to suck together and can cause all kinds of weird ditches in the air.

The landing gear location is the same on a biplane as upon any tail tragger, keep the leading edge of the wheels near the leading edge of the top wing, a bit ahead is better, and your take-offs will be a thing of beauty. That is if you made sure that the tail wheel tracks straight. Before we close our discussions on biplanes, I do want to mention something that I will go more into later. That is the airfoil section of the horizontal stab. I really don't like a slab of balsa for a stab, personally, I like a slightly lifting section for an all-around sport aircraft, but if you're one of the many who cannot believe this works, then use a symmetrical airfoil for the stab, but make it a minimum of 1/2" thick. 1/4" thick balsa slab stabs just aren't enough for a larger aircraft. In the next few months we will take a look at stab design, and how it affects the flying of your aircraft.

And, a reminder, mark July 21 and 22 on your calendar for the dates of the Second Annual Jumbo Fly In, to be held at Thunderbird Field, on the shores of Lake Benbrook, just west of Fort Worth, Texas. Plan to be there, you will enjoy it. Write to me at 2440 Colonial Parkway, Fort Worth, Texas 76109, for more information. Load your biggie in the family bus and come on to T-Bird field. ☐

FROM THE SHOP

from page 2



Cecil Weatherly III was a recent visitor to our offices. The license plates on his van tell the story.



Our Technical Editor, Dick Kidd, has his hands full of big boxes filled with Pitts Special stuff. We are not sure if he knows what the arrows on the box mean.

Elevator - Convenient means for retrieving sailplane from roof of tall building.

Flap - Motion of wings of some sailplanes at moderate speeds.

Leading Edge - First portion of aircraft to strike goalpost.

Longeron - A cause of fuselage misalignment, as in "it's longeron one side than the other."

Pitch - Early form of Hot Stuff.

Rudder - Prefer to.

Spoiler - Device for disturbing airflow over wing. It usually performs this function in two positions - open and closed.

Stab Area - Center of landing circle.

Strut - Characteristic locomotion of Alex Mladineo after winning contest.

Taper - Poor source of light for night flying.

★

In closing for this month, we liked Buddy Scott's cartoon that appeared in the Cape Radio Flyers Flysheet from South Africa, Len Salter, Editor. The only way to go!! □



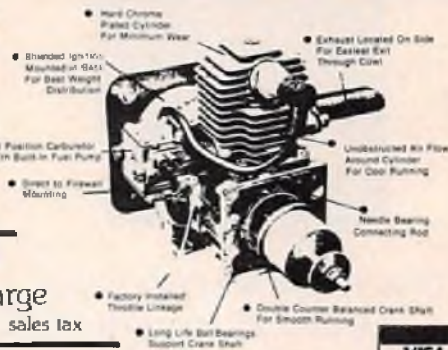
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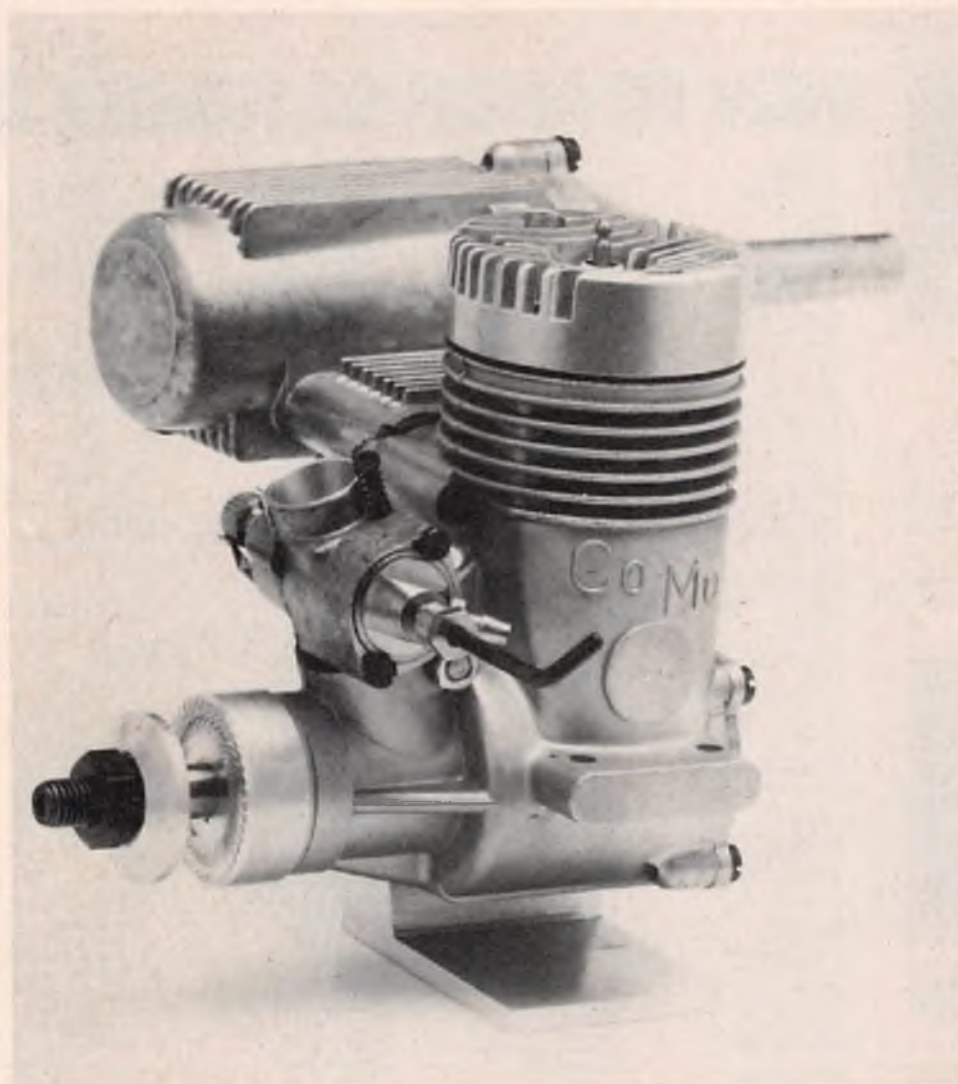
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