


# RcM



49115

NOVEMBER 1979

\$2.25



# radio control MODELER

THE WORLD'S LEADING PUBLICATION FOR THE RADIO CONTROL ENTHUSIAST



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# America's Waterways await you.

The Futaba 6JB makes maximum model boating more than possible, it makes it simple. Using the total performance electronics of the J-Series, the new 6JB gives you the control it takes for total scale



Program your next cruise. Adjustable throw rudder and mixing controls are concealed in the back of the 6JB transmitter.

realism. Built into our 6 channel system are a dual throttle mode, an exclusive throttle/rudder mixing circuit and heavy duty, watertight S107 servos. And, as with all J-Series systems, you've got Direct Servo Control, modular AM or FM RF boards, sophisticated logic circuitry, built-in servo reversing, adjustable, open-gimbal control sticks, ATV and even programming for rudder and throttle. But don't



give our 6JB a twenty-one gun salute, just tell your ship that her radio has finally come in.



**We've got your radio.  
Futaba.**

555 West Victoria Street/Compton, CA 90220





# MODELER

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**This month's cover**

features Miss Lorrie Shannon  
snuggled up in front of the fire place  
with a Top Flite P-47D-30. The P-47  
has Rhom Air Retracts, flaps,  
S.T. 60 Bluehead and utilizes a  
Multiplex radio. Ektachrome  
transparency by Keith Houston of  
Milton, Ontario, Canada.



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# From the Shop

DON DEWEY

After 17 years as a magazine editor, the single greatest reward is still the letters that I receive from you, the readers. Often times you write to offer your suggestions, or state your disagreements and criticisms. Each letter is carefully read as it is of valuable assistance in producing the best possible R/C publication. There are also some happy letters. This month I would like to share a few with you.



RCM plans. The Lazy Ace has the Swedish built DAMO four stroke motor and is performing very well. The Bird of Time recently flew a 61 minute thermal flight and the Viking has flown for nine months without any problems. I am right now building the Mirage from your plans.

Thank you for a splendid magazine.

Gunnar Pettersson  
Sweden

Dear Don:

Last May (1979) my whole family went to Prague (Czechoslovakia) from Manila (The Philippines). It's a pretty long trip with two aircraft changes (at Singapore and Frankfurt).



Dear Sir,

Enclosed you will find a picture of a fellow flying buddy, Mr. Bob Presender. Bob used to come out to our flying area here in Vegas in a Cadillac. About two months ago when the fuel crunch hit Vegas first before the rest of the country, Bob decided to take matters into his own hands. He got out his bike, and old golf cart and proceeded to make his own "gas beater." Bob is retired and lives with his wife and dog in a trailer park about 3 miles from the flying site. So he not only gets his exercise, but thumbs his nose at the gas pumps as he goes by.

I just thought I would show how resourceful we modelers are.

Yours truly,  
R. Duane Sides  
Las Vegas, Nevada



Dear Don:

I am sending you a couple of photos of my models built from



With my wife and 3 children (the youngest isn't in the photo as he's still a baby) to keep me company, I decided to bring a huge box (54" x 24" x 18") with two planes - a Fun-Tu (RCM

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## SAVE UP TO 68% ON HARDWARE!

<p><b>BULK PACKAGE</b> <b>Control Horns</b> 75 Control Horns <b>only \$3.35</b> Compare at \$10.00! 3 sizes  HLH801</p>	<p><b>BULK PACKAGE</b> <b>Polypropylene Hinges</b> 200 Hinges <b>only \$2.99</b> Compare at \$9.50  HLH802</p>	<p><b>BULK PACKAGE</b> <b>RC Metal Clevises</b> 35 Clevises <b>only \$4.99</b> Compare at \$13.12  2.56 threaded, plated—can be soldered! HLH803</p>	<p><b>BULK PACKAGE</b> <b>Nylon Tube Pushrod</b> 25 feet Nylon Outer Tube 25 feet Nylon Inner Tube <b>only \$3.99</b>  HLH808</p>	<p><b>BULK PACKAGE</b> <b>Brass Threaded Couplers</b> 35 Couplers <b>only \$3.99</b>  HLH809</p>	<p><b>BULK PACKAGE</b> <b>Mini Nylon Pop Clevises</b> 35 Clevises <b>only \$3.99</b> Compare at \$7.25  HLH812</p>	<p><b>BULK PACKAGE</b> <b>Mini Nylon Pin Hinges</b> 66 Hinges <b>only \$3.99</b> Compare at \$8.58  HLH814</p>	<p><b>BULK PACKAGE</b> <b>8 Wheels</b> 4 Pairs: 2" thru 2 1/2" <b>only \$6.99</b> Compare at \$10.76  HLH810</p>
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**Bridi RCM TRAINER 40** BR1006  
List price \$54.95  
54" span for 4 channels, .35-.49 engine.  
**ADVANCED TRAINER.**

**SALE!**  
**\$35.99**



**Lanier JESTER C** LAN124  
List price \$74.95  
63" span, for 4 channels and .60 engine. HAS **WON EXPERT CLASS PATTERN CONTESTS!** Almost-ready-to-fly!

**SALE!**  
**\$46.99**



**Midwest CESSNA A-R-F** MID125  
List price \$34.95  
**ALL FOAM—ASSEMBLED!**  
Flies best with a .15 and 3 channels.

**SALE!**  
**\$21.99**



**Sig PIPER J-3** SIG003  
List price \$49.95  
**SCALE KIT.** Bio 71" span for .19 to .35 engine. 4 channels.

**SALE!**  
**\$34.99**



**Bridi RCM TRAINER 60** BR1002  
List price \$62.95  
58 1/2" span for 4 channels for .40-.61 engines.  
Advanced Trainer—**CADILLAC OF Balsa KITS!**

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**\$39.99**



**Marks WANDERER 72** MAR005  
List price \$23.95  
72" span 2 channel glider. **VERY EASY TO BUILD!** Just \$16 will buy the accessories to get it ready to fly!

**SALE!**  
**\$13.99**



**Bud Nesen AERONCA CHAMP** NON002  
List price \$99.95  
**9 FOOT SPAN!**

**SALE!**  
**\$69.99**



**Sig KOUGAR** SIG035  
List price \$52.50  
**SHARP LOOKING 4 CHANNEL** plane. 51" span for .35-.50 engine.

**SALE!**  
**\$36.99**



**Lanier TRANSIT A-R-F** LAN108  
List price \$47.95  
3 channel **BASIC TRAINER.** 65" span for .35-.45 engines.  
**ALMOST READY TO FLY!**

**SALE!**  
**\$29.99**

**SALE! SENSATIONAL KIT PRICES!**  
**PHONE your order in quickly!**

Prices in effect only to Nov. 20, 1979. COD or CREDIT CARDS only!  
Prices subject to change if list prices change.

When you phone for your kit, order the **KIT ACCESSORY PACK.** We've figured out every hardware and covering item that's needed for each kit in this ad. Our **ACCESSORY PACKS** contain everything you need to complete the plane except for engine, radio and tools. Cost? Usually less than the kit.



**SUR116 Sureflite PIPER J-3**  
List \$39.95  
For .15-.19 engine, 52" span, 2 to 4 channels, 2 hour assembly.

**SALE!**  
**\$23.99**



**Lanier COMET II** LAN105  
List price \$64.95  
63" span **ADVANCED TRAINER.** For 4 channels and .50-.61 engine. Almost ready to fly!

**SALE!**  
**\$48.50**



**M.E.N. TRAINER** MEN002  
List price \$31.95  
58" span for 3 channels and .15-.25 engines.  
Super stable beginner's plane!

**SALE!**  
**\$23.99**



**Sig KADET** SIG031  
List price \$43.95  
Great Trainer. **NOW** includes ailerons! For 3 or 4 channels. 19 to .30 eng. 57" span.

**SALE!**  
**\$29.99**



**SUR109 Sureflite CESSNA SKYLANE 182 FOAM A-R-F**  
List \$39.95  
For .15-.19 engine, 53" span, 420 sq. inch area, 2 to 4 channels. Steerable nose gear, 2 hr. assy.

**SALE!**  
**\$23.99**



**Lanier CESSNA** LAN119  
List price \$49.95  
48" span. **GOOD BEGINNER'S PLANE.** For 3 channels, .19 engine. Almost ready to fly!

**SALE!**  
**\$30.99**



**Midwest SUPER CHIPMUNK** MID126  
List \$35.95  
**ALL-FOAM ASSEMBLED!**  
46" span for 3 channels and .10 to .19 engine.

**SALE!**  
**\$22.99**



**Sig COLT** SIG043  
List price \$25.95  
45" span **FOAM WING.** 3 channel trainer. For .09 to .15 engine.

**SALE!**  
**\$17.99**



**Top Flite HEADMASTER** TOP111  
List price \$28.95  
48" span for .19-.35 engines, 3 channels. **Good TRAINER—EASY TO BUILD!** The kit box doubles as a fuselage jig!

**SALE!**  
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## SAVE UP TO 40%

### SWAMP BUGGY and ENGINE COMBINATIONS!

These are simple to build because most of the parts are die cut plywood. Engine installation is easy—just bolt it on and use an airplane prop. RC equipment installation is easy—just rudder-only or rudder and throttle control to hook up.

They run on water, snow, wet grass—just about anything.

Buy one now and SAVE, at these special combination prices!



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18" long Swamp Buggy.  
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**DUM004CB DUMAS SWAMP BUGGY and FOX 19RC ENGINE** ..... \$44.00  
28" long Swamp Buggy.  
Total list price value - \$68.45.



**DUM005CB DUMAS BIG SWAMP BUGGY and FOX .40 RC ENGINE** ..... \$49.99  
31" long Swamp Buggy.  
Total list price value - \$82.95.

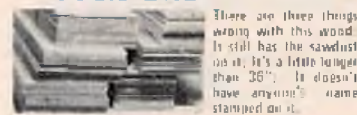
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We don't know of a cheaper way for you to outfit yourself with a high performance fiberglass RC plane!



F 16A Deluxe	\$94.00	Phantom 60	\$47.45
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### STOCK UP NOW AT THESE SENSATIONAL PRICES! BULK BALSAM WOOD



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

Stock No.	Width	Length	LIST	SALE
W00001	20-1/16x3x36		\$14.00	\$6.35
W00002	20-1/16x4x36		\$24.00	\$9.02
W00004	20-3/32x3x36		\$17.50	\$7.35
W00005	15-3/32x4x36		\$19.50	\$8.52
W00007	10-1/8x4x36		\$15.50	\$7.01
W00008	10-3/16x4x36		\$16.00	\$8.68
W00009	10-1/4x3x36		\$14.00	\$8.18

## SALE! SENSATIONAL KIT PRICES! PHONE your order in quickly!

Prices in effect only to Nov. 30, 1979. COD or Credit Cards only!

When you phone for your kit, order the KIT ACCESSORY PACK. We've figured out every hardware and covering item that's needed for each kit in this ad. Our ACCESSORY PACKS contain everything you need to complete the plane except for engine, radio and roots. Cost? Usually less than the kit.



**Airtronics SQUARE SOAR GLIDER AIR101**  
List price \$24.95  
**EASY, EASY TO BUILD!**  
72" span, for 2 channels.

SALE!  
\$18.99



**Bridi SUPER KAOS 40**  
List price \$56.95  
32" span, 4 channel, for 35-.49 engine.  
**GREAT FLYER!**

SALE!  
\$36.99



**Midwest ATTACKER A-R-F**  
List price \$44.95  
**All-Foam, 3 hour assembly!**  
48" span, for 4 channels, .19-.35 eng.

SALE!  
\$27.80



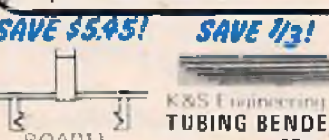
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**Top Flite P-51 MUSTANG**  
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SALE!  
\$44.50



**ROADIE Robert Model Incidence Meter**  
List \$15.95, \$10.50



**K&S Engineering TUBING BENDER**  
KSN321 99¢  
Set of 5 springs bend tubing without flattening. 1/16" thru 3/16".



**Andrews H-RAY**  
List price \$39.95  
**Gentle trainer! Easy to build!** 50" span for .15, 2-3 channels.

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**Bridi DIRTY BIRDY 40**  
List price \$59.95  
**PATTERN FLYER ON A BUDGET!** 58" span.

SALE!  
\$39.99



**Bud Nosen NONO005 9 FT. PIPER J-3**  
List price \$119.95  
**Build a classic!** 9' span, easy flyer.

SALE!  
\$79.99



**Southwestern HONKER**  
List price \$19.95  
3-hour assembly! Pre-built wing! 36" span, for .049 and 1-2 channels.

SALE!  
\$12.99



**Sig KAVALIER AILERON TRAINER!**  
List price \$49.95  
56" span for .29-.40 engine, 4 channels.

SALE!  
\$34.99



**Sig BEECHCRAFT BONANZA**  
List price \$77.50  
**SCALE!** with easy-to-build ABS plastic cabin. 64" span for .60 engine.

SALE!  
\$53.99



**ROADIE Robert Model Incidence Meter**  
List \$15.95, \$10.50



**K&S Engineering TUBING BENDER**  
KSN321 99¢  
Set of 5 springs bend tubing without flattening. 1/16" thru 3/16".



**WID001 WIND METER**  
price ..... \$8.88  
Hand held meter, 2 scales, 240 MPH and 465 MPH. Accurate and durable. 7" tall. Includes plastic case.



**TAT080 TATONE ENGINE TEST STAND**  
List price \$10.50

## NEW!

### CB ASSOCIATES 1/4 SCALE ACCESSORIES!

These are strong oversize items made primarily for 1/4 scale aircraft. The plastic items are molded of glass-filled nylon. Metal parts are either steel (the wing strut fittings) or brass (the bushings in hinges) or machined aluminum (the cable pulley wheels).



**CBA212 Butt hinges, 4 pk.**  
price ..... \$3.95  
Buy 3 packs for only ..... \$8.89  
Hinge is 1" x 3/4". Webs 1/16" thick.



**CBA213 Combination Hinges, 4 pk.**  
Buy 3 packs for only ..... \$8.89  
Long strap is 2".



**CBA214 Strap hinges, 4 pk.**  
price ..... \$3.29  
Buy 3 packs for only ..... \$7.31  
Each strap is 2" long.



**Strap Hinge**



**CBA550 Wing Strut fittings, 4 pk** ..... \$3.95  
Steel strut piece is 2 1/2" long.



**CBA549 Bellcrank** ..... \$1.50  
2 7/8" long. Smooth non-jamming bearing.



**CBA580 1/4 Scale Tailwheel Assembly** ..... \$15.96  
List price \$19.95  
2" wheel is included. Leaf springs are steel. Wheel is steerable or can be allowed to caster.



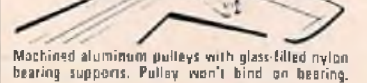
**CBA545 Control Horns, 2 Small** ..... \$ .85  
"Small" horns are 2 5/8" overall. Clamp in center is 1/4" inside.



**CBA546 Control Horns, 2 Large** ..... \$ .95  
Each large horn is 1 1/2" tall. Glass-filled nylon is 1/8" thick.



**CBA547 Cable pulleys, 4 price** ..... \$4.25  
Buy 3 packs for only ..... \$9.56

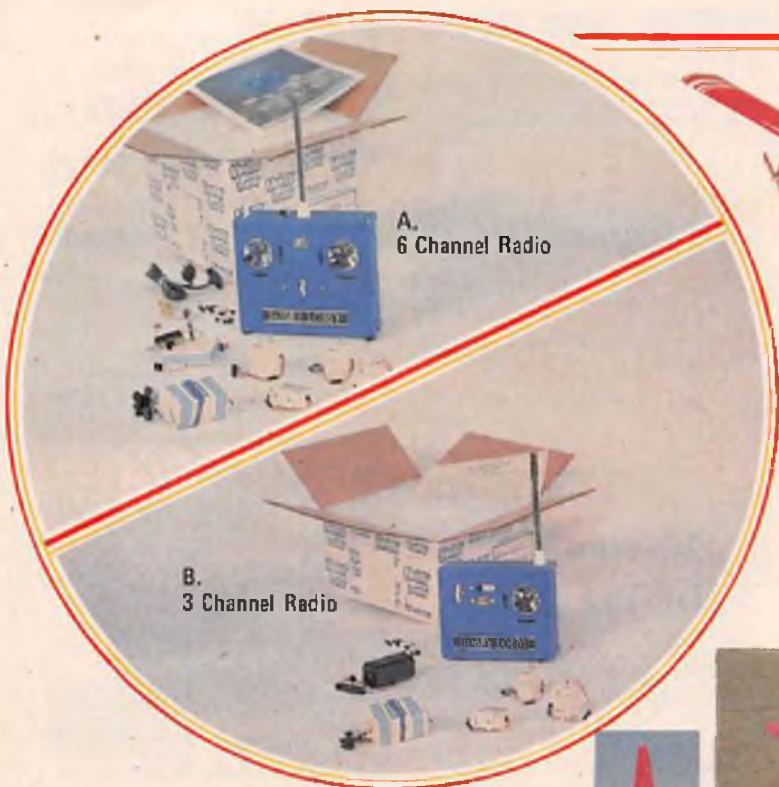


Machined aluminum pulleys with glass-filled nylon bearing supports. Pulley won't bind on bearing.









A. 6 Channel Radio

B. 3 Channel Radio



C. Papillon



D. Senior Telemaster



E. Junior Telemaster



F. Power Center



Mini Star

G. Z-10



H. 12 Foot Telemaster



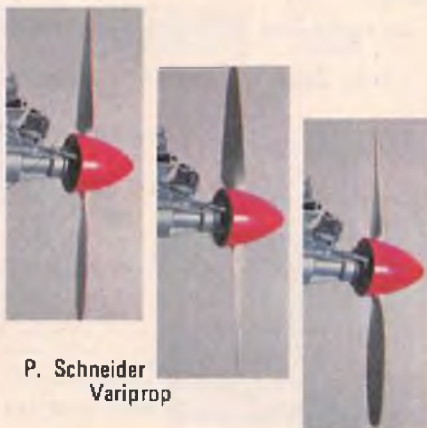
I. Evra 190 Engine



L. CF-5 Tiger



K. Harpoon



P. Schneider Variprop



Q. Cessna .09



M. Cessna Skyhawk



R. Superkate



O. Easy Flyer



S. Tiger



T. 10" Multi-Prop

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V. Delta 40



W. Taig Micro Lathe



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Our FAI Soaring Team Manager Dan Pruss, has passed on to me the partial results from Belgium on the Second World Sailplane Competition. The South African Team of Frikkie Roos, Roy Spavins, Nord Gerneke, and managed by Jack Abbot, took First Place Team Honors. The Austrian Team of Herbert Sitar, Werner Sitar, Anton Wackerle, and managed by Fridolin Fritz (who by the way is the designer of the "Dassel" which was flown by the whole Austrian team) took the second spot. Germany's team of Norbert Luka, Ralf Decker, Friedheim Schiborr, and managed by Dieter Pffafferkorn, placed Third. The United States team of Skip Miller, Terry Koplán, Steve Work, and managed by Dan Pruss, came home with Fourth Place honors.

Individual honors were captured by the Europeans. First Place was won by Anton Wackerle of Austria flying the "Dassel." This sailplane was highlighted in my column in March 1979 RCM. It is very sleek and fast and apparently it held its own in the thermal events. Second Place individual honors went to Ralf Decker of West Germany who, by the way, was also a contestant at the First World Championships in Pretoria in 1977.

The United States team flyers, as individuals, placed with Skip Miller 9th Place, Steve Work 19th, and Terry Koplán 23rd.

Dan Pruss stated that 21 countries entered a total of 62 contestants. Our thanks to the U.S. team for their efforts in this hard fought, close scoring contest.

One of the items that the Foreign countries have gone to is the canopy spoiler. There is a lot of merit to this system. Linkage does not have to be disconnected when removing wings; with the conventional spoiler if one leads the other, pitching and yawing takes over where with the one in the center this won't happen. Talking with pilots who use the canopy air brake system, it is very smooth, fast acting and very effective. When I get more detailed information on linkage and construction I will pass it on as it looks like a real winner.

★ ★

There has been some interest in a three control function mixer that could be simple to build but effective and positive



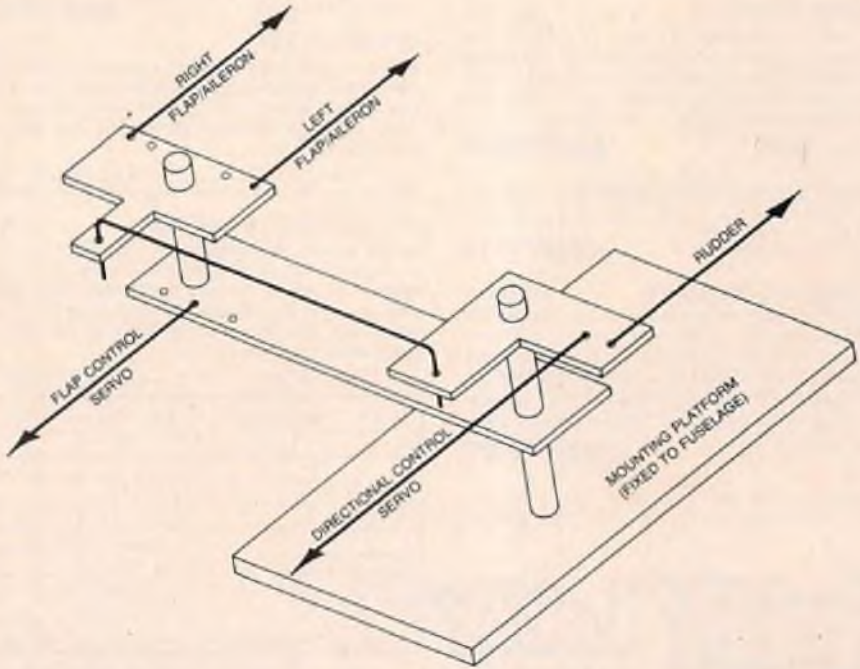
Fridolin Fritz, designer of the "Dassel" who is also team manager of the Austrian team, and chief of the A.M.E. which is a study group for model development. Photo by Markwort.

enough for large sailplanes. Duane Eisenbeiss of Prospect Heights, Illinois, has designed a three function mixer that is very simple to build.

Large sailplanes have higher performance than small sailplanes, but

they tend to be not as maneuverable as the smaller ones. However, by using rudder and ailerons to turn, they can be made to be more maneuverable. Also, additional performance gains can be

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In the April "Engine Clinic" a gentleman sent in several questions related to the mixing of gasoline fuel and castor oil. One question in particular asked why 100 octane aviation gasoline would not mix with castor oil while regular gasoline for his lawnmower would. I wasn't too sure about this myself and could not give a technical explanation. Shortly after the column appeared I received a letter from Steve Archambault who is a product engineer with Continental Oil Company. I did not run Mr. Archambault's letter right away as it was quite long and the mail load has been quite heavy during the summer flying months. I wanted to cover as many problems each issue as I could during the peak of the flying season. Due to the length of Mr. Archambault's letter I could not run the normal number of letters that I usually do. With the mail load easing off now and the increasing interest in the 1/4-1/3 scale ships that use gasoline base fuel, I am running Mr. Archambault's letter this month. I believe that you will find it very interesting as it explains the difference between Coleman fuel, 100 octane gasoline, etc. --- things that I am sure many of you have wondered about, myself included.

Dear Mr. Lee:

In the April RCM you field one heck of a question involving gasoline fuel, mixing with castor oils and then a couple more; one on 70 wt. oils and one on white gas. While each question probably deserves at least one page minimum in explanation, your attempt at all, within the four paragraphs deserves some sort of award of merit for effort! I would like to send along a little more information that might be of background value, for future reference. We may once again feel the need to return to this fuel source for model engine power, and your column questions may start to run more heavily in these areas. (Heavens! Nitro is getting really close to \$1000.00 a drum!)

Gasoline by any other name --- octane, heptane, benzene, toluene, etc., would run just as sweetly in most model engines for several reasons. Two or four cycle, it should make little difference, for one major reason based

on the factors influencing flame front propagation. Some of these factors are compression ratio, combustion chamber dimensions, spark timing, and fuel-air ratio. Simply because of the small area typically involved in model engines and the consequently short periods of time required for flame propagation to completion, "octane ratings" are of virtually no significance to our study. In other words, these small bore engines are insensitive to varying "octane requirements" we have become so completely bombarded with in terms of automotive or aircraft engine fuels.

One popular misconception is that higher octane rating numbers means slower burning fuel-air mixtures. This simply is not true. A close look at the need for "high octane" usually centers on the need to prevent explosive detonation in large bore engines of increased compression ratio, by virtue of bore X stroke calculations, or supercharged installations. While it is relatively true that "detonation" is faster in reaction time than uniform "combustion," it is not meaningful to say that high octane, slow combustion! Rather, more reasonable to say that high octane promotes uniform combustion in high compression situations by reducing the tendency of unburned mixtures to self ignite as the flame front travels to unignited areas, while cylinder pressures soar.

The entire bottom line effort is toward the controlled expansion of gases in the cylinder, by release of thermal energy content from combustion. The reaction, to be most efficient, must take place largely after TDC. Uncontrolled detonation influenced by cylinder environment (deposits, overheated cylinder head, hot spark plug elements, incorrect ignition timing) creates the need for gasoline components to resist explosive detonation. Detonation or "knocking" wastes power, generates dangerous cylinder pressures, and increases temperatures. These are destructive forces, as we know, but probably never occur in small engines simply because the cylinder environment is just so much more conducive to harnessing the reaction of combustion. Two or four cycle model

engines should run equally well on the same given fuel for these same reasons, regardless of "octane ratings."

The Coleman fuel presents another area of interest because of its lack of "octane." It is important to make a point of chemical nature involved in the gasoline story.

The major building blocks involved are generalized into two groups, Parafins (straight chain molecular structures and Aromatics (closed ring molecular structure). Parafins such as methane, propane, heptane, octane can all be used as spark ignition fuels and vary from gases to liquids at normal temperatures. Aromatics are virtually liquids or solids at normal temperatures and include benzene, toluene, ethylbenzene, for example.

These, too, may be used as spark ignition fuels but the comparative cost of doing so --- not to mention the newly found health hazards involved --- makes this impractical. The point here is that each of many substances of these two groups, and the many others from the Olefin and naphthene groups, can and have been successfully used as fuels in spark ignition engines, large and small.

Few people understand that "gasoline," per se, is a combination of chemicals from all of these groups. It is a meticulously balanced refining effort that provides maximum thermal content, balanced by necessary octane ratings at reasonable cost, and --- most recently --- without additives such as tetraethyl lead compounds, used to improve octane rating. This latter element consequently necessitates use of more expensive petroleum chemical components to provide the missing octane rating removed with the removal lead anti-knock additives. What we have then is a tremendous balancing or juggling act to provide gasoline products of adequate quality in performance, stability, and economy. The batches vary from time to time due to the components used, and may contain more aromatics than normal or vice versa, thus effecting the miscibility of vegetable, glyceride compounds such as castor oil, to the extent that additives such as petroleum ether may be necessary to prevent separation of

to page 12





THE 18-WHEELER

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This is Pro-Cision's fabulous radio-controlled 18-Wheeler — a 22 inch long scale model of a customized Peterbilt. This is the one that created a furor in the world of radio controlled vehicles — the one that enables you to hitch and unhitch tractor and trailer on command by remote control!

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## ENGINE CLINIC

from page 10

the gasoline-castor oil mixture.

Coleman fuel is typically a naphtha product having an "octane rating" of about 30. It is not the same as "white gasoline" by virtue of the explanations above. However, if used in a 1925 gasoline engine, by itself, it might prove adequate as a gasoline, just as it does in model spark ignition engines today.

This might present a problem, to some, thinking "octane rating" tremendously important in model engines. If 30 octane rating Coleman

fuel works adequately, wouldn't 100 octane aviation gasoline work better? Strictly on the merits of octane rating alone, it would not! However, on the chemical differences involved and the high probability that there is significantly more thermal energy (BTU's) in aviation gasoline than Coleman fuel, it is very likely that the aviation gasoline will provide more power and, therefore, "run better."

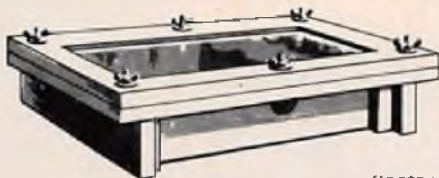
This is due to chemical energy and not octane rating, pure and simple. Again, small engines do not require octane or octane modifiers to provide uniform burning or combustion rates under varying pressures. Automotive

and aircraft engines do, and increasingly so with increasing size and compression ratio, air-fuel mixing, etc. A last example would be the many automotive engines seen in Europe for quite some time --- typically of small bore and high compression.

These engines enjoy the ability to utilize relatively low octane rating gasoline while providing good power outputs per unit of displacement. The V-12 Ferrari engines were famous for this. All was made possible, in these small bore engines, by just that, small bore; thus more uniform burning per unit time. This all equates to better

to page 15

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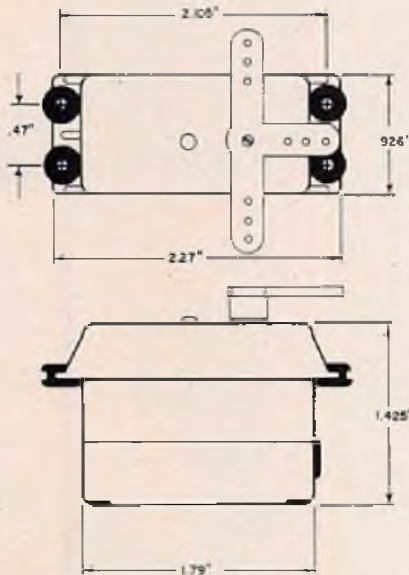
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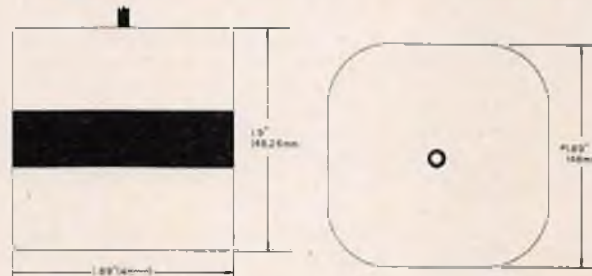
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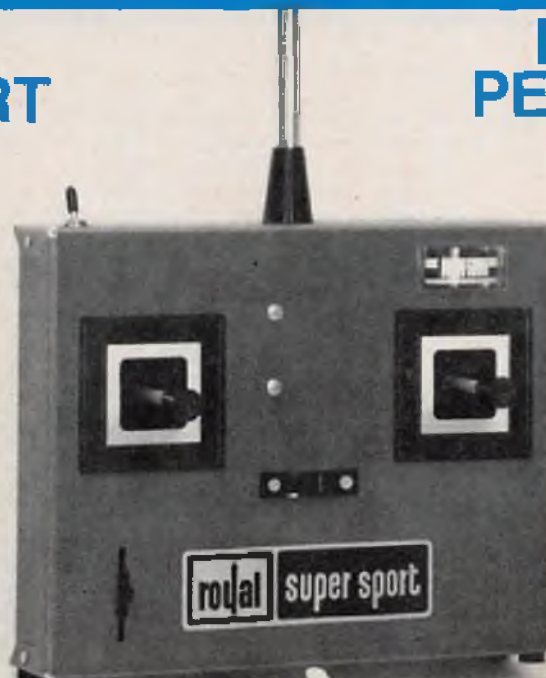
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## THE AMAZING NEW FOX EAGLE II New, Different and Better

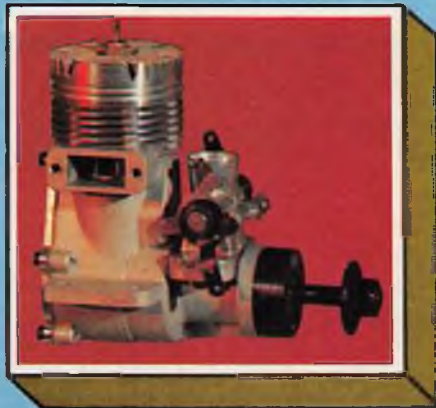
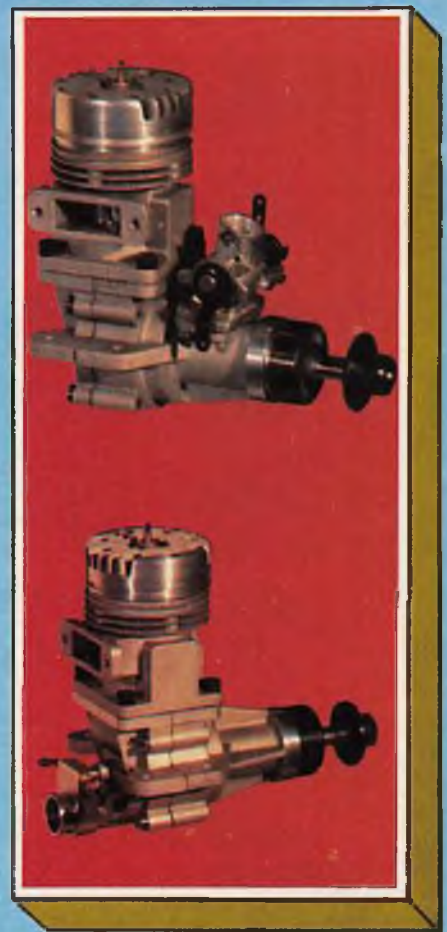
Bore: ..... .907      Weight: ..... .17 oz.  
Stroke: ..... .937      Horsepower: ..... 1.9 at 15,000 RPM

The new Fox Eagle II is truly a major advance in the art. The high power output is achieved by its more efficiently shaped bypassing and cylinder porting configuration coupled with a very massive and structurally sound design. The square cylinder bolt pattern makes it possible to order your engine with the exhaust pointing any one of four ways. Pattern flyers tell us that a rear exhaust installation in a symmetrical airplane handles better in the rolling maneuvers. In addition, the cleaner exterior enables them to pick up speed where it is needed. The massive connecting rod and large lower end (.281 dia. x .312 long pin) gives the assurance of a long life and durability. The removable head button makes it possible to tailor the combustion chamber to your particular flight conditions. The piston is made of low expansion, heat resistant high silicon aluminum and requires less clearance than many. The single high tension piston ring holds compression well at cranking speeds making hand crank starts easy, hot or cold. Modern 60 airplanes represent a lot of time and money and deserve the finest power plant you can obtain. The Fox Eagle II is such an engine.

The Fox Eagle II can also be ordered with a rear intake configuration. This too introduces several advanced concepts. The rotor disc and shaft is one piece so that the rotor disc maintains its squareness with the mating surface. The large diameter case permits a larger than average rotor disc and a larger than average intake so your engine will never run out of air. Again, the square cylinder mounting pattern makes possible turning the exhaust in line with the crank shaft which is ideal for both applications. The massive, rugged moving parts will withstand the beating that racing motors take. For speed and durability the Eagle II is the engine for you.

16200 Fox Eagle II - Racing ..... \$145.00  
26200 Fox Eagle II - Side Exhaust ... \$125.00

26259 Fox Eagle II - Rear Exhaust ... \$125.00  
26300 Fox Eagle II - Marine ..... \$175.00



### FOX 45BB

Bore ..... .850      Weight ..... .12 oz.  
Stroke ..... .790      RPM with 10-6 prop ..... 14,500  
Displacement ..... .45

Our tests show this remarkable engine to be the most powerful 45 on the market. It will put out over one horsepower on straight alcohol fuel and more on nitro fuel. Unlike other high performance engines, the Fox 45 has no temperamental characteristics. It starts easily, idles excellently, has the most linear throttle response of any 45 on the market. It is also extremely durable. The crankcase walls are 3/32 inch thick. The crankshaft has a 19/32 inch diameter. It has a generously proportioned connecting rod. It is easy on glow plugs.

1979 Modifications consist of a head re-design and an appearance treatment. The new head is of the two piece button concept featuring a trumpet shaped combustion chamber that seems to produce another 4-500 RPM. Appearance changes are obtained by matching the fins.

14600 Fox 45BB Schnearle  
for C/L ..... \$4.95  
24600 Fox 45BB Schnearle  
for R/C ..... \$64.95

90252 Conventional Silencer ..... \$7.95  
90302 Tuned Muffler ..... \$19.95  
90412 1/2" Prop Extension ..... \$3.00  
90413 3/4" Prop Extension ..... \$3.00



### FOX HAWK

Bore ..... .907      Weight ..... .15 oz.  
Stroke ..... .937      Horsepower ..... 1.5

The Fox Hawk offers schnearle power at a modest price. It was our finest 60 until the introduction of the Eagle II. Tooling is now paid for and the engine is thoroughly debugged. It has two ball bearings - bushed rods - schnearle ports as do most quality 60s. One unusual feature is the nitrided cylinder with steel fins that we think resists lean runs better than slip-in liners. Another is the flange mounted carburetor which does not distort the crankcase when tightened. Power is about 1.5 horsepower on medium nitro fuel, however, it runs very well on straight alcohol and castor oil. The Hawk weighs less than most 60s, costs less, yet runs equal or better than most.

16199 Fox 60 Hawk for C/L ..... \$74.95  
26100 Fox 60 Hawk with R/C carb ..... \$84.95  
90232 Conventional Silencer ..... \$9.95  
90303 Tuned Muffler ..... \$24.95





efficiency, greater latitude of fuels used, and an escape from costly premium fuel formulations necessary to feed large displacement, high compression engines.

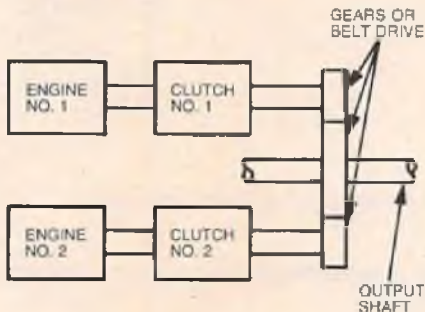
Well, thanks for letting me share this information with you. I've read your Engine Clinic column for many years now and commend you on your patience and job well done.

Please feel free to call me for any information you might desire regarding petrochemical formulations or test data. It is always fascinating to research a particular problem in this area, therefore, opening the door to expand my knowledge, just that much further. Best wishes and continued success to you and the Engine Clinic.

Very truly yours,  
Steve Archambault  
Continental Oil Company  
Project Engineer  
Houston, Texas

Dear Mr. Lee,

I have recently been toying with the idea of coupling two model engines through individual clutches to a single output shaft, according to the accompanying schematic.



This power train would be used to power a radio controlled helicopter. There are several reasons why I would like to use this arrangement. First, and most important, should either engine fail it would simply disengage its centrifugal clutch, leaving the other engine to land the helicopter. Second, I have been told that smaller engines are more efficient (i.e., less fuel consumed per horsepower) than larger engines. Finally, coupling engines would allow larger helicopters to be designed.

I have several reservations about this design and would appreciate your comments on the following:

(1) Centrifugal clutches in R/C helicopters are designed to engage at approximately 3000 rpm so that the engines can be started at idle (i.e., without the main rotor blades turning). Above 3000 rpm the speeds of both engines will be the same if the clutches do not slip. Because of this it is possible, if not probable, that one (or both) of the

engines will be forced to consume more (or less) fuel than it would if it were by itself, operating at the same speed and half the load. Is it possible for a two-stroke engine to do this? I have noticed that some motors are very sensitive to needle valve setting. Is this a problem with two cylinder/two carburetor engines?

(2) Should one engine fail, I am concerned that it would not slow down and disengage quickly enough to avoid over-loading and killing the remaining engine. If one cylinder fails in a two cylinder engine does the engine usually stop?

(3) Finally, would you recommend that a battery be connected to the glow plugs at all times while the engines are running?

Before I jump into this somewhat expensive experiment, any comments you could make as to its feasibility would be very much appreciated.

I look forward to your column every month and own both of your books. Please keep up the excellent work.

Sincerely,  
Gary J. Hobart, P.Eng.  
Calgary, Alberta, Canada

Although coupling two engines together for helicopter use could naturally be done, I believe that you would be asking for more problems than any advantage you would gain from the system. You would only be increasing the unreliability factor. In my opinion you would be better off to use one larger displacement engine to begin with. I realize that you would lose the advantage of a second engine to aid in landing which is the main intent of the project but there would be more problems involved and a single engine might prove to be the more reliable in the long run. You are basing the idea on one engine failing completely and the other taking over. However, in a situation where one engine might go lean and continue to run, it would load the other engine causing it, in turn, to go lean also and you would probably end up with both engines dying. Or as you mention, the one engine might not disengage quick enough by not dying completely, loading the other engine and, in turn, causing it to stop.

As far as two smaller engines using less fuel than one larger engine — there are a lot of variables involved. Actually you would probably get better fuel economy with a larger engine that is not working as hard than two smaller engines that are working at maximum power.

If one cylinder fails in a two cylinder engine, it depends on the needle valve setting whether the engine stops or not. If set for peaked out power, the extra drag of the dead cylinder causes the firing cylinder to go lean and the engine dies. If the engine were set fairly rich to begin with then it could handle the extra

drag and continue to run — at greatly reduced power, however.

There would be no real advantage to keeping the glow plugs lit all the time with a battery. It would be advantageous to turn the battery on below half throttle with a micro switch. This is when engines are more apt to die due to the cooling off of the glow plug/plugs.

Dear Clarence,

I have never read a great deal regarding idle mixture adjustment on engines. Just in the last few weeks a few engines in our club seem to be suffering this problem. I realize this is supposed to be pre-set at the factory but just suppose it is out, would you give me a few clues on how to get this adjustment spot-on?

(1) Which way is the screw turned for rich or lean?

(2) What are the signs to tell you if the engine is rich or lean?

(3) When adjusting, how far should the screw be turned, i.e., what increments?

(4) How far through the rev. range does this adjustment have an effect?

Yours faithfully,  
Kevin Hughes  
Sydney, Australia

Setting up the idle on an engine is not really all that hard. However, the problem most fellows run into is the variables involved. Fuel, glow plug, engine and carburetor design, tank position, etc., etc. These all play a part in achieving a reliable idle. If an engine has bad idle characteristics to begin with or a poorly designed carburetor, then no amount of tinkering will ever get a reliable idle.

First off — engines do not come from the manufacturer with the carburetor adjusted. Few production engines now days are run at all. Any carburetor adjustments are just an approximate setting.

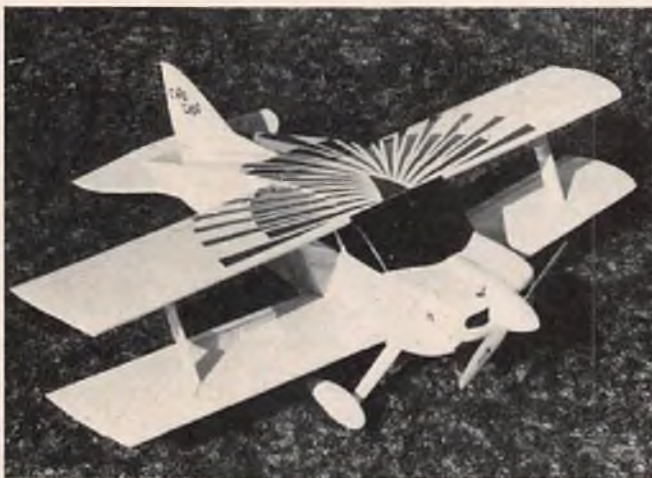
I have covered proper idle adjustment many times in past columns but realize we pick up new readers every month who have not seen many of these past columns. Many pages could be written on proper idle procedure if we wanted to get into all the technical aspects. But I have always felt that this type of thing was more for the arm chair theorists who have yet to fly their first R/C model. I write this column for the guy actively engaged in flying an R/C model so I try to make things as simple as possible.

So without a lot of complicated explanation — the best way to adjust the idle mixture is to note how the engine accelerates when given full throttle. If it sputters and spits, throws out a blue cloud of smoke and gradually picks up speed, the mixture is too rich. The idle mixture screw should be leaned in 1/4 turn increments until proper acceleration is achieved. In the case of the Perry carburetor the idle mixture adjusting disc



# RCM PRODUCT REVIEW

## Master Kit HIPERBIPE



I was bribed . . . with a picture. The first thing I saw after pulling off the box cover was a large color reproduction of the full-size Hiperbiplane. Naturally I figured that anyone who includes such a pretty picture in a kit must be a good guy . . . and it follows, of course, that a good guy would market nothing less than a good kit. So the bribe worked. But it wasn't necessary. I would have been impressed with this kit, even without the picture.

### CONSTRUCTION:

The excellent quality of the wood speaks for itself. The die-cutting, especially the plywood, was the best I've ever seen; the parts literally fell out. Another eye-pleaser were the plans: two sheets of great looking, blue-line drawings, nicely supplemented by a number of isometric sketches.

The hardware package even includes two Fox flanged collars for mounting the wheel pants, which are made out of ABS plastic. There's acetate for the windshield, a 5-page instruction booklet with photos, and a dandy decal sheet for those who want to make their bird look just like the real one. And the main landing gear gets a nod of approval also: those 3/16" wire struts are as sturdy as they look. Although the kit includes the wood needed to make the cowl, a fiberglass cowl is available as an extra from Master Kit . . . it's a real time saver.

This is not a quickie. This is one you have to build. There's nothing really unconventional or difficult about the construction; it's just that there's more to it than slapping some balsa and ply together.

The fuselage sides and framework are built from 1/4" square balsa, with some sheeting and blocks added to it. By the time the landing gear trunion blocks, 1/4" firewall and other

### SPECIFICATIONS

Name .....	HIPERBIPE
Aircraft Type .....	Sport Scale
Manufactured By .....	Master Kit
	6 Fox Road
	Plaineville, CT. 06062
Mfg. Suggested Retail Price .....	\$64.95
Available From .....	Both Mfg. & Retail Outlets
Wing Span .....	42 Inches
Wing Chord .....	7.5 Inches
Total Wing Area .....	630 Square Inches
Fuselage Length .....	33 1/4 Inches
Stabilizer Span .....	17 Inches
Total Stab Area .....	76 Square Inches
Mfg. Rec. Engine Range .....	.40-.60
Recommended Fuel Tank Size .....	10 Ounce
Recommended No. of Channels .....	4
Recommended Control Functions .....	Rud., Elev., Throl., Ail.
Basic Materials Used in Construction:	
Fuselage .....	Balsa & Ply
Wing .....	Balsa & Ply
Tail Surfaces .....	Balsa
Building Instructions on Plan Sheets .....	No
Instruction Manual .....	Yes
Construction Photos .....	Yes

### RCM PROTOTYPE

Radio Used .....	Heath Tx, Royal Rx, Heath, Ace & Dunham Servos
Engine Make & Disp. ....	K & B .40
Tank Size Used .....	6 Oz.
Weight, Ready To Fly .....	88 Ounces
Wing Loading .....	20.1 Oz./Sq. Ft.

### SUMMARY

#### WE LIKED THE:

Wood quality, good die-cutting, plans, flight performance.

#### WE DIDN'T LIKE THE:

Landing gear design, unsatisfactory engine cooling, no plywood splice brace in lower wing.

ply parts are epoxied on, you've got a strong but weird-looking fuselage. It looks much like a section of wing trying to do double duty as a fuselage . . . and that's exactly what the designers of this "High Performance Biplane" had in mind.

The wings present no surprises. They go together like any other high performance airplane wings. There are twice as many of them, but they are pretty small so it's not that much of a chore (especially if you have a thing about bipes). I did make a modification to the bottom wing. Though the plans call for only the top wing to have a 1/8" ply brace in its center section, I did build a similar brace into the bottom wing (this was insurance as I love to do snaps and other kinds of violent maneuvers). Both wings have ailerons; the bottom wing has the muscle and is connected to the upper ailerons by pushrods.

The vertical and horizontal stabilizers are simple. They're built from 1/4" thick balsa strips and die-cut parts, with the rudder and elevator shaped from 1/4" sheet. The only thing different about these tail feathers is that they must be glued in place before the fuselage is covered . . . which makes for a little grumping when you finally get to covering that aft section.

At this point a final check was made on the incidence angles. It's vital that the top wing measures a plus 1/2 degree, the

to page 177





# SKIP MILLER SOARS TO VICTORY ON THE WINGS OF THE AQUILA GRANDE!

Airtronics designs captured top honors in the 1979 League of Silent Flight International Tournament. This grueling three-day multi-task competition between 100 of the country's best sailplane pilots once again proved the championship quality of the Aquila and Aquila Grandè.

Skip Miller of Boulder, Colorado, won first place overall and first in unlimited class, flying an Aquila Grandè with a Cox/Sanwa Medalist radio.

Hoyt Holley of Bethel, Connecticut, won first place overall duration plus first in standard class flying an Aquila.

Tim Renoud of Irvine, California, won first in junior class with an Aquila Grandè and Cox/Sanwa Medalist radio.

The Aquila Grandè is the latest addition to our outstanding line of Airtronics kits. Designed for multi-task, unlimited class competition, the Grandè has already established its championship performance. It can help you to join the winner's circle.

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**FOAM MOLDED MODEL**

• PAINTED • DECALS INCLUDED • STEERABLE NOSE GEAR •

Sport Scale Kit  
**CESNA 177 CARDINAL**  
 .19 - .25 ENGINE



SPAN: 48 in.  
 AREA: 384 sq.in.  
 ENGINE: .19 - .25  
 RADIO: 2 - 4 channel

The Cessna 177 Cardinal is an injection molded model that goes together very fast with a minimum amount of building. The tail parts are balsa wood that have to be hinged and epoxied onto the fuselage. The fuselage comes in two parts, an upper and lower half, that takes only minutes to join together. All parts are pre-painted white and a full set of decals are included. The model is complete with the formed aluminum main landing gear and a pre-bent steerable nose gear. This is our largest foam model and is perfect for 3 channel operation.

RETAIL **\$39.95**  
**\$29.99**

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**Hobby Shack** - **BITOR**  
**RADIO-CONTROL**

**Quick Built Series**

R/C Scale Model  
**PIPER CUB J-3**  
 .20 ENGINE



**Quick building - Good looking - Great flyers**

• QUICK-BUILT FAST BUILDING DESIGN • ONE PIECE VACUUM FORMED COWL AND FORMED SNAP-IN WINDOWS • HEAVY DUTY ALUMINUM LANDING GEAR • PIPER J-3 AUTHENTIC RUDDER DECALS • BEAUTIFUL HAND MACHINED Balsa PARTS & DIE CUT PLYWOOD PARTS • FULL SIZE PLANS WITH PHOTO INSTRUCTIONS •

SPAN: 55.1 in.  
 LENGTH: 34.6 in.  
 AREA: 449.5 sq.in.  
 WEIGHT: 3.41 lbs.  
 ENGINE: .19 - .25  
 RADIO: 3 - 4 channel

RETAIL **\$49.95**

**\$39.99**

**Hobby Shack**

**THUNDERBOLT**  
**R/C LONG GLOW PLUGS**



6/ **\$4.99**

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**RADIO-CONTROL**

**Quick Built Series**  
 Slope Stunt Glider

**Q.B. SLOPE 13**



Span: 63 in.  
 Area: 496 sq.in.  
 Weight: 1.98 lbs.  
 Radio: 2 - 3 ch.

RETAIL **\$49.95**  
**\$39.99**



**.049**  
**MEDALLION**

RETAIL **\$17.00**

REG. **\$12.76**

**\$9.99**

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**#3012-6 R/C ELECTRIC CAR**

6 CELL ELECTRIC CAR KIT MINUS BODY  
 1/12 SCALE R/C CAR KIT  
 Complete except for the radio system.

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**BRIDI HOBBY**  
**TRAINER 60**



Span: 60 in.  
 Area: 672 sq.in.  
 Engine: .40 - .60  
 Radio: 4 channel

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**\$41.99**

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**SS-6 ELECTRIC STARTER**



SS-6 .25 THRU .60 ENGINES

RETAIL **\$42.95**  
**\$29.99**

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**Trainer Model Balsa Kit**

**JUNIOR 100**



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**\$27.99**



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 Gas Model Engines



**IBS**  
**.099 SR R/C**  
 RETAIL **\$37.95**  
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**FOR R/C  
LIVE STEAM  
OPERATION**

- All brass, metal & plastic deck fittings included
- All running hardware included

**STAR LIGHT**



• Beautiful gel-coated fiberglass hull

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LENGTH: 35.4 inches    RADIO: 2 channel  
BEAM: 8.36 inches    ENGINE: V4PR (not included)  
HEIGHT: 20 inches    BOILER/BURNER: B2E (not included)

RETAIL \$299.95  
**\$219.99**

To see our complete line of R/C steam boats, steam engines, boilers & burners, send for our 1979 Modeler's catalog

**Hobby Shack**

**FOAM LUSTER**

Spray Paint...

Specifically Formulated For Foam

Foam Luster is the final answer in the finishing of foam model airplanes. It can be sprayed directly on to the foam surface with absolutely no fear of ruining the parts, as is possible with most other types of spray paints. You do no sanding, no filling, and NO other special preparation! Simply take (for example), the Cessna 150 wing out of the box, wipe off the dust, and spray away for a final finish that will amaze you! The color will be rich and vivid, and the high gloss finish will help make any model look great!

**YELLOW, DARK BLUE,  
RED, ORANGE, BLACK, WHITE,  
LIGHT BLUE & GREEN.**

Spray Paint...

Specifically Formulated For Foam

- 8 GREAT COLORS • EASY TO USE
  - FUEL RESISTANT • QUICK DRYING
  - LIGHTWEIGHT FINISH • NO SPECIAL SURFACE PREPARATION •
- LIST \$2.36  
**\$2.95**  
1 1/2 OZ. CAN

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Designed by *Swan Odessen*  
**CALIFORNIA  
STATE CHAMPION 1937  
PACEMAKER-40**



RETAIL \$89.95  
**\$69.99**

SPAN: 73 in.  
AREA: 632.4 sq.in.  
ENGINE: .40  
RADIO: 4 channel

**Hobby Shack**

RADIO-CONTROL

**ALMOST READY TO FLY  
CESSNA 150**  
(20 ENGINE)



RETAIL \$99.95  
*Sale* **\$79.99**

Span: 52 in.  
Area: 425.5 sq.in.  
Engine: .20  
Radio: 3 - 4 ch.

**Hobby Shack**

RADIO-CONTROL

**BALSA KIT**

**CUTLASS**  
Delta Model Planes  
**.20  
SIZE**



RETAIL \$49.95  
**\$39.99**

Span: 39.8 in.  
Area: 635.5 sq.in.  
Engine: .18 - .25  
Radio: 3 - 4 ch.

**PRO-CISION**  
POWER STREAMER

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BORA**



**\$59.99**  
EACH

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**Hobby Shack**

RADIO-CONTROL

**ALMOST READY TO FLY**

A.R.F. 40 Sport & Trainer Model  
**TRYPSTAR-40**  
40 ENGINE



RETAIL \$129.95  
**\$99.99**

SPAN: 56.7 in.  
AREA: 527 sq.in.  
ENGINE: .40  
RADIO: 3 - 4 channel

**Hobby Shack**

RADIO-CONTROL

**ALMOST READY TO FLY**

A.R.F. 4 ch. Sport & Trainer Model  
**SHELLFLY-20S**  
20 ENGINE



RETAIL \$99.95  
*Sale* **\$79.99**

SPAN: 52 in.  
ENGINE: .20  
AREA: 450 sq.in.  
RADIO: 3 or 4 ch.

ALL YOU NEED IS YOUR ENGINE AND RADIO

**Hobby Shack**

**SS-8 ELECTRIC  
STARTER**



SS-8 .40 THRU .80 ENGINES  
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R/C SPORTS MODEL



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2 CHANNEL TRAINER  
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**NEW** Hobby Shack **ACROMASTER-20**  
 RADIO-CONTROL  
 Quick Built Series  
 Balsa Wood Kit



SPAN: 39 in.  
 AREA: 418.5 sq.in.  
 ENGINE: .19 - .25  
 RADIO: 4 channel

Retail \$44.95 **Sale \$34.99**

**Inflation Fighter**  
 SUPER VALUE  
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 - PILOT  
**TRystAR 15 ARF**



Span: 49.2 in.  
 Area: 403 sq.in.  
 Engine: .15  
 Radio: 3 channel

Retail \$79.95 **Sale \$52.77**  
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**NEW** Hobby Shack  
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Span: 8' 10 1/2 in.  
 Area: 2,163 sq.in.  
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 Radio: 4 channel

Retail \$129.95 **\$89.99**

Sporty Model Kit  
**Q.B. 40S**  
 40 ENGINE  
 QUICK BUILT KIT



SPAN: 59 in.  
 AREA: 573.5 sq.in.  
 ENGINE: .40  
 RADIO: 4 channel

Retail \$59.95 **Sale \$39.99**  
 Cat. \$44.99

Hobby Shack **hiroba**  
**FALCON**  
 RADIO CONTROL HELICOPTER  
 WITH COLLECTIVE PITCH



MAIN ROTOR DIAMETER: 52.8 in.  
 FUSELAGE LENGTH: 48.8 in.  
 WEIGHT (fully equipped): 7.3 lbs.  
 ENGINE: .40 - .45  
 RADIO: 4 channels

Retail \$319.95 **Sale \$219.99**  
 Cat. \$249.99

HOBBY SHACK-PILOT  
 Scale Model Kit  
**Q.B. CESSNA 20**  
 20 ENGINE  
 QUICK BUILT KIT



SPAN: 53 1/2 in.  
 AREA: 427.8 sq.in.  
 ENGINE: .20  
 RADIO: 3 - 4 channel

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HOBBY SHACK-THUNDER TIGER  
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Retail \$19.95 **\$12.99**

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**FUJI .25S R/C**  
 WITH MUFFLER



Retail \$54.95 **\$36.56**

Hobby Shack  
**STAGGERWING**  
 ALL FOAM



SPAN: 39 1/2 in.  
 AREA: 450 sq.in.  
 ENGINE: .15 - .25  
 RADIO: 2 - 3 ch

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**SPIRIT of 76**



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 the little aircraft company  
**J-3 CUB**



Retail \$39.95  
 SPAN: 52 in.  
 AREA: 442 sq.in.  
 ENGINE: .15 - .19  
 RADIO: 2 - 4 ch

**\$24.79**

Hobby Shack  
**FUJI .40SS ABC IBS**  
 WITH MUFFLER



Retail \$99.95 **\$69.99**







# Cunningham On RC CHUCK CUNNINGHAM



## SECOND ANNUAL SOUTHWEST JUMBO FLY-IN

**T**he Second Annual Southwestern Jumbo Fly-In was just that, a very super Jumbo Fly-In. This year the Texas weather cooperated with beautiful, windless days of 92° each of the two days and, despite the threat of no gas to be had in the Fort Worth/Dallas area, the builders and fliers came from all over to be a part of this great get-together. Beautiful Thunderbird Field was alive with giant aircraft of all types, ranging from Nosen and Sky Master kits to all kinds of scratch designed and built

aircraft. Lots of Gere Sports were there, as well as a Fleet Bipe, scratch-built Quadra powered Gee-Bee, lots of Mr. Mulligans, Miss Texas' and Lazy Aces. Eighty-five aircraft were registered with another batch that escaped registration. The pit area extended for three hundred yards, and several thousand spectators found out about the Fly-In even though no announcement was made to the general public in the area.

On Sunday morning a fly-over was made by several Clipped Wing Cubs. One, the full size replica of a jumbo model on the field, a Pitts Special, a Bucker Jungmeister, a Stinson Reliant, and several other aircraft. Several low

passes were made over the field, and it was amazing how much quieter the full to page 24



*Clipped Wing Cub, Quadra powered. Flown by Kerry Robertson. Wendell Roberts and Terry Detch are owners. Best Scale Trophy winner.*



*Gere Sport - by Bill Nickell, flew very realistic, Quadra powered.*



*Bud Nosen Mr. Mulligan with Quadra engine. Built by Archie Klassen of Kingsville, Texas.*



*Nosen P-51 by Gary Jones of Wichita Falls, Texas. Model was incomplete and was shown static only.*



*Original model called "Early Bird." Built and flown by Ken Bina of Topeka, Kansas. Best Non-Scale trophy winner.*



*Bridi Rearwin Speedster built by Tom Egbert of Glaremore, Oklahoma - flew great.*



*Jim Simpson's version of Duane Cole's Clipped Wing Taylorcraft. Weight 20 pounds, wing span 88".*



*Beautiful scale rendition of an Arvo Tutor built and flown by Ernest Harwood, Arlington, Texas. Excellent workmanship!*



*Owen Gogburn of Fort Smith, Arkansas, ready and anxious to fly his Quadra powered Pitts. Fellow club member holds.*



*Would you believe? A Quadra powered Gee Bee! Built and flown by Darrell Neyland of Austin, Texas. A very ambitious project.*



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

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

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

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

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

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

"The gentleman that I built the birds for is an excellent pilot, but like all of us, can have his share of hard luck. He stuck the fibreglas fuse straight in from a high altitude. The impact shattered the fuse and bent the 1/4" wire to a 30° angle. The wings appeared to be unhurt, as well as the tail feathers.

"Upon inspecting the wings for damage, I noticed that the rib at the polyhedral (outboard) end felt punky. I slit the covering at that point and the outer wing panel fell off. Both dihedral braces were broken, and the rib was pulverized at the leading edge, as well as being split.

**There was no outward sign of damage as the Coverite had no wrinkles or tears."**



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

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

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

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

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- 4-bladed rotor kits
- Heli-Baby II kits

DEALER INQUIRIES  
INVITED



## CUNNINGHAM ON R/C

from page 22

size were compared to our birds.

A trophy was awarded, based upon judges decision, for Most Impressive Aircraft. It was won, for the second straight year, by Don Apostilico and his Nosen Cessna 310 powered by twin speed Webra .61 engines. This aircraft weighs 28 lbs., and yet flies beautifully. Don flies it around Tulsa, Oklahoma, just about every weekend just for fun. Best Scale Aircraft was awarded to Wendel  
to page 166



Gere Sport by Darrell Neyland. Quadra powered, MonoKote covered. Darrell hails from Austin, Texas.



Unusual aircraft called Turkey Buzzard powered with K & B .61. Looks like Mickey is doing his thing on the wing.



Beautiful Concept Fleet by Robert Masten of Lubbock, Texas. Quadra powered, neat engine installed with C.B. mount. Aircraft flew superb.



Gere Sport built and flown by Garland South of Cleveland, Oklahoma. Powered by McCulloch chain saw engine.

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5%	12.95	
10%	13.95	
15%	15.95	
25%	18.95	
40%	25.95	
Helicopter	14.95	

Give your engine a treat!!! Feed it Cool Power and you'll both be pleased. These are a few of the in-the-know people who do:

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Rhett Miller Ron Chidgie  
Dave Platt Steve Helms

Cool Power is now available in metal cans as well as plastic bottles (\$1.00 more in cans).

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### SYSTEMS FEATURE

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SMOOTH STICK OPERATION



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aero sport  
two **79<sup>99</sup>**

Aero Sport Two Systems Include: 2 channel receiver, 2 channel transmitter, both for AA Alkaline battery operation (batteries not included), 2 Aero Sport NS-IC servos, dry airborne battery box, switch harness, frequency flag, extra servo wheels and full 180 day warranty. 72 mHz only.

aero sport  
three **105<sup>99</sup>**

Aero Sport Three Systems Include: 3 channel receiver, 3 channel transmitter, both for AA Alkaline battery operation (batteries not included), 2 Aero Sport NS-IC servos, dry airborne battery box, switch harness, frequency flag, servo trays and full 180 day warranty. Choice of 72 or 75 mHz.

aero sport  
four **169<sup>99</sup>**

Aero Sport Four Systems Include: 4 channel receiver, 4 channel transmitter, all Ni-Cads for both transmitter and receiver airborne, dual charger (charges both batteries at the same time), 4 Aero Sport NS-IC servos, servo tray, extra servo wheels, instruction book, frequency flag and full 180 day warranty. 72 mHz only.

aero sport  
six **189<sup>99</sup>**

Aero Sport Six Systems Include: 6 channel receiver, 6 channel transmitter, all Ni-Cads for both transmitter & receiver airborne, dual charger (charges both sets of batteries at the same time), 4 Aero Sport NS-IC servos, servo trays, extra servo wheels, instruction book, frequency flag and full 180 day warranty. 72 mHz only.

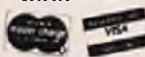
Hobby Shack takes particular pleasure in knowing that we are offering the American modeler the finest line up of radio systems and accessories at real money saving economical prices. For the past seven years we have been contracting for our radio systems to be manufactured by the largest and best radio maker in Japan. This has allowed us to keep pace with the new electronic technology and get quality craftsmanship. For 1979 we have four systems, giving you a choice of four radios to choose from, depending upon your needs and progression in the radio control hobby.

No one else that we know of as of this writing has a better two channel to offer you than our Aero Sport Two. Our two channel transmitter is an aluminum vinyl covered case unlike all the other plastic cases. Only Aero Sport Two offers a triple tuned front end receiver the same as our other radio systems have. Only the Aero Sport Two offers you three servo types to select from when you make your purchase. We think the Aero Sport Two is the best two channel you can buy at any price and our price is only \$79.99. This year we have expanded our servos al-

lowing you a choice of six different types to best suit your needs. In fact all systems are shown in the catalog with several servo options for the initial purchase. This year we have introduced our brand new stick assembly giving you open gimbal action with a dust shield to keep the dirt out. When you select an Aero Sport System you're getting quality, dependability, up to date engineering design, and back up service and warranty. That's the reason we have always sold so many radio systems each year and know that we have the best for 1979.

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# Contender 40 Low Wing R/C Trainer

**THE BUILDER'S CHOICE.** Bent wing or straight wing, Top Flite's all new Contender 40 is a pilot's dream. Kit includes hardware package, many die-cut and precision machined parts plus easy to read plans for minimum building time and maximum flying enjoyment. Listen to how Al Betkey of Col. Betkey's Flying Circus describes this .40 size, low wing trainer. "Top Flite's Contender 40 is the star performer of our Flying Circus. Virtually stall proof, its short field capability

along with its fantastic pattern handling make the Contender the real workhorse of our aerial demonstration. I heartily recommend this great Top Flite kit to anyone who wants to experience the ultimate in performance and stability all in one easy to build package."



Actual photo of model built from kit using straight wing option.



Internationally acclaimed Colonel Betkey and his Flying Circus.



Actual photo of model built from kit using bent wing option.

Length ..... 43 3/4"  
Wing Span .... 47"  
Wing Area .... 500 sq. in.  
Engine Size ... .40  
App. Weight ... 4 1/2 lbs.  
Kit No. .... RC-22

List Price

**\$49.95**



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# BIG is Beautiful



BY DICK PHILLIPS



**S**ome time ago, one of my correspondents in France sent me a subscription to a French modeling magazine, *Radio Modelisme*. While I do not read French as well as might be the case had I paid more attention in class when I was going to high school, I can manage to make reasonable sense out of the language.

In the May '79 issue of *Radio Modelisme* there appeared a two page article entitled "Big is Beautiful." As you might imagine, this immediately caught my eye, for the obvious reason, and for the reason that it was in English. The article was written by Claude Kieffer whom I don't know and was written in general terms about the Quarter Scale movement.

In one section of the article Claude remarks that the **big** movement is not restricted to any one area but appears to be pretty well worldwide. He mentions the QSAA twice in the article and indicates a wide interest in France in the larger models. When I look back on my early attempts at large models and the kind of flack I used to get about being "some kind of nut," it's hard to resist saying I **was** right, after all!

I mentioned an O & R engine some months ago as one I had managed to pick up with the intent of converting it to a model engine. This conversion has just been completed by my good friend Mel van Vianen who has been a flying buddy for many years. Mel has a micro lathe and with it has created a prop hub and done some machining on the engine

to get rid of extraneous material and to prepare it for flight. We had it running a few days ago (see photos) and it looks as if it is going to work out well. It turns an 18/6 Punctilio prop at 5200 rpm, idling down to about 1100-1200.

I should specify that the engine is quite noticeably smaller than the 2 cubic inch engines we are currently running, but I do not know what its rating is. Mel managed to shave 10 ounces (net) off the weight of the engine in removing some of the metal no longer required. The engine was originally shrouded in, and air was ducted to the cooling fins in order to assure it ran properly cooled. We judged this to be unnecessary in a model with the engine out in the air so we removed most of it.

The engine is ignition, using parts of a prototype L & L electronic ignition sent to me by L & L for evaluation. They advised me of a problem with the electronic module and they were right — it failed about one minute into the first test run. (*Ed. note: Checked with mfg. and bad components were in prototypes sent out for evaluation only.*) We then by-passed it and ran it as a straight ignition engine, using their battery for power. It works really great and is good for about three hours flying time between charges.

The engine is provided with both a hand operated choke and a prime button and hand starts easily, hot or cold. It is a precision piece of machinery (and expensive) and I am looking forward to trying it out in a somewhat smaller than usual 'large' model. I suspect it would be

great for something like the Dave Platt Bucker Jungmeister but not as the kit comes out of the box. The kit was intended for glow operation and should remain so without extensive alteration. I have already altered my version of it to the extent that I have added 1/32" plywood skins over the balsa fuselage sides and plan even more changes before powering it with an ignition engine.



Don Godfrey of Binghamton, New York, who has been a faithful correspondent and friend for quite some time, dropped me a note recently detailing a recent discovery of his. Don, who is well known for his Super Stearman plan, wanted a smoke system to use with the Stearman but was not satisfied with the usual diesel fuel for oil used to make smoke, so he did a little research and discovered a couple of chemicals which make more smoke than you'd believe.

The first of these is made by Dow Chemicals and is known by several names: Dowanol DB, Diethylene Glycol and N-Butyl Ether.

The other is made by Union Carbide and is called Butyl Carbitol. Both of the above make large (very large) quantities of lovely thick white smoke.

Now, let me add this caution. I am not familiar with either of the above compounds and do not know if they are hazardous to your health or not. **Be sure** to check with your source of either or all of the above if there are any cautions

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Material removed from O & R engine as not being required. Ignition is L & L airborne electronic ignition which requires on-board battery. Net saving in weight is 10 ounces.



O & R engine converted to Model power. Engine is beam mounted, throttles down to 1100 rpm from a peak of 5200 with 18/6 prop.



O & R and Super Hustler side by side. O & R is much smaller and a great deal lighter. Hopefully it will fill the gap between large glow engines and the 2 C.I. gas engines.



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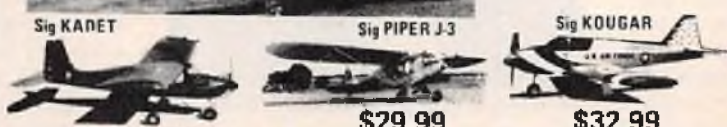
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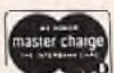
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from page 27

you should observe with their use, whether the smoke is dangerous or harmful, and what storage is required for them. I hesitate to pass along this sort of information when I don't know enough about it to be able to tell you what to be careful of with their use. In this case, so many have asked about smoke that I am printing the information with the above cautionary memo.

Incidentally, on the same subject, if anyone knows of a means of coloring smoke, or producing a colored smoke, I'd like to have that information for this column as well. So many of us are building Golden Age Bipes which are flown in air shows and which require smoke for real prototypical performance that a source of colored smoke would be a real plus.

We have tried the smoke flares used by parachutists and skiers to add to the effect of their performances but find they have a couple of shortcomings which are less than acceptable. They burn with a great heat, they are of short duration, and they produce a residue which ends up on the tail surfaces of a model and are hard to remove. The shortcomings by far outweighed the advantages and they are rather expensive as well, too much so to be feasible for regular use.

Also, on this same subject and for the benefit of those who missed it, Claude McCullough in his Scale Views column in the July '79 RCM detailed a smoke system accessory from Harry Higley and Sons of Glenwood, Illinois. If you are in the market for a smoke system you can control from your radio, have a look at this one.

Don Godfrey is using the Higley smoke producing system along with the chemicals mentioned above and says it really works great. I have only seen pictures of it as this is written and it looks well made, is small enough not to be a problem even in the smaller scales and ... it works great according to Don.

I had a letter a while back from Bill Schulz in Olney, Texas. Bill has been a correspondent for some time now and we enjoy one another's letters. Bill stated that he had shown some of his fellow modelers some samples of wheel pants and cowls he had made up from fiberglass for a 1/3 Scale Skybolt he is working on. Bill said the other guys backed off when they saw glass work was necessary and they went on to explain why.

"Something on working with glass needs to be repeated for the modeler who lives in "Cactus Junction" whose only source of supply is either "John's Feed Store" or to order what he wants. I've found Sears finishing resin and 7½ oz. cloth works well, and everyone can



*John Bright with business end of half sized SE-5 under construction in England. Project was conceived by Graham Brown who called for help when he realized what a large project he had chosen. Prop is hand carved.*

get it. Also using regular lumber (2' x 8', etc.) for a plug, and plaster of paris for a mold, helps. Remember, way out here in the sticks we can't go to our neighborhood fiberglass store for supplies, as most articles call for.

"What the modeler needs, at the end of an article, is the name and address of suppliers of the items called for and approximate prices. He can probably find them closer to home, but out here in "Cactus Junction" it sure simplifies things if he could order what he needs, regardless of the distance or cost."

Bill is right, of course. I, too, live rather remotely from a good source of supply for modeling items and have, for that reason, done a good deal of improvising.



*SE-5 has more wing area than full scale Vari-Eze and will fly on 110 cc Rowena chain saw engine. Upwards of 10 hp to pull this WW I fighter around!*

I haven't been in a hobby shop for some time and don't miss it since much of what I am now using for model building comes from a homebuilt supply house about 500 miles away.

There are a few things which are distinctly modeling items that are hard to duplicate elsewhere, such as wheels, spinners, and that sort of thing, but there are lots of items we can improvise with. Much of the specialized items can be obtained from one of the mail order houses of course, and if you are quite specific about what you want, you'll usually get it.

I try to make it a habit to suggest a source for the things I mention, but it isn't always easy to do. Much of the material I write about here in the column comes from you guys out there who read this thing on a regular basis and who share things with me and my readers. Sometimes I get great information as to sources and sometimes not. When it comes to me, I pass it on or at least make a suggestion as to where to look.

I think one of the best ways to arrange for the kinds of things we need, and especially in the larger models where we are into a different ball park than building "model airplanes" is to realize that what we are doing is building miniature aircraft and if you can develop a mental attitude, that you are always looking for something you can use. You'll be amazed at the things you run across every day which will fit right in if you are always looking.

An example, I have been toying with the idea of using dowel in the leading edge of aileron and flaps as hinges. I had thought of allowing the dowel to stick out past the end of the control surfaces and run through holes in a wing rib. I was a bit reluctant about the possibility of getting excessive wear with a hardwood dowel rotating in a wooden wing rib which would be quite thin. The other day I was browsing in a hardware store and found some nylon drawer catches, the kind that are fastened inside a cupboard and have a spring like pair of curved arms mounting on the door which grip the nylon catch when the door is pushed shut. By making a few careful cuts in the nylon part of the catch, I now have a good supply of nylon bushings for the dowel to turn in.

So, if you stay alert, you'll find all kinds of neat things that will fit into what you'd like to do. Just remember, because you've never seen something done, doesn't mean it can't be done. Every good idea ever developed for flying our models was originally conceived by some guy who wanted to do something and there hadn't, prior to that time, been a way to do it, so he invented one.

Speaking of invention, have you heard the latest addition to Murphy's Law? "If there is a way to mess something up, government will find it. If

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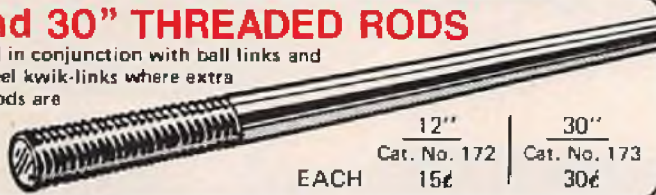


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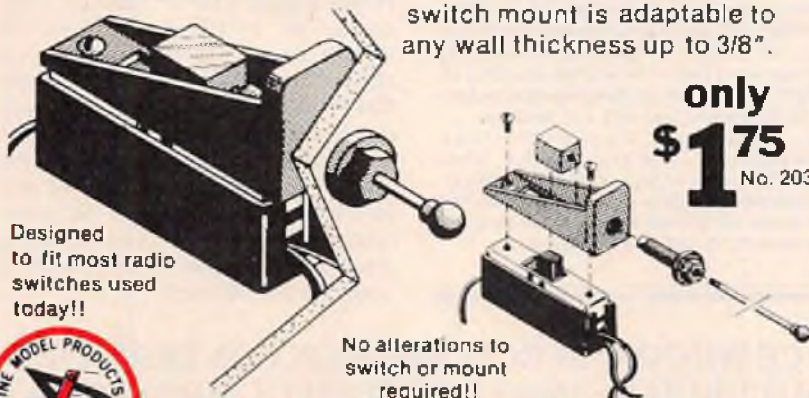


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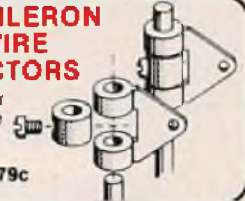
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# CASSUTT MODEL "2"

## ABOUT THE AUTHOR

Donald C. Hewlings was born August 31, 1924. His first ride in a real airplane was in 1932, and here is where the first love started. He began building models in 1935 and began winning contests from 1939 through 1941 in an era when Megow Kits were given as prizes. World War II marriage and family put modeling aside until 1958 when he built another F.F. gas. In the meantime Don earned his private pilot's license in 1948.

In 1968 radio control became his number one choice both as a hobby and as a sport. Most of his time is spent training newcomers in either one of the two clubs that he belongs to. Don has taught or helped to teach over seventy newcomers and feels a lot of pride standing on the flight line and seeing a fledgling pilot making his first successful take-offs and landings.

Don helps with club work, files demonstrations, runs club fun-flies, does benefits, and, tries to be a good Sunday Flyer.

In presenting the Cassutt "2," Don hopes that a few of you will benefit and enjoy building and flying something just a little different.

**A**fter seeing the 3-views of the Cassutt "2" racer in E.A.A. Magazine, May, 1962, my first impression was, "Boy, that would make a beautiful model, some day I will build it!" Numerous times over the years the pictures were pulled out, looked over and the words "some day" uttered again. Last October, hunting a new challenge, out came the Cassutt "2" pictures again — that "some day" finally arrived! What size plane do I want? What scale? (16'-0" overall length equals 48" in 1/4 scale; 13'-8" wing spread equals 41" in 1/4 scale; 59" chord equals 14 3/4"; 41 x 14 3/4" equals 604.75 sq. inch total area.) Material plus radio and engine was estimated to equal 5 3/4 lbs to 6 1/4 lbs. finished weight. Here you have a 1/4 scale aircraft that will fly with a good .40 engine in its nose or really perform with a .60 engine. The real plane had a top speed of 240 mph (1/4 scale equals 60 mph).

**CHOSEN AS THE FIRST PLACE WINNER IN RCM'S DESIGN CONTEST, THIS ONE QUARTER SCALE CASSUTT BUILDS INTO A BEAUTIFUL MODEL THAT NOT ONLY FLIES WELL BUT OFFERS NO TRANSPORTATION PROBLEMS BECAUSE OF SIZE. BY DONALD C. HEWLINGS.**



With the above calculations laying on the dining room table in front of me, and a glass of refreshment in my hand, the decision was made. I could go 1/4 scale without buying a new engine and have a plane that is easily transported in most any car --- a plane that fits the bill as a 1/4 scale pylon plane or a fine subject for scale buffs. The plans are as near scale as possible with four exceptions --- namely: (1) scale spinner should be 2 7/8" (commercially available spinners are 2 3/4" or 3", I chose the 3"); (2) the strip ailerons; (3) the size of the tail wheel, and (4) the canopy --- more about these later.

Having dreamed, designed, cut, fit, and built this bird, read the next line and decide if you fit the plane. If you are the type of builder who wants three bulkheads, and four slabs to make a fuselage with, a ready made foam wing, some iron-on covering, and be out at the field next weekend with a new bird, don't read any further! But if you have some time to spare and aren't afraid of a challenge, read on --- the finished product is worth it. This Cassutt is not for the beginner builder but if you have built two or three kits and one or two scratch-builts you should have no problems. After all, scratch-building is only making your own kit before you assemble it, **right?** Use loving care as you make each piece, remember you

are the craftsman or butcher who has to use these pieces during assembly, you decide which.

What building technique to use was my next hurdle. After much sketching and planning I decided to try a new method (probably not new to some of you but it was new to me). I decided to hang eight plywood bulkheads on two 1/4" x 1/2" spruce stringers running internally through these bulkheads (Photo #1). This seemed to sound like a very strong frame. Add a 1/8" balsa skin and, with all those external angles, they should give plenty of strength for a tail-dragger on rough field landings. Use solid balsa parts for the empennage. The wing scale thickness came out to .999". If foam is used, spruce spars and sheeting should be used so I decided to build up the wing with double "I" beams plus 1/16" balsa sheeting which raises the "G" forces well into the safety zone.

Now to the nitty gritty of the fuselage. Lay your 1/4" x 1/2" beams (wishbone) over the plan view and mark the angle points behind bulkheads No. 4. Mark the bevel angles at the tail. Now cut the tail bevel angles; carefully cut a narrow "V" notch 3/4" through the angle points behind bulkhead No. 4. Replace on the plan view and dry fit these parts. When you are satisfied that they match the plan, epoxy the angle joints and epoxy the bevel joints at the tail. Pin to the plan

and let it set-up (Photo #1). Mark and cut off the 1/4" x 1/2" wishbones 1/4" in front of the bulkhead No. 1. Now, on a straight building board, erect eight equal height piers (Photo #2). Use the view given to you at the top of plan sheet No. 1. This view has been inverted for you.

After assembling the jig or fixture, it resembled bridge piers. After making the 1/4" x 1/2" beams for the fuselage the beams looked like a 4' long "wishbone." Never having seen this method used, I will name it the Hewlings Bridge or "Wishbone Method" of building. No matter what you call the method it is by far the best way I have found to keep an irregular shaped fuselage straight, true, level, rigid and firm during all those early bendings of sheeting over bulkheads.

Space the bulkheads 1/2" away from the piers, so that the bulkheads can be epoxied with a little room to work gussets and fillets (Photos #2 & #3). Next, epoxy the 1/4" ply landing gear mount and 1/4" ply floor below tank. Drill, tap and bolt the landing gear in place; lock these bolts because soon they will be seen no more (Photo #4). Now begin the 1/8" skin, bottom first. When dry, bevel the edges and add the next two pieces of skin, one each side. These first 3 pieces of skin go from the No. 2 bulkhead to the tail. Next add the two lower side skins, from bulkhead



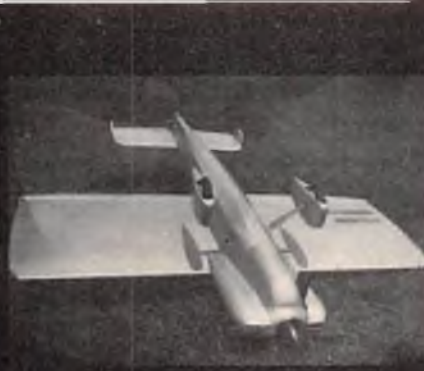


No. 1 to the tail. Fill in the bottom skin between bulkheads No. 1 and No. 2. Add the bottom skin to the cheek cowls between bulkheads No. 1 and No. 2. (Your fuselage should now look like Photos #5, #6, & #7.)

Next, bolt on your engine mount and engine. Put a piece of duct tape over the exhaust port. Use several thicknesses of Saran Wrap and rubber bands over the carburetor to keep the dust and chips out of your power plant. Next hang former F-0 over the engine; cut a 1/16" balsa spacer like F-0 and hang this over the engine. Now bolt on the backplate for your prop spinner. A C.B. Associates 3" plastic and aluminum spinner was chosen, mainly because of the thick aluminum backplate to clamp the F-0 former to and its close to scale shape. Next take three "C" clamps, clamp the spacer and former F-0 to the rear of the prop spinner and align carefully. Its relation now will always show throughout the plane's life. Next cut pieces to fit from F-0 to the bottom of the firewall. (I used up a lot of 1/4" scrap balsa and made 1/2" wide pieces like the chin block.) Start on the center line and add 1/4" each side until you have the chin block complete for the width of the fuselage (Photos #8 & #9). Isn't it nice to do all of this kind of work with the fuselage nice and solid and not being bumped around the work bench? Another little hint, look at the pictures of the fuselage on the bridge --- at the tail end you will see a white rectangle sticking out. I always set my bottom rudder hinge between the side sheeting at assembly. Beats the devil out of trying to cut epoxy out to center a hinge late. Try it, you will like it! Now cut out 1/8" deep x 1 1/2" long from the rear bottom. Epoxy a piece of 1/8" plywood in its place to screw your tail wheel mount to. Release your hold-downs and lift your fuselage off the bridge and turn it over. It is fairly light, it is as straight as your bridge, and it is strong (Photos #10 & #11).

Next add your elevator and rudder NyRods, or whatever your favorite pushrod material might be. Epoxy them fast to the skin where they exit and to bulkhead No. 7. Leave the front lying loose inside the fuselage until you install your servos. Add the turtledeck from bulkheads No. 4 to No. 8. Next construct the cooling duct from bulkhead No. 1 to the bottom of the cheek cowl (see plan). Build the box and glue it in, you can cut the exit hole later from the bottom. Finish covering the cheek cowls from the front of bulkhead No. 1 to rear bulkhead No. 2 and up to the edge of the hatch both sides.

Now let's look at the wings. If you decide to go the foam core route, use the same template as used for the wood ribs. It is hard to burn out the notches for the spars, so cut the core and then route the 1/16" deep spar grooves. Make sure



## CASSUTT RACER

Designed By : Donald C. Hewlings

<b>TYPE AIRCRAFT</b>	
1/4 Scale Racer	
<b>WINGSPAN</b>	
41 Inches	
<b>WING CHORD</b>	
1 3/4 Inches	
<b>TOTAL WING AREA</b>	
604 3/4 Square Inches	
<b>WING LOCATION</b>	
Shoulder Wing	
<b>AIRFOIL</b>	
Mod. NACA 23006	
<b>WING PLANFORM</b>	
Constant Chord	
<b>DIHEDRAL, EACH TIP</b>	
None	
<b>D.A. FUSELAGE LENGTH</b>	
48 Inches	
<b>RADIO COMPARTMENT AREA</b>	
(L) 7 1/4" x (W) 3" x (H) 3 1/2"	
<b>STABILIZER SPAN</b>	
17 Inches	
<b>STABILIZER CHORD</b>	
6 1/4" Average	
<b>STABILIZER AREA</b>	
93 3/4 Square Inches	
<b>STAB AIRFOIL SECTION</b>	
Flat	
<b>STABILIZER LOCATION</b>	
Mid-Fuselage	
<b>VERTICAL FIN HEIGHT</b>	
2 1/2 Inches	
<b>VERTICAL FIN WIDTH (Inc. rudder)</b>	
5 1/2" Average	
<b>REC. ENGINE SIZE</b>	
40- 61 Cu. In.	
<b>FUEL TANK SIZE</b>	
10 Ounces	
<b>LANDING GEAR</b>	
Conventional	
<b>REC. NO. OF CHANNELS</b>	
4	
<b>CONTROL FUNCTIONS</b>	
Rud., Elev., Alt., Throt.	

<b>BASIC MATERIALS USED IN CONSTRUCTION</b>	
Fuselage	Balsa, Ply & Spruce
Wing	Balsa, Ply & Spruce
Empennage	Balsa
Weight Ready-To-Fly	100 Ounces
Wing Loading	23.8 Oz./Sq. Ft.

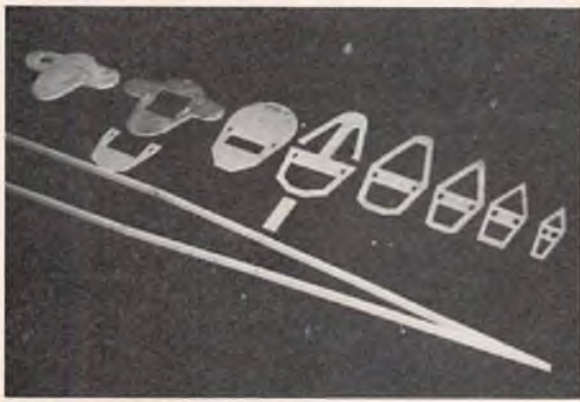


the 1/8" thick spars and the 1/16" sheeting match on the outside before any gluing is done. If you go the built-up route it is pretty straightforward. Build it over the plan on a straight building board or drill the ribs and use a wing jig (Photo #12). If you use the board method, tack down the bottom main spar over the plan, use a 3/16" shim under the front edge of the rear spar, continuously across wing length. Start in the center with the two 1/4" plywood center spacers and 1/4" ply with dowel on rear spar. Now, alternately, place wing ribs and shear webbing until you reach both ends; adjust last shear web for length so that your last rib is flush with the spar ends (Photo #13). Now add the top spars and come back to the center and finish your servo opening, etc., using 1/16" balsa, sheet the top (Photo #14). Remove from board, turn over and sheet bottom. Remove from board add 1" square balsa wing tips. Rough sand the entire wing. Place it in the fuselage and work the fuselage sheeting away until the wing sits firmly on bulkheads No. 3 & No. 4. When you are satisfied that the wing is properly aligned, drill and tap two 1/4"-20 thread holes per the plan for hold-downs. (See Photos #15, #16, #17, #18 & #19.)

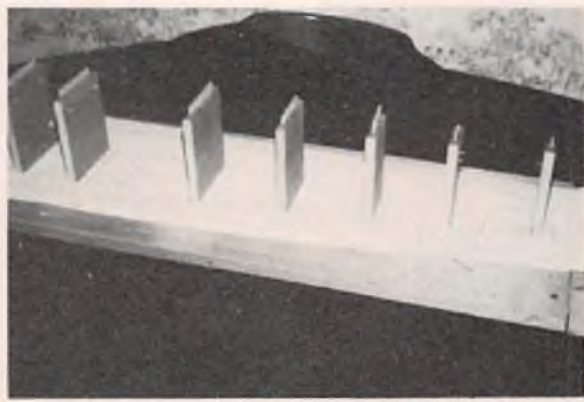
Lift the wing slightly so you can slide waxpaper between the wing and the fuselage sheeting, tighten 1/4"-20 bolts firmly, turn over the fuselage and the wing. Now complete the cheek cowls from bulkhead No. 2 to where they terminate under the wings, and up to the center line of the leading edge. Be sure the waxpaper keeps the new work from adhering to the wing. Make sure the new work is well glued to the fuselage side sheeting. While the plane is upside down, now is a good time to cut out the exit from the duct work which you built into the cheek cowl earlier. Turn the plane right side up; leave the wing in place. Cover the center of the wing with waxpaper and build the framework for the cabin hatch. While the framework is drying, trace the canopy outline from the side view of the fuselage, cut four 1/16" medium balsa sheets this size and shape with enough left over on top to bend over and meet on the top center line. Glue two of the 1/16" sheeting to the cabin hatch frame. When dry, remove from plane. Cut the center portion that you wish to use from a Sig World War II Canopy 13" No. WC-813. Let the canopy material cover the wood 3/8" on all sides, hold in place with rubber band and mask the line of the canopy opening, leaving the 3/8" overlap clear. (I now laid the canopy aside and black doped the inside of the hatch because you can't do it very easily later.) Contact cement the 3/8" inside of the canopy and 3/8" around outside of hatch. When this has set, spread canopy with all 10 fingers and set in place

text to page 40





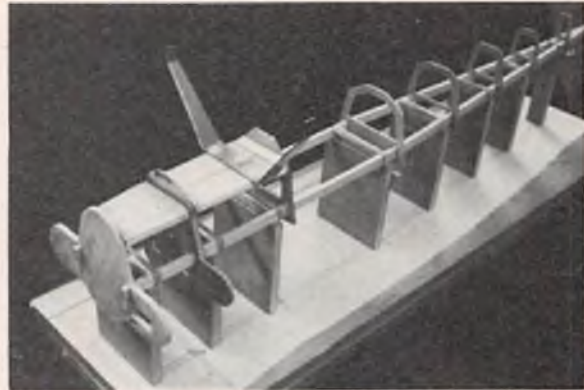
1) The completed wishbone and the eight bulkheads.



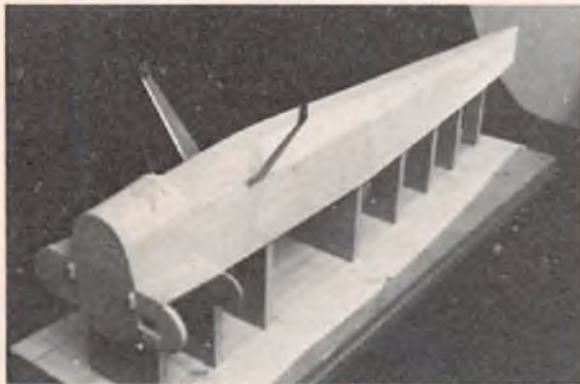
2) The row of bridge piers with spreaders on top. Use a centerline and make sure everything is symmetrical around it.



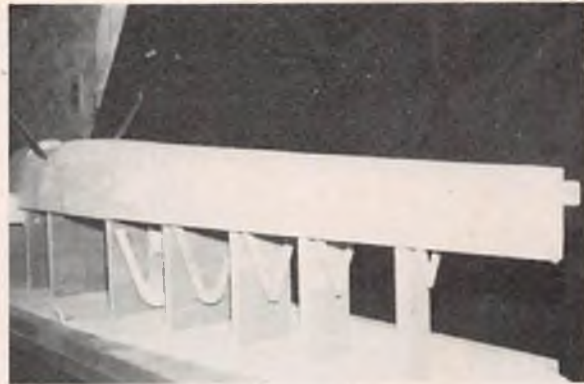
3) Frame ready for landing gear mount and floor board.



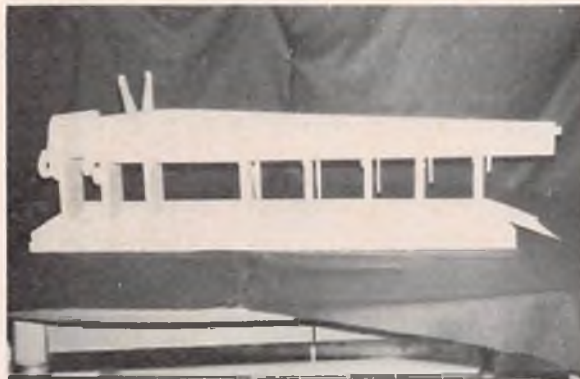
4) View of bridge piers, wishbone, bulkheads, floor boards and landing gear. All work has been epoxied (3) 1/4"-20 nylon bolt heads seen holding down landing gear.



5) Front view ready for engine and former "F-O".



6) Rear view of fuselage after bottom sheeting is complete. Note bottom rudder hinge already sandwiched between the sides.

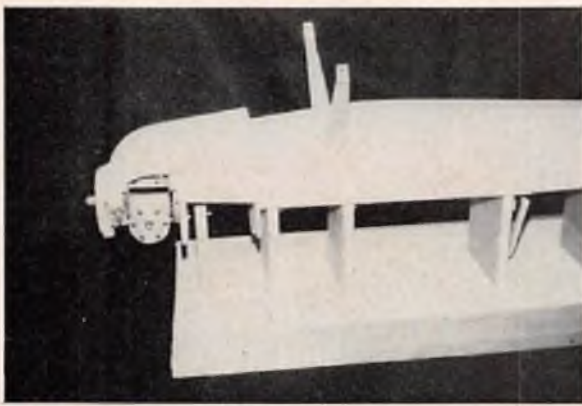


7) Lower fuselage ready to receive engine and chin work.

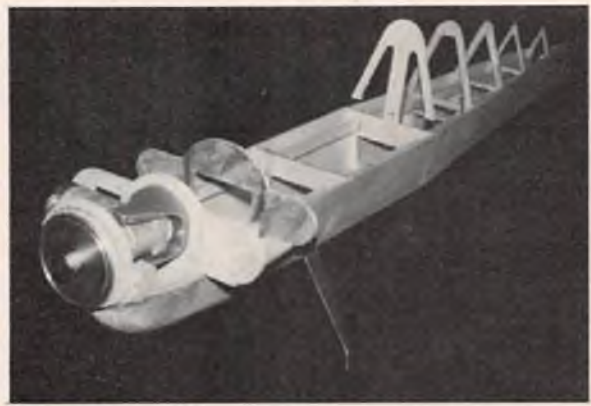


8) Chin blocks complete, whittled and sanded ready to remove spinner back plate.

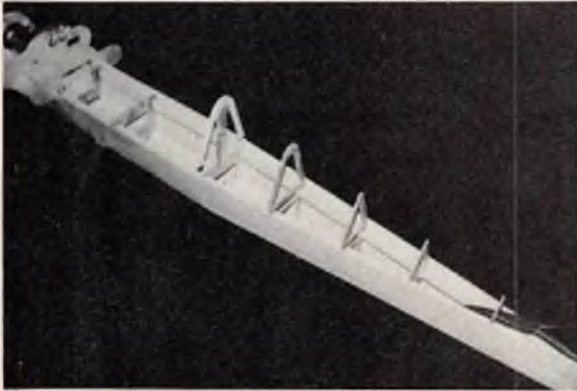




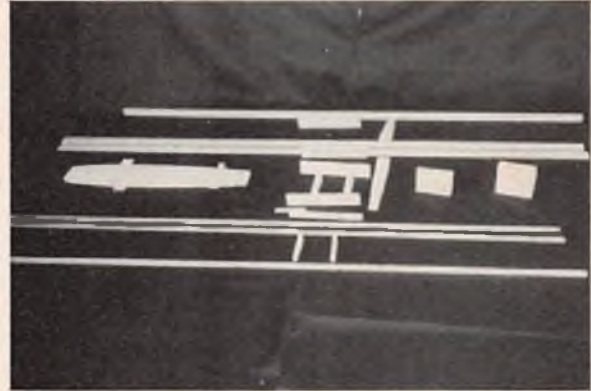
9) Side view of chin block.



10) First view after fuselage is removed from pins.



11) Fuselage ready for turtle back.



12) Wing frame members top to bottom 1/4"x1/2" balsa leading edge, 2 spruce spars 1/8"x3/4". (L) 3/32" wing ribs, (C) servo mtg. frame, (R) 2 piles 1/8" thick spruce shear webbings, (B) 2 rear spruce spars, 1/4" sq. T.E.



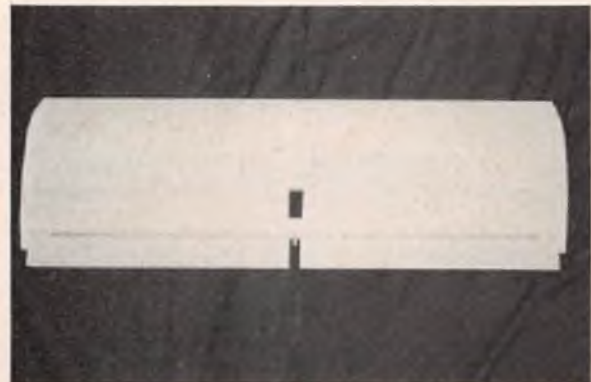
13) Wing left side ribbed and shear webbed, right side ready for the same treatment.



14) Wing ready for top sheeting.

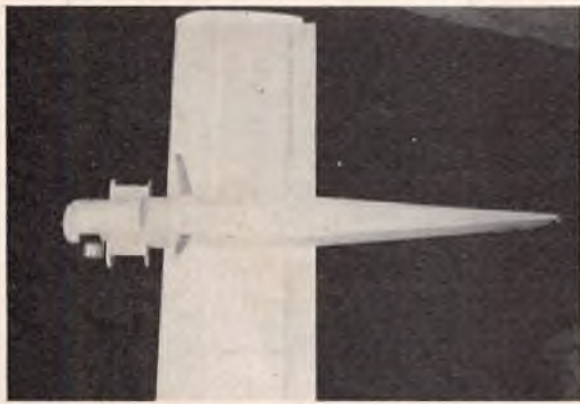


15) The wings top sheeting is complete. Wing has been turned over and is ready to have its bottom skin applied.



16) Wing skin complete, tip blocks added, rough sanded and ready to be fitted to fuselage.





17) Bottom view of wing being fitted to fuselage.



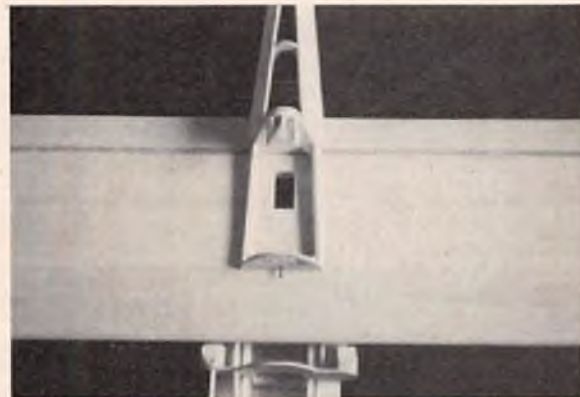
18) Top view of wing after being fitted, hold-down holes drilled and tapped. First time bolted down.



19) Here we see the side sheeting of the turtle deck being fitted to the fuselage and around the trailing edge of the wing.



20) Cabin hatch frame in center, 1/16" sheeting around it with the canopy above. Sounds hard in the text, but really isn't.



21) Cabin hatch frame being fitted to wing, drill 1/8" dowel to align hatch with bulkhead No. 4.



22) Here we see the final fitting of all three hatches to the wing and fuselage. Note the neat well organized shop in the background. H and Northrop thought his work bench was Cluttered!



23) An exploded view of the Cassutt already for fine sanding, except the cabin hatch. Canopy and outer skin to be contact cemented yet. No those white discs are not the wheels, they are the horizontal stab tip plates.



24) The proud author showing off his completed Cassutt "2".











touching both front and back top centers first. Firmly work from these points to the bottom both sides. Now apply contact cement outside of the hatch and the remaining two 1/16" sheetings; line up edge of canopy openings and carefully place outside skin in place. When all sheeting has been added to the hatch, remove the masking and marvel at the neat canopy you have constructed. No sloppy epoxy lumps around the edges or what have you (Photo #20 & #21).

Build the engine and radio hatch next with the wing and the cabin hatch in place. This is easy going so I will say no more here. Follow the plans. Add the upper part of the cheek cowls to the top of the wings. This leaves us looking at a partially naked nose. I used a solid soft block for the left cheek cowl. The right cheek cowl will take some time no matter what route you decide to go. Personally I like an engine that can be reached easily when one has to. I took small blocks and strips of wood, fitting each one to the plane and around the engine. Here again, keep waxpaper between the parts that you don't want stuck together. These projects help keep the small balsa pieces used up. By removing two #4-40 cap screws my entire engine is exposed for cleaning or checking. A thought I better convey to you now, for those of you who may want to use either a .40 or a .60 size engine, build around the larger engine then drill and tap a motor mount so your .40 size fills the distance from the firewall to the spinner.

Now let's look at the other end --- looks small doesn't it? Here I had a great urge to enlarge it, but as the tail grew on the plans the nice lines of the Cassutt faded. The elevator is short in length but wide, they look like little barn doors once they are hinged. Add the stab tip plates to the vertical fin area and this starts to look good. Build all parts out of 1/4" medium balsa. Be sure the tip plates are on square and parallel with the plane center line.

Ailerons are well shown on the plan. The only thing I wish to convey to you here is about tip washout. The washout line and the 1/8" dimension shown on plan sheet two is the cut line. Mark this line, then whittle or plane the bottom of the aileron away. Now, with a sanding block, smooth it and blend it. When you are done sanding, even some of the bottom wing sheeting blends in and becomes washout. Work carefully. Get both wing tips the same. When finished the washout is near 3/16" each tip.

Wheel pants, scale say 3/4" diameter wheels. A trip to the hobby shop and I found Williams Brothers #142, right diameter and, most of all, slender enough to keep scale thickness on the pants and still have room to spin freely inside.

You are now ready to finish your work of art. I know you will use your own pet technique so I will not elaborate too much here. I used two coats of K & B

resin and two coats of Hobbyepoxy #H-93 silver. The license and race number is bright red, 3" high license numbers: start 1" behind aileron and center with aileron both sides of fuselage. Use your own AMA number. 6" high racing number on top left wing and bottom right wing. Tom Cassutt raced with number eleven or use your N.M.P.R.A. number. Two 1/2" wide 1/4" spaced apart black vertical stripes on the outside of the stab tip plates finished his decorations. No striping or multi colors to dazzle the eyes --- just a functional clean airplane.

Photos #22 & #23 pretty well tells it all! You can now start feeling that urge to get it out to the field. I will now tell you about this prototype's first trip to the field.

MATERIAL LIST	
<b>Spruce</b>	
(3) 1/8" x 3/4" x 48" (wing)	
(3) 1/8" x 3/8" x 48" (wing)	
(2) 1/4" x 1/2" x 48" (fuselage)	
<b>Plywood</b>	
(1) 1/4" x 12" x 12" (wing and fuselage)	
(1) 1/8" x 12" x 36" (fuselage and wheel pants)	
(1) 1/16" x 6" x 12" (wheel pants)	
<b>Hard Wood</b>	
(1) 3/8" sq. x 6" maple (hatch hold downs)	
(1) 1/4" dia. x 6" maple dowel	
(1) 1/8" dia. x 1" maple dowel	
<b>Balsa</b>	
(1) 1/4" x 4" x 36" (empennage and misc.)	
(2) 1/4" x 3" x 36" (empennage and misc.)	
(1) 3/8" x 2" x 36" (ailerons)	
(2) 1/8" x 4" x 48" (fuselage sides)	
(7) 1/8" x 3" x 36" (fuselage sheeting)	
(13) 1/16" x 3" x 36" (wing sheeting)	
(2) 1" x 1" x 12 1/2" (wing lips)	
(1) 1/4" x 1/2" x 48" (wing L.E.)	
(1) 1/4" Sq. x 48" (wing T.E.)	
(1) 1/2" x 3" x 36" (wheel pants)	

The moment of truth. On a clear crisp April morning my good friend and flying buddy, George Prosser, and I took a couple of hours off from work and went down to the field. No crowd or commotion, just the two of us. I gave him a quick course on operating my 35 mil camera and told him to catch what he thought was good --- if need be we would get more later. I fueled up, started the K & B, checked the controls, took a deep breath and eased the throttle ahead. Some up elevator was required when taxiing, rudder control was good on the ground. I turned into the wind, checked the idle and controls once more, pulled full up elevator, full throttle and a little right rudder, straight down the field, neutral elevator then a blip of down elevator, tail came up, speed good, a little up elevator and it lifted off then I released right rudder, climbed out clean for a short ways. Then the climb steepened, down elevator was sharp and abrupt. For the next few minutes it looked like a roller coaster. I then throttled back, the slower it flew the

better it handled, brought it around, lined it up, cut throttle, came in, flared and touched down three point. George and I checked balance, etc. I decided to try one more slow flight --- at least we knew now what to expect but nothing new was learned. Going back in the car we discussed **why!** That night I took out the one degree 30 minute incidence. Next day's lunch found us back at the field with a zero degree wing and tail. No improvement but now the landings were a little hotter. Next lunch found us back there two degree down engine, zero degree wing and tail. No great improvement here either.

My fear from the beginning now stood in front of me like a wall --- that beautiful small scale tail had to go, we needed more area back there to control it. Off came the tip plate, added approximately one third more horizontal stab and one third more elevator. Went out to the field again, good elevator control now, shows signs of needing some right thrust. Back to the shop. Tip plates put back on, 1 1/2" incidence put back in the wing, 1 1/2" right thrust added to the engine and it's back to the field to see if this will give us a plane that the average flyer can handle and be happy with.

Again George and I take off from work and slip down to the field at 8:30 a.m. Check everything and turn it loose. Good take off, steady climb out, a touch of down firm and a touch of left aileron. Turn around and straight level hands-off flight back past us. No dutch roll or yaw, no roller coaster, I do a split S, three rolls coming back left, three rolls right, same roll rate both ways. Good clean loops and Immelmans. Sharp pylon turns and low fly by. Then music to my ears, George is saying, "Don, we have it now, that's wonderful." I climb upstairs and throttle back, it settles into a steady predictable glide, down to a nice flair and touch down. Taxied it by into the pit area; it felt just like a bird that had been around for a long time.

The plans reflect the final version with the large stabilizer and elevator; you will see the small scale elevator in dotted lines if you wish to experiment. Any average pilot who can fly an Ugly Stick, Kaos, or Eyeball, can handle this. You will just have to learn a little about a tail dragger.

I suppose you wonder why all the gory details in the last couple of paragraphs. Here is the truth of it all --- damn few planes fly right off the drawing and building boards. It takes a lot of just what you read here: a dream, follow it through with work and then iron out all those kinks. Problems have solutions, some are just harder to solve than others. I added this for all the young modelers who despair and lose heart too easily and for the older modelers who never tried anything but a kit or a ready to fly. But most of all I added it for those who



# INSTRUMENT MAKER

By Gene Hopkins

I have a technique which I use for making instruments and other small items which saves a lot of time if several of the same parts are needed. Listed below is the required material to make an instrument housing.

**Step #1:** Make a master instrument as shown in Figure 1.

**Step #2:** Make a frame as shown in Figure 2.

**Step #3:** Fill the frame with **regular modeling clay** (not Play-Doh or similar products).

**Step #4:** Wax the brass master. Note: this is not always necessary.

**Step #5:** Make as many impressions as you can without deforming any with the brass master in the clay — you must push straight in and pull straight out.

**Step #6:** Mix some fiberglass resin and carefully fill the impressions in the mold.

**Step #7:** After the resin has cured remove the parts from the clay (clay may be used again).

**Step #8:** Sand the back of the instrument to the proper thickness. Note: the hole for the dial will open up as you sand.

The only drawbacks to this method are: (1) You must carefully make the impressions in the mold (clay), and (2) You must pour the resin carefully to avoid trapping air bubbles in the mold.

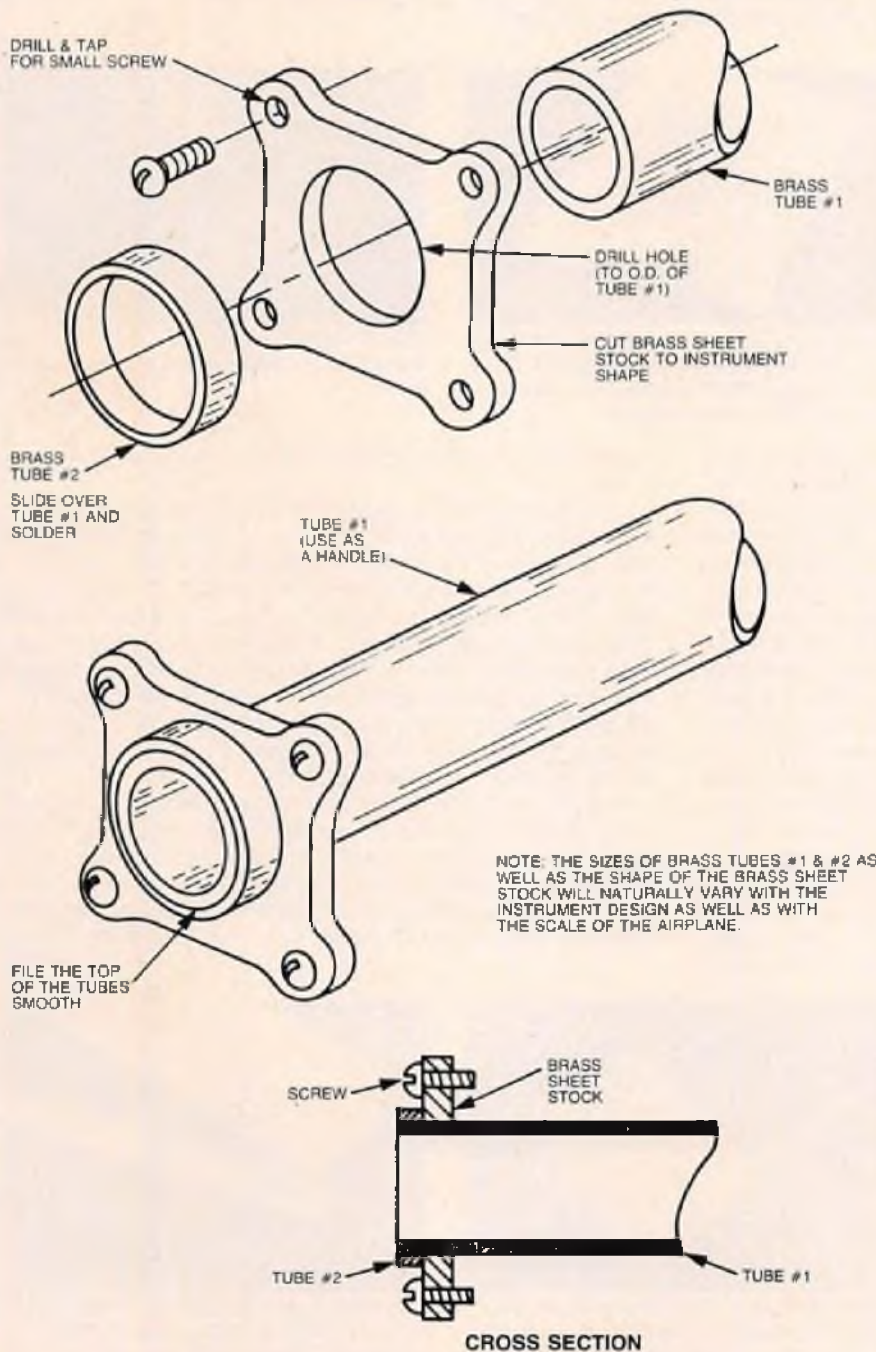
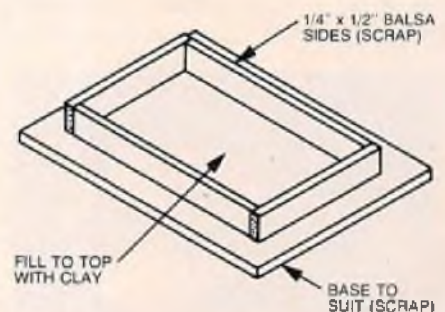


FIGURE 1



NOTE: SIZE IS NOT REALLY IMPORTANT, MY FRAME IS 3" x 6".

FIGURE 2



CARL GOLDBERG MODELS

# SUPER JET

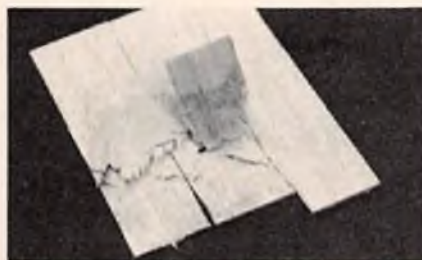
By Ben Strasser



To apply a doubler, lay down a pattern of Super Jet, then press doubler in place.



Doubler glued in place.



Test doubler applied with Super Jet (Photo #1). Balsa failed, not glue joint. Also shows that adhesive spread out between the doubler and base wood.



Using Super Jet to glue outer NyRod tubing to an oversize hole in a piece of balsa.

In the last issue of RCM, Carl Goldberg Models announced the first of a new generation of cyanoacrylate adhesives: Super Jet. Of course, their regular Jet, which is the Goldberg version of the familiar instant glue, has worked very well. Regular cyanoacrylates, though, do have their drawbacks. For example, because they are water-like in consistency, the surfaces to be glued must fit perfectly or the adhesive won't fill the gap. And, you'd never think of applying the regular stuff to a piece of balsa before the balsa was in place. By the time you'd get the parts properly located the adhesive would have disappeared into the wood.

Based on the sample of Super Jet forwarded to RCM for testing, we found that this new formulation has some properties that not only make it easier to use than present cyanoacrylates, but these properties extend the applications of this adhesive as well. First, Super Jet has more body than regular cyanoacrylates. That is, instead of being water-thin, it's almost the consistency of the old-type modeler's cement. As a result, Super Jet won't disappear into a piece of balsa when applied. It does penetrate into the wood for a strong joint,

but it doesn't soak into the wood as though the wood were a blotter.

The second special property of this new adhesive is that when applied to one surface in a sort of bead, it tends not to "go off" immediately. Rather, it waits awhile until the two parts to be joined are mated and the fluid is squeezed into a very thin layer. Once the parts are joined, the thin layer of the adhesive between the mated parts sets up to hold them firmly in place. Then, the thicker areas of the adhesive also set up to fill any irregularities in the glue joint, but that takes a little longer to go off giving the builder time to be sure that those rough spots are adequately filled — or filleted. In a way it's almost as though Super Jet were two adhesives in one.

As a result of these special properties, several jobs unsuited for a regular instant glue are perfect for Super Jet. For example, you don't have to take the time to carefully sand all of the parts for a perfect fit. Super Jet will fill in the rough parts for you. When you use Super Jet to glue hinges in place, squirt the adhesive down into the hinge slot, then insert the hinge

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The balsa broke when we tried to remove the NyRod. Note that the adhesive did not separate from the NyRod.



Test sheeting glued to leading edge and ribs with Super Jet. The pinhole technique used to see if Super Jet would penetrate. Very good bond resulted.



A bead of Super Jet applied down length of edge of sheeting, then pressed to 1/2 x 1/2. When we tried to separate the two, the balsa failed.





Four tunnels: Ray Beyer's Hughey Boat, Excaliber's owned by Doug Riha and Bill Pistello and Dumas Hot Shot by author.



Harold Root proudly holds his Mighty Dolphin by Steve Muck's R/C Boats.



Contest Director Bill Pistello and referee, Paul Prufft have a good vantage point from atop the club trailer.

## JOHN SPANGLER

By Bob Preusse

# MEMORIAL RACE

On May 20, 1979, the Minute Breakers Model Power Boat Club hosted the "John Spangler Memorial Race" at the Lombard Lagoon in Lombard, Illinois. The event was sponsored by Al Fuchsen, of Al's Hobby Shop in Elmhurst, in memory of John Spangler who, at the age of 23, died of Hodgkin's Disease. John was an avid modeler and a good friend to all of us in R/C boating and flying. He was an employee of Al's Hobby Shop for several years and is credited with developing more powerful servos. We will all miss John.

In an effort to help offset some of the expensive hospital bills, the Minute Breakers and Al Fuchsen decided to hold a memorial race to raise funds for John Spangler's parents. Through everyone's efforts selling raffle tickets at the race and adding all entry fees, we were able to raise approximately \$800.00 for Mr. & Mrs. Spangler.

Though this is not a large amount, we hope it will help some.

Outboards were divided into 3 classes; outriggers or thingies, tunnel hulls, and monos. The tunnels and monos were required to have a driver for added realism. The tunnels also had realistic paint jobs, racing numbers and sponsor names. 32 entries made the tunnels the biggest class followed by the monos with 8 entries and the outriggers with 5 entries.

The first heat of the day fielded all the outriggers driven by: Ed Hughey, David Preusse, Jim Fetters, Richard Jones, and William McCormick. It turned out to be a cakewalk for Jim Fetters of Indianapolis, who went on to win this class with a total of 725 points.

The eight monos were run in two heats of four boats each. Jeff Olsen of Morris, Illinois, drove a Vee hull very well, collecting 425 points. Harold Root of Elmhurst, powered his Mighty Dolphin

(of Steve Muck's R/C Boats) around the bouys very well. Harold is a very good builder and should do nicely at future races. Bill Martin, from Berwyn, collected the third highest total in this class with a respectable 600 points with second place finishes in the first and third heats. Bill was driving a vee hull by West Coast Marine. As usual though, experience won out as Bernie Rich had an almost perfect total of 1100 points with his original design hull. His daughter, Bonnie, also drove the same hull and finished in second place in the mono class.

Now we come to the tunnel class --- where do I start with 32 entries? There were plenty of Dumas "Hotshots," Excalibers, Hughey tunnel boats, and scratch-builts. All looked very racy with numbers, sponsor insignias, drivers, etc. Bill Pistello's "Team Mercury" tunnel was all decked out with red and

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The Olympia Beer Boat by Joe Palek is displayed alongside of the Team Mercury by Bill Pistello.



Shannon Mueller of Wisconsin brought her very nice Shanny '79.



Gary Preusse proudly holds his Johnson Outboard boat.



The action was hot and heavy in the pits.



A modified and reduced 4-60 by Mike Meelbuch

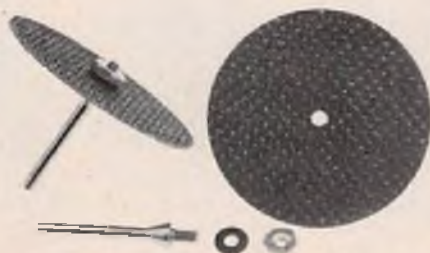


The Borg Warner entry and its owner, Doug Riha.



# House of Balsa Leads The Way With A New Shatterproof Fiberglass Reinforced Abrasive Cut-Off Disc

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The new 2" dia. Tuf-Grind cut off disc from House of Balsa, 20134 State Rd., Cerritos, CA 90701, has an abrasive impregnated fiberglass cloth base. HOB also has a new heavy duty 1/8" dia. Mandrel. The 2" Tuf-Grind and Mandrel combination is available at \$3.98.



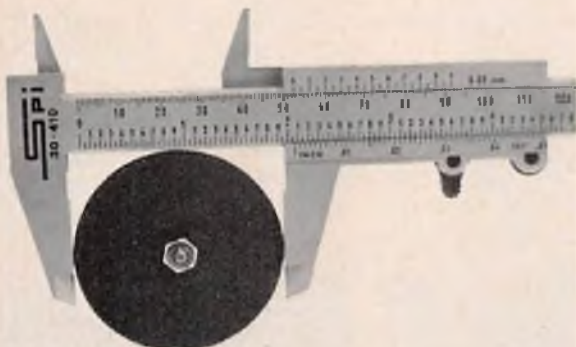
A 1" abrasive cutting wheel is shown on left, the 1" HOB Tuf-Grind in center and the 2" Tuf-Grind at right. With any cutting tool, caution must be used to let the wheel cut, do not try to force it.



A valuable feature of the Tuf-Grind is its ability to withstand side load shock. We seem to break more solid abrasive wheels by bumping them on the work bench than any other way.



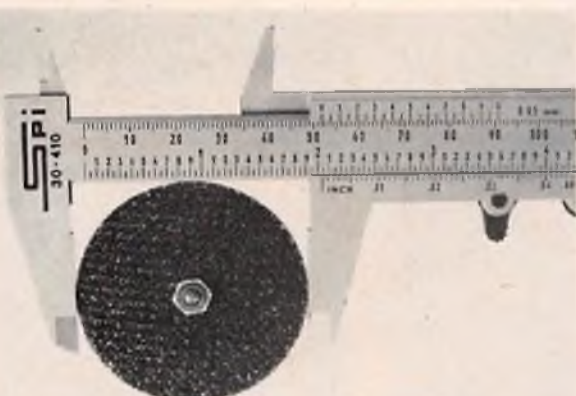
A Tuf-Grind wheel mounted in a 12v Wen Mini Power Tool is a handy addition to your field box. It operates from a 12v starter battery. Wen tools can be obtained through hobby shops, California Hobby Distributors, Alhambra, California, is the distributor.



This unused Tuf-Grind measured 2.066" diameter prior to our wear test. The test used the Tuf-Grind mounted in a Dremel Moto-Tool to cut a variety of materials.



Materials cut for our test were (L to R): 5/32" music wire, square brass tubing, 3/16" steel bolt, 3/8" dia. steel tubing, 3/16" x 1/2" aluminum bar stock, 1/2" dia. maple dowel, and 1/2" dia. thick wall stainless steel tubing.



The Tuf-Grind measured 2.037" after cutting the group of materials shown above. The wear was only .029". The test was a typical modeler activity, simply clamp the material in a vise and buzz through it. We experienced no breakage and very little wear.



By all means use eye protection when using any power tools. We used these economical Safe'r safety glasses from Hobby Products. Hobby shops can get them from A & L Distributors, Van Nuys, California. Safe'r retails at \$2.69 each.

By Dick Tichenor



# SMALL AIRPLANE SERVO INSTALLATION

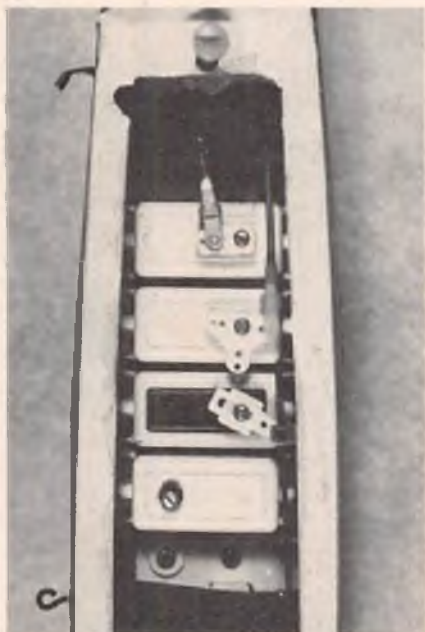
By Eloy Marez

One of my other hobbies is ham radio. For those of you who share the hobby, I am W1DBN, having worked that call with a number of suffixes such as /4, /V02, and Aeronautical Mobile; the latter including such choice spots as over (under?) the South Pole. Other calls I have held are DL4LE, YS1XEE, HU1P plus guest operator stints at many DX stations like HZ1, SV1, ZL3, KZ5, ZC4, etc.

What does this have to do with R/C models? Bear with me! I have in my collection of QSL (Acknowledgement) cards one from a Russian ham that bears a picture of a stern looking bearded gentleman with the caption: "Popov, Inventor of Radio."

And here many of us had been thinking it was Guglielmo Marconi! I hear also that there is some doubt about Columbus, the Wrights and other notable and famous "Firsts."

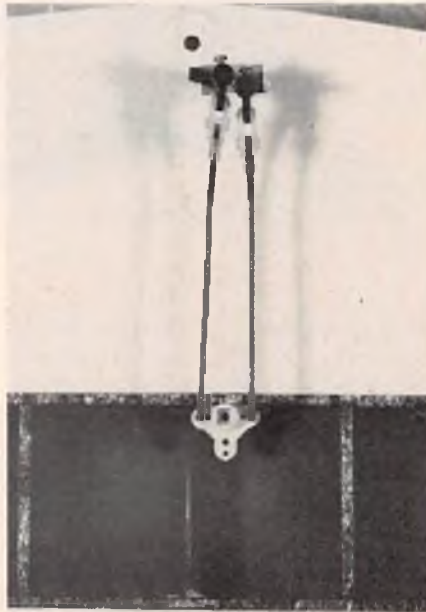
So it should not come as any great surprise to learn that the origin of some of our modeling techniques is somewhat in doubt. This questionable fatherhood applies to the method of installing aileron servos and the associated linkages that I am going to present to you here. I personally first ran into it with Bob Root's most successful "Li'l Cobra" Quarter Midget design, where it is a



Four channel installation in "Li'l Cobra" fuselage. Forward servo is for ailerons.



Small R/C airplanes often require many techniques all their own. "Li'l Cobra" Quarter Midget and Half-A "Miss Norway" shown use servo mounting/attaching techniques described.



Aileron linkage as used in "Li'l Cobra"; standard hardware used throughout.



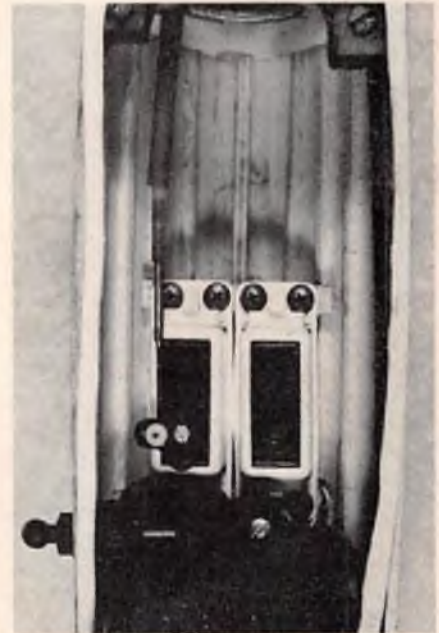
View with wing raised. Servo arm is put on servo, retaining screw installed, wing dropped down and secured.

simple, but effective, solution to the equipment installation problem in a crowded fuselage.

Some time later, I acquired a new kit that shows the same procedure for aileron servo installation on the plans. One of my modeling friends saw it, and remarked, "I see they are using my method for installing aileron servos in the fuselage."

There will no doubt be a number of other modelers who will come up with similar comments, however, every time I

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Two Ace R/C Micro Servos in Miss Norway. Right servo is for ailerons.



Aileron linkage in Miss Norway. Short pushrods do not create any installation or operating problem.



# GASOLINE ENGINE SAILPLANE TOW WINCH

By Rogers R. Sanders

I have had several requests for small winches, that could be built by the average sailplane modeler with moderate skills and equipment at reasonable cost, since publication of my miniature electric winch (RCM 2/77). I recently was commissioned to actually try to build such a winch. I was not able to meet all the goals, but an interesting winch was produced that does a fine job. It is built around a small chain saw engine which is not expensive if found used. It is very light, only 12 pounds. The parts are readily available. It will tow the largest gliders with no trouble.

There are several advantages to the gas winch. First is that it is light and small. It has lots of power. It can be built fairly inexpensively with readily available parts. It is extremely economical on fuel and you should be able to run all day on the standard tank. You simply don't have to worry about running down a battery, maintaining a battery, or replacing one (which would cost you more than your entire gas engine).

Maintenance should be almost nothing. I should think that you could run the winch for several years before requiring an overhaul and even then it shouldn't cost much.

The winch has one unexpected and suprisingly delightful feature: You almost cannot break line or wings with it, because the line tension is limited by clutch slippage. It works like this: To launch the glider, you give the winch full throttle and as soon as the rpm picks up, the centrifugal clutch engages and the drum starts to turn. When some tension is built up, the glider is launched. If there is a little wind, the glider will load the winch and slow the engine. The combination of lower rpm and heavy resistance to rotation at some point causes the clutch to start slipping. The engine maintains a constant rpm at this point (I would estimate about 5000 rpm for my unit). However, strong torque continues on the winch drum and the glider continues to climb. If the wind is blowing strongly, the drum may actually start paying out line while the engine continues to wind away. The result is very much like a high start in that it is



*Poulan chain saw with chain and chain bar removed.*

hard to break wings or line because the line pull is limited to a reasonable amount. Note, however, that this winch will pull much harder than a high start even when the clutch is slipping. It will tow the largest gliders with ease.

I have been concerned about the durability of the clutch when used in this manner. However, chain saw clutches are known to be very durable and they seldom fail. Of course, it is better if you learn to regulate the winch with the throttle, but it is nice to know that you don't have to do so and that even beginners can use it without fear if they have a reasonably strong airplane.

## CONSTRUCTION

This article is designed to give information that has never been available before to my knowledge. Specific information concerning required line tension and speed have been determined and will be presented along with suitable math for making the necessary calculations for designing your own winch. Since there are myriad types of chain saw engines available, the construction of this particular one will be in photographic form and you can make suitable modifications to make



*Garrison about to launch his glider. Note small size of winch compared to sailplane. Winch has no trouble launching the largest glider.*

your particular motor work. Various types of drive methods will be discussed as well as machine techniques and construction methods.

I have done considerable experimentation regarding the amount of line speed and tension required. These figures and tests were based on the requirement of launching large and heavy gliders. Small gliders are, of course, very easy to launch and the system is not designed for them. The major area where the "standard" 6 volt winch fails is in regard to line speed. I have determined that to launch a large, heavy glider in a mild tail wind or dead calm air requires a line speed of about 2000 feet per minute. About 40 pounds of line tension is required. Note, however, that the two are not needed simultaneously. At high line speeds, only a moderate line tension is required (10 to 20 pounds). As the line is slowed such as when towing a glider into the wind, the angle of the glider to the line increases to nearly 90 degrees and much greater line tensions are needed in order to prevent the glider from stalling. This is a very fortunate turn of events since line tension means torque, and speed means rpm. Torque times rpm equals power, and power means big heavy devices. Since we only need lots of torque at slow line speeds or lots of speed at moderate torque, we don't actually need terribly great amounts of power. If the correct winch drum diameters and reduction ratios are used, we can get by quite nicely on power plants that produce about 1 horsepower or less. My Poulan chain saw is a 2 cu. in. displacement motor and probably develops a little less than one horsepower. My electric winch uses a

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(L) Clutch side of engine exposed bell housing turned around so clutch sprocket is between clutch and engine. (C) Clutch shoe assembly and bell housing removed. Clutch shoe assembly simply unscrews from crankshaft. (R) Engine housing is cut away around clutch to allow clearance for winch drum. A bandsaw, Dremel saw or coping saw could be used.



(L) Bell housing drilled and holes countersunk to accept flat head machine screws. (C) Alum. disc mounted to housing with bolts. Inner side of disc was relieved in center to allow it to seat on the conically shaped housing. A lathe was used, the same effect could be obtained without machine work with a washer between disc and housing on each bolt. (R) Housing and disc from other side. Holes around the perimeter of disc will be used to sandwich housing to a disc on the other side.



(L) Disc will be attached to other side of housing. Thick alum. collar already bolted to it. Collar will act as mount for 3/4" steel winch hub end and be used to mount 6" hub flanges. 3 set screws are mounted in collar and will set into holes in winch drum. (C) Previous assembly but hub flange attached. Flange is 1/8" thick alum. plate and held in place with 3 countersunk screws. Groove machined in face of disc will mount on clutch housing. Groove holds assembly concentric with engine crankshaft. (R) Disc assemblies are clamped to clutch housing using 6-32 machine screws. Screws have their tension adjusted slightly to align winch drum shaft with crankshaft. Assembly must be completed at this point on engine with clutch housing held in place with clutch shoe assembly.



(L) 3/4" steel winch drum hub in place and held with set screws. The far end of the shaft is machined smaller to fit the support bearing used at that end. (C) Other flange is attached to 3/4" steel hub. Flange has a thick alum. collar attached with 3 countersunk screws and collar is held firmly on shaft with 3 set screws placed into depressions drilled in shaft. If depressions are not used, fine forces will squeeze the flanges from the hub. (R) Exploded view of all the parts and their relative positions to engine. All that remains now is final assembly and a base so far bearing can be aligned with engine.



(L) View of final assembly minus the base. (C) Ready to go! Small winch drum required for high speed direct drive. Winch hold-down stake required for light winch. (R) Small size and light weight (12 lbs.).



motor rated at 650 watts (horsepower is about 750 watts). The motor is probably about 70% efficient so I am probably getting about 0.6 hp. That is plenty of power, but I stress that you must have the right winch drum diameters and reduction ratios. This is where the "standard" winch fails. The car starter motors have gobs of torque, but only near stall (in fact you can't stall them, they are just too powerful) since they are series wound motors. As soon as they are unloaded, their rpm quickly picks up, increases their counter (electromotive force) and they stop winding up. With only 3" diameter winch drums, they can't generate enough line speed. If they used 5" or 6" winch drums, then both line speed and torque would be plenty. However, then there would be one other problem: They have too much torque. It would require a very skilled pilot to keep from breaking the line in the wind if the drum were larger because these motors have tremendous amounts of torque. The smaller motors such as I recommend will also break lines, but they can be stalled and this makes it much more difficult to break the line. They are much easier to modulate in the wind and, at the same time, have higher line speeds than the conventional 6 volt winch.

Okay, then the question is how to you determine the correct sized winch drum once you have found a suitable motor in the 1/2 to 1 hp range. To do this you need to decide on your drive system because eventually we are going to have to work with rpm. You have a choice of doing the project in direct drive or with some type of reduction mechanism. If you are using a small motorcycle starter you can't go direct drive because the torque is marginal and the rpm is very high. You would probably have to use something like a 1/4" winch drum which would not be practical from a strength standpoint. In addition, as the line began to wind on the drum, the diameter would rapidly increase which would drastically decrease your line tension. Obviously I am choosing an extreme example, but I am trying to demonstrate the problem. On the other hand, a car starter designed for 12 volts and operated on 6 volts has a very slow speed and lots of torque so using a reduction drive is impractical and unnecessary. The catch to all of this is that light, high power devices usually turn high rpm at low torque and, therefore, reduction drives are usually required if you want lightweight winches. The chain saw engine falls somewhere between the two extremes. I don't have a tach, but my best guess is that under no load, my particular engine will turn about 10,000 to 12,000 rpm. This makes it possible to use either direct drive or reduction drive. In this case, I wanted to experiment with a high speed direct drive and I liked the simplicity of it as

well. It is also cheaper. However, there are several penalties for this. The one that is the biggest is that some tricky machine work was required. Other disadvantages will be noted later in this article.

There is a little formula that I use for determining the size of the winch drum once I know the rpm it will turn under very light load:

$$\frac{7600}{\text{RPM}} = \text{Diameter of winch drum in inches}$$

Also useful:

$$\frac{7600}{\text{diameter}} = \text{RPM}$$

Note that rpm is that of the winch drum and that this figure should be multiplied by the reduction ratio to determine motor rpm if a reduction drive is used.

From this it can be seen that if my engine turns about 10,000 rpm under very light load, I need to use a winch drum diameter of about .76" diameter. It would be possible to use a solid steel 3/4" shaft for this and that is what I did in this case. In the case of my electric winch, the motorcycle starter turns about 11,000 rpm under light load. A reduction drive was used at 2.57:1, therefore, my winch drum rpm was 4280 rpm, and a winch drum of 1.78" is required. 1 1/4" aluminum bar stock would work just about right. You can pick any combination you wish. For example, you could use a reduction drive on the gas engine and use a winch drum of 1 1/2" diameter if you use about a 2:1 reduction drive. If you wanted to use a 3" drum with a 10,000 rpm engine you could if you used a 4:1 reduction drive.

Turning to the specifics of constructing a gas driven winch, the first thing to do is get a suitable engine and, if it is not new, rebuild it and get it spotlessly clean. If you want durability and long life between overhauls, it makes sense to get everything like new from the beginning rather than having to tear the whole thing apart to rebuild it 2 months after you finish it! Finally you simply cannot afford to have unreliable engine performance because this could crash an airplane. Fortunately, gas engines are usually their most reliable when operated at or near maximum rpm. By this I mean that they are just not likely to suddenly die on you at 8000 rpm like they are at idle or on acceleration. In use, the engine will be taken from idle to full rpm, and it will stay there for several seconds while you are building line tension. If it was going to die, it would be expected to do so immediately, and not 2 seconds after you launch your ship.

We have had no problems of this sort with this winch. The engine should be carefully and completely broken in at this point, and the carburetor should be adjusted for quick throttle response. The high speed carburetor jet should be

adjusted when you have the clutch stalled so the motor is pulling against the clutch steadily. As in modeling practice, it is better to run a little rich than a little lean. These engines usually recommend something like a 16:1 fuel/oil mix. I do not feel that this is necessary for winch use and you run the risk of a fouled spark plug. We have been using outboard oil mixed to 40:1 with no problems. There is extremely little smoke with this mix and we have never fouled a plug. I think it is safe to run this mixture for several reasons. First, recall that chain saws generally run for prolonged periods at full power. We are running our winch for only a few seconds at a time. Second, the main reason for all the oil is for cooling. Again, we are not getting the high temperatures because the engine is only run for a few seconds and then is shut off and it cools while the line is returned. Finally, the oil used for outboards is of much higher quality than standard 2 cycle oil and it takes much less oil to do the same job. Note also that these motors have ball and needle bearings and this feature really reduces the amount of lubrication required. About the only things that require lubrication per se in the engine are the cylinder wall and piston ring, and the 40:1 mix seems to do the job. Having said this, I will also say that I accept no responsibility for any engine damage that you may incur by using the 40:1 mix, and you are completely on your own about this. If you are a little chicken, then use the recommended mix.

This brings us to the tough part of this project: Constructing the winch drum and attaching it to the engine in some way. Although I built mine direct drive, it was much more difficult than using a reduction drive. I feel that the slight additional cost of a reduction drive is well worth the money and it may be the only way you can do it unless you are a skilled machinist. The big problem is that the clutch on the engine shaft is usually turned inside out. That is to say that the drive sprocket is positioned between the clutch bell housing and the engine. This presents major problems if you want to attach a shaft to the clutch, because you must now mount the assembly on the other side of the clutch. The job would be vastly easier if the driven side of the clutch were on the side away from the engine so that the sprocket would be readily accessible from the side of the engine. Look closely at the photographs and you will see what the problem is. I noted that some chain saw engines are not like this one, but most of them are. Apparently it is easier to get the chain in line with the engine for better balance when the clutch is turned around this way. If you seriously want to make a direct drive unit then try your best to get an engine with a clutch with the sprocket mounted on the outside rather than

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# SKID KID

**S**mooth and highly maneuverable, this little airplane excels at "close-in" flying. I refer to those antics performed close to the pilot, or within a confined area. At reduced airspeed the Skid Kid can really perform safely; for example, a horizontal Figure 8 at 5' to 10' altitude, or it can pick-off a few daisies in the corner of the field. How about trying a 12" limbo or flying under your transmitter antenna?

Of course you can't do this on a

*Sue Morey proudly displaying Uncle Ralph's Skid Kid. Photo taken by her husband, Rick Morey.*



**If you're shy about the strange looking airfoil — don't be. It's a real performer, especially in confined areas.**

**By Ralph Pearson**

crowded field --- safety first. At our own field we stand aside and watch as our top pilot puts the "Kid" through such gyrations.

You don't need to be a top pilot to enjoy this airplane, or feel limited to the perimeter of the field or runway. My original, at 20 ounces and powered by a Cox. 049 Golden Bee R/C (half the power of the Tee Dee), can outspeed most trainer types.

To get the most pleasure from the "Kid," throttle control is a must. Cox throttles (sleeve type) really do work well and are trouble-free.

Nothing I've constructed or designed to date can match the effortless performance of the "Skid Kid," so don't be shy about using that strange looking airfoil. More on this airfoil later.

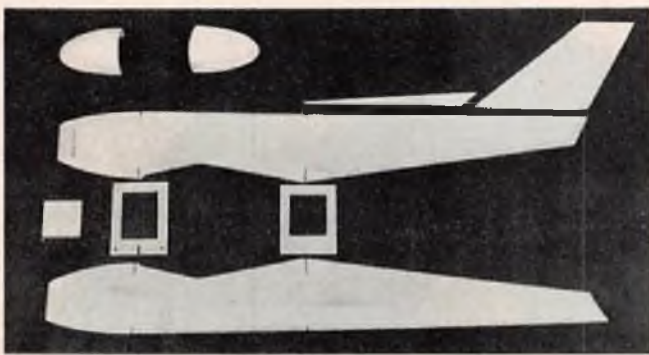
There are two or three places that could cause you extra work and some trouble if not done in proper order, so be sure to study the plans and read the entire construction article before proceeding to build this plane.

Please don't add braces, gussets, strengtheners, or whatever, to this airplane. Don't ever build a plane to be crash proof. It can't be done. The extra strength you add becomes the extra weight. This leads to a more powerful engine and a larger fuel tank. Now the plane is so heavy it flies poorly and, when it does crash, it hits harder resulting in more damage than normal.

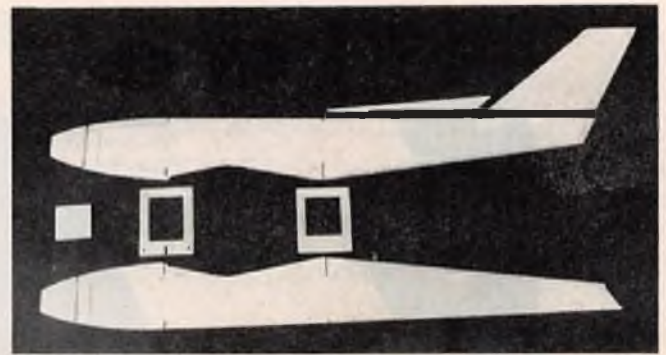
However, you can ad lib in several areas --- always keeping the weight factor in mind.

There are three choices of stabilizer

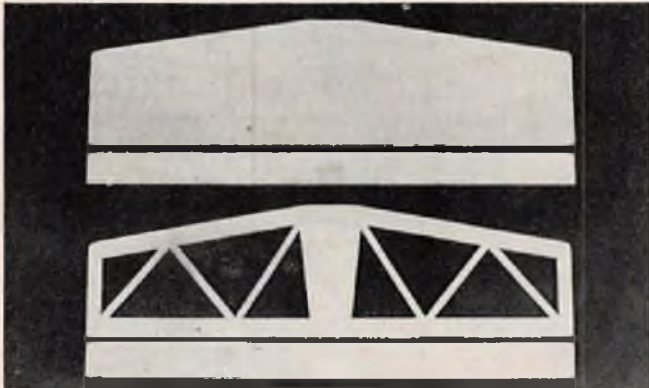




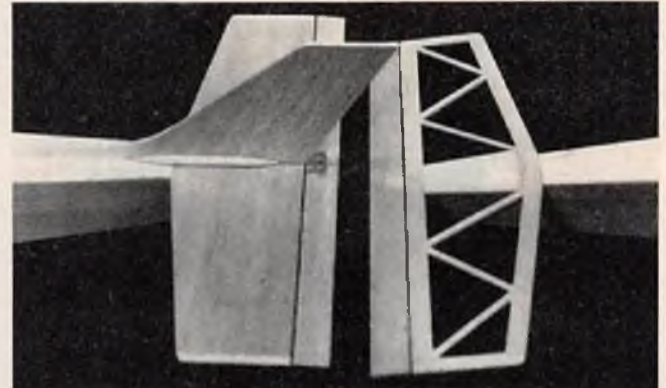
Fuselage parts layout for SK-1.



Fuselage parts layout for SK-2.



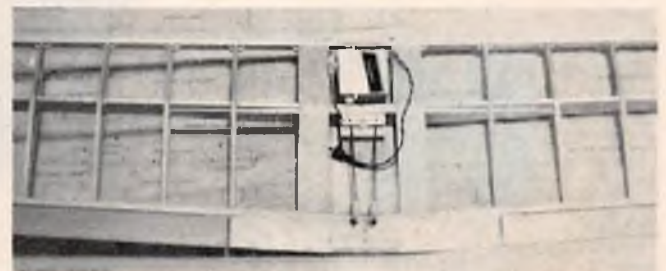
Two versions of stab can be built.



Close-up of tail assembly showing both stabs.



Completed wing awaiting servo installation. Wing is lighter and stronger than sheet rib type.



Aileron servo installed. Note bellcrank arrangement from servo to aileron torque rods.

construction. The original used medium light 3/32" balsa sheet. This is ideal but is difficult to hinge. The "built-up" (1/8" stock) stabilizer, shown on the plans, is more work but is light and easy to hinge. The third choice would be very light 1/8" sheet balsa.

The new Goldberg small "flex point" (RK-4) hinge is very easy to use, but is stiffer than pinned hinges, resulting in higher drain on that little 225 battery pack. Use pinned small Klett (RK-2) on the ailerons at least.

Gold'N-Rods (Pylon-GRF-36) are shown on the plans, but a "made-up" pushrod can be used. Use 3/16" square medium balsa with the ends of your choice. Du-Bro spring thread couplers will be very handy here. The couplers for .047 wire will be ideal for the newer very small servos.

The wing tips can be laminates of 1/8" balsa or 3/16" balsa.

I used basswood for the original

dihedral brace, but good basswood is hard to find. Basswood was used for the skid also. You can use two pieces of 1/16" plywood (epoxy together) for the firewall. This can also be done with other 1/8" plywood parts.

#### CONSTRUCTION

You needn't build the Kid super light, but you can't get careless with heavy wood or gobs of epoxy either. Don't try to hide the wood grain on the painted parts, as this adds weight fast. Choose your wood carefully, using mainly lightweight balsa. The main spar, however, should be cut from straight, hard, very strong stock.

An optional "built-up" spar is included on the plans and should be used with the SK-2 version. Be sure to use 3/32" plywood for the spar brace in this case.

**Wing:** If you use the "built-up" spar, build this first. An easy way to do this is to add pieces of 1/8" medium balsa (vertical grain) to one strip of 1/8" square

spruce. Do this on a covered work surface, making sure the spruce strip is held straight. When this is dry, use a straightedge and cut this assembly down to 9/16" at one end and 11/16" at the other. Now when you add the other 1/8" square spruce strip you will have the proper spar size 13/16" tapered to 11/16". Sand the sides flat. This will help later when the spar brace is added.

I highly recommend Ambroid, Sigment, or similar for the first four steps in the wing construction. Titebond, or similar, is a second choice.

Construction of this type wing is easier than describing the procedure. It also takes longer to make a set of ribs (sandwich style) than to build one half of the "stick type" wing. Also, for a bonus, the wing will be lighter and will be less susceptible to bench rash. One can really manhandle this wing while sanding, etc.

Protect the plans with kitchen wrap,





*Close-up of aileron servo. Note servo board hold down screw in front.*

film backing, etc. Make sure the trailing edge stock is a full 1/4" at the high side --- some are not. Add a piece of 1/8" stock (at the front edge) if this is the case.

Tack glue (5-6 places) the trailing edge to the rear spar. Go easy on the glue, as these parts will be separated later, after sanding. Pin this assembly in place on the plans, while drying.

Pin down the gauge strip (1/8" square balsa) and proceed to install all lower rib forms. Rib #1 is 13/16" wide and should be light balsa. All the other ribs should be

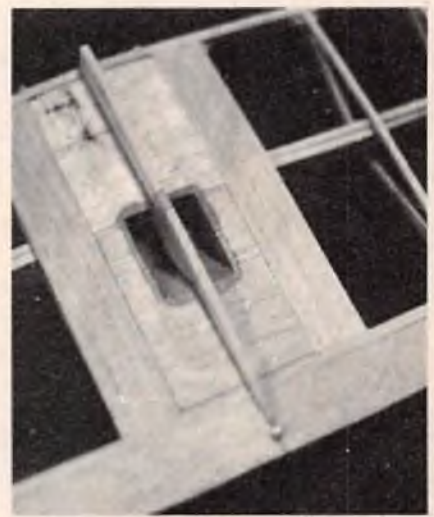
somewhat firmer stock.

Treat each rib form in the same manner. Fit each one at the rear spar, mark at the front edge position of the main spar (see View #1 on the plans) and cut (or break) off beyond the gauge strip. Now make the necessary saw cut, dampen (water or saliva) the reverse side slightly and proceed to glue and pin it in place. Angle the pins (View AA) so construction can continue. Glue and pin all lower rib forms in place and then add the main spar. Use a gauge and pin the spar so it will not move. The same gauge will be used on the other wing half.

Glue the "false" leading edge (1/8" square balsa) and the rear gauge strips (1/16" x 1/8" x 1/4") to each rib form.

Proceed to fit and glue the upper rib forms. Use the same procedure as on the lower forms. In this case, however, two cuts plus a slight notch will be necessary because we have a greater "bend" here. Wet these slightly more than the lower ones. Breaking is rare, usually caused by using too hard balsa. Try again with a new piece. This assembly should dry several hours or overnight. Remove from the building surface and cut off all the stubs at the leading edge. Sand this straight and square. When gluing on the leading edge, glue only the area near the rib ends, as most of the false leading edge (useless weight) is cut away. See plans.

Sand the trailing edge to conform (scale center and tip rib shown) to airfoil



*Bottom view of wing showing skid. Note thumb and finger hole for launching.*

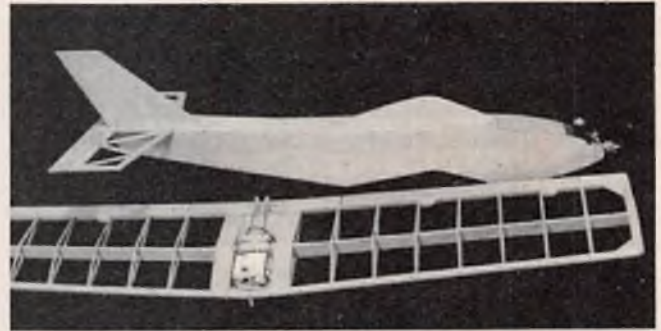
shape. Mark (with pencil) the aileron position and separate the trailing edge from the rear spar. Use a double edge razor blade and work carefully.

Put the trailing edge aside and proceed to join the wing halves. Glue the main spar brace (3/32" birch plywood is used on the SK-2) to one wing half. Use epoxy here but be sure to sand the plywood for a better bond. Always sand plywood before gluing. Clean up any epoxy that oozes out of the joint --- it's heavy.

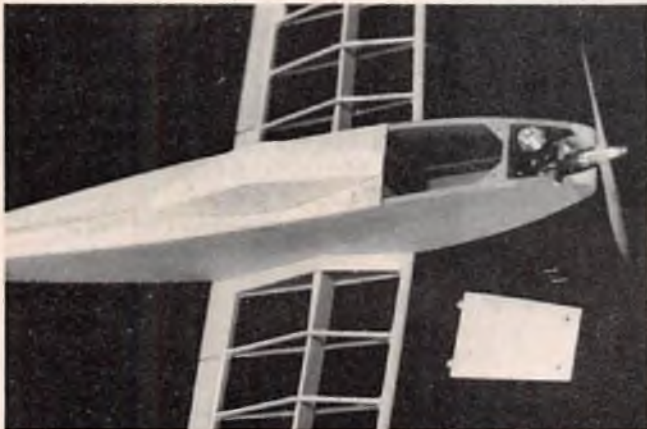
When this is dry (cured) clamp but do



*Simple throttle 'hook-up' works well on Cox Golden Bee if engine is well 'broken in' before attempting complete throttling.*



*Completed SK-2 ready for covering, this model can be powered with Cox Tee Dee or Medallion .049. A hot .051 should work well.*



*The SK-2 model showing removable hatch cover for tank access and battery pack.*



*Skid Kid sits on top of a Goldberg "Handi-Tote" along with Cannon radio awaiting the next flight.*



not glue the other wing half in place. Check for proper fit of the leading and trailing edge braces. The leading edge dihedral brace doubles as a servo board retainer. This 1/16" plywood brace can be bent to fit (wing taper) but sand it slightly wedge shape to help the situation here. The rear spar brace (1/32" plywood) is simply bent to fit. When everything fits properly, use epoxy and clamp together. Check dihedral before epoxy sets.

I used the Du-Bro, 1/2A strip aileron linkage. Don't make the horn end of the 1/16" wire any longer than needed for your particular installation. A low profile here is desired and can be obtained using my method of installing the aileron servo. (See construction photos.) Any degree of aileron movement can be adjusted into this system without long aileron horns. In most cases, 1/4" of total aileron movement will be ample. Slightly more movement is needed on poorly fitted ailerons.

Finish gluing all the trailing edge pieces, wing tips, and tip corner braces.

Be sure to sand the leading edge, main spar, and the trailing edge flat at the dihedral break. This is shown on the plans.

Sheet the wing center sections later. Leave this open until the wing dowels have been glued in place.

Sand the entire wing now. The missing portion of the wing bottom sheeting will have to be sanded later. Shape the leading edge carefully. This is **very important**. A sloppy job here, can lead to drastic trim problems on any plane.

Ve the wing screw hole brace (at trailing edge) slightly and epoxy in place. Make sure it clears the rear fuselage bulkhead.

Fit and hinge the ailerons, but **do not** glue on at this time. Put the wing aside for now.

**Fuselage:** Cut out all fuselage parts. Glue bulkheads F2 and F2A together and, when dry, drill the dowel holes. At this time, drill all necessary holes in the firewall and install the blind nuts.

Glue all doublers and stringers to the fuselage sides, allowing for a snug fit of the bulkheads. When this is dry, use a Zona saw, or something similar, and make five cuts (three for SK-2) across the front doublers, as shown on the plans. This will make it much easier to bend the fuselage. More on this later.

Assemble the fuselage upside down over the plans using bulkheads F2 and F3. Square this up and allow to dry before pulling the tail end together. **Do not** glue on the firewall at this time.

Fit the wing to the fuselage, making sure it will fit straight and level — this is important. When you are sure it will fit properly, glue in the wing screw hold-down block, using the wing for a guide. It would be wise to use wax paper to protect the wing for this procedure.

When this is dry use rubber bands and pins to secure the wing in place in order to drill the dowel holes and rear screw hole. A length of 1/8" brass tubing works fine to drill the dowel holes. Put the dowels in place and glue them to ribs #1. After the wing is removed, put a couple of drops of Zap (or similar) where the dowels come through the leading edge. Now back to the fuselage.

pushrod, now is the time to glue in the necessary rear support. Roughen the outer rod (at both ends) and epoxy or Zap at the rear only. The front support is glued only after servo position has been determined. Finish sheeting the fuselage and wing.

By all means, use the hand launching grip as shown on the plans. This grip area can easily be enlarged to suit your hand. Simply make a cover from scrap and, when dry, cut out the bottom sheeting below the cover.

The skid is glued on after all sanding has been completed. If this is shaped from pine or basswood, the 1/32" plywood cap will not be necessary. The vertical brace can be 1/8" dowel stock or spruce. The small brass tubes (for better grip) are epoxied in place after painting has been completed. Drill the holes for them at this time. Do not substitute dowels here, they won't do the job.

**Tail Surfaces:** These are simply cut to shape and sanded lightly. Use whatever hinge you prefer. I epoxied the stabilizer on at this time. More on this later. Use extra care when gluing on the rudder and dorsal fin. I glued the braces to the rudder first. I then glued this assembly to the fuselage and then added the fin.

**Canopy:** An "open" type canopy is shown on the fuselage side view (SK-1). This makes a handy place to mount the switch. To date, because of the horizontally mounted engine, no exhaust residue has collected here.

On the SK-2 version, however, a "closed" canopy is needed. A commercial type can be used, or you can make one from sheet balsa as I did. This one is easy to assemble and looks good on both versions.

The side view, is a true pattern. The canopy base is shown on the SK-1 fuselage top view.

Pin down the base (C2) over a protective cover and glue bulkhead (C1) in place. Brace this (C1) with a piece of scrap balsa and let dry. Don't remove the pins when this is dry, but proceed to glue and pin both canopy side pieces in place. When this is dry, remove the pins and sand across the top of the canopy to remove the bevel. Now glue (cross grain) the top cover, and pin in place.

Let this assembly dry well and then cut away the center of the base --- no need to remove the bulkhead. Lay the canopy on a piece of sandpaper and "scrub" the bottom until it is flat and level.

Proceed to sand the sides and top and "round" the corners. Shape the ends to please your eye. Now go over the top and sides with fine sandpaper and you're ready to paint.

**Finish:** I'll describe my finish method and you can decide on its merits and do as you like. Super MonoKote is highly recommended for the wing because of the type of construction used.

**SKID KID**  
Designed By : Ralph H. Pearson

**TYPE AIRCRAFT**  
Low Wing Sport

**WINGSPAN**  
36 3/4 Inches

**WING CHORD**  
6 1/2 Inches

**TOTAL WING AREA**  
236 Square Inches

**WING LOCATION**  
Low Wing

**AIRFOIL**  
Diamond

**WING PLANFORM**  
Double Taper

**DIHEDRAL, EACH TIP**  
1 1/2 Inch

**OVERALL FUSELAGE LENGTH**  
27 3/4" (Incl. Eng.)

**RADIO COMPARTMENT AREA**  
(L) 7" x (W) 2 1/4" x (H) 2 1/2"

**STABILIZER SPAN**  
14 Inches

**STABILIZER CHORD (Incl. elev.)**  
4" Average

**STABILIZER AREA**  
56 Square Inches

**STAB AIRFOIL SECTION**  
Flat

**STABILIZER LOCATION**  
Top of Fuselage

**VERTICAL FIN HEIGHT**  
4 1/8 Inches

**VERTICAL FIN WIDTH (incl. rud.)**  
3 1/8" Average

**REC. ENGINE SIZE**  
.049

**FUEL TANK SIZE**  
Tank Mount (1 oz., SK-2)

**LANDING GEAR**  
None (Skid)

**REC. NO. OF CHANNELS**  
2-3

**CONTROL FUNCTIONS**  
Ail., Elev., (Throt. Opt.)

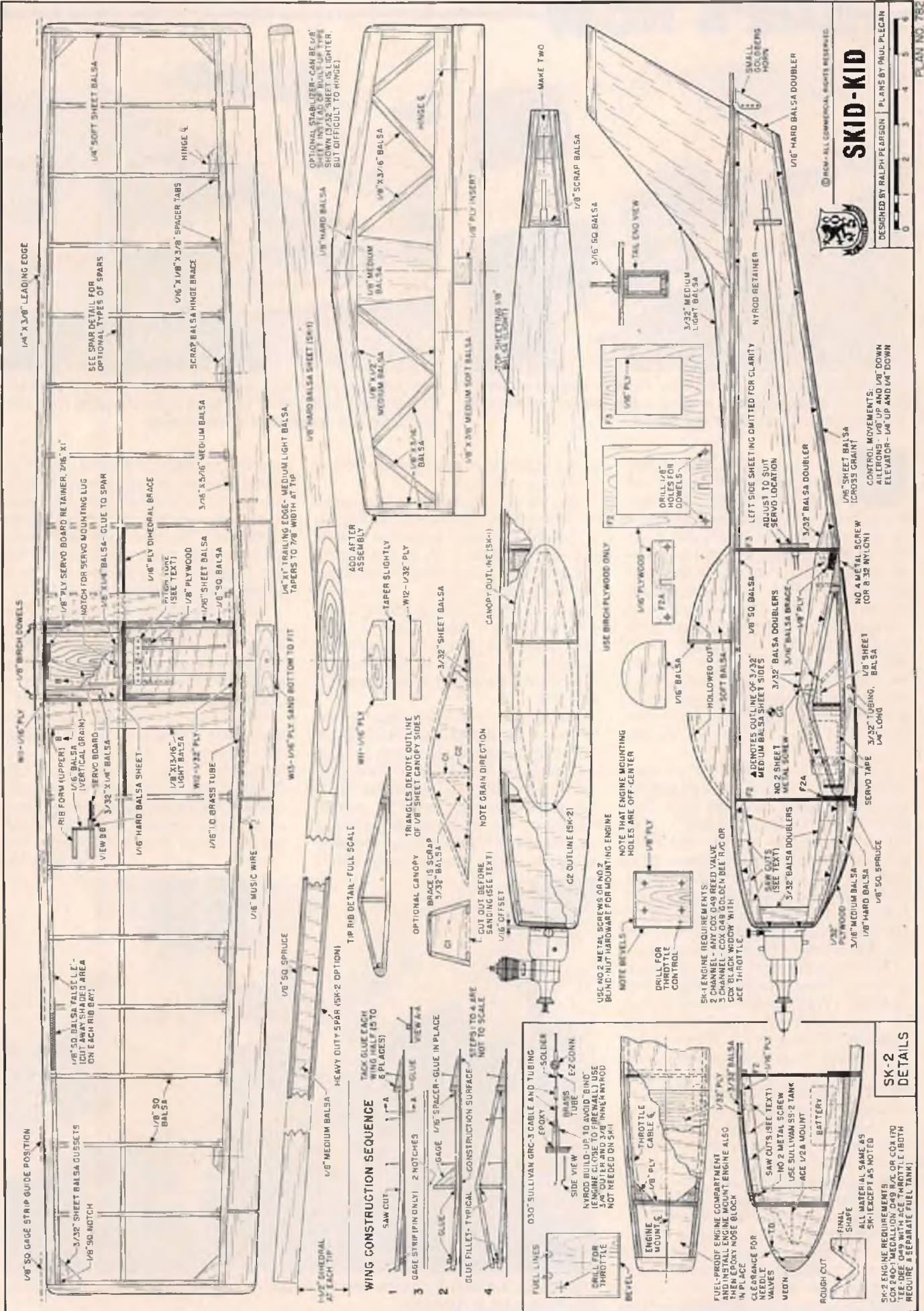
**BASIC MATERIALS USED IN CONSTRUCTION**

Fuselage	Balsa & Ply
Wing	Balsa & Ply
Empennage	Balsa
Wt. Ready-To-Fly	20 Ounces
Wing Loading	12.15 Oz./Sq. Ft.

Wet all of the front outer surface of the fuselage with water from bulkhead #2 forward. Mix enough epoxy for the firewall and also enough to smear into the saw cuts. Epoxy the saw cuts first and then the firewall area. Pull the nose together and hold the firewall in position using rubber bands and pins. Wipe any excess epoxy from the doublers.

If you are going to use "NyRod"





# SKID-KID

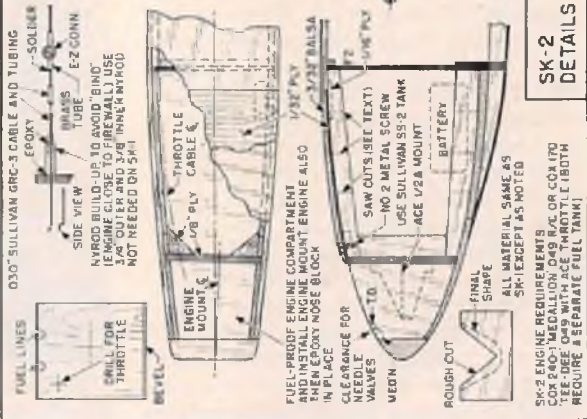
DESIGNED BY RALPH PEARSON | PLANS BY PAUL PEGAN  
 0 1 2 3 4 5 6  
 PLAN NO. 782

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CONTROL MOVEMENTS:  
 AILERONS - 1/8" UP AND 1/8" DOWN  
 ELEVATOR - 1/4" UP AND 1/4" DOWN

## SK-2 DETAILS

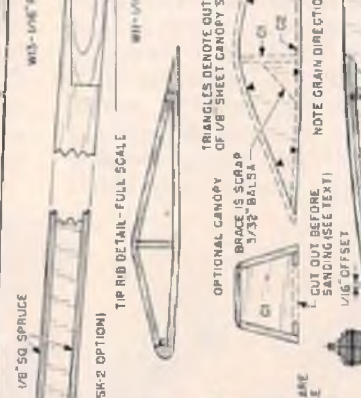
SK-2 ENGINE REQUIREMENTS: 1/8" OR 1/4" COIL W/ 1/8" TEE-DRIVE SHAFT WITH ACE THROTTLE. (BOTH REQUIRE # SEPARATE FUEL TANK)



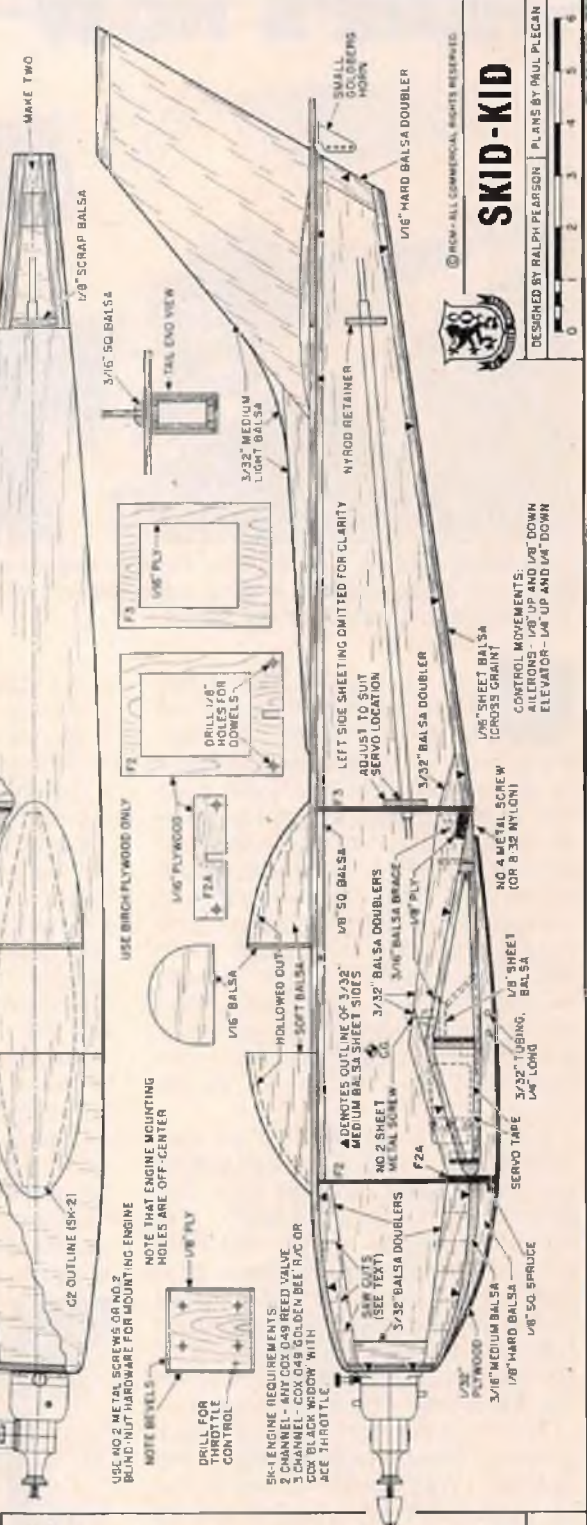
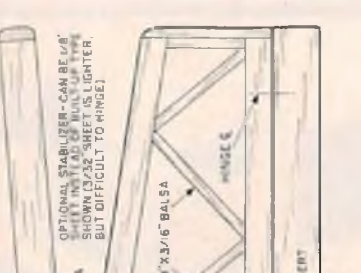
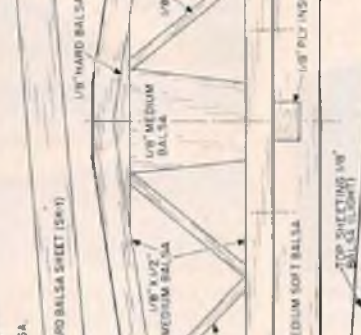
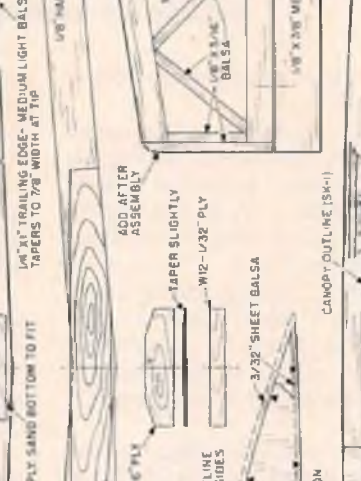
## WING CONSTRUCTION SEQUENCE

1. GAGE STRIP (PIN ONLY) - 2 NOTCHES
2. GLUE 1/8" SPACER - GLUE IN PLACE
3. GLUE FILLET - TYPICAL CONSTRUCTION SURFACE
4. STEPS 1 TO 4 ARE NOT TO SCALE

## TIP RIB DETAIL - FULL SCALE



## TIP RIB DETAIL - FULL SCALE





# HERE'S HOW



*Two Rossi .60's on a Byro Drive. Custom engine mounts and front pulley besides engine arrangement presented an unusual challenge for the builder.*



*Two engines piped into special muffler making it difficult to tell when both are lit up. Note pressure lines for each fuel tank and support of exhaust pipes.*

Until recently I thought I had seen most everything that had to do with RC'ing. However, every time I make such a statement I end up embarrassed because there is no end to what you guys out there can think of. What really turned me on this time was the Byron Pitts, shown with the two heaters up front. This unique and ingenious arrangement of engine mounting belongs to my good friend Walt Schoonard of Winter Haven, Florida. Walt is really a swing wing man, however, since the large airplanes arrived on the scene, it appears he has been bitten. More than slightly, as you can see.

Looking over Walt's power arrangement it is really apparent that he has ample power to fly the Pitts. The Byro Drive is highly modified, with respect to engine mounts and front pulley, to accept the two Rossi .60's. Both engines are piped into a special muffler and fit nicely under the standard Pitts cowl. Each engine has its own 16 oz. fuel tank (1 qt. to fill her up!) which are pressurized with muffler pressure.

The initial test flight of this bird was almost a disaster. After tuning up the engines, Walt could not resist the moment, even though the Pitts had not received its final paint job. With engines running and an open field ahead, it was more than Walt could stand --- he had to fly it. The Pitts headed straight down the runway and then started into a hard right turn heading for the spectators. Walt didn't have it and couldn't shut it down. Luckily the Pitts did a perfect ground loop, missed everything and everybody, and came back into range enough for Walt to get her in low throttle. Walt breathed a big sigh of relief and so did many spectators! It was soon apparent that the receiver tuning needed some attention. The Pitts was under-propped with a 20/8 prop which probably was one

of the accountable factors in not getting it in the air.

By now, I'm sure Walt has corrected all his problems and the Pitts is flying like it should. One thing I would like to point out if you decide to try a twin engine hook-up. It was very difficult to tell when both engines were lit up. It must have been the common muffler or maybe with a larger prop it would make a more noticeable difference in rpm. It is always great to look at something different. Thanks, Walt Schoonard, you gave us a real thrill.

I received an interesting idea from Mr. A. Janacek of Seattle, Washington. Some of you scale buffs out there should be interested in this one. It involves a working landing light system that could be adapted to most any R/C aircraft; however, Mr. Janacek designed it specifically for his 60" Pittcairn Mailwing scale job. I don't know about flying R/C

after dark in order to make full use of this lighting system, but apparently he felt if the full size aircraft had them his model must also --- and they should actually be functional. The true spirit of a scale model builder always rises to the top with ingenious ideas of realism. This is known as the "scale builders law No. 1."

Getting back to the landing lights. This idea can be used on any airplane; that is, if you have a hankering for some extra gadgetry. Can you imagine landing lights on a Falcon "56"! I can't, but it could be fun. And something different.

Here's how Mr. Janacek worked out his landing light system. He purchased two Eveready "Captain" (C-cell) flashlights. They are listed as "JR Captain," for C size batteries, in most stores. These particular flashlights have an all plastic reflector, a part which we are interested in using. Remove the

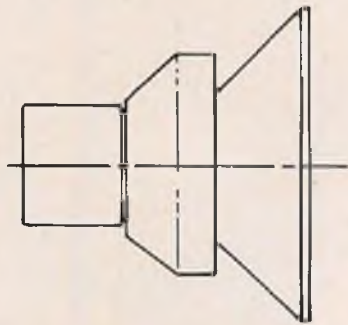
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*Pitts being readied for unexpected initial test flight. Walt touches engine head to determine if it is running.*

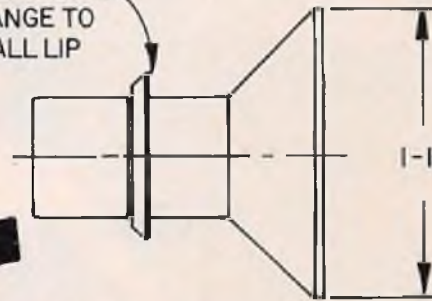


LANDING LIGHT SYSTEM



STANDARD REFLECTOR AS REMOVED FROM "JR. CAPTAIN" EVEREADY FLASHLIGHT. SHOWN FULL SIZE.

GRIND DOWN FLANGE TO SMALL LIP



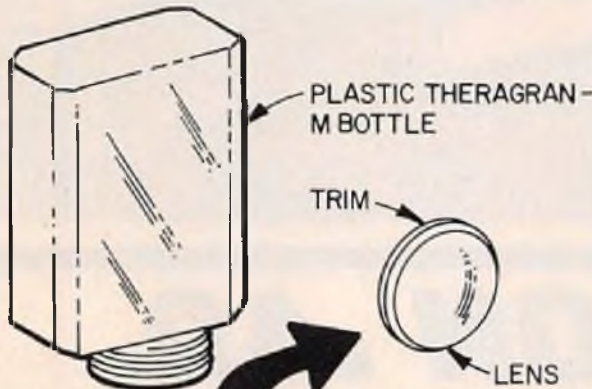
1-1/2" DIA

MODIFIED REFLECTOR

SOLDERING PAD



REPLACE PR4 BULB WITH PR3 (4-1/2V) BULB.



PLASTIC THERAGRAN-M BOTTLE

TRIM

LENS

CLEAR PLASTIC HEAT TO 375°F IN OVEN.

ROUND METAL TEASPOON MEASURE.



TO MAKE LENS FOR LIGHT — PLACE HEATED PLASTIC ON TEASPOON MEASURE. CAREFULLY ALIGN BOTTLE MOUTH OVER HEATED PLASTIC. PRESS DOWN AND SQUEEZE — FORCING PLASTIC INTO TEASPOON.

SERVO AND MICRO SWITCH

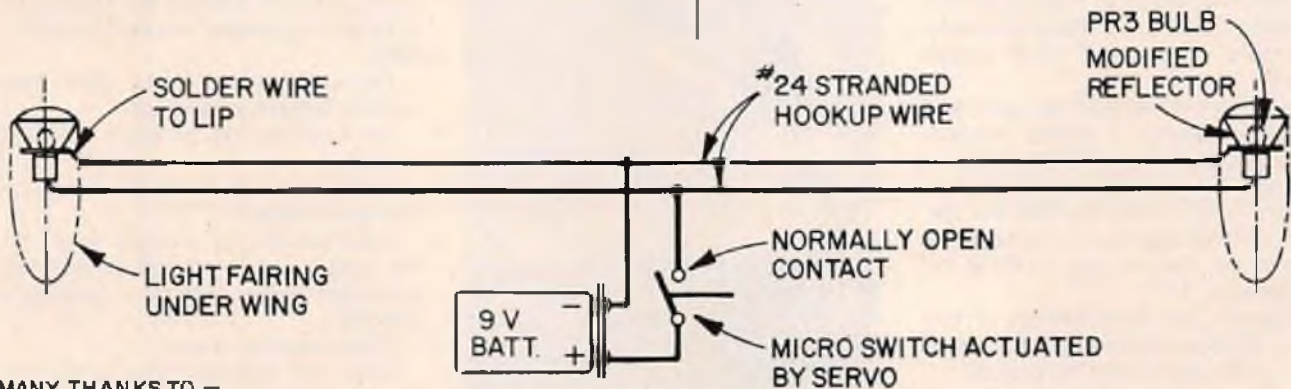
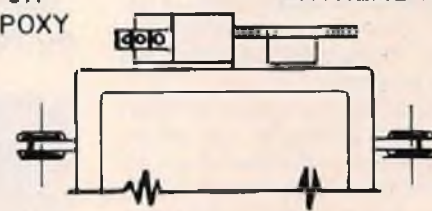
GOLDBERG MICRO SWITCH OR EQUIV.

MODIFY SERVO WHEEL, AS SHOWN, TO ACTUATE SWITCH.



HOT STUFF OR EPOXY

SERVO SHOWN AT EXTREME TRAVEL



SOLDER WIRE TO LIP

#24 STRANDED HOOKUP WIRE

PR3 BULB MODIFIED REFLECTOR

LIGHT FAIRING UNDER WING

NORMALLY OPEN CONTACT

MICRO SWITCH ACTUATED BY SERVO

MANY THANKS TO —  
A. JANACEK  
SEATTLE, WA

SCHEMATIC





# ASTRON .40

By Bill Evans

It was inevitable that interest in the .19 powered Astron would lead to the development of the Astron .40 which, due to the wing area, could more appropriately be called the Astron eight-eighty.

Those who have built, seen, or flown the Simitar 540 (RCM Oct. 78) will be interested in knowing that the Astron .40 can fly faster and slower than the 540. Though the Astron .40 can be flown two channel (aileron and elevator), it is recommended that it be flown with four channels — the two additional channels for engine control and nose wheel steering.

The Astron .40 is definitely new and different — always a crowd pleaser! Witness the fact that the Astron in the air, with its X-wing configuration, will not only stop cars passing the field but the drivers eventually get out, run across the field and ask "Do you guys fly these for the movies or TV?"

Obviously the development of the Astron .40, from start to flying, has been a successful and rewarding project.

For your convenience Astron .40 wing cores (\$18.00) and 1/64" plywood sheeting (\$16.00) may be ordered from

*The Astron is not only a practical design which places X-wing flight within the reach of all RC'ers, it is the first X-wing design to fly!*



Designer Bill Evans and one of his fleet of outer space vehicles.

Soaring Research, 19216 Calvert St., Reseda, CA 91335, telephone (213) 344-6391. Add \$2.00 for shipping. California residents add 6% sales tax.

## Materials

- 3 — 1/4" x 4" x 36"
- 4 — 1/4" x 3" x 36"
- 1 — 1/8" x 2" x 36"
- 1 — 3/16" x 4" x 36"
- 1/64" plywood 12 sq. ft.  
(or equivalent) 1/16" balsa sheet

## Construction

Glue and pin 1/8" balsa leading and trailing edges to foam cores. Make sure to keep wing panels free from bends or warp.

Cut out fuselage parts sides, top, bottom, formers and firewall.

Pin fuselage bottom down on a flat surface.

Glue and pin fuselage sides to fuselage bottom.

Glue and pin 1/2" triangle stock into the bottom inside corners (where the fuselage sides meet the fuselage bottom).

Glue firewall in place.

Glue 1/2" triangle stock to the top inside edge of the fuselage sides.

Glue and pin fuselage front top 1/4" sheet in place.



Glue and pin in rear former, corner triangles, and top and bottom.

Glue and pin in nose filler blocks.

Trim and sand leading and trailing edges of wing panels so that wing sheeting will fit nicely over them.

Sheet wing panels using contact cement such as Sig Corebond or the new double sided sheeting transfer tape "Corefilm" (Corefilm is a new product available from Soaring Research).

Join wing panels with 5-minute epoxy. The top wing has 3" of dihedral under each tip; bottom wing has 2" of anhedral. (The bottom wing joint is best made by setting the panels upside down on a flat

surface and blocking each tip up 2".)

Sand front of fuselage square, and glue 1/16" ply nose ring.

Trim and sand wing leading edges and glue on 1/4" balsa leading edge.

Cut and sand elevons, vertical stabs, and wing tip plates to shape.

Trim and final sand wings.

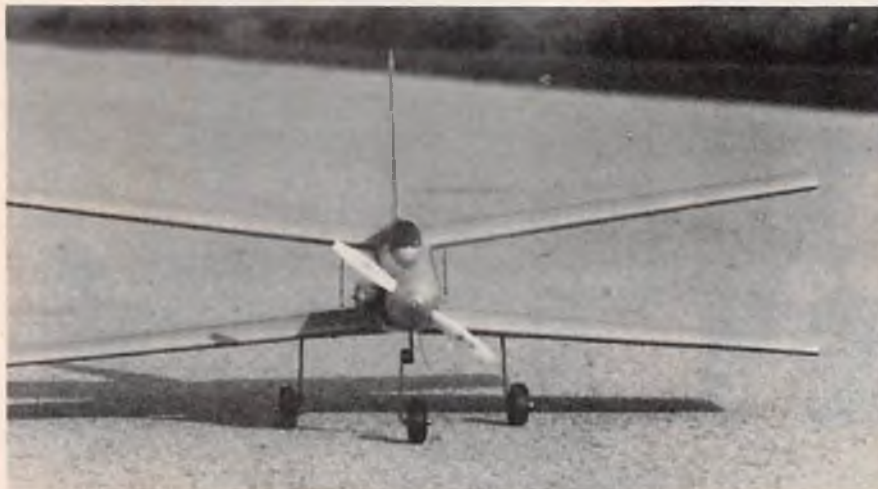
Trim and sand fuselage to shape.

Cover all parts with your favorite covering material (for the original we used orange Solarfilm).

Hinge elevons to the wings (to provide for free movement and to eliminate hinge line gap; Solarfilm or MonoKote hinges should be used).



Above is David Herbert of Kraft Systems with his Astron 40 which he flew to 4th Place in the Unlimited Class in the 7th Annual Multiwing Championships at Omaha, Nebraska. Dave's trophy was separated from the First Place trophy by only 8 points. This certainly proves that the Astron has more than sufficient pattern capability.



Looking at the business end of the Astron which shows off the X-wings.



Cluster of Astron .40's poised for launch.



At left Astron (K & B .21 powered). Right three are the larger K & B .40 powered version. Successful formation flying with these look-a-likes is an accomplishment.

**ASTRON .40**  
Designed By : Bill Evans

**TYPE AIRCRAFT**  
X-Wing

**WINGSPAN**  
40 Inches

**WING CHORD**  
13 1/4" Root — 9 1/2" Tip

**TOTAL WING AREA**  
920 Square Inches

**WING LOCATION**  
Top & Bottom of Fuselage Pod

**AIRFOIL**  
Semi-Symmetrical  
Reflexed

**WING PLANFORM**  
Swept T.E.

**DIHEDRAL (TOP WING)**  
3 Inches Each Tip

**ANHEDRAL (BOTTOM WING)**  
2 Inches Each Tip

**OVERALL FUSELAGE LENGTH**  
28 1/2 Inches

**RADIO COMPARTMENT AREA**  
(L) 12" x (W) 2 1/2" x (H) 2 1/2"

**VERTICAL FIN HEIGHT**  
8 1/2 Inches

**VERTICAL FIN WIDTH (Incl. rud.)**  
6 1/2" Average

**REC. ENGINE SIZE**  
40 Cu. In.

**FUEL TANK SIZE**  
6-12 Ounces

**LANDING GEAR**  
Tricycle

**REC. NO. OF CHANNELS**  
4

**CONTROL FUNCTIONS**  
Elevons (2), Throt. (1), Nosewheel (1)

**BASIC MATERIALS USED IN CONSTRUCTION**

Fuselage	Balsa	Ply
Wing	Foam	Ply
Empennage	Balsa	
Wt. Ready-To-Fly	80 Ounces	
Wing Loading	12.5 Oz./Sq. Ft.	





Side mounted K & B .40 with Zinger 10/6 prop and CB spinner. Tank is pressurized for maximum output.



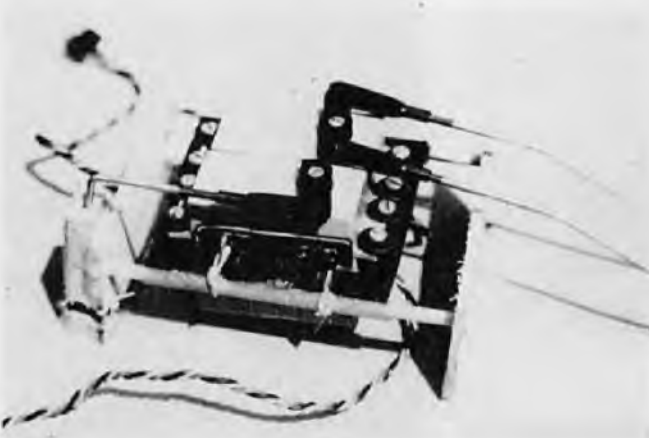
Aft view showing elevon linkage to top wing. Servos located in lower wing. Tailpipes add to looks.



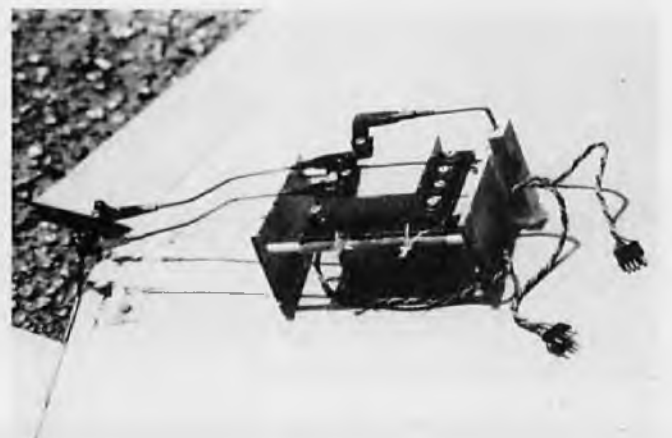
Conventional mounting on fixed main gear. A set of retracts would be fantastic.



Inside fuselage showing nose wheel and throttle servo. Note linkage going to rudder which was tried on one or two prototypes.



Elevon servo installation showing sliding tray. Simple and quick to make.



Another view of elevon servos from right side.

Build and install sliding tray as shown on plans.

5-minute epoxy the top wing to the fuselage (a bit of baking soda mixed with the 5-minute epoxy to thicken it helps prevent running).

Install wing wood pegs and 1/4-20 nylon bolts for fastening lower wing to fuselage.

Use 5-minute epoxy to attach the vertical fins and lower wing tip plates.

Install engine tank and radio; balance per plan.

Install elevon couplers, per plan, using 1/4" O.D. brass tubing, threaded rod, and snap links as shown on plans.

Be sure to align all four elevons. Neutral position should be set 3/32" above what would normally be considered as neutral. This is to provide the necessary reflex which is required on flying wings. □



Correcting for crosswind on straight in approach from Saddleback Mountain.









(L to R) Second Place Ralf Decker, W. Germany; the new World's Champion Anton Wackerle, Austria; Roy Spavins, South Africa, Third Place.

# WORLD SOARING CHAMPIONSHIPS

By Meesh Rheault Miller

**T**he story of the 1979 FAI RC Soaring Team reaches back into the early fall of 1978 when flyers from all over the U.S. competed in Pensacola, Florida, at the FAI Finals to gain a position on the U.S. FAI Team. Without question the competition there was stiff and, when the scores were finalized and the team chosen, there was little question that these men were the three most competent F3B flyers in America. Steve Work of New Mexico, Terry Koplan of California, and Skip Miller of Colorado, would be the flyers of the 1979 team. Skip Miller was also the 1977-78 World Champion and, as such, would also be defending his title. The team members chose Dan Pruss as their team manager and Dave Thornberg as their hand tower and assistant.

Not many realize the amount of work involved in preparation for a world competition. This involved endless hours of building sailplanes (each flyer brought 3); building a strong, compact box to transport the models; testing radio gear; studying the F3B rules; and, of course, most important --- practice. The team met twice (at their expense) in California to familiarize themselves with each other's flying style and needs. They drilled for hours on the three tasks of FAI: Speed, Distance and 6 Minute

Duration/Precision. Strategies for every possible situation were discussed and enacted. And at home each man had his own ritual of flying nearly every day for a few hours using the FAI length of line for launching and keeping a disciplined account of working time as is necessary for F3B. Weekend competition kept the edge honed.

Finally the months of preparation were behind us as Skip and I boarded our first plane to Belgium. Some 30 hours later with stops in Chicago, Iceland and Luxembourg (where we were rescued from overzealous customs agents by Raymond Pavan, Luxembourg's team manager) we arrived by train in Liege, Belgium. Exhausted, we were met by the rest of the team and Bill Latham, an American serviceman stationed in Germany who took leave to give us a hand. (I could

write a book about Bill's generosity and good nature!)

The first week found us driving early each morning to the field in Amay where the competition was to be held. About 1000 by 1200 feet, the field had a little clubhouse and was bordered by the town and a 125' tower on the north side and the Meuse River only 200-300 feet to the south. Though relatively flat, the site was full of holes and large stones making hand towing and landing treacherous. During the week a huge circus tent was erected for meals and, in case of rain, for planes and flyers. Flags of all the countries were flown on poles by the clubhouse. A sort of military train car was painted yellow and housed the frequency control, courtesy of Hewlett Packard. A tent village grew with each country claiming a piece of ground for its home.

One interesting note --- Belgium, though only the size of Maryland --- has 73 frequencies available for R/C flyers.

During the first few days we had the field to ourselves in the cold damp weather. It was windy and very fall-like. Each day the team worked a little better together as signals and strategies became second nature. Other flyers joined us on the field; Hassing of Denmark; the South African team of Frikkie Roos (he was 2nd at the last World Champs), Roy Spavins, and Nord Gerneke, flyers, and Jack Abbott, team



Last year's champ, Skip Miller inspects Aquila Grande before flying begins in morning.

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Anton Wackerle (Austria) with "Dassel", new World Champion.



Friendships renewed; Skip & Meesh Miller with Franca and Eugenio Pagliano of Italy.



U.S. Team doing "Can Can."



Austrian Team walks on to the field. L to R, Fridolln Fritz, team manager, Wackerle with "Dassel", W. Sitar, H. Sitar.



Wackerle flies with W. Sitar (left) and Fritz (right) spotting during duration flight.



Inside Austrian Team's tent - the "Dassel's" in special rack.



S. African Team won the Team Championship. L to R, Spavins, Gerneke, Jack Abbott (team manager), Roos.



Mexican Team.



German Team. L to R back, Schiborr, Pfeffercorn (team manager), Decker, Luka, front unidentified helpers.



Dutch Team. L to R, Bazelmans, TenHolt, Schoorel, Peter Kein, team manager, kneeling.



Japanese Team.



Pagliano (Italy) ready to fly his "Allure."



Hansen (Denmark) ready to launch Unica which had a device for twisting wings.



Learmont prepares to launch O'Reilly's (both of Australia) "Super Birdie" which is really a modified Aquila Grande.



Michael Pawlenko (Belgium) with wife Adana.



manager (he was the C.D. at the last World Champs). The South Africans decided to use up their quota of bad luck right away. Roos' ship --- unnamed at this point --- met a homing pigeon which broke off the entire tail section (from then on the plane was called "La Paloma" which is Spanish for Pigeon). Spavins lost radio control while practicing at 6:30 one morning and watched his ship spin down into a residential area. A woman was busy watering her plants when the nose of the "Yellow Bird" crashed through her corrugated fiberglass roof. (Since there is a nuclear plant in Amay, she thought it was exploding!) Amazingly enough both of these ships were repaired by the next day (Kevlar makes the difference they say). Michael Pawlenko, a Belgian with Russian heritage, arrived with his "Sidewind" (this design is now available in a limited market in Europe). Unfortunately his #1 example of this impressive ship met the tender on a speed run and was demolished.

Eugenio Pagliano of Italy and his wonderful multi-lingual wife, Franca, showed up with a week-old new design, the "Allure" which he flew for the first time. An unusual design, it resembled a sailplane with a swept back configuration without a nose. He ran two test flights half-ballasted on the Speed course and managed a 10.5 and 10.8 second run. This ship had a fiberglass fuselage and built-up wings, covered in Econokote, and a spoiler which doubled as radio access in the center of the wing area. His other ship, the Ago 79 "Vivace," was a highly advanced fuselage with a pylon and molded wings of foam core and fiberglass cloth covering. All his ships reflect the very highest of quality craftsmanship.

The Austrian team arrived with an incredible array of tents, trailers, a complete machine shop (with machinist of course), a cook and lots of special measuring devices for tabulating their speed runs. They all practiced with the same trainer ship. All flyers would fly the Dassel but the ships are so identical in their construction that there is no reason to fly the official ship until the competition starts. Their training routine was very efficient utilizing an excellent winch/retrieval system which allowed a flyer to launch, fly a Speed run and be ready to launch again in 43 seconds. With a specially rigged Texas Instruments' mini-computer, a readout of all pertinent statistics of each Speed run was printed: time from plane A to B, time in executing the turn, and time from B to A. They measured and recorded wind and temperature and kept records of every flight. The fastest time they told us they had achieved in practice was 8.73 seconds. The Dassel has a constant chord wing; a foam core covered in fiberglass made in a mold with the Eppeler 193 airfoil. Its

streamlined surfaces are all accurate to one thousandth of an inch, it is a simple efficient design carried to an extreme in perfection.

The entire team was well prepared. Each member of the team was a specialist in one area or another of construction, molds, radios, etc. Fridolin Fritz, team manager and designer of the Dassel, was the scientist behind the team and was very open about their techniques. With the thousands of man hours involved in the technological evolution and building of molds for the Dassel, it was easy to see why so many Europeans stood in awe of them --- it was not the sort of ship just anyone could build in his basement. The meticulous accuracy required not only a dedicated builder with special skills and tools, but time and a lot of it!

Monday arrived a little warmer with a

**2nd World Championships  
of R/C Soaring  
Amay, Belgium July 1979**

**TEAM STANDINGS**

1. South Africa	42260
2. Austria	42094.5
3. Germany	41697
4. United States of America	39401
5. Switzerland	38828
6. Great Britain	38777
7. Holland	38137
8. Denmark	36492
9. Belgium	35924
10. Norway	35902
11. Australia	35863
12. Italy	35608
13. France	35068
14. Japan	34708
15. Sweden	33478
16. Canada	31766
17. Spain	30667
18. Luxembourg	28684
19. Argentina	26758
20. Mexico	17936
21. Brazil (Dropped out)	

break in the wind and cold and we spent the day registering sailplanes and moving into the boarding school which would be our home during the competition. No hot water for three days, an elevator that wouldn't work (and us on the 4th floor!) and beds made for 7 year olds ... it was not the deluxe accommodations of South Africa, but we would survive.

Tuesday was slated a practice day for all teams, competitors, timers, flaggers, etc., to get in the groove. Each team had a chance to choose a task per flier and go through the motions of ready time, working time, etc. Most chose Speed. It was a relaxed day with the air of anticipation. By evening all had flown and twenty of the twenty-one countries gathered for the opening ceremony (Argentina would arrive late that evening). With the flags of so many countries, it resembled a meeting of the

U.N.: Australia, Argentina, Austria, Belgium, Brazil, Canada, Denmark, Great Britain, Holland, Italy, Japan, Luxembourg, Mexico, Norway, S. Africa, Spain, Sweden, Switzerland, United States of America and West Germany had all sent teams to this 2nd World Championship of R/C Soaring. With much fanfare, the playing of numerous anthems and speeches in at least six different languages, the raising of all the flags; this World Championship was officially opened.

**The Competition Begins**

A dense fog enveloped us as we crossed the Meuse River early the first day of competition. With Koplan being the first to fly, we had skipped the school breakfast and brought our own. The tents were silent in the pale morning. The few camping here were still asleep. As Skip, Steve and Terry assembled their ships, carefully checking every surface and every control, I reflected on how much effort had gone into the approaching competition, the many sacrifices they had made to this end. An electric flying wing broke the silence and we watched as it disappeared into the hanging fog. With a ceiling of only 125-150 meters, we would have to wait to fly. The hours dragged by. Flyers tried to abate their nervousness by socializing. We watched in frustration as time ticked by.

Finally at 11:30 a.m. the fog lifted enough for the competition to start. Koplan's Speed task, though smooth, was not as fast as the practice runs --- 14.2 seconds. Miller flew a clean 14.3 and Work a 13.2, which only netted him 750 points when calculated against the Austrians. At the end of that first Speed task, a pattern was set by the Austrians as they placed 1, 2, 3 with a 10.3, 11.0 and 11.5.

The next task was Duration. Learmont of Australia and Roos of S. Africa both flew perfect 6-minute flights with 100 point landings for 1000 points each. Miller (U.S.), TenHolt (Holland), and Wackerle (Austria) all flew near perfect with 996 points. Koplan and Work (U.S.) gained 920 and 828 points, respectively. By now, the afternoon was becoming a warm evening for flying with calm and even conditions. Paulette Halleux, the Contest Director, called a meeting of the team managers to take a vote as to whether the pilots wanted to fly or go back to the school for supper. It was nearly unanimous --- the vast majority wanted to keep flying. Many flyers, having traveled halfway around the world to attend this championship, felt it was far more important to fly (especially in the excellent evening conditions ... the sun doesn't go down until at least 10:00 p.m.) than to eat.

But little did we know what powers the cook had. The cook gave an ultimatum to the organizers: either we return immediately to the boarding school to



eat dinner or there would be no more food for the remainder of the contest. Amazed, everyone packed up planes and gear to go back for dinner which turned out to be fish sticks --- yes, just like those frozen ones you dreaded as a kid.

After dinner Dave Thornberg helped everyone forget their aggravation with his tiny R/C hand-launch glider. In the green soccer fields behind the school, Thornberg drew a large international crowd who applauded his cocky little glider.

Thursday dawned another gray day. Fortunately the fog burned off by 8:30 so that the Round 2 Distance task could begin. As usual there were cycles of sink followed by cycles of lift and, with F3B's strict allotment of working time, ready time, etc., there is no room for sandbagging. When it's your turn, you must go or lose valuable time. Miller (U.S.) was fortunate not to be in a sink cycle but he still had to work for his 11 laps. Koplan flew during a time when everything was coming down. Though he flew very well, he only made 5 laps while the others in his flight group managed only 3.5 and 4 laps. The following group, in the tremendous lift that followed, all got 12 laps. All three Austrians maxed as did most of those flying in those flight groups. It is clear that although a 12 lap cap limited the luck factor somewhat it did not by any means eliminate it. Koplan should have received a score reflecting the fact that he outflew everyone in his group in the conditions provided, instead he received only 417 points --- a piddling score for a good flight. We might take a leaf from the German's book and fly Duration and Distance in the "man on man" format --- a much truer test of skill and a much fairer approach.

By the end of another Duration task and the end of Round 2, Austria was in first; S. Africa, 2nd; Holland, 3rd; Great Britain, 4th; Germany, 5th; and the U.S., 8th. We knew we had to work very hard to make up those points.

Round 3 began with another Duration that afternoon and all members of the U.S. team flew near perfect. Herbert Sitar (Austria), in his worst flight ever (having launched several times), was 58th in the task with a flight of under 2 minutes. This hurt the Austrian team standings considerably.

Speed would help this as Wackerle and Werner Sitar (Austria) both flew 10.2 seconds for 2000 points and H. Sitar flew 11.2 for 911 points. They retained the team lead. Ralf Decker (W. Germany) flew a beautiful Split-S turn for 12.0 seconds to bring him into 3rd Place. Luka (W. Germany) flew an 11.3 to help the W. German team's position further. Work flew an excellent 12.8, Miller at 14.0 and Koplan a 14.5. The S. Africans all flew fast enough to retain their 2nd Place in team standings with a 13.1

(Spavins) and 13.4 (Roos). The U.S. team moved into 6th place.

It was an evening with very still air, smooth conditions but little lift. Round 4 began with Distance, a tricky task in

#### GENERAL STANDINGS

1. Wackerle	Austria	14677.5
2. Decker	Germany	14676
3. Spavins	S. Africa	14424
4. Roos	S. Africa	14314
5. Schiborr	Germany	14153
6. Sitar W.	Austria	14009
7. Worrall	Great Brit.	13783
8. Baumgartner	Switzerland	13692
9. Miller	U.S.A.	13677
10. Gerneke	S. Africa	13522
11. Bannister	Great Brit.	13484
12. Sitar H.	Austria	13408
13. Learmont	Australia	13256
14. Pawlenko	Belgium	13189
15. TenHolt	Holland	13129
16. Hasegawa	Japan	13097
17. Hammeken	Denmark	13018
18. Schenk	Switzerland	12924
19. Work	U.S.A.	12923
20. Lehoux	France	12915
21. Luka	Germany	12868
22. Westgaardronning	Norway	12849
23. Koplan	U.S.A.	12801
24. Beutis	France	12660
25. Givone	Italy	12641
26. Bazeimans	Holland	12627
27. Lindh	Sweden	12534
28. Schoorel	Holland	12381
29. Reinhard	Canada	12338
30. Hansen	Denmark	12248
31. Gerber	Switzerland	12212
32. Stensby	Norway	11918
33. Herzog	Belgium	11913
34. Dagna	Italy	11763
35. Webb	Great Brit.	11530
36. O'Reilly	Australia	11523
37. Hassing	Denmark	11226
38. Pagliano	Italy	11202
39. Jespersion	Norway	11135
40. Bourbon	France	11113
41. Carratala	Spain	11087
42. Morris	Australia	11084
43. Kawamura	Japan	11008
44. Gustavsson	Sweden	10923
45. Vandermeulen	Belgium	10822
46. Gamborino	Spain	10691
47. Tsuji	Japan	10603
48. Carley	Canada	10538
49. Duval	Luxembourg	10200
50. Cerdan	Argentina	9980
51. Kemp	Luxembourg	9686
52. Humphreys	Canada	8890
53. Torres	Spain	8889
54. Heblisch	Luxembourg	8798
55. Stancoff	Argentina	8679
56. Mungia	Mexico	8392
57. Munoz	Argentina	8099
58. Lopez	Mexico	7357
59. Farquet	Mexico	2187
60. Martins	Brazil	Out
61. Kadow	Brazil	Out

these conditions. Nonetheless, Miller, Work and Koplan flew carefully and beautifully for three 12 lap maxes. At least we could sleep well with that score, 3000 points for the team! What a long day!

Friday we resumed Round 4 with

Duration. By the end of the round the U.S. team had moved ahead of W. Germany into 4th Place. We began Round 5 with another duration and Miller flew the only perfect 1000 of the round, both Work and Koplan flew better than 98% perfect. Miller now stood in 6th Place, Decker in 3rd, Wackerle 2nd, W. Sitar 1st.

The round continued with Speed --- always the task where the U.S. team would lose the most points. Herbert Sitar flew a lightning fast 9.5 second run, the fastest time of the competition, a new world record in F3B. There were no unnecessary moves, just a flight as smooth as silk. W. Sitar flew another good speed with a 10.4. Luka (W. Germany) flew an excellent 10.9. Spavins and Roos (S. Africa) hung in there with very good times of 12.4 and 11.7, respectively. Decker (Germany) continued his consistent performance by turning an 11.7 and Wackerle flew an 11 flat. With a 14.4 Miller (U.S.) fell to 11th Place, while W. Sitar stayed in 1st, Wackerle in 2nd, Decker in 3rd, Gerneke 4th and Spavins 5th.

Sometime between the 5th and 6th Round, the wind came up and steadily increased. Round 6 opened with the Distance task and Wackerle went 12 laps for a max. His team mates (both Sitar) managed only a fraction over 6 laps. This hurt their team standing immensely. Spavins and Roos (S. Africa) both gained 12 laps pulling their team ahead of Austria. Decker also flew 12 laps keeping his 3rd Place. Miller struggled in the wind for 10 laps moving into 8th Place. When it was Koplan's turn to fly his radio had mysteriously gone dead and Miller sprinted the distance of 2 football fields to retrieve the back-up ship. In the wind with an unballasted ship he was only able to fly 4.75 laps.

In Duration, Koplan flew the only perfect max while W. Sitar flew nearly as well with 998 points. Miller, Gerneke and Roos all gained 993 points.

At the end of this round the U.S. Team stood 5th, Holland, 4th; Germany, 3rd; Austria, 2nd; and S. Africa, 1st.

Round 7 brought the last Speed task. Wackerle and W. Sitar flew a 10.4 and 10.7 for 1st and 2nd in the task, respectively. H. Sitar had a malfunction and his air brake (canopy) yawned open making it their slowest flight, a 13.1. Schiborr and Luka (W. Germany) each flew 11.7 while Decker flew a 12.3. Work (U.S.) ran a smooth 12.8 and Miller a 13.3 boosting the team's position another notch.

In Duration, in spite of the strong wind, Wackerle flew a perfect max with Miller close behind with 998 points. Decker found little lift and fell out under 4 minutes. With the wind definitely a factor, there were many short flights and lost landings.

At this point Wackerle stood 1st; W. Sitar, 2nd; Roos, 3rd; Decker, 4th;





*Fridolin Fritz (Austrian Team Manager) with special device used for gauging turn anticipation on speed and distance.*



*Work launches "Bird of Time."*



*Belgium's '73 frequencies for R/C flying.*

Spavins, 5th; Schiborr, 6th; and Miller, 7th.

By Round 8 (the last round) the wind was fierce. (In spite of the conditions, the organizers were determined to finish that day rather than bring their helpers back another day.) Under a lot of pressure, Decker flew a perfect flight for 1000 points. Spavins was right behind with only a second's difference. Wackerle was only able to achieve 459 points. This closed the gap between him and the others.

Miller searched the entire sky for the thermal he knew must be there and finally followed one downwind. It seemed he would get his max when suddenly, on his way back to the spot, he hit a terrible patch of sink. It looked like an invisible pair of hands was pulling him to the earth. Since he had landed outside the limit he would have to relaunch or get a zero. In the little working time left, Miller got what few points he could manage. It was a gamble and he had lost.

The final task in this ridiculous wind was to be Distance. Ballasted as for Speed it was very difficult to get a max. Only Decker (W. Germany), Hasegawa (Japan), Baumgartner (Switzerland),

Koplan (U.S.) and Wackerle (Austria) got 12 laps. More than half of the rest got 8 laps or less.

It was early evening when the computer had finished checking over the scores. Out of a possible 15,000 points only 1.5 points separated Wackerle (Austria) 1st, and Decker (W. Germany) 2nd. In Third, a surprise to many Europeans (but not to the Americans) was Spavins of S. Africa. His sailplane, having wings not made in a mold but with polyhedral meant it's still a sport for the modeler who builds in his basement. You didn't have to be a "full time" modeler after all! Certainly Speed was the deciding factor here since it was the only open-ended task (i.e., in Duration you can do no better than 6 minutes and perfect spot; in Distance, no better than 12 laps; but in Speed you can go as fast you you can driving your opponent's score down considerably with every second faster you go). Had the Americans been flying faster ships there is no question that they would have finished very differently. With Spavins in 3rd, Roos in 4th and Gerneke 10th, the South Africans won 1st Place as a team. And for many it is the team honor that is most coveted. The Austrians with

Wackerle in 1st; W. Sitar, 6th; and H. Sitar in 12th, won 2nd Place as a team. With Decker, 2nd; Schiborr, 5th; and Luka, 21st, the Germans were 3rd as a team. With Miller in 9th, Work 19th and Koplan 23rd the U.S. took 4th Place. The Swiss were 5th, Great Britain, 6th; Holland, 7th; Denmark, 8th; Belgium, 9th; and Norway, 10th.

It had been an enlightening time for us all. The leaps and bounds in technology in Europe were fascinating and, at the same time, the piloting skills were a factor as well. We had learned a whole new perspective with regard to sailplane building and, once again, had seen how serious the Europeans are towards F3B competition. Perhaps the handful of FAI enthusiasts in the U.S. will grow and develop their own speed ships. Certainly the skill level is there! I look forward to the next World Championships wherever it may be for the friendships renewed and the exchange of new ideas. It can only get better with time.

When we left Amay to travel we drove with the Deckers to Munich, Germany, to visit them for a few days. While there we saw Ralf's incredible flying site; almost a square mile of lush green flat lands

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*Sean Bannister, Great Britain, with Algebra. Note wind - this was last day of competition.*



*Twisting wing mechanism from Gunnar Hanssen's, Denmark, "Unika."*



*Paulette Halleux C.D.*





## Electric Planes, Cars and Boats

**W**e get lots of questions requesting info on electric power. I must admit that I'm really not up on what is going on in this phase of modeling but I think I can field a few of the questions.

Dear Mr. Oddino,

I'm just now starting to get into R/C electric cars and I would be very grateful if you could help me with some answers to a few of my questions. Here they are:

(1) Is there such a thing as a fast charger for 6 cell electric motor (05 size) battery packs that plugs into the wall and runs off 120v house current? If there is, where can I get one, or how could I make one of my own?

(2) How do I go about determining the charge rate, in volts and amps, to fast charge a battery?

(3) What are the maximum safe voltages and current to run motors like the Astro 05?

(4) What are some popular motors used in the 1/12 scale, 6 cell cars? How do Vantec and Dumas motors compare to the Astro 05?

Thank you,  
Randy Schroeter  
Covina, Calif.

(1) I don't know of any such charger on the market but I believe a number of people are working on them. You could build your own and it would look something like Figure 1.

The components depend on what you are trying to do. If you are satisfied to charge at 2 amps maximum and get 80% charge in fifteen minutes, use the following parts: A 110/12.6 volt, 3 amp transformer; 400 volt, 3 amp diodes or

a bridge rectifier with the same rating; a 7808, 3 terminal regulator and a 3 amp meter. Set the 100Ω pot for 9.0 volts with a 15 to 20 ohm load in place of the battery. This should be about a ten watt. The charge current will start out at 1.5 to 2 amps and slowly decrease. If the battery is hot from a high current discharge you must be very careful not to charge it too long or it will be damaged. Note that the charging itself will not heat up the battery unless you are overcharging. Theoretically you could build a charger to sense the rise in temperature and then turn off the charger. Anyone out there tried this yet?

The reason I started out under the assumption that you will be satisfied with 80% in fifteen minutes, is because of some of the rumors I've heard about electric car competition. From what I've heard, it is a competition to see who can get the most capacity out of their batteries. It is kind of an enduro type thing. Not only who can go the fastest but can they finish. Sounds like it is going to be hard to beat the guys who can select their cells, and then sense when they are 100% charged. If someone would give us the straight scoop on the rules maybe we can come up with a better solution.

(2) The fast charging technique I recommend is a constant voltage, current limiting scheme. I set the voltage at 1.5 times the number of cells and the current somewhere around four times the battery one hour rate (4 x .550). You can go slightly higher than 1.5 volts/cell and charge faster but there is a better chance of overcharging and doing some permanent damage.

At 1.5x the current will drop to some fairly low level (≈ .5 amp) which gives you quite a tolerance on how long you

can leave it on. You can add a bathroom heater timer like Astro-Flight uses to take the guesswork out.

If speed in charging is what you are after you could make a constant current charger at some pretty high current. Then you definitely need a method of sensing overcharge. G.E. makes cells called "Power-Up 15" that are designed for this type of charging.

(3) I believe the Astro 05 is designed to run on a 10 volt, 8 cell battery pack. I'm sure you can put more voltage on it but it sounds like you have already decided on a 6 cell pack which would give you a nominal 7.2 volt supply. The current will be a function of the mechanical load. Astro-Flight curves indicate maximum power at about 13 amps, however, efficiency is down to about 50%. At this point, torque is 10 ounce-inches and rpm about 9800. Higher current will produce more torque, lower rpm and lower efficiency.

(4) Can't offer any help on what motors are being used in 1/12 scale cars.

By the way, many of your questions on electric power can be answered by studying Bob Boucher's new manual called "The Quiet Revolution." It should be available in hobby shops by the time you read this. We hope to review some of the info presented in this book from time to time, but don't hold your breath. Go buy the book.

### Automatic Field Charger

Master Kit, 6 Fox Road, Plainville, CT 06062, has come out with a new automatic field charger. The unit was designed to replace the charge that was removed during a normal flight with a four channel system, in about ten minutes. It is powered by a 12 volt source such as a motorcycle battery and charges at 250 to 270 ma until the pack is at 90% of its rated capacity. At this point the charger automatically switches to a low charge rate of 15 to 27 ma. This means you can walk away and forget it and you don't have to worry about overcharging. It was apparently designed for small airplanes that use small batteries like the Ace 100 ma-hr packs. It could also be used on 550 ma-hr packs but you could probably get away with continuous charging at 250 ma on these packs. I have checked the unit out and it does do what it is

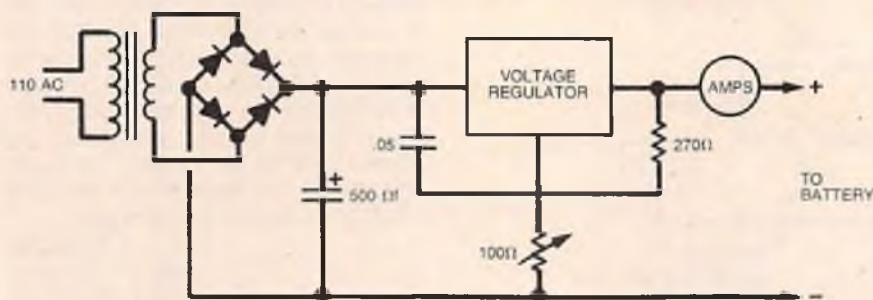


FIGURE 1



advertised to do. It appears to have temperature compensation built in, but I did not test it over the expected temperature range.

So if you are trying to get away with the smallest battery pack possible, get yourself an Ace 100 ma-hr pack, a Master-Kit AQ2 TFC automatic charger, charge after every flight and fly forever. Don't forget about the transmitter batteries though.

#### On Board Glow-Plug Driver

Dear Mr. Oddino,

I read with great interest the article in July '79 RCM about a Glo Driver working from a 12 volt battery. This would make an ideal addition to the flight box. I am, however, also interested in a driver that will operate from a 5 volt Flight Pack for an on board starting power supply for the glo plug. I have been using C cells size, 1200 mil nicads built into each plane for both Rx & glo plug using a resistor and a push button for starting, however this causes great waste of power in the resistors whereas I understand from the circuit description in the article that this glo driver would not. Am I correct? Am I also correct in assuming that the driver would work off lesser voltages as shown by simply remaining on for longer periods while voltage builds in the coil, thereby making it possible to drive it with any power supply from 1½ volts to 12 volts? If this is not correct I would appreciate any suggestions or explanations as to how the current could be altered to do this.

Thank you,  
Robert M. Traxler  
Whitewater, Wisc.

A similar circuit could be designed to work with a 5 volt source. Just lowering the input voltage is not the way to go. I don't know what the efficiency would be but it would be better than the dropping resistor. The best efficiency would be to use one "C" cell for the plug and four separate ones for the receiver pack. That way all the power goes into the plug. It also won't cause radio interference. Switching regulators are notorious for causing noise and extensive filtering would be required. I would recommend the connection shown in Figure 2.

As you know, keeping the glow plug hot really allows a super low idle. I have used this set-up and it works great. Also, it impresses people when you don't

connect anything to your plug, just start cranking.

#### Big Airplane Problem Solved

I believe this is the third letter we've printed from Maj. Jacquot describing first the problem, and now hopefully the solution to making his big J-3 fly.

Dear Jim,

Some time ago you printed a letter of mine where I cried on your shoulder about all the interference I was getting with my Quadra powered J-3 Cub. At the time I thought it might be the engine but subsequent investigation proved it not to be. You may be interested in what transpired.

A friend of mine with much more electronic savvy than I went over the aircraft from stem to stern with an oscilloscope and determined that the small radiation from the engine wasn't affecting the receiver at all. The problem was that in my effort to build strong and durable I had built in loads of metal-to-metal contacts. With the vibration of the engine these were sending out all kinds of RF noise. This coupled with the fact that the struts were out of aluminum tubing and almost exactly the antenna length caused the glitches in certain positions.

Since I was faced with either a rebuild or junking the airplane in order to fly with my 72 MHz rig, my friend suggested I convert to FM since it is allowed here in Germany on 35 MHz and 40 MHz. I tried this approach and found that it **completely** solved the problem, I've now virtually flown the wings off the Cub and haven't had one glitch!

This info will not be of academic interest to those modelers in the USA except the ones that can use FM on 50 MHz, but I thought it might be of interest as a follow-up on my experiences. Keep up the great column, some of the stuff is 'way over my head' but a lot of it I can grasp.

Sincerely  
Bob Jacquot  
APO New York

Well that's it guys, the official RCM solution to your big plane problems. What's another \$400 to you guys with 1/4 Scale airplanes? Seriously, the FM

set I've been flying has never missed a beat. I also think FM on 72 and 35-40 is just around the corner in the U.S. but if someone has got the solution to fixing the problem with our AM sets, we're still listening.

#### NE 5044 Availability

Dear Jim:

I enjoy your column very much. Being an electrical engineer, I enjoy the "deep" stuff. Keep it up.

My question concerns the availability of the NE 5044 encoder (Signetics). I wrote to Signetics - no response. Ace RC says their "Super Seven" transmitter will be available this summer. Where and how can I get an NE 5044?

Enclosed for your information is an item I came across in Electronic Design Magazine. Was this chip developed for R/C? It looks interesting even though its sensitivity (18µv) and upper frequency (49 MHz) are not suitable for our applications. What if an R.F. amp, local osc. and mixer were put in front of it to make a double tuned super het?

Keep reporting the new devices as they come along. If it keeps up at the present pace we'll have the entire transmitter on one chip and the receiver on another.

Sincerely,  
A. Paolillo

As you might expect, we've had many requests for the new Signetics circuits. Samples were given to the RC manufactureres at Toledo and I just received a notice from Bob Scott that they are now in limited production. I'm guessing that if you tried Ace again they would fix you up. If they don't let me know, I may go into the parts distributing business.

The enclosed information referred to concerns the National LM 1872 receiver/decoder and LM 1871 transmitter. My guess is that these devices were designed for the RC toy market. However they would be suitable for any application where you don't get too far away, such as small electric planes and cars. There are special license-free frequencies near 49 MHz but you are limited as far as radiated power goes.

#### Charging Mixed Packs

Dear Jim,

I have a Cannon 4 channel. When I ordered it I specified a 225 ma pack but of course the transmitter has 500 ma batteries. My question is: How does this affect my 225 pack, when it is charged in series with the 500 ma pack? Also would it hurt any to "short out" the charge lead to the receiver batteries and charge the 225 pack on a separate charger - I have a Vari charger?

Sincerely,  
Ralph H. Pearson  
Falconer, New York

You are right. Charging the 225 ma pack at the 500 ma rate would shorten

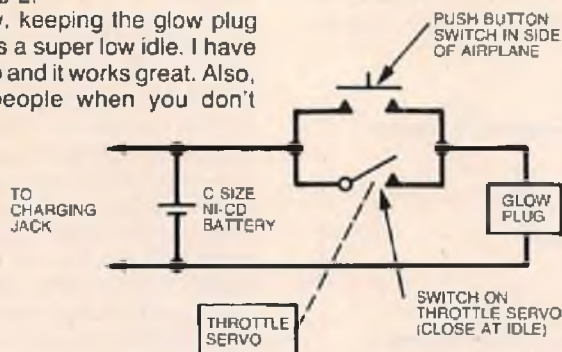


FIGURE 2



the life of the receiver pack. You can short out the lead to the receiver pack and charge the receiver pack at 20 ma with the Vari-charger as described. You must find the right pins on the transmitter and put in a jumper as shown in Figure 3.

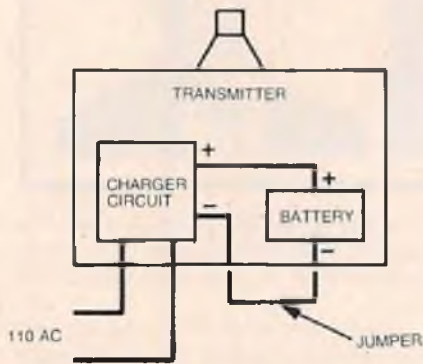


FIGURE 3

The transmitter charge current is virtually unaffected by doing this.

**Super Charger**

Dear Jim Oddino,

I am writing to see if you might be able to help me locate a battery charger. Pro-Model Products, P.O. Box 5182, Fort Wayne, Indiana 46805, used to make a neat one called a Supercharger. It was a constant current device using a differential amp, into a 150W Darlington power transistor regulator. It worked from 0-20 vdc and 25 ma to 775 ma. The neat thing about it was it was a constant current device which worked well on charging as the voltage is always

changing. It also had five slide switches that allowed you to select current ranges in the range. But, as always happens, I got my letter back. They are out of business.

Do you know anyone who has anything similar? None of the hobby stores even know what I'm talking about. Thank you for your assistance.

Yours truly,  
J. Bradley Flippin  
Fairfax, Virginia

Don't know of anything on the market that is exactly what you are looking for. However, it ought to be easy to build with the circuits available today. It would look something like Figure 4.

The heart of the circuit is the three terminal voltage regulator. It keeps a constant voltage across the selected resistor and thus a constant current through it. Let's say you want 20 ma when switch 1 is closed:

$$R_1 = \frac{5}{.020} = 250 \text{ ohms}$$

The power dissipated in the resistor is:  
 $P = 5 \times .02 = .1 \text{ watt}$   
So a 1/2W resistor will work here. If we want 775 ma when switch 4 is closed:

$$R_4 = \frac{5}{.775} = 6.45 \text{ ohms}$$

$$P = 5 \times .775 = 3.875 \text{ watts}$$

I'd use a ten watt here. Of course

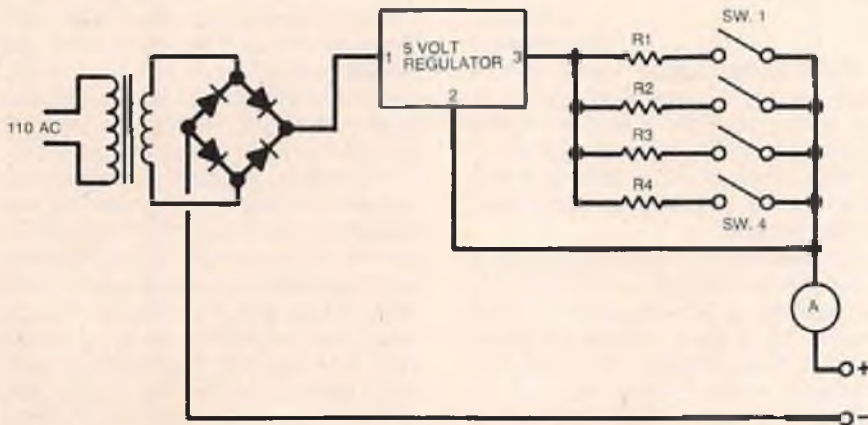


FIGURE 4

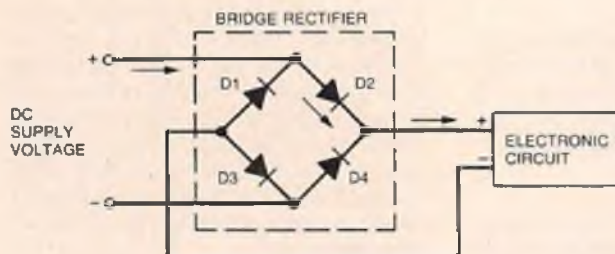


FIGURE B  
NORMAL POLARITY

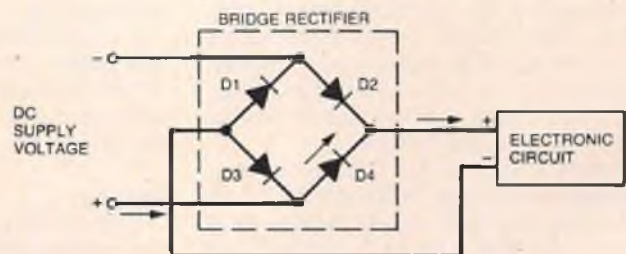


FIGURE C  
REVERSE POLARITY

you can't buy a 6.45 ohm resistor but you can get there by paralleling other resistors and of course you could put a pot in series and make it adjustable. Just pay attention to the power ratings.

**Circuit Protection**

Dear Mr. Oddino:

From reading your articles over the years, I've learned that many people damage electronic devices because they inadvertently connected the input cables backwards. This can be prevented by installing a bridge rectifier between the input cables and the electronic device.

Even though most people think of a rectifier for use in AC circuits, they can be used in DC circuits to accomplish



FIGURE A

various functions. Figure A shows how to hook up the bridge rectifier and Figures B and C show what happens when you hook the system in the normal manner and the reversed direction.

In Figure B the junction of D1 and D2 is connected to a positive voltage source. As the solid arrows indicate, current passes through D2 to the positive terminal of the electronic circuit. In Figure C we see that the positive supply voltage is applied to the junction of D3 and D4. As the clear arrows indicate, the current passes through D4 and arrive at the same positive input terminal of the electronic circuit.

From these two figures it can be determined that the electronic circuit will function properly whether the input cables are connected properly or not.

Bridge rectifiers can be purchased at most electronic stores or made from four discrete component diodes as shown in Figure B. Bridges or discrete diodes should be selected for voltage and current needs as required by the individual user.

Respectfully,  
Jimmy Carter  
Houston, Texas

I wonder what the President is doing in Texas? See you next month. □





## Timely Tips On Tip Stalls

**T**hanks, fellows, this has to be one of the easiest columns I've assembled for you in a long time. And one of the most informative, too. In the July issue of RCM, I published a letter from Ollie Bakker, in which he plaintively asked for help in solving, or at least avoiding, the problem of tip stalls on a Constellation model he was building. He quotes differing opinions from experts.

Devout coward that I am, I ducked the question and threw it out to you readers for your answers. And did you come through for me! Almost as many letters came in as did back when we kicked around the "downwind turn" syndrome. Also, in the same vein, the results were not totally in agreement.

I have selected some of the most representative replies, so read on, Sunday fliers, and learn all about tip stalls.

The first letter I received was from Brad Powers, 5470 Castle Hills Drive, San Diego, Calif. 92109. The "Old Engineer" writes:

Dear Ken;

*I think your advice to Mr. Bakker concerning his tip stall problems is 100 percent correct.*

*Tip stall is a function of several factors including Taper Ratio, Aspect Ratio, Sweepback, Span-wise Lift Distribution and induced upflow over the tips. Straight wings of constant chord usually are not plagued by tip stall problems, but highly tapered and swept-back wings are, for the following reasons:*

*(1) On tapered wings most of the wing area is well inboard and the relatively large chords generate an induced up-flow pattern which is often too much for the small tip chord to handle at high angles of attack. In other words the tip chord flies at a higher angle of attack than the root chord and thus tends to stall prematurely.*

*(2) The span-wise lift distribution on a tapered wing often does not fall off as fast as the taper would dictate, thus loading the tips to a higher lift coefficient, and a sooner stall, to say it another way.*

*(3) The effects of sweepback are*

*such as to load up the tips in much the same way as taper.*

*The problem, therefore, is that the tips are flying at a relatively higher angle of attack than the inboard portion. The solution, of course, is to reduce or eliminate the disparity by the use of wash-out as you suggest. This may be further enhanced by introducing some positive camber which tends to point the nose of the tip airfoil more directly down into the induced up-flow, and by the avoidance of sharp nosed airfoils in this region.*

*For original designs an old empirical rule for acceptable taper ratio is:*

$$TR = \frac{20 + AR}{20 - AR} \quad \text{where } TR = \frac{\text{Root Chord}}{\text{Tip Chord}}$$

*Thus, for an Aspect Ratio of say, 7, the Taper Ratio is 27/13, or about 2/1. With a moderate amount of wash-out as you suggest, this criterion should give a planform with good tip stall characteristics.*

*Sincerley,  
Brad Powers*

Made me feel better --- well, at least more secure, to have Brad agree with my advice to Ollie (keep the same section from root to tip and wash-out the tip three degrees) since Brad is a very well known and highly respected aerodynamicist.

But washing out the tip which is fine for a transport model that's not intended to fly inverted, isn't necessarily the right answer for a stunt design because, when it flies inverted, the wing has wash-in which could lead to an accentuated tip stall. Maybe that's not all bad either; you're not going to land it inverted, and the wash-in should give the stunt job a real hot inverted spin characteristic.

The next letter came from Bob Bruce, 408 Brooks Circle, Valparaiso, Florida 32580. Bob is a practical designer, and believes in the adage "the proof of the design is in the flying." Bob writes:

Dear Ken,

*I've been enjoying your model designs and chit chat for years. I try not to miss your "Sunday Flier" column. I read your comments on tip-stall prevention with considerable interest. I*

*have just tested the thick-tip theory to the point of having all my remaining hair stand on end --- quite inadvertently, of course.*

*I design my own R/C aircraft and have enjoyed modest success mostly by avoiding radical concepts. The tip-stall phenomenon, and the related snap roll, has been a matter of interest for some time. I have found that tip plates do a lot to alleviate the problem. Wash-out, as you have suggested, is probably best for non-aerobatic aircraft.*

*I recently built a model called Sprite, mostly to test the effectiveness of thick tips. It is a .25 powered, sport aerobatic bird with 430 square inches and weighing 54 ounces. The wing is tapered, and has a symmetrical airfoil. The root camber is 14%, and the tip camber is 17%.*

*Sprite turned out to be one of those birds that doesn't require any trim changes on the first flight. She has no vices, handles smoothly, and is a joy to fly. We got around to testing the stall characteristics on the third flight, with friend Mel Bray on the sticks. First, the elevator servo locked in full up. Next, Mel pulled the throttle back, and the engine quit cold. That's the point at which my hair came to attention. Fortunately we had some spare altitude, and Mel found the rudder and ailerons still working. After a gyration or two he got it leveled off and headed back toward the runway. The glide was very mushy, with the attitude flat and level. She porpoised mildly at about thirty foot intervals. She hit the runway pretty hard, but perfectly flat - and with zero damage. The nice thing was that Mel had positive aileron control all the way in, with never a sign of tip stall, nor tendency to roll up on a wing tip.*

*Maybe I'm too easy to convince, but I believe the thick tips have proved themselves. Another design factor that may have helped is that the maximum camber of the root airfoil is at 35% of the chord, and at 30% of the tip airfoil. This gives a relatively blunter leading edge toward the tip. I am presently building a larger version of this wing for a .40 powered bird.*

*Happy landings,  
Bob Bruce  
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## 1979 WORLD'S CHAMPIONSHIPS

**G**eneva, Switzerland was the site of the 1979 World's Championships from July 2nd to July 8th. This race was sponsored by the Auto Model Club of Geneva and the Lignon's Club, and both clubs deserve a great deal of thanks for staging a first class race. The race was held on the parking lot of the Vernets Sporting Complex. The track was 1000 feet long and the surface was smooth with no bumps.

There were 166 racers from 22 countries ready on Monday for the first day of practice. The track was very slippery and the local racers said that it was the best it got. Most of the Americans did not bring differentials, so we looked pretty bad that first day, with the exception of Arturo Carbonell and Rick Davis who had diffs on their cars. Arturo had been in Switzerland for a month preparing for this race and a week earlier he had easily won a club race at Bruegg. All of the Europeans had diffs on their cars and Ronnie Ton from Holland, looked to be as fast as anyone on the track. The object of that first day was to just keep off the "Blue Dots," which was impossible on this day. These blue dots were like plow discs only higher. They were about 18" in diameter and about 4" high. There were about 60 of these around the track, even on the straightaway, which were launching cars into the spectator area. The dots on the straightaway were soon removed, and then it was a very good layout.

After a couple days of practice the traction started to come up and we started to feel a little better. The higher the traction came up, the faster we went, and the more the diff equipped cars started to bounce. We expected our main competition to come from the Serpent and PB teams, but rumors were flying around the pits about how fast the Japanese were going. Tomorrow would be the first day of qualifying and we would find out.

Sure enough, the man we were all chasing was Naoki Ishihara from Japan, with his Road Ace car powered by an OS Max .21 engine. In talking with some of his teammates, they said he is always Top Qualifier in Japan and always wins the Main Events if he doesn't have any car problems. The qualifying heats were 20



Only part of the 166 racers from 22 countries at the 2nd World's Championships for R/C cars in Geneva, Switzerland.



Vernets Sporting Complex was the track site for the Championships. The 1,000 foot long track was an ideal track with a variety of turns. On Saturday and Sunday it was standing room only for spectators, with 10,000 paid spectators for the week. (Photo courtesy Richard Grin).

laps long, which on this long track would require a pit stop — but not for Ishihara. He managed the whole 20 laps without pitting, drove his usual perfect race and got fast time of 7 minutes 18 seconds. He doesn't really look awfully fast on the track, and he's not out-horsepowering anyone, he just simply does not make any mistakes. Curtis Husting, USA, was the closest to Ishihara in qualifying with a 7.28, which included being upside down once and a 6 second pit stop, so they were running about the same speed on the track, as was Arturo Carbonell, USA, with a 7.29. Bill Jianas, USA, was Fourth

with a 7.34. The first rounds of qualifying were simply to determine the fastest 64 drivers who would advance to Sunday to commence qualifying all over again. The second group of 64 drivers would run in consolation heats on Saturday.

The race facilities were first class and included: a printed readout of each lap time of each racer, plus a printed readout of each heat which was posted on a board minutes after the heat; a 10' high drivers stand with more than enough space for 10 drivers; a radio impound system that was flawless

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(L) New World's Champion Phil Booth from England with PB car. Even if we'd voted on it, we could have chosen a finer gentleman to represent R/C car racing as World Champion over the next 2 years. (C) Bill Jianas qualified for a sit out spot in the Main and was leading the Main until two flameouts dropped him back to a 2nd Place finish. Bill is probably the most consistently fast racer in the world today. (R) Chuck Phelps easily won the first Semi Main and lead the first part of the Main. He ran out of fuel midway through the Main dropping him back to a 3rd Place finish.



(L) Naoki Ishihara, Japan, was Top Qualifier in both sessions with Phoenix Road Ace car. (C) Ishihara's car is a very basic designed car featuring light weight, O.S. Max 21 ABC engine with McCoy type muffler and Sanwa radio. (R) Curtis Hustling was 2nd qualifier in the first round, won 2nd Semi Main by 2 laps over Phil Booth and was running away with the Main Event when his flywheel locked up.



(L) Jeff Rold 2nd qualifier in second round with time of 7.28, including 6 second pit stop. Ishihara's time of 7.24 without a pit stop. (C) Crowd's favorite was 12 year old Repete Fusco, New York. Repete was extremely fast, qualifying 6th overall with a time of 7.34. His uncanny driving ability had the crowd of 4,000 spectators on Sunday yelling and screaming approval of his every phase. (R) Fastest of the Europeans was Ronnie Ton, left, qualified for a sit out in Main and with Peter Bervoets make up a strong Serpent team.



(L) Center you'll see a car that appears to be coming in for a nose landing. Actually it's still climbing - tail first - through the air. Every driver saw his own car in this position more than once the first few days. (C) I would never have believed this if I hadn't seen it for myself - "Open Practice," where anything goes. NO frequency control whatsoever. Jianas and Phelps are on the drivers stand, plus 13 other drivers plus 5 more drivers on the ground. (R) Reba Steele came all the way from San Diego, CA, to win Concours with her Jenkins painted body.

**SEMI FINAL**

**SEMI FINAL**

**MAIN EVENT**

1 Chuck Phelps	USA
2 Rick Davis	USA
3 Fujio Sasuga	Japan
4 Kyokatsu Kishi	Japan
5 Ted Ljungcrantz	Sweden
6 Katsunori Kondo	Japan
7 Rich Lee	USA
8 R. Hassig	Swiss
9 Bob Errington	GB
10 Giulio Ghersi	Italy

1 Curtis Hustling	USA
2 Phil Booth	GB
3 Dave Martin	GB
4 Kiyoshi Suzuki	Japan
5 Kunsei Takeda	Japan
6 Gene Hustling	USA
7 Franco Sabbatini	Italy
8 Carl Petri	Swiss
9 Repete Fusco	USA
10 Peter Bervoets	Holland

1 Phil Booth	USA
2 Bill Jianas	GB
3 Chuck Phelps	USA
4 Fujio Sasuga	Japan
5 Naoki Ishihara	Japan
6 Rick Davis	USA
7 Jeff Rold	Italy
8 Ronnie Ton	USA
9 Dave Martin	USA
10 Curtis Hustling	Holland

Country	Car	Qual.	Engine
GB	PB	7.35	OPS
USA	Assoc.	7.31	K & B
USA	Assoc.	7.35	K & B
Japan	AAT	7.38	ST
Japan	Road Ace	7.18	OS
USA	Assoc.	7.37	K & B
USA	Assoc.	7.28	K & B
Holland	Serpent	7.30	OPS
GB	PB	7.45	OPS
USA	Assoc.	7.28	K & B





## SCENE AT LINCOLN

**W**hen a flier at the '78 Nats last year in Lake Charles complained about the heat and humidity, I told him it was really no worse than the Midwest. Thanks to an unusually mild summer, the '79 extravaganza on a couple hundred acres of surplus concrete on one side of the Lincoln Municipal Airport started out pleasantly enough, but got increasingly hot and windy as the week went along, with a more typical 98° sizzler on Sunday for a finish. Attendance was not as high as had been anticipated for the central location, probably a result of the nationwide trend to less long distance travel on vacations that has affected many contests.

The flying surface was smoother and in better condition than average but the fact that F-4, and other full-size operations, were going on from a parallel runway made it necessary to establish a boundary safety line about 600' out from the spectator safety line. This dictated a change from the U.S. figure eight, perpendicular to the runway, to the FAI figure eight, which is flown up and down the runway. A check point car, linked to the flying line by CB, lowered the boom on fliers who violated the outer limit.

The pace of the contest was relaxed, without a lot of whip-cracking on the ready line. Perhaps this is because most of the contestants seemed to prefer it that way. Bringing off such a large operation takes hard work by a lot of people, doing thankless jobs like judging, tabulation, crowd control, etc. Since I don't have a list --- and it would be a long one --- I'll not try naming

everyone involved because some would be left out. They all deserve our thanks plus a little consideration when things don't happen to come off with text book precision.

## GO TEAM

The top three fliers in Precision Scale were automatically chosen as the U.S. Team to the 1980 World Scale Championships in Ottawa, Canada. Former World Champion, Bob Wischer, showed he still has the touch, breezing home to 1st Place, flying his Piel Beryl. George Rose (Curtiss P-6E) came in 2nd and genial Bob Underwood, President of the National Association of Scale Aeromodelers, Hyperbiped his way to 3rd Place by a mere .2 of a point over Earl Thompson's FW-44J.

The FAI has adopted Sport Scale as an official World Class Competition beginning in 1984. In the meantime, international competitions to test the rules are encouraged. One of these is planned for the Canadian World Meet. The top three in Sport Scale — George Buso (Piper Navajo), Ralph Jackson (Windecker Eagle) and Hal Parenti (Bearcat) — qualified as our representatives at the unofficial Sport Scale event next year.

## TWO ENGINES = DOUBLE TROUBLE

Sometimes there is muttering that multi-engine airplanes have an advantage, getting double points for an option that usually is scored highly by the judges. I thought the Nats flying was an object lesson in how dearly these "easy" points are purchased. Six twins were entered. Three of them bit the dust. At least two of these were caused by engine sync or failure problems. A twin

can be flown with an engine out or sagging, but it is a tight-rope walking situation with no balance pole that can become unmanageable, even in the hands of the most expert flier. And, even if he can keep up the juggling, the maneuvers done under these conditions look bad. There should be an inflexible rule inscribed on every brain cell of a twin flier --- land the instant there is the slightest hint of engine trouble and fix it. Otherwise you'll be trading a good airplane for a pitiful handful of points. Unfortunately, some don't get a chance to decide to stop or continue. When the engine goes, the airplane goes immediately, which seemed to be the case when Bob Underwood's Petlyakov PE-2 wound straight in and erupted in a multi-colored mushroom cloud of confetti. Somebody should tell the ivory tower theorists who wrote the FAI international complexity bonuses "to compensate models of complex prototypes for their inherent disadvantage in flight" that they have it all wrong. Instead of giving 10 points for twins, 15 for three engines, 20 for four and 25 for use of more than four engines, in the real world of the working model builder it should be just the reverse, with the biggest bonus for twins and the lowest for four or more. And I'm only partly kidding!

## THAT OLD DISCUSSION — ONE MORE TIME

Some Sport Scale contestants get a bit uptight when they see a former Precision model being entered in Sport. There were at least two this year to fuel the conversations in the pits. Ralph Jackson had his Windecker Eagle and

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A familiar trio — Bob Wischer, Dolly and Piel.



The kind of detail it takes — Wischer's Piel Beryl.



George Rose's P-6E tip-toes in to land.





(L) Flying in the Nats Airshow to boost the hobby, Bob's Hiperbiplane was shot down by a phantom transmitter, seemingly deliberately, along with two other fliers. (C) Parenti's F8F showed fine low speed characteristics. (R) Wayne Owen's scratch-built Martin B-26B, shortly before it reeked itself.



(L) The odds were 50-50. The PE-2 was one of the losers. The 3rd unfortunate was Tom Cook's ME-262. (C) A small bump on a smooth bird ... the Eagle. (R) Dick Graham spread two cups of Johnson's Baby Powder on the judges to soften them up.



(L) One scale that won't be tall heavy ... Atkinson's T-34C. (C) George Buso's Navajo had fixed gear, flew as good as it looked. (R) An unusual subject by Larry D'Attilio, the Fokker D-23 Dutch twin-engine push-pull fighter.



(L) Jim Bonanno's Hellcat dived into the ground, stripping off the prop, landing gear and tail wheel. It then bounced 50 feet into the air and glided 300 feet back to the judging area, seen here on the way! (C) Bob Karlsson's big Ryan PT-22 cruised around low and slow, giving a great exhibition of scale speed. O.S. 90 powered. (R) Bob Violett Model's Skyhawk is captured during demo flight at 79 Nat's by the keen camera eye of Claude McCullough. A/C was recently clocked by radar at 116 mph in unaccelerated level flight upwind/downwind average.

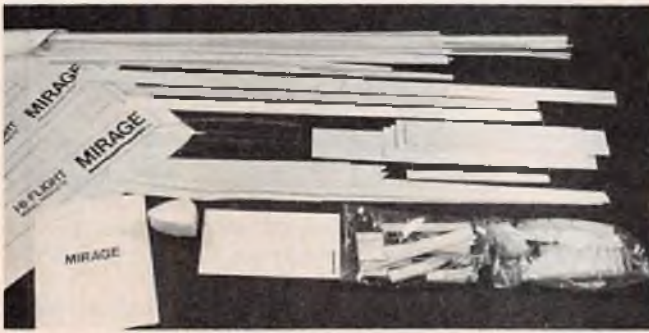


(L) A survivor of the twin engine lottery --- Hank Likes' 13 lb. Cessna 310. (C) Frank Pohlmann flew the prototype of the upcoming new Sig kit of the Cessna 172. (R) Earl Thompson's FW44J, a copy of Monty Groves full-size restoration.



# RCM PRODUCT REVIEW

Hi-Flight Prod.  
**MIRAGE**



## SPECIFICATIONS

Name	MIRAGE
Aircraft Type	Thermal Sailplane
Manufactured By	Hi-Flight Products 43225 Whittler Blvd. Hemet, California 92343
Mfg. Suggested Retail Price	\$59.95
Available From	Both Mfg. & Retail Outlets
Wing Span	112½ Inches
Wing Chord	9" (Center), 6" (Tip)
Total Wing Area	915 Square Inches
Fuselage Length	48½ Inches
Stabilizer Span	28 Inches
Total Stab Area	192½ Square Inches
Mfg. Rec. Engine Range	DNA
Recommended Fuel Tank Size	DNA
Recommended No. of Channels	2
Recommended Control Functions	Rud., & Elev.
Basic Materials Used In Construction:	
Fuselage	Balsa & Ply
Wing	Balsa, Spruce & Ply
Tail Surfaces	Balsa & Spruce
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (9 Pages)
Construction Photos	Yes

## RCM PROTOTYPE

Radio Used	Heath
Engine Make & Disp.	DNA
Tank Size Used	DNA
Weight, Ready To Fly	40 Ounces
Wing Loading	6.3 Oz./Sq. Ft.

## SUMMARY

### WE LIKED THE:

Plans and instructions; parts fit; flight stability; control response.

### WE DIDN'T LIKE THE:

Wood quality; lowhook; missing control horns.

manual. I didn't like having to remove wing panels from the building board before the leading and trailing edges were glued in place. It made me feel as if the wing, and not I, had control during construction.

As with everything else in the kit, the balsa wing ribs and plywood parts were easily identified, smooth and fit well. I used Hot Stuff for most of the construction, first dusting lightly with micro-balloons to insure that all joints would be sound. One leading edge piece had to be replaced because it was terribly warped. I did appreciate not having to mess with dihedral and wing rods: the whole wing center section on this bird is absolutely flat.

The alignment of the ply tongues on the two wing tip panels to their respective receiver boxes in the center section was easy thanks, in part, to the isometric drawings on the plans. The airfoil on this wing is, according to designer Rawdon, "... the most important feature," and therefore, time and patience should be spent shaping the leading edge. It didn't seem possible, but it took me almost 6 hours. The photos, although limited in number, were clear and informative.

The empennage was completed next. In order to keep the tail section as light as possible, I used Hot Stuff here also. The pre-cut tapered parts fit well, and I took the time to sand and shape all leading and trailing edges to conform to the plans: I was determined not to be tail heavy.

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**D**estructive testing is not usually part of an RCM Product Review. Of course accidents do happen. A nick here ... a bang there ... and perhaps even a hard landing or two is okay. But Technical Editor Dick Kidd does not authorize Kamakaze attacks.

Well, authorized or not, that is exactly what happened to "Marabell" on her very first launch. She never really got any flying time because she never got off the hi-start: the beer can pull-tab I use(d) for a tow ring somehow wedged in the towhook and I could not pull it loose. As a result the hi-start dragged poor Marabell down. She was moving at a pretty good clip when she hit and buried her nose into the soft (whew) rain-soaked earth. I was afraid to take a closer look since I could see that both her wing and canopy had been ejected from the upright, quivering fuselage.

After taking a few deep breaths, I muttered some new words for the neighborhood kids to learn and shuffled hesitantly toward the crash site.

"How'm I going to explain this to Kidd," I asked, shaking my head. "I'll be banned from flying, ostracized by other pilots, and made fun of by technical editors."

I surveyed the carnage. She had imbedded her nose a good 3" into the moist ground, which refused to relinquish its victim. I took a closer look as she finally pulled free. Glory! Glory! There didn't seem to be any damage. None at all. I stuffed the battery and receiver back where they belonged and turned to check the wing. I could not believe what I didn't see. It too was undamaged. All 112" had escaped without a scratch. Thanks to the rubber bands popping off when she made that sudden stop, the wing met no resistance as it came flying off the impaled fuselage. Even the canopy and the ingenu pilot were unharmed.

A touch of irony. While building the Mirage I kept telling my wife, my dog, and anyone else who would listen, that this wing just didn't seem to be too strong. When this crash on the first launch occurred, I had just about convinced myself that the wings were not going to last beyond a few hefty launches.

This feeling first hit me when I opened the box and unrolled the two sheets of plans; the wing had little in the way of planking compared to most other sailplane wings I'd built. My thinking was also influenced by the nine page instruction



# BIG PLANES & SMALL CARS: an answer

By Charles W. Parish Jr.



I don't know about you, but I could break more planes getting out to the flying site than I did once I got there. Once I bought my new smaller car (to save on gas), I had to come up with an easier way to get planes out to the field other than the crowded back seat or the trunk.

I had an old two wheel trailer that I had used to haul firewood and trash. It was good and sturdy with big tires and springs. It had a steel frame with four angle-iron corner posts and a long tongue. The bed itself is 4' x 6'. After I put new bearings in the wheels (1939 Chevy pick-up), I started to work on the interior design.

The 2' high sides didn't need to be especially strong. The important thing was that it be waterproof. I used the least expensive 1/4" paneling I could find. After bolting the sides to the angle-iron corners, they were given two coats of



*The trailer safely transports all this equipment plus a good size cooler for "refreshments."*

polyester resin and the corners were reinforced with glass cloth. The top was reinforced with pine 2 by 2's around and across in modeling style . . . epoxied, naturally! (Weight isn't a problem here!)

Just to show off, a color to match my car was obtained from the paint store and it was given an enamel finish.

Expandable closet hangers were screwed to wood blocks with long bolts epoxied into them (see photo). This is so the height of the cradle can be adjusted for different sized aircraft. The cradles themselves were made from 3/8" copper tubing soldered to the oversized piece of closet hanger. This is hard to explain, but once you get the closet rod you'll see! These cradles can be moved from side to side, and when you get them where they need to be, they are secured with sheet metal screws. The tubing is covered with the old standby --- black insulation. Since the copper is rather soft, it can be moved slightly for planes that are a little too "fat" . . . like a Waco.

The wings are secured with rubber bands and cup hooks to a frame that is

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*The versatile retaining features are all clearly shown in this photo.*



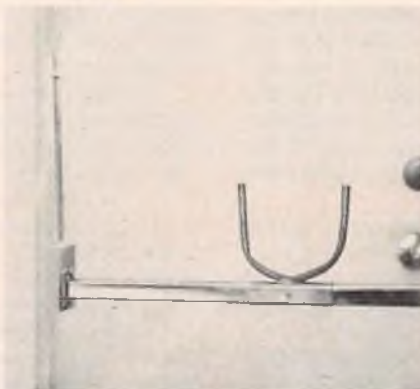
*Wings are secured with rubberbands to hinged frame.*



*With wing frame raised, access to lower space is easy.*



*Adjustable heights screw installation for fuselage rack can be seen here.*



*Soft copper tubing used for cradles can be shaped as required to fit different width fuselages.*



*Padding for cradles is soft foam refrigeration insulation tubing.*



# RCM FUSELAGE STRETCHER

By Eloy Marez

**R**ecently, while fitting out an Airtronic's New Era, we ran into a common problem in our hobby --- not quite enough room in the fuselage to properly install everything we needed to carry. Included was a reasonably sized gas tank and airborne battery, plus enough padding to protect the equipment for the cold hard cruel earth if something ever went wrong. We didn't need a lot more room, a fraction of an inch here and there, or a slightly different shaped component would make the difference between jammed and comfortable.

A simple solution was at hand, and we are passing it along as we have found a surprising number of our fellow flyers are not aware of its existence. It is a slightly electrically smaller battery that is physically smaller enough to make a decided difference in installation but not in the available flight time.

It is a 450 mah airborne pack that has actually been around for three years or so, and available from a number of sources. But, since it is not standard with many systems, it has been overlooked. The battery pack is shaped just different enough to fit in places where some of the others won't go, and it is physically smaller in total cubic measurements as well as in weight. The difference in capacity is not enough to limit your flying by a considerable margin: most of us don't even approach the full allowable flying time in any one session. For those of you who do, at least one type of these 450 mah cells (those available from Kraft Systems) are of the fast charge type that you can be pumping some

energy back into between flights with the proper charger. However, 450 is 450, and some care must be exercised when using these batteries with high drain systems. The use of a battery discharger such as the Ace Digi-Pace or the Power Pacer is strongly recommended to determine the exact time available under your particular use.

By comparison to common airborne batteries, the 450's stack up thusly:

Type	Weight	Height	Width	Depth	Cube
550 mah	4.6 oz.	2.25"	1.875"	1.0"	4.22"
500 mah sq.	4.0 oz.	2.25"	1.25"	1.25"	3.55"
500 mah flat	4.0 oz.	2.22"	2.40"	.72"	3.84"
450 mah	3.4 oz.	2.78"	1.34"	.78"	2.90"

The dimensions might all vary slightly due to slightly different battery case styles and material thicknesses in use, but is average and representative of what is available. You will note a decided difference in all critical figures from one extreme to the other. The 450 can save as much as 1.2 ounces and almost 1.5 cubic inches of space.

Charging: Another bonus is that a special charger is not required. The normal charger designed for 550 or 500 mah cells will charge the battery at just slightly over the recommended C/10 rate, but not enough to overcharge or shorten its life.

Now that we've solved your space problems, we'll go on to solving your other problem that we created at the same time: where do you get them.

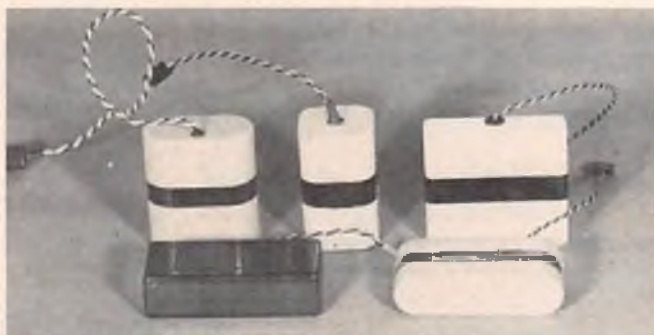
Some of the sources known to us are Kraft Systems, and Cannon Electronics, who have these size batteries available as options or extras with their systems.

Any of their dealers should be able to obtain one for you, or possibly a battery and case only, if yours is a different brand radio. In the latter case, you'll also need a battery harness of the proper type from your system's manufacturer or one of his service centers.

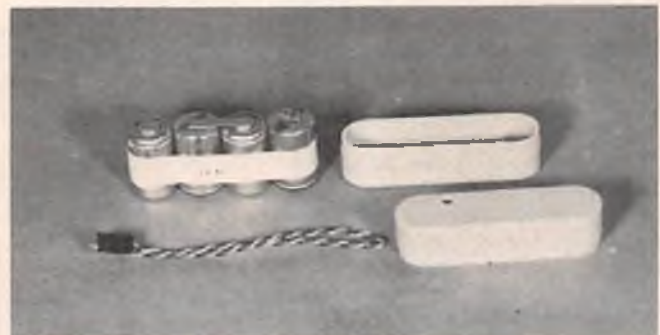
Batteries and cases can also be obtained from Ace R/C, who has the latter in two models, one of their own brand and one made by Dunham's

R & R. The 4 cell, 4.8 volt battery with the Ace case No. 38K56F is \$13.50. The Ace case alone, No. 38L5F is \$1.00; and the Dunham case, No. 38L12 is \$1.95. Ace also has battery harnesses for those systems using D & R wiring, such as Mathes and RS. Component parts for those harnesses using Deans plugs are also listed in their catalog.

Wiring your new 450 mah battery is simple: Positive lead to positive terminal, negative lead to negative terminal. Translated, this means that the red wire goes to the battery terminal that has the raised button top on it and the black goes to the one that is completely flat on top. Both will have a metal strap welded on, to which the solder connection is made. Make a good clean secure solder connection, and a knot on the harness where it comes out of the hole in the case to relieve the strain, and go fly! Which is a good idea --- we'll meet you at the field. □



Front, two styles of cased 450 mah airborne batteries; recommended as replacements for any of the other 550/500 mah styles shown to save space and weight.



View of uncased 450 mah battery components, showing case parts and sample of lead required. Case halves are held together with vinyl tape.



# FOR WHAT IT'S WORTH

Having problems with removable fuel proof, fuel tanks and lines? Try this silicone method for a fool proof, fuel proof, fuel system from George Turco of Carmel, New York.

(1) Drill 1/4" holes concentric with the lead out lines.

(2) Apply a very light coating of machine oil to prevent the silicone from sticking where it shouldn't.

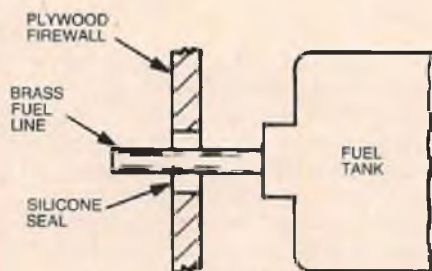
(3) Install the tank so that the lines are concentric with the holes in the firewall.

(4) Block off the ends of the tubes with paper or tape to prevent the silicone from blocking the tubes.

(5) Place the nozzle of the silicone tube over the lead out lines and press the silicone through the firewall.

(6) When tacky, remove the tape, trim any extra and let cure.

There you have it --- the lines will slip in and out with the advantage of an excellent seal! Sketch shown for added clarity.

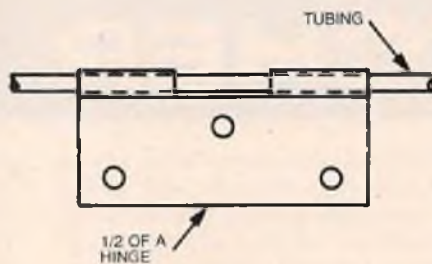


If you have had a problem with your Dremel cut off wheel breaking before it's worn down completely, you might try this method that I. Pierson Taylor of Toughkenamon, Pennsylvania, uses. Just iron on a piece of MonoKote to one side of the wheel before installing it on the Dremel Tool. This has helped so much that he hasn't broken one before it was worn down since using this method.

From Douglas C. Carlton of Courtland, Alabama, comes this handy hint for helicopter or boat enthusiasts. Doug uses a large "O" ring for starting his helicopter. He purchased this "O" ring from an industrial wholesaler and has been using the same ring for over a year and it still looks good.

When you want to be sure your connectors from the receiver to the battery and servos stay together, use a piece of heat-shrink tubing over both connectors together. It works for single connectors or blocks. You may have to use a spacer when not all sockets are filled on a block connector, but a piece of balsa works fine. The tubing is easy to

cut away for unplugging. This idea and accompanying sketch was submitted by Larry Renger, of Santa Ana, California.



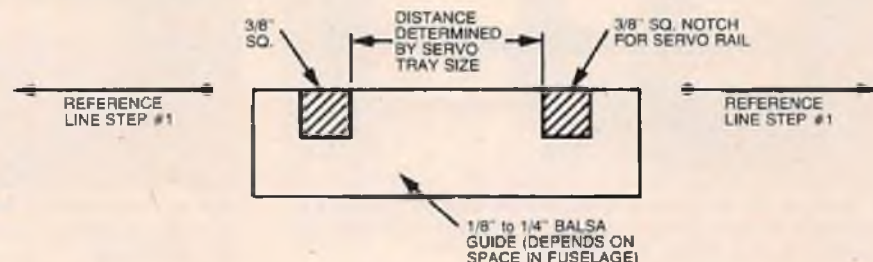
Melvin A. Mattsen of Antioch, California, has a nifty suggestion for cutting small brass or aluminum tubing. The use of a vise will squeeze it flat. Melvin uses one-half of a hinge (see sketch) of the appropriate size to hole the tubing. The hinge can be placed in the vise for ease of working.



Want to protect the belly --- of your sailplane, that is? Bob Dick of West Covina, California, sends along the following idea. Using masking tape, mask off the fuselage leaving the long narrow area where you want your skid to be. Get yourself a tube of GE or Dow Corning silicone rubber sealant, and lay out a ribbon of it on the un-masked portion of the belly. When it cures, you'll have as nice a skid as you'd want --- and for just pennies. When it gets chewed up, skin it off and repeat the whole process. A tube should last a couple of seasons, and it comes in black, white, clear and silver.

From Harry R. Braunlich of Victor, New York, comes an easy method of servo mounting.

Step 1. When starting fuselage construction, draw a reference line on the inside of each fuselage side. It should be the length of the radio/servo



compartment. It must be high/low enough to allow for servo clearance. Using this line as a guide, you'll have your servos and tray level.

Step 2. Using your servo tray as a guide, cut two pieces of balsa to the following shape as shown in the sketch.

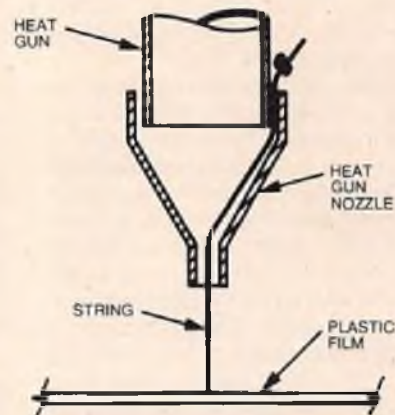
Step 3. Line up (top/bottom as needed) balsa guide on reference line (Step #1) glue in place.

Step 4. Cut servo rails and glue in place.

Step 5. Drill screw holes to mount servo tray.

Richard L. Shirey of Sewickley, Pennsylvania, sent along this idea he found to be very helpful on applying film covering.

A piece of string can be used to gauge the distance from your heat gun nozzle to the surface of the plastic film covering, especially the low temperature type, to prevent burning through from too much heat. Some scrap covering can be used to experiment with to find the distance in which the material will shrink but not burn or melt through. See the accompanying sketch for details.



John Valentine of Phoenix, Arizona, comes up with a wealth of small parts all from the ever popular disposable butane cigarette lighter. This little gem contains a myriad of small finely machined parts that can be incorporated into the modeler's parts inventory.

A few of the parts, and the uses John has found for them are: The gas valve; two finely threaded parts, male and



# FOR WHAT IT'S WORTH

female, can be used to make a threaded fuel line coupler. They also make excellent water proof exit bearings for a seaplane water rudder; small "O" rings, less than 1/16" I.D.; springs, excellent as anti-kink device in fuel line tubing. Fits neatly.

Probably the most useful and easily adapted part is the scratch wheel (for lack of a better name.) Pry it apart and fix it to the end of a Dremel cut-off mandrel. It makes a small sharp fast cutting rotary rasp. Stack two or more on a sanding drum mandrel. Their fast smooth cutting action can't be beat. Hub sizes vary with brand, so some may have to be bushed.

Jack Harvey of Hixson, Tennessee tells us of a time and temper saver when using the ever popular Hobbypoxy "Stuff" filler. The lid should be replaced tightly to prevent Stuff from drying out. But it's a pain to pry the lid off over and over to use Stuff. My solution for an 8 oz. size can of Stuff was to seal it with a snap-on tupperware lid #297-37. It's a perfect fit and snaps on and off easily.

If your RCM subscription or request for information has gone unanswered, it may be simply that your name and address which you wrote in such a hurry can't be deciphered. To prevent this, place a return address label on the upper right hand corner of the first page, as well as on the proper place on the envelope. They are inexpensive, as 1000 labels sell for \$1.00. They are fast to put on, and easy to read. Helpful hint from Danny Moore, Cottage Grove, Oregon.

A cutting hint from Ohio's Leonard Corona. If you want to make your Dremel cutting wheels, part #409 last much, much longer, all you have to do is put a couple of drops of any of the cyanoacrylates on both sides of the wheel, let it soak in and set. You now have an extra strong wheel that will last several times longer than the untreated ones.

Todd Langston of Jupiter, Florida, tells of his method used to accurately mark nylon motor mounts (Kraft, Bridi, etc.) upon which pens and pencils will not write clearly. By rubbing some chalk in the area to be marked and drilled, a ball point pen will make a clean, easily seen mark.

Bill Osborne, of Guilford, Connecticut, tells of his solution to a pressing problem. The nylon tape that is used for reinforcing wing center sections comes all folded up in a poly bag. Using it "from

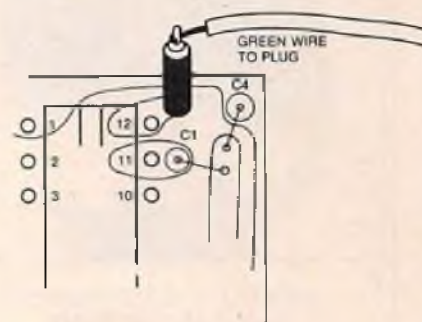
the bag" always presents the problem of pulling out the ever present creases and wrinkles when applying the resin, and holding it during curing. When Bill was doing his last wing, he used his MonoKote iron to iron out the creases and wrinkles. The ironed tape goes on the wing nice and flat and results in a perfectly smooth job.

Ever have a plane re-kitted as a direct result of a wire letting go at one of the switch terminals? It seems not all R/C systems have any stress relief at the switch harness. For some extra insurance take off the plastic cover and completely encase the wires in silicone sealer. This eliminates stress at the connections and increases reliability! Be careful not to let silicone seep inside the actual make-break contacts. This suggestion was submitted by George Turco, Carmel, New York.

To obtain a straight cut when slitting tubing for cockpit trim, try slipping the appropriate size music wire or dowel into the tubing to make a snug fit. Put it into a vice below the top of the jaws. Then, using one of the jaw's edge as a guide for your knife, make your straight cut. This straight story is from Mitchell Ackerson of Saginaw, Michigan.

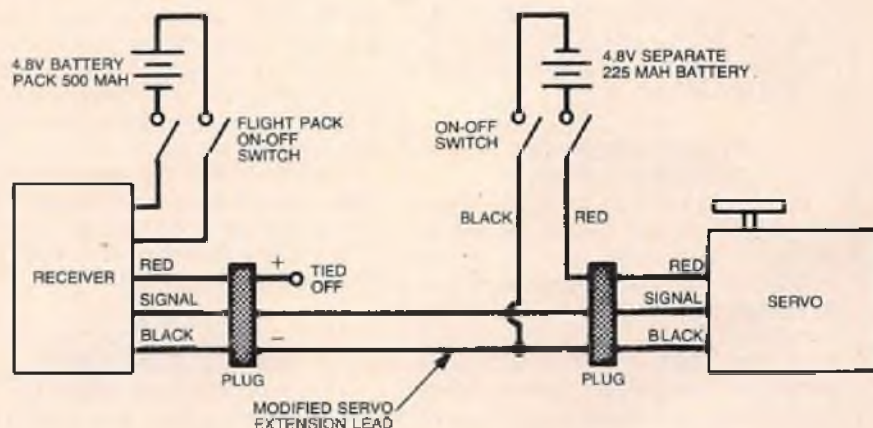
When a retract servo is used to operate 2 or 3 wheel retracts and takes its power from the flite pack batteries, if through any reason the servo is stalled or malfunctions, it could drain the battery pack in short order and cause a crash. Glen P. Saxby of Alice Springs, Australia, has a successful solution that has worked well for him. The schematic shows the way Glen uses a separate battery of 4.8 volts solely for his retract servo. Glen has used a 225 mah battery to operate his Kraft retract servo in a "Tiger Tail" for over 4 years without any problems to raise and lower his Goldberg retracts.

Dale D. Griffith of LaPlace, Louisiana, reports that a problem of incompatibility exists when trying to use the newer Heath GDA-1205-5 servos with older Heath GD-19 receivers, in that the servos tend to run to one extreme and lock there. The problem can be solved by adding a 10K 1/4 watt resistor, Heath P/N 1-9-12, in series with the green wire to the plug. The resistor can be added right at the PC board, at the land which connects to pin 12 of the IC. We queried Heath Co. about the problem, who informed us that the problem can also be cured with a mod to the receiver, Heath P/N 830-3, available from them at no charge.



A problem with the fast setting epoxies is that they do not have enough penetration into wood for the best possible strength. For superior results, heat the mixture with a heat gun for a few seconds. It will flow better, be absorbed more, and greatly increase the strength of the joint; also set up slightly faster. This handy hint was from Dr. Philip Kantor, Canonsburg, Pennsylvania.

While looking around for an oxygen mask and accompanying hose to be used by the pilot in a scale installation, Wayne T. Wall, of Lake Park, Florida, discovered a 10¢ plastic fishing worm to be just the thing. It can be cut and shaped with a sharp knife, and attached with silicone rubber. □





# showcase '79

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



any 72 MHz spot. Properly colored shirts for the 27 and 53 MHz frequencies are also available, on special order, at no extra charge.

Only \$6.95, postpaid, with special prices on quantity purchases by clubs. The "Radio Control modelers do it with frequency" on the front is an additional bonus. Flightline Shirts is at 12504 Saratoga Ave, Saratoga, CA 95070.



## SHUR-LITE ELECTRONICS AUDIO FLIGHT TIMER

If you are the type who consistently runs out of gas far, low, and downwind, read on, this is especially for you. Here is a handy dandy little solid state timer that starts to work when you turn on your transmitter and then signals the passage of every minute with audio tones. One tone indicates one minute, two for the second minute, and so on, until 15 minutes have elapsed, after which the cycle repeats. The Model TXL-15, as it is called, comes uncased and is designed for installation inside your own transmitter. The component board is only 2.2 x 1.24", with the audio horn separate for ease of installation. Current drain is less than 40 micro-amps during idle periods, rising to 25 mils only during the actual tone signals. Available from dealers only in our neighboring country to the north. U.S. readers should check availability from Shur-Lite Electronics Ltd., 210 Don Park Rd., Markham, Ontario, Canada L3R 2V2. Price is \$27.95.

## FLIGHTLINE SHIRTS FREQUENCY SHIRTS

It is always nice to know what frequency the other guy is on, and of course, it is an added safety to let the world know yours. Any additional help in this respect has just appeared with the introduction of Flightline Shirts Frequency Shirts, available with white printing on appropriately colored shirts to designate and advertise your use of



## GIEZENDANNER — USA PRECISION CONTROL FITTINGS

Designed, developed, and produced by two-time World Champion, Bruno Giezendanner — that ought to be enough recommendation for anybody or anything! In this case we are speaking about his Precision Control Fittings, for that all important mechanical hook-up between the control surfaces and the servopushrods.

These new fittings, designated GMP-1300, offer precision control surface adjustment, in very small increments for those precise adjustments so necessary in competition or sport flying. The fittings are molded from nylon, for its excellent bearing qualities, low wear resistance, and complete noise-free operation. Two per package, at \$1.25 per package. From Giezendanner USA, P.O. Box 818, Pottstown, PA 19464.

## ROYAL PRODUCTS WET CELL CHARGER

The Royal Products Model No. 601 Wet Cell Charger has just been



announced, designed for automatic charging of any 2, 6, or 12 volt battery. It contains circuitry that adjusts to the needs of the battery to which it is connected eliminating the need for constant monitoring. Complete instructions are provided, and it is recommended that they be read and followed. Priced at only \$16.95, the Model 601 is available from your local dealer. From Royal Products, 790, West Tennessee Ave, Denver, CO 80223.



## METRIFAST SUPER DRIVER TOOL KIT

Muscle and speed — that about describes the Super Driver Tool Kit now available from Metrifast, 51 S. Denton Ave., New Hyde Park, NY 11040. This new tool features twice the turning power of conventional screw or nut drivers, and the internal reversible ratchet enables the user to turn fasteners continuously with a natural turning action of the wrist. The kit includes 15 pieces: a ball torque handle, drive shaft, socket adapter, 6 sockets (3/16, 7/32, 1/4, 11/32, 3/8, and 7/16"), 4 screwdriver bits in straight and Phillips types, 1 Robertson Square bit, plus a fitted plastic case. All socket wrenches and screwdriver bits are magnetized by a permanent bar magnet located in the drive shaft, to make starting screws or nuts easier. The complete kit is priced at \$8.95, postpaid from Metrifast, at the address listed above.

## GILBERT R/C MODELS PIPER "TOMAHAWK"

A Stand-Off Scale model of Piper's





latest trainer, the "Tomahawk" for .40 engines and four channel R/C has just made the Canadian scene; also available here in the U.S. by direct order from the manufacturer, Gilbert R/C Models, 255 Legris, Duvernay East, Laval, Quebec, Canada H7C 1R3. It features an epoxy glass fuselage and cowling foam wings, and a balsa tail. The span is 63" for a total wing area of 630 squares, and flying weight between 5 and 6 pounds. The cost is \$125.00, please inquire about shipping charges to your area.



### STEVE MUCK'S LIL STREAKER

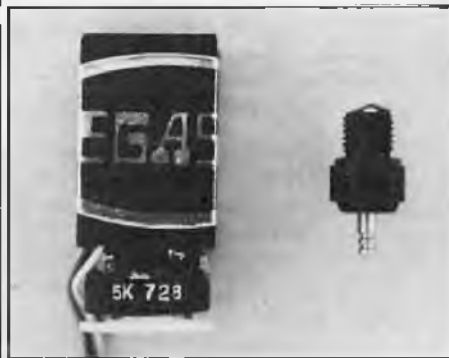
Once upon a time, there was a "Streaker," and in time, because of its success and popularity, there was a "Lil Streaker." And, it is very similar to the large version; both come from Steve Muck's Dallas based R/C boat dock, both feature a fiberglass hull, and both come with excellent instruction books which include step-by-step photos and drawings for a stand specially designed for the Lil One. Naturally, it is designed for the K & B 3.5cc engine which can be used either inboard or outboard. The glass hull features an overlapping rub rail deck, which makes joining easier and stronger, wood engine rails and transom doubler are already installed and ready for a 4" motor mount. An optional fiberglass hatch is also available. This new Deep Vee has a 16 degree bottom, for speed and stability. It is 32" long, 10" in beam, and uses Steve Muck's No. 67 stern drive. For additional information and prices on this and many other boat kits and hardware, inquire from Steve Muck's R/C Boats, 6003 Daven Oaks Dr., Dallas, TX 75248.



### JCM CLEVIS TOOL

We all have our modeling frustrations!

Some of us hate to install hinges, others particularly dislike installing and adjusting nose wheel linkages. And, most of us don't really care for putting clevises on and off, especially down inside the fuselage of a small airplane. Well, along comes a Clevis Tool to make life easier for us. This simple but clever device operates with one hand, with a plunger action, and effectively opens up those sneaky and slippery clevis fingers for easy installation or removal. This all-metal tool is manufactured by JCM Specialties, P.O. Box 194, Addison, IL 60101.



### PEGASUS ELECTRONICS ELECTRONIC SWITCH

The traditional way to operate auxiliary equipment such as lights, horns, drop chutes, etc., is to link a servo to a switch, which in turn controls something else. A better way is Pegasus Electronic's Electronic Switch which plugs directly into the receiver servo output, and in turn controls any switchable electronic device connected to it. It draws only 1/2 mil from the airborne battery for its own operation, and is capable of switching as high as 2.5 amps, using an external battery for the aux equipment supply. It is adjustable to match the exact pulse width of your particular equipment. The Pegasus switch is very small, very light, and compared to the price of a servo, very inexpensive, being only \$17.95. It is encapsulated for ease of installation and maximum protection. Look for them at your favorite store, or order from Pegasus Electronics, 12180 Nebel St., Rockville, MD 20852.

### MASTER KIT'S "T.N.T."

Master Kit's latest offering to the beginner Glider and Sport Flyer is the T.N.T. — no, not the boom boom variety — in this case, it stands for The No Tow. This Bob Wallace design was featured in the June 1977 RCM, with only minor changes to facilitate production requirements. The T.N.T is designed for complete freedom from winches and high starts and, also, from power pods of any sort. The kit features a built-up balsa fuselage, foam core wing, with false



capstrips, and an acetate windscreen. Wing attachment is accomplished with neat and clean looking nylon bolts. An optional landing gear is included, and as are full size plans, hinges, and other miscellaneous parts. The specs of the T.N.T. are: wingspan 72"; wing area 518 sq. in.; wing loading at 40 ounces 11.1; and a length of 36". A two channel R/C system is recommended, with an optional throttle or cut-off, if desired. Any .09 to .15 engine can be used, with a 2 ounce fuel tank recommended. The radio compartment is 2½" square by 9", ample for most modern systems. The T.N.T carries an introductory price of \$32.95; dealer and distributor inquiries are welcome. From Master Kit, 6 Fox Road, Plainville, Connecticut 06062.

### NEW ELECTRONIC PRODUCTS

Electronic Model Systems, P.O. Box 1242, Placentia, California 92670 recently announced a new line of electronic products beginning with three types of servos. All EMS servo amplifiers use the improved Signetics NE544 integrated circuit and silicon PNP output drive transistors. The EMS Bantam Midget servo uses the famous D & R mechanics with Clarostat conductive plastic pot for an output torque of 21 oz., in. Eight case colors including Kraft gold are available. The EMS-14II and EMS-15II servos use the famous Kraft KPS-14II and KPS-15II gold or ivory mechanics with the acclaimed Giezendanner wipers and CTS pots for best competition performance. These servos produce 29 oz., in., and 38 oz., in., of torque, respectively. The servos are priced at \$29.95 for the Bantam Midget and \$32.95 for either the 14II or 15II. All servos are fully assembled and fitted with the proper connector to match most modern digital systems. Also available is a new plug-in servo reverser that installs between the receiver and servo when output rotation in the opposite direction is desired. The SR-1 is fully assembled covered with heat shrink tubing and available with proper connectors for popular positive or negative pulse systems. Extremely light and useful at only \$10.95. All EMS products are available direct or through local hobby dealers. □



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from page 74

padded with carpet underpadding. Our friendly carpet company gave me the padding and the scrap carpet that lines the floor.

The three foot "V" section of the trailer tongue is enclosed simply because it would have been wasted space. This extra space is used for the tool box, fuel, and "refreshments."

The trailer has a couple of real advantages . . . besides the gas angle. Now my wife doesn't fuss at me for having planes all over "her" house. They just stay in the trailer unless they are being worked on. And, they can be charged in place. When I leave for the flying site I'm not as likely to forget

something . . . like the transmitter which, incidentally, fits into a foam lined box for protection.

This trailer has now made many trips to our ARCS (Alamo Radio Control Society) flying site without a single scratch on my planes --- and no oil on the seats of my new car either!

from page 73

The fuselage also went together with no fuss. A big help here were the eight different fuselage bulkhead drawings, complete with legible notes and comments (a lack of sufficient cross sectional data seems to be a common ailment on many plans). In my quest to save weight, I laminated the doublers

with Hot Stuff. In fact, I used Hot Stuff on everything but the triangular support stock, which were glued in with epoxy. Both the sides and the doublers were uneven in grain and hardness, and I found it impossible to keep the fuse from looking a little like a banana (a la Thornburg).

After sufficient sanding, I continued to follow instructions and glassed the forward part of the fuselage with resin and two ounce cloth (I usually glass the whole fuse with 3/4 ounce cloth). The canopy, which was soaked in Rit "Wine" Dye and came out the color of Mateuse Rosé, was Hot Stuffed to the canopy tray. As with the wing construction, there

to page 84



# AN OPEN LETTER TO ALL R/C MODELERS FROM BRIDI HOBBY

Dear Friends:

The folks here at Bridi Hobby sincerely want you to enjoy both building and flying our BRIDIKITS. We recognize, though, that no matter how much thought we put into designing and manufacturing our kits or how detailed the construction notes are, it's not unusual for you to run into some problems or questions you'd like answered. Because we build and fly what we sell and want you to enjoy our products as we do, we've set up a special Customer Service Line to answer your questions. All it will cost you is a telephone call to 213/549-4971. So, if you have trouble at the building board or at the flying field, give us a call. Ask for Customer Service. We'd like to help.

Sincerely,

  
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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	68"	glass/foam
P-51	.60	64 1/2"	glass/foam
T-28D	.60	68"	glass/foam
Kraft Super Fli	.60	60 1/2"	balsa/foam
Shrike	T/.40	79 1/2"	glass/foam
Tiger Cat	T/.40	65"	glass/foam
Spitfire*	.60	64"	glass/foam
Waco Meteor*	.60	62"	glass/foam

### SAILPLANES

Soar Birdy	.049	78"	balsa
Big Birdy		99"	balsa

### SPORT FLYER BRIDIKITS

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Tweedy Bird	.19	48 3/4"	balsa
15-500	.40	51"	balsa
Quickest 500	.40	50 1/4"	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

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<b>ASTER MARINE LIVE STEAM</b>	USCC Lilbeboat	Glow Plug Std	69	Hawk Foam RTF	<b>RUBBER STRIP</b>	1mm, 1.6mm, 3mm, 4.6mm Spool 1 lb.	\$ 7.50
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Powerbrance	DV 10	<b>FUTABA R/C SYSTEMS</b>		D.V. Speed Boat RTS	Swivel Monokote	Mini Monokote	6.22
All Metal Tug	DV 20	GFN W/S18	\$75.54	Turbatrol	Mini Monokote	Iron	15.55
	DV 40	4FN w/S18	217.46	<b>M.R.C. ENYA ENG</b>	STERLING	<b>WILESCO</b>	
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	PT 109	JPN w/Needs 3 Single Stick	164.63	15 R/C	Fledgling	<b>WING SKIN</b>	
	USCC Lilbeboat	Dry w/S18	109.08	19 R/C	Citabria	70.70 Red, Yel, Blue	
	S F Tug Small	2F w/S18	101.01	35CC Outboard	PT 17	09.65 Orange, Whit., Lt. Blue	
	S F Tug Lq	2G5 w/S18	89.89	3.5CC R/C w/Muff	Fokker D-7	45.45 7"W x 4"	\$ 1.98
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	DV 20	S10 Sail Winch	66.66	Gear	Waco	22.22 12"W x 6"	4.50
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	DV 60	S18 Servo	37.37	Max-Pile Boat	USS Missouri	37.37	
	PT 109	FP-MCHB Elec Speed Control	22.72	Max-Pile Hel	Armel Scout	41.41	
	USCC Lilbeboat	<b>G.S. GELL BATTERY</b>		Mini-Pile	Yacht Amer	22.22	
	S F Tug Small	12V 4.5 AMP	\$ 25.95	Subline	King Fish	59.99	
	S F Tug Lq	8V 4 AMP	10.95	Z-Drive	Chris Craft 63	70.70	
	DV 10	2V 5 AMP	9.95	Neptune Outboard	Lamb. Countach Comp	66.66	
	DV 20	<b>GILBERT ENGINES</b>		<b>MODEL ELITE</b>			
	DV 40	Glo-Head	7.95	05 Elec Motor	Ferrari 312	\$ 99.99	
	DV 60	Plane-A-Way	8.95	Glympos Bell	Sherman Tank	122.22	
	PT 109	Bombs-A-Way	3.95	Reduction Gear	Leopard Tank	158.58	
	USCC Lilbeboat	Both for	6.50	Speel Fish Boat FG	Gepard Tank	188.88	
	S F Tug Small	<b>G-MARK</b>		Fastlane Boat FG	Hi-Speed Motor	18.88	
	S F Tug Lq	061 R/C Engine	39.95	Islander Twin Eng. Plane	Nicads & Charger	23.23	
	DV 10	w/Muff	3.95	Hummingbird	<b>M.R.C. WEBRA</b>		
	DV 20	12 Twin R/C	119.95	Elec Plane	40 R/C	\$ 79.79	
	DV 40	Engine w/Muff	6.50	Elec Plane	40 R/C S	89.88	
	PT 109	<b>GOLDBERG</b>		Magio Fly Elec Plane	60 R/C	98.98	
	USCC Lilbeboat	Falcon 56	\$ 33.33				
	S F Tug Small	Curtis Hawk	31.31				

<b>COX</b>	<b>ENGEL MAR HDW.</b>	<b>FOX ENGINES</b>	<b>JGL R/C Propeller</b>	<b>Barracuda Giant</b>	<b>60 R/C S</b>	<b>124.24</b>	<b>SCIENTIFIC</b>
Baby Bee 049	Brass Shaft & Stuffing	35 ST	\$ 18.88	Elec Motor	90 R/C	136.36	R/C Sail Fishermen
TD 051	Doz. High Speed	15 R/C	26.96	Hi-Start w/Reel	40 R/C Mar	103.33	Robot E. Lee
R/C Bee I New!	12" Long	19 R/C	25.99	B Stake	60 R/C Mar S	128.28	Thermopolae
Sure Starter	18" Long	36 R/C	27.77	<b>MOKI ENGINE</b>	60 R/C Mini	128.28	<b>TARNO</b>
Med. 09 R/C	24" Long	40 R/C	32.32	28CC World's Largest Engine	90 R/C Mar	155.55	Homeite 1.8 Super 2 Eng.
Med. 15 R/C	Std Shaft & Needlepoint	60 R/C Eagle	48.48	<b>M.R.C.</b>	<b>MIDWEST</b>	<b>Cessna Foam ARF</b>	\$ 23.23
R/C Dumbogdy	Bearing 8"	Glow Plug Std	69	Hawk Foam RTF	<b>RUBBER STRIP</b>	1mm, 1.6mm, 3mm, 4.6mm Spool 1 lb.	\$ 7.50
R/C Cub Trainer	Bearing 10"	Short & Long Glow Plug R/C	99	w/Enya 15	R/C PA7	R/C Corsair	12.95
R.T.F.	Bearing 12"	Short & Long Glow Plug R/C	99	Wiper Speed Boat RTS	R/C Corsair	R/C P39	51.51
R.T.S.	Brass Prop 3/8L L&R	<b>FUTABA R/C SYSTEMS</b>		D.V. Speed Boat RTS	Swivel Monokote	Mini Monokote	6.22
R.T.S.	1/2	GFN W/S18	\$75.54	Turbatrol	Mini Monokote	Iron	15.55
R/C Cessna RTF	1/3/4	4FN w/S18	217.46	<b>M.R.C. ENYA ENG</b>	STERLING	<b>WILESCO</b>	
W/Radio	2/1/4	Above Avair 220V 27	80.80	09 R/C	Mini Fledgling	Marine Steam Engine Set	\$ 54.95
R/C Sportswa RTF	2/1/2	JPN w/Needs 3 Single Stick	164.63	15 R/C	Fledgling	<b>WING SKIN</b>	
w/Radio	3/2/2	Dry w/S18	109.08	19 R/C	Citabria	70.70 Red, Yel, Blue	
<b>DUBRO</b>	Heavy Coupling	2F w/S18	101.01	35CC Outboard	PT 17	09.65 Orange, Whit., Lt. Blue	
25mm	25mm	2G5 w/S18	89.89	3.5CC R/C w/Muff	Fokker D-7	45.45 7"W x 4"	\$ 1.98
30mm	30mm	320 Mini Servo	29.20	6.50CC R/C w/Muff	Simon	51.51 9"W x 8"	3.95
		S10 Sail Winch	66.66	Gear	Waco	22.22 12"W x 6"	4.50
		S15 Sail Bearing Servo	8.08	Mini-Richard	17A Corsair	36.36 15"W x 6"	4.95
		S18 Servo	37.37	Max-Pile Boat	USS Missouri	37.37	
		FP-MCHB Elec Speed Control	22.72	Max-Pile Hel	Armel Scout	41.41	
		<b>G.S. GELL BATTERY</b>		Mini-Pile	Yacht Amer	22.22	
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		8V 4 AMP	10.95	Z-Drive	Chris Craft 63	70.70	
		2V 5 AMP	9.95	Neptune Outboard	Lamb. Countach Comp	66.66	
		<b>GILBERT ENGINES</b>		<b>MODEL ELITE</b>			
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		Plane-A-Way	8.95	Glympos Bell	Sherman Tank	122.22	
		Bombs-A-Way	3.95	Reduction Gear	Leopard Tank	158.58	
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		Falcon 56	\$ 33.33				
		Curtis Hawk	31.31				

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R/C Cub Trainer	Bearing 10"	Short & Long Glow Plug R/C	99	w/Enya 15	R/C PA7	R/C Corsair	12.95
R.T.F.	Bearing 12"	Short & Long Glow Plug R/C	99	Wiper Speed Boat RTS	R/C Corsair	R/C P39	51.51
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		<b>G.S. GELL BATTERY</b>		Mini-Pile	Yacht Amer	22.22	
		12V 4.5 AMP	\$ 25.95	Subline	King Fish	59.99	
		8V 4 AMP	10.95	Z-Drive	Chris Craft 63	70.70	
		2V 5 AMP	9.95	Neptune Outboard	Lamb. Countach Comp	66.66	
		<b>GILBERT ENGINES</b>		<b>MODEL ELITE</b>			
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		<b>GOLDBERG</b>		Magio Fly Elec Plane	60 R/C	98.98	
		Falcon 56	\$ 33.33				
		Curtis Hawk	31.31				

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## MIRAGE

from page 82/73

were only a few photos to supplement the building of the fuselage, but they, too, were clear and informative.

I decided to use the balsa pushrods furnished with the kit because they weighed a third of an ounce less than the cable and nyrod I usually install. Four small diameter drinking straws were Hot Stuffed end to end and installed along the bottom rear of the fuselage as the antenna conduit (my finishes aren't that great that I need an ugly antenna

hanging out also).

Not until it was time to cover did I realize that my rosé colored canopy canopy didn't go with any of the iron-on colors I had. So I went with what looked least worse: black MonoKote on the fuselage, and black, transparent yellow, and transparent orange on the wings and tail surfaces, with white auto pinstriping between colors. Her name, Marabell, went on the yellow part of the left wing tip panel with black rub-on letters.

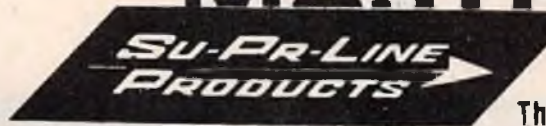
Although construction of the tail feathers is conventional, their installation is not. The fin and rudder are offset . . . mounted to one side of the

plane's rather broad rear end instead of in the middle of that usually tapered area. And only half of the elevator is actually used as a control surface (which necessitates more throw than normal for that surface). The other side is permanently fixed to the horizontal stab. Copious notes cover all possible ways to install these tail surfaces and their respective servos. Since both CW and CCW servo travel is shown, you just pick out the servo installation that you prefer, or that is best suited your particular equipment, and mount it accordingly.

Even though she's an Unlimited Class sailplane, Marabell was built without

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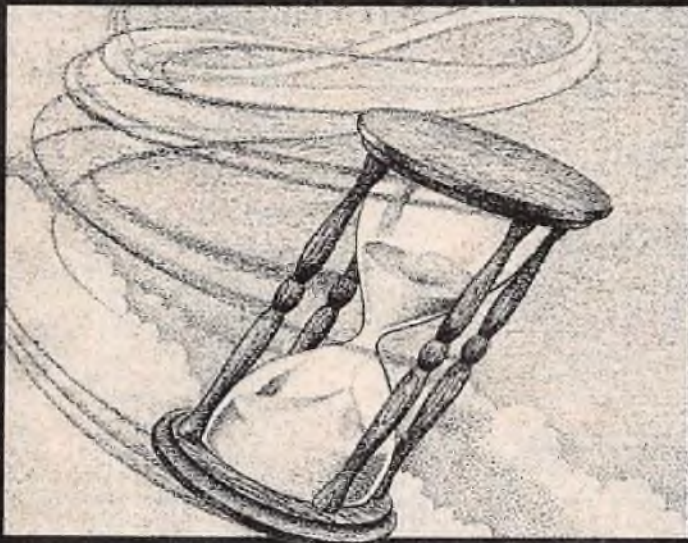
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### MIRAGE

from page 84/73

spoilers, as per plans. A homemade 750 ma battery pack, a Royal 1/2A converted to 4 channel receiver, and two Ace Micro-Servos were installed as part of her guidance system; my old, faithful Heath GD-19 transmitter completed the control loop. I didn't care for the towhook shown on the plans so I installed an Airtronics adjustable hook. I plan to use the same 4-40 bolts that secured the towhook to the fuselage bottom to also anchor the 5 ounce lead plates I made for ballasting. Scotch Magic Mending Tape was used for hinging the rudder and the elevator (been using it for three years and it's never failed). For some reason, my hardware package did not contain the two control horns. Everything else was there, but I sort of felt cheated.

Even though I was conscientious about trying to keep the tail light, I still had to add nose weight to achieve a 35% C.G. (the plans show a nominal 33%), which put my Mirage a full 7 ounces over the target weight listed on the plans. Still, 6.3 ounces per square foot is a respectable wing loading, and in this part of Texas the wind usually blows a bit anyway, requiring more weight for penetration.

I made only one real modification to this kit, and that was where the wing tip panels plug into the center section. What bothered me was that the only means of keeping the wing panels in alignment after they're plugged in and butted together would be the tape wrapped around those dihedral joints. And under high loads, I could see the two trailing edges flexing out of alignment with each other in spite of the tape.

My solution was to install 1/8" OD keying dowels on the center section ends and 1/8" ID tubing, to receive those dowels, in the tip panel roots. These 1/4" long dowels and tubing were Hot Stuffed in place 2" back from the trailing edge

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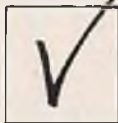
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Unique engine mount offers wide range of positions for locating engine and exhaust equipment beneath cowl.

Precision pulleys—designed and matched for peak performance.

Lightener offers easy adjustment for optimum performance extended life.

20 x 8 maple prop and 3 1/2" spinner included with Byro-Drive.

Tensiometer indicates exact recommended belt tension for peak performance and belt longevity.

Poly-Flex V-belts—proven after years of tool shop applications requiring up to 20,000 rpms.

**\$98.50**

Factory Direct Price

Prop. & Spinner Inc.

## The Proven *Pitts* with *Byro-Drive*

Order Byro-Drive model number for matching engine.

Model No.	for Engine
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RR-11-	.61 & .65 Rossi, rear valve
RF-12-	.61 & .65 Rossi, front valve
WFR-14-	.61 speed Webra, frt. & r. valve
TFR-13-	X.60 Supertigre, frt. valve, r. exhaust
KF-15-	.61 Kraft
HPFR-16-	Silver Star or Gold Cup, frt. & r. valve
OPSR-17-	OPS .60 Speed, rear valve

**\$212.95**

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78-79 SCALE KIT OF THE YEAR

Wing Span: 68"  
Wing Area: 1400 sq. in.  
Length: 62"

Send me \_\_\_\_\_ Pitts Kit(s) at \$212.95 ea. plus \$12.00 shipping & handling.

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Name \_\_\_\_\_

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I have enclosed check or money order for \$ \_\_\_\_\_

Please charge to Master Charge or Visa Account.

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Send to: Byron Originals, P.O. Box 279, Ida Grove, Iowa 51445. Ph. 712-364-3165

Weight: ready-to-fly, 1 1/2 lbs. fuel.  
\* Under 15 lbs. with Econokote finish.  
\* Under 17 lbs. with Epoxy/Fiberglass finish.



All orders received by Nov. 10 will be billed at the introductory price of Pitts \$188.00 Byro-Drive \$89.95. Plus shipping.



# Kits... Includes ALL ITEMS to complete models as shown!

Engine, radio, and final paint not included



## MiG-15

Wing Span - 57"  
Length - 55"  
Ready-to-fly wt. - 8½ lbs.  
Wing area - 600 sq. inches  
For .60 size engines and 4 channel radio

### The First Practical Approach to Realistic Jet Performance That:

- Is designed for the average R/C enthusiast.
- Allows short grass strip take-offs
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**Scale Accuracy**

**Easy Access to Radio and Engine**

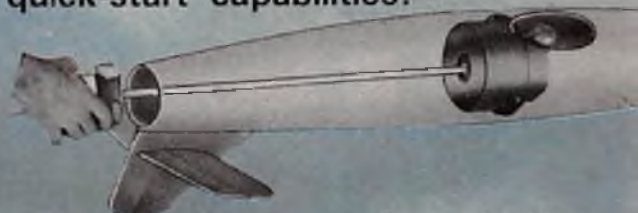


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**Byrojet**  
Ducted Fan



The ducted fan with exclusive quick-start capabilities.



Starter extension provided with kit.

Add \$8.00 for shipping to any U.S. address. Items shipped by United Parcel Service.

**\$168.00**

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

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All control surfaces utilize center point hinging requiring standard servos. Every last item, except radio, engine and final paint are included in kit. No shaping or carving required. No guesswork involved. Only quick, accurate and enjoyable building.

Optional epoxy/fiberglass kit for glassing wings and tail surfaces available for \$22.50.





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DEAR BOB,  
 AFTER REPAIRING MY OTHER ENGINE  
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 TURNED MY 28 LB. BUILT UP, PITTS SIZE  
 INTO A REAL PROPPLER, NOT JUST A  
 "A" FLYER. AS YOU CAN SEE, WE USE  
 THE PITTS AT AIRSHOWS WHERE  
 SUPERIOR POWER AND RELIABILITY GIVES  
 THAT EXTRA WAGON FOR MODEL SAFETY.

MARY THAVIS  
 Gray Trascude



# EWH Specialties SUPER HUSTLER power by HOMELITE®

**SUPER HUSTLER SPECIFICATIONS**

	SAE	METRIC
Displacement	2.8 cu. in.	47.4 cc
Bore x Stroke	1.5625 x 1.375 in.	39.69 x 34.92 mm
Weight	104 oz.	2.95 Kg
Thrust @8800 7100 RPM		
20 x 8 Hustler		
Prop	23-24 in.	
Fuel	20 to 1 Regular Gas/Oil Mix	

**Price** ..... **\$199.95**



**PROPS**

Hustler 20 x 8 for Super Hustler	7.99
Hustler 18 x 6 for Quadra	6.99

(Note: All E.W.H. props are precision fit for our 8 bolt prop hubs. Please specify if you don't want them painted.)

**SPARK PLUGS**

RCJH	1.99
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RCJH	1.99

**Quadra Package**, includes 8 bolt hub, extra plug, two props, throttle link, exhaust tube, six ft fuel line, & C.S. mount ..... **149.95**

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 Call for special prices on radio setup specifically for 1/4 or 1/8 size air craft.

**KITS**  
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**CALL FOR AVAILABILITY OF NEW KITS**

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 without notice  
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## MIRAGE

from page 86/73

(the basic idea came from the Paragon, which also uses plug-in tip panels). Now the trailing edges should remain streamlined because they're keyed, and the tape won't have to do an almost impossible job.

I was so anxious to get Marabell in the air that I completely forgot to try a hand chuck or two (I hate the kind of surprise you get when launching a poorly trimmed, untried machine). Her first launch was described earlier; it almost made a stamp collector out of me. Her

first flight, however, made up for the agony and terror that that dumb (and now deceased) pull-tab had caused. With full rudder throw and 7/8" elevator throw up and down, the Mirage is very responsive and as light on her feet as a ballerina. Keeping the wing tip panels light paid off . . . she turns instantly when commanded.

I moved the towhook back under the C.G. for the second launch and stretched the hi-start out to 800 feet. Her ascent this time reminded me of the way a Paragon goes up: steep, but rock steady. And in spite of the low winds, she came off the hi-start at well over 500 feet and then shot up another 50 feet. Her

light loading allowed her to tell me all about the lift she had run into. I cranked in some right trim, and she started up, all on her own. She appeared to be quite stable, but her tail seemed to skid around more than usual in tight turns. This may be due to the flat center section, the only angular differences in the wing are the dihedral angles between the tip panels and the center section. There is no polyhedral on this design.

The wind came up at this point, which gave me a chance to see just how well her semi-symmetrical section would allow her to penetrate. I thumbed in just

to page 94

QUARTER SCALE ASSOCIATES

**QUARTER SCALE ASSOCIATES 64 RAYMOND RD. PENFIELD N.Y. 14526**

\$1.00 for catalogue.

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#1 trainer! High-lift, flat-bottomed airfoil is responsive to control and inherently stable. Tricycle gear helps ground handling, take-offs and landings. Sturdy built-up balsa construction & light wing loading make the Kadet a great sport or beginner's model. Excellent kit with complete illustrated building & flying instructions. For 3 or 4 channel radio.

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- For .19-.40 engine

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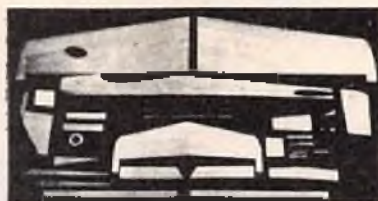
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## ARF SPORT & PATTERN For 60 size engine



UFO, Dirty Birdy, Q-R-A, Gringo or Deception **\$109.00**

Bandito Trainer, RCM Trainer or Ugly Stik II Trainer **\$99.99**

Balsa kits ready to finish! Each kit has foam wings completely covered with balsa and hand sanded. Each fuse is built & sanded, has built & sanded tail surfaces. Firewall installed. All you do is join the wing halves, glue on the tail feathers, cover and install your radio. Hardware included. Spend your time flying, not building!

MODEL MERCHANT



F-4 PHANTOM plus TD .049 **\$39.99**

CRAFT-AIR

**\$40.99**  
WINDRIFTER with spoilers plus 2 rolls MonoKote (transparent or opaque)

FLITE LINE

**\$44.99**  
SKOOTER II with Fox .36 R/C

M&P

**\$58.99**  
7-foot QUAKER plus 4 rolls MonoKote (transparent or opaque)

GOLDBERG

P-6E plus Fox .36 R/C **\$51.99**

**\$73.99**

BIG STATE HAFFAST plus New K&B 8011Q for 500 racing

### Build with DREMEL

#281.....	\$40.99
#371.....	\$40.99
#381.....	\$44.99
#572.....	\$62.99
#580 Table Saw.....	\$62.99
#210 Drill Press.....	\$16.99
#2215 D-Visa.....	\$20.99

### A-justo-jig Full House

Build accurate wings **\$41.99**  
Converts to fuse jig.

CUSTOM CRAFT Deluxe

### MITER SANDER \$19.99

Produces precise angles, performs butt & edge bevel, square up, edge straighten, sheet & spar splice, stock sizing, compound bevel, gusset angle; sands dihedral angle on foam or built-up wing. Easy-to-build kit.

### HOSS FLY II \$30.99



Builds fast, easy to fly. Precision cut, sanded foam cores; semi-planked wing. For .29-.40 engine.

### COVERING

MonoKote Opaque or Transparent.....	\$5.60 or 3/\$15.99
MonoKote Metallic.....	\$6.50 or 3/\$18.99
EconoKote.....	\$4.25 or 3/\$11.99
Super Coverite.....	\$5.75 or 3/\$15.99
Silkspun Coverite.....	\$5.75 or 3/\$15.99
Permagloss Coverite.....	\$6.79 or 3/\$18.99
Day Glo Coverite.....	\$7.50 or 3/\$20.99
Coverite Graphics, 1" numbers.....	\$ .99
2" numbers \$ 2.19 3" numbers.....	\$ 3.99
MonoKote Heat Seal Iron.....	\$13.99
MonoKote Trim Tool.....	\$10.99
MonoKote Heat Gun.....	\$19.99
Balsarite.....	\$ 2.25
Glass Coat.....	\$ 2.25

### HB ENGINES

.12 w/muffler ..	\$27.99
.15 w/muffler ..	\$30.25
.20 w/muffler ..	\$35.15
.25 w/muffler ..	\$39.20
.21 PDP, w/muffler ..	\$47.90
.40 PDP, no muffler ..	\$59.00
.61 PDP, no muffler ..	\$83.50

Some items in limited quantity and advertised specials, subject to availability, will be honored until Nov. 10, 1979. Prices may change if retail price or discount structure changes.

Tape or glue this label to the upper right hand corner of any envelope. Enclose order form and your check, money order or credit card number. No letter postage necessary.



No postage necessary if mailed in the United States

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FIRST CLASS PERMIT NO 161 Ft. Worth, TX

POSTAGE WILL BE PAID BY ADDRESSEE

# THE HOBBY MARKET

Jay Dave

3955 W. Vickery Blvd.  
Fort Worth, TX 76107  
Phone (817) 738-2301

P.O. Box 2172 76113

## The Hobby Market

P.O. Box 2172  
Ft. Worth, TX 76113

THE HOBBY MARKET



# ANNOUNCING TWO NEW BIG ONES

Bob Upton's  
**CORBIN BABY ACE**



This 1/4 scale classic beauty flies on 4 channels with either a .60, .60 w/reduction gear, or a .91. Designed with plug-in wing panels for easy transport, the airframe may be covered with a plastic film covering material if desired. This all-balsa model with an epoxy-glass cowl and wheel pants has a 78" wing span and handles very smoothly in the air.

**\$129.95**

Jeff Tracy & Gary Reusch's  
**CAP 20-L**



Our super-delux kit includes landing gear wheels, spinner, fuel tank, control cables for the rudder and elevator, and much more. Utilizing 4 channels (2 aileron servos required), this glass/foam kit flies on a 1.5-2.4 engine. With an 81" wing span, this acrobatic model may be built either with a one-piece wing or plug-together wing panels utilizing materials provided in the kit.

**\$224.95**

## AND MORE ARE ON OUR DRAWING BOARD INCLUDING:

★ A 78" wing span version of Hanno Prettner's well-known DELOTEL DM 165. All balsa construction for a .90-1.25 engine.

★ The familiar WW2 SPITFIRE, designed for a .60 engine with a 64" wing span. It is planned as a glass/foam kit requiring 4-6 channels.

# BRIDI HOBBY ENTERPRISES

1611 E. Sandison St., Wilmington, Calif. 90744 (213) 549-4971

## MIRAGE

from page 90/73

a tad of downtrim . . . and was impressed. My sweet Marabell really covered ground, in spite of a stiff 15 knot head wind. And as far as I could tell she wasn't sacrificing much in the way of altitude to go that distance either. That's the kind of trade-off I like; you've got to be able to get to that lift, or you're dead.

In this respect, the Mirage flew very much like my Aquila when it had the famous "Miller Mod" installed.

Accurate landings were no problem, as long as I remembered to crank in full downtrim and fly with back pressure. She damn near stops moving forward if her nose is allowed to get too high when stretching for those few extra feet. (It may be the turbulator spars . . . perhaps sheeting the leading edges to the max camber point might eliminate this.) As

long as I kept her nose down during landing, she behaved like a pussycat and made nailing the spot seem easy.

The Mirage was not designed with the beginner in mind. However, a sailplaner ready for his second bird should have no trouble building and flying this machine. The keying dowels I installed in the dihedral joints have given me much more confidence in this airplane, perhaps others will not find it necessary.

to page 98

## JEMCO ANNOUNCES Their NEW "Fun Scale Series" kits

# "MUSTANG"

(at your dealer)

### Features

- Looks Real
- Builds in 7 days
- Upright Engine
- Flies like a Trainer (18 oz. wing loading)
- Very slow landing speeds
- Accurate "JEMLOC" Fuselage construction
- Step by step assembly illustrations (easier to follow than photo's)
- Designed for iron on coverings
- Decals shown in picture
- Simple strip ailerons
- Ideal for small fields or school yards

Designed for the  
Novice Builder-Flyer

"Easier to build  
than a Kadet"

Ideal Second  
Trainer

**\$39.95**

Span 51"  
Weight 3½ - 4 lbs.  
.19-.40 Eng.

JEMCO  
1305 Foothill Dr.  
Vista, CA 92083  
714-724-3242

Write for  
free Catalog's





**L. R. TAYLOR**

**POWER PACER** \$48<sup>99</sup>

Will spot a weak battery, a dead cell, a reversed cell and even an intermittently working failing cell. As a charger, controls input at a safe 50 mah rate. A nicad tester/charger/cycler, aids in preventing crashes due to battery failure. Please specify radio.

**Build with DREMEL**

#281.....	\$40.99
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#381.....	\$44.99
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**HOSS FLY II**  
**\$30.99**

Builds fast, easy to fly. Precision cut, sanded foam cores; semi-planked wing. For .29-.40 engine.

We offer complete service on Kraft, Futaba, Logictrol, Pro-Line & World radios. Call Ted White (817) 738-2301

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**P-6E**  
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**\$39.95**

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Weight 3½ - 4 lbs.  
.19-.40 Eng.

JEMCO  
1305 Foothill Dr.  
Vista, CA 92083  
714-724-3242

Write for  
free Catalog's





# EAST END HOBBIES

Route 25A • Rocky Point, N.Y. 11778 • (516) 744-1500

ADD 2.00 FOR POSTAGE, HANDLING & FULL INSURANCE. PERSONAL CHECKS ALLOW TIME FOR CLEARANCE. FOREIGN ORDERS & ORDERS OUTSIDE THE CONTINENTAL 48 STATES ADD \$10.00 (EXCESS REFUNDED). N.Y.S. RESIDENTS MUST ADD SALES TAX \$3.00 ADDITIONAL ON C.O.D. NOT RESPONSIBLE FOR TYPOGRAPHICAL ERRORS. PLEASE ORDER BY NUMBER. PRICES GOOD UNTIL NOV. 30, 1979

## DUBRO

ITEM	LIST PRICE	East End PRICE
Dubro LG Nylon Hinges	2.49	1.79
Dubro Flex Cable 20"	1.49	.98
Dubro H-203 Kwik — Switch Mount	1.75	1.28
Dubro Prop Drive Unit	99.95	69.95
Dubro Kwik Fill Fuel Pump	10.95	6.98
Nylon Steel Con Rod Assem. #102	1.49	1.09
Strip Aileron Horn #103	.79	.59
Strip Aileron Bearing #104	.69	.66
Lg. Nylon Horn #105	.49	.36
Kwik Link #106	.49	.30
Coupling Sleeve #110	.30	.23
Threaded Coupling #111	.40	.30
Nylon Bearing #124	.75	.57
Mig. & Blind Nuts 2/56 #125	.50	.38
Mig. & Blind Nuts 3/48 #126	.50	.38
Mig. & Blind Nuts 4/40 #127	.55	.41
Mig. & Blind Nuts 6/32 #128	.55	.41
Socket Head & Blind Nut 4/40 #129	1.10	.83
Socket Head & Blind Nut 6/32 #130	1.10	.83
2 Ball Tip Wrench #132	4.25	3.19
Blind Nuts 2/56 #133	.35	.27
Blind Nuts 3/48 #134	.35	.27
Blind Nuts 4/40 #135	.35	.27
Blind Nuts 6/32 #136	.40	.30
1/16 Collars #137	.90	.60
3/32 Collars #138	.80	.60
Wingbolt Set #159	1.25	.94
Prop Balancer #160	2.95	2.22
Filter #162	1.75	1.32
Lock Nuts 2/56 #168	1.10	.83
Lg. Steering Arm #166	.75	.57
Bulk Full Line Med. #197	25.00	14.99

## DREMEL

ITEM	LIST PRICE	East End PRICE
Dremel #271 Moto Tool Kit	54.95	36.95
Dremel #281 Moto Tool Kit	64.95	43.95
Dremel #381 Moto Tool Kit	74.95	46.95
Dremel #572 Deluxe Moto Shop	99.95	66.95
Dremel #232 Moto Flex	79.95	54.95
Dremel #571 Moto Shop	79.95	54.95
Dremel #560 Table Saw	99.95	69.95
Dremel Engraver #290	15.95	10.99
Dremel Moto Kit #261	54.95	38.99
Dremel Moto Lathe #700	54.95	39.99
Dremel Moto Acc. Kit #702	20.95	14.99
Dremel Drill Press #210	23.95	19.99

## MISC.

ITEM	LIST PRICE	East End PRICE
Zinger 11 x 7 (8)	9.60	6.28
Zinger 10 x 6 (6)	8.40	5.48
Sullivan Standard Starter	38.95	27.95
Top Filite 10 x 6 (12) Super Maple	16.20	10.49
Top Filite 11 x 7 (12) Super Maple	18.60	11.79
Xacto #11 Blades (5)	.79	.59
Xacto #5076	13.95	10.39
Xacto #5086	22.95	17.19
Badger 250-1	11.00	7.29
Badger 250-3	13.50	9.99
Badger 350-1F	21.95	16.99
Miller Spray Gun & Compressor #2115	82.95	53.99
Testers 049 #8000	10.99	5.99
Midwest RK-40 AXIFLO	49.95	35.95
Midwest RK-049 AXIFLO	40.95	28.50
Hot Stuff 1/2 oz.	3.95	2.38
Monokote Opaque 3 Rolls	27.00	15.95
Monokote Trans 3 Rolls	27.00	15.95
Monokote Mat 3 Rolls	31.50	17.95

## SPECIAL 1 OF A KIND IN STOCK

Kavan Jet Ranger	469.00	324.99
KYO B-36 Bomber 112" Wingspan U-Control or R/C		159.99
KYO C-124 Globemaster U-Control or R/C Scale 82" Wingspan		129.95
CAP P-47 Thunderbolt R/C 62" Wingspan 40 to 80 Engine		119.95

## R.C. BOATS

ITEM	LIST PRICE	East End PRICE
Bridl Chubasco Deep V 40-60	96.95	77.29
Midwest Klampon Kay	49.99	35.99
Futuraglass 1204 Hydro 40-60	79.98	64.99
1201 Deepvee 20	74.95	60.79
1202 Deepvee 40	83.95	71.99
1203 Deepvee 60	99.95	78.99
1301 Flexible Cable Outdrive - DV20	44.00	34.99
1302 Flexible Cable Outdrive - DV40	44.00	34.99
1303 Flexible Cable Outdrive - DV60	49.00	38.99
1304 Flexible Cable Outdrive - Hydro 40-60	47.00	36.99
Cox Hydro Blaster W/Radio	111.00	77.99
Tradewinds	169.95	119.95

## MRC R/C CARS

RA1010 Ligier JS9 Mateor	62.99
RA1209 Toyota Celica LB Turbo	67.99
RC-11 Batt. & Charger Kits	23.95
RA1205 Lamborghini	52.49
RA1206 Porsche 936	46.99

## LATRIX CARS

CP-012 Cobra	59.95
LTX-40 Compellion Car	129.95

## COX R/C CARS

Ferrari Electric	119.95	83.98
BMW Electric	119.95	83.98
Lamborghini w/Radio	129.95	89.98

## RADIOS

### KRAFT KRAFT KRAFT KRAFT KRAFT KRAFT

ITEM	LIST PRICE	East End PRICE
KP-2AW (Wheel) w/1411A's	139.95	94.98
KP-2A (2 Sticks) w/1411A's	139.95	94.98
KP-2AS (1 Stick) w/1411A's	139.95	94.98
KP-4A w/KPS-1411A's	309.95	215.95
KP-6A w/KPS-1411A's	339.95	210.98
KP-5C w/1411's or 1511's	389.95	276.98
KP-5CS w/1411's or 1511's	389.95	276.98
KP-7C w/1411's or 1511's	529.95	377.98
KP-7CS w/1411's or 1511's	529.95	377.98
KPS-1411 Servo	44.95	34.88
KPS-1511 Servo	44.95	34.88
KPS-16 Servo (Super Mini)	54.95	43.98
KPS-1411A Servo	39.95	27.98
KPS-1511A Servo	39.95	27.98
Kraft Transmitter Module	24.95	19.99
Kraft Receiver Module	24.95	19.99
Kraft Receiver KPR-5C	49.95	39.95
Kraft Servo 15 H	49.95	39.99
Kraft Elec. Rider Motorcycle		53.99
Cesana Cardinal Electric		67.49
EP6 Motor Batt. 004-003		22.49
Slow Rate Charger 004-004		8.75
Fast Rate Charge 004-005		22.49
6 Cell N. Cad Batt. Pack 004-015		22.49

## COX/SANAWA

2 CH Dry (2 Servos)	89.95	71.99
2 CH WHL (2 Servos)	139.95	97.98
4 CH (Champion)	449.95	299.95
6 CH (Champion)	479.95	319.95

## WEBRA — MRC

ITEM	LIST PRICE	East End PRICE
1022 40 RC		79.99
1020 61 RC		100.98
1034 40 RC FI		89.98
1024 61 FI SR		124.98
1026 61 RI SR		129.98
1023 40 RC Marine		94.98
1035 40 RC SR Marine		104.98
1020 61 RC Marine		129.98
1025 61 RC FI Marine SR		139.98
1037 91 RC		139.98
1039 91 RC Marine		159.98

## ENYA'S

.09 RC III TV	42.98	24.99
.15 RC IV TV	48.98	28.99
.19 RC V TV	53.98	31.99
.35 RC III TV	62.98	37.99
.40 RC TV	106.98	57.99
.60 RC III TV	137.98	78.99

## COX R/F PLANES R/C

CUB Trainer w/Radio	99.95	62.99
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## COX ENGINES

Tee Dee 020	20.95	13.99
Tee Dee 049	20.95	13.99
Tee Dee 051	20.95	13.99
Tee Dee .09	24.95	17.50
ORC 049	14.95	10.35
Medallon .049 W/T	18.95	12.50
Black Widow 049 #150	13.95	10.49
Golden Bee 049 #120	12.95	9.79

## COX MISC.

Glowheads 049 302-1	1.75	1.32
Glowheads 049 HC #1702	2.00	1.49
Glowheads D20 # 1032	1.50	1.13
Cox 5 x 3P Props #994	1.00	.75
6 x 3 Props #244	.75	.57
5 1/2 x 4 #243	.75	.57
Waterproof Servo #803060	49.95	29.95
Sail Winch #803810	39.95	46.99

## GRAUMPER R/C

Harbor Tug Bugster	199.98	159.98
Motor Yacht Commodore	126.98	101.98
Bell 212 Helicopter with HB61 Engine & Mechanic	1050.00	569.99
Bell 47G Helicopter	498.98	299.99
Bell 47G Float Gear	32.50	21.98
Bell 47G Canopy & Tanks	39.98	29.98
Gorch Fock — Noh Sailing	66.95	39.98

## WILLIAMS

5% Williams Wheels #145	11.95	8.79
5 Williams Wheels #133	9.85	7.99
4% Williams Wheels #144	9.85	7.99
3% Williams Wheels #143	7.10	5.89
3% Williams Wheels #142	5.25	4.35
Golden Age 3% #152	5.20	4.29
Golden Age 3% #153	6.85	5.65
4% #154	8.20	6.19
5" #155	9.85	7.39



## R/C TANKS

Leopard 1602	174.98	137.98
Sherman 1601	134.98	107.98
RT1603 Flakpanzer - Gepard		199.95



# ENGINES ARRIVING WORLD OCT. 1979

## OS 15 R/C & 20 R/C

After we ship our dealers priority orders on these we will show some inventory stock left so your dealer can get additional stock. These engines are super compact, lightweight, beautiful, excellent throttle response, with muffler.

MAX 15 R/C w/m . . . \$42.00  
MAX 20 R/C w/m . . . \$46.00



## THREE IN A ROW

Dave Brown, for the third year in a row, has won the Nationals in Masters Class R/C aerobatics using a World Engines Expert radio. This, plus his win at the Masters, proves that these are contest caliber radios sold at sport flyers prices. Dave used an OS 61 FSR in his Tipopare.  
7 Ch. Single Stick (5S) . . . \$484.95  
7 Ch. Expert (5S) . . . . . \$464.95  
7 Ch. Single Stick (4S) . . . \$459.95  
7 Ch. Expert (4S) . . . . . \$439.95  
5 Ch. Single Stick (4S) . . . \$419.95  
5 Ch. Expert (4S) . . . . . \$399.95

## OS 90 RSR Marine 65 RSR Marine

These water cooled marine engines show much heavier construction than anything previously offered. Complete with flywheel and universal. Large 7E series carb.

90 RSR MARINE . . . \$299.00  
65 RSR MARINE . . . \$249.95



## Supertigre X-60 RE & SE

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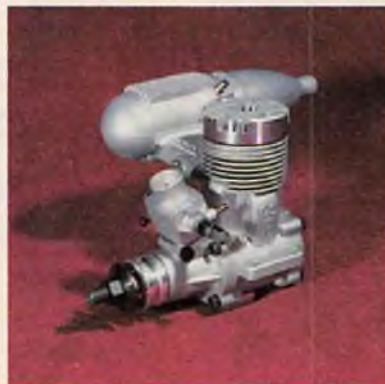
We are now distributing the plain bearing version of this engine. This price will go up December 1, 1979. The ball bearing version is expected July 1980. This engine has real Schnuerle porting and typically Supertigre, it is built on the strong side. Complete with nice muffler and blue anodized head. Carb action is the same as the big Tigres.

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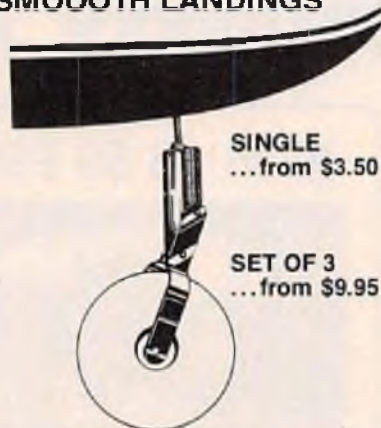


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**MIRAGE**

from page 94/73

I intend to use Marabell as my primary entry during the present contest season. Since the Kamakaze attack proved how robust she really is, I can now concentrate on learning more about her. There's no doubt in my mind that after we get to know each other better, we're going to rip a lot of knickers along the way. □

from page 71

Dick Graham had a Piper Pawnee crop-duster, both, if memory serves me correctly, last seen at Oshkosh 6 years ago, when there was no Sport Scale event. The Windecker, following the cast plastic construction of its prototype, has a near seamless smooth finish with next to no 3-dimensional detailing. It carries a cabin interior, but this is not really visible in the slightest from the edge of the

judging circle and any judge who can read, sees the rule that cockpits are to be entirely disregarded should they catch a glimpse. The Pawnee is mostly a new model, using the tail and assorted bits and pieces Dick found around the landing crater after it was shot down by a radio problem

Comments were made on this question that "there ought to be a rule..." As a matter of fact there is a rule... to page 100



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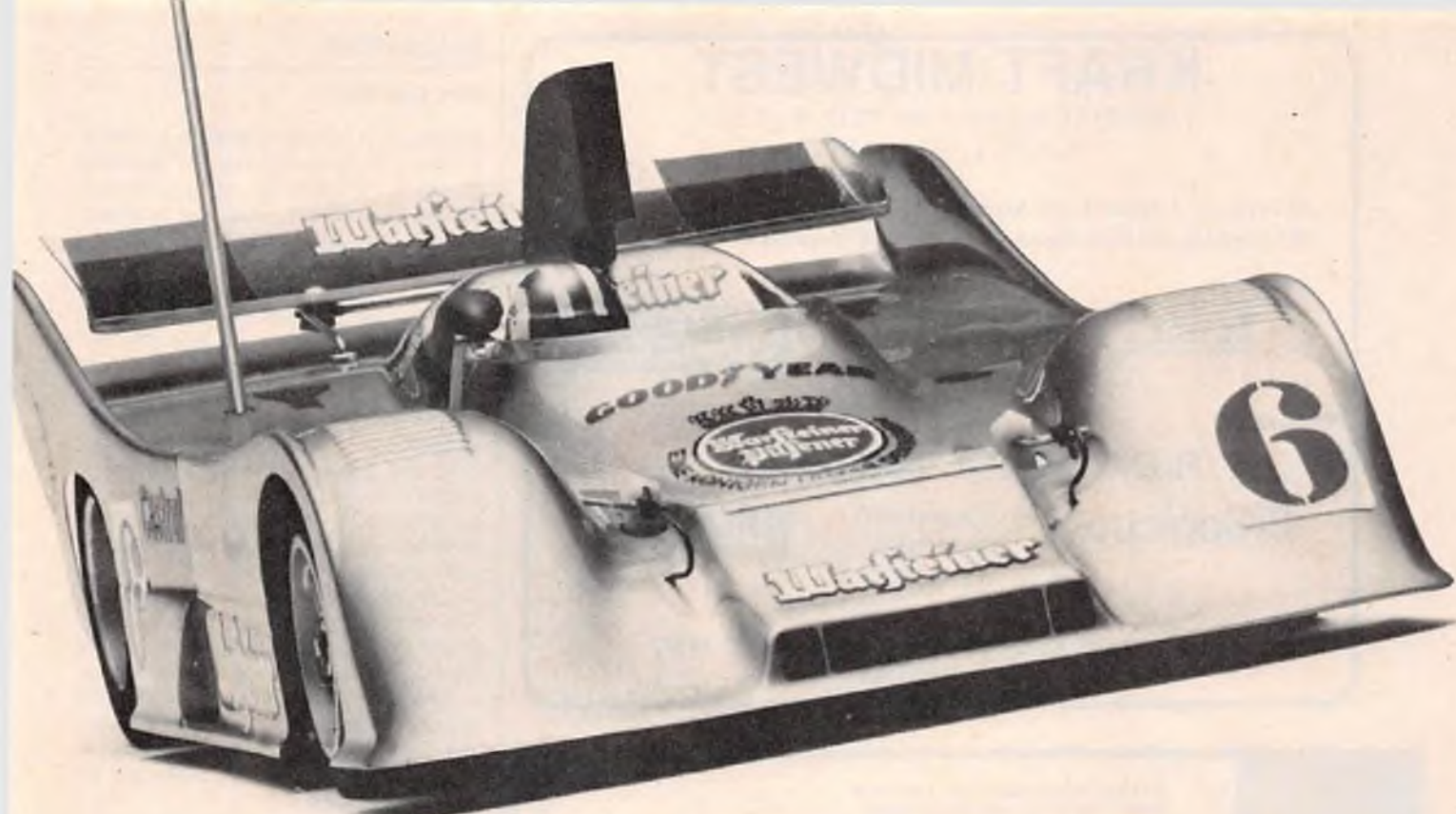
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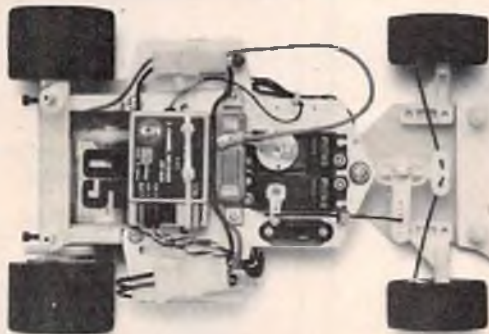
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## SCALE VIEWS

from page 98/71

proposal up for consideration to make winners in three previous Precision contests ineligible for entry in Sport Scale. Presumably, from the proposal before the Scale Contest Board, Precision non-winners could still enter Sport if it were adopted for the rule book. I'm afraid that this well-intentioned idea, with its involved record keeping, is absolutely impractical not to mention discriminatory. It will have to be enshrined with those other unrealistic suggestions previously made to define Precision Scale by the presence of a cockpit, or the use of 3-dimensional panel lines, or measuring all models entered and putting those that are exact scale outline in Precision!

Looking at this year's field, I noted Bud Atkinson's fine flying new ship, the Beech T-34C, turbine version of the Mentor. Though he used to fly a Mentor in Precision Scale, this one was built specifically with Sport Scale in mind. Yet, if one of the above "rules" had been in effect, he would have been put in



Bob Hoover's colors, flown on a Fliteglass P-51 by Lynn C. Elston. 64" span, 9 lbs.



Bridi Tigercat was a good performer in the hands of Eugene Radeke.



Steve Sauger's red and silver Orion, won Sterling Award for highest static score, homemade retracts worked fine.

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Precision by the 3-dimensional dimples on the tail surfaces. Other fliers had instrument panels in models that obviously never had any pretention of being a Precision. Into Precision with them? And I won't even attempt to guess the number of Sport Scales that had exact scale outline dimensions.

I think it is time we all recognize two facts: (1) there is no way that the quality of scale models can be legislated successfully; (2) any rule trying to ban airplanes from Sport Scale, on the grounds that they have previously flown in Precision, is basically unfair. It is quite easy for someone, in an area where Precision Scale is never flown, to build a model of equal quality and enter it only in Sport. The advantages of Sport Scale — no cockpit required, no measuring during judging, no dummy engines, etc. — will continue to make it by far the most popular event without any artificial "protection." But I will give equal time to anyone who thinks they can write a rule worded so as to be uniformly understandable and fairly administered without on the field arguments.

### NOBODY IS PERFECT

The hottest sideline dialogue centered on the perfect 100 point scores in static judging given to Jackson's Windecker and Buso's Navajo. The opinion was nearly unanimous that the judges had gone overboard. I was inclined to the same idea when, sitting a good 25' away, I saw the Navajo turned up on its side to clearly reveal a landing gear torsion bar and retaining strap. A perfect rendition would have concealed this non-scale item. In the case of the Eagle, the engine needle valve can be clearly seen protruding from the cowling in the accompanying flight photo. Closer examination of the models would probably find other areas of less than perfect execution.

Let me hazard a guess as to how this came about. It is possible that early in the judging, scores were awarded to average models that were actually too high. As higher and higher quality models came through, there was no where to go except up and up to make the necessary point distinctions for models deserving higher scores. If this is what happened, and it often does, it could have been avoided had the approach been a little tougher. It is human nature to want to be easy on your friends and neighbors. When it comes to a model fairly far down the totem pole anyway, it is even harder to downgrade it. But when a wide range of models must be numerically graduated, tough is the only way to go. Judging is a rough job and I am reluctant to haul these guys over the coals one more time. But the fact is that the Lincoln judging would have been accepted with little or no adverse comment if the whole field, from the highest to lowest, had been shifted

to page 112

DODGSON  
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top photo, JACK PITCHER with his MAESTRO MK11



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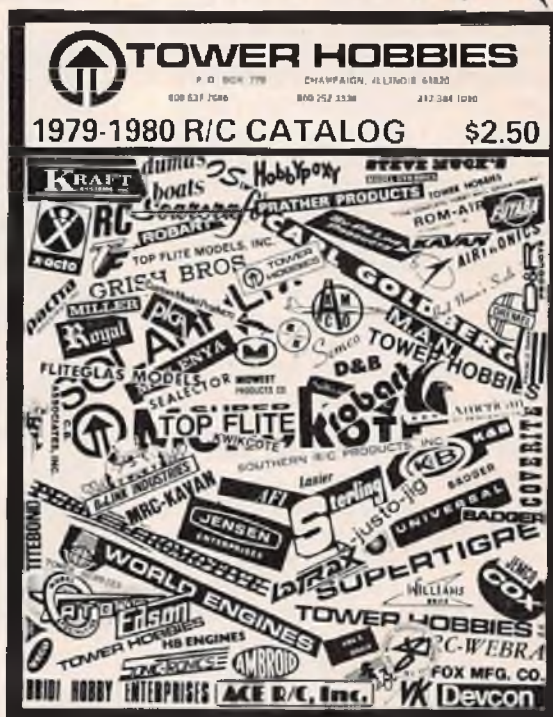




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Introducing the catalog you've been waiting for - the NEW 1979-1980 Tower Hobbies RC Catalog! This is the largest and most complete RC catalog ever published, by far! This new catalog is much more than just a list of available products at super low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

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

mat. This chart enables you to determine what accessories you will need to complete the kits listed in this catalog.

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

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



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Stable, smooth flying scale model of one of America's most popular light planes. Large wing area (295 sq. in. area) makes it a good trainer. Flies 3 to 4 minutes. 44 3/4" span. It is 30 3/4" long and weighs 33 ounces with radio equipment installed. Electric power is clean and simple to operate. Ample power for exciting performance. This prepacked aircraft can be assembled quickly with only a screwdriver. Motor battery pack recharges in 15 minutes. (Battery Pack No. 4-003 not included.) Requires a 2 channel radio. (Kraft 2A or 2AS recommended.) Motor is installed.

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The first real change in RC in many years. It steers and handles like a real motorcycle with positive control. Requires a 2 channel radio. (Kraft 2A or 2AW recommended.) Features proportional speed control and simulated disk brakes, aluminum die-cast wheels with chain drive, front fork rubber damper protects servos, special chassis balance and patented steering system. It is 13.6" long, 4.14" high, and weighs 3 1/2 pounds. Runs up to 25 M.P.H. The average person becomes reasonably accomplished after 1/2 hour of practice. Uses 6 cell Ni-Cad battery pack No. 4-015 and the Ni-Cad battery charger (either the fast rate auto charger, No. 4-005 or the home wall charger No. 4-004). (Batteries and chargers are not included.)

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### AIR CAPITAL MODELS READY-TO-FLY FB-100



Completely ready to fly (without engine and radio). Balsa and ply fuse, foam wing cores with a .012" thick skin. 57" span. Requires a .40-.60 size engine and a 4 ch. radio. Already painted.

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Features the new Cox RC BEE .049 engine with throttle and muffler, 41" span. Requires a 3 channel radio. All foam construction.

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### DREMEL No.730 DISC-BELT SANDER

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Sands, shapes, polishes, cleans, and sharpens. Uses 1" wide by 30" long endless sanding belt and a 5" diameter sanding disc with adhesive backing. Features fixed table for belt sanding, tilting table for disc sanding, miter gauge, 3" throat depth for internal belt sanding, and front-mounted on/off switch. Comes with 4 screws for easy mounting to work bench.

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NOW YOU CAN OWN A TOP QUALITY TOWER HOBBIES SIX CHANNEL SYSTEM WITH KPS-14II SERVOS FOR AS LOW AS \$149.95! PERFECT FOR PEOPLE WHO WANT A 2 OR 3 CHANNEL SYSTEM NOW AND WANT TO ADD MORE FUNCTIONS TO THEIR SYSTEM IN THE FUTURE!

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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 PAINSTAKING 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 -- interchange 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 \$2.50 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

**\$149.95**

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 30% 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 \$3.95  
NOW ONLY \$2.78  
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!



RETAIL \$8.94  
NOW ONLY \$4.68  
RCM002

**COX READY TO FLY SPORTAVIA 30% 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 \$62.98  
RCM014

**L.R. TAYLOR 22% OFF**  
**SUPER POWER PANEL**

**NEW**

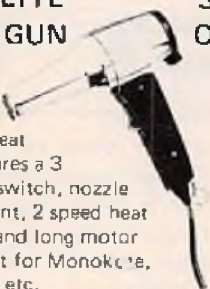


Designed to provide the ultimate in an RC field power system. Includes glow driver, expanded scale voltmeter, safe quick charger, fuel pump switch, and starter jacks. Uses any 12 v. wet or gel cell.

RETAIL \$89.95  
NOW ONLY \$69.98  
RCM333

**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 \$29.96  
NOW ONLY \$19.98  
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 \$99.95  
NOW ONLY \$69.98  
RCM105

**FUTABA 34% OFF**  
**FP-2GS 2 CHAN. RADIO**



One of the least expensive 2 channels available anywhere. It comes with 2 servos and is ideal for cars, boats, small planes, or gliders. Great in the Centurion or Sportavia. Requires 11 pencil batteries.

RETAIL \$109.95  
NOW ONLY \$72.98  
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 \$72.50  
NOW ONLY \$46.98  
RCM008

**K&B .21 36% OFF**  
**OUTBOARD**

This water cooled 3.5cc competition engine is the ultimate in outboard engines. It offers the superior control characteristics of outboard drive.



RETAIL \$107.00  
NOW ONLY \$68.98  
RCM152

**COX 30% OFF**  
**READY TO FLY CESSNA CENTURION**



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 \$69.95  
NOW ONLY \$48.98  
RCM001

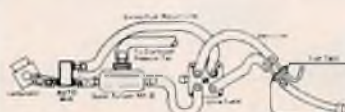
**K&B .61 RC 38% OFF**  
**W/MUFFLER No. 6525**



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

RETAIL \$96.50  
NOW ONLY \$59.98  
RCM012

**ROBART 25% OFF**  
**AUTO MIX**



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 \$9.95  
NOW ONLY \$7.48  
RCM255

**DU-BRO 36% OFF**  
**KWIK FILL FUEL PUMP**



RETAIL \$10.95  
NOW ONLY \$6.98  
RCM010

**WEBRA .61 RC SPEED 34% OFF**  
**SCHNEURLE**



Features the slide valve Dynamix carb which is used by top pattern flyers. The new carb must use pressure (either muff or pump) to run properly. It has a stronger crankshaft & a wider intake port to produce & handle the extra power.

RETAIL \$229.80  
NOW ONLY \$119.98  
RCM341



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**TOP FLITE  
SEALING IRON** 30% OFF



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

RETAIL NOW ONLY \$13.98  
\$19.95 RCM202

**DREMEL  
MODEL 381  
MOTO-TOOL  
WITH FULL  
ACCESSORIES** 37% OFF



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

RETAIL NOW ONLY \$46.98  
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**MILLER No.2017  
SPRAY SET** 40% OFF



Complete set includes a precision built genuine piston type air compressor, 12 ft. air hose, 16G siphon type spray gun & 14G air brush both with open & fine spray nozzles.  
RETAIL NOW ONLY \$48.98  
\$81.95 RCM016

**QUADRA 2 CU. IN.  
ENGINE** 29% OFF



Develops 2 horsepower! An engine suitable for large models with its scale-like sound and realistic performance. Comes with muffler, mount, and Tillitson pump/carb.  
RETAIL NOW ONLY \$99.98  
\$139.95 RCM017

**DEVCON  
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 \$4.48  
\$6.95 RCM018

**DREMEL 572  
MOTO SHOP** 37% OFF



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

RETAIL NOW ONLY \$62.98  
\$99.95 RCM019

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



This all time best seller is now re-designed with ailerons. 56" span. Uses a .30-.40 engine, all balsa construction. An excellent trainer.  
RETAIL NOW ONLY \$28.78  
\$47.98 RCM020

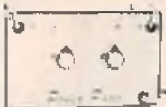
**K&B .40 RC ENGINE  
No. 8011** 35% OFF



THE MOST  
POPULAR RC  
ENGINE EVER  
MADE!!

Features a unique design for high power; and a Perry carburetor for excellent throttle response and easy adjustment - from a slow smooth idle to a roaring top speed.  
RETAIL NOW ONLY \$46.98  
\$72.50 RCM009

**POWER PACER  
BATTERY  
TESTER** 22% OFF



A nicad battery tester, cyclor, and charger. Detects weak and faulty cells. Charges at a safe 50 MAH rate. Holds battery capacity in MAH. Compatible with all popular radios. Order according to transmitter voltage.

RETAIL NOW ONLY \$46.98  
\$59.95  
9.6 v. RCM023 6 v. RCM024

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



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

RETAIL NOW ONLY \$29.98  
\$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 \$24.98  
\$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. BLX-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** 34% OFF

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



RETAIL NOW ONLY \$32.98  
\$49.95 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** 38%  
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 \$28.48  
\$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** 40%  
OFF



A super hot 1/4A engine ideal for free flight, control line, 1/4A RC, and more.

RETAIL NOW ONLY \$14.98  
\$24.95 RCM035

**PICA BUCKER  
JUNGMEISTER** 30%  
OFF



A new model biplane perfect for stand-off scale. This all balsa kit will accept any .40-.60 size engine, 60" span. Features mylar decals, plastic cowl, and wheel pants. Its ready-to-fly weight is 7 pounds.

RETAIL NOW ONLY \$69.98  
\$99.95 RCM340

**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 \$12.98  
\$25.95 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  
\$8.95 RCM038

**MONOGRAM RC  
LEOPARD TANK** 40%  
OFF



Radio included! This 1/32 scale tank is 8 3/4" long. It comes completely ready to run except for three "C" batteries and two 9 v. batteries which are not included. Four pylons are included. Climbs up steep grades.

RETAIL NOW ONLY \$29.98  
\$49.95 RCM302

**ANDREWS  
AEROMASTER** 39%  
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  
\$84.95 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 \$24.98  
\$38.95 RCM033

**K&B .61 RC W/PERRY  
PUMP & CARB & MUFF**



38% 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 \$76.98  
\$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** 38%  
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 \$39.98  
\$64.95 RCM044

**HB .61 RC PDP  
BALL BEARING** 27%  
OFF  
No.6300



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

RETAIL NOW ONLY \$87.68  
\$119.26 RCM143

**SIG KADET  
WITH AILERONS** 28%  
OFF



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. Aileron accessories included.

RETAIL NOW ONLY \$28.78  
\$39.95 RCM256

**LANIER  
COMET II** 37%  
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 \$40.98  
\$64.95 RCM047

**ASSOCIATED RC  
200 & 300 CAR  
KITS** 39%  
OFF



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  
NEW!! RC 300 Kit 32% OFF  
RETAIL NOW ONLY \$129.98  
\$190.00 RCM301



# HOBBIES

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**K&B .40 RC W/  
PERRY PUMP &  
CARB NO. 8360** **38%  
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 \$64.98**  
**\$105.00 RCM049**

**ASSOCIATED 6 CELL  
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 Nationalist Body and radio (requires a 2 ch. radio) are not included. Fiberglass chassis.

**RETAIL NOW ONLY \$69.98**  
**\$102.00 RCM246**  
**ASSEMBLED CAR No. 3024**  
**RETAIL NOW ONLY \$82.98**  
**\$119.50 RCM338**

**GOLDBERG  
P-6E CURTISS  
HAWK BIPE** **33%  
OFF**



Span 41 1/2". Requires a .19-.35 size engine & a 3 to 4 channel radio. Includes molded foam wings, cowl & wheel pants, decals, pre-bent wire cabane parts, maingear, instructions and 3 ch. hardware. Also included are templates to paint the distinctive color scheme.

**RETAIL NOW ONLY \$29.98**  
**\$44.95 RCM296**

**TOP FLITE  
TRIM SEAL TOOL** **27%  
OFF**



Stripe, seal, and cover with the finishing trim touch! Two specially designed tips (one for fillets and curves, another for flat surfaces, hard to reach corners and pin stripping). High and low heat settings.  
**RETAIL NOW ONLY \$10.98**  
**\$14.95 RCM336**

**COX TRADEWINDS  
SAILBOAT** **50%  
OFF**



This new ready-built RC sailboat has a 60" height, and a 35.9" length. Requires a 2 ch. radio. Easily sailed using one servo for rudder control.

**RETAIL NOW ONLY \$84.98**  
**\$169.95 RCM316**

**MIDWEST  
ATTACKER** **36%  
OFF**



This popular molded foam kit builds fast and can perform most of the AMA pattern maneuvers. Requires a .19-.35 size engine and a 4 ch. radio. 48" span. Hardware package and plans are included.

**RETAIL NOW ONLY \$28.98**  
**\$44.95 RCM054**

**A-JUSTO-JIG  
WING AND FUSE  
JIG** **30%  
OFF**



The A-Justo-Jig holds alignment within .1%. Dihedral is built-in making a better and stronger joint. Rotates 360° to work on the bottom. Fuse jig fits on without tearing down your wing jig. Glider wings can be built one panel at a time up to a length of six feet per panel. Any degree of washout can be built in.

**RETAIL NOW ONLY \$41.98**  
**\$59.95 RCM055**

**DREMEL 580  
TABLE SAW** **37%  
OFF**



CUTS  
UP TO  
1"  
THICK-  
NESS!

Multi-purpose table saw especially designed for hobbyists. Rips, cross cuts, miters, straight cuts, dadoes.

**RETAIL NOW ONLY \$62.98**  
**\$99.95 RCM056**

**MIDWEST  
CARDINAL  
A.R.F.** **35%  
OFF**



This all foam trainer has a 46" span. Uses a 2-3 ch. radio, & a .049 to .15 size engine. Rugged and flies great.

**RETAIL NOW ONLY \$21.38**  
**\$32.95 RCM057**

**SIG BEECHCRAFT  
BONANZA** **25%  
OFF**



Perfect for RC sport scale and sport flying. Requires .60 size engine. 64" span, 44" length. Kit features full size plan layout for retracts and foam wing cores with tip chamber and washout. Included are documentation photos and hardware.

**RETAIL NOW ONLY \$52.48**  
**\$69.95 RCM335**

**AIRTRONICS  
OLYMPIC II** **30%  
OFF**



This 99.9" span trainer is capable of contest competition. All balsa with pre-cut parts. An excellent quality sailplane. Everything needed to complete the kit is included except glue, covering material and radio.

**RETAIL NOW ONLY \$34.98**  
**\$49.95 RCM030**

**DUNE  
BUGGY** **18%  
OFF**



This unbelievably rugged kit can tackle the roughest course imaginable. Uses a 2 ch. radio and a .19 size RC engine. 17" length.

**RETAIL NOW ONLY \$163.98**  
**\$199.95 RCM036**

**MARK'S MODELS  
WANDERER** **40%  
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 \$14.38**  
**\$23.95 RCM041**

**K&B .40 RC  
MARINE** **36%  
OFF**  
No.8060



An ideal, dependable, all-purpose engine. It has superb power, is easy to start and requires no break-in. Features water-cooled head, balanced flywheel, precision-machined U-joint nut (fits most ball drives).

**RETAIL NOW ONLY \$52.98**  
**\$82.50 RCM151**

**DUMAS BIG  
SWAMP BUGGY** **35%  
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 \$23.96**  
**\$37.00 RCM063**

**OPS .65 RC  
MARINE WITH  
TUNED PIPE** **26%  
OFF**



A new OPS engine with improvements including five boost ports. Features a water cooled head and will fit in place of a .60.

**RETAIL NOW ONLY \$169.98**  
**\$230.00 RCM337**





# TOWER

P.O. BOX 778  
CHAMPAIGN, ILLINOIS 61820

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**HB .40 RC PDP BALL BEARING No. 4200** **27% 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 \$61.98  
\$84.34 RCM142

**ZINGER WOOD PROPS** **30% OFF**



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

**10X6 WOOD PROPS(6)**  
RETAIL NOW ONLY \$5.88  
\$8.40 RCM021

**11X7 WOOD PROPS(6)**  
RETAIL NOW ONLY \$6.68  
\$9.60 RCM022

**FOX 1.2 CU. IN. OPPOSED TWIN** **30% OFF**



One of the finest 2 cylinder model airplane engines ever produced! Develops over 3 horses! The Fox Twin is a smooth running power plant.

RETAIL NOW ONLY \$174.98  
\$250.00 RCM234

**TOP FLITE F4U-1A CORSAIR** **40% OFF**



61" span. Requires a 4 ch. radio & a .60 size engine. Balsa sheeting for wings and stabs, hardware, and nylon fittings are included.

RETAIL NOW ONLY \$59.98  
\$99.95 RCM277

**PICA CESSNA 182** **33% 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 \$66.98  
\$99.95 RCM254

**MRC RTF HAWK TRAINER WITH ENYA .15 RC** **25% OFF**



You can be ready to fly this foam trainer within one hour. Comes with an Enya .15 engine already installed with muffler. Uses a 2 or 3 ch. radio.

RETAIL NOW ONLY \$74.98  
\$99.95 RCM069

**MRC FMC COMBAT VEHICLE** **25% 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 \$63.88  
\$84.98 RCM070

**ROBERT SUPER PUMPER MKII** **33% OFF**



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

RETAIL NOW ONLY \$11.98  
\$17.95 RCM227

**MRC LEOPARD ELECTRIC TANK** **20% OFF**



18" length. Takes 40 degree incline with ease. Movable latches, swiveling periscope, and authentic decals. Operates forward, reverse, left or right. Turns on a dime.

RETAIL NOW ONLY \$139.98  
\$174.98 RCM072

**K&B .40 (.6.5cc) RC FRONT ROTOR W/MUFFLER No. 9130** **36% OFF**



Outstanding horsepower in a front rotor RC engine! For scale or pattern. Features ABC cylinder and piston, rear exhaust, ball bearings, muffler, and schneurle porting.

RETAIL NOW ONLY \$69.98  
\$110.00 RCM342

**GOLDBERG HANDI TOTE** **34% 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% OFF**



This balsa and plywood kit has a 60" span. Uses a 4-5 ch. radio and a .40-.60 size engine. All nylon fittings, wire landing gear, and struts included.

RETAIL NOW ONLY \$59.98  
\$89.95 RCM165

**WEBRA .91 RC SCHNEURLE**



This powerful schneurle ported ball bearing engine offers reliable idle, smooth transition performance, easy starting, and untemperamental adjustments. Very reliable.

RETAIL NOW ONLY \$144.98  
\$268.35 RCM343

**K&B .21 RC SCHNEURLE W/MUFFLER (No. 8380)** **34% OFF**



Features ABC cylinder and piston, ball bearings, and Perry Carb. Rugged, powerful, and dependable. No break-in period required.

RETAIL NOW ONLY \$47.98  
\$72.50 RCM299

**MIDWEST SWEET STIK** **40% OFF**



54" span. Uses a .19 to .45 size engine. Requires a 4 ch. radio. This is a small version of the famous Ugly Stik. It's an excellent, ultra simple trainer.

RETAIL NOW ONLY \$25.78  
\$42.95 RCM078

**GOLDBERG SR. FALCON** **40% OFF**



The Sr. Falcon is the standard big trainer. 69" span. Uses a 4 ch. radio and a .35 to .60 size engine. Every design element is engineered for simplicity and fast building.

RETAIL NOW ONLY \$38.98  
\$64.95 RCM079



# HOBBIES

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MODEL	RETAIL	NOW ONLY	STOCK NUMBER
<b>KRAFT KRAFT KRAFT KRAFT KRAFT KRAFT</b>			
KP-2AW (Wheel) w/14IIA's	\$139.95	\$91.98	RCM080
KP-2AW (Wheel) w/15IIA's	145.95	95.98	RCM267
KP-2A (2 Stick) w/14IIA's	139.95	91.98	RCM081
KP-2A (2 Stick) w/15IIA's	145.95	95.98	RCM268
KP-2AS (1 Stick) w/14IIA's	139.95	91.98	RCM082
KP-2AS (1 Stick) w/15IIA's	145.95	95.98	RCM269
KP-3AS w/KPS-14IIA's	149.95	99.98	RCM328
KP-3AS w/KPS-15IIA's	155.95	103.98	RCM329
KP-4A w/KPS-14IIA's	309.95	191.98	RCM083
KP-4A w/KPS-15IIA's	321.95	200.98	RCM270
KP-6A w/KPS-14IIA's	339.95	212.98	RCM084
KP-6A w/KPS-15IIA's	351.95	219.98	RCM271
KP-5C w/14II's or 15II's	389.95	274.98	RCM085
KP-5CS w/14II's or 15II's	389.95	274.98	RCM086
KP-7C w/14II's or 15II's	529.95	377.98	RCM087
KP-7CS w/14II's or 15II's	529.95	377.98	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
KPS-20 Ball Bearing Water Resistant Servo	49.95	38.98	RCM330
<b>FUTABA FUTABA FUTABA FUTABA FUTABA</b>			
FP-2GS	109.95	72.98	RCM091
FP-2F w/S-7's	149.95	98.98	RCM092
FP-2F w/S-18's or S-22's	134.95	89.98	RCM274
FP-2E w/S-7's	149.95	98.98	RCM093
FP-2E w/S-22's	134.95	89.98	RCM275
FP-3S w/S-18's	144.98	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-7 Servo	39.95	29.98	RCM104
S-16 Servo	39.95	29.98	RCM103
S-18 Servo	29.95	22.48	RCM247
S-20 Servo (Mini)	39.95	29.98	RCM331
<b>SANWA SANWA SANWA SANWA SANWA SANWA</b>			
No.8020 2 Channel	99.95	69.98	RCM105

STOCK NUMBER	DESCRIPTION	RETAIL	NOW ONLY
RCM107	Airtronics Aquila	\$74.95	\$52.48
RCM315	American RC Commander	385.00	299.98
RCM209	Bridi Dirty Birdy 40 - wood	59.95	40.78
RCM115	Bridi Sun Fli 4-20	29.95	20.38
RCM116	Bridi Super Kaos 40	55.95	37.98
RCM118	Bridi Super Kaos 60	69.95	47.58
RCM061	Bridi UFO	129.95	69.98
RCM124	Coverite Balsarite	3.20	2.38
RCM295	Cox Hydroblaster w/.049 & Radio	110.95	74.98
RCM127	Cox Tee Dee .09	26.95	17.48
RCM126	Cox Tee Dee .051	24.95	15.48
RCM316	Cox RTP Tradewinds Sailboat	169.95	84.98
RCM128	Craft-Air Butterfly II	49.95	32.48
RCM312	Craft-Air Piece O'Cake	24.95	17.48
RCM212	Craft-Air SD-100 Glider	59.95	35.98
RCM217	Dubro No.203 Kwik-Switch Mount	1.75	1.38
RCM131	Dumas Atlas Van Lines U-1	52.50	33.98
RCM220	Dumas Competition DV60 - glass	105.00	66.98
RCM319	Dumas Dauntless	75.00	47.98
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RCM236	Edson Adjustable Motor Mount	6.95	5.58
RCM132	Fox .15 RC Schneurle	37.95	22.78
RCM133	Fox .19 RC	36.95	22.98
RCM320	Fox .35 U/C Engine	26.95	17.48
RCM135	Fox .36 RC	39.95	25.98
RCM134	Fox .25 RC Engine	36.95	22.98
RCM137	Fox .45 RC Schneurle	51.95	32.18
RCM138	Fox .60 RC Eagle	69.95	41.98
RCM237	Goldberg RG3 Tri-gear Retracts	24.95	17.48
RCM321	HB .15 RC BB w/Muffler	43.23	31.98
RCM322	HB .40 RC BB	69.44	49.98
RCM323	HB .50 RC BB	76.27	54.98
RCM324	Hi-Flight Mirage Glider	59.95	41.98
RCM144	Hobbyoxy Formula 2 Epoxy	4.25	2.98
	Jemco Kits		30% Off Retail
RCM046	K&B .19 RC	50.00	32.48
RCM153	K&B .21 Inboard	74.00	44.38
RCM292	K&B No. 9120 .40 RR RE Form I	92.00	54.98
RCM239	L&L On-Board Ignition System	23.95	17.98
RCM223	Lanier Jester	74.95	46.98
RCM156	Mark's Bushwacker w/Accessories	52.95	33.98
RCM326	Mark's Bird Of Time Glider	59.95	38.98
RCM157	MEN Trainer (.15-.25)	31.95	22.98
	Monokote Reg & Trans 6' Rolls	9.00	5.38
RCM068	MRC RTF Cessna w/Enya .35 RC	449.95	277.48
RCM067	MRC RTF Cherokee w/Enya .40 RC	499.95	314.98
RCM242	OPS .60 RC Marine w/Tuned Pipe	195.00	147.98
RCM314	OPS .60 RC Ursus w/Parry Carb	130.00	99.98
RCM279	Orline Fokker D-VII	97.50	74.98
RCM317	Orline Sopwith Pup-NEW!	119.50	89.98
	O.S. Max & Supertigre Engines		Call For Prices
RCM013	Pacer Zap .36 oz	3.50	2.28
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RCM284	Rhom 2 Gear Retracts - mains	87.00	56.58
RCM285	Rhom 3 Gear Retracts - firewall	125.00	79.98
RCM297	Rhom 3 Gear Retracts - Flat Mt	125.00	79.98
RCM166	Robert Wing Incidence Meter	15.95	10.98
RCM327	Robert 2 Gr. 90 Degree Rot. Retracts	49.95	34.98
RCM290	Royal Photocell Tachometer	39.95	33.98
RCM325	Sig Cavalier	44.95	32.38
RCM257	Sig Cougar	47.50	34.18
RCM289	Sig Piper J-3 Cub	44.95	32.38
RCM169	Skyglas Phoenix 5	55.00	36.98
RCM173	Slimline Muffler for K&B .35-.40	9.95	5.98
RCM174	Sonic GR-3A Retract System	55.90	36.38
RCM179	Sonictronics 12 v. Fuel Pump	15.95	11.98
RCM175	Spickler Quickie 500	43.95	32.98
RCM062	Stafford Twin Commanche	149.95	104.98
RCM180	Sterling Fladgling	41.95	26.48
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RCM184	Surellite Foam J-3 Cub	39.95	25.98
RCM231	L.R. Taylor Multi-Charger	24.95	19.98
RCM313	Top Flite Contender 40	49.95	32.98
RCM229	Top Flite Contender 60	56.95	36.98
RCM188	Top Flite Freshman Trainer	47.95	30.98
RCM189	Top Flite P-51 Mustang	74.95	44.98
RCM186	Top Flite 10x6 (6) Super Maple	8.10	5.68
RCM187	Top Flite 11x7 (6) Super Maple	9.30	6.48
RCM230	Tower No. 11 Knife Blades (5)	.80	.48
RCM201	Wing Love Machine	49.95	27.98



We've got a colorful story...

# *pactra* **Aero-Gloss**



hot  
fuel  
proof  
dope

In fact, over 36 colors... in both hi-gloss and flat finishes. You can choose brush or spray in eight convenient sizes. BUT the colors are not the whole story. For over 26 years Pactra's Aero-Gloss Dope has been used by more "Award Winning" modelers than any other brand. WHY? **DEPENDABILITY.** A consistently durable hot fuel proof finish that holds up under the rugged handling a flying model must endure. Aero-Gloss looks good when you put it on, and stays looking good... that's a pretty important story for your pride and joy!

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the NEW  
**FUNETTE**  
the most forgiving  
trainer ever



This Month Only... (\$75.00 List) **\$49.95**

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### **The All Time Classic Trainer**

- 600 sq. in., 90% pre-built Balsa covered wing
- Flat bottom air foil
- Only join wing halves, add cap-strips & leading edge
- Jig pre-built fuselage, you only add tail-feathers and other minor finishing
- A truly "forgiving" trainer
- .35-.40 engine size

**Johnny Cashburn Manufacturing**

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## SCALE VIEWS

from page 101/71

down the scale about 3 points. Judging will never be a perfect job, but we have to keep trying for it.

### B.O.M. EXPLODES

As more and more new scale kits have arrived on the market with a greater percentage of molded and finished parts, it probably was inevitable that someone would challenge one of these under the Builder Of Model rule. On the final day of scale flying, Brian Crossley filed a protest against the entry of a Byron Originals Pitts flown by Dean Copeland. The protest was upheld by contest official Dick Carson and Dean was disqualified. Dean has appealed the decision to the Scale Contest Board, who will have their work cut out for them considering and, hopefully, clearing up the situation for the future.

Observers pointed out that also competing were two Model Merchant Martin Baker MB-5's which come with a built and sanded fuselage, pre-built tail and sheeted foam wings; the Bridi Tigercat, which has a complete fiberglass fuselage with integral fin, fiberglass cowls and nacelles, as well as the Sig Cessna 172 which features formed fuselage shells, cowl pants and cut foam wings. We may need a modern day Solomon to decide where a kit with formed parts ends and an "almost Ready To Fly" begins and write a rule describing this point.

## PIT STOP

from page 69

including an analyzer reading of every transmitter, displaying a digital readout of the transmitters frequency; workbenches immediately behind the drivers stand for the racers; permanent rest room facilities; and concession stands near the track. The Swiss had planned for everything and everything was working like clockwork.

Something interesting happened at the end of each day. They had about an hours "open practice" session. Now their idea of open practice and my idea of open practice was obviously not the same. I'm used to an open practice session where you must have a colored frequency clothespin before you turn on your transmitter. Their idea is just turn on your transmitter. Anything goes. Any frequency is okay, 2, 3, or 4 cars on the same frequency at once, which is impossible is okay. Needless to say, all but the most foolhardy just stood around and watched the Chinese Fire Drill. The driver's stand became too small. I

to page 116





# BALSA

SHEETS		36"	48"
1/16 x 2	[10 PK]	2.75	—
3/32 x 2	[10 PK]	3.30	—
1/8 x 2	[10 PK]	3.65	—
1/4 x 2	[10 PK]	4.55	—
1/16 x 3	[10 PK]	3.05	4.10
3/32 x 3	[10 PK]	3.65	4.91
1/8 x 3	[10 PK]	4.55	6.13
3/16 x 3	[5 PK]	2.55	3.45
1/4 x 3	[5 PK]	2.85	3.83
3/8 x 3	[5 PK]	3.64	4.90
1/2 x 3	[5 PK]	4.54	6.11
1/16 x 4	[10 PK]	4.85	6.53
3/32 x 4	[5 PK]	2.94	3.95
1/8 x 4	[5 PK]	3.30	4.56
3/16 x 4	[5 PK]	3.80	5.22
1/4 x 4	[5 PK]	4.27	5.75

BALSA STICKS		36"
1/16 x 1/4	[30 PK]	2.21
3/32 x 1/4	[30 PK]	2.30
1/8 x 1/4	[30 PK]	2.39
1/8 SQ	[30 PK]	1.85
3/16 SQ	[30 PK]	2.39
1/4 SQ	[30 PK]	3.65
1/4 x 3/8	[30 PK]	3.99
1/4 x 1/2	[30 PK]	4.37

BODY SIDES		42"
3/32 x 4	[4 PK]	2.94
1/8 x 4	[4 PK]	4.23
3/16 x 4	[4 PK]	4.50
1/4 x 4	[4 PK]	4.74

WIND SHEETING		30"
1/16 x 3	[10 PK]	2.55
3/32 x 3	[10 PK]	3.05
1/8 x 3	[10 PK]	3.65
1/16 x 4	[10 PK]	4.04
3/32 x 4	[10 PK]	4.84
1/8 x 4	[5 PK]	2.80

BALSA BLOCKS		36"
1 x 2		1.05
1 x 3		1.52
1 x 4		2.25
2 x 2		1.82
2 x 3		2.27

BIRCH PLYWOOD		48"
1/32 x 6	[2 PK]	3.49
1/16 x 8	[2 PK]	3.79
3/32 x 8	[2 PK]	4.29
1/8 x 6	[2 PK]	4.49
3/16 x 6	[2 PK]	4.49
1/4 x 6	[2 PK]	4.49

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| 3. SMOOTHIE - 52" SPAN - FULLY SYMMETRICAL  | 40 - 50   | 20.99 |
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| THE CUB IS A SLOW EASY FLYING MODEL. A PERFECT TRAINER FOR YOUR FIRST 1/4 SCALE MODEL - 60 - QUADRA   |           |       |
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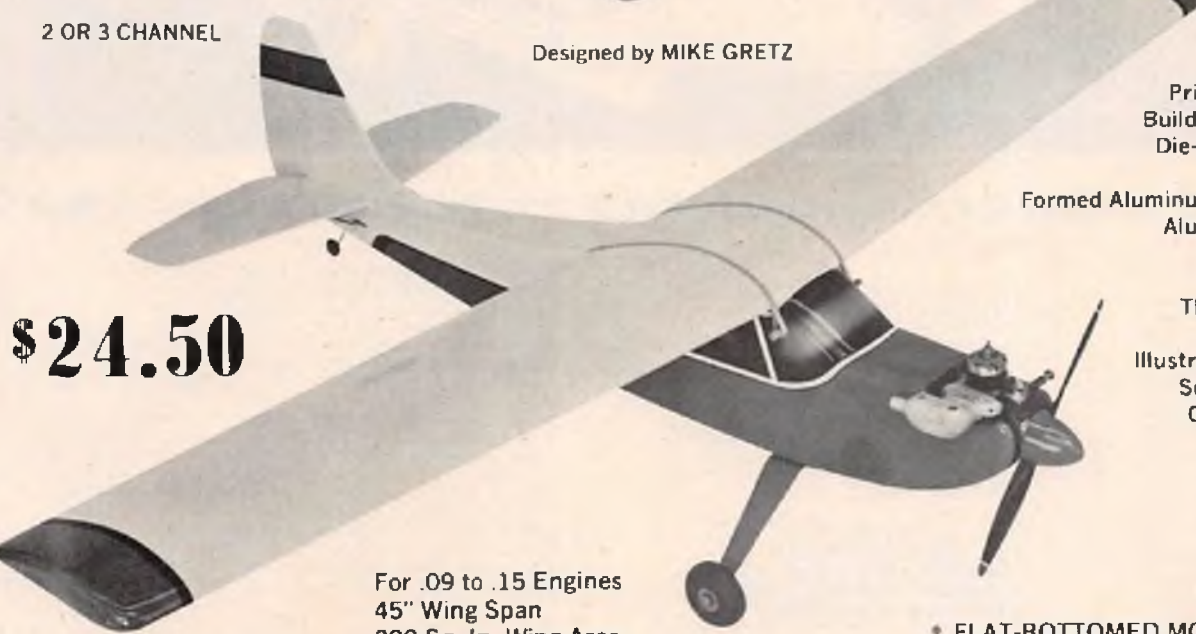
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ENGINES: .40 to .50  
WING SPAN: 50"  
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LENGTH: 45-1/2"



As the USAF Thunderbird pilots head for their F-5s in the background, the Florida Air Show Team gets ready to go into their aerobatic act. The Florida group has 5 Kougars.



## WHY AIR SHOW TEAMS FLY KOUGARS

Col. Art Johnson (of '78 Nationals P-38 fame) is the manager of the Florida Air Show Team (AMA-AST # 112). In recent letters he commented on their experiences with the Sig Kougars: "When I built the first Kougars, we were looking for a model that could be flown in formation to simulate the Air Force Thunderbird act. It was immediately apparent that you could not have designed a better plane for this act if you had had this purpose in mind from the start. We are flying wing man on leader formation and not just doing maneuvers on call. This is probably the most difficult type of flying I can imagine for RC type models but with practice we have been able to do it successfully with as many as four Kougars in flight... We have been using the Sig Kougars as the standard plane for our Thunderbird formation aerobatic act for some time. Each of our seven team members is required to keep one operational at all times.... All of our team members are high in their praise of the Kougars. It looks the part, is stable and forgiving, yet it responds well and is fast enough to look good in the Thunderbird type act...."

Formation acts consistently get more applause and comment at our shows than any other act including Snoopy and the Red Baron. We are hoping to improve and expand this type of flying as we learn more about it. I believe it is a tribute to Sig designers that we have found their kits the best on the market for this purpose."

We appreciate Art's generous comments on the Kougars and other teams have said similar things about formation flying with this airplane. Our opinion is that the low speed stability provided by the built-in washout in the wing, helping to prevent tip stall, in company with fast high speed capability, allows members of a formation to perform catch-up and slow-down maneuvers safely.

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## PIT STOP

from page 112/69

counted 22 drivers running at the same time! Unreal! I'd like more practice, but not that bad.

Sunday was another bright and sunny day, in spite of the English team being up all Saturday night doing their rain dance. Ishihara again set fast qualifying time at 7.26, but the traction on the track now was very good and his car had a noticeable chatter in the corners. Jeff Rold was right behind Ishihara with a 7.28, including a pit stop, so his lap times were actually better than Ishihara's. When the best drivers in the World are named, Ronnie Ton's name must be on the list. Ronnie qualified Third at 7.30, but his car was bunny-hopping so bad I don't know how he kept it pointed in the right direction. Jianas flipped over in his qualifying heat, but still managed a 7.31 placing the top 4 drivers within 3 seconds and moving the 4 of them straight into the Main.

The 5th through 24th fastest drivers raced in 2 Semi-Mains with the fastest 6 moving up to the Main. In the first Semi it was USA 1, 2, 3 leading with Chuck Phelps 1st, Rich Lee 2nd and Rick Davis 3rd. It stayed like this through 56 laps of the 1/2 hour race until Rich dropped out with mechanical problems. Phelps went on to win with Davis 2nd and Fujio Sasuga of Japan 3rd.

The next Semi-Main was up with 4 Americans in, Curtis Husting, Repete Fusco, Carl Petri and would you believe it — me? The race started and I was somewhere in the middle of the pack. They use a rolling start system, so you never know exactly when to punch it, it's sort of a guessing game, which I don't understand but it didn't make any difference. I flamed out in the same corner 6 times during the race anyhow. I think my idle speed was too low, although I hadn't touched the engine for the whole week. About the middle of the race I was running alongside Phil Booth. My qualifying time of 7.41 was close to Phil's and we were running together, when along came Curtis and blew us off like we were standing still. If he could keep up that pace, there'd be no catching him. If I had one criticism of the race, it would be that all of the announcing was in French, and when you realize that of the top 24 drivers only one could understand French and 16 could understand English, it would seem reasonable that some of the announcing should also be in English, as was done in Monaco where David Thomas did such an outstanding announcing job in French and English. What made it all the more frustrating was that something was going on in this Semi that had the crowd

to page 120



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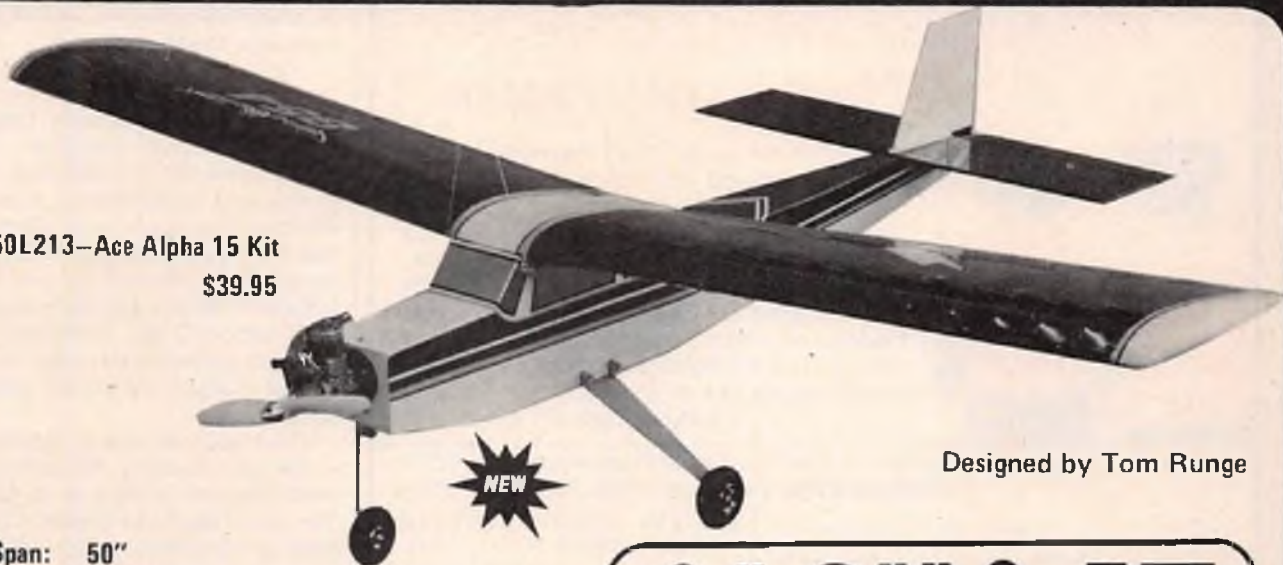
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## PIT STOP

from page 116/69

going bananas. Incidentally, there were over 10,000 paid spectators for the week, with 4,000 to 5,000 here Sunday yelling and screaming at something. After the race, I found out the announcer had the crowd pulling for 12 year old Repete Fusco. Repete had qualified at a fantastic 7.34 and was flying around the track behind Curtis. Everytime Repete passed a car the crowd yelled, and when he got nudged the crowd gasped in unison.

It was really something. Repete got hit in the rear breaking his muffler loose which cost him a move-up to the Main. The crowd died with Repete. Curtis did keep up his blistering pace winning the Semi by over 2 laps with Phil Booth, England, 2nd; and Dave Martin, England, 3rd.

There was about an hour's break before the Main and I was down at Phil Booth's table watching him plaster decals all over his body, wondering if they were to help bulletproof the body or whatever, and all the while Phil is muttering that at 35 years he's too old to drive against these fast kids. I guess Curtis and Repete made a little impression on him. I told him not to worry about it. If he's over the hill at 35 I'm ancient history at 52. I know how he feels — even more so. Curtis and Repete are still improving and I'm definitely not going in that direction.

Main Event time — the cars had their warm up period and then were lined up for the start. Apparently somebody deciphered the starting procedure because Chuck Phelps and Bill Jianas took off in the lead, with about 1 foot separating the 2 cars. Phelps was going very fast and Jianas was content to sit on his tail — just waiting for Phelps to make a mistake. Curtis Husting got caught in the 1st corner traffic jam, but by the 4th lap he was 10 feet behind Phelps and Jianas. Phelps bobbed, Jianas tried to take advantage of it but there wasn't enough room. The 2 cars tangled, spun out and Curtis slipped by to take the lead. Jianas quickly recovered to take 2nd with Phelps 3rd. The 3 of them continued on to pull away from the rest of the field. Jeff Rold, the 2nd Place qualifier, had the nose on his engine loosen up and he was running rich and Rick Davis was just plain down on power. Ishihara tangled with Rick in a corner sending Rick into the boards and I think Rick returned the favor later.

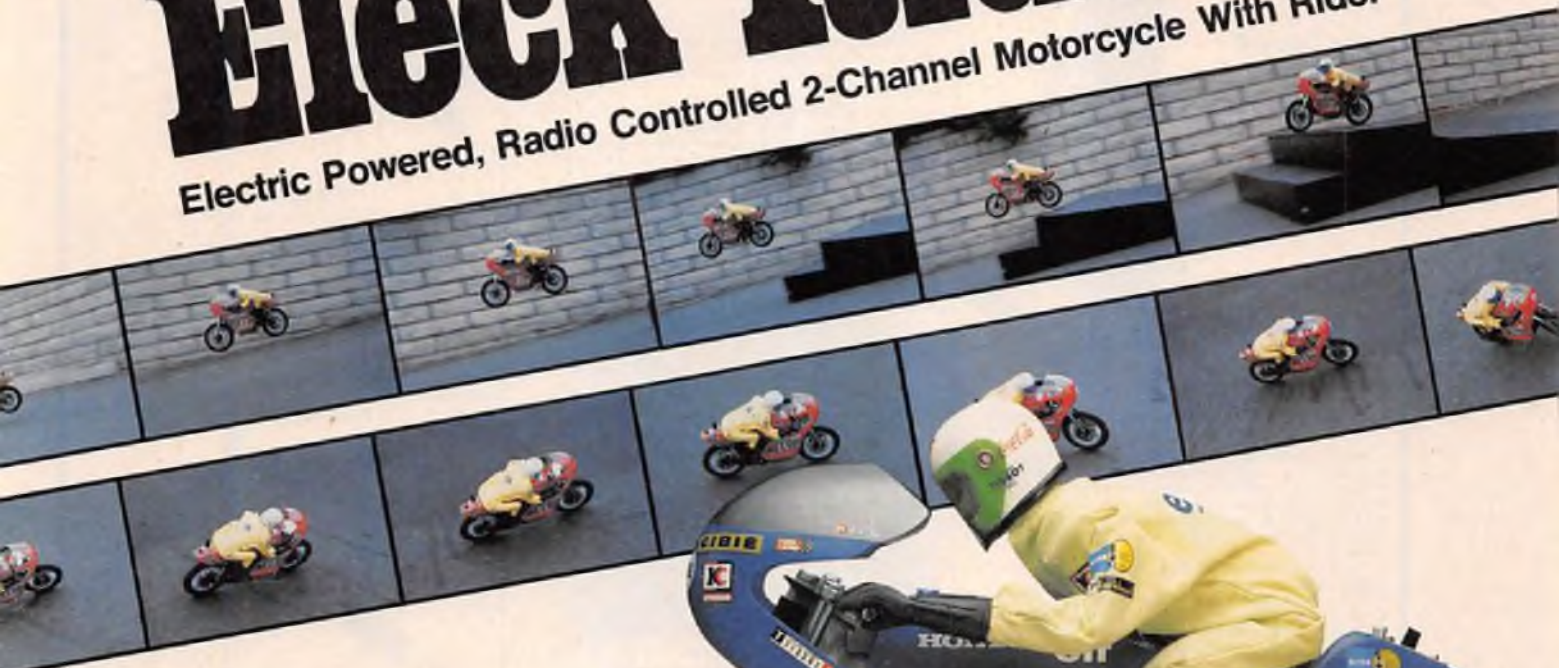
After 38 laps, Curtis opened up his lead, Jianas' engine died dropping him to 3rd and moving Phelps to 2nd. Just then, as Curtis was passing a car, he got knocked into the wooden divider and the engine died. The engine was locked up

to page 124



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580 Table Saw

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You have asked for these tools in your correspondence and phone calls. Well here they are at a savings to you. Some more goodies in my inventory and much more to come. I do appreciate your interest in my stock, and your suggestions do not go unheeded.

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49-04 THE CHOPPER ..... 7.50



**THE DUPLI-CUTTER**

This tool is designed for model builders who work in sheet materials such as styrene plastic (ie. Evergreen, Kemtron, etc). Several needed functions are performed such as (1) Squaring a piece of sheet so that subsequent pieces are easy to handle. (2) Securely holding sheet material providing an easy method to scribe and snap off pieces as desired. (3) But probably the most important function is the ease of making parts exactly the same size — makes duplicate car sides, building sides or sections, anything where you need more than one of the same size part go faster as well as providing a more accurate part. Accepts sheets 6-3/4" wide. Single edge razor blade is the scoring tool (3 blades included). Operating suggestions included.

52-04 DUPLI-CUTTER ..... 7.50

**DREMEL**

MODEL 572



572 Deluxe Moto-Shop ..... 61.95

**DREMEL**

MODEL 701



701 Deluxe Moto-Lathe ..... 39.95

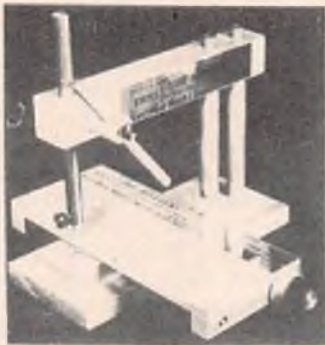
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50-4 SENSIPRESS ..... 28.00

**OPTIONAL ACCESSORIES FOR SENSIPRESS:**

5060-4	V PLATE	1.00
5051-4	BLANK	.50
5052-4	1/16" TIP	.90
5053-4	3/32" TIP	.90
5054-4	CONE	.75
5050-4	OVERSIZE 1/2" O.D.	1.00
5056-4	BORED 2.0MM	.75
5057-4	BORED 3.0MM	.75
5058-4	BORED 1/8"	.75
5100-4	CENTERPUNCH	2.50
5059-4	SET OF ALL ABOVE EXCEPT 5053, 5050, 5060	4.95

\*Is included with 50-4. All above 3/16" shank to interchange into ram except 5050 and 5060

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SENSIPRESS is a MINIATURE PUNCH PRESS. NIBBLER with the installation of the ram adaptor to hold punches, and installation of the die in the base. Punches 1/8" holes easily larger holes may exceed tool capacity depending on material and thickness. Recommended capacity — 1/8" hole in .020" half hard brass. If you want more than just a hole, then "ribble" your way with adjacent punching to make car window openings, etc.

5001-4 PUNCH ADAPTER ..... 2.50

**HOLE PUNCHING TOOLS FOR SENSIPRESS (PUNCH ADAPTER)**

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5011-4	1/16" ROUND DIE	2.50
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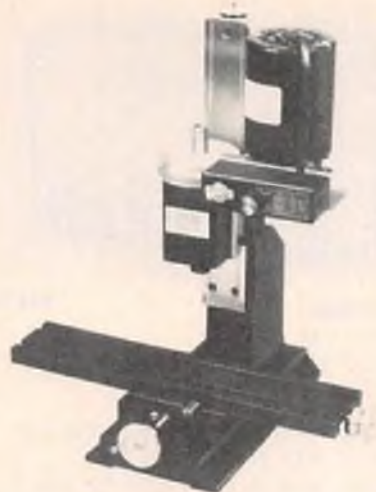
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5000 Vertical Mill ..... 246.50

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3021	Center Drill Set	11.70
3051-N	Milling Vise (new design)	40.50
3052	Fly Cutter	13.45
3054	Boring Head	31.50
3056	T Nuts 10-32 (2)	.85
3059	Slow Speed Attachment	17.95
3060	Set of 3 collets 1/8-3/16-1/4 & Draw Bar	19.95
3072	Drill Chuck & Draw Bar	14.95
4004	Drive Belt	1.80

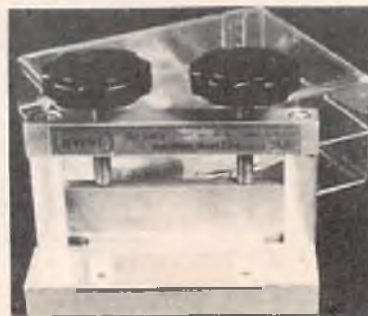
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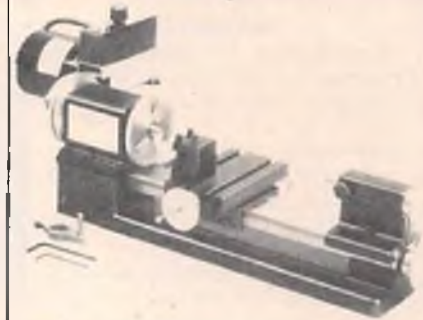
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48-04 THE BENDER ..... 15.50



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4000 Sherline Lathe ..... 203.50

4000-A comes complete with the following: Sherline Lathe (4000) — Tail Stock Chuck and Key (1072) No. 1 Morse Arbor (1188) — 3-Jaw Chuck (1041) — Everything needed to get started.

4000-A Sherline Lathe ..... 254.50

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3055	Morse No. 1 Blank	8.95
3056	T Nut 10-32 (2)	.85
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45-04 THE PULLER ..... 3.75

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## PIT STOP

from page 120/69

and I thought it blew up. I didn't find out till later that something had wedged between the flywheel and chassis plate locking the engine. Phelps had the lead past the halfway mark when he ran out of fuel. Jianas was now 2 laps down, flying around the track trying to make up time. He came up to pass Phil Booth and Dave Preston who was pitting for Phil, yelled up to Phil, "Let Jianas pass." That was a smart move because Jianas was going to pass him anyway. So here we had the Senior Citizen of R/C car drivers, at a staggering 35 years of age, showing all these young upstarts how to win a World's Championship race. Part of being a little older, is you're also a little wiser with a little more experience. Phil certainly was intelligent enough to know that his best chance to win was to drive as error free as possible, whether he had the fastest car or not. The object was to get as many laps as possible in 45 minutes, and this Phil did by winning the race with 116 laps, Jianas finishing 2nd with 115 laps and Phelps third also with 115 laps. Congratulations to Phil Booth — the 1979 World's R/C Car Champion.

Although America didn't win the World's Championship it can surely be proud of its team, with 7 of the top 9 qualifying spots being American, winning both Semi-Mains, leading the Main Event 1, 2, 3, and finishing 2, 3, 6, 7, and 10 placing 5 out of 10 drivers in the Main.

Congratulations guys!!

## SUNDAY FLIER

from page 68

Blunt leading edges stall "flatter" than sharp leading edges, and that definitely is a factor. Some full scale designers even include "stall inducers" in the form of sharp leading edge protrusions at the root because of this feature.

Next we hear from John Brownlee, 2407 Quince Drive, S.E. Decatur, Alabama, 35601, who writes:

Dear Ken,

Some very brief thoughts provoked by your July column.

It is incorrect to assume that the relative performance of airfoils will remain constant over a very wide range of Reynolds numbers. The lower the  $R_N$ , the lower the  $C_L$  at which the separation starts to move forward, resulting in stall at a lower  $C_L$  max value. At  $R_N = 400,000$  and below, thicker sections show higher  $C_L$  at stall, a marginally higher stall angle of attack and a more rapid decrease in  $C_L$  as the stall angle is exceeded. This is essentially the



opposite of the relative behavior of different thickness ratios at very high values of  $R_N$ .

Thus the deBolt suggestion of thick root - thin tip would be technically correct for high  $R_N$ . The Wischer suggestion of thin root - thick tip would be more fruitful for most model flight. Since the wing in question has substantial taper, wash-out would probably be required in either case to provide assurance.

Since the plane is to have four engines, effects of induced flow cannot be ignored. At take-off under full power and high angle of attack the prop wash velocity will be high and will serve both to increase the inboard  $R_N$  and decrease the effective angle of attack, making it doubtful that early root stall could practically be obtained. Keeping the C.G. forward and limiting up elevator travel will make it more difficult to stall the plane but there simply is no substitute for skillful piloting and sufficient flight speed at all times.

Sincerely,  
John Brownlee

Although John is right when he says there's no substitute for skillful piloting and sufficient flight speed at all times, not everybody is a skilled pilot and, at the critical take-off and landing speeds, it isn't easy to always have "sufficient" flight speed. And that's when you really can do without a tip stall! So, if the design will prevent it, you've got an advantage in addition to your skill level.

No discussion of anything having to do with flying would be complete without comment from the Republic of Texas (jus' kidding, Chuck Cunningham!). Jack Scarborough, Jr., 2307 Windsor Road, Austin, Texas 78703, writes:

Dear Ken,

In response to your column in RCM July '79, I would like to throw in my 2¢ worth concerning the relative thickness of the root and tip wing airfoil sections. My experience with three quite different moderately thin (12% to 15%) scratch design .60 powered sport/pattern type planes showed good stalling characteristics with no tendency to tip stall, where the tip sections were substantially the same thickness (in % chord) as the root. Taper ratio (tip chord/root chord), varied greatly from 1.0 (straight wing biplane) to .36, a highly tapered "delta" type wing. Two of the wings have the popular NACA series 6 laminar flow sections. As you did, I also studied NACA section wind tunnel tests to try and obtain both good stalling and high speed characteristics. I selected the airfoils as thin as seemed reasonable for these planes (to favor low drag), but with consistent stalling characteristics from root to tip. Most section tests indicated a rather gentle stall, except for the thin 12% section.

to page 128



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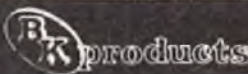
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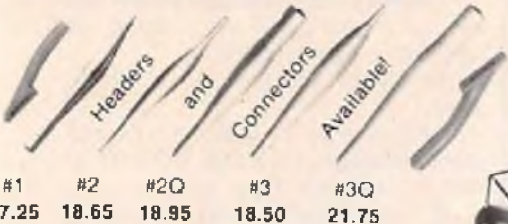
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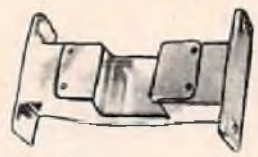
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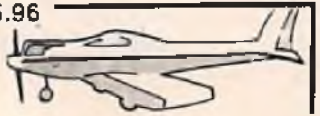


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SUNDAY FLIER

from page 125/68

*This shows a sharp drop-out at stall. But the R/C model plane wing stalled out well with a good max lift.*

*The planes and their NACA airfoils were:*

*(1) Sun Ray biplane (straight planform wings) root and tip 0015 (15%) Ref. RCM March '75, p. 25.*

*(2) Sport/Pattern monoplane (taper ratio = .73) root and tip 65012 (12%).*

*(3) "Delta Pusher" (taper ratio = .36) root 64A014 (14%) tip 64A215 (15%), small camber, with 2° wash-out. Ref. RCM Apr. '78, p. 15. For this wing, because of the extreme taper, the tip airfoil was changed to a slightly thicker one (15%), with a small camber to increase maximum lift, and 2° wash-out to delay the stall there. Otherwise, all wings had symmetrical airfoils. This approach could be used on certain scale planes, especially those with considerably tapered wings. Note that it appears there is a similar treatment to the airfoils on the "Double Eagle," the new high performance pattern ship in RCM May '79, p. 33, with respect to substantially constant % thickness root to tip, and a small wash-out, although the reasons given for the wash-out are different.*

*For the thinner wings 15% and below, I can't see asking for possible trouble by decreasing the thickness at the tip in relation to the root, creating a sharply stalling wing tip whenever the tip does stall. This could happen especially in adverse flight conditions which will inevitably occur, such as a sudden pull-up at low speed near the stall and/or gusty wind conditions at that time.*

*For thicker wings above 15%, the % thickness may decrease toward the tip with no problem, such as in the Bridi Kaos. I believe the root thickness is about 18%, decreasing to 16% at the tip - but in that case all wing sections along*

to page 130

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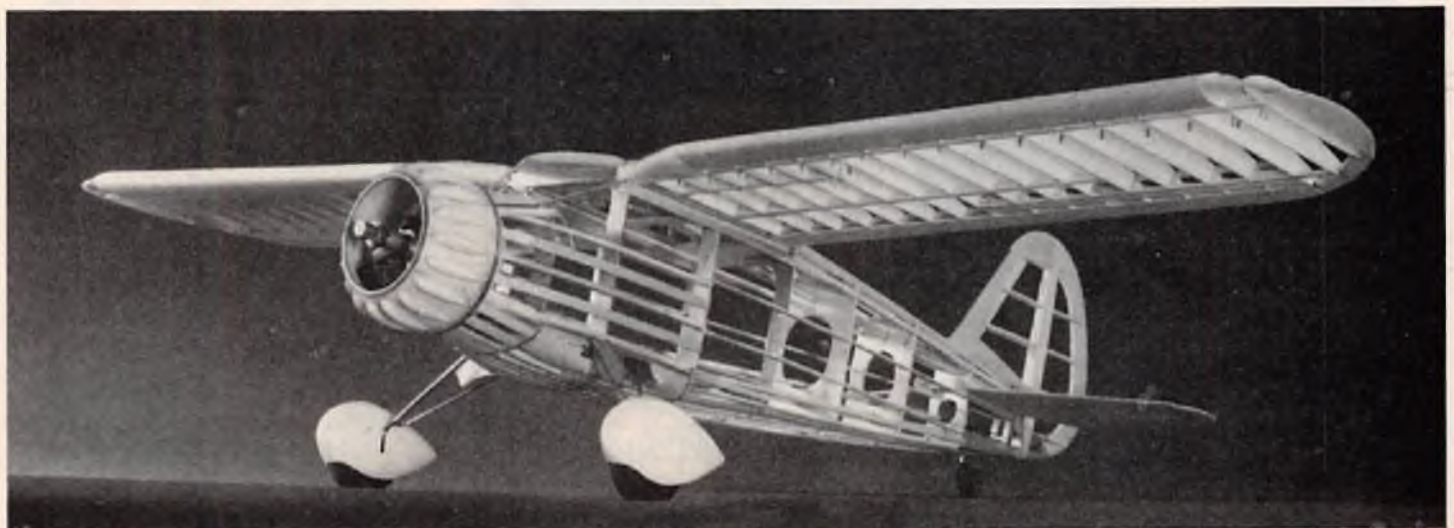
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SUNDAY FLIER

from page 128/68

the span are thick enough with a large enough leading edge radius to stall gently, in my opinion.

The reference for the NACA airfoil section tests is the same as given in my letter in RCM Apr. '78, p. 16 "Theory of Wing Section." This publication includes a comprehensive collection of consistent tests of most all subsonic airfoils. It is, therefore, very easy to compare various airfoils, all in the same book.

Sincerely,

Jack Scarbrough

Let's see now. Translate that from Texanese, and you get "Thin wings should be thicker at the tip and thick wings can be thinner --- as long as you keep the thickness at the tip around 16%."

I've saved this last letter for the wrap-up. After all, any "proud father" should be accorded the courtesy of occupying the "father knows best" position --- usually stated in the family as "and that's the last word!" George Druhak, Centre Island Road, Oyster Bay, N.Y. 11771, is a design engineer and project engineer at the Grumman Aerospace Corporation. The Navy says, "The name Grumman on an airplane is the same as sterling on silver." Here's George's contribution --- almost a column in itself:

Dear Ken,

I have enclosed my views on the wing tip stall controversy as follows. I had not intended that it come out as lengthy as it did --- it just did.

How To Get A

Favorable Wing Stall

Ken, your timing is perfect! I have just gone through an exercise to determine the section characteristics of NACA four digit airfoil sections at low Reynolds numbers. Like any new proud father, I have been dying to expose my new found knowledge to the world. Your request in the July issue of R/C Modeler has provided me the perfect opportunity. So here goes.

Full size aircraft have thinner section at the tip and thicker sections at the root in order to obtain maximum performance and lowest possible drag. The thicker root sections provide the depth for spars to carry the wing bending and torsion loads. The thicker sections result in lighter structure. Since the loads decrease as we approach the tip section, this section can be made correspondingly thinner.

Favorable stall characteristics in the clean condition (flaps up - gear retracted) are obtained by twisting the wing so that the tips have 1 to 3 degrees less incidence than the root (wash-out). Most full size aircraft will have wing twist built in. This wash-out also improves the



span-wise distribution of lift and helps to reduce the bending load at the root.

Before I tackle Ollie Bakker's problem, I would like to review the effects of Reynolds number on the properties of airfoil sections. It is the effect of Reynolds number that causes the controversy you discussed in your July issue.

Reynolds number ( $Re$ ) primarily affects the section maximum lift coefficient ( $CL_{MAX}$ ) and section minimum drag coefficient ( $CDO$ ). At lower Reynolds numbers the  $CL_{MAX}$  is decreased and  $CDO$  is increased. The decrease in lift coefficient is more pronounced on thinner section.

The slope of the lift coefficient versus angle of attack ( $\alpha$ ), the angle at which zero lift occurs, and the section pitching moment are not appreciably affected by changes in Reynolds number.

The data you showed was obtained at a Reynolds number of 3.5 million. NACA has also issued later reports on the characteristics of four digit sections (NACA Tech reports, TR610, TR631). NACA has also provided Reynolds number corrections down to 400,000 in NACA TR586. Let's take a look at what happens to the section characteristics with a change in Reynolds number.

At  $Re=3.5$  million, and the section characteristics corrected for an infinite aspect ratio, a plot of lift coefficient versus angle of attack for the NACA 2412 and NACA 2418 are shown in Figure 1. From the figure it is obvious that a root chord with NACA 2418 section will stall before a tip section that has an NACA 2412 section. Now let's see what happens at a lower Reynolds number. Remember decreasing Reynolds number affects the thinner section more than the thicker sections.

At  $Re=400,000$  the  $CL$  versus ALPHA plot is shown in Figure 2. It is quite apparent that the conditions have reversed. In order to have the desired stall properties, the root section must be an NACA 2412 section and the tip as NACA 2418 section. Thus both sides in the thickness argument can be right if they choose the proper Reynolds number.

One more thing to remember before I get to the problem at hand. At the Reynolds number closest to the model's region of operation, the section maximum lift coefficient can be increased by

- Increasing section camber
- Increasing section thickness (up to about 18%)
- Moving the location of the maximum camber forward

Increasing  $CL_{MAX}$ , increases the angle at which the wing will stall. Keep these facts in mind because we will use them to get the stall characteristics we want.

Okay Ollie, here we go.

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127	1.8	30
128	5.32	35
129	3.16	45
130	7.32	50
131	1.4	55
132	9.32	60
133	5.16	65
134	11.32	70
135	3.8	75
136	13.32	85
137	7.16	90
138	15.32	95
139	1.2	1.00
140	17.32	1.05
141	9.16	1.10
142	19.32	1.20
143	5.8	1.25
144	21.32	1.40

## COPPER TUBE (12")

**117	1.16	25
**118	3.32	30
**119	5.32	40
120	1.8	30

## SQUARE BRASS TUBE (12")



STOCK NO.	SIZE	PRICE EACH
149	1.16	40
150	3.32	45
151	1.8	50
152	5.32	55
153	3.16	75
154	7.32	85
155	1.4	95

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195	.047	.08
197	.050	.08
199	.063	.08

## SOFT BRASS FUEL TUBING (12")

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STOCK NO.	SIZE	PRICE EACH
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172	5.32x5.32	40
173	3.16x3.16	50
174	7.32x7.32	55
175	1.4x1.4	65

## BRASS CHANNEL (12")



181	1.8	45
182	5.32	50
183	3.16	55
184	7.32	65
185	1.4	75

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266	5.32x5.16	1.10
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There are several approaches that can be used to get the root chord to stall first.

(1) Twist the wing (wash-out) and keep the section constant.

(2) Use a thicker section at the tip.

(3) Use a section with a more forward camber location at the tip.

(4) Twist the wing (wash-out) and increase the camber at the tip section.

Let's see what happens in each of these cases.

If you choose to use the first approach, the effect on the wing will be

CONFIGURATION #	WASHOUT (DEG)	ROOT SECTION NACA	TIP SECTION NACA	WING FIGURE OF MERIT	WING CLMAX	EFFECTIVE WASHOUT (DEG)
1	-3.0	2416	2416	157	1.19	-3.0
2	0	2416	2418	152	1.19	-0.3
2a	0	2412	2418	159	1.16	-1.2
3	0	2616	2216	153	1.18	-1
4	-3.0	1416	4416	157	1.22	-3.0
5	-3.0	2316	2316	150	1.20	-3.0
6	-2.0	2318	4314	161	1.27	-2.0
7	-2.0	2316	4312	170	1.25	-2.0

TABLE 1

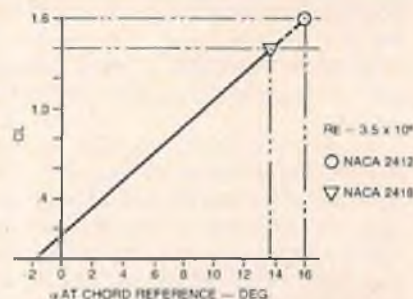


FIGURE 1

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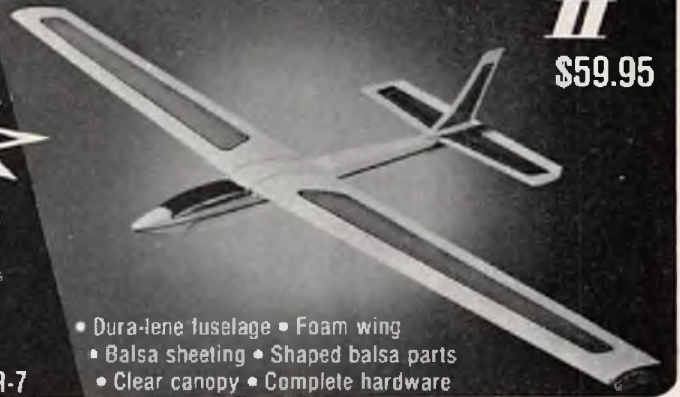
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as shown in Figure 3. Since the same section is used root and tip, the effect of wash-out is to let the tip section operate at a lower lift coefficient than the root. The difference in stall angle is about the same as the wash-out.

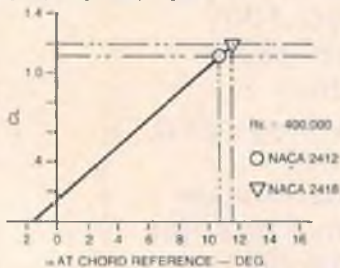


FIGURE 2

You can also get the type of stall you want by using a NACA 2412 (thin section) at the root and a NACA 2418

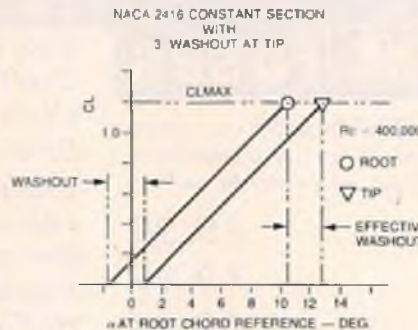


FIGURE 3

(thick section) at the tip as shown before in Figure 2. The difference in stall angles due to this thickness difference is about one degree, which is not as effective as the wing twist. The thin root section will give you some stress problems.

If you choose get a favorable stall by using an NACA 2616 (camber aft) section at the root and a NACA 2216 (camber forward) section at the tip the effect will be approximately about one degree difference in stall angles. Are you with me so far? - good.

Your fourth choice is to combine wing twist with an increased camber at the tip. This means you use a NACA 1416

to page 136

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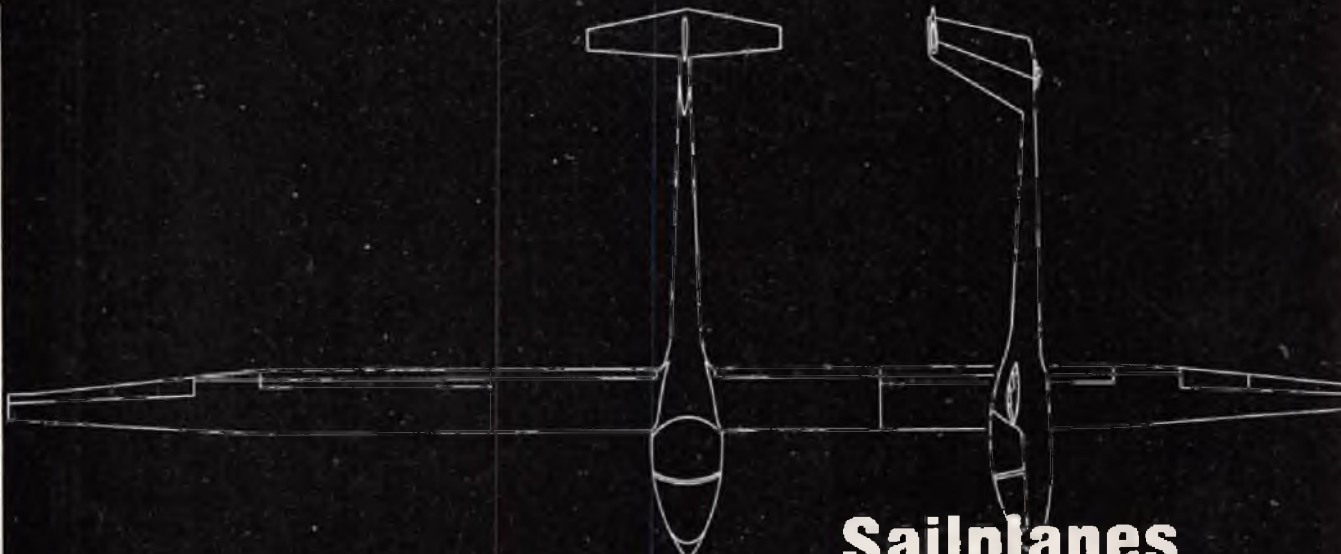
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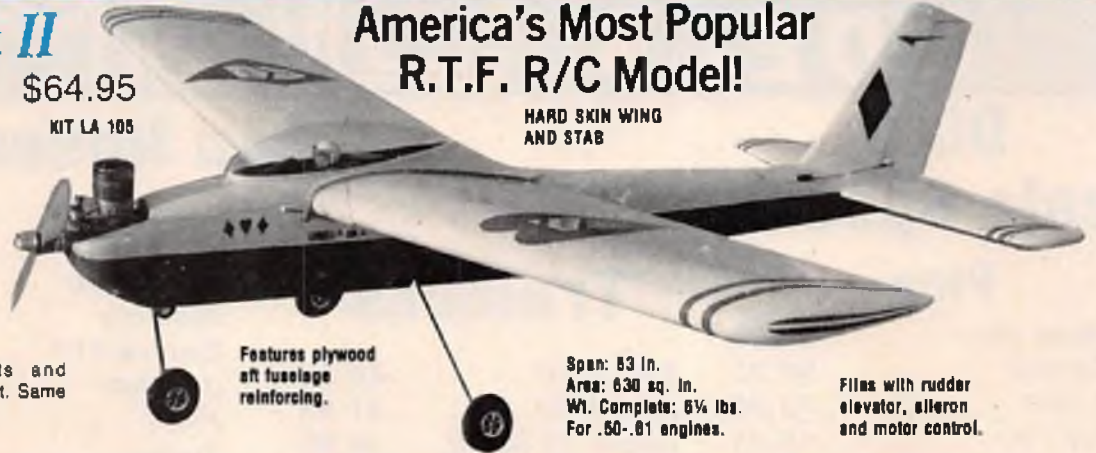
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### SUNDAY FLIER

from page 133/68

root section and a NACA 4416 tip section. The angle at which the lift coefficient is zero is  $-8$  degrees for the NACA 1416 and  $-3.8$  degrees for the NACA 4416. Typical CL $\alpha$  curves for these sections are shown in Figures 4 and 5.

If the tip is washed out three degrees, both the root and the tip will have zero lift at the same time and the entire wing will be at the same lift coefficient up until the root stalls. At this time the tip continues to lift until its maximum lift coefficient is achieved and then it stalls as shown in Figure 6.

What is the advantage of this approach over just adding twist with a constant section. Well, it loads up the

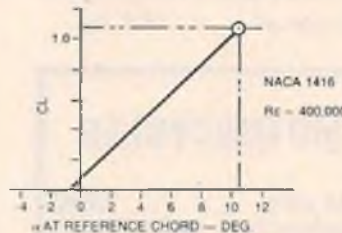


FIGURE 4

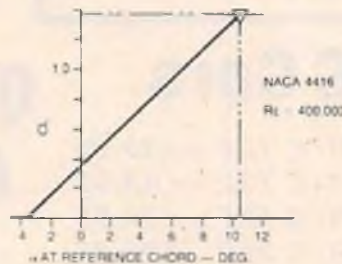


FIGURE 5

wing more evenly — all the sections are carrying their share of the load, otherwise the wing performance is about the same for both set-ups. What do I mean by wing performance? Well just this.

At the low speed end, the model

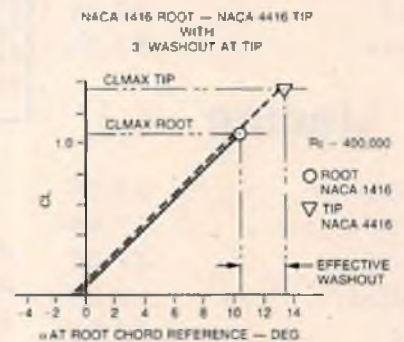


FIGURE 6

to page 138



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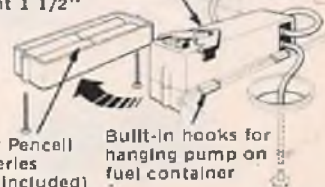
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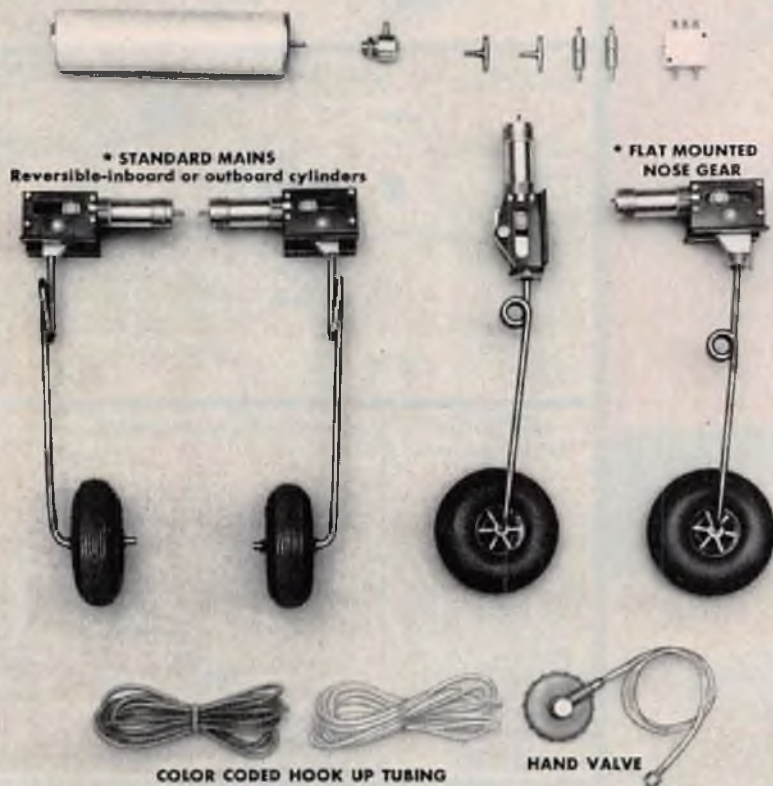


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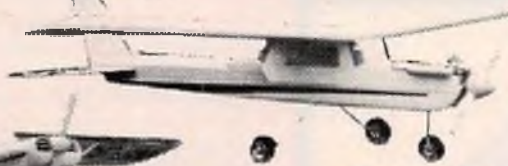
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SUNDAY FLIER

from page 136/68

should land as slow as possible. This means a high maximum lift coefficient. At the high speed end the model should fly as fast as possible. This means a low drag coefficient. Therefore my figure of merit is simply the maximum lift coefficient divided by the minimum drag coefficient.

$M = \text{Section Maximum Lift Coefficient}$

$D = \text{Section Minimum Drag Coefficient}$

The higher the figure of merit, the more efficient the section. Now let's apply this to the different combinations we have just looked at. They are listed in Table 1.

Wash-out is the amount of twist designed into the wing. The wing CLMAX is the average of the maximum lift coefficient at the root and tip. This is what my analysis tells me to expect from that particular section combination. The effective twist is the difference between the maximum angle at stall of the root and the tip. In some combinations it is equal to the wash-out.

You can see that just twisting the NACA 2416 section gives a pretty good overall wing. Using thickness to get good stall is not as effective, even with large differences in thickness. Increased camber at the tip gives about the same wing performance as the thickness change.

Although I haven't talked about them before, I have added three other combinations to the list to show how the wing performance can be improved. The improved performance is primarily due to a more forward camber location than the NACA 2416. The movement is small so I don't expect any bad post-stall effects. Configuration #7 gives the most efficient wing but may be a bit too thin for your model. I recommend #6 as an all around configuration because it has a good figure of merit and a high CLMAX.

Well, Ken, that is it for me. I am sure your other readers out there will also have their good arguments. In the meantime if Ollie wants to use the sections I have suggested and cannot find the ordinates I will be happy to mail them to him.

Yours truly,  
George Druhak  
Oyster Bay, New York

So there you are. Sunday fliers. All the answers on tip stalls, their prevention and cure. And I guess the nicest thing about it is that everybody's right --- depending on your point of view.

So what shall we kick around next month? Depends on what you write to me about. And, once again, please, if you want a personal reply, include a stamped and self-addressed envelope.

In any event, keep writing. We Sunday fliers gotta keep in touch. □



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Wing Span . . . . . 78¼"  
Wing Area . . . . . 635 sq. in.  
Weight Without Radio . . . . . 10 oz.  
Typical Flying Weight . . . . . 19 oz.  
Wing Loading . . . . . 4.3 oz./ft<sup>2</sup>  
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TO ALL MY FRIENDS AND ASSOCIATES IN MODEL AVIATION:

It is with deep regret that I find my appointment to the position of Chairman of Kraft Systems, Inc., to be psychologically incompatible with my personal objectives and consequently not in the best interests of the Company or the radio control hobby. Therefore, I am terminating my employment and relationships with Kraft Systems, effective Oct. 26, 1979.

I could not have been associated with a finer group of people than my friends and associates at Kraft Systems. I firmly believe that "a business is people," therefore, the future of the Company is in good hands.

The new president of Kraft Systems, Inc., Mr. Arthur Leighton, starts Tuesday, September 4, 1979. I hope he will be able to guide the Company to provide a greater contribution to the sport of radio control.

Our seven years association with our parent company, the Carlisle Corp., has been a pleasant one. They are a fine group of people who have been very fair and reasonable in all of our dealings.

I have been involved with model aviation most of my life, in fact, it has been my and my family's life. For whatever success I may have had, I owe a great deal to the hobby.

My future plans are uncertain, however, I hope that all of my friends in the hobby will keep in touch. If I can be of any help at any time, please let me know.

Sincerely yours,  
Phil Kraft  
President

**WORLD SOARING CHAMPS**

from page 64/60

broken only by a few sheep grazing here and there. We saw Ralf's clubhouse which, unlike most European clubhouses (which are filled with tables, chairs and beer mugs), was a workshop geared to the younger modelers. Inside was an impressive saw made especially to cut foam wings, molds for fiberglass fuselages and a group of very knowledgeable modelers to help. When

these kids grow up they are going to be hard to beat! We also went to Dieter Pfeffercorn's house (he is the Germany team manager) where for many months Ralf and Dieter slaved over the molds made for wings and fuselage. Accurate to the thousandth of an inch they have created jigs for every step of the process. It is a most impressive method. With a little sightseeing after Skip flew Ralf's plane, we took a night train to Holland where we stayed with the Schlossers (part of the Dutch support group). Between windmills and wooden shoes and hot air ballooning, Skip was able to fly TenHolt's Alba. Evenings

to page 144

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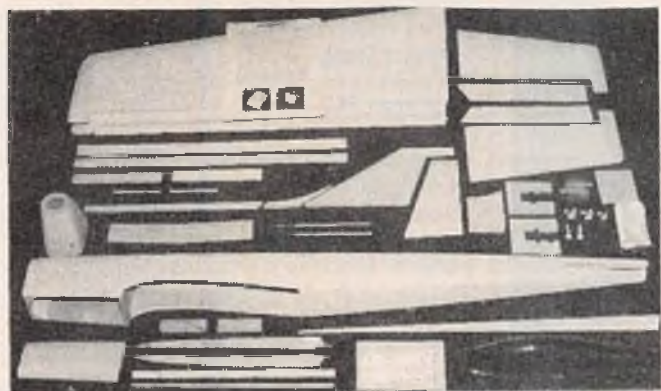
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## WORLD SOARING CHAMPS

from page 142/60

were spent discussing FAI and the types of models necessary for FAI. Finally we returned to the U.S. where Skip would compete in the L.S.F. on his way home. After such saturation with gliders, I was surprised and pleased to learn of his success. So FAI is over for the moment, but only dormant I fear. Another year and another team selection program looms ahead. For now we rest. □

## HERE'S HOW

from page 54

metal flange from the reflector by carefully grinding it off. Leave a small lip in order to solder the ground wire in place. When grinding, use plenty of water to keep the plastic reflector cool. The diameter of the reflector is then cut down to 1½" diameter with a Unimat lathe. Of course, this could also be done in a drill or drill press with a little care. Purchase two PR3 flashlight bulbs to use in place of the bulbs that come with the flashlights. The PR3 bulb (4½V) is normally used in a 3 cell "D" size flashlight.

Using a Carl Goldberg switching system for retracts, cut off the penlite cell case and solder on a snap cap terminal for a 9 volt transistor battery. The 9 volt battery lights the two PR3 bulbs unusually bright and being small, is easy to mount with little weight penalty.

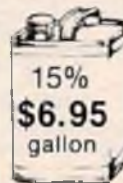
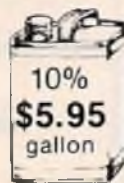
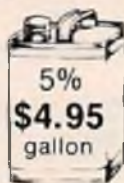
The lens covers were made by the following method. It may take some practice on your part to turn out a good lens. Heat a piece of clear plastic (.020-.030) approximately 1½" diameter in the oven at 375°F. When heated, carefully place it on a metal teaspoon measure. Using a Theragran-M bottle, place the mouth of the bottle directly over the plastic and squeeze the bottle. This will force the plastic into the measuring spoon, thus molding it to shape. The measuring teaspoon and the Theragran-M bottle mouth are approximately 1½" diameter which is exactly scale for the light lens used on Mr. Janacek's Mailwing.

The modified reflector and lens are then placed in a fairing under each wing and wired as shown in the sketch. A servo was used to actuate the microswitch turning the lights on and off. Don't expect too much from the 9 volt battery, which has a limited current capacity, with respect to the two PR3 bulbs. Using the lights for short periods will promote longer battery life.

Mr. Janacek has had great results with his landing light system and claims it lights up the front of his house from 80' away. Does sound interesting enough to try, especially at dusk. But at night --- never! □

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The bottom of the wing center, fuselage, rudder, elevator and ailerons were painted with three coats of Hobbyoxo color. No filler or clear was used. Sand the first coat nearly off, using 180-220 grit. After the second coat, sand with 320 grit and wipe clean. Vacuum wing and stabilizer and cover with Super MonoKote. The inner edges of the covering end at the fuselage side for the stabilizer, and 1/16" inboard at the wing bottom. The third coat of paint overlaps the covering 1/16". Use masking tape to do this (stabilizer also) but be careful when removing the tape so as not to loosen the MonoKote. Tape should be removed within fifteen minutes after the final coat. Now it is clear why I mounted the stabilizer before covering. The newer polyurethane finishes brush beautifully but be careful as they will bleed through the covering when heat is applied. It would be best, in this case, to cover before any color painting is done. In any case, I highly recommend that the fuselage be painted rather than covered with film.

**Assembly:** Ailerons and elevator can be hinged in place after the paint is dry. The canopy was painted separately and then carefully epoxied in place. The interior of the front half (SK-1) was given a coat of black Hobbyoxo.

A drop of fuel in the exhaust port is the easiest way to start these reed engines, so mount the engine "side winder" style.

The throttle control cable can be installed after the servo position has been planned. Use Sullivan .030 cable and tubing. The cable is tinned (solder) at front end before it is cut to length. Make a Z-bend here. If the first try fails, clip off and try again. A good job has no frayed ends. Now this can be cut to length and tinned at rear end. Use a E/Z connector at the servo arm. You may have to use a longer screw on the connector or solder a piece of 1/16" tubing on the cable end. Servo direction is not important as the ring on the throttle can be adjusted for either direction.

Use a 1" length of fuel tubing to act as a needle valve extension on the SK-2.

**Radio Installation:** In most cases it will be necessary to put the aileron servo in front of the main spar for balance purposes. A simple way to do this (see construction photos) is to mount the servo on a piece of 1/16" plywood with servo tape. This plywood tray can be held in position with one small screw. It will be laying flat on the wing lower sheeting. Glue a piece of scrap balsa on the main spar, 1/16" above the lower sheeting. The tray will slide under this retainer. A similar retainer of 1/8" plywood will hold the tray down and locked into position. A #2 metal screw, going through the leading edge brace and into the retainer, does the job.

to page 148

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Futaba FP-2E	149.95	100.	2	no
Futaba FP-2E S18	134.95	91.	2	no
MRC 772	119.95	84.	2	no
<b>2 Channel Wheel</b>				
Cox 8021	139.95	93.	2	no
Futaba FP-2F	145.95	100.	2	no
Futaba FP-2F S18	134.95	91.	2	no
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Cox 8031	159.95	104.	2	no
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Logictrol Ranger	187.95	119.	2	no
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Futaba FP-3FN	219.95	145.	2	yes
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Cox 8040	299.95	189.	4	yes
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Cox 8048	449.95	285.	4	yes
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Futaba FP-5FN	359.95	225.	4	yes
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<b>5 Channel Single stick</b>				
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<b>6 Channel</b>				
Cox 8060	369.95	230.	4	yes
Cox 8068	379.95	205.	4	yes
Futaba FP-6FN	369.95	234.	4	yes
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Futaba FP-7G	579.95	385.	4	yes
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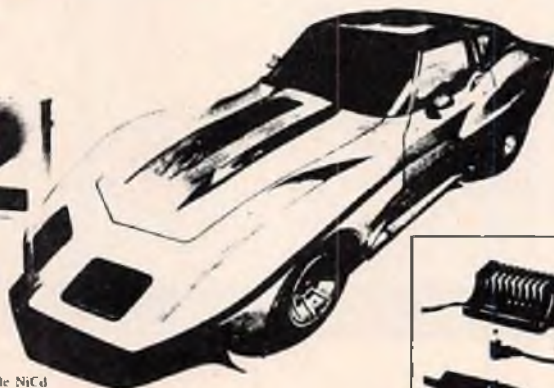
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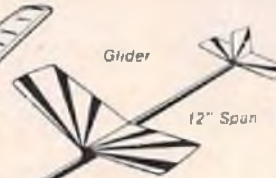


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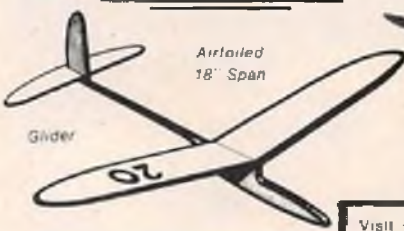
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## SKID KID

from page 145/49

Coat the servo tray with epoxy or dope in order to have a proper surface for the servo tape.

The pitch yoke can be a long servo arm or made from 1/16" plywood.

The average installation will have the battery (225 pack) in the nose compartment, the receiver directly over the aileron servo, and the remaining servos close behind.

For a three channel installation the servos should be of the smaller variety --- 1.25 ounces or less.

In my case, since I am using the Cannon 4 channel with two servos in the brick configuration, it was necessary to change two wires on the receiver-decoder board in order to have motor control along with elevator control

in the brick. This is easily done, but don't try it unless you know exactly what you're doing.

**Flying Notes:** No provision has been made for wing tip protection on landing. Most fields, corner lots, and playgrounds, etc., are grass covered. If you insist on landing on a hard surface --- you're on your own.

Before flying, check for proper incidence. Wing and stabilizer should be at 0 degrees. Hold the spinner and tail end and check for a heavy wing. Put some weight in the light wing tip if you have this condition.

Lock the wing over for any warps. These are usually easy to remove with a little heat. No washout is needed, as the wing is progressively thicker at the tips, giving good control at reduced airspeeds.

The C.G. should be as shown on the plans or slightly rearward for you

experts.

You don't need hot fuels for good performance --- this is not a racing machine. Cox regular glow fuel, or similar, is easy on plugs, the finish, and your wallet. A C-3 prop seems to be ideal. Carry an extra prop and glow plug in your tool box.

If your engine is new, adjust the throttle so it doesn't close fully at low throttle. This can be done at the transmitter trim or by adjusting the ring on the throttle. This can be changed after a dozen flights or so.

I can't visualize any flying problems. If you have flown anything before this, the "Kid" will not give you any trouble --- it has no vices.

Don't run wildly (you could trip) down the field to launch the "Kid." A one-step launch is all that is necessary.

After you have the "feel" of this plane, throttle back half way, or less, and come



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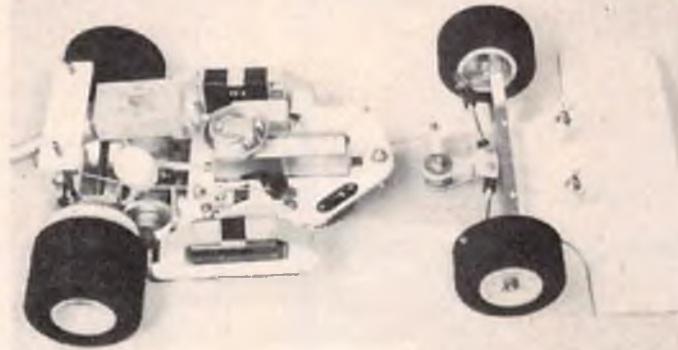


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in close for some real fun. One of my idiot friends (I won't mention any last names, Bill) likes to make furrows in the grass with the propeller, the length of the field. This will ruin any prop, so don't try it. Fly safely and have fun. □

### GASOLINE TOW WINCH

from page 48/46

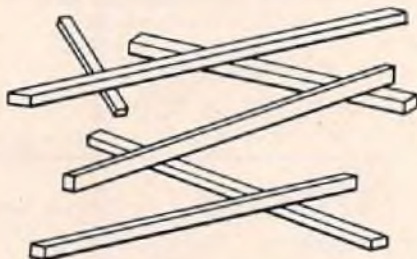
between the engine and the clutch.

I really feel that you will find a reduction drive easier to do and you should be able to go to a firm that sells either synchronous belt drives, chain drives, or gears, and come up with something suitable. You could do it with bicycle sprockets and chains, I'm sure. I do not recommend "V" belts as they tend to slip, place excessive loads on the bearings, and are highly inefficient in transferring power.

Once you get a suitable sprocket or synchronous belt pulley, remove the clutch bell housing and either weld the sprocket/pulley to it, or bolt it in place. If you weld it you must be careful to not warp the bell housing much. If you bolt it you should use multiple small bolts with flat heads so that you can counter sink them so that they don't strike the inner working of the clutch when in operation. One of the biggest problems with these units is that the clutches are very non-uniform and somewhat warped. Add to this the fact that the bell housing is likely to be in the shape of a very shallow cone and you can see that it is very difficult to mount something like a flat disc on it so that it runs true. This is the biggest problem in getting a direct drive unit to run true and, of course, it must run true. If you use a reduction drive, small eccentricities or wobble are not a problem, but in direct drive it is not

tolerable.

If you are using a reduction drive, the next thing to do is to take your winch drum and mount it on bearings in whatever way you find easiest. Flanges can be made out of 1/8" aluminum plate and screwed to the sides of your winch drum. This is another advantage of making a reduction drive, because you will have a large enough hub to drill into axially so that you can simply screw flanges onto the sides. If you go direct drive with a 3/4" steel rod for a hub, you will have to machine some thick collars to mount onto the hub so that you have enough area to mount your flanges. Note that if you use such collars, you will have to mount them with set screws. The forces generated by the winch line are just incredible and will actually slide the set screws on the steel no matter how tightly you try to set them. It will be necessary to drill into the steel about



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1/8" to get adequate anchor points.  
 If you build direct drive, it will be necessary make up some discs that mount on both sides of the clutch bell housing as shown in the pictures. It will also be necessary to face off the edge of the bell housing where the outer disc mates with it because this outer disc simply **must** be true because the rest of your drum assembly is referenced to it. I found it necessary to use a dial indicator after the bell housing was machined, and the final truing required that I diddle the screws on the discs until I got it true. The screws were then anchored with a cyanoacrylic glue such as "Zap" or "Hot Stuff." Finally, fingernail polish was applied to them. (Ed. note: sounds like a good place for some Loctite). All of this was done in an attempt to prevent them from working loose under the high vibration levels expected. Watch carefully as you start to assemble this "sandwich" because some screws must be installed before others or you can't get the first ones in.

In the direct drive unit, you will have to mount a bearing on the end of the drum that is not attached to the engine's clutch. I used a healthy ball bearing sealed race. This bearing has to be mounted solidly to the engine in some way. I made up a base out of 3/4" ply, bolted the engine to it and mounted the bearing at the far side. In my particular situation, this was a big problem because the bottom of the engine is not flat and the entire unit must be shimmed and diddled in order to get the bearing and the engine lined up so that there is no binding. This problem is compounded by the fact that wood is dimensionally unstable. The method used works, but I would prefer to have heliarc-welded a stout aluminum extrusion to the bottom of the engine housing and brought that out to mount the bearing in. Remember that when mounting the engine to the base that a three point mount will give you the best stability.

Winch drum dimensions are not critical. You can expect to easily get at least 2000' of 120 pound test line on a drum that is 4" wide with 5" flanges. This should be adequate for hub diameters up to about 2". You will have to have slightly larger flanges if you use a larger hub.

The throttle can be left to your imagination. Mine was made simply by mounting a piece of 1/4" aircraft ply on a small cabinet hinge. A teflon lined bicycle brake cable with steel cable was mounted so that the trigger was still usable on the saw. It is desirable to keep the trigger throttle functional as it makes starting the engine much easier.

With a winch this light you simply must stake it to the ground. A couple of back packing tent pegs are quite adequate for this purpose. They are

to page 154

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40 RC	106.98	55.98	49RCX Sch. w/Muff.	155.98	97.98
45 RC	106.98	55.98	60RCX Sch. w/Muff.	234.98	119.98
.60811 RC	137.98	68.98			

### FOX ENGINES

	LIST	CHC
.15 RC Sch.	\$ 37.95	\$ 22.98
.19 RC	36.95	22.98
.25 RC	36.95	22.98
.29 RC	39.95	24.98
.36 RC	39.95	24.98
60 EAGLE	69.95	39.98
1.2 Opp. TWIN	250.00	184.98

### K&B ENGINES

	LIST	CHC
40 RC	\$ 72.50	\$ 45.98
40 RC Press.	105.00	67.98
.19 RC	50.00	32.98
.61 RC	96.50	60.98
.81 RC Press.	125.00	80.98
.21 Out Marine	107.00	64.98
.21 In Marine	74.00	44.98

### OS ENGINES With Muffler

	LIST	CHC
.15 RC	\$ 40.95	\$ 30.95
.20 RC	43.95	32.95
.25 RC	46.95	34.95
.30 RC	50.95	35.95
40 RC	78.95	63.95

### WEBBA ENGINES

	LIST	CHC
40 RC	\$134.55	\$ 70.98
.61 RC	181.30	94.98
.20 RC FR Sch.	117.25	72.98
40 RC FR Sch.	156.30	81.98
.61 RC FR Sch.	217.20	113.98
.91 RC FR Sch.	253.65	132.98

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RA1003 Tyrrell P34	77.98	55.98	RA1208 Countach	84.98	59.98
RA1204 XR311 Combat	84.98	59.98	RA1209 Toyota Cel.	84.98	59.98
RA1205 Lamborghini	77.98	42.98	RA1210 Ligier	74.98	41.98



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Super Kaos 40	55.95	37.98
Dirty Birdy 40	59.95	40.98
Kaos 60	66.95	43.98
Super Kaos 60	69.95	47.98
Basic Trainer	39.95	26.98
Sportster	39.95	26.98
T-20 Trainer	34.95	23.98
Quickest 500	42.95	28.98

### LANIER



	LIST	CHC
Cessna	\$48.50	\$30.98
Transit	46.50	29.98
Pinto	48.50	30.98
Comet II	62.50	39.98
Caprice	73.50	47.98
Jester	73.50	47.98

### M.E.N.

	LIST	CHC
Trainer 20	\$31.95	\$22.98
Buzzard		
Bombshell	53.95	37.98

### P I C A

	LIST	CHC
Spitfire	\$89.95	\$54.98
T-28-B	89.95	54.98
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WACO	89.95	54.98
Dualist	99.95	62.98
Cessna 182	99.95	62.98

### MRC RTF

	LIST	CHC
Cessna 177 w/En. .35 & Muffler Installed	\$449.95	\$259.98
Cherokee w/En. .40 & Muffler Installed	499.95	309.98
Hawk Trainer w/En. .15 & Muffler Installed	98.00	74.98
Electra Hawk	199.98	112.98

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	LIST	CHC
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located inside. This can be prevented with a little planning, but what I consider the biggest disadvantage to this top servo mounting is that in the smaller airplanes, it is necessary to mount the servo at an angle to align its output arm with the aileron horns. This results in some built-in and unwanted differential.

What I like most about this system is that it does not require any cut-out in the wing, with the resulting weakening of an already thin and sometimes weak mid-section.

Nuf said! The photos are self-explanatory. In the QM, we mount all four servos across the fuselage, on individual trays. The foremost one is for ailerons, since this allows the longest possible pushrods back to the horns, which gives us the maximum amount of clearance when installing the wing.

Du-Bro or Goldberg hardware is used throughout, and the only critical part is determining the length of the pushrods. I prefer to make a couple out of soft wire to get the proper length before making the permanent ones. As always, be sure to start with the clevis in the center of its adjustment range.

On the Half-A shown, I used 1/16" wire for the torque rods, which required bushing up to 3/32" to fit the connectors for the clevises. A short length of brass tubing took care of that.

Try this system on your next small model, it really works well. And since no one knows who first dreamed it up, when you receive a compliment for being so clever, you can say something like, "Yes, it is one of my better ideas!" □

## MEMORIAL RACE

from page 43

gold stripes over black. It is complete with all lettering and really shines with the K & B clear epoxy. Joe Palek, a second year boater, brought his Dumas "Hot Shot" finished up as Olympia Beer of Unlimited fame. The lettering was just magnificent and really got the attention of the spectators, Joe collected 500 points in some heated racing. Mike Meelbusch drove a modified and reduced 4-60 Octura hydro.

Doug Riha, the wild and crazy redhead, entered his Borg-Warner tunnel. Gary Preusse had a nifty Excaliber finished off like the prototype Johnson Outboard boat. It looked just like the real thing. Gary's problem was running out of fuel on the fifth lap of a six lap heat on two occasions. Rano Wells of Kenosha, Wisconsin, proved to be too much for the other competitors in this class. His original design hull won the first two heats and finished first overall with 1100 points.

to page 160

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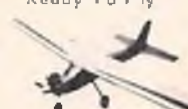
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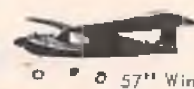
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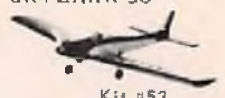


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21900 19 R/C	22.15
22500 25 R/C	22.15
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9505 heavy duty launch pail	25.75
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9511 adjust. tow-hook assem.	1.75

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226 fuel line-silicon, lg.-24"	.81
231 seating tape 1" 8x3" 8x36"	.76
236 mounting tape 1" 8x3x36"	.85
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push rod, 36" flexible (2)	1.44
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162 final filter-in-line	1.55
165 throttle flex cable-20"	1.20
203 kwik switch mount	1.55
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white	5.56
orange, blue, green, yellow, red	6.36

<b>COX R/C ACCESSORIES</b>	
100 aileron ext. cable	2.65
101 dual servo cable	3.55
156 serv. whls. & arms-asst.-std.	2.25
157 switch harness	5.35
158 servo wheels-micro servo	2.25
167 servo wheels-std. servo	2.25
160 extern. switch actuator	1.15
161 serv. tray-aileron, micro serv.	1.70
162 serv. tray-dual, micro serv.	2.25
163 serv. tray-2 micro serv.	2.25
--- 500 mah nicad-rect. or flat	15.99
003 225 mah nicad battery	15.29
152 dual charger	17.95

<b>MISCELLANEOUS</b>	
4 way wrench (austin)	1.50
turn carb. for cox TD 051 049	9.75
tack tag	.65
epoxy brushes 6/pkg.	.89
sandpaper - assorted	.39
nylon sandpaper - assorted	.79
1/2 oz. fiberglass cloth (K&B 8160)	3.80
microballoons-2 1/2 oz. (K&B 8163)	1.60
styramate sealer-1 1/2 oz. (MW 1500)	6.40
styramate thinner-8oz. (MW 1501)	2.25
auto mix - robart	7.49
ultra fueler - robart	3.16
super fueler - robart	1.80
#16 "T" pins-1 oz.	1.79
#20 "T" pins-1 oz.	1.49
foam rubber 1/4 x 8 x 12	.79
foam rubber 1/2 x 8 x 12	.98
foam rubber 1 x 8 x 12	1.59
#64 rubber bands - 1/4 lb. box	1.60
stripping tape (top flite)	
1/16" width	1.49
3/32 or 1/8" width	1.99
3/4" width	2.79
red, yellow, white, dk blue, gold or black	

## R/C KITS

<b>ACE</b>	
allstar biplane	14.99
high glider	11.99
alpha	13.99

<b>AIRTRONICS</b>	
102 q-tee	14.99
206 aquila	47.99
208 olympic II	31.99
210 aquila grande	85.99

<b>ANDREWS</b>	
h-ray	26.99
aeromaster	49.99
trainermaster	35.99
a-ray	29.99

<b>ASTRO FLIGHT</b>	
1001 asw-17 (glass)	53.99
1004 fournier	29.99
1011 bushmaster	26.99
1017 californian	39.99

<b>BRIDI</b>	
120 rcn trainer 40	36.85
130 rcn trainer 60	40.95
210 quickest 500	28.80
240 super kaos 40	37.50
250 super kaos 60	46.90

<b>CRAFT-AIRE</b>	
winddrifter	28.90
j-bird	41.90
drifter II	12.90
butterfly	29.90

<b>CHAMPION</b>	
kingfisher (.60 to .80)	79.90
beginners trainer	18.20
advanced trainer	25.20
150-152	31.50
sportster 20	27.90

<b>GOLDBERG</b>	
50 falcon 56 mk II	28.99
51 sr. falcon	38.99
52 jr. falcon	11.25
53 skylark 56 mk II	28.99
55 skylark 42	12.75
57 skylark 62	38.99

<b>GEE BEE</b>	
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dreamer	43.75
sea hawk	34.90

<b>LANIER</b>	
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108 transit	27.90
116 caprice	44.10
119 cessna	31.53
124 jester	44.10
146 pinto	31.53

<b>MARK'S MODELS</b>	
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windfree	26.90
wanderer	14.40
bird of time	35.90

<b>SIG MFG.</b>	
RC-31 kadet	29.90
RC-32 kommander	33.50
RC-35 kougou	35.90
RC-38 smith mini plane	39.90
RC-39 cavalier	33.50

<b>SURE FLIGHT</b>	
109 cessna skylark 182-ARF	23.99
116 piper j-3 cub-ARF	23.99
122 spitfire	23.99
127 cessna L-19 bird dog	41.99
129 P-39 aircraft	23.99

<b>VK MODELS</b>	
sopwith camel	49.90
cherokee	48.90
cherakoo babe	28.90
niauport "17"	49.90
fokker triplane	49.90

## R/C KITS CONT.

<b>TOP FLITE</b>	
RC-15 contender	34.15
RC-16 p-51 mustang	44.90
RC-17 p-40 warhawk	44.90
RC-20 freshman trainer	28.75
RC-22 contender 40	31.90

## PROPELLERS

<b>ZINGER</b>	
Diapitch	6/pkg each
7 4,5,6,7	5.19 .96
7 1/2 4,5,6,7	5.19 .96
8 4,5,6,7	5.62 1.04
8 1/2 4,5,6,7	5.62 1.04
9 4,5,6,7	5.62 1.04
10 4,5,6,7	5.99 1.12
11 5,6,7,8	6.91 1.28

<b>TOP FLITE</b>	
Super Maple	6/box each
9 x 6,7	5.25 1.00
10 x 6,7,8	5.67 1.08
11 x 6,7,8	6.51 1.24
12 x 4,5,6,8	7.56 1.44

## ADHESIVES

<b>AMBROID</b>	
1 1/2 oz. tube	.72
3.2 oz. tube	1.22

<b>TITEBOND</b>	
4 oz.	1.15
8 oz.	1.75
16 oz. (pint)	2.80
32 oz. (quart)	4.29

<b>HOBBYPOXY</b>	
formula 1-.15 min. (H-51)	1.10
formula 2-.45 min. (H-52)	2.98
formula 3-thixotropic (H-53)	3.25
formula 4-5 min. (H-54T)	1.60

<b>DEVCON</b>	
5 min. epoxy (2 1/2 oz.) R-206	1.85
2 in. appli. dev-tube R-208	1.36
5 min. epoxy (9 oz.) M-209	4.39

## R/C BOATING

<b>DUMAS</b>	
1201 PT-109	27.47
1203 Coast Guard Life Boat	40.20
1204 Tuna Clipper	32.85
1205 Trojan Cruiser	43.55
1207 Shelly Foss	53.60
1210 Cst. Grd. Utility Boat	32.15
1211 Dauntless	50.25
1213 American Enterprise	50.25
1210 Pay'n Pak	26.65
1312 Atlas Van Lines U-76	35.20
1314 Atlas Van Lines U-71	33.50
1315 Drag'n Fly Mark II	27.95
1421 Competition Daep'Vee 21	30.15

<b>DUMAS HARDWARE &amp; ACCESS.</b>	
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2311 For 1203 or 1205	36.75
2312 For Shelly Foss	40.25
2317 For Drag Fly 20MK II	46.70
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2322 For Pay'n Pak	22.50
2328 For At. Van Lines U-76	34.90
2329 For C.G. Utility Boat	31.50
2332 For Daunt. or Amer. Ent.	27.75
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2005 12 volt motor	16.99
2022 speed control for 6v Mtr.	15.99
2023 speed control for 12v Mtr.	15.99

<b>MISC. ACCESS.</b>	
6 volt 6 ampere gell battery	12.99
6 volt 4 ampere wet cell	8.99
6 volt charger	8.50
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## MEMORIAL RACE

from page 155/43

A special event was held in the afternoon which combined "Las Vegas Luck" and fast Figure 8 laps. It went something like this: two contestants on different frequencies stood next to their boats, on the starters command they ran about 40' to an area complete with a dice cup and a pair of die. The object here was to match the total of your first roll. If your total was ten for example a seven and three or six and four would send you back to the pit area. Now you start your engine and proceed to run two Figure 8 laps around the bouys. Mike Meelbusch was the skillful winner with a time of 1 minute and 5 seconds and was awarded a K & B outboard for his efforts. The crowd got a lot of laughs out of this event.

We are most thankful to all the manufacturers who made donations, and we also wish to thank the Lombard Park District for the use of their facilities. Special thanks also to Al, Bob, and Elmer, of Al's Hobby Shop, for their help and sponsorship of the race. The Minute Breakers hope to make the John Spangler Memorial Race an annual event. So see you next year!

### RACING SUMMARY

RACE CONCOURSE  
 WINNER WINNER

Tunnel	Rano Wells	Bill Pistello
Outrigger	Jim Fetters	Dave Preusse
Mono	Bernie Rich	Harold Roots

## SUPER JET

from page 42

... tongue. With this product you don't have to hope that the adhesive has penetrated to the bottom of the hinge slot. You know it did. And because this instant glue can be applied in a bead and won't disappear into the balsa or go off in a second, it's very useful to butt glue lengths of sheeting together and glue sheeting and doublers in place, to mention only a few special jobs. Of course, you can use a regular instant glue to apply a doubler, but then you have to make lots and lots of pin holes in the doubler and hope that the adhesive penetrates. With Super Jet you just lay a pattern of the adhesive on the base piece then press the doubler in place. When you press the doubler down with the palm of your hand, you'll feel the balsa get warm. That's it. And Super Jet will do all of these special jobs in addition to everything a regular cyanoacrylate will do.

The photos and captions show some of our tests with Super Jet. In our view the most exciting are the two that show what happened when we tried to remove a Super Jetted doubler from a base piece of balsa and when we tried to

to page 162

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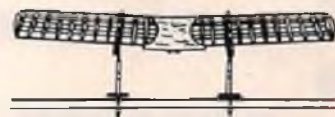
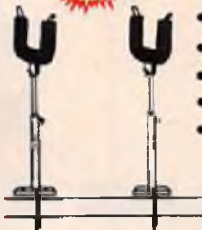


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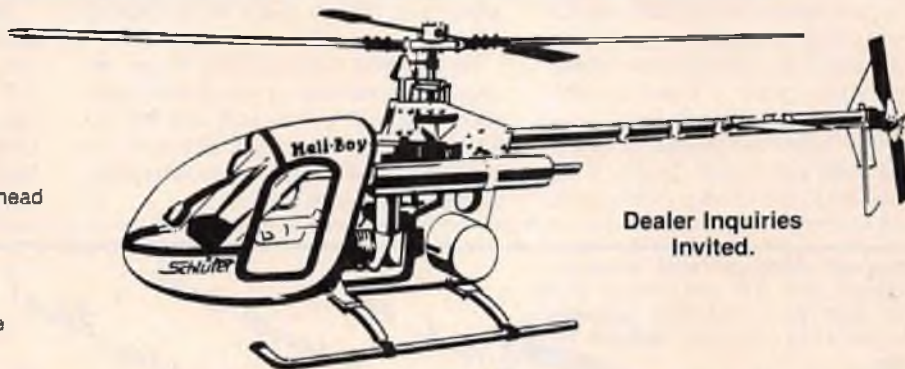
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**MODEL SHOW**

**SUPER JET**

from page 160/42

remove a length of outer NyRod which had been glued in place in an oversize hole with the adhesive. The balsa failed, not the glue joint. We also tried this new generation of instant glue on some old yellowed balsa (without the usual sanding as is recommended with regular cyanoacrylate), plywood, metals, to apply a canopy to a fiberglass fuselage, and, we even glued a piece of ABS plastic to fiberglass. In each case Super Jet worked superbly. Indeed, it is the cyanoacrylate with a plus. That is, it not only does what the familiar products do

but, because of its special properties, it does lots more. To sum it up simply, Carl Goldberg's Super Jet is one super cyanoacrylate (love that word!) that can be used on virtually any R/C, U-control, or Free Flight building or repair job. When you've finished building, as with other cyanoacrylates, store Super Jet in a cool dry place. Above all, keep the adhesives out of reach of the young ones.

By the time of publication, Super Jet should be available at your local hobby shop. The 1/2 ounce size will sell for \$3.95 and the 1/4 ounce size sells for \$2.25. Like the regular cyanoacrylates, a little goes a long way. □

**CASSUTT "2"**

from page 40/32

think they fly right off the drawing board. Some do, but most don't. When I see an article where the author says this is the third, fourth, or fifth prototype before it really did what he wished, I believe him and respect his honesty and dedication.

Some other items not shown here or on the plans (1) Kraft aluminum engine mount. (3) 8-32 bolts and tee nuts. (5) 1/4"-20 x 1 1/2" long nylon bolts. (5) 4-40 capscrews 1" long. (2) 8-32 x 1 3/4" long bolts, nuts and washers. (1) Du-Bro Muff-L-Aire Muffler.

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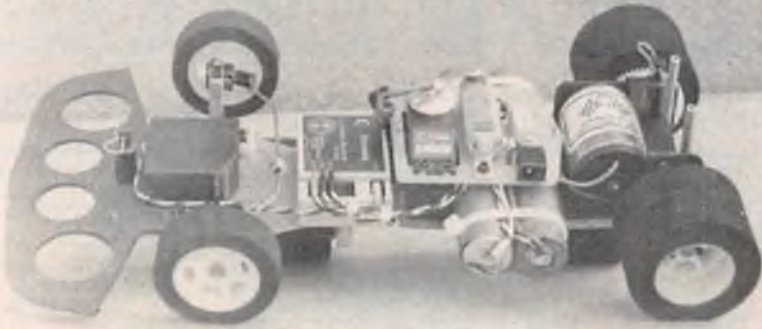
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### BIG IS BEAUTIFUL

from page 30/27

there isn't, they'll invent one!"



This summer I have had more chances to do some flying than has been the case for the past couple of years, and I am truly impressed with the difference in the Quadra engines I fly since Dario Brisighella did his 'magic' on them. I don't have that many others here who fly really large models and even those who aren't into **big** have commented on how smoothly the engines now run. I hear the modification will be incorporated into the engine at the manufacturing level in the near

future and that will certainly turn the most popular of the small chain saw engines into one of the best.

Don't forget to store your fuel safely now that the flying season is coming to an end. Gasoline/oil mix can be trouble if you are careless with it so be sure yours is where it won't create a problem for you. Don't allow any smoking around your model when you are fueling up at the field either. Glow fuel can be dangerous enough, gas/oil can be dynamite . . . literally. Use caution around yours.

I store mine outside in a shed and last winter some water got into the can without my knowledge. You'd all have enjoyed the trials and tribulations I had trying to get those Quadra's to run on water! Mind you, with the current gas problem, if I had managed to do it, I'd have made a million! Instead all I got was blistered fingers, a sore arm and

frustration!



As is pretty obvious from the pictures printed here, in England they **really** believe that **big** is Beautiful. John Bright sent me the pictures of a half sized SE-5 which was begun by Graham Brown, who realized he had bitten off a large job and called on friends to pitch in and help with the project. The 'model' will fly on a 110cc chain saw engine (10cc is approximately equal to a .60!). John mentioned in his letter that a group of people building full scale Vari-Eze were surprised to find the SE-5 had more wing area than their full sized home-built.

Control will be a Futaba with 30 pound servos (thrust, not weight). A secondary control set-up is required by CAA rules and this will be incorporated as required. Servos are mounted close to the control surfaces to avoid any linkage problems.

to page 166

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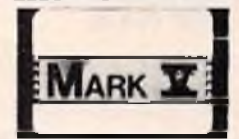
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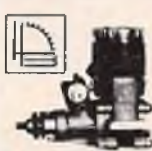


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The Model of the Month Award Program is designed to encourage the sport and novice competition flier to submit details of his most recent kit or scratch-built model to RCM in order to encourage general model craftsmanship and the overall promotion of R/C flying.

Each month Dremel will award a 371 Variable Speed Moto-Tool as illustrated in the photograph. The second and third place winners each month will receive a one year subscription to R/C Modeler Magazine, or, if they are a subscriber, an extension of their current subscription. If you would like further information concerning the winning models, write to us giving us the winner's name and what month he won, and we will forward your letter on to the winner. For rules of Model of the Month Contest, see the Oct. 1979 issue.

## NOVEMBER WINNERS

### SECOND PLACE

**John S. Cooley**  
Orlando, Florida

A scratch-built Focke Wulf 190 A-4 built from Bob Holman plans has a 60.3" wingspan and weighs 8½ lbs. The engine is a K & B .61 with a Perry Pump and Du-Bro Muff-L-Aire II muffler. Paint is Perfect camouflage over K & B Super Pox resin and glass cloth. Home-made retracts are operated by Sonic gas cylinders. It features operational split edge flaps and complete cockpit details. The radio is a World Engines MK II Expert 7 channel system.



### THIRD PLACE

**Sam Roper**  
Grand Prairie, Texas

An oldie but goodie, this slightly modified Astro Hog was built from an ancient Berkeley kit. The 6½ lb. Hog has a 72" wingspan and is powered by a K & B Torpedo .45 engine. It is covered with silk (what else?). A Kraft 5 channel radio provides guidance.



### FIRST PLACE

**Brian Sisson**  
Yreka, California

Brian Sisson, a 15 year old modeler, built this Pitts Special from a Midwest kit. The Pitts has a 48" wingspan, weighs 8 lbs., and is powered by a K & B .61 Pumper. It is covered with Coventry Permagloss and uses an ACE 5 channel radio.



## BIG IS BEAUTIFUL

from page 164/27

As can be seen from the photos, it is going to be rather large.

John also mentioned a very large Twin Otter that is under construction there, in addition to the Spitfires, Lancaster and ME-109 mentioned here earlier. He has also promised to keep us in touch with their progress on the SE-5 along with flight photos when available.



I have M.E.N.'s Beechcraft Staggerwing kit and Ikon Northwest's Monocoupe kit on order and will be

reporting in detail to you as soon as these arrive. (What a yummy building season I have ahead of me this winter!) Both kits are due in the next month or so. Judging from what I heard in Toledo last spring, the Beechcraft is going to be some fancy kit and the Monocoupe (in the photos I have seen of it) looks gorgeous. Naturally, I'm anxious to see them as a new mother to see her offspring. The Dave Platt Jungmeister is waiting the arrival of an engine and Don Godfrey is building me one of his Super Stearman big birds. I may be a bit thin for flying machines this year, but next summer could be a banner year. Stay in touch, see you next month. □

## CUNNINGHAM ON R/C

from page 24/22

Roberts of Little Rock, Arkansas, flying his Clipped Wing Piper Cub with a Quadra engine up front. This model was a replica of the full size Clipped Wing Cub that later made the fly-over. Wendel told me the Cub had been based in Memphis when he modeled it. Best Non Scale Aircraft went to Ken Bina of Topeka, Kansas, flying his Early Bird. This is a very spectacular aircraft, being powered by a self converted 3.2 cubic inch engine. The entire structure is

to page 170



Dean Koger 1979 Aerobatic U.S.A. Team Member and 2nd at the 1979 Nat's with his famous EU-1. Ask Dean about Giezendanner products.



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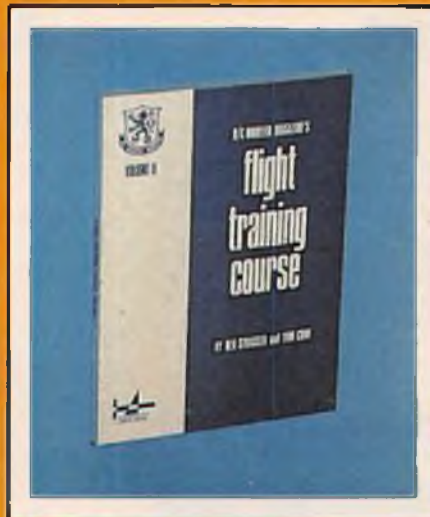
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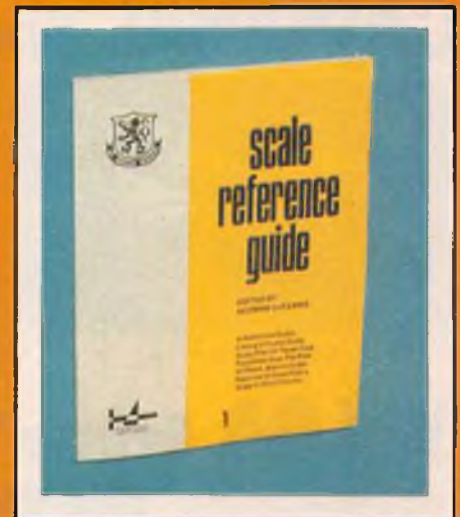
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## CUNNINGHAM ON R/C

from page 166/22

made of spruce, pine and plywood, and the wheels are handcrafted from automobile heater hose. The span is 10'-6". All of the wood was well finished and the exposed portion of the fuselage structure (similar to an Antic) was all varnished. Controls were via cables to all surfaces. The pilot is a Snoopy head, about a foot high --- really a spectacular aircraft. The trophy for the entrant traveling the longest distance to enter was taken home by Wayne Flowers of Fort Pierce, Florida.

Terrific Ted White put on a super demonstration with his normal size Martin/Baker during the air show portion of the Fly-In, capped by a dead stick three rolls right over the field.

All in all, it was a super time. Over two hundred contestants registered to be a part of this Fly-In. Many who showed up with models this year were spectators last year.



*Don Apostilico's Nosen Cessna 310. Two Webra .61's. A real crowd pleaser. Most impressive Airplane trophy winner.*



*Cunningham's fleet of biggies - he came well prepared to fly. And he did.*



*Miss Texas built and flown by Joe Smith, Dennison, Texas, St. 60 - purple and white MonoKote.*

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an accurate, useful and durable tool comes along at an affordable price. Our vernier caliper manufactured in Switzerland to traditional PRECISION and PERFECTION is such a tool. Craft modeling is a pleasurable hobby. And, our caliper will add to that pleasure.

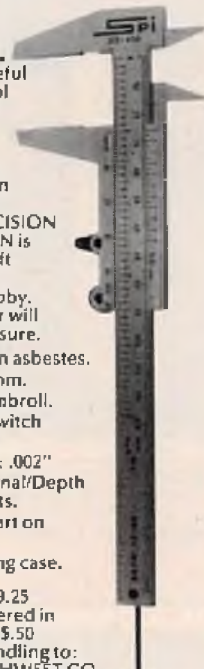
- Made of nylon asbestos.
- To 5" or 130 mm.
- No slack thumbroll.
- Perfect lockswitch engagement.
- Accuracy to  $\pm .002"$
- External/Internal/Depth measurements.
- Drill & tap chart on reverse.
- Handy carrying case.

Priced at only \$9.25 (add 6% if delivered in California) plus \$.50 Postage and handling to: WEST BY SOUTHWEST CO. Box 162, Coronado, CA 92118

## OUR PLEDGE:

Orders always mailed day of receipt. Our merchandise is accurately represented in our ads.

FULL REFUND of purchase price on date of return if returned for any reason within 30 days.



## LITCO EQUIPMENT BY PHONE!

Available from Litco's approved servicing dealer. See Litco ad for prices. Prompt C.O.D. shipment on all phone and mail orders.

Also available reverse servo, add \$1.00, servo with Kraft, Futaba, W.E., MRC, etc. Connectors, add \$2.50; connector adapters, add \$3.50; six meter crystals for Litco receivers, add \$8.00.

Now also Visa & Mastercharge orders taken.

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Prevents dead-stick landings.

Generates incremental audio timing signals.



Ideal for timing pattern flights, gliders, boats, etc.

With case, less battery:  
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# SERVOS, RECEIVERS, COMPLETE FLITE PAKS REGULAR OR MICRO, ASSEMBLED OR KIT

Litco flite paks or components can be purchased assembled or in kit form. Assembled units are pretuned and ready to use with transmitter specified below. All units use Deans connectors. Servos are supplied with extra female Deans connector to simplify installation.

Litco Systems has pioneered the concept of fully assembled flite paks custom matched to various transmitters. Our servos are electrically adapted to match the transmitter specified. Please order from table below.

PLEASE CIRCLE THE MAKE OF YOUR TRANSMITTER:

KRAFT EK ROYAL FUTABA WORLD MRC RS ORBIT HEATH ACE UNICOM CANNON  
(PRO LINE COMPLETE FLITE PAK ONLY) SANWA CIRBUS MICROAVIONICS KRAFT KP4A

## REGULAR COMPONENTS



## MICRO COMPONENTS



### SERVOS

- Double sided PC boards, 544 AA IC
- Long life potentiometers
- High quality servo motors
- 4.0 lb. power, 0.5 sec transit
- 8 mA drain
- Fast, precise high resolution
- Gold plated Deans connectors

REGULAR Size: 1.5x1.45x.73 Wt. 1.2 oz.  
MICRO Size: 1.28x1.3x.6 Wt. 0.7 oz.  
MIDGET Size: 1.12x1.43x.7 Wt. .85 oz.

### RECEIVER

- Double sided PC boards
- Double tuned front end
- 1.5  $\mu$ V, AGC on 4 stages
- Gold plated Deans connectors
- High selectivity and rejection
- 5 channels, 8 available

FREQUENCY: 72.08, 72.16, 72.24, 72.32,  
72.40, 72.96, 75.640  
REGULAR Size: 1.9x1.7x.8 Wt. 1.5 oz.  
MICRO Size: 1.75x1.14x1.0 Wt. 1.5 oz.

### BATTERY

- REGULAR
- 500 mA/HR, vibration resistant
  - Nylon D&R case
  - Gold plated Deans connectors
- Size: 2.2x1.25x1.25 Wt. 4 oz.
- MICRO
- 225 mA/HR, vibration resistant
  - Nylon D&R case
  - Gold plated Deans connectors
- Size: .85x1.45x1.45 Wt. 2 oz.

### SWITCH HARNESS

- Noble high quality switch
- Deans gold plated connectors
- Nylon protective cover
- Wt. 0.4 oz. (charging connector to be supplied by user)

WRITE: We answer inquiries immediately. We ship rapidly when paid by money order or cash.

## New! BANTAM MIDGET AT LOW PRICE

The newest addition to our tremendously popular 544 servo line is the Bantam Midget. It features beautifully engineered D&R mechanics and a new powerful motor. It is capable of controlling airplanes from 1/8A to 50 pattern. It is lighter, stronger and faster than anything in its size range. The electronics is the same as in all our 544 servos and it is the best money can buy: the newest highly advanced 544AA IC offering internally regulated power supply, dynamic braking, linear ramp timing and the need for very few external components. Parts are mounted on the most sophisticated PC board in the industry — double sided,

plated inside holes, reflowed in hot oil and manufactured of epoxy glass. We use only the best pots — CTS metered deposition. The kits are simple, straightforward and easy to assemble. Our flite pak approach has been an unbelievable success and many modelers have purchased their 4th or 5th flite pak. If you have been holding back — don't — you are missing a good thing. With the dollar dropping and high inflation, prices will be going up. Flite pak prices are sums of component prices and all parts can be mixed.

ATTENTION KIT BUILDERS: REGULAR BANTAM D&R SERVO KIT STILL ONLY \$17.00!

NAME _____		ZIP CODE _____		
ADDRESS _____		ZIP CODE _____		
QUANTITY	CAT. NO.	DESCRIPTION	PRICE	TOTAL
	S5441	Rotary D&R Bantam servo, assembled (For precision and speed)	20.00	
	S5442	Rotary Dunham servo, assembled (For power and strength)	23.00	
	S5443	Rotary Dunham micro servo, assembled (For size and weight)	31.00	
	S5445	Rotary D&R Bantam Midget servo, assembled (For weight and strength)	25.00	
	R2000	Receiver regular, assembled Frequency _____	36.00	
	R2001	Receiver micro, assembled Frequency _____	39.00	
	B1000	Battery regular, assembled	13.00	
	B1002	Battery micro, assembled	14.00	
	H1001	Switch harness, assembled	5.00	
	S5441K	Kit of S5441 servo	17.00	
	S5442K	Kit of S5442 servo	19.00	
	S5443K	Kit of S5443 servo	27.00	
	S5445K	Kit of S5445 servo	20.00	
	R2000K	Kit of R2000 receiver Frequency _____	30.00	
	H2010	5 male and 5 female Deans 3 pin connectors & assortment of wire	8.00	
	S2000	Trays for all regular servos and S5445, 5 pcs.	5.00	
	S2000A	Single snap on tray for S5443	1.25	
<input type="checkbox"/> COD, Shipping, handling & insurance <input type="checkbox"/> Cash, money order, bank draft, certified check, shipping, handling & insurance			2.50	
On personal checks delay of up to 3 weeks. N.J. res. add 5% sales tax. Foreign orders add 10% of the total.			1.50	
			<b>TOTAL</b>	

**Litco Systems** BOX 90, EAST HANOVER, NEW JERSEY 07936



from page 170/22

# The Classics

## THE RYAN ST-A

This classic is a 1/4A-10 sport scale model, with realistic appearance. Using our unique wing construction, it's aerobatic and stable. The fuselage is extremely well detailed and adds to the over-all appearance of this famous pre-WWII trainer. It's a real pleasure to assemble and fly this — beautiful classic of all classics.

SUGGESTED  
RETAIL

\$34.95

MODEL  
MERCHANTS

P.O. Box 3792  
Irving, Texas 75061



ORDER  
NO. 107

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\$25.50 labor plus parts

2 = 3 CH. System with/two servos:  
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EXPERT SERVICE ON ALL  
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K.S.E., TOWER, P.C.S.

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RADIOS and ACCESSORIES  
WARRANTY REPAIRS ON:

Ace, E.K. Logicrol, ProLine  
REPAIR SERVICE FOR:

ORBIT (We have all available parts &  
repair facility for Orbit Systems)  
WORLD, FUTABA, CIRRRUS, MICRO,  
CANNON, R.S. SYSTEMS, M.R.C.,  
ROYAL, HOBBY LOBBY, BONNER, MAC'S

Good friend Jerry (Here's How) Smith came down from the wilds of Indiana to take pictures again this year and to help me over the rough spots of putting this show together. Jerry spent many happy hours flying other people's airplanes, and even got to make a test flight on a just finished Gere Sport. Jerry had as much fun as I did. Helmer Johnson arranged for the full size fly-over and did his usual great supporting job in the weeks prior to the Fly-In. All of the Fort Worth Thunderbirds pitched in to make this the outstanding event that it has become. We're going to do it all over again next year, so make your plans now to attend the Third Annual Southwestern Jumbo Fly-In, sponsored by Sky Master Industries, hosted by the Fort Worth Thunderbirds, and held at Thunderbird Field. Mark your calendar now for the third weekend in July, 1980. Among the things planned for next year will be an official shop and swap tent, so pack up your goodies, bring your biggie, wife, and or girl friend, and be here --- you're going to enjoy it!



Mr. C. kept the fans entertained with many words of wisdom. Jan (wife far left) did the signing in and bookwork.



Chuck Cunningham proudly displays trophies - Chuck sponsored this great 2nd annual biggie.



The Tucson Radio Control Club extends an invitation to the richest unrestricted R/C Contest in the country, the

# 1979 Tucson Winter Nationals

MARANA AIR PARK, TUCSON, ARIZONA

November 23, 24 & 25, 1979

AMA Sanctioned

**CASH! TROPHIES! PRIZES!**

**SPONSORED BY:**

Leading R/C Magazines  
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**EVENTS:**

Pre-Novice, Novice, Advanced, Expert,  
Master, Mammoth Sport Scale, Sport Scale

**The Tucson Winter Nationals:** The richest unrestricted contest in the country with cash, trophies and prizes and the talk of the contest circuit! You may drive or fly directly to Marana Air Park, 30 miles Northwest of sunny Tucson. Ideal contest facilities, acres of concrete, unlimited parking and modestly priced food. This contest offers more for the Expert and Novice alike. If you want more than a plastic trophy for your efforts in R/C then spend your Thanksgiving weekend at the Tucson Winter Nationals.

---

**ENTRY AND PRE-REGISTRATION FORM**

**SEND TO:**

Tucson Winter Nationals

9255 E. 26th  
Tucson, AZ 85710  
(602) 885-1053

Registration Fee is \$15 plus  
\$5.00 for **each** event

Registration \$15  
Pattern \_\_\_\_\_ \$ 5

(class)

Mammoth Scale \$ 5  
Sport Scale \$ 5

TOTAL Enclosed

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

AMA Number \_\_\_\_\_

\_\_\_\_\_ MHz

\_\_\_\_\_ MHz

\_\_\_\_\_ MHz

Complete information packet with schedule, contest information and hotel accommodations will be mailed upon receipt of pre-registration form and fees.



# \$ SAVE BROWN'S SAVES \$

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**\$239.95**  
**KP-5C**



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5 CHANNEL - 2 STICK ON 72 - 75 MHZ  
CHOICE OF KPS 14 (JR); 15) SERVOS  
OPEN GIMBEL

**SUPER SALE PRICED FINAL CLEARANCE-**

SEND A MONEY ORDER FOR PROMPT SHIPPING. ALLOW CLEARANCE TIME FOR PERSONAL CHECKS. NO C.O.D.'S! THIS PRICE CANNOT BE BEAT, AND THIS OFFER IS EXCLUSIVE WITH BROWN'S HOBBY CENTER.

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THESE ARE VERY LATE "77" SETS AND ARE COMPLETE. THE LIST IS \$375.43 AND WILL GO VERY FAST AT **\$239.95.**

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KRAFT	LIST	BHC	MODEL	BHC
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KP-4A	309.95	203.99	4FN4 (S-18)	185.00
KP-6A	339.95	234.99	4FN4 (S-16)	205.00
KP-5C	389.95	277.99	6FN (S-18)	215.00
KP-5CS	389.95	277.99	6FN (S-16)	235.00
KP-7C	529.95	384.99		
KP-7CS	529.95	384.99		
KPS 14, 15	SERVOS			

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**"NIMBUS" 4 CHAN.**  
2 STK. - BHC 186.95

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**NEW LOW, LOW PRICE ONLY \$235.95**  
EXPERT 5 CHAN 2 STICK 4 SERVOS.

WORLD ENGINES	LIST	BHC	SUPRE TIGRE	LIST	BHC
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OS 10 FSR R/C	39.00	30.40	X21 CAR	85.00	68.00
OS 15 STD	35.00	28.00	S1 23 std	36.95	29.60
OS 15 R/C	42.00	32.60	S1 23 R/C w/muff	53.95	43.20
OS 20 STD	38.00	30.40	S1 35 std	53.50	42.80
OS 20 R/C	45.00	35.80	S1 45 R/C w/muff	80.00	64.00
OS 25 STD	41.00	32.80	S4.60 R/C B.H.	99.95	79.99
OS 25 R/C	49.00	39.20			
OS 25 FSR R/C	64.00	51.20			
OS 25 FSR STD	57.00	45.50			
OS 30 STD	45.00	38.40			
OS 30 R/C	53.00	42.40			
OS 35 STD	52.00	41.50			
OS 35 R/C	58.00	46.40			
OS 40 R/C	80.00	64.00			
OS 40 FSR R/C	95.00	78.00			
OS 60 FSR R/C	135.00	108.00			
OS 60 FSR B.H. R/C	104.00	83.20			
OS 60 FSR R/C w/PUMP CARB & MUFF	165.00	132.80			
OS 60 RSR R/C	142.00	113.60			
OS WANKEL	120.00	96.00			
OS 65 RSR R/C	145.00	116.00			
OS 60 4 CYCLE	225.00	187.50			
OS 10 R/C MARINE	46.00	36.80			
OS 21 MARINE	79.00	63.20			
OS 20 R/C MARINE	55.00	44.80			
OS 45 RSR MARINE	126.00	100.80			
OS 90 R/C	225.00	157.50			

**MRC SYSTEMS**  
772-2 CHAN ..... LIST BHC  
119.95 95.50  
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279.95 197.95  
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PORSHE CAR LIST 77.98 BHC 62.40  
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**AUDIBLE CONTINUITY TESTER 177**  
ONLY \$12.95  
Belt Clip, Long Life, On/Off, Back, Switch, LED, Test Leads, Resistor, Case.

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ONLY 1 1/2" LONG UNDER 10 OZ. WT.  
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**Champion Models**  
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72" SPAN - 750" AREA - 6 1/2 - 7 1/2 LBS - 4 CHAN - 60-80 ENGINES - RETRACTING WHEELS - STAND OFF SCALE - ABS COWL TIP FLOATS, NACELLE - FORMED WIRE PARTS -  
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ALL 4 KITS HAVE FINEST QUALITY DIE CUT Balsa FULL SIZE ISOMETRIC VIEWS, DIE CUT RIBS, FORMED WIRE PARTS, PRE-CUT FORMERS, WHEEL PARTS, HARDWARE PACKAGE, AIR-CRAFT PLYWOOD, ABS COWLS, NACELLES, WHEEL PARTS, TESTED FLIERS, MAPLE GEAR BLOCKS, EASY CONSTRUCTION METHODS SAVE TIME

**40% OFF "HOT" SPECIALS!**  
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Variable Speed MOTO-TOOL KIT 381  
Includes Model 380 Moto-Tool with ball bearing construction and .9 amp motor. 115V 60 Hz AC. Contains over 30 accessories in carry/storage case.  
LIST 74.95 BHC 44.95 ★ special

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WE HAVE A COMPLETE LINE OF DRUMEL TOOLS AND ACCESSORIES

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  - #8382 3.5cc SI OUTBOARD LIST \$107.00 BHC \$74.90
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**BHC ONLY \$26.99**

CHARGER A GREAT TEAMMATE

**SUPERSTAR OF STARTERS**

DELUXE \$30.80  
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## FULL LINE OF CONTROL LINE KITS, ENGINES, & ACCESSORIES. AT BIG DISCOUNTS

**DU BRO FUEL PUMP**

NOTHING TO BREAK OR WEAR OUT!

LIST \$10.95  
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JAPAN NATIONAL 2-5-0 "MOGUL" TYPE LINE STEAM LOCOMOTIVE AND TENDER IN 1/32 SCALE COMPLETE WORKING MODEL 22" LONG. BUILT PAINTED READY TO RUN. ALCOHOL ONLY \$54.00

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LIMITED OFFER LIST \$375.43 BHC \$264.95

SEND MONEY ORDER FOR IMMEDIATE DELIVERY ADD \$4.00 FOR SHIPPING

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DUMAS HIGHEST QUALITY BOATS AND PLANES IN WOOD AND FIBERGLAS AT 30% OFF-FITTINGS AT 20% OFF. SEE OUR LIST. SAVE \$3

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STEVE MUCK'S LIL LIGHTNING ALL PARTS PRE-CUT—PHOTOS INCLUDED FOR EASY CONSTRUCTION A REAL PERFORMANCE!

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SHARK CO2 MOTOR AND CHARGING GUN LIST \$19.95 BHC \$15.99

## LOWEST PRICES ANYWHERE ON ALL KITS, BOATS, ENGINES, BATTERIES, ADHESIVES ETC.

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- PACER 19.95 14.00
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## HIPERBIPE

from page 16

... bottom wing a plus 1 1/2 degrees, and the horizontal stabilizer a negative 1 degree. If these angles are not set properly the plane will not only fly poorly, but even worse, it will have an extremely high stalling speed and be prone to snap. The bottom wing must stall before

the top wing, or you're in for hairy times.

Besides fiberglassing the cowl and both the wing center sections, I also glassed the nose section. I wanted the kind of strength you cannot get from iron-ons. My original plan for finishing this bird was simple: to make it look just like the one in the picture.

It wasn't until I had the whole thing MonoKoted that I realized the scale color scheme, white with a little green trim, would cause orientation problems. So, since I wasn't planning on entering the bipe in any scale contests, I decided to go for maximum visibility. Using green MonoKote trim sheets, the entire bottom of the plane was made into a

checkerboard while the topside came out looking something like an Aztec drawing of a bird.

Although the top and side windows are simulated (Frank Massa of Master Kit opted for structural integrity), the windshield must be cut, fitted, and glued in place. This will probably cause the worst muttering and grumping, especially if you're used to having those pre-formed canopies to work with. The windshield template closely matches the contour of the nose and very little trimming was required. After soaking the acetate in black Rit dye and then lightly dusting the edges of the tinted windshield with baking soda, Hot Stuff



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was used to make a strong, clean bond to the nose section. I went one step further and contoured a mixture of epoxy and micro-balloons along the bottom of the windshield. It looks nicer and insures that no fuel will seep through.

All the glassed areas and the wheel pants were painted with Pactra's Formula-U Polyurethane paint which matched the white MonoKote perfectly. This stuff is quite good; it covers very well and sticks tenaciously to MonoKote (I didn't scuff the surface at all). After the name "Choo-Choo" was put on the vertical fin, all the trim MonoKote was given a few light coats of clear polyurethane to eliminate the possibility of lifting due to handling or fuel soaking.

#### Engine:

A trusted and well-used K & B .40, with a Du-Bro Mufflaire II clamped on, was mounted in the nose.

#### Radio:

Guidance was provided by my usual hodge-podge of electronics: a Royal 1/2A receiver converted to four channels; a Heath servo; an Ace Bantam servo; an Ace Bantam Midget servo; a Dunham Dual-Rack servo; and a homemade 500 ma battery pack.

#### Flying:

Because this ship has wheel pants and small wheels, and because ours is a grass flying field, I had planned on leaving the pants on only for the picture-taking. However, I got overanxious, started to taxi without removing them, and before I knew it there was daylight between the wheels and the runway.

Other than taking out the bit of downtrim I had purposely put in earlier, no trim adjustments were needed. "Choo-Choo" responded beautifully, tracking extremely well during inside and outside loops. Her rolls, even the slow and point rolls, were easy to keep straight and string together. Spins and high speed snaps were predictable and easily controlled. Frank Massa was right about her vertical capabilities; I was amazed at the speed she maintained in the climb, considering the old K & B that was pulling her. Inverted flight required just a tad of downstick and the hammerhead and stall turns made me look as if I really knew what I was doing. And this particular design should make knife-edge easy for anyone.

Five minutes into this first flight my engine quit due to overheating; the resulting glide was fast and flat, with the control surfaces retaining most of their effectiveness. It wasn't until touchdown that the folly of leaving the wheel pants on became evident. What seemed like a good landing was followed immediately by the plane flipping over on her back because the pants and small wheels could not handle grass and the uneven surface of our runway. Damage was slight and limited to a few small cracks in the wheel pants.

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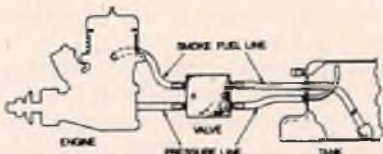
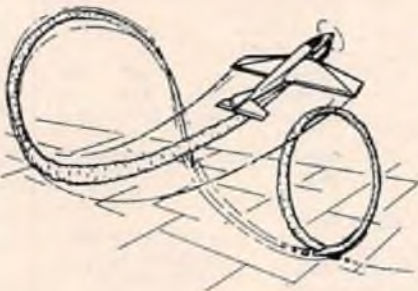
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F4 Phantom	"	37"	51.5"	14.50

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Increasing the area of the air outlet duct on the cowling cured the overheating problem, and two subsequent flights gave me a chance to make numerous take-offs and touch and go's. Ground handling was fine, regardless of speed. Most of my powered planes are tail-draggers, and I've found that toe-in and a bit of camber do make the difference. The way this little beast handled on approaches and landings reminded me very much of my Super Kaos, which I always feel comfortable with.

### CONCLUSION:

So far I've painted a pretty good picture, but nothing is perfect. So now's the time to tell you what I found wrong or didn't like about the "Hiperbipe." By the way, Frank Massa will be incorporating these changes into the next run of kits.

(1) The landing gear trunion blocks were not drilled to accept the 3/16" struts. The gear is installed at an angle, and unless the builder has a drill press, he'll never get the holes drilled correctly. They should be pre-drilled.

(2) The 1/16" wire used for the tailwheel is too flexible and causes the rear end to bounce quite a bit. On concrete or hard surface this may not be a problem, on a grass field, however, it can bounce the bird over on her nose. 3/32" wire would be an improvement.

(3) This tailwheel wire needs more support besides the small piece of 1/4" ply shown on the plans. Brass or nylon tubing, or an eyelet, used as a bushing should do the job.

(4) The fairing on the top wing is shown only on the side view. A 3/4 view sketch would be a big help.

(5) There's no information about cooling for the many who have never flown with a cowled-in engine before. A few words on saving an engine by proper cooling would be greatly appreciated.

(6) What's good for the top wing should be good for the bottom wing. A ply center section brace in the lower wing will add structural integrity and peace of mind. "Choo-Choo" weighed in at exactly 5½ pounds and, to my amazement, balanced perfectly. The wing loading, 20 oz./sq. ft., is high for a biplane but low for a pattern plane. And that's what the Hiperbipe really is... a double-winged pattern plane.

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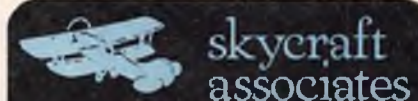
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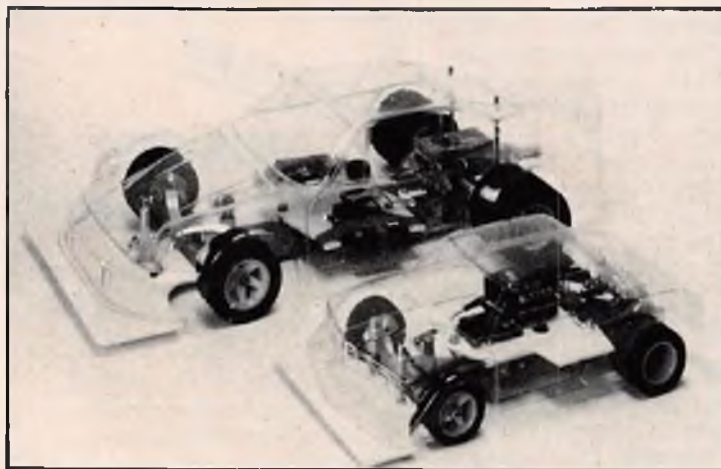
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# LEE'S ENTERPRISES

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## ENGINE CLINIC

from page 10

would be moved a few thousands toward lean. If on acceleration the engine has a thin lean sound and sags slightly, the idle mixture is too lean and should be richened. All engines have some interaction between the high and low speed adjustments. So if the high speed is set very rich, the idle, in turn, is going to be rich and vice versa. So be sure the top end is set properly before tinkering with the low speed.

Turning the screw or adjustment in will always lean the mixture and backing out will richen the same as the high speed needle valve. The only exception to this that I can think of is the Perry Pump pressure adjustment. Backing out increases pressure which will, in turn, richen the mixture, and turning in lowers the pressure thus leaning the mixture. However, the pressure adjustment on

the Perry pump should never be used for adjusting the idle mixture to begin with.

Another method of adjusting the idle is to note how the engine idles at the beginning and end of a flight. If the engine idles okay at the beginning of a flight with a full tank of fuel but has a tendency to die on the landing approach at the end of the flight, the idle mixture is too lean and needs to be richened slightly. If the engine has a tendency to load a little at the beginning of the flight but improves towards the end, the mixture is a little rich and should be leaned slightly. However, it is perfectly normal for the idle to be slightly rich with a full tank in order to avoid going too lean with the tank near empty. A little compromise has to be reached.

Dear Mr. Lee,

*I have a K & B .15 Schneurle port rear rotor engine Series 72. I have about 45*

*minutes break-in time on the engine, but I'm having severe over-heating problems. This engine runs so hot that after 1/2 tank full of fuel the engine will stall and if you lick your finger and touch the head or case, you can see the saliva boiling off. The engine also nearly stalls when throttle is advanced from half to full throttle. I am running a 7/16 Top Flite and a K & B 100 fuel.*

*Thank you very much,  
Rick Eubanks  
Cincinnati, Ohio*

Some of the K & B .15's did go out with a few discrepancies, especially the early engines. Unfortunately there is not much that can be done to correct this now as the engine was dropped from production four or five years ago and replacement parts are no longer available.

I should point out, however, that it is perfectly normal to see the saliva bubble


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### PRODUCT NO. 8100

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when touching the head immediately after shutting an engine off. Cylinder head temperature normally runs in the 360°-370° range. Heat transfer will also make the crankcase very hot. With the engine running, the lower part (crankshaft/bearing area) should not be excessively hot. If the lower end is hot with the engine running this indicates a crankshaft or bearing bind.

Many of the first run of K & B .15's went out with a sleeve that had a crooked mounting flange, i.e., the flange was not square to the cylinder bore. Tightening the head would distort the sleeve causing the piston to bind. This, in turn, resulted in an engine that ran hot and did not develop its full power potential. Remove the glow plug and see if there is any tendency for the piston to stick at the top of the stroke. If so, loosen the head screws and see if the tightness goes away. If it does, the sleeve flange

needs to be trued. You would have to find a friend with a lathe that could take a light truing cut on the top and bottom surfaces of the flange. Be very careful not to remove any more metal than necessary to true the flange. Only a couple of thousandths are required. Any more than this and the sleeve timing, compression ratio, etc., will be affected. The piston drag should be the same with the head tightened as it is with the head loose. This is true with any engine regardless of make. Proper tightening of the head is also essential. A head that is unevenly tightened can result in distortion causing the piston to bind also.

Dear Mr. Lee,

I'm 15 and have been building boats. This time I bought an O.S. Max 45 FSR marine. It has had two backplates at this time. I have a new one now.

The backplate breaks around the

base where the carburetor slips into the engine. The engine was bolted down securely and the carburetor was bolted in tight. I also see a lot of vibration - so much that the carburetor set screws have already worn through the carburetor body and I haven't even broken the motor in.

I hope you can give me some advice on how to cure my problems and not ruin another backplate.

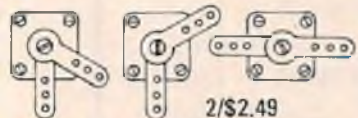
Thank you very much,  
Donald Lusk  
Brighton, Michigan

Don, evidently you have a very bad source of vibration (I know, the motor) that is breaking your backplates and causing the carburetor to come loose. However, are you sure that the carburetor is not hitting the side of the motor mount. Carburetors often come loose due to vibration but it is very unusual to break the backplate casting

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## Differential Bellcrank



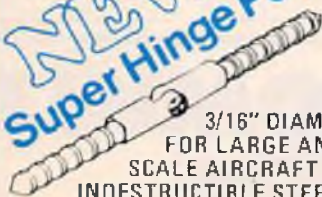
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as well.

If the carburetor is not hitting anything, then vibration is the source of your problem and, unless it is cured, broken backplates will be the least of your trouble. You will probably be experiencing breakage of your mounting screws or even the motor mounting lugs also.

Chances are pretty good that you have a badly out of balance flywheel or drive shaft. The flywheel must turn dead true with absolutely no wobble. The hole in the flywheel must be absolute dead center. Any oscillation will shake the boat apart. A sloppy fitting U-joint or excessive angle between the motor and

prop shaft can cause excessive vibration. Mount your engine on the same plane as the prop shaft. If you check these things out you will solve your problem. □

**SOARING**

from page 8

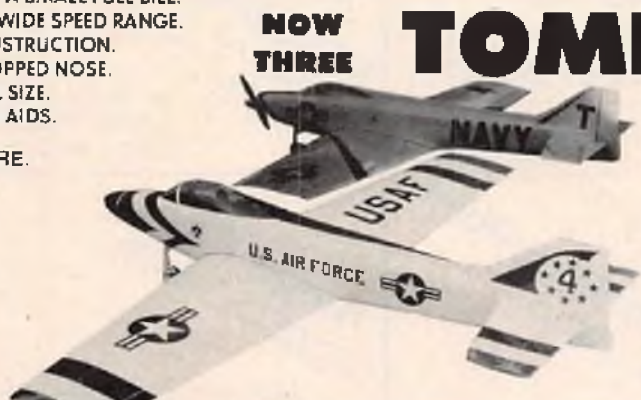
realized through the use of flaps. Furthermore, full span flaps are much more effective than partial span flaps. Combining these ideas require full span flaps to be used as flaps and also to be moved differentially as ailerons while coordinating the rudder with the

ailerons. With an appropriate mixer, these three control functions: flaps, ailerons and rudder can be driven by only two servos.

The January 1977 issue of RCM had an article which featured several mixer designs, but were for two control functions only. I, therefore, thought you readers might be interested in a design of a three function control mixer. This type of mixer is installed in a 12' original sailplane with full span flaps. With flaps up, the ship is rather fast and has good penetration. With flaps 10° down, the ship slows down and thermals very well. The flaps can also be lowered to 60° to provide additional drag for steep

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descents. And, there is always good maneuverability by using ailerons coordinated with rudder.

★ ★

Now that the FAI Soaring Championships are history, Ray Marvin the United States Program Manager for the FAI program is always ready for news and views, or what have you, about the FAI program and competition for 1981. Putting one of these programs together takes a lot of time and correspondence with you out there. So help us by letting us hear anything on how the team selection process, types and number of contests, locations and, most of all, how the program can be

improved and upgraded. Drop me a note through RCM, or contact Ray directly: Ray Marvin, 2781 S. Garfield, Denver, Colorado 80210.


★ ★

We'll close this month with a little humor supplied by Carl Russel of Huntsville, Alabama.


Frank Deis and Rex Powell, two of Huntsville's finest NSS members, were overheard in a heated discussion about the possibility of there being a suitable flying site in heaven. After much argument back and forth on the various possibilities they finally decided to take the problem to a local spiritualist for resolution. She couldn't give them an

answer immediately, but offered to have a series of seances and give them an answer in a week. After a week Frank and Rex returned to hear the results.

She told them she had some good news and some bad news. They wanted the good news first. She told them, Heaven does have the finest kind of flying site. It has 6000 foot runways, grassy median areas, good winch systems, unbreakable lines, fully charged batteries, always cheerful timers, sportsman-like competitions, unambiguous rules, fool proof frequency control, and thermals you wouldn't believe. "So what's the bad news?" they asked.



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Lee Hines, right, holds many records for indoor hand launch gliders and is on the U.S. team for A2 glider, for which he also holds many awards, talks with Mark Smith, Dave Fredricks, Keith Kindrick and Howard Short at a southern California sailplane meet.



Caught in the act was the team of Aumen's Jr. and Sr., taking the warp out of a wing panel with the heat from Auto exhaust. Didn't ask if it was unleaded or regular, or odd or even.

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## FROM THE SHOP

from page 2

... plan Nov. '77) and a Marutaka Mini-Bird. Well we didn't get hassled at all by the airport people. I guess it was the way the box was labeled. Maybe your readers might be interested.

We had been corresponding with Pavel Bosak (the bearded fellow in the photograph) who is an excellent R/C airplane designer — having designed the L-39 Alabatross featured in RCM Jan. 1978. Well there was a contest, all right, in Pilsen — but my plane was not qualified to join. Well I flew in Prague anyway and had a marvelous time — the best part was making friends in the same hobby. Everyone I met was very kind, hospitable and very generous — Pavel especially — and when I go to



Prague again I'll most certainly look him up. The weather at the time was terrific - beautiful spring weather! But since we came from a hot tropical country you can see the difference in attire. This was a source of amusement.

You guys run a fantastic magazine. Keep it going!

Obi Mapua, Jr.  
The Philippines

Dear Sir,

I would like to pass along something that may or may not interest your readers who have trailers or campers. I keep a trailer on private property at a dry lake in Southern California and, after packing two new A/C for a four day trip, I found the harsh winter had ruptured a 3/8" copper water line in the trailer and, as always, it's where you can hardly reach and could not be replaced. (Breaks in the water line have, and still are, a big and expensive problem of RV's.) So out came the torch, solder, brazing rod, etc. Later, after my son and I put out the fire (minor damage), I was ready to call it quits and head home. I would have to come back another day and cut through the wall from the outside, to get at the pipe. Then I remembered something I read in "For What It's Worth, Vol. IV."

I sanded clean, the copper pipe, 2" up and 2" down from the break. I mixed 5-minute epoxy and coated the area. After the epoxy started to set (tacky) I wrapped one layer of 1" masking tape around, so it just overlapped, after it set up (approximately 15 minutes). I repeated this procedure, then finished with one last coat to finish.

I let this set for one hour before turning on my water pump (35 lbs.). It not only held, but it will last the life of the trailer.

After taking a hot shower, my son and I had three good days of flying.

Thanks for a good magazine and keep up the good work.

Sincerely,  
Ralph Keays  
Garden Grove, California

#### ATENCIÓN

#### AHORA HABLAMOS ESPAÑOL

Con orgullo, deseamos avisarles a nuestros amigos en España y en America Latina que ahora hablamos Español aquí en RCM. Les solicitamos nos manden información y noticias, con fotos en blanco y negro, sobre sus actividades en el mundo de radio control.

También estamos aquí para servirles con información ó como podamos. Favor de dirigir su correspondencia a Eloy Marez. Si se desea llamarnos por teléfono, el numero es (213) 355-1476, de Lunes a Miercoles.

★

And we will leave on that note and see you at the flying field. □

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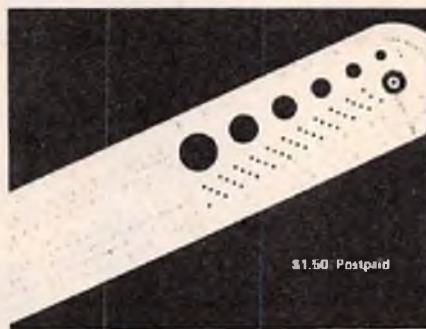
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By James Zarembski

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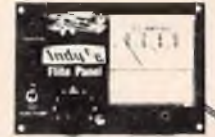
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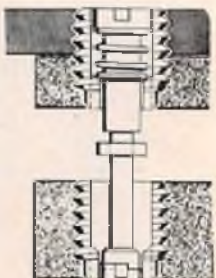
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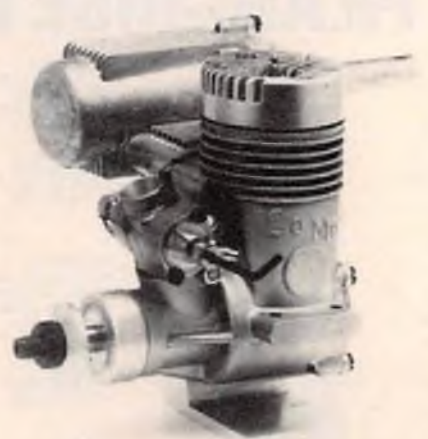
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