
RCM
radio control
MODELER
49115
MAY 1978
$1.50
THE WORLDS LEADING PUBLICATION FOR THE RADIO CONTROL ENTHUSIAST
VIKING
A New Concept In Sailplanes
REVENGER
Sleek New Pattern Ship

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Dual conversion receiver

We built the Contest 7 to prove a couple of important points. First, we packed more unique features into the entire system than any previous Futaba radio. Features to assure you of competition-caliber performance coupled with our famed reliability. And we held the price to just $579.95, just to make sure that our reputation for quality and value continues to be unequaled.

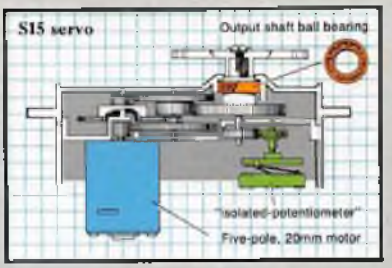
We began with the receiver, which boasts a dual conversion IF stage in addition to our standard double-tuned, RF amplified front end. And we've also used our exclusive, extra strength 3-pin connectors for the ultimate in positive contact.

Then we built the FP-T7G-72 transmitter complete with 7 channels, dust-free, ball-bearing open gimbals, dual-rate elevator and aileron controls, slide auxilliary pots, and a beautiful aluminum case.


Dust-free open gimbals

Even the servos for the Contest 7 are special.

The system includes four S15's (3-S15's/1-S15L), our ball-bearing equipped, miniature marvels.

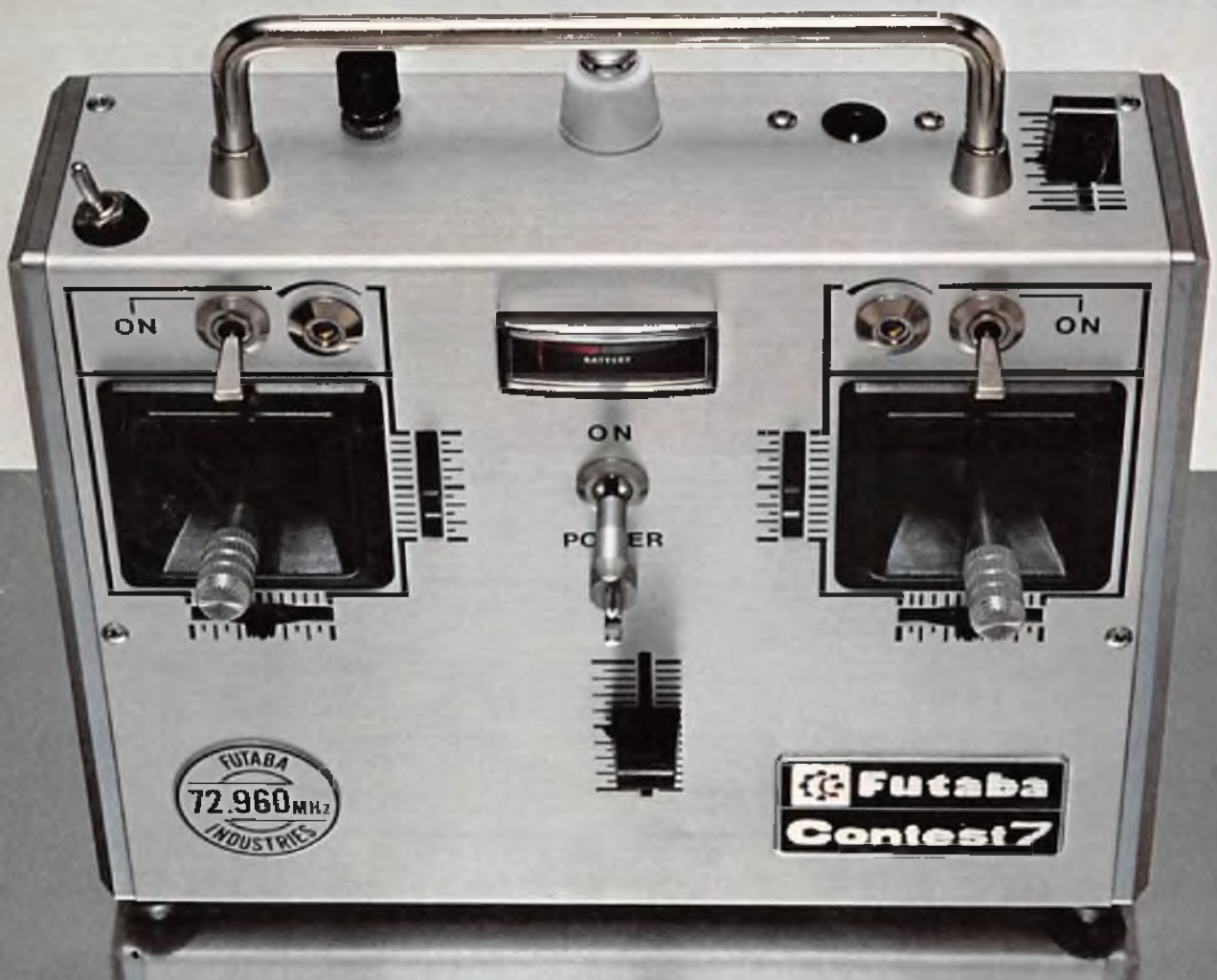


Within each sturdy nylon case lurks a custom monolithic, single-inline IC and a separate output Stage 9 pin IC for the optimum in selectivity and accuracy.

The Contest 7. It all adds up to the most Futaba money can buy.

Futaba

The Futaba Contest 7.



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

VOLUME 15 1978 NUMBER 5

R/C MODELER

FEATURES

MAY

This Month's Cover:

features lovely Miss Diane Hooten with Cox Hobbies well-known "Olympic 99" sailplane. Photo was taken in Florida by Ed Okie.

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From The SHOP

DON DEWEY

From the Philippines comes this interesting account of an "RC Friendship Conference" - - - a step in the right direction.

Dear Sir:

The Philippine RC flyers were part of a 15 man delegation to the "First Philippine-Japan Radio Control Friendship Conference" held last October 18 to 26, 1977. Among the subjects taken up were RC boat racing, RC buggy and Formula car racing, and RC airplane pattern flying. The training was under Mr. Isao Matsui, one of Japan's top RC flyers.

A reciprocal conference was held in Manila, Philippines, November 10 to 11, 1977, with an 18 man Japanese delegation. To top the conference, there was an RC boat race, a thrilling RC formula car race, and an RC pattern plane contest. Mr. Sakai, Japan's national helicopter champion, came to give helicopter exhibition flights.

Everybody had lots of fun and the next RC FEST is being planned early next year.

Very truly yours,
Vic Salvador
Philippines

•

Have you had a problem with your antenna? Read this suggestion reprinted from Starlifters Model Airplane Club newsletter for a possible solution.

Transmitter Antenna

Some of our transmitters have antennas that collapse all the way into the case — and others collapse only down to the first section and have to be unscrewed and removed from the case. But they all have sections that telescope into each other . . . and these sections pick up dirt and grime, especially when our hands are smeared with raw fuel and we grab the antenna.

Then, when we collapse the antenna, all that oil and dirt starts to cake up inside the telescoped sections, making the sections increasingly harder to move and building up a layer of insulation. Eventually you will end up with an antenna that has lost its continuity and is electrically shorter than it should be — the result is reduced range and probable disaster.

RC flyers from the Philippines who observed and underwent training with Mr. Isao Matsui of Tokyo. From left to right: Iyoy Manalo, Ico Manalo, Isao Matsui, Ronnie Salvador and Vic Salvador.

There is an easy way to prevent this problem from ever occurring. All you have to do is take your handkerchief (or any clean cloth) and wipe the entire length of your antenna a couple of times, starting from the bottom and working toward the tip. It would also be a good idea to frequently wipe the antenna with a clean rag that has been moistened with alcohol (whenever you're in your workshop). This practice of keeping your transmitter antenna clean will also increase the longevity of that part.

•

At the Plenary Meeting of the C.I.A.M. (December 1-2, 1977), a sub-committee (working group) for Electric Powered RC models was set up. This working group will be consulted for advice on sporting and technical matters in this special category by the RC sub-committee, as well as acting to coordinate all (worldwide) "Electro Flight" activities.

All proposals to change the new provisional rules (C.I.A.M. Dec. 1977) can pass via this working group. The easiest way is to forward them to Peter J. Blommaart, Rue Wauters 28, B 6200 Gosselies, Belgium.

•

If you are the owner of a Super Cycle (originally manufactured by Electra Star) you will be interested in the following information:

Since Electra Star Systems Inc., the manufacturers of Super Cycle, went out of business, L.R. Taylor & Company are able and willing to repair Super Cycles to the extent that parts availability permit. In fact, they have already repaired several. For further information concerning this service center contact L.R. Taylor & Co., 10711 Baile Ave., Chatsworth, California 91311.

•

The following letter was forwarded to us by Kraft Systems. We have not attempted to alter the translation of Mr. Simanek's account - - - RC'ers around the world will appreciate his perseverance!

Dear Friends,

At the beginning of the last year I have bought your radio set, the apparatus Kraft KP5 Sport Series. During the everyday operation I've had no trouble overall. The apparatus was used for the control of models F3A. On 22 November 1975, I wanted to celebrate my 40th birthday. Unfortunately that day wind velocity was about 15m/sec, and so I used your apparatus for controlling of sailship model Optimit produced by Graupner. Also, in this case, the wind was too strong, but in spite of that I couldn't resist and launched the vessel. Approximately after 15 minutes the ship was found to be uncommanded. Antenna was badly fastened to the main-

to page 182

You'll see many good radios in this magazine. Here are the BEST ones.

When we say these are the BEST radios you can buy we'd better have good reasons for saying it. We do:

MOST RELIABLE

1. Hobby Lobby Radios are the radios best designed to prevent vibration-caused failures. Ours are the ONLY radios you can buy that have the servo amplifiers inside the more shock-protected receiver case rather than inside the servos.

2. You get more SAFE FLYING TIME from a Hobby Lobby Radio. Our servo amplifiers use very little current. With a HL radio you can fly confidently right through your last flight of the day while owners of other radios are worrying about discharged batteries.

3. You are never the test flyer for any Hobby Lobby Radio system. The electronic design of HL radios is a well-proven design. It has not ever required redesign. The tradition with less reliable radios is to redesign annually. And each annual change makes the RCer the guinea pig for field testing.

4. Owners of other radios have to worry about the security of their often-disconnected aileron servo connector (which can't be tightened like Hobby Lobby's). The owner of a HL radio can tighten the connectors on his set and then forget about them. Flying a high performance RC plane can be nerve-racking enough without having to worry about connectors coming apart.

5. We don't recommend this, but many owners of HL radios tell us that they can fly their HL radio with the transmitter antenna partially collapsed. You can fly your RC plane much more confidently knowing that there is tremendous extra flying range built into your HL radio system.

6. Hobby Lobby Radios use electronic circuitry that gives you one-cell-out flight capability. In the rare event that one of the four cells in the airborne battery pack loses its charge or shorts out your HL Radio continues to fly safely.

MOST USABLE

1. One transmitter is capable of flying many RC planes. But, with most RC outfits it costs you almost the price of a complete new radio system just to buy four new servos to put into a second airplane. When you own a Hobby Lobby Radio you only pay for the expensive servo amplifiers once—they're inside the receiver case (except for the two auxiliary channels on the HL6). So, extra servos for our radios only cost you $14 each. There's no other radio made that lets you equip a second 4 channel plane with 4 servos for only $56.

2. "Usable" means your being able to change the direction of rotation of our servos in less than a minute. It's so simple to do this that you can do it right at the flying field. If you own any other radio than a HL radio you have to send the servo back to the factory for this change. Or, worse yet, you have to buy another servo.

3. The HL6 and HL3 both have adjustable centering tension on the control sticks. You can adjust yours real tight if you're a beginner and need tight sticks to keep yourself oriented during nervous first flights. When you become an expert you can loosen our control sticks so there's nothing between you and the "feel" of your high performance aircraft.

4. You get an Owner's Manual with the HL6 that tells you how to do routine maintenance, how to install the radio in a plane, how to reverse servo rotation, how to adjust servo neutral—one more example of how we make our radios more USABLE.

5. A "usable" radio is one that'll fit into today's smaller RC planes. The four-servo version of the HL6 weighs only 11½ ounces. The two-servo version of the HL3 will only add 7 ounces to a small .049 plane (with our optional small battery). And these light airborne weights are for radios that give you enough servo power to fly planes as big as a 25 pound, 12 foot span Curtis Robin that we've flown.

These are the reasons that we can say that Hobby Lobby Radios are BEST. Call us and order one today.

☐ **HOBBY LOBBY 6 DIGITAL PROPORTIONAL** **$219.00**
(Includes Transmitter, Receiver, 4 servos, Rechargeable nicads for transmitter and airborne, Charger, 6 month limited warranty, extra servo outputs, mounting grommets, Illustrated Owner's Manual. Available on all 27 mhz. and 72-75 mhz. frequencies.

HOBBY LOBBY 3 CHANNEL SYSTEMS (27 or 72 mhz. frequencies)

☐ with 2 servos . . . . . **$109** . . $119.00
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20—1/16x3x36 **$7.77**
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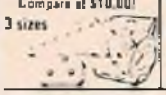
10-1/8x4x36 **$8.88**
10-3/16x4x36 **$9.99**
10-1/4x3x36 **$7.77**

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

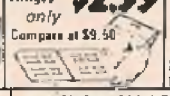
BULK PACKAGE Control Horns

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



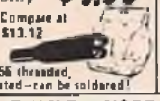
BULK PACKAGE Polypropylene Hinges

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



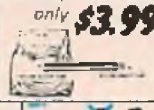
BULK PACKAGE RC Metal Clevises

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



BULK PACKAGE Nylon Tube Pushrod

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



BULK PACKAGE Brass Threaded Couplers

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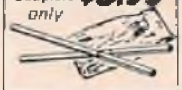

BULK PACKAGE 8 Wheels

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

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Compare at $7.25

BULK PACKAGE RC Steel Links with 18" Rods

25 Links only **$4.99**
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BULK PACKAGE Flex Cable Pushrod

20 feet nylon tubing
20 feet 1/16" bronze cable
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20 threaded wood blocks
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Compare at $6.50
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Larger Quantity

3, 7 Fuel Filters

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NEW!

BULK PACKAGE 10 FEET Surgical Fuel Line Tubing

only **$1.99**

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Compare at $8.50

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NEW!

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SURFLITE A-R-F FOAM KIT
SPITFIRE MK I $26.56
List price $34.95

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

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For .15-.19 engine. 52" span, 442 sq. inch area. 2 to 4 channels. Includes semi-scale engine cylinders, vinyl numbers, stripes, Cub decals, steerable tail wheel.

CESSNA SKYLANE 182 FOAM A-R-F $26.56
List price $34.95
For .15-.19 engine. 53" span, 420 sq. inch area, 2 to 4 channels. Steerable nose gear, 2 hour assembly.

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List price $44.95

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

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Brand New Design! Lower Price!

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

Hobby Lobby POWER CENTER

$17.88

List price $29.95

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

NO ADAPTERS NEEDED!
These will fit any engine!

NEW! KAVAN ALUMINUM SPINNERS

1½" (40mm) diameter	$4.60
1¾" (45mm) diameter	$5.10
2" (50mm) diameter	$5.40
2¼" (55mm) diameter	$5.70
2½" (60mm) diameter	$6.00
Kavan Four-way wrench	$2.50

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

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

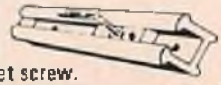
Hobby Lobby RECRUIT

$21.95

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

NEW! KDH ADJUSTABLE GLIDER TOW HOOK $3.95

Made of extruded aluminum. Tow hook quickly adjusts fore and aft by loosening a set screw.



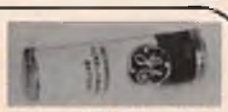
SPECIAL!

G.E. Nickel-Cadmium Batteries

1.2 volt 500 mah. Pencell size

4 for $9.99

Retail $3.29 ea.



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

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15-4	$4.75
15-5	$4.75
15-6	$4.75
16-4	$5.95
16-6	$5.95
18-4	$7.95
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NO ONE UNDERSELLS Z-10

1/2 oz.
14.1 Grams

$1.99

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

Hobby Lobby's

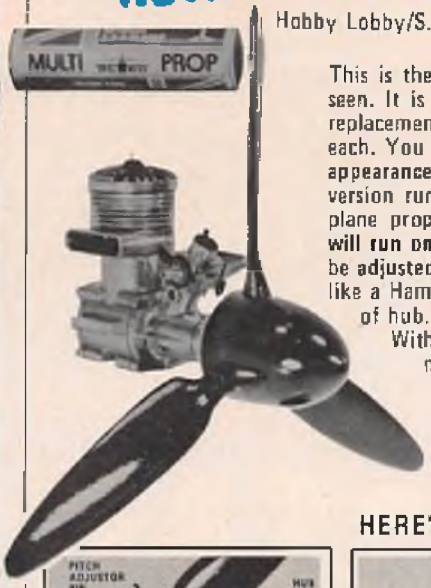
SUPERKOTE

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

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

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

NEW! Revolutionary! Variable Pitch Prop!



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

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

HERE'S HOW IT WORKS:

BRAND NEW! Now available in 12" diameter!

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

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

only **$15.96** List Price $23.95

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

- Precisely cut, easy-to-build, all balsa kit from Japan.
- 2-channel powered glider—great trainer slope soarer and sport plane!

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

NEW! HARPOON Flying Boat a.r.f. $88.00

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

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

JUNIOR TELEMASTER BEGINNERS OUTFIT $277

A Hobby Lobby JUNIOR TELEMASTER

C Fox 15 R/C ENGINE

B Hobby Lobby 6 RADIO

D 2 rolls/Hobby Lobby SUPERKOTE

Combination price in effect until May 30, '78

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

Hobby Lobby
09 CESSNA TRAINER
$22.57

List price $33.75

One of the EASIEST-TO-BUILD balsa & plywood kits you'll ever see! One piece fuselage sides, machine cut wing ribs, drop-out die-cut plywood fuselage formers for strength, dural landing gear, and plywood & balsa wheel pants. 42½" span, 317 sq. inch wing area, for 2 or 3 RC channels. Words can't do this kit justice—you've got to see it!

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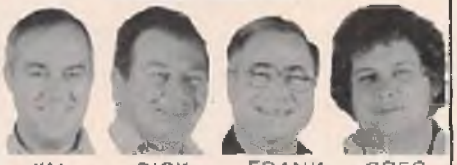

JIM DICK FRANK GREG

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Cunningham On RC

CHUCK CUNNINGHAM

Okay, all of you guys who have made good use of this super lousy winter to get ready for spring flying, hold up your hands. Goofed off - - - didn't we? There is something about crummy weather that after a time begins to get to me, and I don't want to do anything but sleep. Now, I know why bears go into a long sleep in the winter. As I am writing this, the East is trying to dig out of its latest greatest snow storm of the century, down here in Texas we are covered in ice and snow, and in California everything is washing down the hill, and out into the Pacific. For all I know, perhaps old Fearless and Dickie & the Harem have been washed right off of the foothills and down all the way to Los Angeles. But, if we all survive, and this column finally gets to you, and the sun is shining, and the birds are singing in the trees, and the weather is warm . . . then, how come all of us didn't use all of this great winter building weather to get ready for the flying season . . . how come?

But, if you did do your homework, and you have been spending the time creating a big, monster type airplane, then let me extend an invitation to you to come to the First Annual Jumbo RC Fly-In. This fly-in will be held Saturday and Sunday, July 22 and 23, at Thunderbird field in Fort Worth, Texas. The Jumbo RC Fly-In is just what the name implies. It is for jumbo RC airplanes. Scale, scale-like, semi-scale, or what have you, is not a requirement - - - big is. Big is the only requirement, and the fact that it must be radio controlled. So full size aircraft can't enter, Clyde. As most of you know by now, I have been hooked on **big** RC airplanes for the past four years or so, and believe that this is a great way to enjoy RC. Last year I predicted that 1978 would be the year of **big** RC airplanes, and this has proven to be a correct guess. All of the model press are featuring large airplanes, and columns about how to build them, and I think that this is great, with one exception. I personally feel that "Quarter Scale" is much too limiting. Jumbo, or mammoth as Bill Northrup likes to call the movement, is much less restrictive. What would be a Quarter Scale of one aircraft might well result in a pretty small aircraft (a quarter scale of a Knight Twister, for example) while a Quarter Scale of a 747 would be so darn big that "there ain't no way . . .". So, also for the scale requirement. Why not simply emphasize "**big**". So, for the First Annual RC Fly-In, the following requirements will be in effect. Any type of RC model is welcome, provided that for mono wing planes the minimum span is 80" and for biplanes, the minimum wing span is 66". Antique and Old Timer aircraft will be welcome right along with Telemasters, Lazy Aces, Miss Texas, Quadra powered biggies, giants, or jumbos of every type. Even big gliders will be welcome, because this isn't a contest, it is a Fly-In. A gathering place for RC'ers to show off their latest effort, fly some, talk some, enjoy a lot, and see what the other guy is doing. Thunderbird Field can accommodate the largest to the smallest aircraft with lots of room to fly and pit. Sure, the weather will be hot, so bring some shade and lots of beverage. If you are interested in attending, write to me at 2440 Colonial Parkway, Fort Worth, Texas 76109, for additional details. But, plan now to attend, you will have a good time. And, if you don't have your big bird finished yet, bring along the pieces, perhaps someone will have a helpful idea, or just come to look. It's going to be a great **happening**.

While on the subject of Jumbo RC I'd like to mention a few points about constructing the larger than average RC aircraft. First, in all RC construction you should be very careful to make good glue joints. This is true for large or small aircraft, Antiques or Quadra type. But, on the the biggies it is even more important because the loads on the glue joints are ever so much greater. If you're building an aircraft to gently fly around the sky with an occasional landing thrown in every once in awhile, you can get by with limited beef in your construction, and just average glue joints. But, if you're building a jumbo that will fly around the sky doing loops, rolls, spins, what have you, the building techniques need to be a lot better. Muscle is the name of the game, muscle in the structure. Let me cite an example: In all of my designs for large aircraft, I use rather large plywood dihedral braces to carry the load from one wing panel to the next. The dihedral braces tie the two wing panels together by having the spruce spars from each wing panel epoxied to the dihedral brace, thus making a very strong wing joint - - - unless, for some strange reason, the spars don't get firmly glued to the ply dihedral brace. And, this happened to me on my Lucky Lady. I folded a wing pulling out of an inverted spiral dive. I was coming down too fast, and made too abrupt of a pull out, and folded the wing. It's a big airplane with lots of wing area. The Lucky Lady made somewhat of a mess of itself upon smiting the ground. I salvaged all of the pieces and examined the wing panel where it parted company from the center section, and found that the glue joint between the spars and the dihedral brace failed. In fact, the builder failed (me) because I thought that I had a good glue joint when, in fact, the epoxy hadn't even contacted between the spars and the dihedral brace. I thought that it was sound, and it wasn't. The builder had failed, not the strength of the design. I picked up all of the pieces, took them home and piled them in a box in the garage. Two days later I took a good look at them, started cleaning them up, and in three evenings and one Saturday afternoon had the Lucky Lady back ready to fly again, with a well glued center section. The reason for telling you all of this is two-fold. First, to encourage you to make darn sure that you're building strong and well, and to reinforce my words of several issues ago about repairing aircraft after a crash. Pick up all of the pieces, take them home and set them aside. Then, after two or more days you'll realize that the parts can go back together, and you will find out that a crashed airplane can live to fly again.

•

I received a letter the other day asking me a question about the Fokker D-VII that I designed and which was published in 1973. The question started my thinking along the lines of an answer, and that answer should be brought to all of you readers. The question concerned down thrust and side thrust of the engine mounting. The writer wanted to know if it was okay to leave them out, and to also change the 1° positive incidence in the horizontal stab. I wonder how many builders make changes to magazine plans or kit plans, not knowing why the design was made that way in the first place. I know that a lot of builders don't seem to concern themselves with the location of the Center of Gravity, overall weight of an aircraft, down thrust, side thrust, amount of surface move-

to page 180

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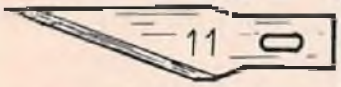

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Engine Clinic CLARENCE LEE

Dear Clarence,

Having read your column for several years, I find it very informative, to the point, and seldom do you err! But I gotcha' this time! In your January 1978 column on pipe tuning, you stated that the OPS pipe differs from others "in that following the expanding cone section, the rear portion remains a constant diameter with a flat back." This is true. It does remain constant (on the outside) but what you see is not all you get. The back portion is actually the muffler for the pipe and it does indeed have a converging section internally. It seems to me that a pipe in the configuration you suggest would be no more than a very large and long muffler. The flat back would kill any reflected pressure wave present. What you would have is a pressure build-up that would reduce power somewhat.

Now, for a more head scratchable problem: I have an OS .40 FSR that I run with an OPS 40SS pipe on a pattern ship. the engine runs like crazy with the pipe, stock carb (4B) and pipe pressure. In trying to increase power, I tried a Perry pressure carb designed for a Webra .60 (just fits perfectly) and a Robart pump. The problem is that it goes slobbery rich after 2 to 3 minutes into the flight. If I set the needle to an over lean condition at take-off, I can usually get a good run as it richens up some after 2 to 3 minutes into the flight. Notice I said usually. Sometimes it will go too rich anyway. I have tried locking down the needle to keep it from unscrewing, new pumps, increased and decreased pressure, cleaned the carb, raised compression, lowered compression, retuned the pipe, checked and replaced gaskets till I'm blue in the face – all to no avail. Yet it will run great on the ground – good idle, mid-range and wide open. Now, I could understand it going lean with this carb due to the venturi size, but rich? What gives? The tank is on the center line of the N.V. and after all this, when I put it back as it was, the problem disappears.

I have run 35's (combat C/L) with larger throat area than the Perry has and without any trouble (crankcase pressure). I find it hard to believe that this engine can't handle that much mixture. (10% Coal-Power fuel run exclusively in this engine.) Any help will be greatly appreciated.

Very truly yours,
Jerry N. Clifton

I guess I blew it in regards to the OPS 60SS pipe. Like everybody else, I sometimes put the columns off until the last minute and then sit up into the wee hours of the morning trying to get it done in time for the deadline. Quite often the thought I have in mind and what ends up in print are two different things. I am well aware of the OPS 60SS pipe being constant diameter on the outside only and having the converging cone inside since I am running one of these on my own K & B .61. OPS makes both the conventional double taper pipe and the SS muffler pipe with the constant diameter outside shell. I was trying to differentiate between the two types but did not do a very good job in my explanation. The addition of the constant diameter housing does seem to broaden the rpm range of the pipe over the standard double taper type without the housing which is what I was attempting to say.

Now as to your problem with your O.S. .40. Nine out of ten times when an engine goes excessively rich after take-off, it is due to foaming of the fuel. While on the ground, the fuel is foaming, requiring a richer setting to compensate for the excessive air in the fuel. In the air, the foaming stops and the engine goes very rich. I would guess that installing the .60 size carburetor increased the rpm of the engine into a vibration range that is causing the foaming. Engines go through vibration modes and most engines hit a bad vibration period right in the 13,000-14,000 range. You have to be very careful about prop balance, spinner balance, and tank mounting. The tank should be surrounded by rubber or plastic foam and not jammed in too tightly.

The problem could also be caused by the pipe cooling off in the air (or the engine itself for that matter). On the ground, all the heat from the pipe is being transferred back to the engine. In the air, the pipe cools off, in turn, allowing the engine to run cooler and the mixture richens up. Always be sure to use a piece of silicon rubber hose between the pipe and the engine exhaust manifold — never a direct metal-to-metal connection. Many times painting the pipe black will help. Rust-Oleum Bar-B-Q black is excellent for this. Spray it on, let it set until the wetness is gone, and then stick it in the oven at 200° for an hour.

One final suggestion would be to lower your tank so that the center line is 3/8" to 1/2" below the center line of the needle valve. It is normal for engines to richen slightly after take-off and with a high tank position the tendency is increased. Larger venturies are more susceptible than smaller venturies due to lower fuel draw ability even when helped by pump pressure.

Our next letter is a two-parter — the letter sent to me and also a copy of a letter Mr. Gallant (the sender) had received in reply to a previous inquiry he had made to the manufacturers of WD-40 regarding problems with the product.

Dear Mr. Lee,

Out at the flying field at Lake Elsinore I was told that WD-40 was causing corrosion on model engines. I became worried as I have been using WD-40 on all my engines (20), handguns, shotguns, and rifles, for years. I took a Super Tigre that had been put away for ten years, with an occasional squirt of WD-40, down to San Diego for a check by Mr. Agnew and enclosed is his report. As you can see, the rumors are false and if at all possible would you put the report in your Engine Clinic column. A lot of people may have been told the same thing I was and have become concerned. Besides, I hate false rumors that are spread without facts. Keep up the good work. I enjoy your Engine Clinic column very much.

Yours truly,
Harold R. Gallant
Sun City, Calif.

Dear Mr. Gallant,

It was very pleasant chatting with you the other day. We were especially pleased with the opportunity to inspect and disassemble your model airplane engine which had been treated with WD-40 periodically, and stored for a 10 year period.

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to page 169

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Sunday Flier

KEN WILLARD

For years I 've been a great advocate of the small R/C power jobs - - - 1/2A, 1/4A and .010 (1/8th A?). Properly designed, they can be excellent performers, both for sport and racing. But for some reason, they never reached the level of popularity which they deserve.

But times are changing. With spiraling costs for materials and fuel, many modelers are taking another look at the smaller jobs. You can fly all summer on about a gallon of fuel, and, because the planes are smaller, building costs are less. So are repairs.

One of the major drawbacks to 1/2A flying has always been the lack of a really good, reliable throttle. As a result, most 1/2A fliers just flew at full throttle until the engine quit, then made power-off landings. It wasn't as much fun as being able to throttle back, land, then take-off again - - - but it was better than nothing.

One phase of 1/2A flying didn't need a throttle anyway, and that was racing, so gradually we've seen a lot of interest building up for 1/2A racing. It was gradual, though; a lot of the big engine enthusiasts couldn't see the event at all. It was only a few years back — maybe four — that I was at the MACS Show in Anaheim and talked with Glen Spickler, the high priest of racing. I asked him about rules, course, design limits, and stuff like that for 1/2A racing. His reply? In essence, "I don't pay any attention to that kid stuff." And that was that. But that was four years ago. Since then, 1/2A racing has grown in popularity to the point where it really can now be rightfully termed "big time". Sometimes I wonder if that's all to the good. Why? Here me out.

When we started having 1/2A races in this area, the event would draw seven to ten entrants. Anybody with an Upstart had a chance to win. Then the engine refinements came along. First thing you know, someone was getting 2000 more rpm than the others. Glowheads were replaced after each race. Nitro content went to 30, 40, 50, and 60 percent of the fuel - - - and I hear that some new combo is out where the nitro content is even higher - - - and more expensive.

Even so, the number of entrants stayed fairly low - - - although interest in Southern California was growing much faster.

Then, in December, the Wavemasters had a big two day 1/2A event at the Hill Country Air Museum Field. The first day was for a one design event. The plane they selected was the Honker. Refinements in wing and stab settings were permitted, but the basic structure had to be unchanged. And there were no restrictions on the engines.

The second day was for the unlimited design event. Any wing planform, no limit on maximum thickness of the wing; the only restriction was that the minimum weight be 20 ounces, without fuel. The winning planes were weighed after each race.

A simultaneous hand launched start was used, rather than the staggered start, which was previously used on the basis of safety. It is interesting to note that there were no collisions between racers at the start, as had been previously feared. The Wavemasters also had a good innovation for the start; in addition to the audible time count during the 90 seconds permitted for engine starting, a visual timer was placed just to the side and ahead of the launch area, easily visible to the pilot and/or the pitman. The pointer began moving from the three o'clock position, and when it reached the six o'clock point there were 60 seconds left; at the nine o'clock point, 30 seconds remain. The final 15 seconds are clearly marked - - - and if your engine isn't running by then,it gets pretty frantic. But it does away with the claims of a "fast count". Every racing club should have one.

Starting timer clock for R/C racing, devised by the Wavemaster Club, visually shows the 90 second countdown.

The Wavemasters' 1/2A contest may not have been the biggest ever held, but it certainly was the biggest ever held in Northern California. And it goes to show that, as in almost every sport these days, money attracts entrants. It wasn't much - - - compared to Las Vegas, but $75.00 for First Place in the Honker contest, and $100.00 for the Unlimited Class, resulted in 23 Honker entries, and 41 Unlimited. Counting the back-up planes, there were close to 100 1/2A racers in evidence.

Jack Doty, Contest Director, and Tom Kalivoda, Contest Manager, with 20 of the 23 Honker entries in the Wavemasters 1/2A racing event in December.

The pit area of a 1/2A race is always a scene of feverish action – preparing, repairing, or comparing notes on strategy.

And wouldn't you know it? Lee Hezel won First Place in both classes. I really wasn't surprised. Lee is the most throroughly prepared 1/2A racing buff I've ever seen. I took a look in his equipment box; five or six spare engines, some twenty to twenty-five glow heads, a few spare crankcases, pistons and

to page 31

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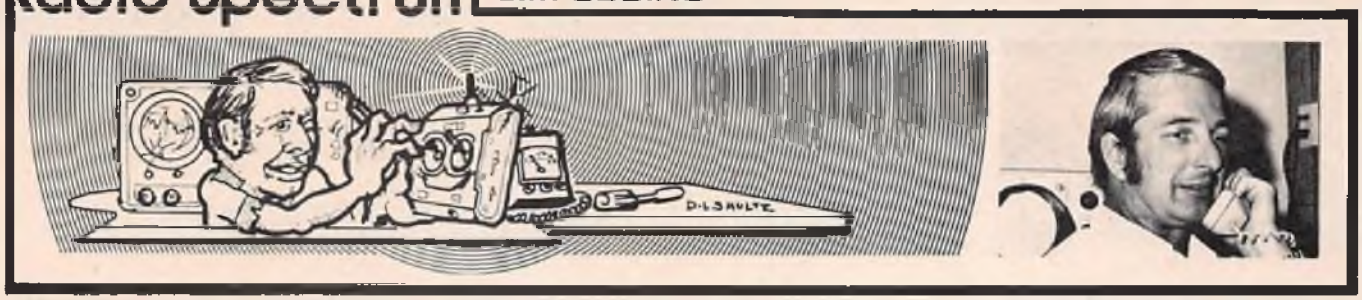
Radio Spectrum

JIM ODDINO



I suppose there are a lot of New Yorker's who haven't seen the Statue of Liberty and Romans who haven't visited the Pope, but I bet you'd be surprised to know that I had never visited Kraft Systems plant in Vista, California, even though it is only about two hours from my place. I took care of this omission in my education a couple of weeks ago at the invitation of Peter Berg of the Kraft engineering staff. Peter has been working on an FM system that Kraft plans to market in Europe. It should also be available on six meters in this country by the time this is published. Being all pumped up on FM, as you can tell from my previous columns, I wasted no time and jumped at the chance to see the Kraft approach.

I must say they did exactly what I would have done and that is to look at what had already been done by the German manufacturers. Last month I mentioned that the new German RC frequencies are only 10 KHz apart and that there was a misconception that only narrow band FM could be used with this spacing. I pointed out that theoretically you should be able to use AM and in fact Simprop had elected to stay with AM. However, Peter found out what I'm sure most of the other German companies did, and that is the fact that it is easier to do with NBFM. In order to cut down on the transmitted bandwidth, one must filter the base band signal (signal coming from the encoder). This has the effect of rounding off the pulse rise and fall times as shown in Figure 1.

In our standard AM systems, the leading and trailing edges of the encoder pulse train are sloped to reduce the side bands but additional filtering would be required with 10 KHz spacing. This is not difficult and must also be done in an FM system to maintain narrow bandwidth. The problem occurs on the receiving end of the system. The greater the slope on the pulses, the better the AGC must be in order to eliminate pulse to pulse amplitude variations which, in turn, can cause pulse width variations to the servos. This is illustrated in Figure 2. I used triangular waves just to make it easier to draw, but the principle is the same with sine waves, trapazoids, etc.

Notice that the pulse width to the servo gets longer if the pulse amplitude gets lower. If the amplitude fluctuates significantly, this can cause a degradation in the pilot's ability to put the plane where he wants it. A better AGC minimized the fluctuations.

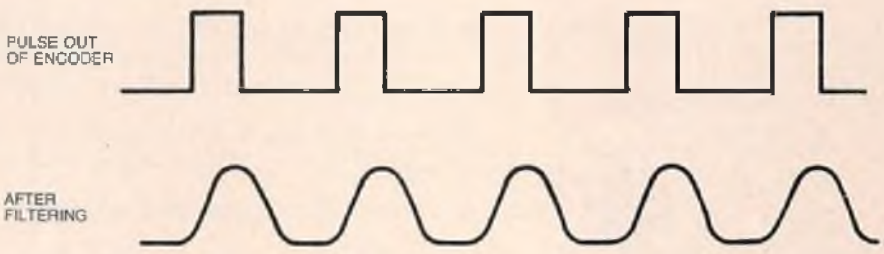


FIGURE 1

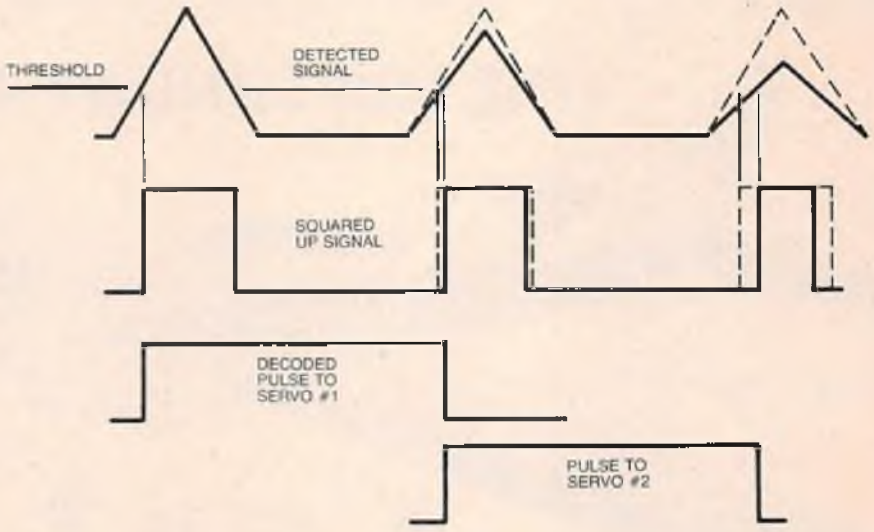


FIGURE 2

In an FM system with limiting, this problem is eliminated. The signal is ramped from one frequency to another, but this results in a fixed amplitude out of the discriminator regardless of the transmission path, as long as you are limiting. The net result is a better system, unless you can build an AM system with a super AGC. Perhaps Simprop has done this.

Anyway, it was decided that FM was the easiest way to build a system to operate on the German frequencies. The next step was to look at some German FM systems. The two Siemans integraded circuits I talked about a few months ago, provide the heart of the receiver. The Kraft engineers started with these and used tried and proven preselector, IF filter and decoder circuits. One notable change is shielded RF coils which allow tighter packaging. The ceramic filters used are the same series that Kraft has been using, but with a narrower bandwidth. The decoder uses a dual OP amp and a Johnson counter which works out very nice. The only transistor used is in the battery filter circuit which effectively cuts the ripple to the receiver circuits. With the receiver configuration determined, the only real problem is selecting the bandwidth, frequency deviation and discriminator characteristics. One of the biggest challenges in building FM systems will be frequency stability and control. To fit in the 10 KHz bandwidth, they settled on a 4 KHz frequency deviation with a 6 KHz receiver bandwidth. This will allow

to page 18

ANNOUNCING! – 3 NEW

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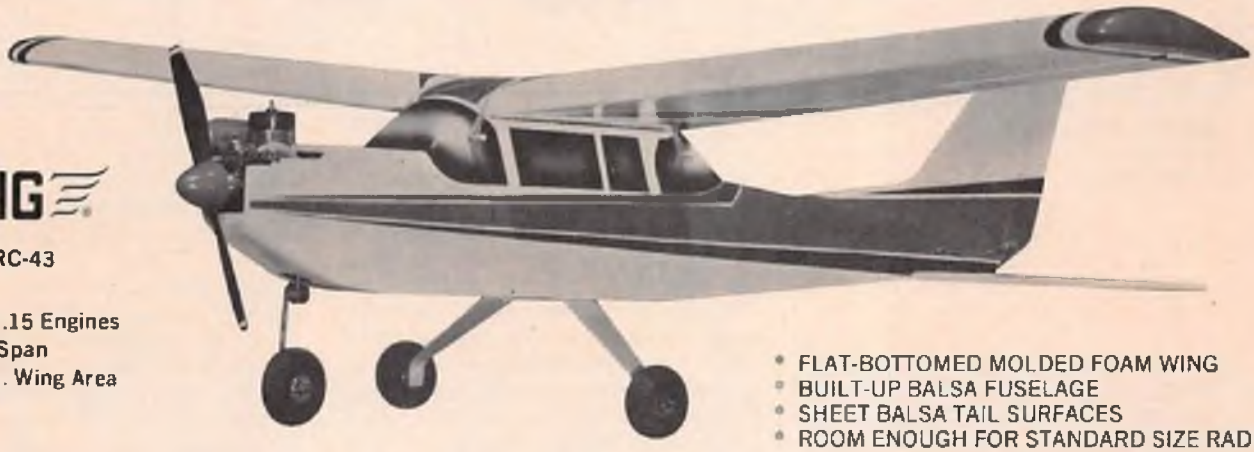

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RADIO SPECTRUM

from page 15

transmitter oscillator, receiver local oscillator, and discriminator drift to add up to about 2 KHz without degrading system performance. The discriminator is designed to be linear over the entire 6 Hz bandwidth of the receiver so the voltage out will not change if the frequency drifts slightly.

The classic way of generating NBFM signals in the transmitter is to use a varicap (variable capacitance diode) in a crystal oscillator that is operated at some fraction of the operating frequency. On 6 meters, the Kraft oscillator will operate at 1/3 the operating frequency and then be tripled in the buffer stage. This also triples the deviation which means you only have to "pull" the crystal oscillator 1/3 x 4000 Hz. For stability reasons, they decided not to use a varicap, but instead switch a trimmer capacitor in and out at a controlled rate to get the required deviation. The remainder of the RF section is similar to previous Kraft circuits which incorporate an FET output stage. The neat thing about this is the 6 volt (5 cell) power supply. They do plan to make a plug-in module of the RF section for use in your existing transmitters, but this is off in the future.

We talked a little about the advantages of a wider bandwidth which could be legally incorporated on the 6 meter version, and Peter said he was considering this, however, my guess is that you probably couldn't tell the difference and, in fact, you may not be able to see any improvement over your present AM equipment if it is working well. Somehow though, I'm awfully attracted to that all integrated circuit receiver which prom-

ises to be a consistent performer. One definite advantage is its rejection of static as you might experience with an ignition engine.

So, if you are thinking about a new system this year, I think I would be inclinded to give this one a try.

I'd like to thank Peter Berg for taking the time to show me what he has done and make it possible for me to share it with you. I tried to talk him into writing this column so I could sit back and read it for a few years, but he respectfully declined. Actually, if I had more inputs like this, I'd probably pay to do it.

•

Mathematicians 10 — Aerodynamicists 1

Of the people who read Radio Spectrum, it would appear that we have ten mathematicians for every aerodynamicist. We made this startling discovery accidentally when we presented the following problem in the February 1978 column.

A pilot takes off from the local airport and flies directly into the wind for 10 miles at constant speed. At that point, he passes a balloon drifting downwind towards the airport. He continues to fly straight ahead for an hour, then turns around and flies downwind back to the airport where he arrives at the same time as the balloon. What was the wind velocity? If you can figure that out, you ought to be able to figure out the speed of the airplane, right?

I must admit that when my daughter brought this problem home, I attacked it from an algebraic approach, and really solved it from a trial and error method before making the equations work.

Of the first twenty letters I received, ten people solved it with equations, and nine others had the right answer with no explanations. I'm not sure if they are mathematicians, aerodynamicists or cut and triers, or all three.

The twentieth reply was from a Lufthanza pilot who seemed to know something the rest of us didn't. I showed it to Bill Salkowski and with a little mental gymnastics, we discovered his secret. It was only then that I realized what a clever problem I had layed on you. If you recognized a fundamental aero principal, the math was pretty easy, in fact, a second grader could get the answer.

First, let's take care of the problem with algebra. There are a couple of ways to set it up, here is mine:

Let D = distance from sighting to furthest point upwind. Tu = time to fly upwind (1 hour) and Td = time to fly downwind. Ra = airplane velocity and Rw = wind velocity. Distance equals velocity times time, so we can write:

$$D=(Ra-Rw)\,Tu$$

$$D+10=(Ra+Rw)\,Td$$

We also know that the total time out and back equals the time for the balloon to go the 10 miles. Therefore:

$$T\ total=Tu+Td$$

and

$$10=Rw\cdot x\ T\ total$$

Substituting:

$$\frac{10}{Rw}=\frac{Ra-Rw+10}{Ra+Rw}+1$$

$$\frac{10}{Rw}=\frac{Ra-Rw+10+Ra+Rw}{Ra+Rw}$$

$$\frac{10}{Rw}=\frac{2\,Ra+10}{Ra+Rw}$$

$$10\,Ra+10\,Rw=2\,Ra\,Rw+10\,Rw$$

$$10\,Ra=2\,Ra\,Rw$$

$$Rw=5\ mph$$

Ra is independent and any speed over 5 mph will satisfy the equations. So, if the pilot were in a J-3 Cub or an F-16, the results are the same. That should have been a tip off that we had discovered a "basic law" of flight. However, I didn't start thinking until I received the following letter:

Dear Jim,

The problem allows solution of wind speed only, being 5 mph, while the problem works with any aircraft speed. The wind component slowing the aircraft on its way out will push it home faster by the same amount, so time out will be 1 hour from time meeting the balloon. Time home to airport is 1 hour as well. So, as the balloon is drifting 10 miles in 2 hours, wind speed is 5 mph. This works for any aircraft speed under one condition: Time for 180° turn around is zero!

Sincerely,
Klaus Panten
Lufthanza

I said to Bill, "How does he know it's going to take exactly 1 hour to get back to the airport?" Then it clicked. The old sea of air principle. Forget the ground. Think in terms of one flying object relative to the other. They could both be going 5000 mph or standing still.

So let the balloon stand still. If you fly away from it for one hour, it will take one hour to get back to it. The airplane doesn't know the wind is blowing if it uses the balloon and not the earth as its reference. If we could fly our models from the balloon, it would be like flying with no wind. We wouldn't have to worry about those downwind turns anymore and we could have saved Ken Willard a lot of headaches a few years ago.

Here is a list of the smart guys: Ray Isherwood, Poway, Calif.; James Gibson, Spokane, Wash.; Norm Pos, Imperial Beach, Calif.; Tim Peters, Jennings, Kan.; Kent Rianda, Union City, Calif.; Neil Byrd, Duluth, Minn.; Joe Foard*, Hopkinsville, Ky.; Ed Seay, Charlottesville, Va.; John Rushing, Plantation, Fla.; Dennis Knollenberg, Franklin, Wis.; Steven Harris, W. Palm Beach, Fla.; John Swonger, Buena Vista, Pa.; Joe Hopwood, San Antonio, Tex.; Don Childers, Clarksville, Ind.; John Fusselman, Carrollton, Tex.; Ken Brown, Coos Bay, Ore.; Ed Van Wagner, Webster, N.Y.; Lawrence Alzheimer, Dutton, Mont.; Dennis Lymons, San Diego, Calif.

* Joe should be classified as a Manager or General (or Tyrant) and his wife gets credit for the math. His note attached to his wife's three pages of calculations read: . . . thanks for giving my wife something to do while I worked on my latest model!!

Thank you all for responding. It is good to know that someone is reading this stuff, and I might add, it sounds like some pretty sharp people out there. Guess I'll try to keep exercising you with the technical stuff.

•

In our discussion on FM, we talked about the importance of having good AGC in an AM receiver. The following letter would appear to be a very good example.

Dear Jim,

I wish to inform users of the Heathkit eight channel receiver model GDA-405-2 that they probably have an unsafe aircraft under their control. This is due to an improper AGC circuit. (Editor's Note: I don't think I'd go that far.)

I assembled my kit in 1970 and used it several years without any obvious problems. I did get occasional glitches, but simply chalked them up to RFI because they seldom lasted more than a second.

Then came my first attempt at glider flight at Torrey Pines in San Diego. Every time my glider crossed over the cliffs, it would go bananas for about two seconds and then fly normal after getting clear of the cliffs. On the return back over the cliffs, the problem would reappear. Since I operate on six meters, I assumed this problem was due to RFI also. Thorough testing of the receiver revealed no abnormalties.

One day I was discussing this problem with a fellow modeler and he stated his Heathkit (72 MHz) GDA-405-2 did the same thing at Torrey Pines, but his Heathkit five channel receiver model GD-19 worked fine out there.

This was when I decided the receiver was too deep into AGC and the receiver was actually being cut-off by its own AGC voltage when the aircraft flew from strong signals into weak signals.

Observe the value of C-3 enclosure one and C-103 enclosure two. Now compare these values to C-9 and C-18 of enclosure three. It was obvious to me

to page 162

Soaring

AL KINDRICK

One of the by-products of this years NATS at Riverside, California, was the introduction of many new faces to the world of officialdom. Ray Marvin from Denver did a yeomans job against many odds with the National Soaring Society, to pull off the Soaring events for the AMA.

Ray has accepted a much more demanding challenge this year. He is the program director for the FAI R/C Soaring Team Selection Program --- a tremendous job that needs everyones help. Many things have been said against the FAI program. Many of the short-comings have been corrected: it is the Universal Standard World Wide Skills program to determine a true champion; it is the greatest challenge in the model soaring today.

The FAI R/C Soaring Team Selection Program is underway again to select the team to go to the World Championships in 1979. Plans are to run this program in essentially the same manner as the previous one, which Jim Simpson so ably conducted. It was a good program which resulted in a team which went on to take First Place Individual and First Place Team honors at the World Championships in South Africa. In the coming program we will be seeking a team which can repeat this performance. The program is being conducted by the National Soaring Society but is not restricted to NSS members. It is open to all AMA members.

For those who are not aware of how the program works, the procedure is as follows. The first step is to enter a Quarter Finals Contest. the cost will be $25.00 plus the cost of an FAI stamp, but there will be no additional charge if you advance to the Semi-Finals and the Finals.

We are in the process of setting up the contest schedule now, so check in your area to see if there is a Quarter Finals Contest scheduled. If not, get your club to sponsor one. The next step is for an AMA C.D. in your club to apply for a sanction and schedule the meet during the months of April, May, or June.

The C.D. of each Quarter Finals Contest will be provided with program registration forms & will be able to collect for FAI stamps and AMA membership. When each contestant registers, the C.D. must check for valid (current) AMA license with FAI stamp, collect the $25.00 program entry fee, and fill out the registration form. Following the Quarter Finals, the C.D. will complete a contest report with names and scores of all entrants, regardless of standing. This report will be forwarded, with all entry fees collected, to AMA headquarters immediately upon completion of the contest, with the fees to be used for team travel to the World Championships.

Dan Pruss jokingly reminds us who was number one.

Results of snagging a winch line on launch. Photo shows untouched Oly II at completion of flight.

The contests will be run in strict accordance with FAI rules, with the exception that motor gliders are excluded. In order to advance to the Semi -Finals, a contestant must attain at least 80% or more of the winning score after at least three complete rounds. If you fail in your first attempt, you may enter one other Quarter Final Contest and try again.

If you qualify to fly in the Semi-Finals, you may attend the one you choose. There will be from six to ten scheduled in various parts of the country and they will be flown over the first weekend, July 1-3, or on the following weekend, July 8-9. That is, one contest in a given area may be scheduled on the first weekend while a second one may be scheduled on the second weekend. Results of the Semi-Finals Contest will be forwarded to the program chairman and the number of contestants from each Semi-Finals Contest, who are eligible to advance to the finals, will be determined according to the following formula.

Number of contestants in your Semi-Finals times 36 equals Total number of contestants in all Semi-Finals.

You will be notified if you are eligible to attend and you must notify the finals C.D. if you plan to attend. Alternates will be invited to attend if those who have qualified are unable to. Final competition will be over the Labor Day weekend and at least six rounds will be flown. The top three flyers will comprise the U.S. team and if anyone should be unable to attend, the first alternates from the finals will be invited.

By convention, the three members from the preceding team are qualified to enter the finals. They are Skip Miller, Dale Nutter and LeMon Payne. They may enter no more than two Quarter Finals and one Semi-Final by payment of entry fee. However, their scores will not be used to calculate who else is eligible to advance in competition. The site of the finals contest has not yet been determined.

It will not be known until March of 1978 where the World Championships will be held, but the AMA has made a bid to

to page 160

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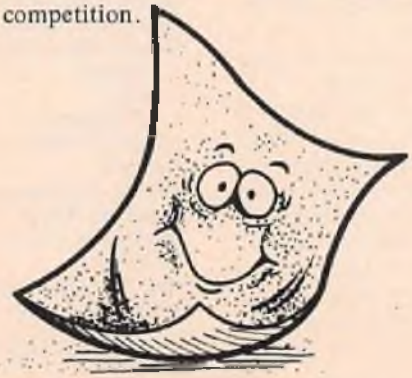
Using wet #600 sandpaper, dust particles can be removed rather easily, without removing the Glaskote shine. This means that multiple coats of Glaskote will produce a deep, ultra high gloss finish suitable for "Toledo" competition.



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You might expect some drawbacks with a product that is as tough as Glaskote and as shiny; but its remarkable resins keep working for a long time. Glaskote is non-tautening, will remain pliable and will resist yellowing. Glaskote really is the ultimate finish!

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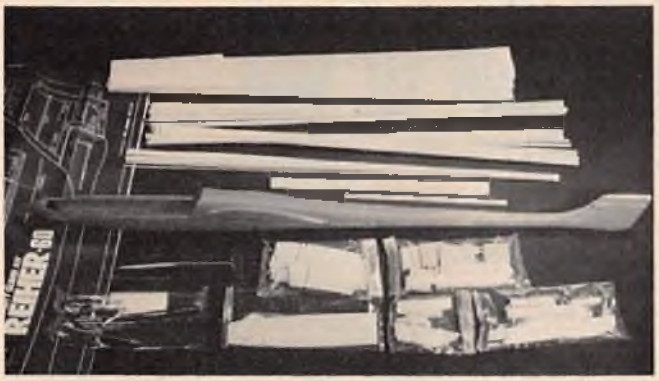
RCM PRODUCT TEST

Hobby Shack REIHER 3300



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Plans		•				Parts Match to Plans	•				
Written Instructions			NA			Overall Parts Fit	•				
Quality of Hardwood		•				Ease of Assembly	•				
Quality of Fiberglass						Fidelity to Scale			NA		
Other Materials		•				Flight Performance	•				
Accessories		•				Overall Appeal	•				
Die-Cutting			NA								

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

SPECIFICATIONS

Name	Reiher-3300
Aircraft Type	Thermal Glider
Manufactured By	Pilot — for Hobby Shack 18480 Bandilier Circle Fountain Valley, California 92708
Mfg. Suggested Retail Price	$79.99
Available From	Hobby Shack
Mfg. Recommended Usage	Thermal Glider
Wing Span	128 Inches
Wing Chord	7½" (Avg.)
Total Wing Area	960 Square Inches
Fuselage Length	52 Inches
Radio Compartment Dimensions	(L) 12" x (W) 2¼" x (H) 2¼"
Wing Location	Shoulder Wing
Airfoil	Flat Bottom
Wing Planform	Double Taper
Polyhedral	5° each panel
Stabilizer Span	33 Inches
Stabilizer Chord (incl. elev.)	5" (Avg.)
Total Stab Area	165 Square Inches
Stab Airfoil Section	Symmetrical
Stabilizer Location	Top Of Fuselage
Vertical Fin Height	10 Inches
Vertical Fin Width (incl. rud.)	6 Inches
Mfg. Rec. Engine Range	.NA
Recommended Fuel Tank Size	NA
Landing Gear	NA
Recommended No. Of Channels	2
Recommended Control Functions	Rudder & Elevator
Basic Materials Used In Construction:	
Fuselage	Fiberglass
Wing	Balsa
Tail Surfaces	Balsa
Hardware Included In Kit	See Text
Plan Size	25½" x 55½" (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	No
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. Rec. Flying Weight	Not Given
Wing loading based on rec. flying wt.	5-8 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	40 Ounces
Wing Loading	6.35 oz./sq. ft.
Covering & finishing materials used	Super KwikCote & D.J.'s

The Reiher-3300 is manufactured by Pilot, and available from Hobby Shack. The kit comes with a fiberglass fuselage, all balsa and hardwood that will be needed to build. The hardware includes everything required, including a pre-formed canopy, wing wires, control rods, clevises, etc. Opening the box is really one pleasant surprise after another. What really makes the whole thing so nice is not only the completeness of it, but the really exceptionally fine quality of the component parts. Pilot has really packaged everything beautifuly, too. Outstanding quality material, and packaging. But you want to know how it goes together, looks, and flys, right? Well, Pilot and Hobby Shack haven't let you down. This is a really going concern in all departments, and the Reiher-3300 kit is, indeed, a lovely way to go.

For instance, ribs, bulkheads, canopy tray and all the other pieces that are such a chore to do, are already done - - - and sanded to the exact size and shape necessary, and sealed in their own clear plastic envelopes. You say you want more? Well, every individual rib, bulkhead, etc., is not only cut out and sanded for you, it also has a code number lightly imprinted on it! What does that do? Well, look at the plans, find the part with the imprinted number that matches what you are looking at on the plans, and there you are - - - half way home! And speaking of plans, these are very good indeed, so good, that separate instructions are not used. Conventional as well as perspective drawings assure an easy to follow blueprint for your building pleasure.

As mentioned earlier, the fuselage is fiberglass, and rates excellent in quality, finish & appearance. Color is moulded in, but if you wish, you can, of course, paint it in your own pet scheme and design.

And speaking of design, this sleek, polyhedral sailplane rates right at the top of the class when it comes to outright competition, or just fun-hunting thermals. Our only modification that would improve its' contest performance, would be the addition of spoilers. It's a smooth, easy flyer capable of contest winning. It'll win your eye when you see it - - - we know, it won ours. □

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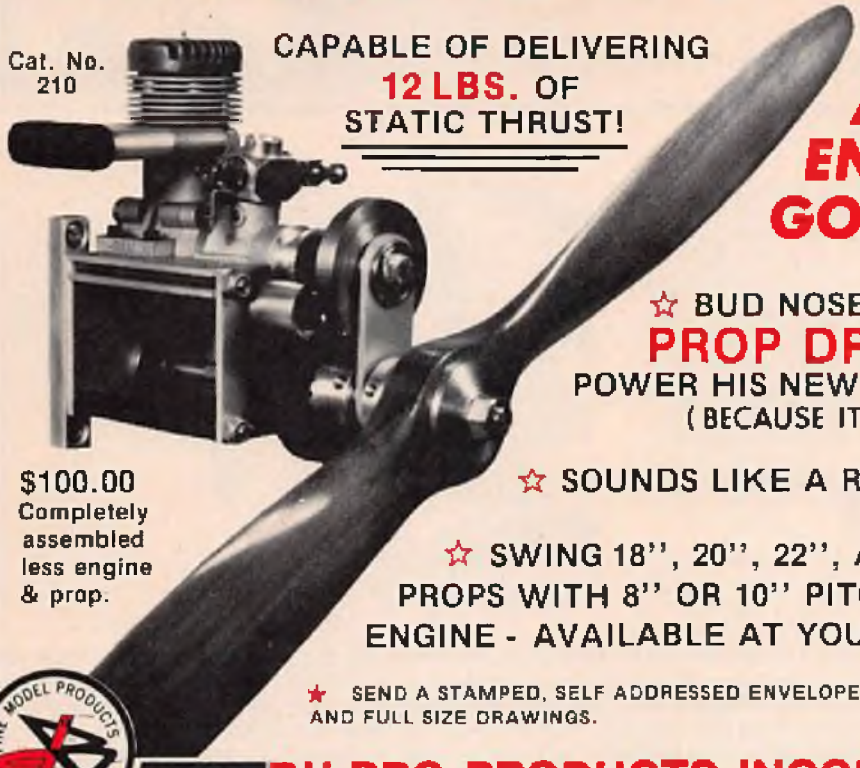

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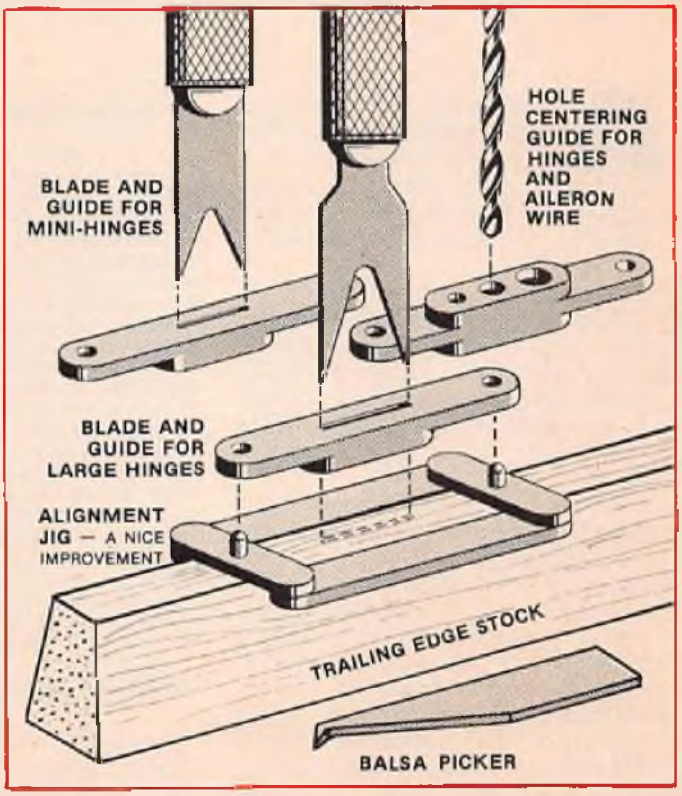

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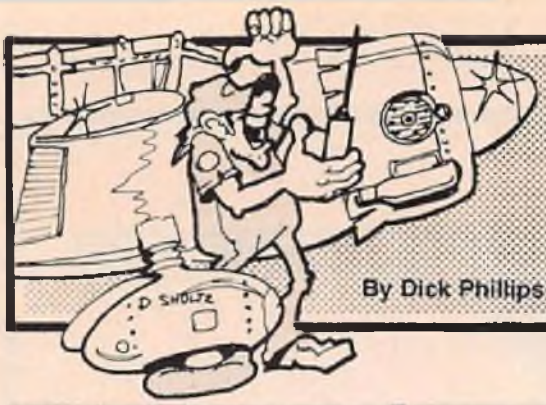
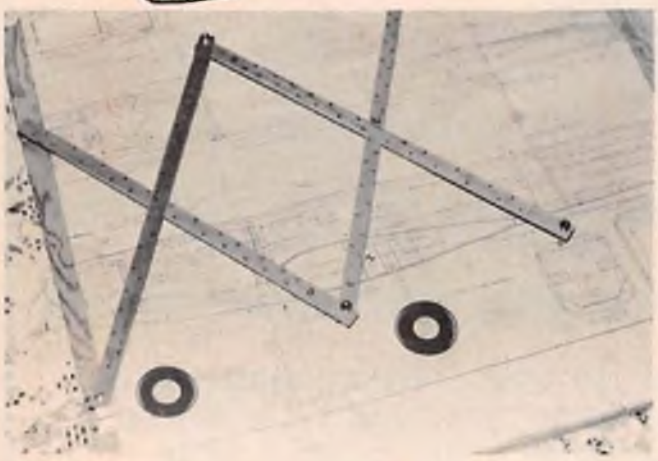


SUPER Scale

By Dick Phillips



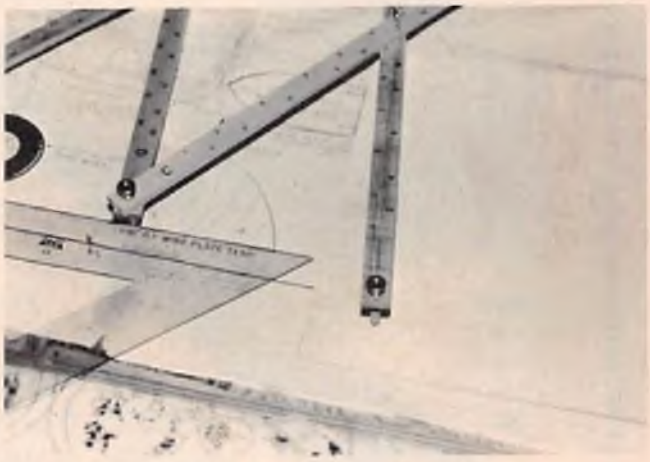


FIGURE 1: The Pantograph. A simple device that has been around for many years. It is fastened to the drawing board in the lower left hand end and swivels about this point. All points of connection are free to move about their centers. The two centers of the 'X' are held together with a movable pin which can be re-located to provide different ratios. The two lower points, to the right of the mounted arm, are the stylus, in the center which is used to follow the drawing being enlarged, and the right hand lower arm end contains a pencil and transfers the enlarged design to either the new plan or to the material to be used in construction. In this figure, the pantograph is set for 1:2 ratio, doubling the plan being reproduced. FIGURE 2: Using a straight-edge to produce a usable line right onto the material to be used in construction. In this case the wing template for a Super Kaos .60. Note the stylus is following the base line using a drafting triangle as a straight-edge. The end of the pantograph in the lower right corner will produce a template double the size of the original. The reproduced line comes out very light and must be redone in order to produce a line to cut the part from.

As suggested in the previous Super Scale News column, I'll continue with another method of enlarging plans to the sizes we are interested in for the Big Birds, Quarter, and One Third Scale, and anywhere in-between.

Last issue I covered the graph method, which is a bit tedious and requires a fair amount of work and a degree of accuracy in order to produce a usable plan. If you have ever built from a rather loosely conceived plan and had to make alterations on it, you'll know what I mean!

The next method of enlarging is through the use of a device called a pantograph (see Figure 1). This is a drawing instrument which will both enlarge and reduce a drawing in size. There are a few toy ones around and I would suggest that while they may be used, they leave a lot to be desired, in that they are usually not well made and they rarely offer a selection of ratios of enlargement or reduction which you will find quite useful. The one pictured in Figure 1 is a commercial product made from wood and sells for about $20.00. You can spend a good deal more than that on one, but I would not spend less since, for less money, you won't get as much machine.

ABOUT THE AUTHOR

A new addition to RCM's regular contributors, Dick has been involved in the model aircraft hobby for over 30 years, having gotten involved in rubber powered modeling in the '30's, progressed through powered control line and RC flying, having taken up RC in the mid-sixties. Dick's predilection for large models was evident in an article appearing in the May '77 issue of RCM entitled 'Big Is Beautiful', detailing the construction and flight of a 9' J-3 Cub powered with a gasoline fired Quadra engine. He has since entered a correspondence with literally hundreds of modelers world-wide and started a newsletter called 'Super Scale News' to supply information to those also interested in large model aircraft. His column in RCM is an outgrowth of this newsletter. Any correspondence or inquiries to Dick on the larger models may be addressed to RCM. Letters of general interest will be answered in the column. Super Scale News will appear bi-monthly for the time being and may be published in each issue if interest warrants more frequent appearances.

The holes along the arms provide a means of assembling the device so as to provide differing ratios of enlargement (please assume 'reduction' as well, from here on). A stylus on one arm traces the outline of the existing plan and a pencil or sharp pointed marker traces out the enlargement from the other arm. Instructions are provided with the device so I won't go into a great deal of detail here.

The actual tracing can be done using straight-edges and french curves, etc., but, generally, the tracing is done free-hand and the resultant lines are then cleaned up and smoothed out using the straight-edge and french curves, as necessary, to provide a usable drawing. This can be done on tracing linen, mylar, or tracing paper which, when inked, can be used to reproduce the plan again and again (Figure 2).

The main advantage to the pantograph is that you can take the original plan, trace it as above, but place the material to be used in actual construction under the 'output' arm and draw the part right on the wood from which you will make the aircraft. This naturally speeds up the process of getting from a small original to a large model as it eliminates the production of a full drawing from which to work. The drawbacks are that you will not create a plan which can be reproduced (although you can always duplicate parts from the original), you won't have a full sized wing plan on which to make the wings (which won't bother those of us using a wing jig) and, last of all, you will have to 'clean up' the

to page 26

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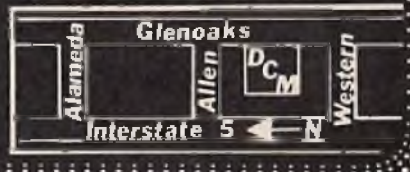

SUPER SCALE NEWS

from page 24

drawing on the wood you'll be using in construction.

A city of any size will have a firm that sells drawing instruments and if they don't carry pantographs, they'll be able to show you pictures and prices on the ones available to them. I suspect that those among us who are particularly handy could make their own from the picture in Figure 1. I can assure you the idea works as one of our local modelers used the one in the picture to build a 9' wingspan Sea Bee from the January 1977 RCM plan for a much smaller Sea Bee. As this is written, it has been taxi tested but not flown. As this is being written, local temperature is 20 degrees below zero (C) and our water is a bit too hard to fly hulled aircraft from! However, plans are to fly it in the spring and I'll have a report for you at that time and some pictures of the brute. It weighs in at 30 pounds and is powered by a Quadra, using Tractor props on the rear shaft. Judging from the taxi tests, it should fly and will likely be close to the full sized aircraft, that is, stall, landing and take-off speeds all within about 5 mph of one another!

★

I mentioned in the first of these columns that I would give you some information on some additional materials from which to build the larger models. The list of materials is always open and is limited only by the imagination of the builder. If you come up with what you feel is a good idea, let me know and I'll pass it along.

Some of the guys at Du-Bro have been building with corrugated cardboard and many of you will remember the Cardboard 500 from RCM some time ago. Duane Life of Wichita, Kansas, currently has a cardboard bird in the air (see photo) and his letter to me on it was pretty enthusiastic. He was goaded into flying it while taxi testing and his version of how it flew was a collection of

FIGURE 3: The finished pattern. This was drawn on paper rather than the material used in construction and the paper pattern can be transferred to a full sized plan for the big bird or used as a pattern from which to make the part. Note the use of the lettering guide.

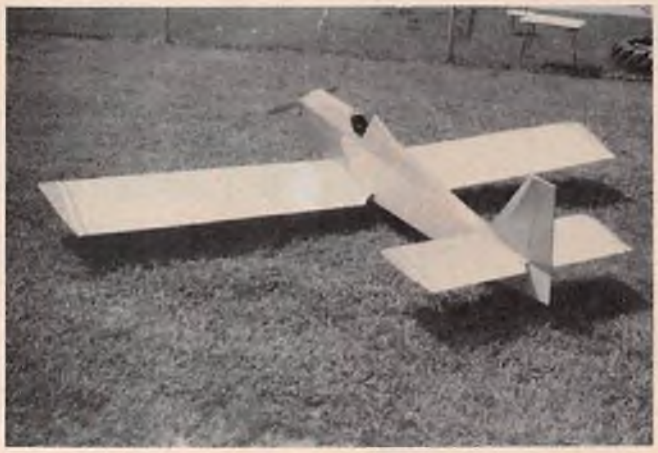

FIGURE 4: Duane Life of Wichita Kansas, built this biggie out of corrugated cardboard. While this material results in rather angular models, Duane says it flies like a dream and the price is certainly right! Power is a Quadra and the take-off has to be seen to be believed. The wingspan is 10 feet, weight is 20 pounds.

superlatives. He was using a material which he felt was a bit inferior to the material he had used previously (both corrugated cardboard) and was looking forward to being able to get some more of his favorite stock shortly after his letter to me.

Cardboard is very light for its strength and can be shaped quite well, although the forms you can make with it pretty well preclude any compound curves. I suspect that many of the home-builts which usually have fairly angular lines would make good subjects for cardboard. A combination of ordinary plywood and cardboard would probably be the safest and best way to go and should produce a pretty sturdy bird.

One of our local modelers has been experimenting with wings of cardboard and he uses a vertical fluted board (the flutes being the corrugated material between the outer facings) as a wing spar and then creases the wing surfaces so the wing comes out in an elongated diamond shape. This flies well, despite the fact that it doesn't really look like an airfoil and may not be aesthetically pleasing to the scale builder.

Another local model builder made a section of wing using pretty conventional construction with the ribs made from cardboard, along with the spars and the parts 'egg-crated' together, then covered with artist's board and finished with cloth and fibreglass, using a lightweight cloth. The result was as strong as anything we've seen and took more stress than a comparable balsa wing of similar size and section.

I feel I would use a box spar made out of cardboard or a wooden I beam type spar in this sort of construction for the larger models, but then, I'm notorious for wanting things to be especially strong, which may be the result of my heavy handed flying!

Another material which has possibilities is called Foam Core. There was an article in a recent RCM detailing its use in model construction. I haven't actually used it yet, but I have seen what it can do. Basically it is a layer of styrofoam, sheeted on one or both sides with a nice grade of artist's board. It is used in art work and display commercially, and is made by Monsanto, which might help you find some. It comes in 4' x 8' sheets (yummy!) and sells for less than $15.00 per sheet. The samples I have, have been tried in a variety of ways. They take a very nice bend after a light scoring on the inside and the surface of the material is ready for finish painting with **no** preparation. It comes in at least two thicknesses (3/16" and 5/16") and there may well be more than that. It will glue with the normal glues we use, but the styrofoam inner filling is susceptible to breakdown by the usual solvents. 5-minute epoxy doesn't eat it but K & B thinner, acetone, gasoline, etc., cause it to turn into instant goo, so you'll have to protect it from contact with these materials.

One of the best ways to use it is to edge glue it to wood (balsa or whatever), making sure the inner surface is sealed in properly. For example, if it were glued to adjacent edges of square stock, this would satisfy the need to protect the styrofoam from the finishing material that would eat it and it would also permit rounding the fuselage edges for a more attractive and less angular shape.

In any case, I'm sure it has possibilities and if I ever get to the point that the holding pattern over my building board ever gets below about 20 potential models, I'm going to slip one made out of Foam Core into the pattern!

Covering these large birds can present a fair sized bill for materials, so I have been doing a bit of experimenting after getting some great advice from Jim Crawford of Hamilton, Canada. Jim has been building large models for some time now and he too has been concerned with the high cost of putting a skin on them. He commented on the fact that I covered my big J-3 with Super Coverite at a cost of about $40.00 which doesn't make much sense considering the cost of the airframe was less than $25.00!

Jim uses a polyester material which is used as a drapery lining material by ladies who still do that sort of thing. It's quite inexpensive ranging from 50 cents to around a dollar a yard, 48" wide. Jim uses ordinary contact cement to put it on the surface to be covered. It has the unhappy knack of curling when dope is used with it and is hard to get it to stick to the framework. Using the contact cement, the material adheres well to the framing, and must be pulled fairly tight. Then the heat iron is used on the outer surface of the material to cure the cement. This makes a good bond and the material can then be shrunk tight with the heat iron or heat gun. It doesn't shrink as much as the conventional covering materials so it must be pulled fairly tight during application in order to get a completely wrinkle-free surface. Jim then carries on with the conventional dope, dope plus powder (corn starch or whatever) finishing process.

Being a much lazier type than Jim, and having less time for the building board, I have been experimenting with the polyester material in a bit of a different way. I paint the framework with Balsarite (from the same people who gave us Coverite) and use two coats on the bare wood. The polyester will then heat seal, just like any heat sensitive covering, to the wood. Again, it must be kept fairly tight as it doesn't heat shrink as much as the usual covering materials. After it's sealed down to the wood (coat **all** wood surfaces for a reason which will become obvious in a moment) it can then be shrunk as before. I then give it a spray with water and that seems to shrink it even tighter. I'd go carefully with this extra step as it will shrink pretty hard and might warp a lightly built struc-

to page 151

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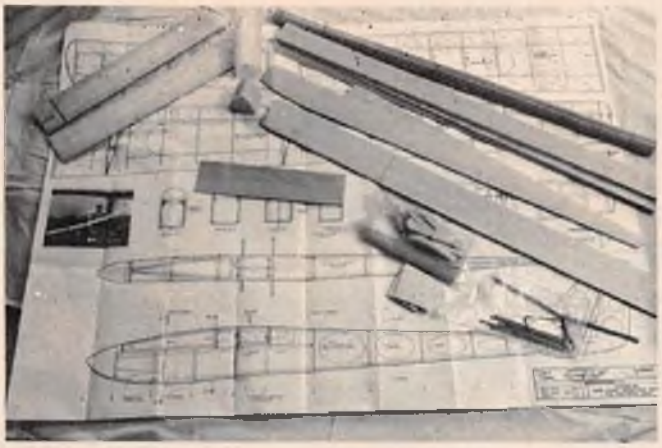
RCM PRODUCT TEST

Mark's Models WINDFREE



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

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

The Windfree is a Class A Competition sailplane manufactured by Mark's Models, and was designed by Mark Smith. Windfree first spread its wings in R/C Modeler Magazine in June 1972, when a detailed construction article was presented to its readers. Since that time, Windfree has gone on to establish one of the most enviable records of competition sailplanes in its class that this reviewer has knowledge of. It is, as the instructions say, "for the flier who has reached the intermediate level of R/C soaring." It is not a glider for the novice, but neither is it necessary to be an expert to build and fly this very fine craft. With these thoughts in mind, let's see what the kit looks like, how it goes together and, best of all, what happens after the building is past and the flying starts.

A glance at the plan sheet tells why this glider has been around so long and done so well. It is all straightforward construction and design with the emphasis on simplicity. This is meant to be complimentary, and anyone who has looked closely at the very clean, lean lines of this marvelous sailplane, will know at once it is one of the great ones. Plans and written instructions are clear, and no problems were encountered during building due to any omissions or errors. We rate the kit as excellent in these two categories. Pre-shaped parts, quality of hardwood, the matching of parts to the plans, and general ease of construction was all rated good. And good they were. Modifications were few, and were as follows: We fiberglassed the fuselage from the wing mounts forward with 3/4 ounce glass cloth. During building, it appeared that hard spot landings and, indeed, normal sport flying could give this area a bad time. So we glassed it and have had no problems since. You might wish to fly without glassing, as I'm sure thousands are doing right now. And, perhaps too, you might land a bit easier

to page 150

SPECIFICATIONS

Name	Windfree
Aircraft Type	Sailplane
Manufactured By	Mark's Models P.O. Box 2134 Escondido, California 92025
Mfg. Suggested Retail Price	$44.95
Available From	Both Mfg. and Retail Outlets
Mfg. Recommended Usage	Competition Sailplane
Wing Span	99.25 Inches
Wing Chord	5.6 Inches
Total Wing Area	560 Square Inches
Fuselage Length	41.5 Inches
Radio Compartment Dimensions	(L) 8" x (W) 2" x (H) 2⅜"
Wing Location	Shoulder Wing
Airfoil	Flat Bottom
Wing Planform	Double Taper
Dihedral	5-3/16 Inches
Stabilator Span	20 Inches
Stabilator Chord (incl. elev.)	3⅜ Inches
Total Stab Area	67½ Square Inches
Stab Airfoil Section	Symmetrical
Stabilizer Location	Mid-Rudder
Vertical Fin Height	7⅝ Inches
Vertical Fin Width (incl. rud.)	5½ Inches
Mfg. Rec. Engine Range	NA
Recommended Fuel Tank Size	NA
Landing Gear	NA
Rec. Number of Channels	2
Recommended Control Functions	Rud., Elev.
Basic Materials Used In Construction:	
Fuselage	Balsa, Ply & Spruce
Wing	Balsa & Spruce
Tail Surfaces	Balsa, Ply & Spruce
Hardware Included In Kit	See Text
Plan Size	50" x 36" (1 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (18 pages)
Construction Photos	No
Kit Includes	Die-Cut arts
Mfg. Rec. Flying Weight	30 ozs.
Wing loading based on rec. flying wt.	7.7 oz./sq. ft.

RCM PROTOTYPE

Weight, Ready To Fly	32 ounces
Wing Loading	8.2 oz./sq. ft.
Covering & finishing materials used	Balsarite & MonoKote
Engine Make and Disp.	NA
Muffler Used	NA
Radio Used	Royal Electronics
Tank Size Used	NA

Jack Doty with winners in the Honker races. Lee Helzel (the "old man speed" of 1/2A) was 1st. Chuck Messamer was 2nd. Mike Mitchell was 3rd (Mike is a top glider racing expert). Dave Doty was 4th (Dave is 13 years old!). Dick Dietz was 5th.

SUNDAY FLIER

from page 12

cylinders, and a slew of specially prepared props. Lee leaves nothing to chance. And his flying technique is not only unique, it is potentially dangerous. He doesn't stand near the two downwind pylons; he walks out about mid-way on the course, and calls his own turns. If you want to win - - - and Lee does - - - you have to take chances. And you have to spend money. Lee does both.

Earlier I mentioned the hopping up of engines. You can get a standard Cox .051 for around fifteen bucks. But if you want to race, you send it to Vince Coleri, up Sacramento way. For forty-five bucks, he'll modify your engine and come up with two to three thousand extra rpms - - - and that means your plane will go seven to ten miles an hour faster. But it's up to you to fly the course.

So 1/2A racing, like Formula I and Quarter Midgets, keeps going faster - - - and costing more. Would you believe that the Honkers were almost as fast as the Unlimiteds? The fastest Honker time, at 1:23, was just a few seconds slower than the Unlimiteds. Shows how important a hot engine, plus a tight course, can be. And in today's competitions, you need both. Wonder how it would be if we could have a racing event like the recently established International Race of Champions in auto racing. Each racer has an identical machine - - - same engine, tires, suspension, fuel, everything. So the race has to be won on the basis of skill and strategy. The Wavemasters Honkers event was a start in that direction - - all that is needed now is to provide each racer with stock engines and props, and identical fuel. My guess is that the same guys would still win.

Now take a look at 1/2A sport flying. There are numerous kits on the market, but the volume, compared to the larger models, is still relatively low. It is my belief that one of the main reasons - - aside from the erroneous contention that they are "squirrelly", has been the lack of a reliable throttling system. And that is no longer the case.

Throttles for 1/2A are not new; a number of years ago, Cox put out a Medallion with a coupled exhaust baffle and variable intake. It worked fairly well, but even so, the lower end of the rpm range was too high for what could be termed "idling." And if you went to lower rpms, it wasn't reliable. Fuel would spray up on the glow element and kill the engine.

The straight exhaust baffle, if closely fit to the cylinder, was fair, but again, the speed range wasn't enough. And so, for a number of years, nothing happened. Then, some enterprising modelers tried modifying the Cox engine to accept the O.S. Max .10 intake throttle, and it was quite an improvement. If you coupled it with an exhaust baffle, the flexibility was even better. The only problem was that you had to be a pretty good tinkerer to get the set-up right.

Recently things really began looking up. The Tarno carburetor, specifically designed for 1/2A, gave promise of really good throttling. I experimented with one; it worked fairly well, and had a very good speed range, with a good low idle. But you have to be careful when going from idle to full power - - if you move the throttle servo too fast, the engine loads up and quits. Again, the glow head can't take the rich mixture which occurs before the air flow leans it out. There's a

to page 166

There is hardly an R/C Modeler around these days who does not have a few thoughts now and then on the subject of what airplane would make an acceptable construction article. In other words, what does this country need besides a good 5¢ cigar? It is not an easy answer to come up with when you consider the large number of plans for all kinds of planes just waiting for an eager builder like yourself.

Tom Mountjoy, if you don't already know, is a serious contender for the taildragger of the year award. Tom has noticed that 9 out of 10 Scale or Sport Scale winners, whether it be a flying or static contest, are taildraggers. Not only the winners but also the entries.

There are many different reasons for the popularity of the taildragger type, but when it is all said and done, I suppose the real attraction can be summed up in a few well chosen words. For example: classic lines, visible details, colorful paint schemes and, for the old timer, just plain "nostalgia" (means homesickness).

During one of the last big R/C shows, I had the pleasure of talking with several of the super builders who entered some of the most beautiful models I have ever seen. I was surprised to learn that many of these experts were not too interested in flying their creations. A situation that seems logical when you consider the hours spent on this type of project.

With the above in mind, it occurred to me that what the scale modeler needed was a "taildragger trainer". Something that could be built in a reasonable length of time, that is relatively easy to fly, and rugged enough to take abuse. A sort of basic trainer, to fill the gap between the high wing tricycle job you learned to fly on, and the beautiful scale job you may have just about finished. Since a scale modeler has a need, as well as talent for showmanship, I decided the taildragger trainer must be colorful in appearance and still maintain the vintage look of the 1930's. With the above in mind, I went to work.

Constructing The Fuselage

The first step is to read the plans carefully and make certain you understand the method of construction. You will note that the 1/2" square balsa rod running from behind the firewall to the tail post acts as an assembly jig for moutning each of the bulkheads. Make sure the rod is straight and made from hard balsa. After cutting out the bulkheads, they can be glued in their proper position along the rod. Make certain the 1/8" x 1/4" hard balsa stringers fit properly in each of the slots in the bulkheads while the bulkheads are still in the flat. Use the stringers (minus glue) as an alignment tool for truing the bulkheads to the master rod.

Before applying the stringers, glue the 1/2" square balsa tail post to the aft end of the master rod. When gluing the stringers, do the top and bottom first, then the sides, alternating from side to side in order to hold the proper alignment. The top stringers just under the wing position are made in three separate pieces on each side, as shown on the fuselage plan.

The next step is to line the inside of the fuselage from the firewall F1 to the forward cockpit bulkhead F5 with 1/16" plywood. The floor of 1/16" plywood is added last in the same area. This forms a strong box-type construction to protect your radio gear in case you zig when you should have zagged.

After framing up your fuselage, you are now ready to cover it with a good grade of 1/16" balsa sheet (I used Balsa U.S.A. throughout and found it very satisfactory). Use as large a sheet as your skill can accommodate, going from side to side to insure alignment. Be sure to leave the balsa covering out of the landing gear area until the gear is securely in place. You will also want to leave the balsa covering from the top between bulkheads F1 and F2 until your fuel tank is fitted into position. An 8 ounce Sullivan slant tank works nicely in the space provided. Should you wish a different or larger tank, some modification will be required.

You will find that the plywood firewall F1 is backed up with a 1/4" hard balsa bulkhead F1A. Also, that F1A is undercut 1/16" to allows for the flush application of the sheet balsa covering.

The final step in the assembly of the fuselage is to add the "V" shaped 1/8" hard balsa spacer T1 between the two stringers at the aft end directly under the stabilizer location.

Wing Construction

An effort was made to design the wing as simple, yet as strong as possible. A straight wing with no struts for support must contain sufficient internal structure or it may fold up under excessive stress. It is better to have the wing a little on the heavy side than to worry about its ability to remain in one piece.

The two lower wing spars are 1/4" x 3/8" spruce or pine, the two upper spars are hard balsa. You will want to angle the rear top spar as shown in cross section before installing the ribs. This will allow for a proper seating of the rear top balsa sheeting and capstrips.

The ribs are cut from 3/32" medium grade balsa with the exception of the center section ribs which are made from 1/16" plywood. Using a level flat surface, assemble the ribs to the lower spars first before adding the upper spars. The right and left outer panels are assembled separately before joining them to the center section. The leading edge is made from 1/4" square hard balsa. Use a medium grade balsa for the trailing edge, which is cut from sheet stock, or buy pre-tapered as shown on the plans.

For added strength, the center section is made from 1/16" ply. Make certain the aileron servo box is adequate in size for your servo before final assembly. The upper and lower front spars are tied together and reinforced with a 1/8" plywood doubler plate J-1 which also establishes the 2" dihedral at each wing tip. At the rear of the wing, each upper and lower spar has separate 1/8" ply doublers (J-1 and J-2), allowing the wing ribs to extend through to the trailing edge. Note that the outer center section ribs (1/16" ply) glue directly to the inner wing panel ribs at time of assembly to the center section. Make certain these opposing ribs are in the proper plane for butt joining. The small leading edge ribs are located after the wing panels are secured to the center section.

Upon completion of the basic wing

text to page 146

TAILDRAGGER TRAINER

Designed By: Tom Mountjoy

TYPE AIRCRAFT
Trainer
WINGSPAN
63¼ Inches
WING CHORD
9¼ Inches
TOTAL WING AREA
571 Square Inches
WING LOCATION
Shoulder Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
2 Inches
O.A. FUSELAGE LENGTH
40½ Inches
RADIO COMPARTMENT AREA
(L) 9" X (W) 3½" X (H) 4"
STABILIZER SPAN
17¼ Inches
STABILIZER CHORD (incl. elev.)
6¼" (Avg.)
STABILIZER AREA
97.6 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
6 Inches
VERTICAL FIN WIDTH (incl. rudder)
6¼" (Avg.)
REC. ENGINE SIZE
.35-.45 Cu. In.
FUEL TANK SIZE
8 Ounces
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail. & Throt.

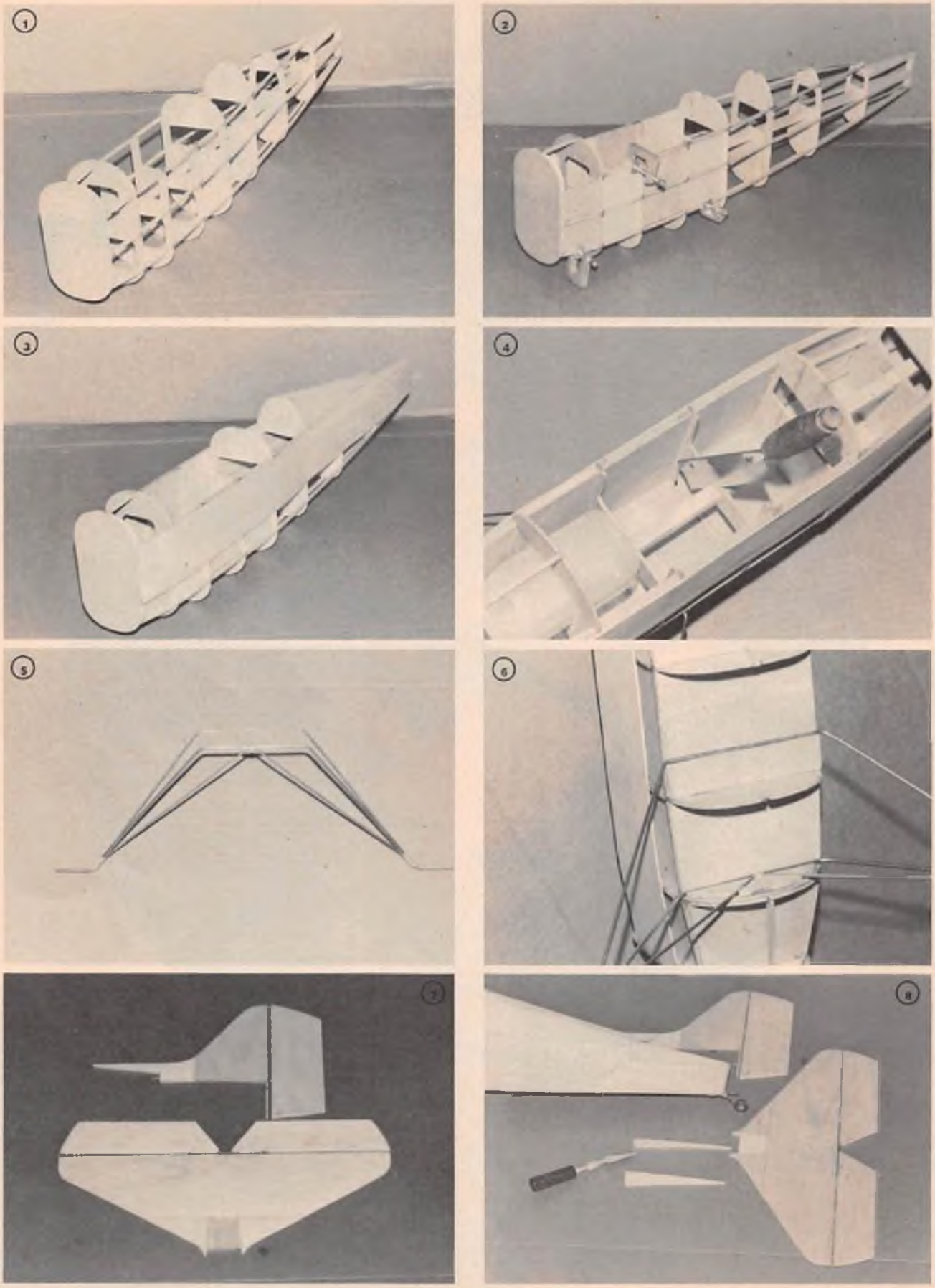
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, & Ply
Wing	Balsa & Ply
Empennage	Balsa & Basswood
Wt. Ready-To-Fly	96 Oz.
Wing Loading	24.2 Oz/Sq. Ft.

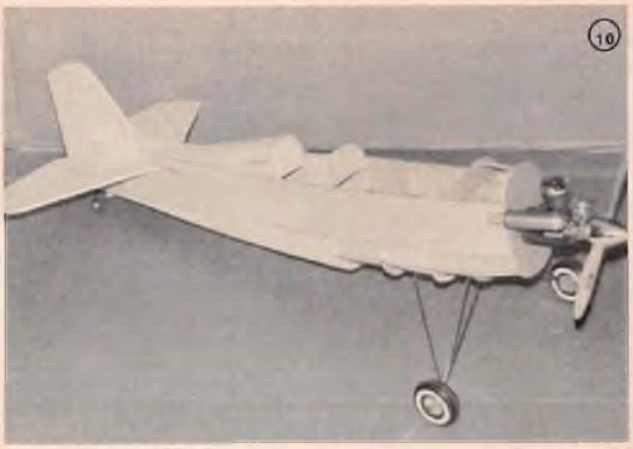
TMTT

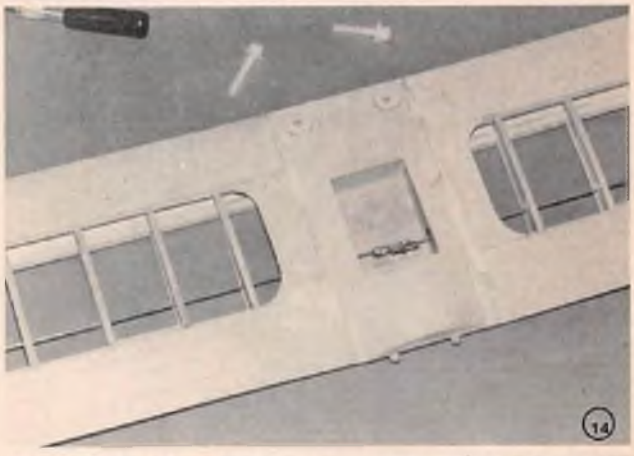
If you want a taildragger that appears to have flown right out of the Thirties, try this one on for size.

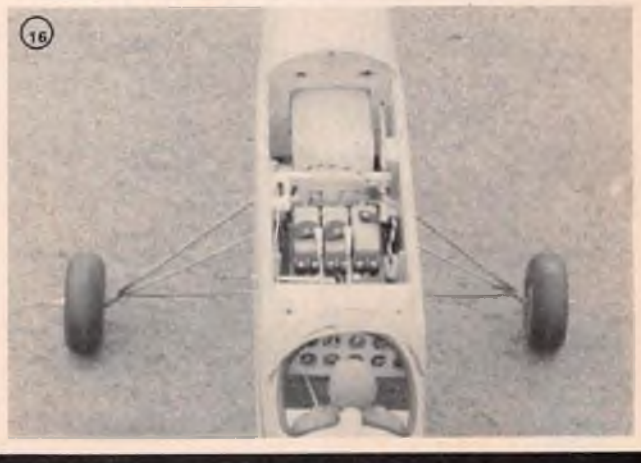
Photos & Text By
Tom Mountjoy



(1) Basic fuselage structure built on 1/2" sq. balsa crutch. (2) C-clamps used to glue 1/16" ply doublers inside fuselage. (3) Start of the outside sheeting. (4) Crutch is cut out at servo location. (5) Landing gear bent & soldered ready for installation. (6) Landing gear installed. (7) Tail feathers ready to attach. (8) Filler blocks trimmed to shape prior to assembly.

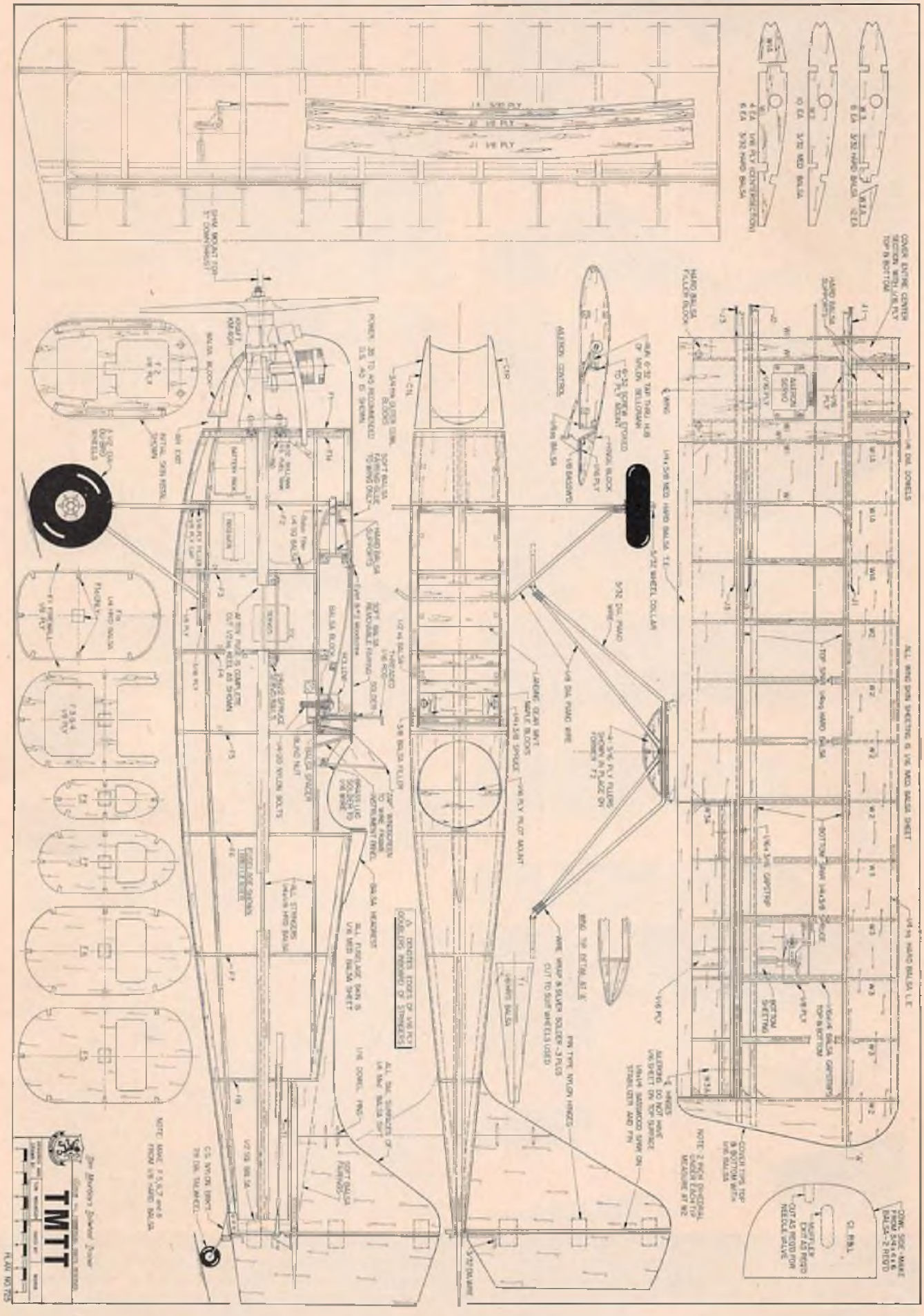






(9) Tail glued in place. (10) Engine mounted and ready for cowl blocks. (11) Cowl shaped and sanded. (12) Wing hold-down block epoxied in place. (13) View of aileron bellcrank and linkage. (14) Aileron servo compartment showing wing dowels and nylon hold-down screws. (15) Wing in place. Hatch cover not shown. (16) Wing removed showing very neat radio installation. Pilot has a full instrument panel.

FULL SIZE PLANS AVAILABLE — SEE PAGE 187



FLUTTER

PART II

by Herk Stokely

The fortunate flier who gets his plane back, undamaged, from an encounter with flutter, and the less fortunate one who is hoping to re-build, are likely to have one question in mind, "What do I do now to keep that from **ever** happening again?" Likewise, a proud builder with his freshly completed, but unflown, "Pride and Joy" may suspect for several reasons that flutter is a real danger to his model. Large heavy control surfaces, soft springy control linkages, high power in a small streamlined model, long flexible strip ailerons, high aspect ratio in a glider with rather flexible wing construction, long torque tubes operating inset ailerons, or models with controls operated by curved, flexible push-pull tubes, are all candidates for some kind of flutter. This is most likely to develop under conditions where two things are present. The first is high speed. This factor is almost always relative to the normal speed at which the particular type of plane would fly. An 8' span "Citabria" will obviously not reach the same high speeds that a Formula One racer can. But, it has very large heavy control surfaces and long pushrods compared to the racer. This means that even though its top speed is much lower than the racer, its tendency to flutter at the lower speeds is also much greater. The second condition, which is almost a necessity to the start of flutter, is flight at low angle of attack. Last month I showed that at higher angles of attack, the oscillation frequency of the aerodynamic forces which drive flutter is about one-half of what it would be at the same speed, but at a low angle of attack.

Keeping that in mind, it only makes sense to very carefully explore the high speed — low angle of attack end of your model's flying capability. A long shallow dive with gradually increasing speed is a much better procedure than a full power vertical dive from 800 feet. Also, if a low pass at fairly high speed shows that some flutter is starting, don't let it get any faster. What we've got here is a **flutter sandwich**. On the top is the increasing energy and oscillation frequency of the aerodynamic driving force as the model speed increases. On the bottom is the inherent natural vibration frequency of the control installation. At low speeds, on a well built model, this natural frequency for each control (aileron, rudder, elevator, flap, or rotor blade) should be considerably higher than the oscillation frequency of the driving force. As speeds increase, the power and frequency of the driving force increases and, when the plane can go fast enough for them to meet (the middle of the sandwich), we get flutter.

This leads to the first of the two methods that we have of preventing flutter. If you can raise the natural frequency of the control installation until it is so high that the plane cannot reach a speed that will excite it then, for practical purposes, you have eliminated flutter. Technically, flutter is still possible; it's just that the model can't get into the speed range at which it will occur. Obviously, this is the main reason that most of the models that you see at the flying field aren't having a problem with it. It is also the reason that experienced builders will tell you to avoid certain types of control installations on heavy or high performance models. Raising this natural frequency in the control installation involves working with two factors which I discussed briefly in the first installment of this article.

The first (1) is the moment of inertia of the control installation, and the second (2) is its stiffness.

(1) The moment of inertia is increased by increasing the mass of the control system, and also by increasing the distance between the Center of Gravity of the control system and its hinge axis. This means that a wide heavy control surface with a long control horn and a heavy pushrod will have a large moment of inertia, with a corresponding (undesirable) low natural frequency. On the other hand, a lightweight narrow control surface, with a short control horn, and a lightweight pushrod will have a small moment of inertia with a (desirable) high natural frequency. With rotor blades and glider wings, it's hard to take advantage of this particular factor because the structural techniques which result in low moment of inertia can also result in low torsional stiffness so that any advantage gained by reducing moment of inertia is offset by increased flexibility. I won't forget you guys though, because all of the remaining things that I have to talk about can be applied to your machines very effectively.

(2) The stiffness factor is affected by several items involving both the structure of the control surfaces and the control mechanism arrangement. This can get very complicated and my greatest desire is to keep the explanations as simple as possible. As the speed of the model increases, the first factor to come into play is "slop". Every control system has some. Play in the pushrod connection at the control horn, or at the servo arm; slop in the servo gears, and especially the play in some types of push/pull cable-in-tube arrangements due to space between the inner cable or tube and the outer tube, will definitely result in some free play (hopefully small) in the control linkage. As you move it by hand you can easily feel how much of this slop is present. Within this free movement band the control is free to vibrate at its lowest unrestrained natural frequency. If there is very much play in the linkage, the amplitude of the vibration can get large enough to become visible flutter, with large inertial forces on each vibration cycle driving the control beyond its normal "slop" limits and far into the area where movement of the control surface is restrained by the springiness of the control system. Obviously, if the slop band in the system is small, the unrestrained vibration amplitude will be small, and it is less likely that the system will develop noticeable flutter. Beyond the "slop" range there are actually several components in the control system that contribute to its stiffness (or springiness as the case may be). You may be able to visualize that a nylon push/pull tube is very much like a long plastic spring, connecting the elevator to the servo. Even neglecting any slop that's present, this spring-like characteristic establishes a flexible springy connection and through the action of this spring on the mass, and moment of inertia of the control installation, the natural vibration frequency is established. By making this spring stiffer, we can increase the natural frequency of the installation. Remember that this is desirable for preventing flutter. A straignt pushrod made of fiberglass, or spruce and wire, is harder to visualize as a spring than the plastic pushrod, but it is, of course, and much stiffer too. That is one of the reasons that an experienced builder will tell you to use strong straight pushrods on heavy fast models. Take that same straight pushrod with its desirable stiffness, put a "Z Bend" in it to get it out through the side of the model, and you will find that you have nearly doubled the springiness of the installation. This will cause a dramatic (undesirable) lowering of the natural frequency of the control system and will really increase its susceptibility

to page 135

HERE'S HOW

The E.W.H. prop adapter. Special screws allow lock wiring for extra safety. Lock wire is included with adapter kit.

Drilled prop to accept the six No. 8 socket head cap screws. Front washer is used as a drill template as accurate drilling is a must. E.W.H. will furnish pre-drilled props upon request.

Quadra engine with prop adapter mounted. Will cut down on the vibes and add plenty of realism to your model.

After becoming intensely interested in large R/C models, I began to look around for some experience with this latest trend in our hobby. Needing some large props for my Quadra engine, I gave E.W.H. Specialities of Arlington, Texas, a call and put in my order. Interesting enough, after some conversation, it wasn't long before I discovered that here was an outfit with some experience. Far more than I had, and it turned out to be mighty interesting.

E.W.H. Specialities, Inc. (just recently incorporated) has been in the R/C business for a number of years as a designing, developing, testing, and cutting service for other manufacturers of R/C products. The corporation is headed by W.E. Neeper, better known as "Skip". All of the principal members of the corporation have been building and flying R/C aircraft for many years, as well as having a lifetime of experience related to the aviation industry, engineering and general aviation. E.W.H.'s principal sales is the Quadra engine, including parts and accessories, although they are currently developing a number of products to go along with the Quadra engine.

The Quadra is a Schnuerle ported, two cycle engine with magneto ignition and pump type carburetor that runs on a 20 to 1 gas/oil mixture. It is two cubic inches and is rated at two horse power. Out of the box, it will turn an 18/6 prop 7800 rpm and, as it breaks in, it just keeps improving. The engine weighs 48 ounces, ready to fly.

The Quadra comes complete with magneto, spark plug, motor mount, muffler, diaphragm, pump carburetor, prop adapter and a piece of neoprene fuel line. It can be run as it is out of the box and it will perform beautifully if you take care in setting it up. Follow the instructions in the box and it should start with relative ease. Contrary to glow engines, it does start and run better inverted and this is a big advantage when mounting it in your scale ship. Six ounce cans of McCullough chain saw oil are not only handy but economical; use one can per gallon of gasoline and it burns clean - - - not a gooey mess to clean off the plane at the end of a flying session. Testing the Quadra for economy, it will run at various speeds simulated to actual flying for twenty-seven minutes on ten ounces of fuel. All this for a dollar a gallon? Now are you ready for this? With the Quadra you don't have burned up glow plugs, dead starting batteries, dead ignition batteries, or many of the other headaches associated with glow engines.

E.W.H. currently sells the Quadra as described for $114.50 plus shipping, C.O.D. and tax, if applicable. My first contact with E.W.H. was Bob Hutton. Bob, a great guy, full of enthusiasm for his forthcoming projects, told me of all the experimenting they had done with large models. As a matter of fact, they call them miniature aircraft. And that's just what they are. But, why not let Bob tell you what they are doing. Especially about the vibration problem so much associated with the Quadra engine.

"Vibration characteristics on the Quadra are somewhat different than on other R/C engines because of the low rpm's, large props, and the size of the mass that is reciprocating. As good a product as the Quadra is, it still had some room for improvement. Consequently, the E.W.H. prop adapter has been developed. In turning an 18/6 wooden prop, we found that on the stock adapter the wood had a tendency to crush a little and this is not necessarily equal on both blades; thus the prop does not swing a true arc, causing some severe axial vibrations on the fuselage and in some instances, causing empennage failure. We did a lot of experimenting and testing to develop an adapter that would minimize vibration. This unit allows the prop to be tightened equally around the surface at the hub without crushing the wood and with no possibility of the prop loosening, thus keeping it in a true arc and almost eliminating axial vibrations.

"The adapter has a scale appearance with the six 8/32 bolts through the steel hub plate. It is precision machined and comes complete with a tightening shaft, safety wire and instructions for $14.95. Of course it is not a necessity to run or fly your Quadra with this adapter — it simply improves the appearance and cuts down a lot of the vibration."

I asked Bob about their first kit and requested a description of what a prospective buyer could expect to receive for his hard earned money.

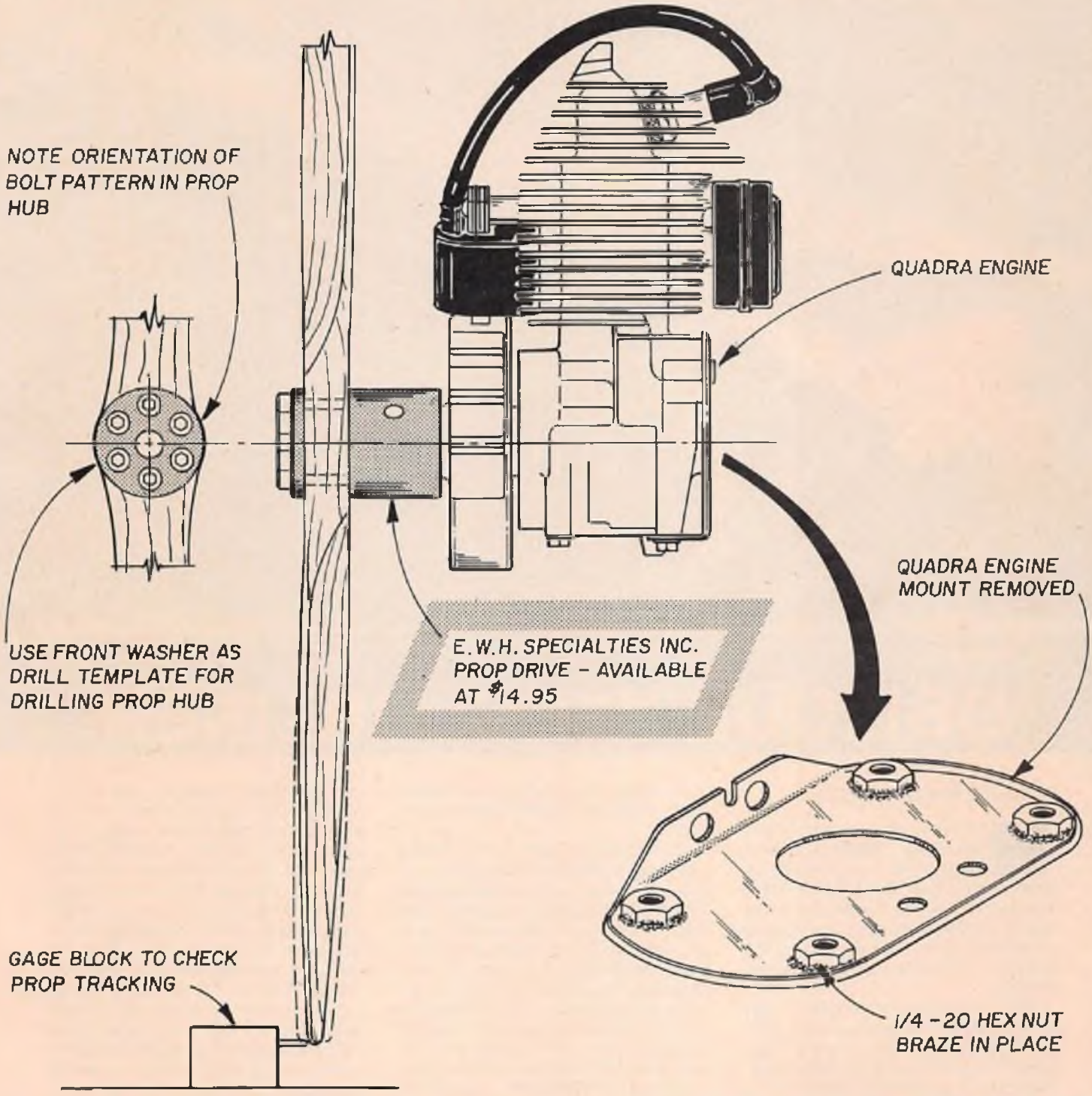
"In developing what we consider to be a successful aircraft to be flown by remote control, we have experienced some outstanding conclusions. First, don't set out to build your favorite scale bird in 1/4 ot 1/3 size to experiment with your new Quadra. Let that dream come to pass after you've gotten a number of hours flying time on an aircraft designed to make the transition from your favorite Sunday machine to the world of Quadra. No matter how good an R/C pilot you are, or think you are, there is much to be learned and we feel that you should have the advantage of using our knowledge and money to develop your skills. We found this out the hard way, sticking our first bird in the ground. I'm not trying to disenchant you from the thrill of the 1/4 size world but am simply trying to enlighten you on the facts as they are, based on as much experience as anyone has had in this field. Believe me, we have learned a lot; but we are still learning and we feel that we have found a method by which you too can experience the thrill and excitement of miniature aircraft without experiencing the anguish and frustrations that we did at first.

"Second, there has not, at any time in my many years of flying R/C, been a thrill to compare with that which I had when I flew my first Quadra powered aircraft. The size alone was something to marvel at as it absolutely dwarfed anything else at the field; the realistic sound of the Quadra as it taxied out was inspiring to

to page 134

QUADRA TIPS

NOTE: WHEN ROTATING PROP TO CHECK TRACKING ALIGNMENT, REMOVE SPARK PLUG LEAD TO PREVENT ENGINE FROM FIRING.



TO ALIGN PPOP FOR PERFECT TRACKING, SIMPLY TIGHTEN THE SIX NO. 8 -32 SCREWS, AROUND THE PROP HUB, EVENLY. THIS IS HOW IT'S DONE ON FULL SIZE AIRCRAFT. BY ALL MEANS — BALANCE THE PROP CAREFULLY.

USING A VERY HEAVY PLYWOOD FIREWALL, FACE IT WITH .040 ALUMINUM TO PREVENT ENGINE MOUNT FROM PULLING INTO FIREWALL. E.W.H. SPECIALTIES INC. HAS AVAILABLE ALUMINUM FIREWALL BACKING, PREDRILLED FOR THE QUADRA ENGINE. JUST $3.95.

RC Model For The

Photos and Drawings courtesy of NASA

OBLIQUE WING AIRLINER

By Lt. Col. Wm. D. Siuru, Jr.

How do you build a high speed passenger transport without running into the difficulties experienced by the Concorde SST? This is a problem the National Aeronautics and Space Administration (NASA) is working on and they think they have found the solution — the oblique or scissor wing transport.

The oblique wing aircraft has a single, straight, and thin wing that is attached to the fuselage through a central pivot point. This wing can pivot during flight. For landings, take-offs, and loitering, the main wing would be positioned at right angles to the fuselage. Since the wing is very slender, it has a high aspect ratio which results in a high L/D ratio (lift to drag ratio) and, thus, is very efficient at low speeds. This means significantly lower power requirements and fuel consumption during take-offs, landings, and while in the holding pattern. Lower power usage also means quieter operation in and around airports, and less pollution.

For high speed flight, the main wing could be pivoted up to 60°. It is a well known fact of aerodynamics that a swept wing flying at supersonic speeds sees only that portion of the velocity that is perpendicular to the leading edge of the wing. For example, a wing swept back 45 degrees and flying at a Mach Number of 1.0 actually thinks it is only flying at a Mach Number 0.7. Now it turns out that the drag of an airfoil increases drastically in the transonic speed regime, that is near a Mach Number of 1.0. Thus, with its main wing pivoted, the oblique wing transport can fly at speeds slightly supersonic, say up to Mach 1.4 or so, and the wing can be spoofed into believing it is flying a Mach Number of less than 0.8 to 0.9 where it is relatively efficient and the fuel consumption would not be excessive.

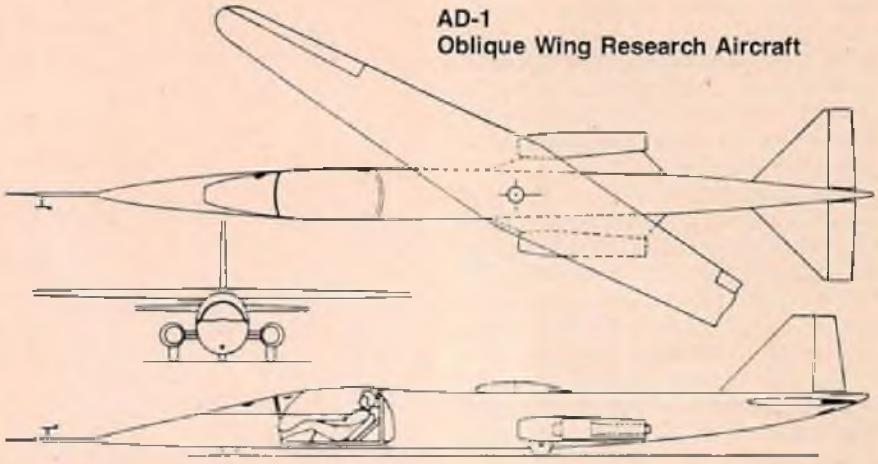
This change in sweep back, or variable geometry, is already used on aircraft such as the Air Force F-111. The advantage of the oblique wing is that, because it is made in one continuous piece, the pivot bearings can be made much less massive. Thus, a much lighter aircraft evolves. In the normal swept back airplane, the pivot bearing must be made very substantially in order to absorb the loads tending to bend the wings. This is not the case with the scissor wing since the wing itself absorbs these loads. In addition to lighter bearings, the root of the wing can be thinner, again giving a weight savings as well as making the wing more efficient at transonic speeds.

The oblique wing transport can travel efficiently without creating sonic booms that disturb the population below. In order to have a boom, the shockwave caused by a moving airplane must be traveling faster than the local speed of sound, or at speeds greater than Mach One. Now the speed of sound depends

on the atmospheric temperature which, in turn, changes with flight altitude. Essentially, the higher the altitude, the less the speed of sound. Therefore, it is possible for an airplane to be traveling at supersonic speeds at some high altitude and, yet, relative to the speed of sound on the ground, it would be moving at subsonic speeds. Consequently, the shockwave produced by the airplane would never be felt as a boom on the ground. Therefore, the oblique wing airline could travel at speeds of almost Mach Number 1.4 and still take advantage of this phenomena. Now one asks why not do the same thing with the Concorde? Well, the normal SST is designed to operate efficiently at moderate supersonic speeds (around Mach Number 2) and is a real fuel guzzler at transonic velocity.

As an interesting sidelight, we should mention Dr. Bob Jones of NASA, who is the inventor of the oblique wing concept, has been its chief advocate for many years. Back in the 1940's, Dr. Jones gave us the idea of the swept back wing that is now incorporated on all high speed aircraft.

Even though the oblique wing cannot travel as fast as the Concorde, it still has great potential. It is estimated that an oblique wing airliner could chop two hours off a flight from New York to Los Angeles, and could do so with no environmental problems.



The next step in the Oblique Wing Aircraft Program will be this one man research aircraft. Powered by two jet engines, it will be able to travel up to 300 mph, further proving the feasibility of the scissor airplane.

So the scissor wing concept looks good on paper, but will it actually fly, and how well? These are the questions that NASA engineers must answer before full-scale development of an oblique wing airliner can be started. While engineers can learn a lot from computer analyses and wind tunnel tests, the final proof has to come from actual flights of a new concept. Unfortunately, full-scale test aircraft are enormously expensive. This is where scale model craft called Remotely Piloted Research Vehicles (RPRV) come to the rescue. Besides being much less expensive, the RPRV provides a means of flight testing risky

The Oblique Wing RPRV in flight over Edwards AFB with the wing pivoted 45 degrees.

technology without subjecting human pilots to these risks. The concept calls for large scale models of the test aircraft to be flown by a test pilot located on the ground. The pilot radio controls the model in its test maneuvers using television and telemetry.

The oblique wing model NASA designed to demonstrate the flight characteristics of this concept is a rather large and sophisticated radio controlled craft. While the real scissor wing would fly at speeds up to 750 mph, the RPRV flies no faster than 100 mph. However, from these relatively low speed flights, engineers are able to extrapolate the flight characteristics all the way up to transonic speeds.

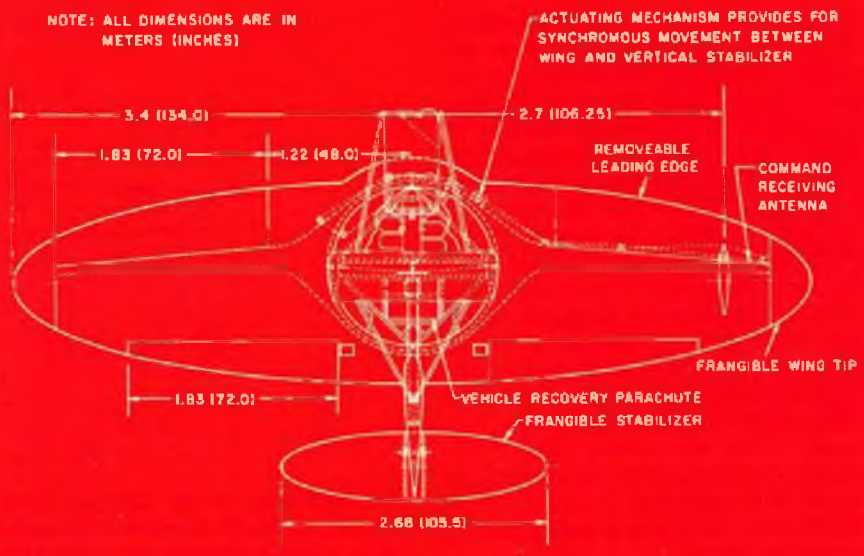
The RPRV has a wing span of slightly greater than 22 feet and a gross weight of 900 pounds. The overall length of the craft varies since the engineers are interested in determining the effect of tail length on the plane's handling qualities. The maximum length of the plane is almost 25 feet.

NASA's model is essentially made entirely of fiberglass/epoxy resin. The engine mounts and the landing gear are the only primary structures that are made out of metal. In order to make quick repairs on the structure in case of rough landings, many of the pieces of the structure are easily removed and replaced. And since 90% of the structure was fiberglass, it could be easily repaired in the field with new pieces of fiberglass cloth and epoxy resin.

The RPRV is powered by a 90 horsepower, two cycle, four cylinder, air cooled McCulloch engine. This engine is normally used to power target drones. The engine weighs only 84 pounds including propeller. The engine sits in the center of the craft and is enclosed in a shroud. The shroud provides thrust augmentation at low speeds, reduces propeller noise, and makes ground operation a little bit safer. However, these were not the main reasons for having a shrouded engine. Originally, NASA planned to try to recover the RPRV with a recovery net and the shroud would have prevented the propeller from becoming entangled in the net. However, this recovery method was not used. The aircraft takes off and lands normally on tricycle landing gear.

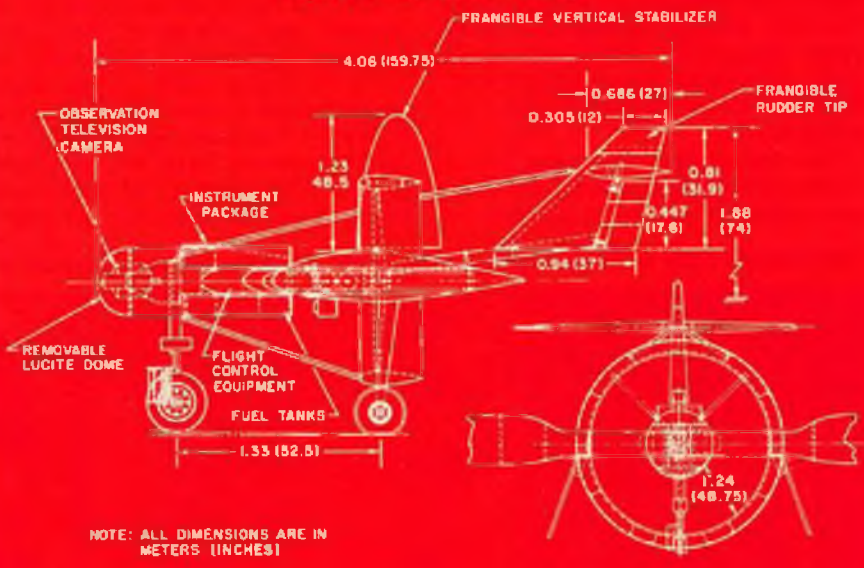
In case the craft could not be landed normally, it could be equipped with an emergency parachute system. The parachute, which is packed behind the engine, can drop the RPRV to the ground with only minor damage, provided the chute could be deployed at altitudes greater than 600 feet. To reduce weight, the parachute was not used during the flight test program.

The electronics on the RPRV serve several vital functions: command and control, telemetering of test data to the ground, and navigation. A television camera is mounted in the nose of the



(a) Plan view.

Figure 2.- OMNRA three-view drawing.



(b) Side and front view.

Figure 2.- Continued.

OBLIQUE WING REMOTELY PILOTED RESEARCH AIRCRAFT
COMUNICATION AND CONTROL SYSTEMS

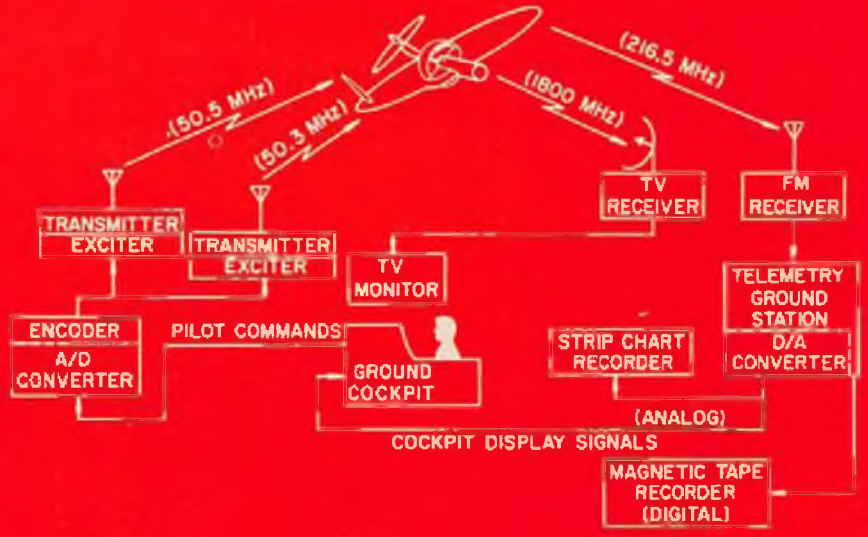


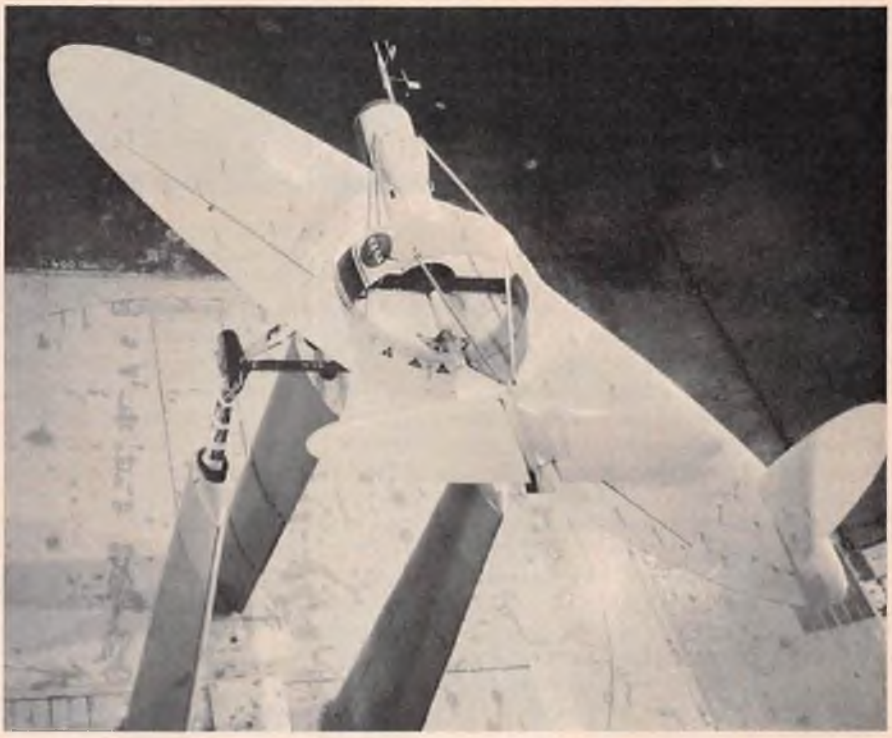
Figure 6.- OMNRA communications and control systems.

airplane behind a Lucite bubble. The pilot takes off, flies, and lands the RPRV using the picture from this camera displayed on a TV screen in front of him. NASA engineers found the normal radio control flying mode did not work too well for this large model. On taxi tests, the pilot found it difficult to watch the craft and control it because of the dust kicked up by the propeller, the several hundred yards needed for the take-off, the large distance the pilot had to stay away from the aircraft for safety reasons, and the fact that, again, safety considerations ruled taking off the plane directly towards the R/C pilot. The TV camera arrangement makes the pilot feel that he was in the cockpit - - - well almost.

Many of the parts of the command and control system used to fly the model are standard R/C components. The pulse width modulation (PWM) transmitter/receiver scheme can control up to seven channels simultaneously, although a total of twenty channels are available. The airborne equipment is based on the Proline PLR-7 seven channel receiver. The transmitters on the ground are Kraft KPT-7's that put out about 25 watts each. Four of the transmission channels are proportional control and thus are used to control such functions as the ailerons, elevators, rudder, and the throttle. The remainder of the channels are discrete, i.e., on/off, right/left, etc., and are used to control such things as pivoting the wing and killing the engine in an emergency situation. Actually, two receivers and transmitters were used. Each was tuned to a different frequency in the 50 MHz range, but both transmitted identical commands. A special circuit aboard the model examines the transmissions from the two transmitters for missing or weak pulses and determines which is the best signal. The receiver on the frequency with the clearest signal is selected and the command is executed by the aircraft's flight control system. For safety reasons, the system was designed so that if the receivers did not receive a signal from the ground for approximately four seconds, the engine was killed.

The airplane could be flown in either manual or autopilot mode. In the autopilot mode, the difference between control surface position (i.e., elevator, aileron, or rudder) and a reference gyro results in an error signal. This error signal sends a command to move the particular control surface to cancel the error. When the error is zero, the airplane is in the desired attitude. To fly in the autopilot mode, the reference is changed causing the affected control surface to deflect to cancel out the resulting error and thus the aircraft changes its attitude.

A telemetry data system was used to help fly the plane, as well as transmit important test data taken during the flight. Almost two dozen pieces of data



Here the Oblique Wing RPRV is undergoing tests in a NASA wind tunnel. Note the ducted engine in the center of the craft.

This photo shows the Lucite bubble covering the TV camera in the nose. The pilot flew the craft using this camera.

can be transmitted to the ground by a pulse code modulation (PCM) telemetry system. This data consists of aircraft flight information such as airspeed, altitude, attitude in pitch and roll, pitch, roll, and yaw rates, and accelerations in all directions. In addition, information on engine operation and other flight gear is relayed to the pilot.

In October of 1976, the Oblique Wing RPRV was flown over the dry lake at Edwards Air Force Base, California, the same location where the Space Shuttle is now being tested. On successive flights, the model was flown with the wing pivoted at 15, 30, and 45 degrees, and it flew reasonably well. Now, NASA had the data they wanted to verify their theoretical studies and wind-tunnel data.

What is the next step along the way to the day when pivoting wing airplanes becomes a common sight around our airports? In order to fully prove the concept, the scissor wing has to be flown by

to page 132

MAGIC MOLDER & FORMING MACHINE

By Mack Moffat

For some time now the scratch-builders have been vacuum forming their own canopies, cowls, and other model parts, using machines they have constructed, or having the parts formed by a commercial forming company. The vacuum forming machines they build are usually complicated to construct and expensive to build. When a commercial forming company did the work, it was just as costly to have two parts made as fifty parts. So what does a scratch-builder do? Wing Mfg., 15 Morgan St., Crystal Lake, Illinois 60014, has the answer in their new Magic Molder and Forming Machine (patent pend.) which sells for $99.95.

Wing Manufacturing's, forming machine comes complete with an aluminum holder frame, steel platen, reflector and vacuum chamber, a hose adapter, Allen wrench, assorted thicknesses of colored plastic sheets, and instructions (see Photo 1). The only items required for operation are an oven and a shop vacuum cleaner.

Any household oven will work as long as it will maintain a temperature of 400°F and large enough to hold the reflector and holder frame. Do not attempt to use a micro-wave oven as damage to the oven would result. A house vacuum cleaner can be used on the forming machine, but a shop vacuum is better.

The only assembly required is to install the angle brackets to the holder frames with sheet metal screws, which are furnished.

Okay, now that you know what is included in the Magic Molder and Forming Machine, and what is required, let's hook up the machine and pull a few parts.

Referenced photos are supplied as a visual aid to the following step-by-step procedures:

(1) Clamp or screw the platen and vacuum chamber to a work surface located within a few feet of the oven. This is very important, the closer to the oven the better so as to avoid heat loss when transferring the holder frame to the vacuum chamber. I had mine clamped to the cutting board, 4' from the oven.

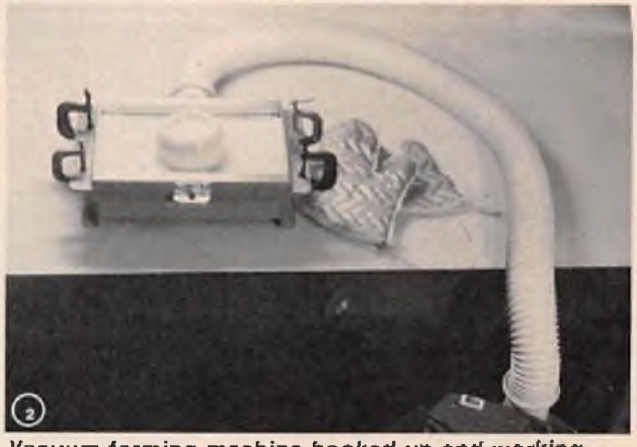
(2) Install the hose adapter between the shop vacuum hose and the vacuum tube leading into the vacuum chamber (see Photo 2).

(3) Turn the shop vacuum on and check for leaks at the vacuum chamber and shop vacuum. If there are any leaks, wrap them with duct tape or electrical tape. Also, check that you are connected to "vacuum" not "blower" since you should pull the part, do not push it. Make sure the filter bag and tank are clean for maximum efficiency.

(4) Place a sheet of plastic in the holder frame; tighten the Allen screws and add additional clamps as shown in Photo 2. This prevents the sheet of plastic from being pulled out of the frame (see Photo 3).

(5) Adjust the oven rack to approximately 5" from bottom of oven. Set the oven at 400°F and let it heat up thoroughly. Use exhaust fans or open the windows and doors for good air circulation and adequate ventilation.

This is what is included in the Magic Molder and Forming Machine.



Vacuum forming machine hooked up and working.

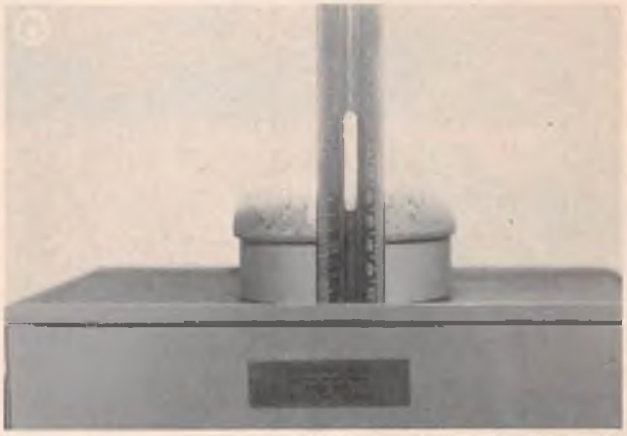
Plastic softened and ready for forming.

Finished vacuum formed part.

The wrong way and the right way.

Canopy formed from 1/32" thick plastic.

Canopy mold and formed clear canopy.



Cowl was pulled 2⅛".

Canopy was pulled 1⅞".

The molds and finished vacuum formed parts.

(6) Using pot holder gloves, place the reflector on the oven rack and then place the holder frame assembly on the reflector.

(7) Close the oven door and wait 60 seconds. Open the door and check the plastic for softness by pressing on corners with your finger, being careful not to burn yourself on the oven or the holder frame assembly. The plastic is ready to mold when all corners are soft and it has a gentle drape to it (see Photo 3). Keep checking the plastic every 15 seconds or so until the plastic appears to be ready. Remember, the thicker the plastic, the longer it will take to get soft. For instance .010" thick material should take from 1 to 1½ minutes to soften and .060" material will take as long as 2 to 3 minutes. What you are trying to accomplish is to get the plastic as soft as possible without melting it. Under no circumstances leave the plastic in the oven unattended. Most plastics, when they reach a liquified state, will give off a toxic gas and become combustible after a period of time. Use only recommended materials for vacuum forming, such as A.B.S., styrene, Royalite, butyrate, acetate, vinyl, or plexiglass.

(8) Make sure the mold is located in the center of the platen and turn the vacuum on.

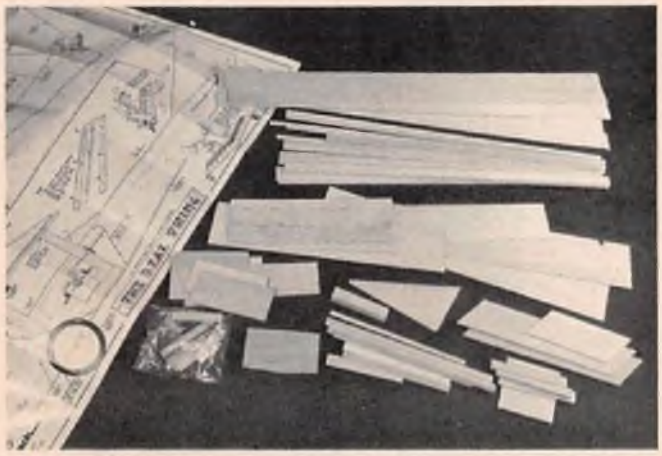
(9) Using pot holder gloves, remove holder frame assembly from the oven and place over platen. The quicker the soft plastic is applied to the mold, the better reproduction details you will obtain.

(10) Push down until the plastic seals around the edges of the platen. Hold this position until the part is completely formed (see Photo 2). This will take only a few seconds.

to page 130

RCM PRODUCT TEST

Hobby Shack
THE REAL THING



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

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

The Real Thing is a 46" span general sport airplane that was designed by Bob McVickar and is available from Hobby Shack for $11.99. Conventional materials and building methods are used, and this little cutie (just remember, beauty is in the eye of the beholder) can be built in an easy three evenings, or a weekend. Take our advice and build in the evenings and save the weekend for flying it.

This project proved to be a real **fun** thing, with everything going together with ease. Instructions are very good and any beginning builder will have no problem turning out a first rate job. We made a slight modification on our plane by including a small tail wheel that is hooked up to, and controlled by, the rudder. This was kind of gilding the lily, so to speak, and totally unnecessary - - - but this sort of madness takes hold of you when you really get involved with The Real Thing!

The specs call for power in the .049-.10 range, and we used a Cox Medallion .09 with great results. The building, as we mentioned, was fun and greatly enhanced by all the extra perspective sketches on the face of the plan sheet.

Flying is what this darlin' does best, and it really does it in style. You like loops? Take your choice, because it will perform outside as well as the common garden type inside ones — with ease. Fly it low and slow at about half throttle and it will give you the urge to chase it with a butterfly net. Or, as Our Fearless Leader said, ". . . take a whack at it with a fly swatter!" Long flat glides, relaxed flying, easy landings, and ear to ear grins is what The Real Thing produces. The perfect plane for all you Real Pilots. □

SPECIFICATIONS

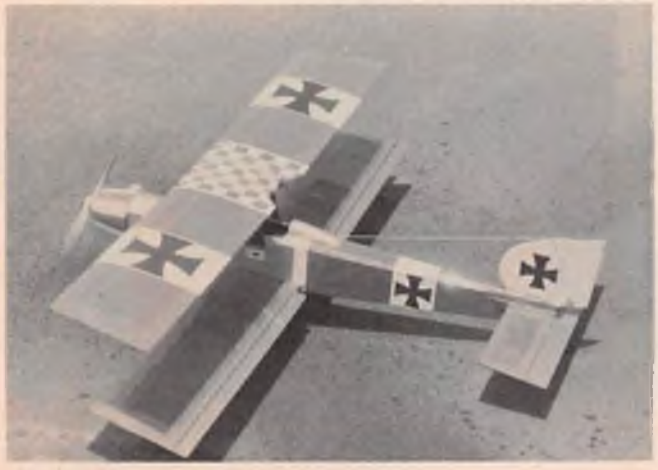
Name	The Real Thing
Aircraft Type	Stand-Off Scale
Manufactured By	Pilot — Hobby Shack 18480 Bandilier Circle Fountain Valley, California 92708
Mfg. Suggested Retail Price	$11.99
Available From	Direct from Hobby Shack
Mfg. Recommended Usage	General Sport Aircraft
Wing Span	46 Inches
Wing Chord	7¼ Inches
Total Wing Area	319 Square Inches
Fuselage Length	Not given
Radio Compartment Dimensions	(L) 6" x (W) 2" x (H) 2"
Wing Location	Parasol
Airfoil	Flat Bottom
Wing Planform	Constant Chord
Dihedral	1½ Inches
Stabilizer Span	Not given
Stabilizer Chord (incl. elev.)	Not given
Total Stab Area	Not given
Stab Airfoil Section	Flat
Stabilizer Location	Top Of Fuselage
Vertical Fin Height	Not given
Vertical Fin Width (incl. rud.)	Not given
Mfg. Rec. Engine Range	.049-.10 Cu. In.
Recommended Fuel Tank Size	4 Ounce
Landing Gear	Conventional
Recommended No. Of Channels	2-3
Recommended Control Functions	Elevator, Rudder, Throttle
Basic Materials Used In Construction:	
Fuselage	Balsa, Ply
Wing	Balsa
Tail Surfaces	Balsa
Hardware Included In Kit	See Text
Plan Size	Not given
Building Instructions on Plan Sheets	Yes
Instruction Manual	No
Construction Photos	No
Kit Includes	Die Cut Parts
Mfg. Rec. Flying Weight	Not given
Wing loading based on rec. flying wt.	Not given

RCM PROTOTYPE

Weight, Ready To Fly	Not given
Wing Loading	Not given
Covering & finishing materials used	Solarfilm
Engine Make & Disp.	Cox Medallion .09
Muffler Used	Yes - Tatone
Radio Used	Cirrus
Tank Size Used	4 Ounce

RCM PRODUCT TEST

World Engines
BOX FLY BIPE



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

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

The Box Fly Bipe is the biplane version of the Box Fly Series, imported and marketed by World Engines. This series consists of a shoulder wing, a low wing, and the biplane, and are all of the same basic design.

The Box Fly Bipe is designed for a .20 size engine, but a .35 or .40 is what the Bipe needs. With a wing area of 700 square inches and a weight of 64 ounces, the wing loading is only 13.1 oz./sq. ft. Even with this light wing loading the Box Fly Bipe snaps like crazy.

All fuselage parts are cleanly die-cut from 3mm plywood, except for the balsa tail filler, hardwood motor beams, and landing gear blocks, as well as a pre-cut phenolic motor mount. All bulkheads are tabbed to fit into notches in the fuselage sides, top and bottom, and they fit together very nicely. The wings have hardwood leading edges, spars, pre-shaped balsa trailing edges, ribs and wing tips. The rudder fin and elevator are sheeted balsa while the stabilizer is built-up.

RCM's prototype was finished with transparent red MonoKote over the open structure, silver MonoKote on the front of the fuselage and white MonoKote on the rudder. The crosses and background were done with MonoKote trim. Modifications to the kit included replacing all of the black wire with piano wire (5/32" was used for the gear), addition of a steerable tail wheel, and a Kraft Hayes engine mount in place of the engine beams/phenolic motor mount. A "Miss World" cowl was used which can be ordered direct from World Engines for $3.95.

The prototype had the occasion to be crash tested when another transmitter on the same frequency was turned on. The

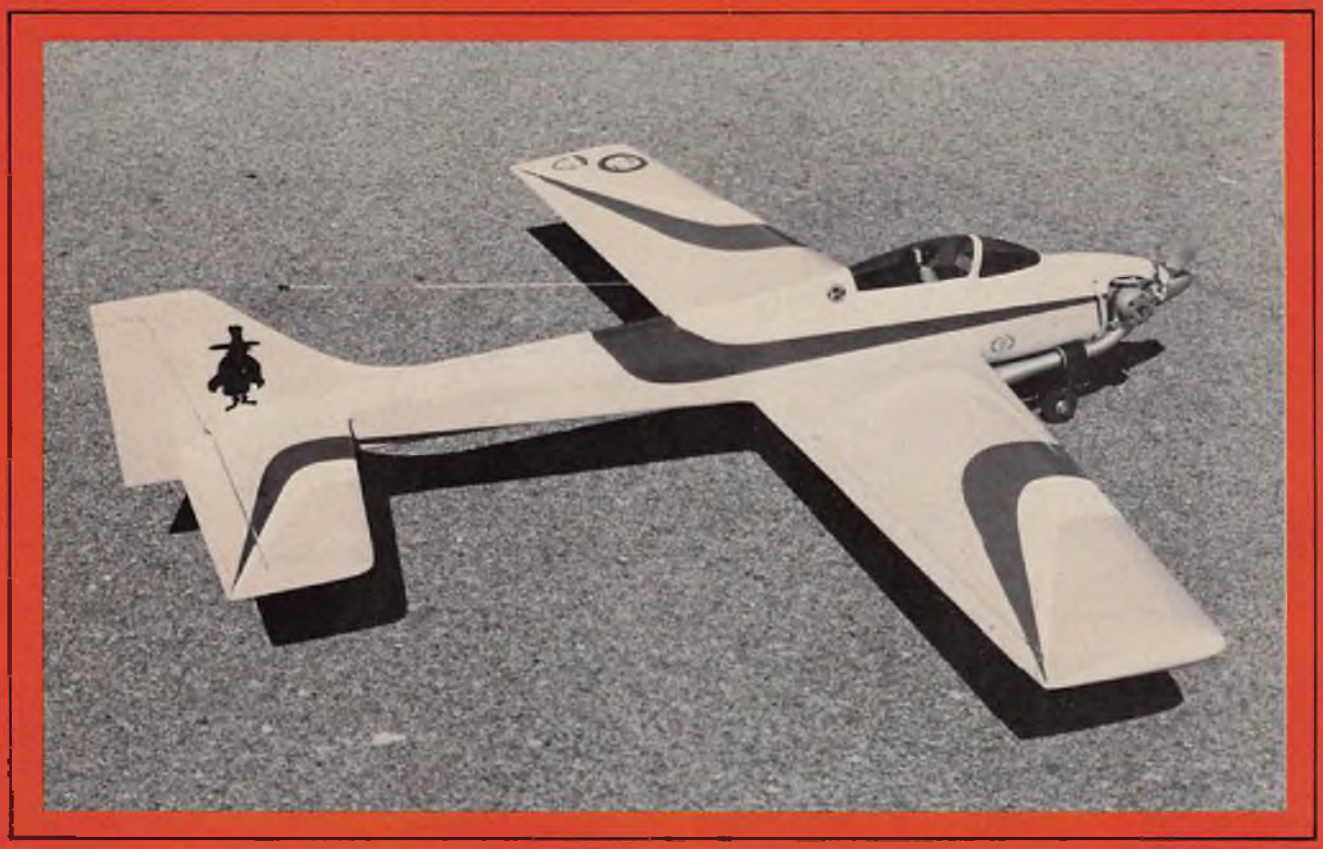
to page 130

SPECIFICATIONS

Name ..... Box Fly Bipe
Aircraft Type ..... Biplane
Manufactured By ..... Pilot - World Engines
8960 Rossash Ave.
Cincinnati, Ohio 45236
Mfg. Suggested Retail Price $39.95
Available From ..... Retail Outlets
Mfg. Recommended Usage ..... General Sport
Wing Span ..... 50 Inches
Wing Chord ..... 7 Inches
Total Wing Area ..... 700 Square Inches
Fuselage Length ..... 34¼ Inches
Radio Compartment Dimensions ..... (L) 8¾" x (W) 2½" x (H) 3½"
Wing Location ..... Biplane
Airfoil ..... Symmetrical
Wing Planform ..... Constant Chord
Dihedral ..... 3 Degrees
Stabilizer Span ..... 17 Inches
Stabilizer Chord (incl. elev.) ..... 4¾ Inches
Total Stab Area ..... 80 Square Inches
Stab Airfoil Section ..... Flat
Stabilizer Location ..... Mid-Fuselage
Vertical Fin Height ..... 5 Inches
Vertical Fin Width (incl. rud.) ..... 6½ Inches
Mfg. Rec. Engine Range ..... .20
Recommended Fuel Tank Size ..... 4 Ounces
Landing Gear ..... Conventional
Rec. Number of Channels 3-4
Recommended Control Functions ..... Rud., Elev., Throt., & Ail.
Basic Materials Used In Construction:
Fuselage ..... Ply
Wing ..... Balsa
Tail Surfaces ..... Balsa
Hardware Included In Kit ..... See text
Plan Size ..... 25" x 37" (2 sheets)
Building Instructions on Plan Sheets ..... Yes
Instruction Manual ..... No
Construction Photos ..... No
Kit Includes ..... Shaped & Die-Cut Parts
Mfg. Rec. Flying Weight ..... Not given
Wing loading based on rec. flying wt. ..... Not given

RCM PROTOTYPE

Weight, Ready To Fly ..... 64 Ounces
Wing Loading ..... 13.1 oz./sq. ft.
Covering & finishing materials used ..... see text
Engine Make and Disp. ..... S.T. .40
Muffler Used ..... No
Radio Used ..... Heathkit
Tank Size Used ..... 6 Ounce



REVENGER

The Revenger is the newest and sleekest design to be offered to the modeler in years. One of the unique features of the Revenger is its laminar airfoil wing. The laminar airfoil provides the modeler with a wing that few model designers attempt to use. Literally years of testing and development has resulted in a design that will take a back seat to none.

As with any scratch-built airplane, one of the biggest tasks is preparing the parts for assembly. I have found that two sets of plans (one for templates and one for building) will save hours of work in the long run. I would suggest making templates from chrome-cote card stock which can be found at most of the large stationary supply stores.

Cut the parts from the drawing slightly oversize and spray with 3-M- 77 adhesive spray and bond to card stock. When dry (just a few minutes), trim to final cut size. A parts list has been provided as an aid in preparing your parts for assembly.

I have broken down the assembly into major components, i.e., fuselage, wing, empennage, etc. This will enable you to jump around during build up. Throughout build up, the writer will assume you are using templates.

Fuselage:

Cut two matching sides from 3/16" x 4" x 48" medium hard balsa, using the fuselage template as a guide. Be sure to cut the front edge (firewall) for 2° down thrust. Measure back (from firewall end) 3/8" and draw a line parallel to edge. cut two top stringers 1/4" x 1/2" x 39" and glue to top of fuselage sides(s) (using Wilhold Aliphatic Glue) starting 3/8" aft of forward edge (firewall). Clamp using clothespins. Cut off and retain the upper half of stabilizer opening (make cut vertical at leading edge of stab opening), which will be used later when installing horizontal stabilizer.

Cut two (2) forward fuselage doublers from 3/16" x 3" x 6½" soft balsa and two (2) wing saddles from 1/8" x 2" x 16½" hard balsa or light plywood. Place on fuselage side as shown on drawing. Using a felt tipped pen, draw an outline around doubler and wing saddle. Apply a light coat of contact cement to doublers, wing saddles and area outlined on fuselage sides. When contact cement is dry (to touch), place doublers and saddles and press firmly in place. Note: As an aid in installing the doublers and wing saddles in the exact position, place a piece of waxed paper over the contact cemented area. Place doubler(s) and wing saddle(s) on top of waxed paper. Slowly pull waxed paper out from under the balsa and press pieces firmly in place.

Cut two (2) lower stringers from 1/4" sq. x 25¼" balsa and glue to bottom of each fuselage side using Wilhold Glue. Lay the R/H fuselage side on plans and mark position for vertical stiffeners. Cut stiffeners to size and bond in place using "Hot Stuff". Note: Cut a relief in stiffeners to clear wing saddles.

Cut forward bulkhead from 1/4" (5 ply) plywood and mark location for wing hold-down dowels as shown on plans. Drill holes using a 1/4" drill. Epoxy to one side (using Devcon 5-Minute Epoxy) using a small square to make sure bulkhead is in straight. After bulkhead has dried, turn fuselage upside down and apply a film of epoxy to exposed edge of bulkhead and bond to opposite fuselage side. Note: Be sure to use a small square (or angle) to insure bulkhead is straight on fuselage. When dry, measure width of fuselage (just above bulkhead). Cut 5 cross braces (to length just measured) from hard 1/4" sq. balsa, and epoxy in to position shown on drawing.

The most important step in building a

fuselage is to build it straight and true. If you have a fuselage jig, the next step will be easy and straightforward. If you don't, I'll give you a tip on how I assemble the fuselage without a jig and still keep it straight.

Draw a straight line on your building board (a few inches longer than fuselage). Measure width of fuselage and draw a line parallel to line previously drawn. Draw a centerline between both lines (to represent centerline of fuselage). Pin fuselage (at mid-section) upside down, aligning sides with lines previously drawn. Join the sides together (at tail) and trim lower stringer (1/4" sq.) at an angle until stringers fit flush together. Bond together using Hot Stuff and pin to building board. Using 1/8" x 3" balsa sheet, cut bottom sheeting cross grain and glue to bottom of fuselage using Wilhold Glue.

Cut firewall from 3/8" (7 ply) aircraft plywood using dimensions shown on drawing. If 3/8" ply is not available, cut two pieces, one 1/4" ply and one 1/8" ply and glue together using Wilhold Glue. Clamp securely and allow to dry overnight. If you plan to use a Fox mount and Southern or Proline gear, you can layout the firewall as shown on the plans; if not, use the same relative location as shown on plans, but drill holes to suit mount and gear selected. For nose gear installation drill four (No. 25 drill) holes for 4-40 blind nuts and four (No. 21 drill) holes for 6-32 blind nuts for engine mount. Note: It is very important that the firewall be 3/8" plywood. By using the 3/8" (or larger) you get better vibration and load distribution of the engine specific firing impulses throughout the entire fuselage. This not only provides for increased power but can also reduce the possibility of radio failure due to vibration.

If you use the Fox mount, you will need to make some minor alterations to enhance installation. Using a Dremel Tool (or electric drill) equipped with a rotary file, remove enough material on back of mount to clear the 4-40 blind nuts. File each beam to a slight angle to clear engine cowling.

Next chamfer right and left sides of firewall 3 degrees and epoxy on front of fuselage. Clamp and allow to dry. When dry, remove fuselage from building board and install the remaining 1/4" sq. cross braces across aft fuselage section using Wilhold Glue. Stand fuselage tail end down and place a small amount of micro-balloons in apex of tail joint. Bond in place using Hot Stuff.

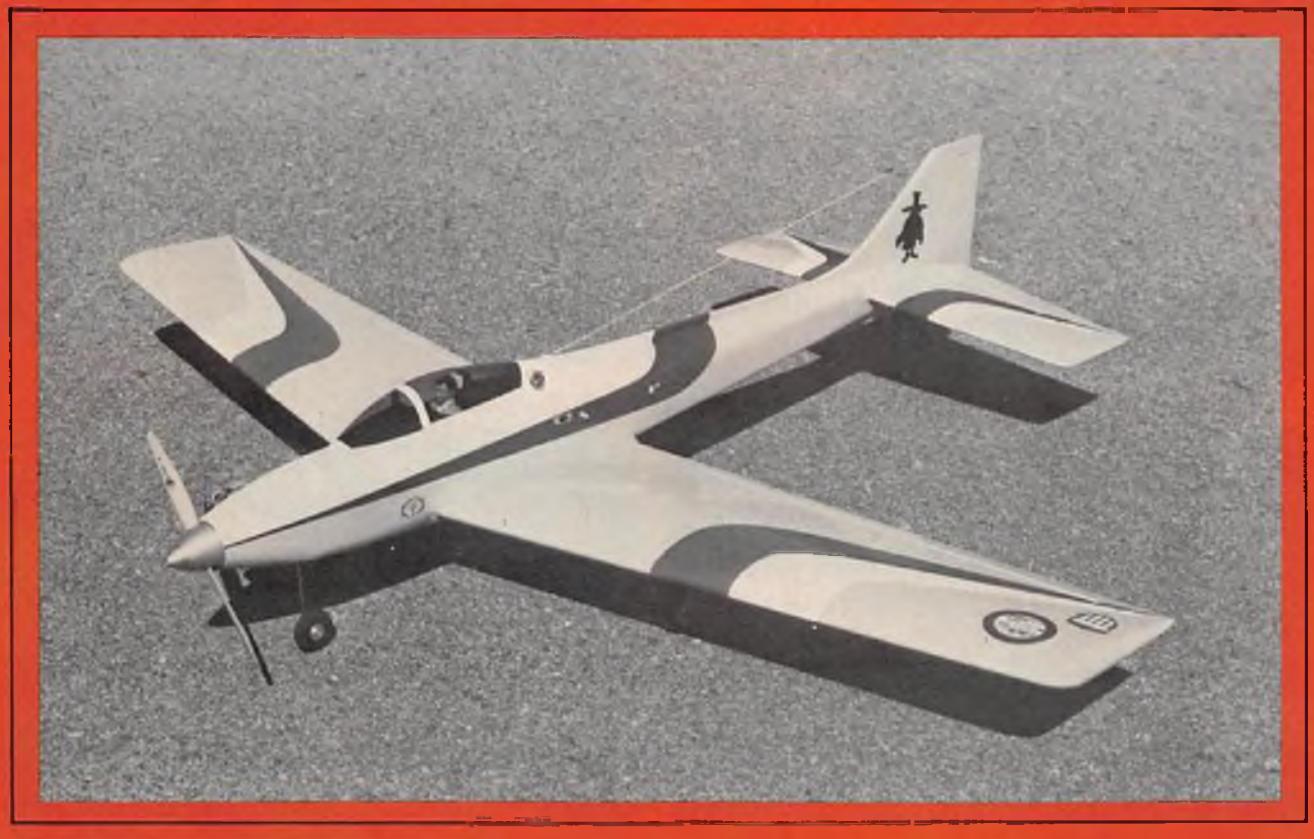
Temporarily install nose gear on firewall. Measure from top edge of fuselage down to nose gear and draw a line on inside wall(s) of tank compartment to locate tank floor. Cut two 1/4" (triangle) 6" long and Hot Stuff in place on line drawn. Next cut two 3/4" triangles 3-1/16" long. Cut out as required to clear nut plates and nose gear assembly. Apply a dab of vaseline to back of nut plates and epoxy triangles into corners of fuselage. Cut 3 pieces of 1/8" x 3" x 2-3/4" balsa (cross grain) for tank floor. Edge glue the pieces together (cross grain) using Hot Stuff and cut to shape as shown on drawing. Install in tank compartment using Hot Stuff.

If you haven t drilled the holes for the nose steering and throttle cable, now is the time to do it. I recommend using 1/16" music wire for nose steering and Su-Pr-Line Products Masterod for the throttle. Drill 1/8" holes in forward bulkhead. Install guides and secure with a light film of 5-minute epoxy.

Cut top block (tank cover) from 3/4" x 3-5/8" x 7" balsa. Place on top of fuselage and draw a line on block to shape of nose section and trim block to lines. Draw a line 5/16" inboard of block edge

By Dick Russ

A NEW AND SLEEK PATTERN AIRCRAFT FEATURING A LAMINAR AIRFOIL WING



THE REVENGER
Designed By: Dick Russ

TYPE AIRCRAFT
Pattern
WINGSPAN
70"
WING CHORD
10½ Inches (Avg.)
TOTAL WING AREA
747 Square Inches
WING LOCATION
Low Wing
AIRFOIL
Laminar
WING PLANFORM
Swept L.E.
DIHEDRAL, EACH TIP
1-3/16 Inch

56" (Inc. Spinner)
RADIO COMPARTMENT AREA
(L) 13¾" x (W) 2¾" x (H) 2½"
STABILIZER SPAN
25-5/8"
STABILIZER CHORD (Incl. elev.)
7⅜" (Avg.)
STABILIZER AREA
178 Sq. In.
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
6 Inches
VERTICAL FIN WIDTH (incl. rudder)
9" (Avg.)
REC. ENGINE SIZE
.61 cu In.
FUEL TANK SIZE
14 Ounce
LANDING GEAR
Tricycle retracts
REC. NO. OF CHANNELS
5
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt., Ret.
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Ply
Wing	Balsa, Ply & Foam
Empennage	Balsa, Ply & Foam
Wt. Ready-To-Fly	112-136 Oz.
Wing Loading	21.59-26.21 Oz/Sq. Ft.

(on each side) which represents tank compartment. Remove material within this area for tank clearance. (I have found the Kavan 14 oz. tank works well for this installation.) Prior to installing the top block, coat the entire tank compartment with a good sealer, I personally prefer to use Hobby-Poxy Formula 2 glue. This way I can seal the tank compartment and glue the top block on, all in one operation. Hold the top block down (until dry) with rubber bands.

Using 1/4" balsa sheet (or scrap), lay out the formers 1 through 7 and cut to shape. Next glue the formers on top of fuselage using Hot Stuff (or Wilhold).

Fabricate nose cowl by cutting top, bottom, and two sides from 3/8" balsa sheet as shown on drawing. Glue assembly together using Hot Stuff. Note: The top and bottom pieces fit inside the side pieces. Cut four (4) 1/2" triangle stock 6" long. Using 5-minute epoxy, epoxy triangles inside corners of cowling. Install engine mount on firewall and fit cheek cowling. After cowling fits to your satisfaction, epoxy into place using 5-minute epoxy. Note: Cut or file a half round opening in bottom of cowl to drain fuel.

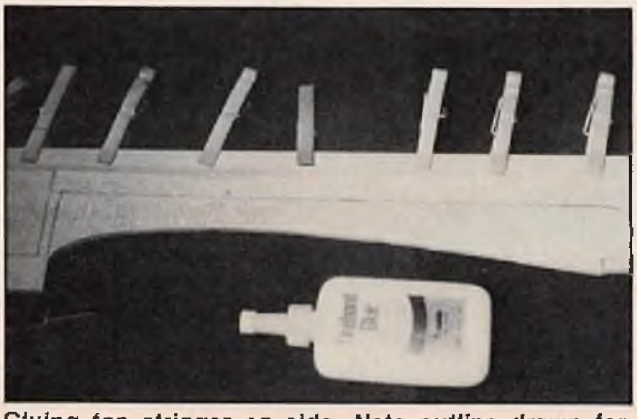
Draw a line (using felt tipped pen) 3/8" (down) parallel to top edge of sides (from top block to tail). Using and X-Acto knife (or plane) remove the balsa (on both sides) within this area forming a chamfered edge from top block to tail. Select a soft sheet of balsa 1/8" x 5" x 36" and trim length to 33". Using warm water, wet the entire sheet on one side only. Apply a film of Wilhold Glue to formers and along entire length of fuselage sides (chamfered edge). Carefully place the top sheet into position on fuselage and hold in place with masking tape (wrapped around sheet and fuselage). Set aside and allow to dry overnight.

When fuselage top is dry, remove masking tape and trim top sheet flush with sides.

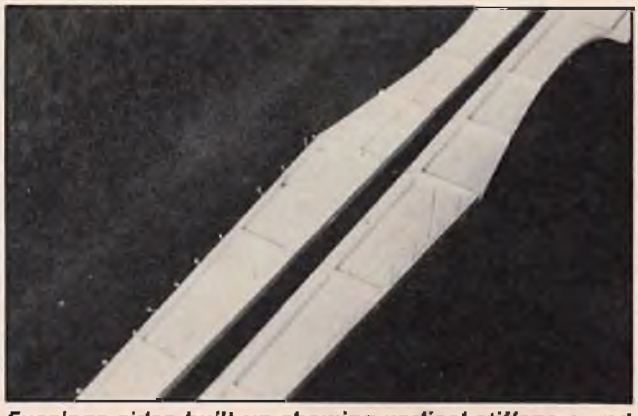
Temporarily install nose gear on firewall. Cut two lower nose blocks from soft blocks 1-1/8"x x1-1/4" x 6-5/16". Trim each block as required until blocks fit (flush with sides) in nose area. Draw an outline of the fuselage sides on side of block. Remove excess material from blocks. Temporarily reinstall blocks and trim as required for nose wheel and gear operation. Carve out excess material from blocks to form a concave inner surface. The blocks are now ready to be glued in place but before you do, determine where and how you plan to actuate the gear. Personally, I like "Sonic Systems" pneumatic actuators and they work exceptionally well in this installation. Cut a small block of maple 3/8" sq. and drill a 1/16" diameter hole in block to hold cylinder attach lug. Epoxy block to forward bulkhead and tank floor. Temporarily install actuator using a No. 2 x 3/8" sheet metal screw. Fabricate a wire pushrod using a Goldberg 1/16"

text to page 54

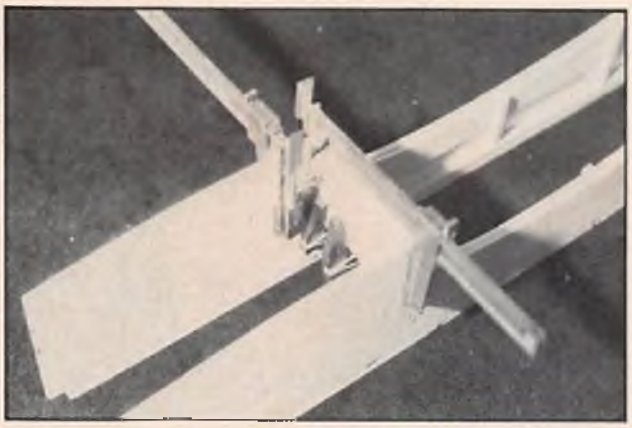
Cutting fuselage sides.



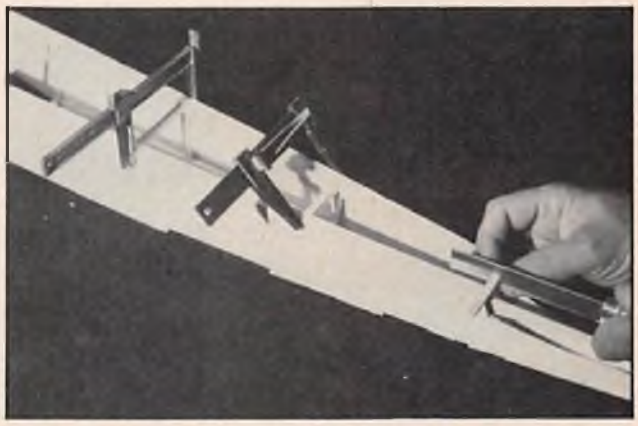
Gluing top stringer on side. Note outline drawn for doublers.



Fuselage sides built up showing vertical stiffeners and doublers.

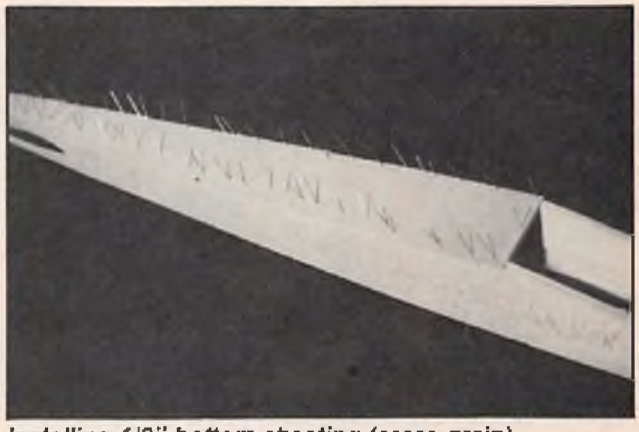


Joining sides at forward bulkhead. Note small aluminum angle brackets in corners for alignment.

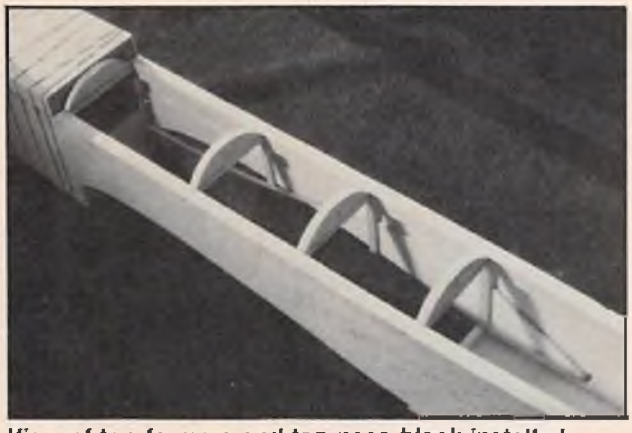


Installing upper 1/4"sq. cross braces in aft fuselage.

Installing firewall.

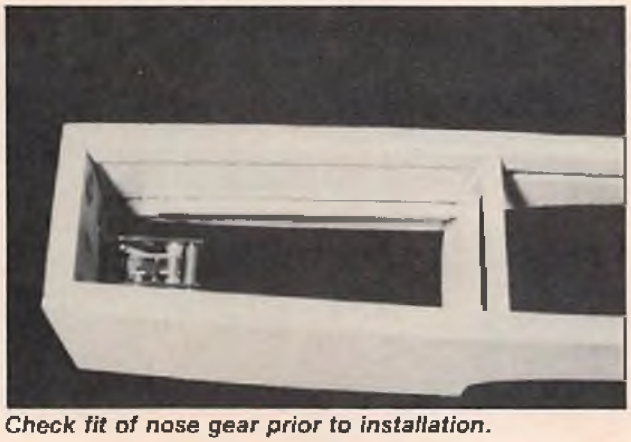


Installing 1/8" bottom sheeting (cross grain).

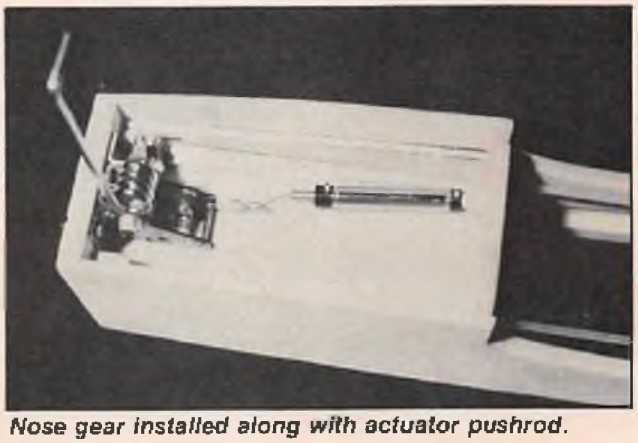


View of top formers and top nose block installed.

Ventral fin pinned & glued in place.



Check fit of nose gear prior to installation.

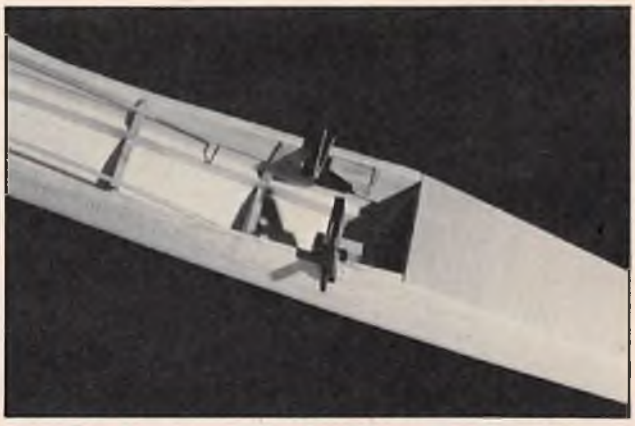


Nose gear installed along with actuator pushrod.

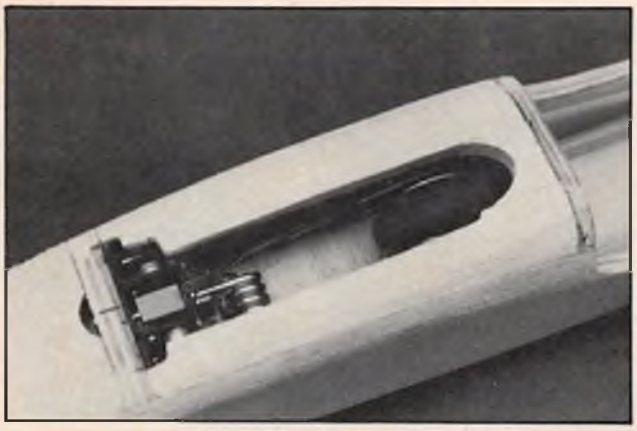
Build up of tail for fin installation.

Fin glued in place.

Fitting ply nose ring to cowl blocks.

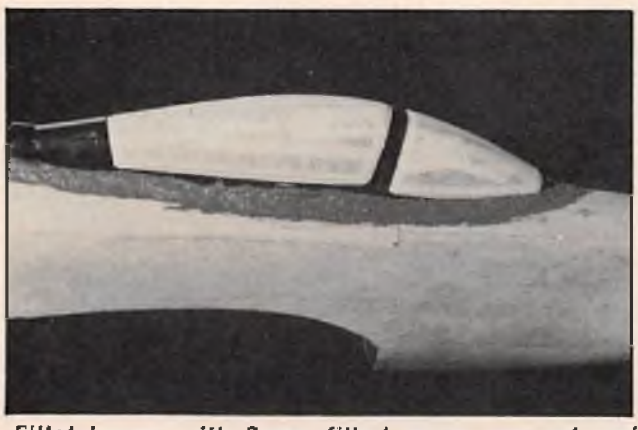


Installing hardwood wing hold-down blocks.



Lower nose block glued in place with cut-out for retract.

Canopy secured in place with cyanoacrylate adhesive and micro-ballons prior to making fillet.



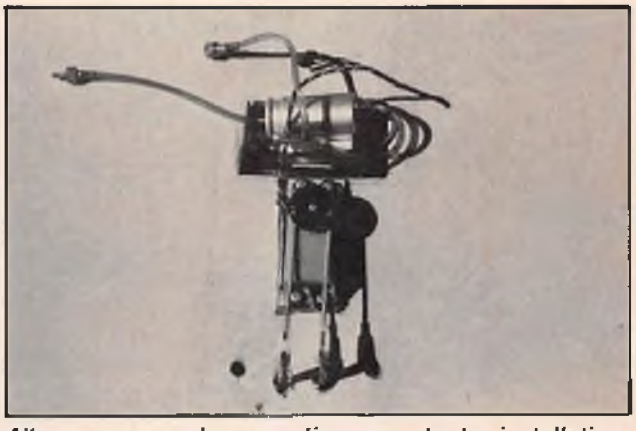
Fillet lay-up with Sears filled epoxy cement and micro-balloons.

Wing fillets made from Sig Epoxolite.

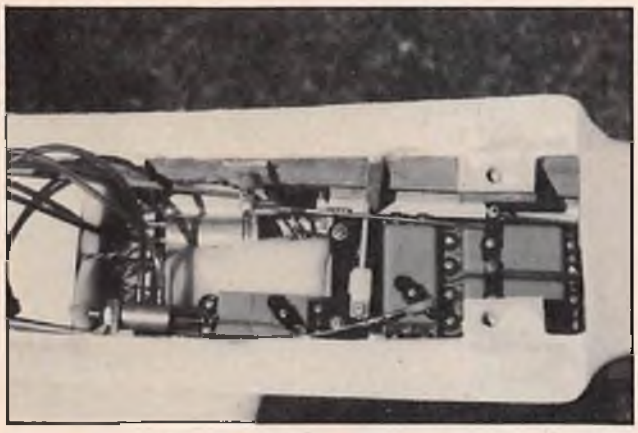
Canopy and wing fillets completed ready for final finish.

Completed job makes the time and effort worthwhile.

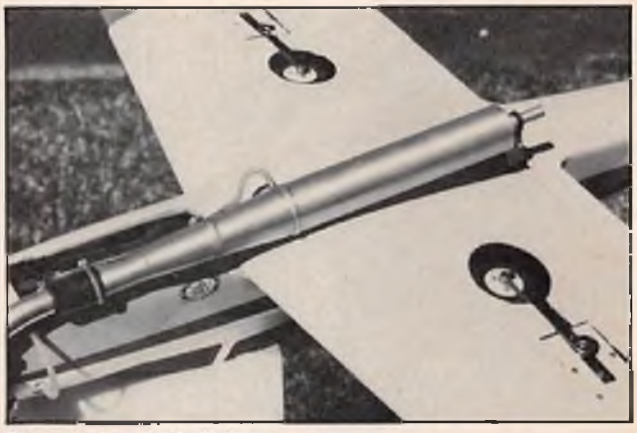
Bottom view of stab showing dual elevator pushrods. Ball link used on rudder horn.



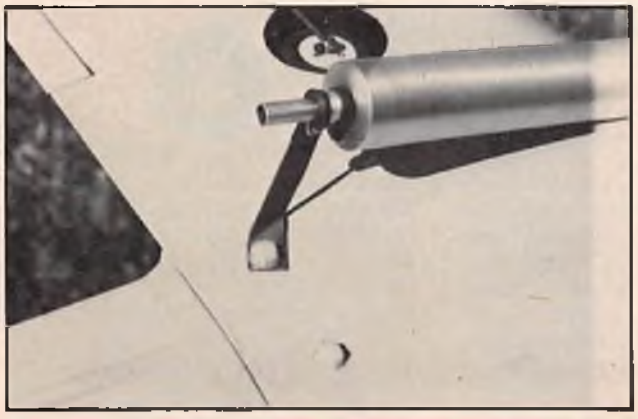
Aileron servo and pneumatic gear actuator installation. Note differential ailerons and Hydralock installation.



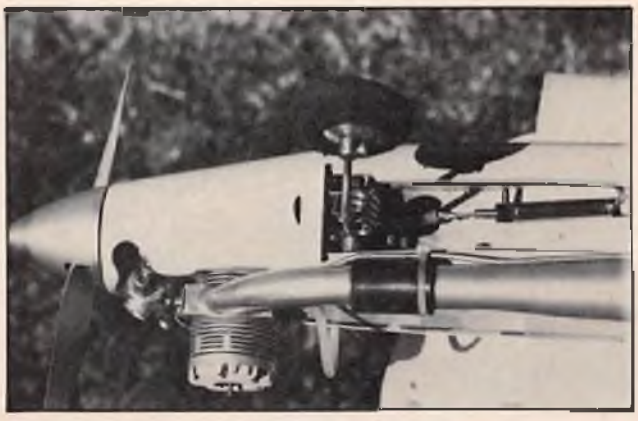
Servo installation in fuselage. Note Hydralock cylinder and nose steering reduction arm.



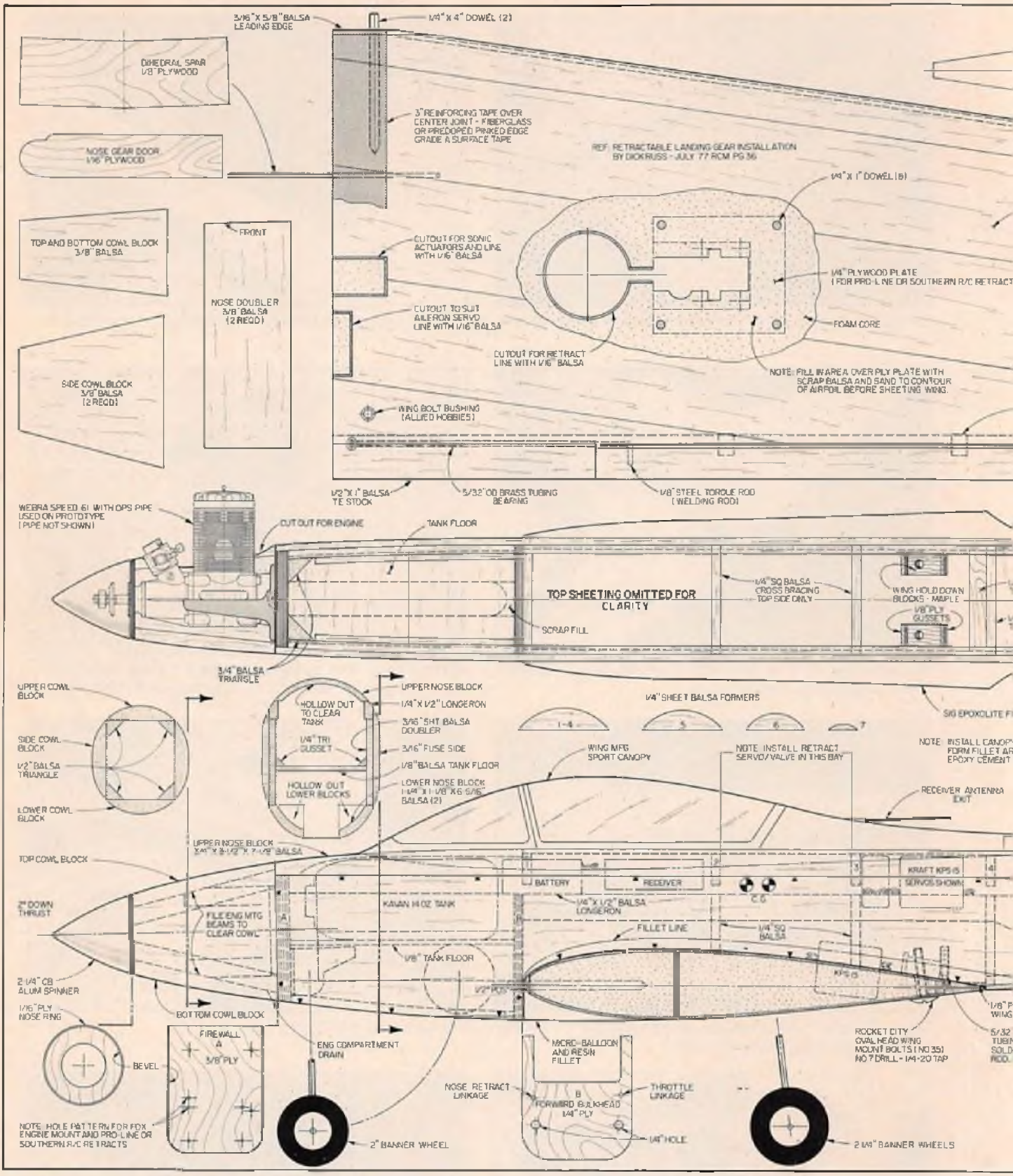
Tuned pipe installation.



Rear bracket on tuned pipe using wing hold-down bolt.



Webra speed .61 using OPS tuned pipe.



diameter Kwik-Link wire.

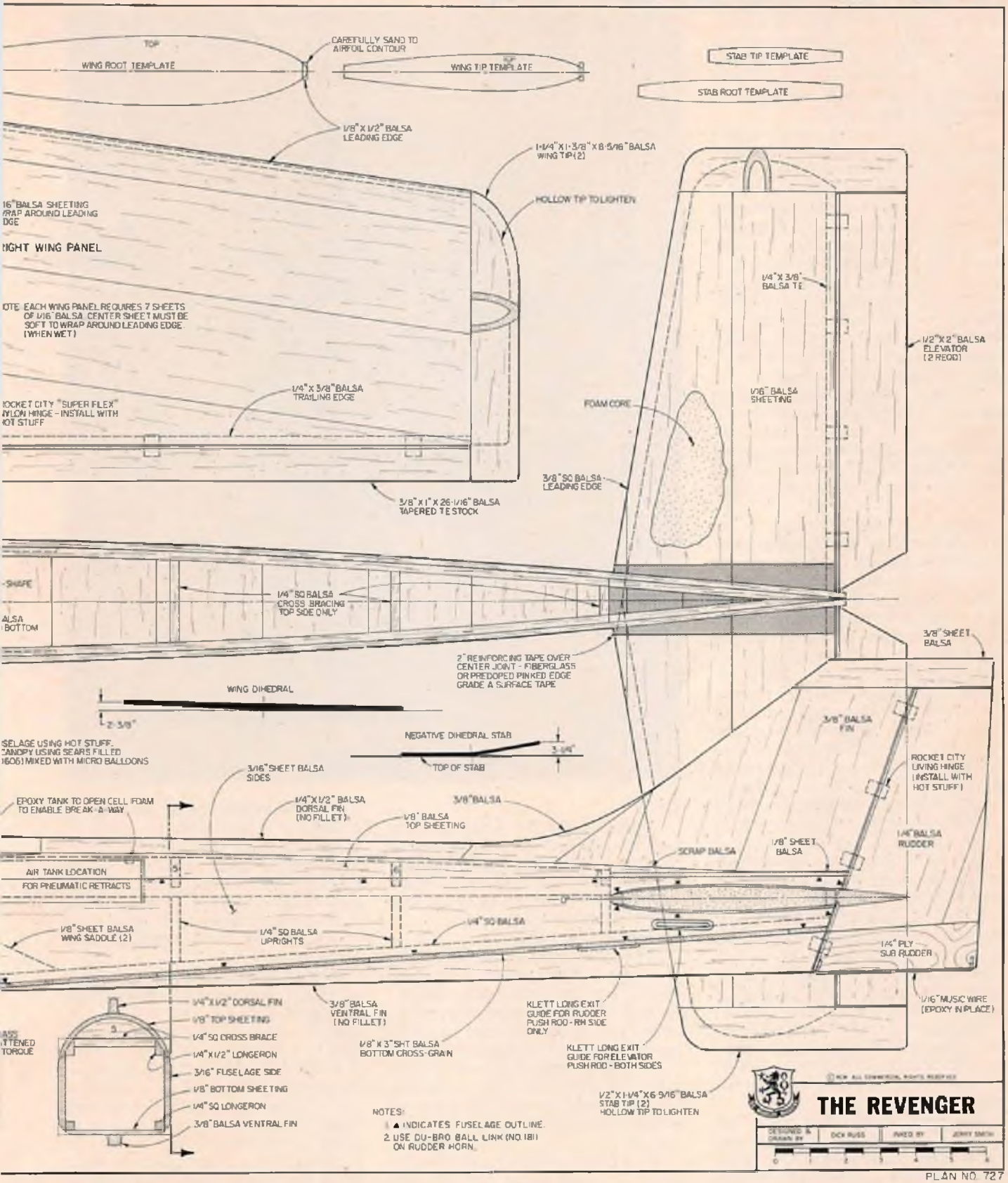
Remove actuator and nose gear assembly from fuselage. Mix up a batch of Hobby-Poxy Formula 2, and paint entire nose gear compartment. Coat lower blocks with epoxy and pin into position and set aside to dry.

Drill (or cut) a large hole in center of right cowl and gradually enlarge size of hole (to enable installation of engine) and temporarily install engine on mount. Install spinner and backplate on engine and check alignment of nose cowl (where nose ring fits) and engine position. Sand as required to obtain clearance and alignment needed for the 1/16" plywood nose ring. Remove spinner and engine and epoxy nose ring to engine cowl.

Using 80 grit (or 120 grit) sandpaper and sanding block, shape and contour fuselage as shown on drawing. After fuselage has been shaped, sand with 320 grit to remove heavy scratches, finishing off with 400 grit.

Wing Buildup and Assembly:

On both wing cores, glue on the 1/8" x 1/2" balsa leading edge and the 1/4" x 3/8" balsa trailing edge using Wilhold Glue. When glue has dried,



sand and shape the leading and trailing edges as shown on drawing.

Select 14 sheets of medium to soft 1/16" x 3" x 36" sheets of balsa (to be used for wing sheeting). Sheets are to be edge glued to form a large one piece panel, but prior to joining, the sheets must be straight. Using a straight-edge and X-Acto knife (or razor blade) trim both edges of each sheet to be joined. Select two sheets for the leading edge (or center sheet) and draw a centerline (using a felt tipped pin) down center of each sheet. Note: Both center sheets must be straight grain and soft balsa to enable wrapping around leading edge of wing panels. Starting with the center sheet, join the remaining six sheets (three on each side) by joining with masking tape (one side only). Turn assembly over and one at a time bend each sheet back over tape (using tape as a hinge) and apply a light bead of Wilhold Glue along entire joint. Lay down on a flat surface and wipe off excess glue and join with masking tape. Place the wing core (leading edge) on the centerline of the center sheet. Carefully lay the core down (in a rolling motion) as if sheeting wing. At trailing edge,

draw a line on sheeting approximately 1/4" from trailing edge. Repeat the preceding for the other side of sheeting. Remove this area from sheeting and glue onto opposite end of sheeting forming a wedge shape sheet.

When glue has dried, remove masking tape. Lay wing sheeting on a smooth flat surface and sand both sides with a flat sanding block and 320 grit paper.

I won't go into any details on installing the landing gear in this writing. The drawing should be clear as to how I recommend installing Southern R/C retracts. If you plan on using a different gear, I would recommend that you follow their instructions. For further assistance I would like to refer you to an article I wrote in the July 1977 issue of RCM on installing retractable landing gear.

Using 320-400 grit sandpaper and flat sanding block, lightly sand both cores to remove ridges made by the wire cutter. Carefully vacuum both cores to remove the styrofoam dust, and also vacuum both balsa wing sheets to remove balsa dust.

Using warm water and a sponge, wet the center sheet of balsa sheeting panel (wet on side opposite that being glued to core). **Note: Be sure to test your wing core to make sure it is compatable with 3-M-77 before spraying entire core and sheeting.** Turn panel over and spray entire panel with 3-M-77 adhesive spray (caution - - do not use 3-M-77N). Set sheeting aside while you prepare core. Spray one side of wing core (using 3-M-77) starting at trailing edge and working towards leading edge. Be sure to spray partially around leading edge (towards other side) to insure a good bond. Allow core to dry a few minutes (at least until the panels become very tacky) before continuing. Lay sheeting on a smooth flat surface. Take wing core and place leading edge on centerline of wing sheeting. Very carefully (with rolling action) pull on sheeting and press core down on sheeting. Spray opposite side of core and allow to dry as before. Pick up entire assembly and carefully press core down pulling on sheeting as core is being joined. Place covered core on scraps core was cut from and place on a flat surface and weight down with books or similar weights. Let stand for at least 48 hours. Repeat preceeding steps for opposite wing.

When both wings have dried, trim sheeting flush with tips, wing root and trailing edge. Sand wing roots to angle shown on drawing. Coat spar and wing root(s) with 5-minute epoxy and join wings together. Hold tightly until epoxy sets up. Temporarily glue wing tip blocks on each wing using a small dab of 5-minute epoxy on each tip. When epoxy has dried, sand each top to size and shape shown on drawing. Carefully break away each tip from wing and hollow each tip as shown on drawing and reinstall on wing using Devcon 5-Minute Epoxy.

PARTS LIST*

Nomenclature	Size	Material	# Req'd.
Fuselage sides	3/16" x 4" x 48"	medium balsa	2
Fuselage doublers	3/16" x 3" x 6½"	medium balsa	2
Wing doublers	18" x 2" x 16½"	hard balsa	2
Top stringer	1/4" x 1/2" x 39"	medium balsa	2
Bottom stringers	1/4" x 1/4" x 25¼"	medium balsa	2
Bottom sheeting	1/8" x 3" x 24½"	medium balsa	1
Forward bulkhead	1/4" x 3⅛" x 3⅛"	5-ply plywood	1
Firewall	3/8" x 3¾" x 4¾"	5-ply plywood	1
Stiffeners	1/4" x 1/4" x 44"	medium balsa	as req'd.
Firewall gussets	3/4" Tri x 3¾"	medium balsa	2
Tank floor	1/8" x 3" x 6"	hard balsa	1
Tank floor gussets	1/4" Tri x 6"	medium balsa	2
Lower fuselage blocks	1⅛" x 1¼" x 6-5/16"	soft balsa	2
Top sheet	1/8" x 6" x 36"	soft balsa	1
Cowling sides	3/8" x 4⅛" x 4⅛"	medium balsa	2
Cowling top	3/8" x 4¼" x 2½"	medium balsa	1
Cowling bottom	3/8" x 4¼" x 2½"	medium balsa	1
Cowling gussets	1/2" Tri x 6"	soft balsa	4
Nose ring	1/16" x 2¼" dia.	plywood	1
Wing cores		styrofoam	2
Wing trailing edge	1/4" x 3/8" x 36"	medium balsa	2
Wing leading edge	1/8" x 1/2" x 36"	medium balsa	2
Wing sheeting	1/16" x 3" x 36"	med & soft balsa	14
Wing spar	1/8" x 2" x 6"	plywood	1
Ailerons **	1/2" x 1¼" x 36"	medium balsa	2
Wing tips	1¼" x 1⅜" x 8-5/16"	balsa	2
Aileron torque tube bearing	1/8" I.D. x 6¾"	brass tubing	2
Aileron torque tube	1/8" O.D.	steel welding rod	2
Stabilizer foam cores		styrofoam	2
Leading edge	3/8" sq. x 12"	balsa	2
Stab trailing edge	1/4" x 3/8" x 12"	balsa	2
Stab sheeting	1/16" x 3" x 12"	balsa	8

* Sizes are approximate minimum sizes needed.
** Cut wing fixed trailing edge (houses aileron torque tubes).

Carefully locate the wheel well and gear box and cut out as required for clearance. Wheel well can be lined using 1/16" balsa or thin cardboard. I would recommend sealing the gear box with Devcon 5-Minute Epoxy.

Aileron Torque Tube:

Cut two pieces of 1/8" ID brass tubing 6½" long. Cut two pieces of 1/8" OD welding rod (or equivalent) approximately 9½" long. Bend one end approximately 3/4" long. Lubricate rod with vaseline and insert into brass tube. Bend 1" of opposite end of wire 90° to first bend. Fabricate the other assembly keeping in mind the bend for the servo linkage must be opposite of that just completed.

Cut a piece from each balsa aileron stock 7½" long (for aileron linkage) using an X-Acto gauge (or equivalent), cut a groove approximately 5/32" deep and 5/32" wide down centerline. Place the right hand and left hand aileron torque tube in groove and bond with Hot Stuff (use caution when applying so as not to get Hot Stuff on inner rod). Cut a half round opening on upper surface to allow movement of torque rod. Fit check on wing and cut a corresponding opening in wing. When satisfied with fit, apply a bead of Devcon 5-Minute Epoxy to edge and bond into place on trailing edge of wing. Cut two pieces of 1/8" ID brass tubing 1¼" long. Flatten 3/4" of each tube and drill a series of 1/16" diameter holes for linkage. Install tubing on torque tubes and sweat solder into place.

Determine location for aileron servo as shown on drawing and remove this area from wing. Line with 1/16" balsa and epoxy into place. Install hardwood rails for servo attachment.

A strip of 3" reinforcing tape should be installed at the wing center section. I prefer to use pre-doped pinked edge grade "A" surface tape that is used on fabric aircraft (which can be found at most airports) but fibregalss cloth will serve the same purpose. If you use the grade "A" tape, bond onto wing with nitrate dope. If you use glass tape, bond onto wing with epoxy.

Horizontal Stabilizer:

On both stab cores, glue on the 1/4" x 3/8" trailing edge and 3/8" x 3/8" leading edge using Wilhold Glue. When glue has dried, carefully (using a sanding block and 320 grit sandpaper) sand the leading edge to match the airfoil as

shown on drawing.

Select eight sheets of 1/16" x 3" x 12" soft balsa. Cut four forward sheets the shape of stab leading edge. Place pieces on a flat surface and tape the forward and rear sheets together using masking tape. Turn assemblies over (4), using tape as a hinge and apply a bead of Wilhold Glue to each seam. Wipe off excess glue and join with strips of masking tape.

When assemblies are dry, remove masking tape. Place on a smooth flat surface and lightly sand both sides of each sheet. Lightly brush all dust off the cores and sheeting. Vacuum both the cores and sheets to remove any traces of sanding dust. Spray one side of each core and sheeting with 3-M-77 paying particular attention to the leading edge and trailing edge. When adhesive becomes tacky (approximately 3 to 5 minutes) carefully join both the balsa sheeting and the core. Repeat the above for the other side. Place in core scraps and press down for 24 to 48 hours. After removing cores, sand the tip ends and epoxy the tips in place. When dry, sand each stab half and contour leading edge and tips as shown on drawing.

Sand stab roots to the angle shown on drawing and bond together using Devcon 5-Minute Epoxy.

Using 2" wide fiberglass tape or predoped grade "A" fabric, apply tape to center section of stab. Ref: Wing section for specific taping instructions.

Elevators:

Elevators are constructed from 1/2" x 2" elevator stock that is available in most hobby shops. Cut elevator stock to size and shape as shown on drawing. Draw a line (using felt tip pen) down leading edge of both elevators. Using a plane (or sanding paper) chamfer leading edge to line previously drawn.

Fin:

Using 3/8" x 3" (medium hard) balsa, cut three pieces of balsa the size and shape as shown on drawing. Assemble the three pieces on a flat building surface and join one side with strips of masking tape. Turn assembly over and bend at seams using tape as a hinge. Apply a bead of Wilhold Glue to each joint. Wipe off excess glue and tape joints with strips of masking tape. When dry, remove tape and sand entire assembly to airfoil shape shown on drawing. Note: Do not sand dorsal fin at this time, (will be sanded after assembly).

Rudder:

Fabricate rudder from 1/4" hard balsa. Rudder is made from two pieces of balsa and a sub rudder made from 1/4" plywood. Cut pieces from balsa and plywood as shown on drawing. Glue pieces together using Wilhold Glue. Tape seams and set aside to dry.

Ventral Fin:

Ventral fin is a straight cut triangle fabricated from 3/8" sheet, cut to size and shape as shown on drawing.

Assembly:

I will assume that all components of the Revenger have been shaped and sanded to where they are ready for either finishing with a pre-finished covering (such as Solarfilm, MonoKote, etc.) or Coverite (or what have you). As with any competition pattern plane, whether being flown in competition or for just plain sport flying, weight is a critical factor. With the Revenger, to keep weight to a minimum, I would recommend covering the wing with MonoKote and painting the fuselage with K & B Super-Poxy, but again this is up to the builder.

Cut two wing hold-down blocks (from 1/2" hard maple) 3/4" x 1". Using Devcon 5-Minute Epoxy, epoxy into position in the location shown on drawing. Note: Apply epoxy on 1" width and install flush with wing opening. Position wing on fuselage and measure distance from each tip to fuselage. When wing is centered on fuselage, draw a line on wing (next to fuselage) using a felt tip pen (to aid in aligning wing). Cut two 1/4" dowels approximately 1/2" long. Grind or sand each dowel to a sharp point. Insert dowels (point out) into holes in forward bulkhead. Place wing on fuselage and align fuselage with lines previously drawn. Carefully slide wing forward until wing contacts the two dowels (indenting leading edge of wing), then remove wing. Cut two 1/4" dowels 4" long. Grind or sand each dowel to a point, and force into leading edge of wing until it stops against front spar. Remove each dowel and pour a small amount of Devcon 5-Minute Epoxy in holes. Coat dowels with epoxy and insert dowels in holes. Wipe off excess epoxy and set aside to dry.

Mark location (on side of fuselage) of wing hold-down blocks. Install wing on fuselage and mark location (on wing) for wing hold-down bolts. Drill a small pilot hole (for each bolt) through wing into hold-down blocks. Remove wing from fuselage and verify pilot holes are approximately in center of blocks. Drill and tap hold-down blocks using a #7 drill and 1/4" x 20 tap. Drill holes in wing using a 3/8" drill. Coat inner surface with Devcon 5-Minute Epoxy and insert on Allied Hobbies Wing Bolt bushing (or equivalent). Trim bushing flush with surface of wing. Fasten wing to fuselage using Rocket City oval head wing hold-down bolts (part #35).

Position horizontal stabilizer on fuselage and align with fuselage, and wing. Prior to installing, permanently check for decallage angle using a Robart Incidence Meter. Note: If you do not have a Robart Incidence Meter, I would highly recommend buying or borrowing one, as this check is very important. As with any airplane, the angle of incidence and decallage can mean the difference between a good flying plane and one that just flies!

After you are satisfied with the fit of the stab, install stab permanently using Devcon 5-Minute Epoxy. Install the two upper pieces (that was previously cut off during fuselage build-up) using 5-minute epoxy. Fill in voids with scrap balsa using epoxy. Install fin and dorsal fin using epoxy. Use caution to make sure fin is straight and vertical. Build up remaining area using scrap balsa, maintaining contour of fuselage. All that remains to complete the emmpenage is the fillets. You may have your own ideas on building fillets, but I'd like to share mine with you. I have tried many different types of materials but have found "Sears Filled Epoxy" cement mixed with micro-balloons to make the smoothest, strongest and lightest. Mix up equal parts of the catalyst and resin, and mix in a large amount of micro-balloons. Blend to a smooth consistency. Using a tongue depressor or coffee stirer, start building up the fillet. Fair in fillet using your finger (wet with water). Keep smoothing fillet until satisfied with contour. Set aside to dry.

On upper surface of wing, cover upper surface (in fuselage area) with Saran Wrap (or equivalent) held down with masking tape. Reinstall wing on fuselage and tighten bolts securely. Mix up a large amount of Sig Epoxolite and build up wing fillets. Note: The Sig Epoxolite is very strong and durable and builds beautiful and large fillets. The fillets should be approximately 3/4" wide at trailing edge and start approximately 3/4" above wing, tapering to a small fillet at leading edge.

Fillets may be contoured using your finger dipped in water and smoothed out to where very little sanding is required. Allow to dry overnight prior to separating wing from fuselage. Use K & B Finishing Resin, mix with micro-balloons to form the wing lower fillet (use cardboard as a mold).

The next step brings up a lot of controversy regarding the canopy and what to do with it. I personally like a detailed cockpit with pilot and instrument panel. The Wing Manufacturing canopy (with insert) lends itself to this type of installation. One of the most attractive is one with the insert (or interior) done in a krinkle finish. Krinkle finish is available in an aerosol spray can in many different colors. I personally like the black krinkle. Bond insert on fuselage in position shown on drawing using contact cement. Cut and trim the canopy to fit contour of fuselage and install using Hot Stuff (sparingly) around outer edge of canopy. Using 1/4" masking tape, mask off canopy approximately 3/8" above edge of canopy. Mix up a batch of Sears Filled Epoxy Cement and a lot of micro-balloons. Build fillet around canopy from fuselage to slightly past edge of masking tape. By keeping your finger wet (with water) you can mold the fillet to where very little sanding is required. When fillet

to page 122

DUCTED FAN DESIGN

By R.W. Kress

PART IV

Now that good and bad inlets have been depicted and some of the basic aerodynamics discussed, it would be interesting to examine some bad inlet designs. At the outset, it is assumed that no object such as an engine is placed in the inlet or diffusor passage. That would simply be asking for disaster unless the object was carefully streamlined and considered as an integral factor in the inlet flow passage design. It is further assumed that the interior flow passages are smooth (hopefully sanded and painted) and free of bumps. In the illustrations to follow, the inlets are drawn as if they were symmetrical about the centerline of the fan for ease of illustration. Bear in mind that any of the bad situations to be described can exist in various parts of non-symmetrical inlet systems (e.g., chin, side, wing leading edge, etc.).

The upper half of Figure 11 illustrates one very common source of trouble. While the interior diffusor divergence angle is okay, the lip is too sharp. In the static case, the streamlines trying to curl around the sharp lip into the inlet simply can't make the trip and flow breakaway ensues. As the flow accelerates around the lip, the high flow speed prevents the air molecules from staying "stuck" to the lip. Centrifugal forces on the molecules cause flow breakaway just like when your U-control lines bust. The result of the breakaway is flow burbling with a large loss in average dynamic pressure. Thrust falls as explained earlier. The cure is quite simple. Put a nice airfoil shape on the inlet lip as shown in the bottom half of the inlet of Figure 11. Or, if for scale purposes, you can't put part of the rounded lip outside due to scale contours, then put it all inside. Two cautions on the inside build-up; make sure the throat area is not less than the 83% throat diameter mentioned earlier and do not allow the interior divergence angles downstream of the lip to become excessive (7 degree rule of thumb).

One might legitimately ask if there was not a flight speed where the capture area was such that the stagnation streamline just landed on the cowl lip as depicted in the inset of Figure 11. This would smoothly divide the interior and exterior flow such that no streamline would have to negotiate the sharp lip. Such a speed does, in fact, exist. Unfor-

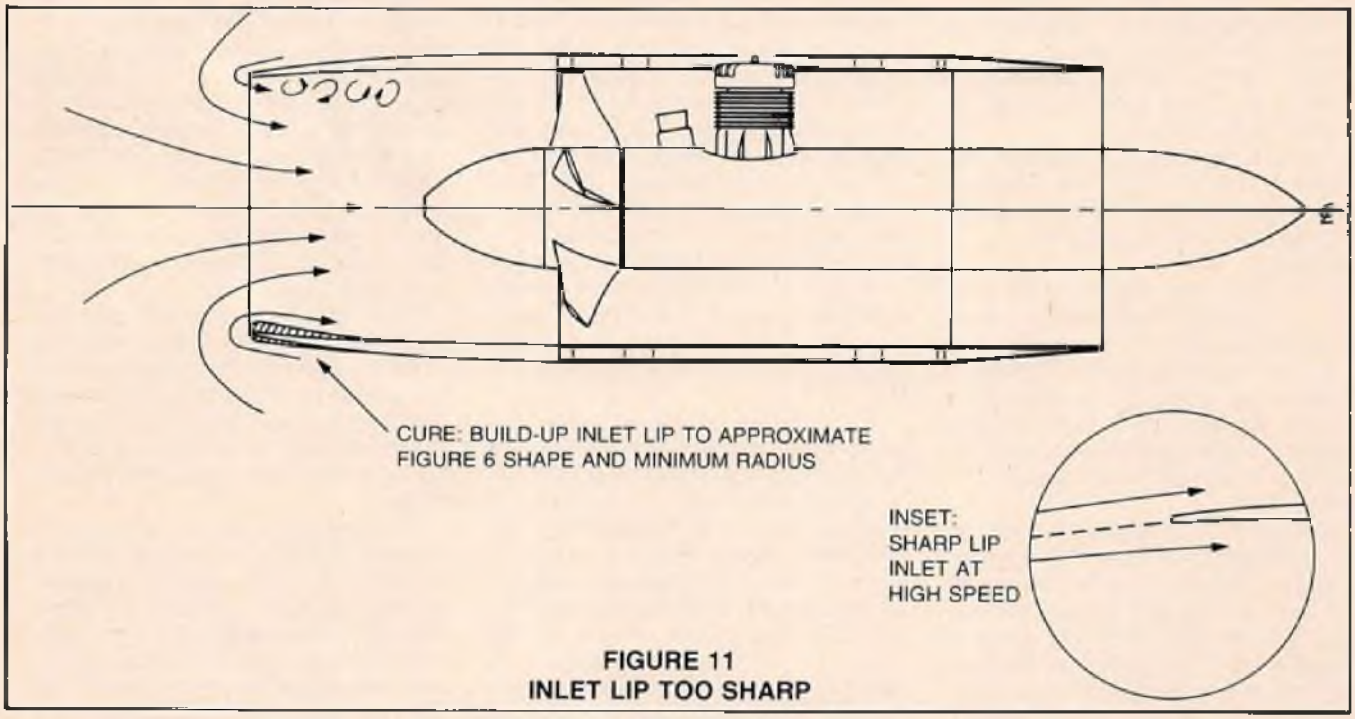


FIGURE 11
INLET LIP TOO SHARP

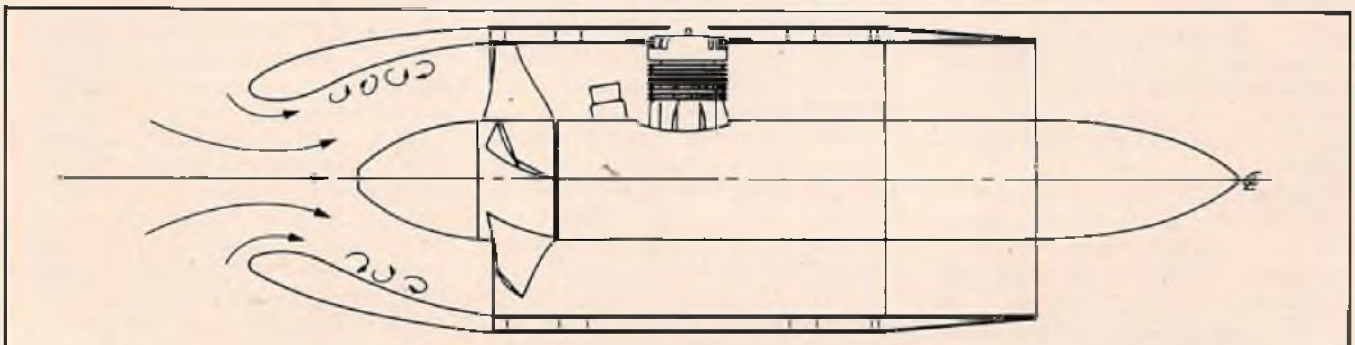


FIGURE 12
INLET LIP GOOD; INTERNAL DIVERGENCE ANGLE TOO HIGH;
THROAT DIAMETER OF 57% TOO SMALL

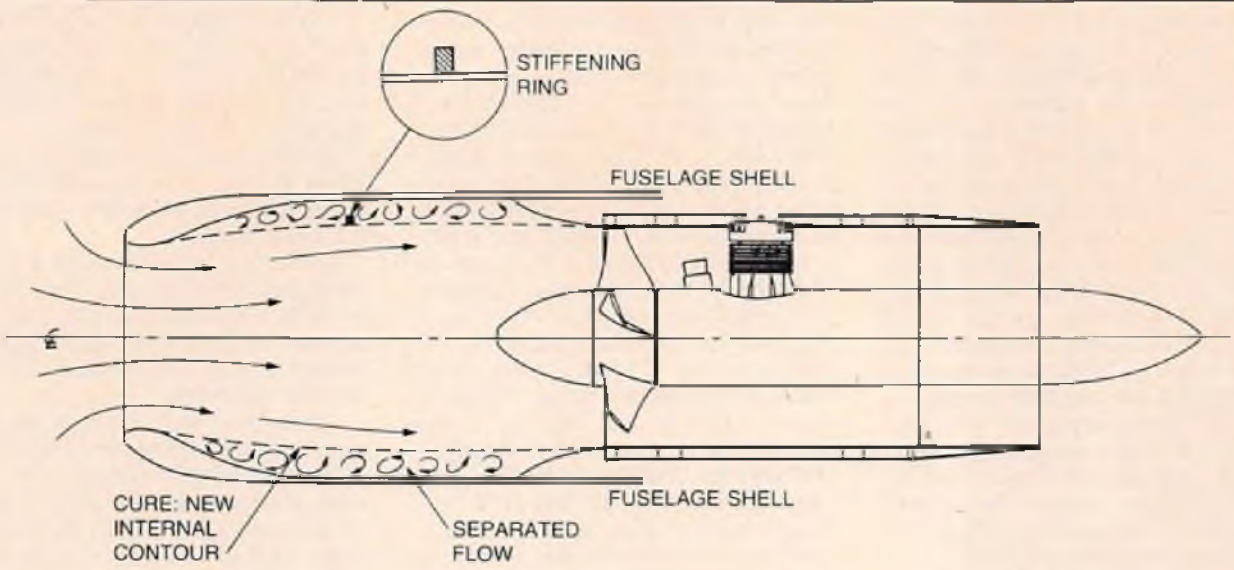


FIGURE 13
INTERNAL SEPARATED FLOW DUE TO UNNECESSARILY LARGE FUSELAGE CAVITY

tunately, it is a bit higher than the speeds of interest in model flying. The fan statically has an axial flow velocity of roughly 120 mph, which is increased somewhat as speed increases. This means that the capture area does not drop below the fan diametral area until roughly the same model airspeed is reached. The "captured" air below that speed (and even considerably above it for smaller diameter sharp inlets) is therefore forced to flow inward, around the lip and into the fan with risk of attendant flow separation.

Figure 12 is really an illustration of a point previously made. It reflects an inlet which has a nice lip design but an excessively divergent diffusor with attendant flow separation. In this case you will usually find that either the inlet hole is too small (less than the suggested 83% throat-to-fan diameter ratio) or the inlet is too short. Depending on the identification of the source of the trouble, the cure will be obvious, a bigger hole or a longer cowl or both.

Now that you are getting the hang of it,

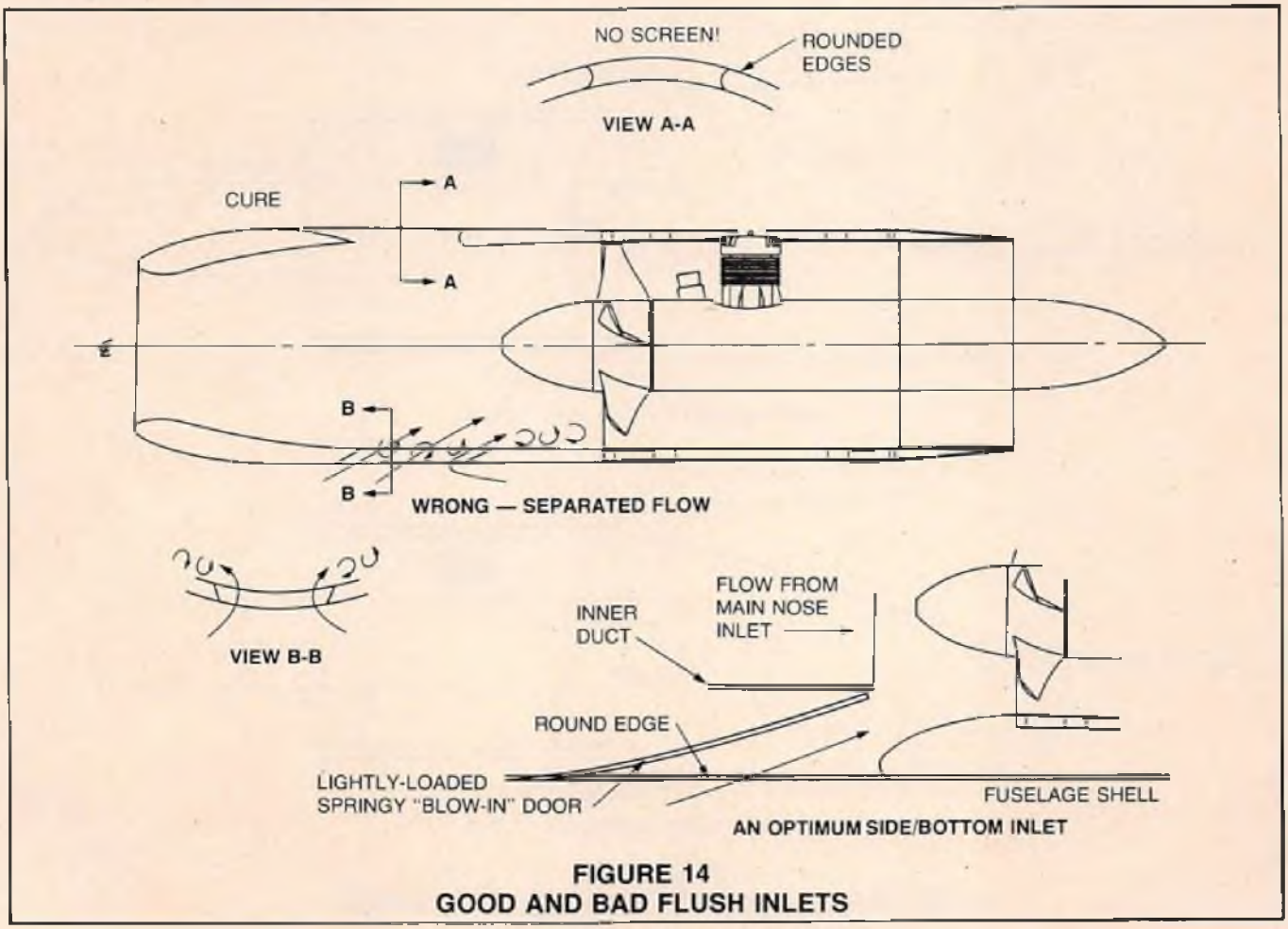


FIGURE 14
GOOD AND BAD FLUSH INLETS

I will illustrate a couple of more "horrors". Figure 13, I call the "Gibson Girl" inlet. It is really a variant of the Figure 12 inlet. The inlet lip is nice but the flow interior to the fuselage is unnecessarily allowed to expand outward to fill the cavity. The unnecessary expansion can result in a separated diffusor of grand proportions, as illustrated. The cure is simple, provide an internal passage following roughly the dashed lines in Figure 13. The internal passage can be very light, perhaps 1/64 ply or equivalent. But make sure it has radial external stiffening rings like in the Figure 13 inset. Unlike the tailpipe, which can be unsupported, the inlet is feeling a surprising suction pressure which could collapse the duct. You can feel this, quite dramatically, when you put a fan starting hatch on with the engine at full throttle.

Figure 14 illustrates the "side door special". They are generally resorted to when the press of scale makes the forward-facing inlet area too small. Flush side or bottom inlets can be okay, if done right. Unfortunately, they are all too often done wrong. The bottom half of the Figure 14 inlet shows the wrong way. Sharp aft or side edges can cause flow separation. Generous lip radii are again in order. The top half of Figure 14 shows a good side inlet with proper lip radii. A ramp into the inlet interior to the fuselage is also desirable, if at all possible. The ultimate crime is a screen over a flush inlet. You might as well put a cork in it!

Side and bottom flush inlets are, of course a problem when it comes to scale. The bottom right hand corner of Figure 14 shows an optimum bottom/side inlet with good scale potential which, however, requires some mechanical ingenuity on the part of the scratch-builder. First of all, a central duct is provided to bring aft to the fan whatever nose inlet airflow you have available. Remember, duct stiffening rings may be required for thin stock. Basically, the trick is to use a lightly spring-loaded "blow in" door (more properly called a suck-in door) to feed the fan at low speeds, much like past full-scale jet aircraft practice. These are closed for static judging and at higher speeds for low drag. The inner duct shape should be formed to match the aft edge of the door when "blown-in". A two point free hinge must be used for the door rather than flexible compound surface bending to avoid "oil canning" of the door. This hinge is used with a very light compression spring.

It is my intent to develop and market a more or less standard set (varying size) of "blow-in" doors for scale jet models, hopefully in 1978.

The inlet of the top of Figure 15 has a near-perfect horribleness factor combining most of the previously discussed ills with the exception of those of the flush inlet.

The design basically combines sharp inlet edges with the unnecessary diffusor of the "Gibson Girl". Recognize it? Yup, the Forward Swept Wing Fighter Model inlet we started with!

To start with, the original inlet had plenty of area — no problem there as Figure 1 reveals. More than 100% of the fan swept area.

So the first part of the inlet improvement program consisted of building up the lip to give a nice gentle contour. The build-up was partially inside and partially outside so that external lines were not affected drastically.

The second part of the modification consisted of spreading the slope of the upper surface of the inlet interior out over a longer distance. Also, it is not unnecessarily carried to the fuselage outer shell and then back again to the engine inlet.

The improved inlet is to be flight tested shortly and I expect that the 27% thrust loss (2 lb.) will be almost totally recovered.

Figures 16 through 20 are photos which may be of interest to ducted fan modelers. Figures 16 and 17 are the .049 and .40 versions of Nick Ziroli's A4D, designed for the RK-049 and RK-40 Midwest fans. The .049 A4D is in the final production stage at Midwest. Figure 17 shows what a well designed inlet system should look like.

Figure 18 shows another view of

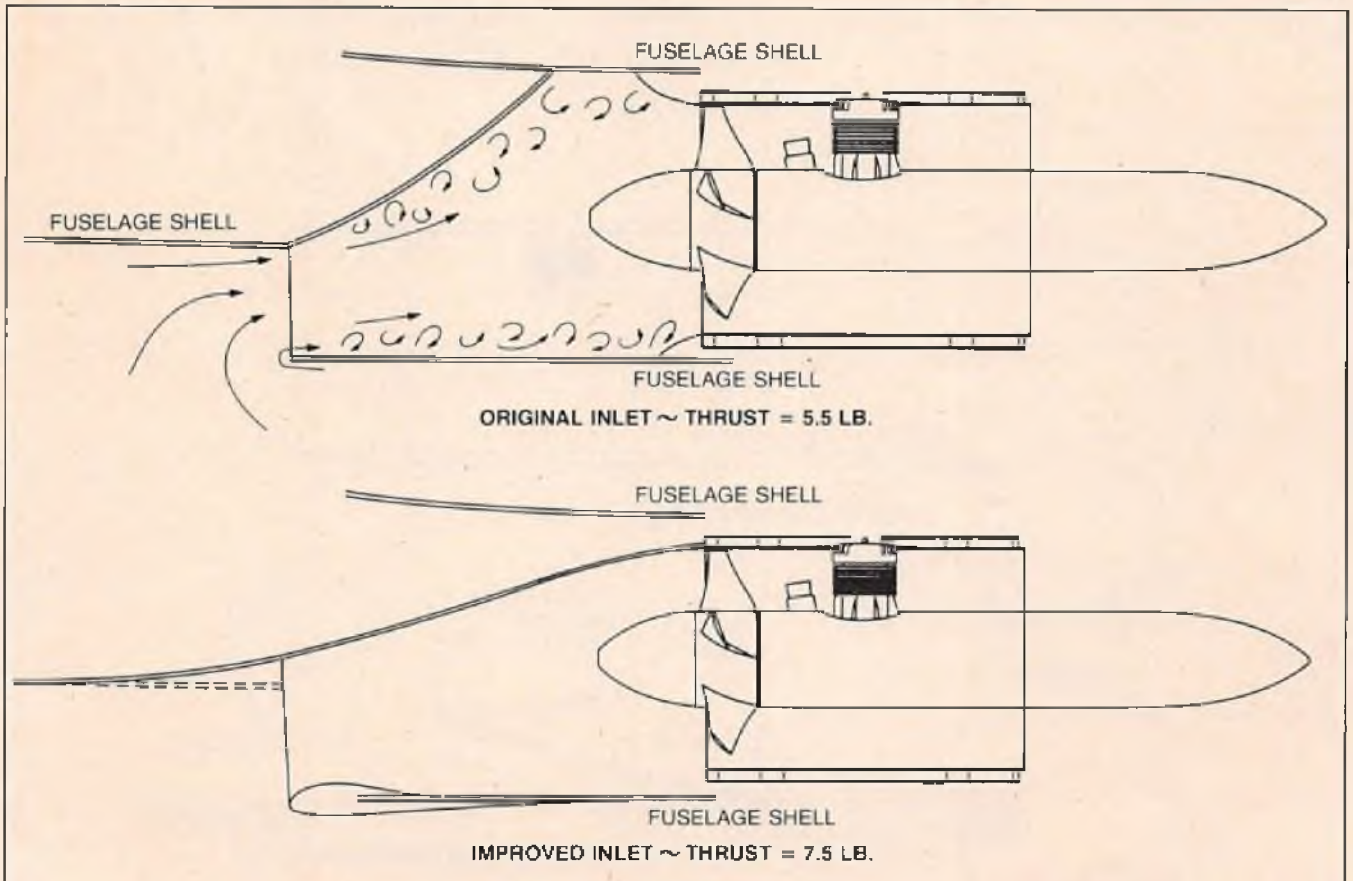


FIGURE 15
FORWARD SWEPT WING FIGHTER MODEL INLET

FIGURE 16

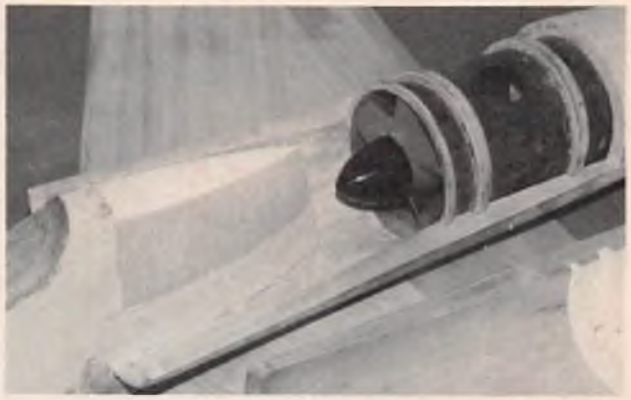


FIGURE 17

FIGURE 18

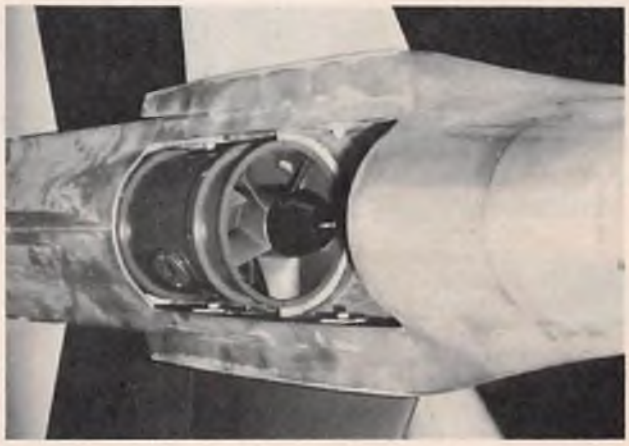


FIGURE 19

FIGURE 20

FIGURE 21

Grumman's Forward Swept Wing Fighter being held by Nick Ziroli, on the left, and Grumman Preliminary Design Engineer, Glen Spacht, the creator of the full-scale design, on the right. Figure 19 shows an RK-60 fan partially installed in Nick Ziroli's F-16.

Figure 20 shows the same engine "swallowed" by the fiberglass fuselage of an F7U Cutlass preparatory to designing the internal air ducting.

Figure 21 shows what my wife calls "the denizen of the cellar", yours truly, lovingly cradling the prototype RK-60 fan barrel, or is his thumb caught in the cylinder hole?

That about concludes my dissertation on good inlet design. In view of the importance of good inlet design to the successful growth of ducted fan modeling both here and abroad, I am offering free inlet consulting services to scratch builders and kit manufacturers. If you will send me a copy of your plans, I will suggest inlet system improvements, if needed, by marking up the drawings and returning them to you. All I ask is that my advice be heeded, and in the case of manufacturers, I would appreciate a kit to see how it all turned out.

My address is: Robert W. Kress, President, Kress Technology, Inc., 27 Mill Road, Lloyd Harbor, New York 11743, (516) 421-1564.

Before winding up, I have a few items of interest for ducted fan devotees concerning axiflo fans.

(1) A 13 oz. tank for the RK-40 fan will be made available for those who would like more than the original 9 oz. capacity. The tank is 2.1 inch longer.

(2) A low loss, low drag integrated muffler/head fairing is being designed for the RK-40.

(3) The RK-20 fan will be 4.1 inches in diameter and will produce 4.0 lb. of static thrust with the K & B 3.5 cc. This fan should be a really attractive item, particularly for multi-engine jets.

(4) For those requiring really high installed thrust using the RK-40 fan, it has been found possible to install piped OPS-60 or Rossi engines in them with suitable modifications. Static thrust with a pipe would be 10.5 lb. at 23,000 rpm. More details will be published.

(5) An RK-049 fan powered Heinkel

to page 122

"AREGATO GOZAIMAS"

Flying In Japan

By Barbara Renaud

View of mountain – flying site – tram is clearly visible at bottom of picture – chair lifts stop on side of mountain, from there it is on foot to the peak for flying.

How far are you willing to travel just to fly a model airplane? Would you believe - - - a bus ride starting at 4:30 am to the Tokyo train station - - - followed by a train ride of three hours to Kyoto. A second bus from the Kyoto train station to a recreational area in the Japanese Alps. Some three hundred miles and five hours of travel and that was only the beginning! Carrying a radio and one sailplane, carefully held together by rubber bands, you now board a tramway to start the climb to the top of the mountain. The first level of the mountain is scaled via tram, but ahead are two more rides via a chair lift. Each one getting closer to the top of the mountain, which was 4000 feet above sea level! The final effort is made on foot — and at last the very top of the mountain is reached! Now that we are all here, how in the world do you fly a model airplane?

Even if your heart rate ever gets back to normal, and your fear of heights is ignored, there is barely enough room for several people to stop and take in the beautiful sight, much less fly. And yet, it was here on October 30, 1977, that twenty-five of Japan's most distinguished fliers gathered to fly sailplanes with an American modeler and his family.

Excitement and pride are the words that came to mind as one watched these men. The excitement of the flying, the pride these filers had in their planes, and how they flew. These men were from all professions, and represented a wide variety of ages. The lack of English spoken was no burden, modelers the world over seem to have little or no language barriers!

The models that day were special, because they were American designs that happened to be very familar to us. We found that Mode I is used by all of the Japanese fliers. It was a surprise to see that spoilers are not widely used. Tossing the models off the side of that mountain took courage, to say nothing of the courage needed to land — without spoilers and in high wind conditions!

Bear in mind that since it is necessary to travel so far by public transportation to this and other flying sites in Japan, no back-up ships are there if you lose a model, crash, or mid-air. It's one model, one radio, a great amount of patience, a happy disposition — plus a great desire to fly a model sailplane.

Several happy hours were spent flying, comparing techniques and models, and even autographing models! We were fortunate to have Mr. Kajikama, as well a Japan's National Soaring Champion, Mr. Hasagawa, as our hosts and interpreters. They were responsible for arranging this flying session which was followed by a luncheon, at one of the restaurants located near the foot of the mountain.

to page 120

Toss that airplane (your kids are here to chase it when it lands down the mountain side!)

Question and answer time after lunch. Mr. Kajikama, Lee, Bob, and Tim Renaud.

An introduction is made: Mr. Hasagawa, Japan's Soaring Champion, Lee Renaud, B. Renaud, Mr. Kajikama.

Some of those patient, warm, hospitable and expert Japanese modelers.

Much MonoKote used to welcome American modeler!

Autographing an Olympic II – what else!

RCM PRODUCT TEST

Andrews Model Aircraft AEROMASTER "TOO"

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

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

The Aeromaster "Too", manufactured by Andrews Aircraft Model Co., and designed by Lou Andrews, is a general sport biplane.

The Aeromaster "Too" kit comes with plans that allow for a choice of three different wing configurations for this sporty little airplane. Version No. 1 is a 48" swept top wing, and a 48" straight bottom wing. Version No. 2 is for a 52½" swept top wing and a 48" straight bottom wing. Version No. 3 offers a 52½" swept top wing and a 52½" swept bottom wing. We opted for Version No. 2 for eye appeal, and probably the most realistic appearing, even though the model isn't intended as scale class. Opening a kit for the first time is always an experience — sometimes a disappointment — but, generally speaking, it's an indication of how well the thing is going to go together and how much fun (or how much trouble) it's going to be to move it from plans to the flying field. Happily, the Aeromaster "Too" looked good in kit form and, as we shall see, proved itself in the flying department. The first thing that caught our eye was a sheet of 57 photos illustrating step-by-step construction. These photos are in addition to the two sheets of plans, and really are a pleasure to look at, use, and refer to, during building. Even before starting your project, the photos are good to study and allow for a better understanding of what is ahead. The Aeromaster "Too" makes use of "box-lok" construction and proved to be simplicity itself when working on the fuselage. The quality of the ply and balsa was very good indeed, as was all pre-shaped parts. The landing gear wires were pre-bent, and proved to be right on, with very little attention required of them when final assembly came up. We found, also, that by following the plans exactly (something we don't always do — usually to our regret) the wing saddle for the bottom wing, and the saddle for the horizontal stabilizer, gave us perfect alignment in these two critical areas. Additions and modifications were few and were as follows: We added a tad

to page 118

SPECIFICATIONS

Name ..... Aeromaster "Too"
Aircraft Type ..... Sport Biplane
Manufactured By ..... Andrews Model Aircraft Inc. U.S. Rt. 1 & North St. Topsfield, Mass. 01983
Mfg. Suggested Retail Price $74.95
Available From ..... Both Mfg. and Retail Outlets
Mfg. Recommended Usage ..... Sport
Wing Span ..... 52½ & 48 Inches
Wing Chord ..... 8⅝ Inches
Total Wing Area ..... 864 Square Inches
Fuselage Length ..... 43½ Inches
Radio Compartment Dimensions ..... (L) 8½" x (W) 3" x (H) 3½"
Wing Location ..... Biplane
Airfoil ..... Semi-Symmetrical
Wing Planform ..... Constant Chord
Dihedral ..... 19/32 Inches
Stabilizer Span ..... 19½ Inches
Stabilizer Chord (incl. elev.) ..... 7½" (Avg.)
Total Stab Area ..... 140 Square Inches
Stab Airfoil Section ..... Flat
Stabilizer Location ..... Mid-Fuselage
Vertical Fin Height ..... 9⅝ Inches
Vertical Fin Width ..... 9½ Inches
Mfg. Rec. Engine Range ..... .40-.61
Mfg. Rec. Fuel Tank Size ..... 10-12 Ounce
Landing Gear ..... Conventional
Recommended No. Of Channels 4
Recommended Control Functions . Elevator, Ailerons, Rudder, Throttle

Basic Materials Used In Construction:
Fuselage ..... Balsa & Ply
Wing ..... Balsa & Ply
Tail Surfaces ..... Balsa
Hardware Included In Kit ..... See Text
Plan Size ..... 36" x 50" (2 sheets)
Building Instructions on Plan Sheets ..... Yes
Instruction Manual ..... No
Construction Photos ..... Yes
Kit Includes ..... Shaped & Die-Cut Parts
Mfg. Rec. Flying Weight ..... 112-120 oz.
Wing loading based on rec. flying wt. ..... 20-22 oz.

RCM PROTOTYPE

Weight, Ready To Fly ..... 118 ozs.
Wing Loading ..... 20 oz./sq. ft.
Covering & finishing materials used ..... Silk & Dope
Engine Make & Disp. ..... S.T. G-60 F1
Muffler Used ..... Yes
Radio Used ..... World Engines
Tank Size Used ..... 12 Ounces

V I K I N G

No one has ever developed an airfoil that would turn 13 seconds on an FAI speed run and then fly in 20' diameter circles at 10 mph, climbing out from 50'. In other words, sailplanes which are best in light air thermals are not best in speed events. Well then — how about one sailplane with **two wings** — one wing designed to be best in light air thermal events and one wing designed to be best at the combined FAI tasks.

Now you can go to **any** contest prepared for **any** task under **any** wind conditions and not have to decide until 2 minutes before your 1st flight which wing to fly. It's like having two entirely different sailplanes yet only having to invest in one radio, one fuselage and tail feathers; also, there is a growing pressure to revise the rules to allow changing wings, etc., between rounds.

The flat bottom airfoil I designed in 1974 for the Windrifter is known to be the best for light air thermalling. That takes care of one wing. Now I have a **semi-symmetrical** airfoil which (those who have flown it believe) is the best yet compromise for the combined FAI tasks.

The history of the design of the airfoil is in itself interesting. It all started about 3 years ago when Bill Watson, then working for Hi Johnson, was developing an aerobatic slope ship (Rubber Ducky). Bill asked Hi's advice on the selection of an airfoil. Hi suggested the NACA 2R, 12. So it was. Later Bill used this airfoil on his Goose, a big machine. It is **very** fast, but is marginal in thermals and really suffers on the launch.

Blaine Rawdon decided to try a compromise between the 2R, 12 and a Paragon airfoil (similar to the Windrifter). He split the difference in camber between the two. The result was an excellent airfoil. His Mirage, built light (5 oz./ft^2) launches well, thermals well and is fast but, in my opinion, is not forgiving enough to make consistently good landings so necessary in today's contests.

I modified the Rawdon airfoil by dramatically increasing its sharp leading edge radius. The Viking Mark II airfoil is much thicker at 5%, 10% and 15%, but is the same from 30% back. The result — excellent launches (as good as a Windrifter), competitive in thermals and fast, yet easy, to fly and make consistently good landings.

To win in FAI events, the sailplane needs to be (1) Large but not too large — I selected 3 meter span. (2) The aspect ratio should be moderate so as to keep the Reynolds Number about 12:1. (3) The tail surfaces should be designed to just achieve stability — not like a free-flight. (4) The weight must be kept down to keep the wing loading below 7 oz./ft.^{2}. (5) Large, effective rudder. (6) Effective spoilers. (7) Flaps are not needed with 12% high lift airfoil. (8) It should be attractive — pretty sailplanes fly better.

I proudly present to you the Viking. I hope you enjoy building it — I know you will enjoy flying it. Use the Mark I wing in light air thermal contests and for sport flying. It will go up when nothing else will. When the wind is up and you want to penetrate or go fast, fly the Mark II wing. You will be pleasantly surprised at its performance.

CONSTRUCTION

Adhesives:

Use of the proper adhesive is just as important as using any other proper building material. I feel that this is so important that I have specified the proper adhesive for each joint in the step-by-step building procedure. Where more than one cement type is acceptable, the preferred adhesive is listed first.

(A) Aliphatic Resin (Titebond, Wilhold Aliphatic Resin, etc.)

(B) Butyrate Cement (Ambroid Aero Gloss 40% Stronger, etc.)

(C) Cyanoacrylate (Hot Stuff, Zap, Jet, etc.) Use micro-balloons or soda as fillers. If structures are fabricated with type C, each butt joint must have a fillet of type A added before covering.

(D) Contact Cement — volatile solvent latex — the type used to bond plastic counter tops — has strong odor (toluene). Water base contact cement is not to be used on the Viking.

(E) Epoxy — Any brand of 5-minute or 15-minute epoxy is acceptable.

Fuselage:

(1) Trace the fuselage side view and cut out your pattern.

(2) Cut the aft sides from 1/8" x 2" sheet. Use the scrap to splice the piece between F4 and F5. Type C or A.

(3) Cut the forward sides and the batten from 1/8" Italian poplar plywood. Grain direction is not critical on the batten, but fore to aft is preferable.

(4) Bond the battens in place to form the sides. Be careful to make one right side and one left side. Type E.

(5) Taper the four pieces of 3/8" triangular stock. The top pieces stop at F4. Notch out for the batten on the bottom pieces. Butt join the bottom pieces just forward of the batten. Saw slot as shown, and attach. Type C or A.

(6) Position the left side over the plans and cement on F3, F4, and F5. Type A. Notch the bottom of all three to fit the triangular stock and also the top of F5. Allow to dry.

(7) Position the right side and check that the nose and tail ends are square, etc. When you are happy, bond F3, F4 and F5, to the right side with cyanoacrylate — then add a fillet of aliphatic resin. Type C and A.

(8) Space the tail end of the sides 1/4" apart and clothespin in position. Mark the location of F6 and install while squeezing the sides together. Type C and A.

(9) In a like manner, bond in F2 and F1. Type C and A. Now is a good time to cut a hole at the bottom of F2 large enough to pass the battery pack connector.

(10) Add the forward ply bottom. Type C & A, or A, or E.

(11) Add the forward and top nose blocks. Type E.

(12) Plank the bottom of the fuselage, all the while checking for centerline symmetry. Type A.

(13) Install the radio, antenna tube and control rods. Keep the tube and the control rods to the side in bay F3-F4 to allow for ballast installation.

(14) Build the ballast compartment hatch. Type C, A, or E. Wax paper is handy to keep the hatch from being glued in. **Caution:** At this point, make

sure the control rod housings are rigidly affixed to each frame and in the tail. Use Cyanoacrylate and micro-balloons (or soda). It requires major surgery to do this later. Type C.

(15) Cover the top of the fuselage from F4 aft. Type A. **Do not glue on the aft top piece.** This piece will be attached to the fin and installed with the fin.

(16) Fabricate the canopy tray from 1/8" poplar plywood. Type A.

(17) Attach the canopy. Type B.

(18) Notch the top nose block & F-2 to allow a square 500 ma battery pack to fit into the forward compartment. Set the fuselage aside at this point until the fin has been completed.

By Tom Williams

(9) Remove from building board. If type C was used, go back and reinforce all right angle joints with a small fillet of Type A.

(10) Install the forward aluminum tube. Type E or C with filler. Crimp one of the tube ends closed and dent the tube in the center to hold the wire, but not too firmly.

(11) Use the bellcrank to mark the aft holes and drill for, and install, the rear tubes. Install the 3/32" x 1/2" sub spars. Check alignment and parallels before gluing in the tubes. Type E or C with filler.

(12) Use a large sanding block to sand the approximate airfoil shape shown on the plans. The exact shape of airfoil surfaces on the emmpenage is not paramount to good performance on R/C sailplanes. A symmetrical shape has slightly less drag in turns. Make it look pretty. Aesthetics plays a part in performance - it must be psychological, but pretty sailplanes do fly better.

Fin and Rudder:

(1) Cut all fin parts.

(2) Construct a sandwich of the fin base. The 1/4" sq. forward fin base must be tapered on both sides to 1/8" thick so that the total thickness of the base sandwich (1/16" ply — 1/4" balsa — 1/16" ply) at the L.E. will equal 1/4". Type C or A.

(3) Space up the L.E. and fin post 1/16". Glue the L.E., base, fin post and top rib together — add the corner braces. Type C or A.

(4) Shape the L.E. spacer for the stabilizer base sandwich. Glue in the 1/4" sq. spacer and the L.E. spacer. Type A or C.

(5) Position the sub assembly just made, and attach. Type E.

(6) Add the 1/16" x 1/4" fin post fillers. Type A or C.

(7) Shape the L.E. and check that the fin is not warped.

(8) Carve the 1/2" x 3/8" stab root blocks to fit onto the fin and attach. Type A or C. Fit the stabilizer to the fin and carve the stab roots for a neat fit.

(9) Cut and pin down the 3/8" x 1/4" rudder post. Slot the rudder base for the T.E. and pin down.

(10) Shim up the L.E. and rudder top 1/16". Slot the 1/4" sq. top for the T.E.

(11) Glue together the rudder spar, bottom, L.E., top, T.E., and corner brace. Type C or A.

(12) Slot the ribs as required for the T.E. and glue in all ribs. Type C or A.

(13) Use a large sanding block to shape the rudder to a symmetrical airfoil shape. Relieve the rudder post to clear the fin post in turns. Fit the hinges and control horn.

(14) Drill 1/8" diameter through for the bellcrank axle (1/8" aluminum tube). Make sure the hole is exactly perpendicular to the fin. Install the bellcrank. Slot for the rear wire. When everything is working to your satisfaction, bond in the tube. Type C.

(15) Note the grain of the aft fuselage top piece. Make this piece and attach to the fin. Type A.

(16) If Type C was used on the fin and rudder, go back now and add a small fillet of Type A to each joint.

Wing:

If you're serious about R/C soaring, you will probably build more than one or two polyhedral wings, and a little time and a couple of bucks invested in a wing building board now will save you many hours in the future. The material required is:

2 pcs — 12" x 3' particle board shelving.

2 pcs — 15" x 3' composition ceiling board (Celotex).

Stabilizer:

(1) Cut the tapered spar webs.

(2) Fabricate both I-beam spars. Type C.

(3) Cut the balance of the parts. Slot and notch the ribs.

(4) Pin down the 1/8" x 1/2" root rib. Block up the 1/4" sq. tip block 1/8".

(5) Pin and block as required to center the L.E., and the assembled spar.

(6) Set the T.E. in the rib and tip slots. Type C or A.

(7) Bond in the forward and aft ribs. Type C or A.

(8) Add the corner braces. Type A or C.

1 pr. — 1½" loose pin hinges with screws.

1 pc — 2" x 4" x 1'.

6 — 1" #8 F.hd. wood screws.

Hinge the shelving together (endwise) to form a 6' board. Block up one end to conform to the 7½° tip dihedral requirement with the 2 x 4 and put in a couple of the wood screws to secure it. (This may be relocated later as required to conform to different dihedrals.) Cut away for hinge clearance and cover the shelving with the ceiling panels **upside down**.

Pins will hold beautifully in this mate-

text to page 67

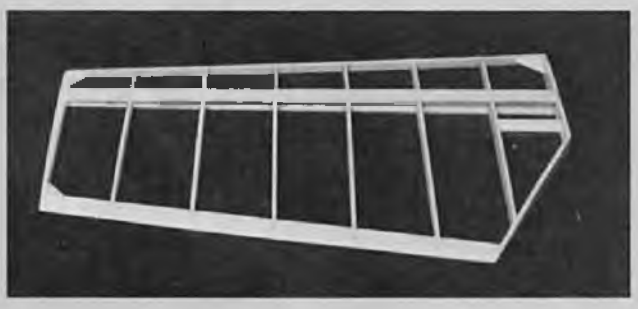
A New Concept — One Sailplane designed to be the best at all tasks!

Fuselage sides ready to join. Photo shows splice batten to top of fuselage. Was later shortened for ballast hatch clearance.

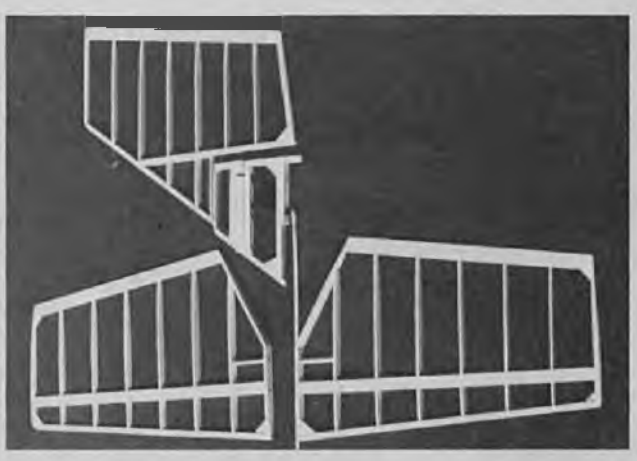
Tail end of fuselage ready for fin to be installed. Last piece is glued to fin then on to fuselage.

Fin completed and ready to attach to fuselage.

Completed fuselage and fin.

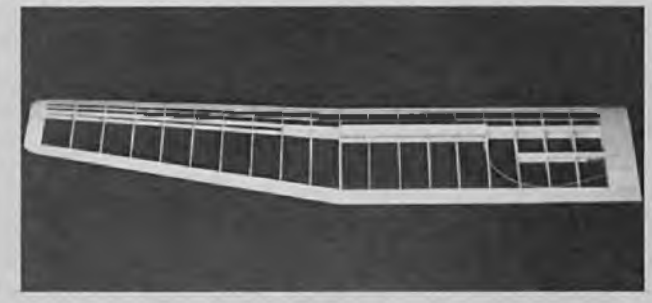


Completed stab panel.

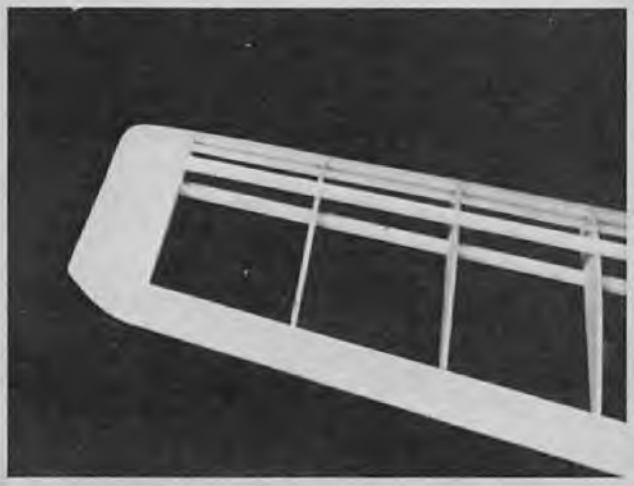


Entire tail group completed and sanded to shape.

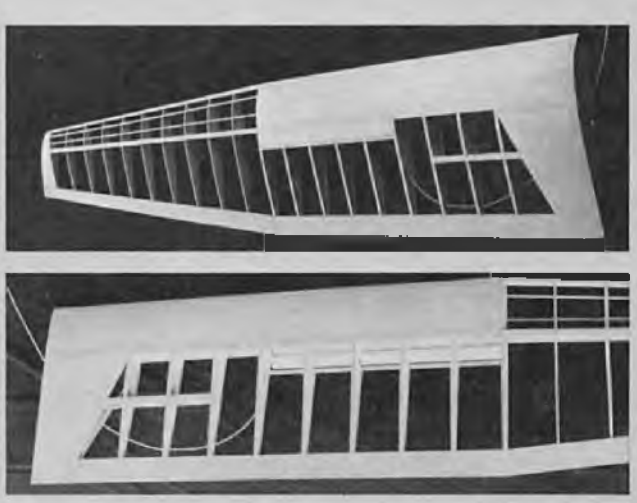
Ballast hatch cover ready for sanding. Servos shown for location only; fuse needs final carving & sanding.



Completed MK.I wing panel. First bay only is sheeted.



Close-up of the anti-vortex wing tip.



TOP: Completed MK.II wing panel. Note the D-Tube sheeting as compared to the MK.I. ABOVE: Bottom view of MK.II wing panel. Note spoiler cable.

rial, yet are easy to remove. Now your entire wing half can be built at once, saving lots of time and insuring a strong, true wing.

Note: The Mark I and Mark II wings require some differences in procedure. Steps which are common to both are noted with an asterisk. Since four wing halves and the fuselage must match exactly with two steel rods, before proceeding with either wing, make a set of four 1/32" ply W1 rib blanks with matched drilled 5/16" diameter holes.

Mark I Wing:

(*1) Taper the tip L.E. and T.E. stock. Pin down the lower half of the T.E., the lower main spars, and the lower sub spars.

(2) Pin down the L.E.

(3) Glue on W1 rib. Lean the rib 6° (top outward). Type A.

(*4) Laminate two W5 ribs together. Type D. Cut notches for the dihedral wires.

(5) Cut out for the spoiler and the spoiler frame in four of the W5 ribs.

(6) Glue on the balance of the ribs. Type A.

(*7) Glue in the 3/32" spacer on the center section T.E. Type A or C.

(*8) Complete the T.E., i.e., add the top piece. Type A or C.

(*9) Roughen the 5" pieces of 1/16" diameter steel wire (not music wire) with the edge of a flat file and bend in the center 7½°. Slip one through the notch in the double W5 ribs.

(*10) Slip in the fiberglass wing rod tubes and fit and glue in the main and sub spar webs. Type A. Remove the tubes.

(*11) Add the spruce spar top pieces. Type A. Set the prepared wire spar splice piece in place before putting in the spruce.

(12) Put in the spruce turbulator spars from W2 to the polyhedral break and the balsa ones in the tip section. Type A or C.

(13) Install the spoiler framework. Type A.

(*14) Install the 1/4" x 1/2" x 1/2" spruce screw eye base. Type A or C.

(*15) Install the ASA plastic spoiler horn. Type B or C.

(*16) Route the 25" nylon spoiler cable housing as shown through the ribs. **Do not cut off.**

(*17) Cut a 1/4" square piece of tin from a coffee can lid, or what have you, and cement to the spoiler. Type E.

(*18) Epoxy the magnet on to the rib. Type E. Install the dacron cable and check out the action of the spoiler. Use Scotch Magic Tape as a hinge.

(19) Remove the wing from the board and sheet the bottom of the first half of the first bay. Type A. Repeat these 19 steps on the other half of the wing.

(*20) Slip the fiberglass wing rod tubes in position in both wing halves. Check their alignment. Cement the tubes to the ribs with epoxy. **Don't economizeon the epoxy.** Puddle in large epoxy fillets around the tubes to insure that the stress in the tubes is transferred to the spar. Plug the tubes with 1/4" sq. balsa forced in. Leave 4 ⅛" unplugged for wing rods. Type E.

(*21) Epoxy the dihedral wires to the upper and lower main spars.

(22) Sheet the top of bay one. Type A.

(*23) Reinforce W1 with 1/32" plywood. Type D.

VIKING
Designed By: Tom Williams

TYPE AIRCRAFT
Competition Sailplane
WINGSPAN
3 meters (118 in.)
WING CHORD
11½" (root) 6½" (tip)
TOTAL WING AREA
1200 Square Inches
WING LOCATION
Mid-Wing
AIRFOIL
Mark I, 11½% Flat Bottom
Mark II, 12% Semi-symmetrical
WING PLANFORM
Constant Chord - center section
Double Taper - tip panels
POLYHEDRAL EACH TIP
6 Degrees center
7½ Degrees tips
O.A. FUSELAGE LENGTH
48 Inches
RADIO COMPARTMENT AREA
(L) 9½" X (W) 2¼" X (H) 2⅛"
BALLAST COMPARTMENT AREA
(L) 5¼" x (W) 2¼" x (H) 3"
STABILIZER SPAN
14⅞ Inches
STABILIZER CHORD (incl. elev.)
7½" (Avg.)
STABILIZER AREA
94 Square Inches
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Mid-Fin
VERTICAL FIN HEIGHT
3½ Inches
VERTICAL FIN WIDTH (Incl. rudder)
8½" (Avg.)
REC. ENGINE SIZE
NA
FUEL TANK SIZE
NA
LANDING GEAR
NA
REC. NO. OF CHANNELS
3
CONTROL FUNCTIONS
Rud., Elev., & Spoilers
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Ply
Wing	Balsa & Spruce
Empennage	Balsa
Weight Ready-To-Fly	Mk. I, 54 oz. Mk. II, 56 oz.
Wing Loading	Mk. I, 6½ oz./sq. ft. Mk. II, 6¾ oz./sq.ft. or 17 oz./sq. ft. w/ballast

(*24) Attach the tip block flush with top on W15. Type D.

(*25) Plane the bottom flush and radius bottom surface. Trim ends to continue L.E. and T.E. lines. Carve and/or sand top surface from spar forward to continue top contour of W15. This will form the tip profile. Rough carve the top rear surface to approximate shape (no material is removed from the extreme tip from the spar back). Use a pocket knife or a paring knife — X-Acto is not long enough to cut a straight line (varying angle) from the top of W15 to the extreme tip. Wrap a piece of 60 or 80 grit sandpaper around a piece of broom handle, a dowel, a piece of pipe or what have you, about 1" to 1½" diameter and sand in the convex shape. The T.E. of the tip should be square and 1/16" thick.

(*26) Sand the top of main T.E. to continue the rib contour and to achieve a square T.E. 1/16" thick.

(*27) Sand the L.E. to the proper contour. It's a good idea to make a template.

(*28) Cover the wing with Top-Flite Super MonoKote. Make sure the MonoKote adheres to every rib and spar. My designs are "stressed skin" and require the superior strength of MonoKote, properly applied. Our tests have proven, to my satisfaction, that MonoKote is both the strongest and the lightest covering commercially available. Cut out the spoiler. Reseal the covering to the spoiler and all around its frame. Hinge the spoiler with Scotch Brand Magic Tape 3/4" wide. This acts as a return spring. **Don't leave the spoilers open in the sun.**

Mark II Wing:

Because the bottom of the Mark II airfoil is not flat, a slightly different building procedure is required. Most of the steps are the same and are not repeated. Refer to the Mark I wing for these steps.

(*1) Same as Mark I.

(2) Block up the L.E. 1/8" and pin.

(3) Glue W1 rib to the T.E. and sub spar. **Do not glue ribs to the main spar or L.E. The L.E. and main spar are in place to aid in rib alignment. Type A.**

(*4) Same as Mark I.

(5) Cut out for the spoiler in four of the W5 ribs.

(6) Attach all the ribs to the sub spar and the T.E. Type A and C or A.

(*7) & (8) Same as Mark I.

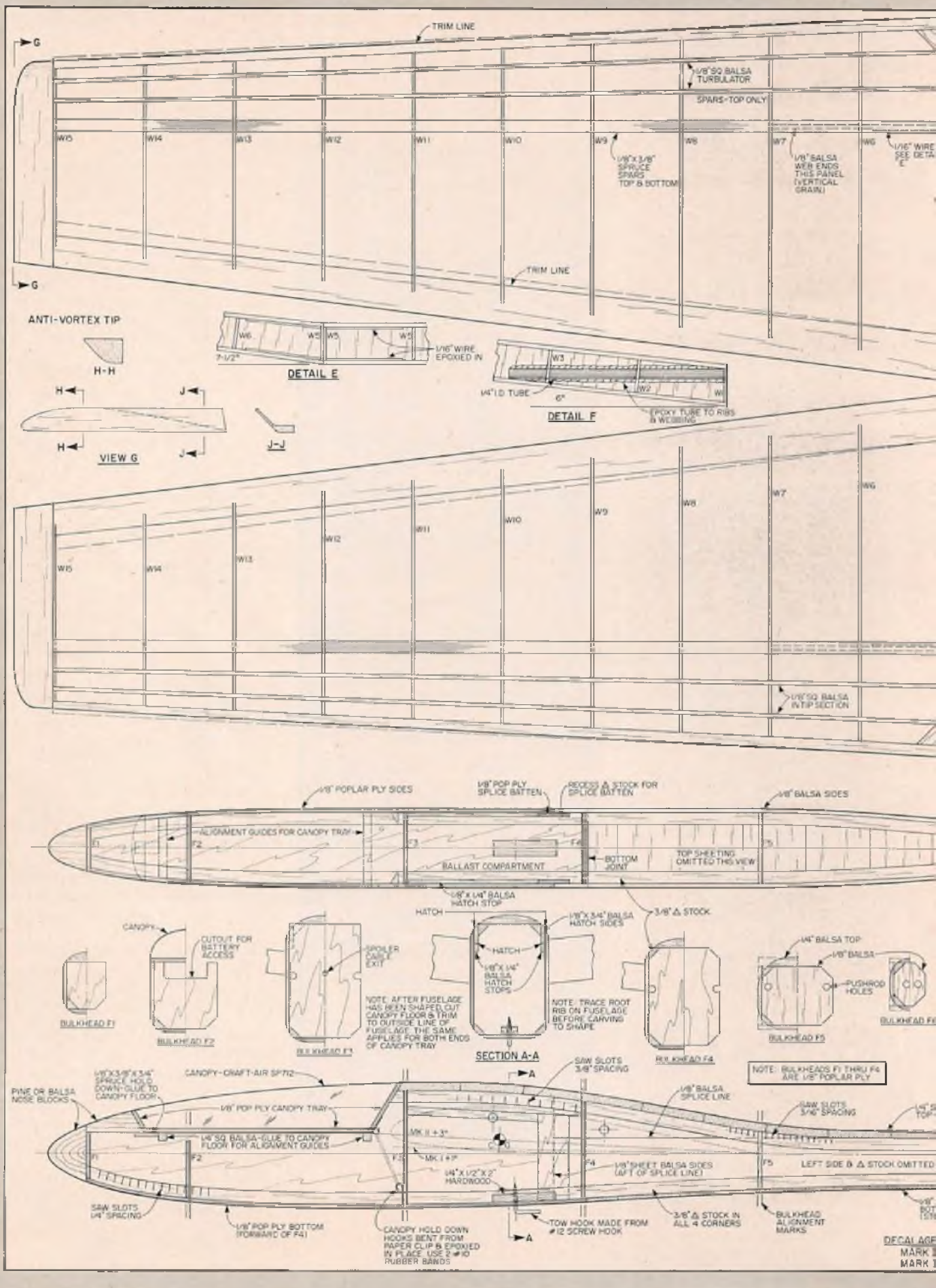
The trailing edge is now complete. When the glue is dry, remove the pins and block up the T.E. 1/4" at the forward edge in the root section tapered to 1/8" at W15. Block up the root ribs just ahead of the main spar 1/16" to allow for sheeting. Glue all ribs to the main spar and to the L.E.

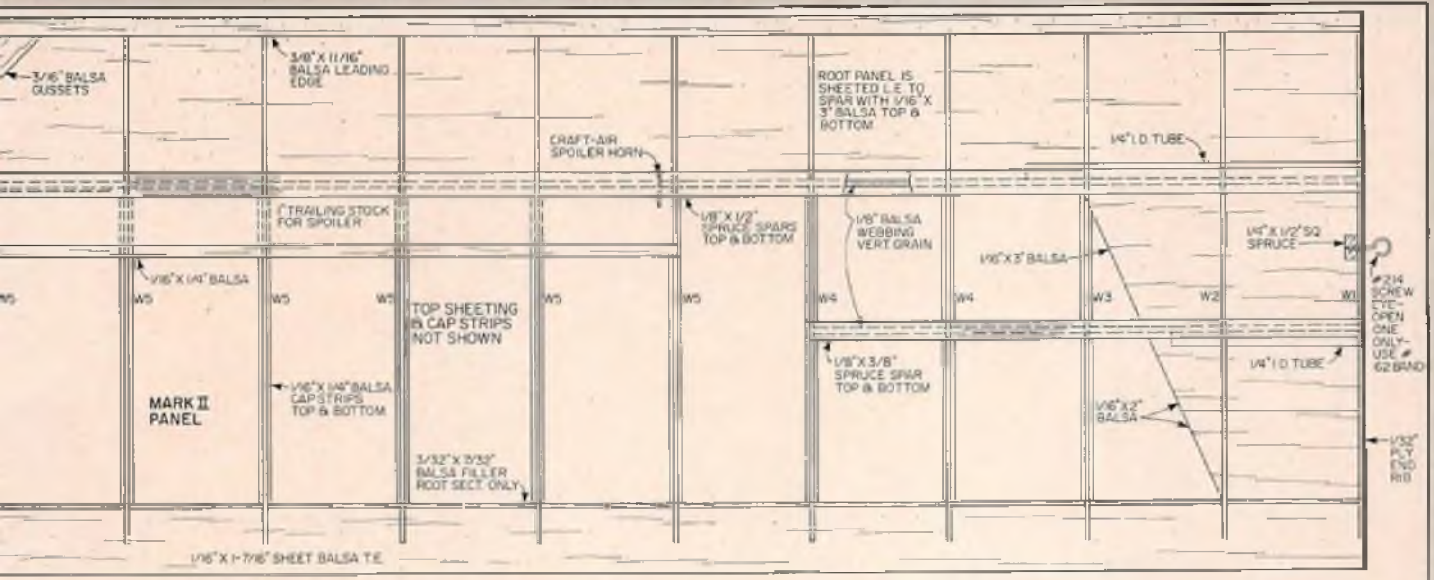
(*9) through (11) Same as Mark I.

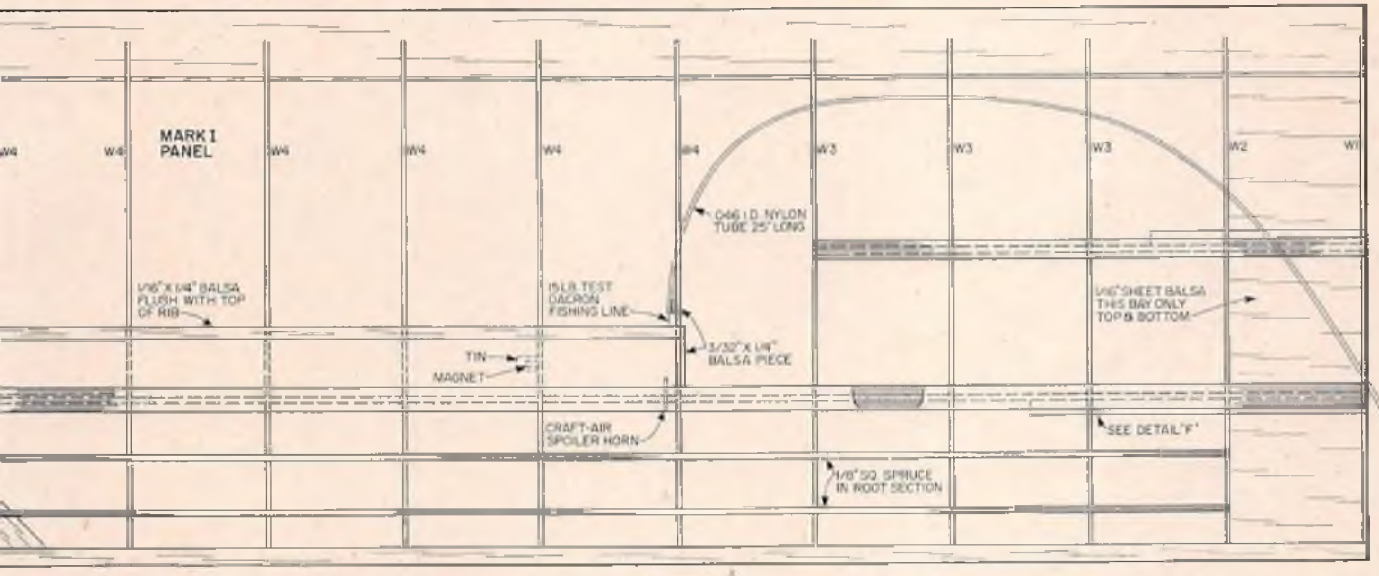
(*12) Put in the balsa turbulator spars in the tip section. Type A or C.

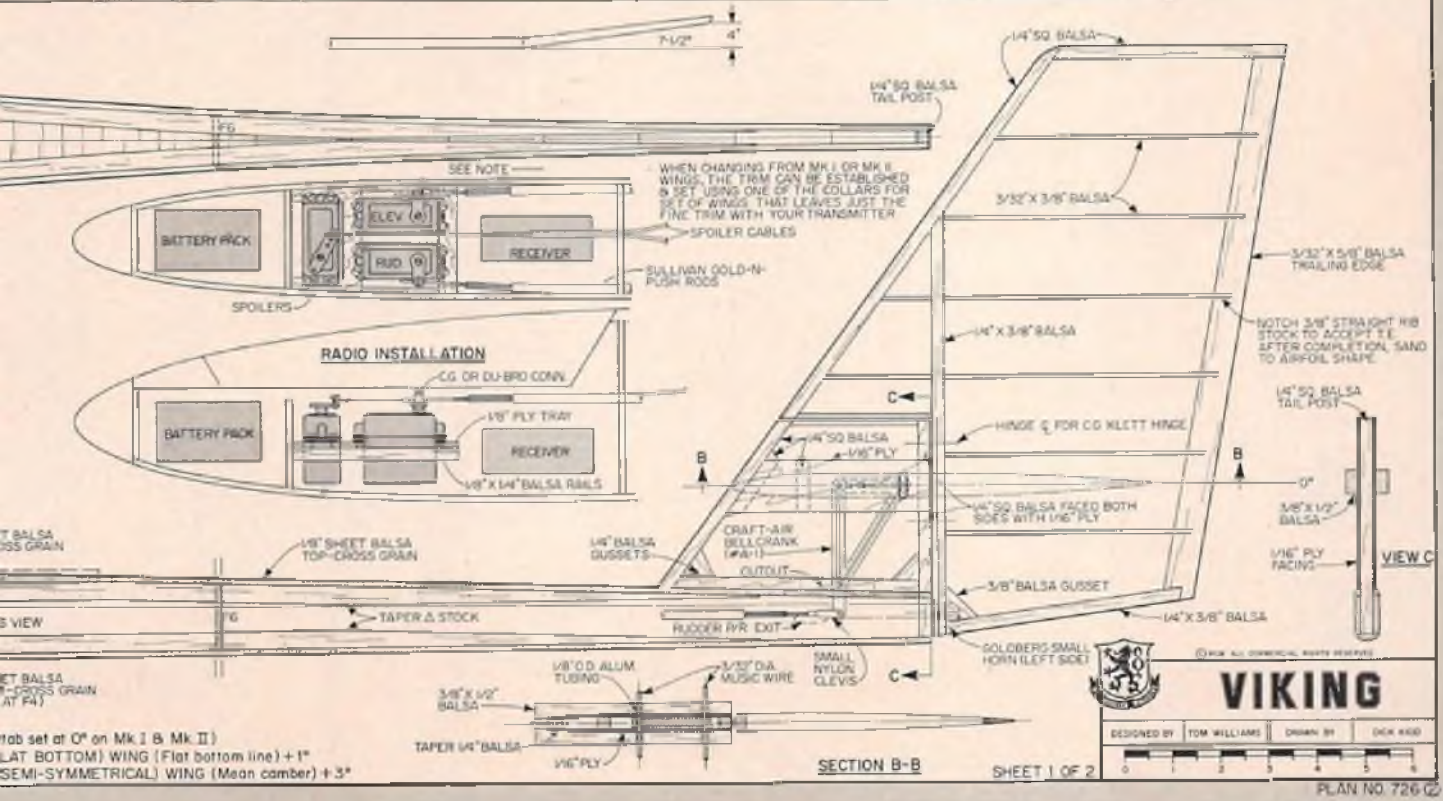
(13) Install the spoiler framework and the cap strips. Type A or C.

text to page 116


TRIM LINE
1/8" SQ BALSA TURBULATOR
SPARS-TOP ONLY
1/16" SPRUCE SPARS TOP & BOTTOM
1/8" BALSA WEB ENDS THIS PANEL (VERTICAL GRAIN)
1/16" WIRE SEE DETAIL E
TRIM LINE
ANTI-VORTEX TIP
H-H
DETAIL E
1/16" WIRE EPOXIED IN
DETAIL F
1/4" I.D. TUBE
EPOXY TUBE TO RIBS & WEBBING
VIEW G
J-J
1/8" SQ BALSA IN TIP SECTION
1/8" POPLAR PLY SIDES
1/8" POP PLY SPLICE BATTEN
RECESS & STOCK FOR SPLICE BATTEN
1/8" BALSA SIDES
ALIGNMENT GUIDES FOR CANOPY TRAY
BALLAST COMPARTMENT
BOTTOM JOINT
TOP SHEETING OMITTED THIS VIEW
1/8" X 1/4" BALSA HATCH STOP
3/8" Δ STOCK
HATCH
1/8" X 3/4" BALSA HATCH SIDES
1/8" X 1/4" BALSA HATCH STOPS
CANOPY
CUTOUT FOR BATTERY ACCESS
SPOILER CABLE EXIT
BULKHEAD F1
BULKHEAD F2
BULKHEAD F3
NOTE: AFTER FUSELAGE HAS BEEN SHAPED, CUT CANOPY FLOOR & TRIM TO OUTSIDE LINE OF FUSELAGE. THE SAME APPLIES FOR BOTH ENDS OF CANOPY TRAY
NOTE: TRACE ROOT RIB ON FUSELAGE BEFORE CARVING TO SHAPE
SECTION A-A
BULKHEAD F4
1/4" BALSA TOP
1/8" BALSA
PUSHROD HOLES
BULKHEAD F5
NOTE: BULKHEADS F1 THRU F4 ARE 1/8" POPLAR PLY
PINE OR BALSA NOSE BLOCKS
1/8" X 3/8" X 3 1/4" SPRUCE HOLD DOWN-GLUE TO CANOPY FLOOR
CANOPY-CRAFT-AIR SP712
1/8" POP PLY CANOPY TRAY
1/4" SQ BALSA-GLUE TO CANOPY FLOOR FOR ALIGNMENT GUIDES
SAW SLOTS 1/4" SPACING
1/16" POP PLY BOTTOM (FORWARD OF F4)
CANOPY HOLD DOWN HOOKS BENT FROM PAPER CLIP & EPOXIED IN PLACE. USE 2 #10 RUBBER BANDS
MK II +3"
MK I +9"
1/4" X 1/2" X 2" HARDWOOD
TOW HOOK MADE FROM #12 SCREW HOOK
SAW SLOTS 3/16" SPACING
1/8" BALSA SPLICE LINE
1/8" SHEET BALSA SIDES (AFT OF SPLICE LINE)
LEFT SIDE Δ STOCK OMITTED
3/8" Δ STOCK IN ALL 4 CORNERS
BULKHEAD ALIGNMENT MARKS
DECAL AGE
MARK
MARK







VIKING

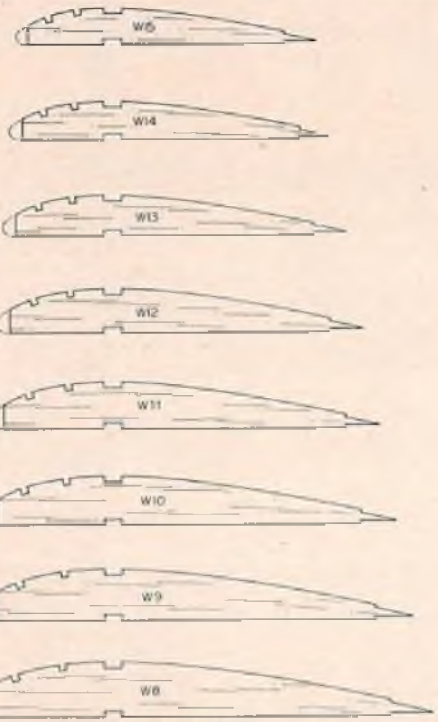
DESIGNED BY	TOM WILLIAMS	DRAWN BY	DICK KOOD

0 1 2 3 4 5 6

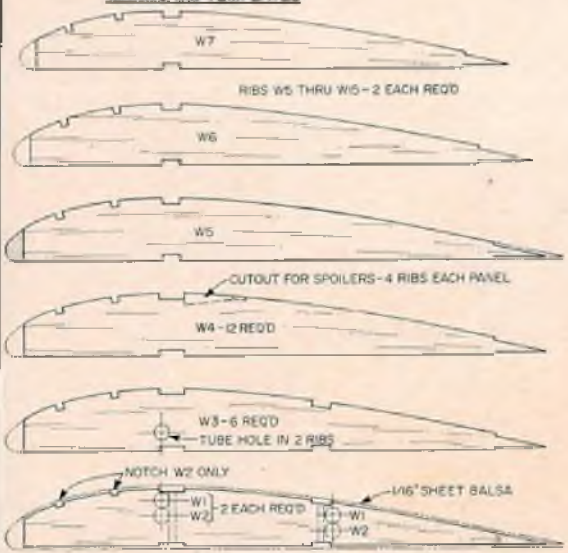
SHEET 1 OF 2

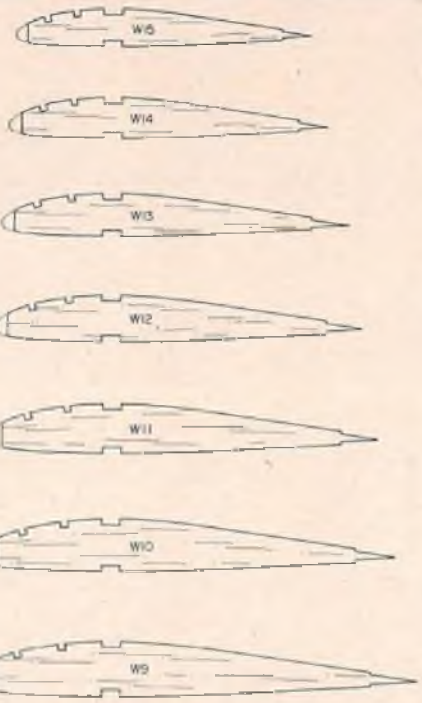
PLAN NO. 726 ©

FULL SIZE PLANS AVAILABLE — SEE PAGE 187

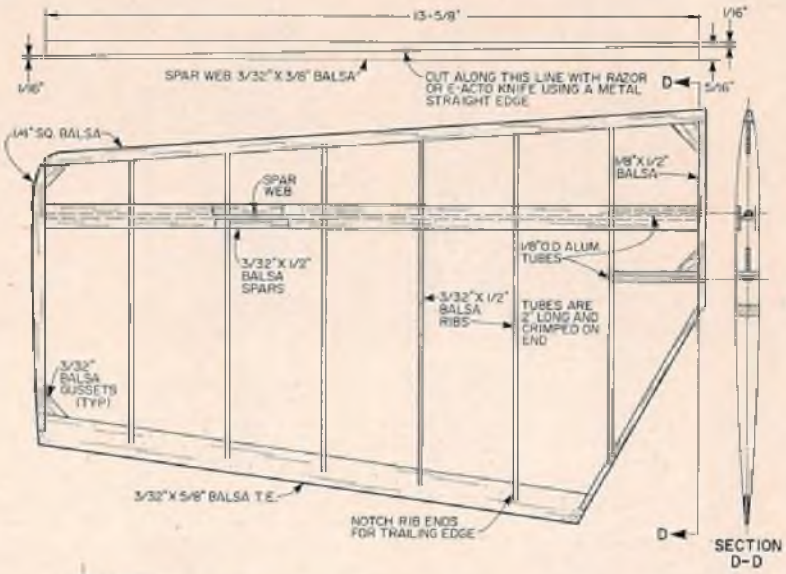


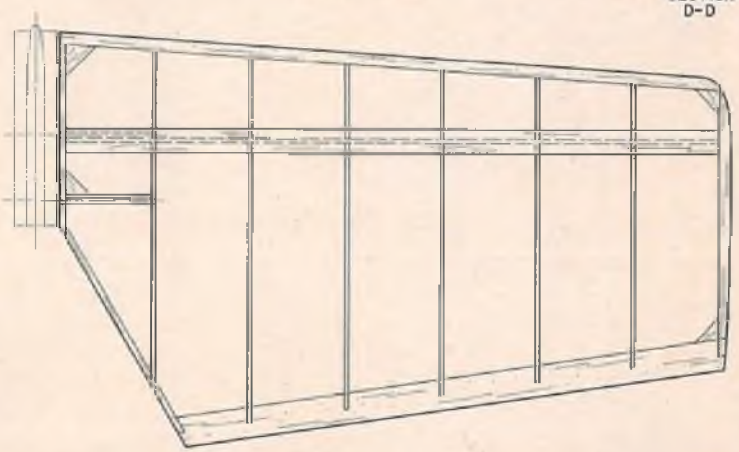
MARK I RIB TEMPLATES





MARK II RIB TEMPLATES





NOTE: ALL WING RIBS ARE 3/32" SHEET BALSA

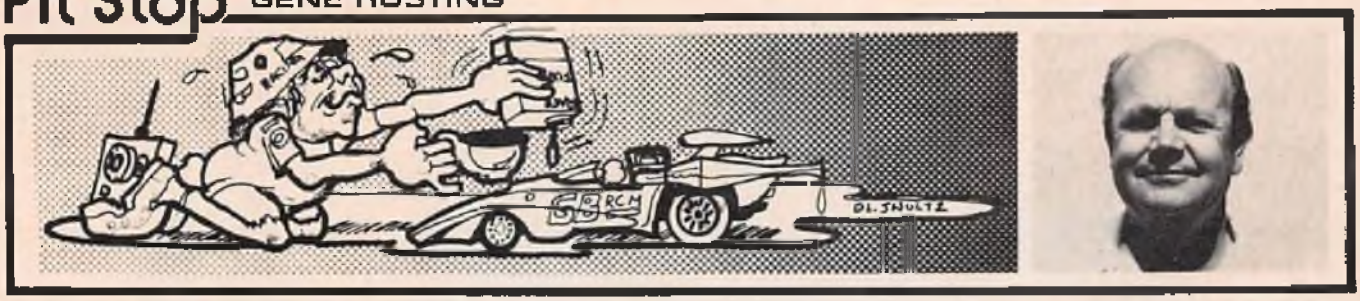
VIKING

DESIGNED BY	TOM WILLIAMS	DRAWN BY	DICK KIDD

SHEET 2 OF 2

PLAN NO. 726 ©

Pit Stop GENE HUSTING



Geneva, Switzerland has been selected as the site for the 1979 R/C Car World Championships, in July 1979. Many great road circuits in England, France, Italy, Holland, etc., were proposed and when the voting was completed, by the European member countries of EFRA (European Federation of Radio-Controlled Automobiles), Geneva won out. The European Countries normally will hold a race on a wet track because they generally have to travel so far to a race, and it rains so much all year round that they feel it's better to run in the rain, than not race at all. This makes a lot of sense. On the other hand, in the U.S.A., we race on dry tracks only. We've tried running on wet tracks, but it wasn't racing so we gave it up. It's just a case of whatever you get used to.

One of the main reasons Geneva was picked is that it normally has the least amount of rain in July and we'd really like to thank the EFRA members for giving us this kind of consideration. As Ted Longshaw from England, the President of EFRA said, "We would have like to have had the World Championship race in England, but the probability of rain in England was very high compared to Geneva." Again, we say thanks, EFRA.

Stig Anderson, from the sponsoring Auto Model Club in Geneva, has already sent me some information on the race. You're probably thinking, "But the race is over a year away!" I know it sounds like a long time away but, believe me, the time goes by fast, and now is the time to start planning. It seemed like the Orange County Club in Southern California started planning very early here, for the first World Championship race, but there are a million details to work out, and, due to this advance planning, our race came off exactly as planned.

I must say that it looks as though the Geneva club plans to have the very best World Championship race ever. The location is Vernets parking lot, which is right in the middle of Geneva. Incidently, English is one of the two languages spoken everywhere in Geneva. Vernets is a huge parking lot for a sporting complex with a restaurent, public facilities, swimming pool and first-aid close by.

I have spoken to many racers in the USA who are definitely going to the World Championship race and many others who are not quite sure yet, due to the cost. But the Geneva Auto Model Club is also making available free, yes I said free, dormitory sleeping facilities for paticipants. So all you've got to worry about is the air fare and food, and if you start saving now you'll make it.

The circuit will be 300 meters long, which is close to 1,000 feet and quite a bit longer than anything we race on, but it should be great. The track will be outlined in painted white lines, with plastic cones to discourage corner cutting, and safety boards around the outside of the track. The Geneva Auto Model Club is one of the rare clubs in the world which is supported by the Sports Association of the city. As a result, it can be put at the disposal of participants and the public — an event without equal. A large drivers stand will be built and also a covered pit area with a starting bench. Lap counting and timing will be assured by Swiss Timing Officiel. And naturally, in addition, there will be guided tours of Geneva for participants. Are you ready to go? I know I am. I'll be keeping you informed of further developments.

Geneva, Switzerland will be the site of the 1979 World Championship. The location chosen by the Geneva Auto Model Club, is Vernets parking lot with an approx. 1,000 foot long course. All facilities, equipment & timing will be first class.

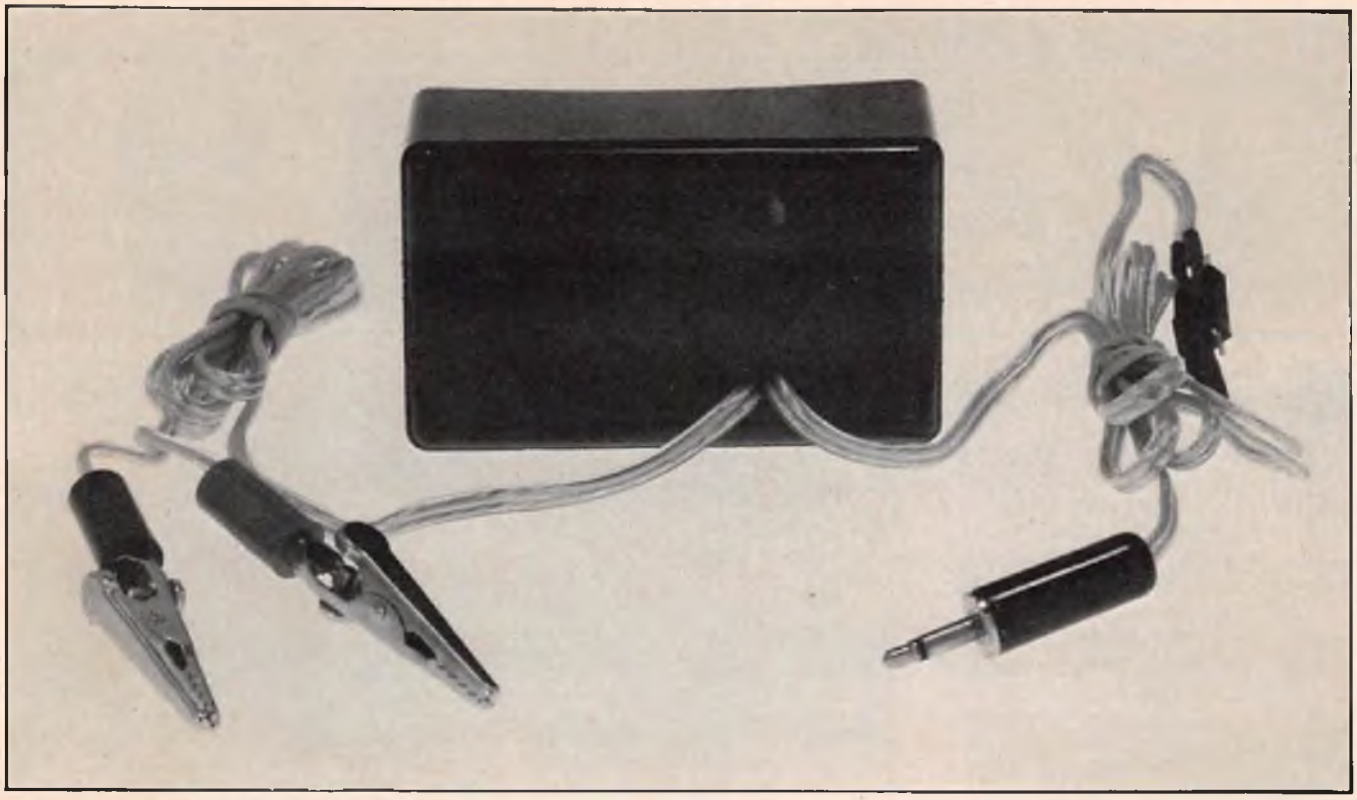
Phil Greeno had the fastest Foreign entry on the straightaway, with his K&B powered P.B. car. You'll notice his rear tires are as small as his front tires, which gives a very low final drive ratio for quick acceleration. Most of the Foreign entries ran very small rear tires.

TIRES

Tires are always one of the most discussed subjects among R/C car racers. And there always seems to be a lot of confusion and conflicting viewpoints. One of the biggest misconceptions is that "the softer the rear tire is, the more traction it will have." This is definitely **not** true. There is an ideal hardness for any

to page 112

A different point of view is shown on Earl Campbell's car. Large 3¼" rear tires are used to give maximum rear traction. The rubber compound is light so turning weight is no problem.



Building The

By Doug Spreng

AUTOMATIC FIELD CHARGER MK TX

FEATURES

The "MK TX" version of the "Automatic Field Charger" will charge any 10 cell (9.6V) transmitter pack from a 12 volt motorcycle, gell cell, or car battery. The charge rate is a constant 500 ma, (1C), until the battery reaches approximately 60% to 75% of full charge. At this time the indicator LED will extinguish and the charge current will decrease to a 50 ma (C/10) rate which further charges the battery. The battery may be left on charge continuously in this mode. Furthermore, there is a voltage sensing circuit built in that prevents damage to the battery if it is being charged from a car battery with the engine running. The reason for this feature is that the car battery voltage, while being charged by the alternator, can exceed 14V. Since the charger runs at 500 ma until the Tx battery voltage is nearly equal the car battery voltage, some means of shutting it down when the Tx battery approaches full charge is mandatory. This makes it possible to charge your Tx from your car battery while enroute to the flying field. By the way, this is safe to do with the Rx battery "Automatic Field Charger" also. You may read between the lines and safely surmise that the proper use of both chargers would eliminate the necessity of charging at home. (See Nov. '77 RCM, "Building The Automatic Field Charger", or the D & D Electronics ad in this issue.)

So much for the features, now let me explain - - -

How To Use It

The A.F.C. may be plugged into your Tx regardless of the state of charge of the Tx batteries. If the battery is fully charged, the LED indicator will merely blink at you and immediately go out, in which case it will charge at a 50 ma rate for as long as you leave it on. If the battery is almost fully discharged, the LED may stay on for as long as 45 minutes. A

Transmitter being charged from 12V battery with MK TX.

MK TX mated with receiver charger (RCM Nov. 77). It's a necessity for the active flyer.

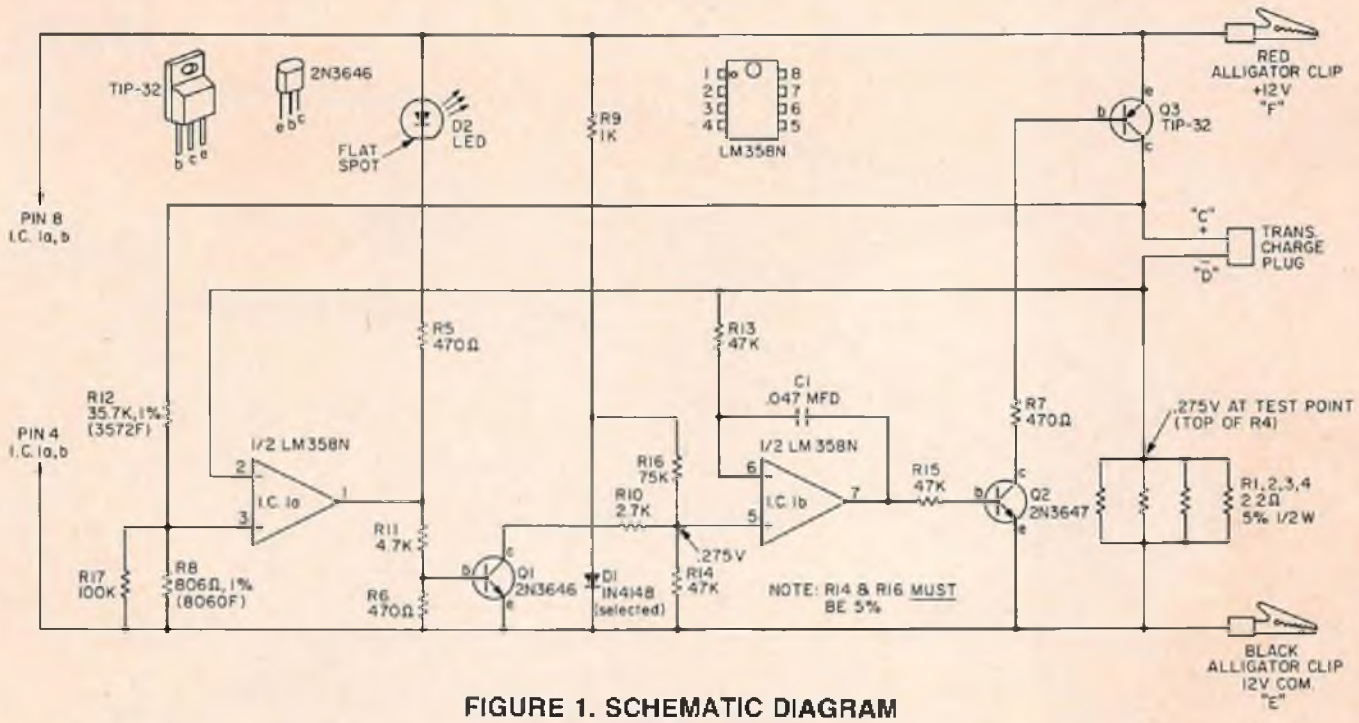


FIGURE 1. SCHEMATIC DIAGRAM

word of caution — remember that the amount of charge put into the Tx depends on the state of charge of the 12 volt charging battery. If it is low, it cannot put in as much charge. I will explain why later.

Always disconnect the charger from your 12V charging battery after use because the charger draws about 40 ma when not being used, (560 ma while LED is lit; 90 ma when LED is out), so it would eventually run down the 12 volt charging battery.

In summary, you may plug the charger in at any time you're in doubt about the state of charge of your Tx battery. When the LED goes out, you know your battery is good for at least 2-3 hours of flying time provided the 12 volt charging battery was up to snuff. You may leave it on after the LED goes out and it will continue to receive a 50 ma trickle charge.

How It Works (For Laymen)

A Tx battery may be charged from a 12 volt battery by means of the circuit in Figure 4. Figure 5, curve (A), is a graph

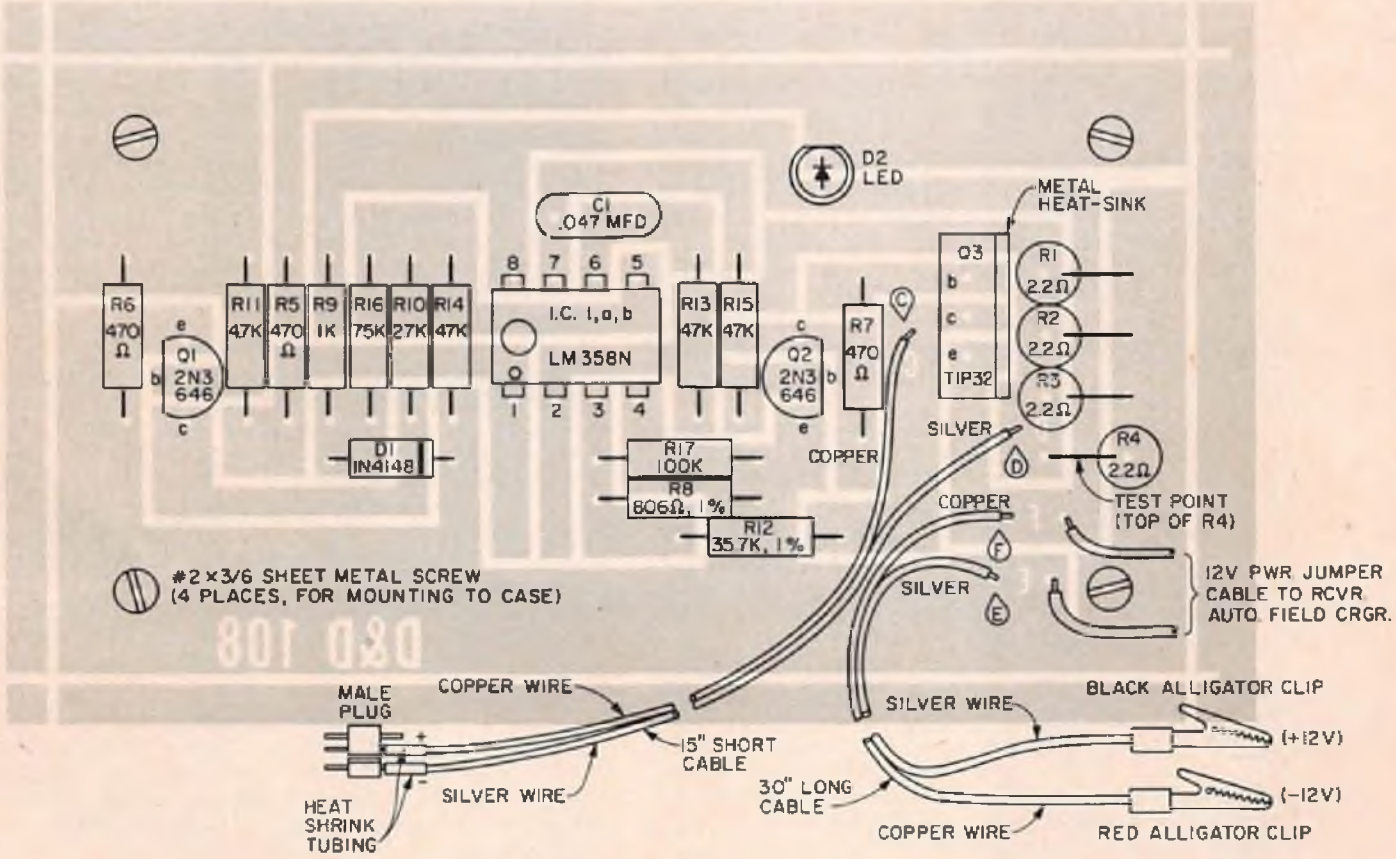


FIGURE 2. PART LOCATION DIAGRAM

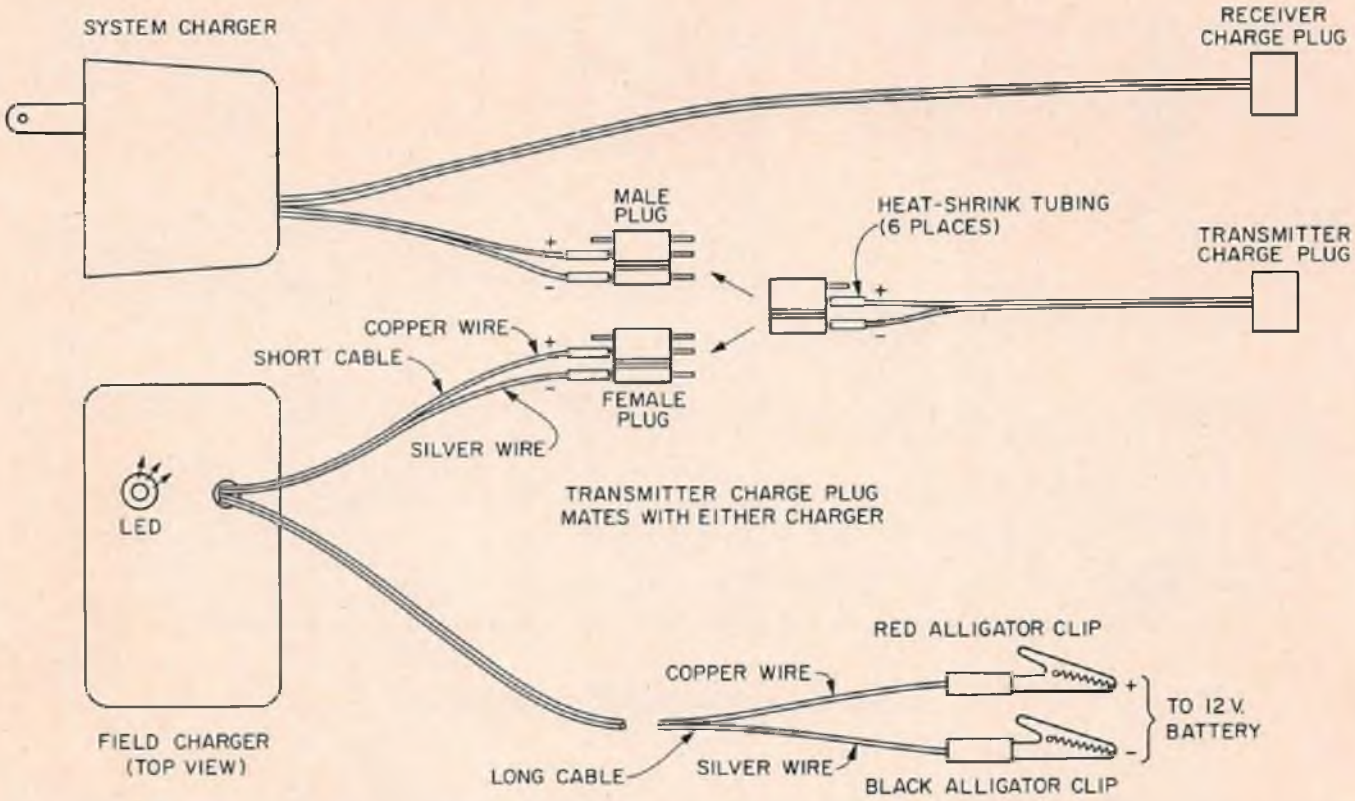


FIGURE 3. CABLE AND PLUG DETAILS

of the resulting charging current. Note that it starts initially at a very high level — approaching several amps if the Tx battery is near full discharge. This alone does not damage a healthy battery. As the Tx battery voltage rises, the charging current goes down.

The current limiting resistor "R" in Figure 4 is chosen so that the Tx battery may be charged in a short amount of time — the so-called "quick charge." All is well if the battery is disconnected at the full charge point by hand or by a timer. If it is not, the battery will go into an overcharge condition. When nickel-cadmium batteries are overcharged, heat is generated internally. Since the battery voltage is a function of temperature and the voltage goes **down** as temperature rises, the charge current **increases.** This, in turn, **increases** the battery internal temperature which causes the voltage to go down further, which increases the charging current — ad nauseum! This condition is called "thermal runaway" and can lead to excess cell pressure. Excess pressure causes the cell to "vent" to relieve the pressure and prevent bursting (some older cells without vents may indeed burst). Naturally if a cell vents, some of its vital fluid escapes in the form of gas, thereby reducing the capacity of the cell.

The time method of terminating the charge is fine **if** you start with a completely discharged battery! If the battery is not fully discharged, it is very possible, if not probable, that the battery will be driven into overcharge (especially if you forget and leave it connected). The A.F.C. MK TX overcomes this problem by charging at a **constant current**, curve (B), until the battery reaches its near full charge condition, and then cutting back the charge to a safe trickle charge which will not damage the battery if left on indefinitely.

How does the circuit know when the battery is near full charge? Battery voltage is also a function of the current flowing in or out. Whereas a fully charged battery may read about 11 volts with no load, it will rise to about 12 volts under 500 ma charge, or drop to 10 volts under a 500 ma load. This is because the battery is not perfect, but has a certain internal resistance. The current that flows through this resistance generates a voltage that adds or subtracts from the nominal voltage, depending on whether you are charging or discharging the battery. It just so happens that under a 500 ma charge, the battery voltage reaches 12 volts at about 75% charge. A healthy well charged 12 volt lead-acid or gel cell battery will read 12.2 to 12.3 volts under a 500 ma load and there is a voltage drop in the charger of about .35 volts. The internal circuitry senses when the Tx battery and the charging battery come within this voltage difference, at which point the charger switches to the low range. This is why it can't fully charge the Tx battery. Under a 500 ma charge, the Tx battery voltage would be about 12.4V. This brings up another point. A car battery will go up to over 14 volts while the engine is running. Obviously, under this condition, the Tx battery could be overcharged if it sensed only the .35V differential, so a circuit was added to terminate the charge when the Tx battery reached about 12.2 volts. Under this condition the Tx battery will be very near full charge. The opposite is true if the charging battery voltage is low — the Tx battery will not receive as much charge.

Hints And Kinks

Close examination of the circuit board will reveal two sets of holes at points "E" and "F" where the alligator clip leads come in. The second set of holes enables you to interconnect the power leads between the RX Automatic Field Charger (D & D 107) and the A.F.C. MK TX (D & D 108). Now you will need only one connection to the 12V battery. The cases are identical and may be joined together by "Zap" or double sided tape to form one neat unit that charges both transmitter and receiver batteries.

If you are able to obtain a transmitter charge cable and plug from either the manufacturer or a service center, you may solder it into the board in place of the #20 gauge lead with the Deans plug.

Technically Speaking

I.C., 1b, Q2, and Q3, form a voltage controlled constant current source. Charge current flowing through the parallel combination of R1 through R4 develops a voltage that is 275 millivolts at .5 amp current flow. This voltage is fed back to the negative input of op-amp I.C. 1b. The output of I.C. 1b drives

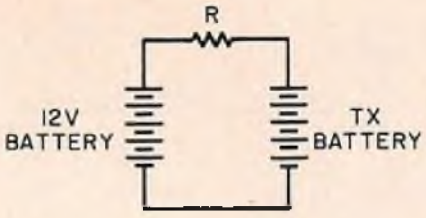


FIGURE 4. SIMPLE CHARGING CIRCUIT

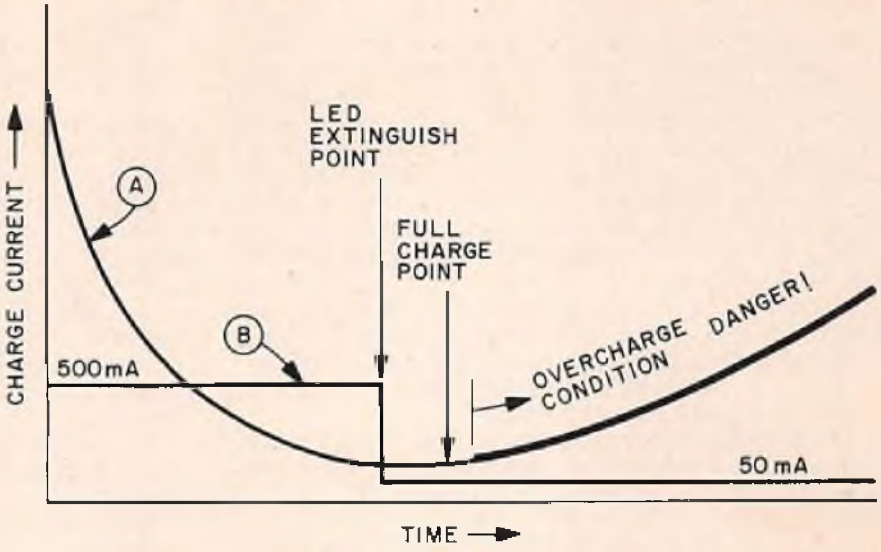
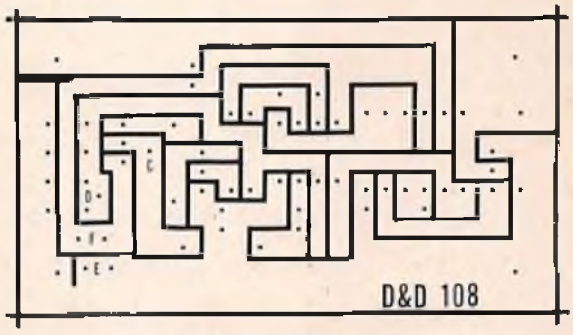


FIGURE 5. COMPARISON OF CHARGE CURRENT CURVES

Q2 which, in turn, controls Q3 collector current. The voltage divider R14 and R16 divides down the voltage at the anode of D1 (.72V) to the 275mv voltage at the positive input of I.C. 1b. Due to the feedback arrangement, the voltage at the test point will always equal the voltage at the positive input of I.C. 1b. It follows then that if the voltage at the test point is held constant, the current flowing through the battery will be constant, regardless of the battery voltage (Ohm's law triumphs again). R9 forward biases D1 to produce the needed reference voltage. This is where the selected diode comes in. Since forward bias voltage will vary from diode to diode, and we wish the reference voltage to be precise so the test point voltage will be as close to 275mv as possible, the diode should be selected to make the test point voltage 275mv. But not to worry — all kits will have selected diodes and they are available from D & D for you scratch-builders (send S.A.S.E. and 50¢ to obtain one). R14 and R16 should be 5% tolerance as well as R1 through R4. Moving right along — it is obvious to the most casual observer that when the Tx battery voltage gets high enough, there will not be enough 12V battery voltage left to maintain the constant current loop. The voltage drop across Q3 at saturation is about 75mv. This, plus the voltage drop across the .55Ω sense resistor (R1-4), which is 275mv, means that there will be a 350mv difference between the batteries when the loop goes out of regulation.

Now, when the loop goes out of regulation, the voltage at the test point can no longer be maintained at 275mv and will start to drop. This is where I.C. 1a comes in. The output, pin 1, is normally low because resistor divider R12, R17, R8, present a voltage at the positive input of I.C. 1a that is slightly lower than the negative input. When the test point voltage drops below the voltage at the positive input, the op-amp output goes high. This does two things. It turns off the LED and turns on Q1. When Q1 turns on, the voltage at pin 5, I.C. 1b is lowered to 27.5mv, thereby reducing the constant current by a factor of 10 to 50 ma. This, in turn, lowers the Tx battery voltage and the



P/C BOARD 1:1

PARTS LIST

Note: Resistors supplied in kit are 5% tolerance. 10% resistors may be used except R8 & R12 which must be 1% units. R14, 16 must be 5%.

R1-4 — 2.2Ω, 5%, 1/2w resistor, red, red, gold, gold.
R5-7 — 470Ω, 5%, 1/4w resistor, yellow, violet, brown, gold.
R8 — 806Ω, 1%, 1/8w resistor, (8060F).
R9 — 1K, 5%, 1/4w resistor, brown, black, red, gold.
R10 — 2.7K, 5%, 1/4w resistor, red, violet, red, gold.
R11 — 4.7K, 5%, 1/4w resistor, yellow, violet, red, gold.
R12 — 35.7K, 1%, 1/8w resistor, (3572F).
R13-15 — 47K, 5%, 1/4w resistor, yellow, violet, orange, gold.
R16 — 75K, 5%, 1/4w resistor, violet, green, orange, gold.
R17 — 100K, 5%, 1/4w resistor, brown, black, yellow, gold.
C1 — 0.047 MFD Mylar Capacitor (473K).
D1 — 1N4148 Silicone Diode (selected).
D2 — L.E.D. (Light Emitting Diode).
Q1-2 — 2N3646 Transistor.
Q3 — TIP-32 Transistor.
I.C. 1a,b — LM 358 Dual op-amp integrated circuit.

Miscellaneous

Printed circuit board, (D & D 108).
1 ea. — red and black alligator clip.
45" — #20 gauge clear plastic insulated "zip cord".
2 — male Deans plugs.
1 — female Deans plug.
6 pcs. — 1/2" long 3/32 heat shrink tubing.
1 — plastic case.
4 — #2 x 3/16" sheet metal screws.

The following is available from D & D Electronics, P.O. Box 2102, Lake Havasu City, Arizona 86403, (602) 855-3526 (Bank cards O.K.). D & D 108 — complete kit of parts, $19.95 plus $1.50 P & H, D & D 108A — assembled and tested version, $24.95 plus $1.50 P & H, D & D 108B, Case, P.C. board, all semi-conductors, 1% resistors, $12.95 plus $1.50 P & H.

Complete servicing available from: Chuck Moses R/C, 915 N. Main St., Orange, California 92666 (714) 639-8886.

circuit latches into this condition. Furthermore, if you are charging from a car battery with the engine running, the battery voltage can exceed 14 volts. In this case it would be possible to overcharge the battery. This cannot happen because when the battery voltage approaches 12.2 volts, the voltage at the positive input of I.C. 1a increases to the point where it will cause I.C. 1a output to go high, thereby shutting down the charger to the 50 ma rate. Finally, R13 and C1 slow up the switching action of I.C. 1b thereby insuring that the charger will always start in the 500 ma state. This eliminates the need for a push-to-start button.

So much for the technical explanation. I have had to keep it brief because this is supposed to be an article — not a book.

O.K. — get the soldering iron hot and let's put one together.

ASSEMBLY INSTRUCTIONS

Refer to Figure 2 for parts location.

Proceed step by step through the assembly instructions. As each step is completed, check the box (☐) at the end of each step.

Step 1.
Install R6, 470Ω resistor, (yellow, violet, brown, gold). Solder. ☐

Step 2.
Install R11, 4.7K resistor, (yellow, violet, red, gold). Solder. ☐

Step 3.
Install R5, 470Ω resistor (yellow, violet, brown, gold). Solder. ☐

Step 4.
Install R9, 1K resistor (brown, black, red, gold). Solder. ☐

Step 5.
Install R16, 75K resistor (violet, green, orange, gold). Solder. ☐

Step 6.
Install R10, 2.7K resistor (red, violet, red, gold). Solder. ☐

Step 7.
Install R14, 47K resistor (yellow, violet, orange, gold). Solder. ☐

Step 8.
Install R13, 47K resistor (yellow, violet, orange, gold). Solder. ☐

Step 9.
Install R15, 47K resistor (yellow, violet, orange, gold). Solder. ☐

Step 10.
Install R7, 470Ω resistor (yellow, violet, brown, gold). Solder. ☐

Step 11.
Install R17, 100K resistor (brown, black, yellow, gold). Solder. ☐

Step 12.
Install R8, 806Ω resistor (8060F). Solder. ☐

Step 13.
Install R12, 35.7K resistor (3572F). Solder. ☐

Step 14.
Install D1, 1N4148 diode (marked as such). Observe polarity as marked by black band. Solder. ☐

Step 15.
Install Q1, 2N3646 transistor, flat spot to left. Solder. ☐

Step 16.
Install Q2, 2N3646 transistor, flat spot to right. Solder. ☐

Step 17.
Install C1, 0.047 MFD capacitor (473K). No polarity. Solder. ☐

Step 18.
Install D2, L.E.D. (Light Emitting Diode), flat spot to edge of board. Leave leads as long as possible. Solder at tip of leads. ☐

Step 19.
Install Q3, TIP 32 transistor. Metal plate to right. Solder. ☐

Step 20.
Install the four 2.2Ω resistors (red, red, gold, gold). They stand vertically. Solder. ☐

Step 21.
Install I.C. 1a,b, LM358N. The notch or large embossed circle goes to the left. Solder. ☐

Step 22.
Cut, strip, and tin each end of a 15" piece of #20 gauge clear plastic insulated "zip cord". ☐

Step 23.
Install the copper colored lead in hole "C" and the silver lead in hole "D". Solder. ☐

Step 24.
Cut, strip and tin each end of a 30" piece of #20 gauge clear plastic insulated "zip cord". ☐

Step 25.
Install the copper colored lead in hole "F", the silver colored lead in hole "E". Solder. ☐

Step 26.
Thread both cables through the top right hand hole in the plastic case as illustrated in Figure 3. ☐

Step 27.
Solder the short (15") cable to a male Dean's plug as illustrated. ☐

Step 28.
Attach the copper colored lead of the longer cable to a red alligator clip. ☐

Step 29.
Attach the silver lead of the longer cable to a black alligator clip. ☐

Step 30.
Using #2 x 3/16" sheet metal screws, fasten the circuit board to the plastic case. ☐

Step 31.
This step eliminates the need to obtain a charge plug to interface with your transmitter. Cut the transmitter charge lead of the 110V charger for your system in two. Using a voltmeter, identify the positive lead from the A.C. charger. ☐

Step 32.
Refering to Figure 3, solder this lead (don't forget the heat shrink tubing) to the center pin of a male Dean's plug. ☐

Step 33.
Solder the negative polarity lead to the Dean's plug. (Figure 3). ☐

Step 34.
Solder the corresponding positive lead (that from the Tx charge plug), to the center lead of a female Dean's plug. (Reference Figure 3). ☐

Step 35.
Solder the negative lead from the Tx charge plug to the Dean's plug (Figure 3). ☐

This completes the assembly of the charger. The following concerns checkout of the unit.

Step 36.
Attach the red alligator clip to the (+) positive terminal of a 12V motorcycle, gel cell, or car battery. ☐

Step 37.
Attach the black alligator clip to the (−) negative terminal of the battery. ☐

Step 38.
Plug the modified charger cable into your transmitter and your newly completed charger. ☐

Step 39.
The L.E.D. (Light Emitting Diode) should light, indicating the unit is charging the Tx battery at a 1C, or 500 ma rate. ☐

Depending on the initial state of charge of the Tx batteries, the L.E.D. will stay on for **less than** an hour. When the L.E.D. is on, the charger will be charging at a 500 ma rate. When the L.E.D. extinguishes, the charger will be charging at a 50 ma rate and may be left on continuously.

CAUTION: Reversed polarity on either the 12V battery cable or the charger output cable will cause damage to the semi-conductor components!!! Be sure to check polarity with a meter before plugging in! ☐

SOFTGLAS

A Product Report By Ben Strasser

The best way to get a beautiful paint job is to have a super smooth surface before the color coats are applied. To fill the grain on balsa we use resin and sand like crazy, dope and silkspan or silk and lots of coats of paint, sanded between each coat. And there are other ways. It seems, though, that whatever approach we use, it either takes lots of time to put on several coats of paint (waiting for each coat to dry so it can be sanded), or it takes lots of hard work sanding finishing resin.

Recently, Superstar Model Products, Box 2522, N. Canton, Ohio 44720, has introduced a new filler, sealer, and primer — all in one can! While their product, Softglas, uses a typical polyester hardener, the real surprise comes when you start sanding.

For our tests we followed the instructions on the can, using exactly the amount of hardener recommended. After mixing, the material was brushed onto some sheets of balsa. In addition we painted some onto some glass cloth that had been resined to a piece of balsa earlier. We also gouged one of the test pieces of balsa a bit with a screwdriver blade to check the material's filling capability. As suggested in the instructions, we filled the gouges by applying the material in coats rather than applying it all in one shot. We also tried the material mixed with about 10% microballoons to build up a fin-stab fillet.

As soon as we applied the Softglas we noted some warping in the 1/8" sheeting

Applying Softglas to a test piece of balsa. Note material applied over a piece of glass cloth.

we used. As one might expect, a thicker 1/2" piece was not affected. The warping wasn't critical by any means (about the same as you'd get when applying dope to only one side of free sheeting) but it does suggest that if Softglas is to be used on thin sheet stabs or fins, both sides should be painted at the same time to prevent the possibility of warping.

Soon after it was applied, the material felt dry to the touch. We waited the recommended set-up time of 2 hours before we rough sanded the Softglas with 100 sandpaper and applied the second coat

Close-up of filled glass cloth.

Test piece sanded smooth. Pore spaces of glass cloth were easily filled.

Test piece with gouges in the balsa. No more gouges. Note feathered edge toward left end of the balsa.

to the gouged area and the fillets. Then, more drying time and the real sanding was to begin.

Having spent many hours getting resin sander's elbow in search of a good finish, I wasn't looking forward to what was ahead. With some 240 wet or dry sandpaper, used dry on my handy sanding block, work began. To my surprise, it was ready for the 400, then the 600 before I knew it. Softglas is about as easy

Test piece painted with dope (darker color) and polyurethane (lighter color). The area at the left side of the test piece is where the Softglas ended and the dope sank into the wood.

The above 2 photos show use of the material to build a fillet, but I don't really recommend its use for that purpose.

to sand as balsa! What a pleasant surprise. And the sanding dust is powdery so it does not tend to clog the sandpaper.

The coated sheeting, dents, and gouges sanded really smooth. It also worked very well to fill the glass cloth. And we were surprised to find that it's possible to feather the edge of the painted-on Softglas very easily without ending up with the depression at the edge we usually get when trying to feather resin along a wing center section. The only problem we ran into was in using a mixture of about 10% microballoons with Softglas to build up a reasonably thick fillet. First, the microballoons and Softglas mixture didn't seem to bond to the balsa as well as it should have. If you're going to use it this way for a thick fillet, we'd recommend painting the area with the straight stuff

to page 104

FOR WHAT IT'S WORTH

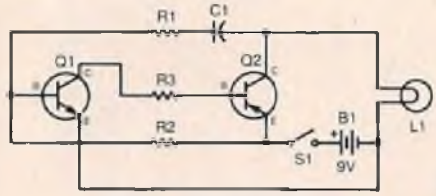
Geoff Watkinson, Manhattan Beach, California, sent us the following useful solution to a problem which almost everyone has had in using film covering materials. Maybe it only happens to me as I seem prone to suffer all the natural modeling disasters known to mankind and a lot more that nobody but me ever heard of before. But it does bug me when I have almost completed a 3' long beautiful straight cut in a roll of MonoKote and, whoosh, the rule skids sideways on that glass-like surface giving me a perfect 4" dog leg that doesn't fit my wing panel at all. (Yes, I do build straight wings). Well, this is one disaster that doesn't happen to me anymore. I have one, two and three foot steel straight-edges that I use for cutting MonoKote panels as well as other uses and I put strips of 1/4" foam wing mounting tape on one side of each of them right up close to the edges. The strips are 2" to 4" long with similar open spaces left between them. Those rules really hold position now on that ice-rink MonoKote and I regularly make long, perfectly straight cuts right up to the point where my X-Acto knife slices the tip off my finger. I'll write with the solution to that problem as soon and I find it; but at the rate my finger tips are disappearing, I may not have to worry much longer as my finger overhang is almost nonexistent already.

There are times in this hobby when it is helpful to be able to shoot some cleaner or lubricant around a corner or into a location that is somewhat difficult to reach. This problem arose for Robert J. Levy of Springfield, Ohio, when he attempted to clean the control pots on his closed stick transmitter, as the pots were hidden behind a circuit board. The stiff plastic tube furnished with the spray can of control cleaner would not make the 90° bend required without kinking, and the kink prevented the cleaner from passing through the tube. By cutting the stiff tube into two parts and inserting a length of clean fuel line tubing between them, he was able to direct the spray of cleaner precisely into the pot. Using essentially the same approach, he was able to lubricate a sticky aileron torque rod with a spray can of WD-40. The beauty of this method is that it uses a material readily available to all modelers and that it is not restricted to spray cans. Pumps and even oil cans are thus usable as pinpoint oiling and cleaning tools. The result is a saving in disassembly time and trouble, much less mess, and less chemical waste.

Wayne L. Boots of Waterloo, Iowa, has found that when cutting foam for any of the number of applications in RC, i.e., receiver, boxes, batteries, etc., it is cut very evenly and quite easily with a standard electric kitchen knife. It leaves a very smooth professional looking cut and it is then a simple matter of placing your receiver or batteries in the foam box and gluing the top and bottoms on with a small amount of Hot Stuff.

This idea for a strobe light or flashing beacon was sent to us by Gary Ingraham of Roanoke, Virginia. Club members of the Roanoke Valley Radio Control Club states that it works beautifully. The schematic should be self explanatory with a complete parts list shown.

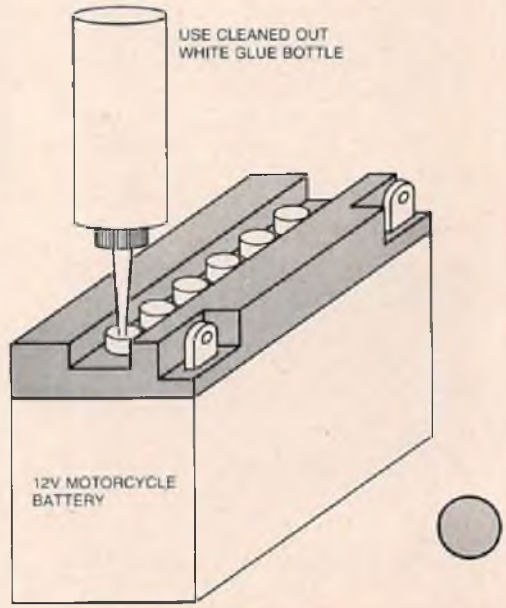
Parts List
B1 — 9V Trans. Battery
C1 — 5μf 35V Electrolytic Cap.
L1 — 2-4V Lamp
Q1 — NPN Transistor (HEP-641)
Q2 — PNP Transistor (HEP-739)
R1 — 470Ω 1/2W
R2 — 220Ω 1/2W
R3 — 2700Ω 1/2W
S1 — SPST Switch



Have you ever ended up with a nose heavy airplane after you finally got the radio in, the paint on it, and the engine mounted? Nobody ever wants to cut into the tail after all the finish work. Try this instead, writes John Gayer of Steamboat Springs, Colorado. Find a long hollow tube, old aluminum arrow shafts work well for this and for pushrods. Weigh out the amount of small lead shot you need to balance the aircraft and subtract a few for the epoxy you're going to use. Make a stiff paper funnel and tape to one end of the arrow shaft. Insert the arrow shaft through the servo compartment to the tail and make sure it's past the pushrod holes. Pour lead shot through the shaft, heat up 24-hour epoxy until it is very runny and pour through shaft into tail. Remove the arrow shaft and leave the plane on its tail until the epoxy has set. If you moved the battery pack back as far as it would go, you can now move it forward to compensate for the extra epoxy you added.

From Jerry Farr of Abilene, Texas, comes some additional suggestions to RCM's November '77 article by Dr. Julio del Castillo entitled, "Modelers Man Your Planes." Plastic pilots of the Williams Bros. type can be readily changed by cutting off the head with a razor saw and cementing it back on slightly turned. This does a lot to eliminate the "stare" of a pilot. Jerry has also used the "customizing putty" that the plastic car people use to make slight changes in the facial expressions or add a moustache or eye brows, etc. A lot of the "GI Joe" parts can be used with Williams heads, etc. Arms and hands on a "GI Joe" torso with a Williams head can look great. Now, we need a good 3" = 1' pilot for jumbo planes.

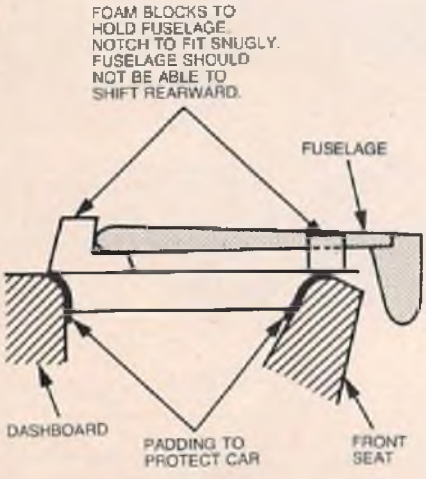
When your lead acid battery seems to be on its last legs and won't hold a charge, it can often be rejuvenated by draining out the acid and flushing out the accumulation of scale inside the battery with ordinary tap water. **Note: Extreme caution should be used when flushing out batteries. Wear protective covering on hands and arms to keep from getting acid on bare skin. Also protect your eyes with plastic goggles.** Refill the battery with fresh acid (obtainable at your local service station or motorcycle shop), it can be changed and should be serviceable for a few more seasons. A handy filler for safely handling the acid or for servicing the battery with distilled water can be easily made by cleaning out an empty white glue bottle. The enclosed sketch sent in by Paul J. Imrisek of El Segundo, California.



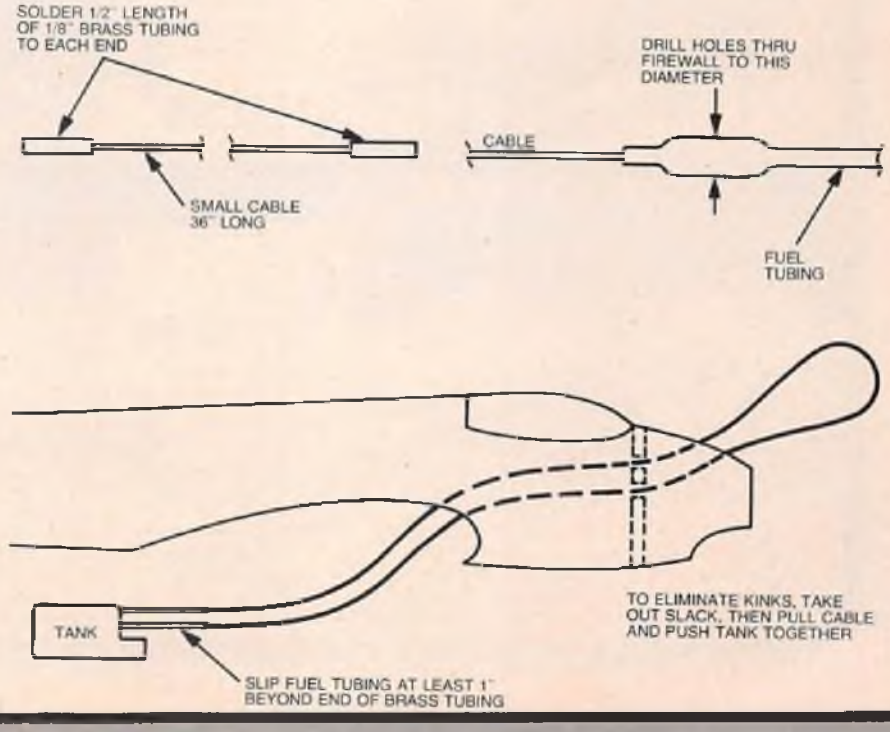
FOR WHAT IT'S WORTH

For low wing aircraft with fixed landing gear, Bob Martin of Kenner, Louisiana, submitted the following suggestion. He has used this on his low wing aircraft with excellent results. Bed the landing gear wire into the mounting block with silicone seal and top off the slot with some more silicone. It works great and if removal is required, cut out with sharp X-Acto knife or razor blade. This method beats punching holes in sheeting or covering if screwdriver slips off screws. With a little practice, the slot can be filled with no flash on sides.

Carrying a large sailplane fuselage in a compact car presents some problems, especially the problem of damage to the fragile tail surfaces. A carrier for these fuselages can be made from light plywood or from cardboard (the kit box!). The carrier is designed to bridge the space on the passenger side from the dashboard to the top of the front seat on that side. The plane fuse rests upside down, nestled in foam blocks, with the fragile tail **behind** the front seat. For additional support, the carrier top can be made with sides which enclose the foam blocks. The notch in the rear foam block should be snug enough to prevent the fuse from sliding backwards. The diagram below should be self-explanatory. This idea was submitted by Robert J. Levy of Springfield, Ohio.

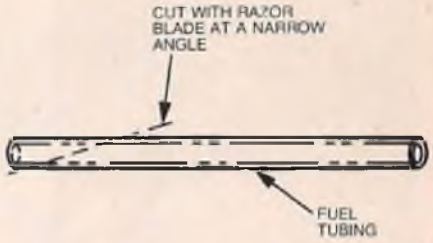


The accompanying sketch shows the tool Frank Moon of Vallejo, California made to simplify threading of fuel lines through firewalls when installing fuel tanks. The sketch is self explanatory and Frank says it works beautifully.



Did you ever need some sheeting to approximate the aluminum sheeted areas of a special bird you were building and been reluctant to use aluminum for fear of creating an interference problem? Then, take heart because you can use some homemade fiberglass sheeting and do the job better, with no chance of the metal sheeting creating an interference problem for you. Simply lay a layer of medium glass cloth on a sheet of glass prepared with release agent, pour some resin over the glass cloth, smooth it out into an even coating, and stand back while the resin cures. Upon curing, remove the sheet from the glass surface, cut it into appropriate size pieces and your sheeting is ready. There are a couple of advantages. You can use resin to fasten the sheeting to the substructure, along with appropriate sized screws if you wish, and the finishing touch can be added by applying rivet heads with a hypodermic needle loaded with resin. The fiberglass panels will 'give' a bit without bending, as aluminum would, and using resin to secure them to the formers etc., underneath, adds significant strength as well. Using different weights of cloth will give varying thicknesses of sheeting and it will take any paint you would normally use on a glass fuselage. This same method could be used with epoxy glass resin as well. Make sure your resin is spread smoothly and evenly on the glass cloth in order to eliminate pin holes and uneven thicknesses. This suggestion was submitted by Dick Phillips of Prince George, B.C.

Herb Mills of Southfield, Michigan along with many of us RC'ers has always found it difficult to feed fuel lines through holes in tight areas purposely drilled smaller than tubing O.D.'s. His neighbor came down to his workshop to observe him in the ticklish task of doing just that. This individual had absolutely no idea of what R/C, or anything mechanical for that matter, is all about — but he does know how to re-string tennis rackets. His problem is similar, in that generally the holes are also smaller than the string. He simply cuts them at a diagonal on the ends and starts them on in. After fooling around for several moments of total frustration trying this old approach of mine, the neighbor made his suggestion and, there you are! Works great.



For the scale model enthusiasts, John Wisniewski of Detroit, Michigan, suggests the following idea for realistic looking bombs. They can be made from spent CO_2 gas cartridges commonly used in small pellet guns or inflatable life jackets. Add fins, paint and add any other details you wish. The similarity will be surprising.

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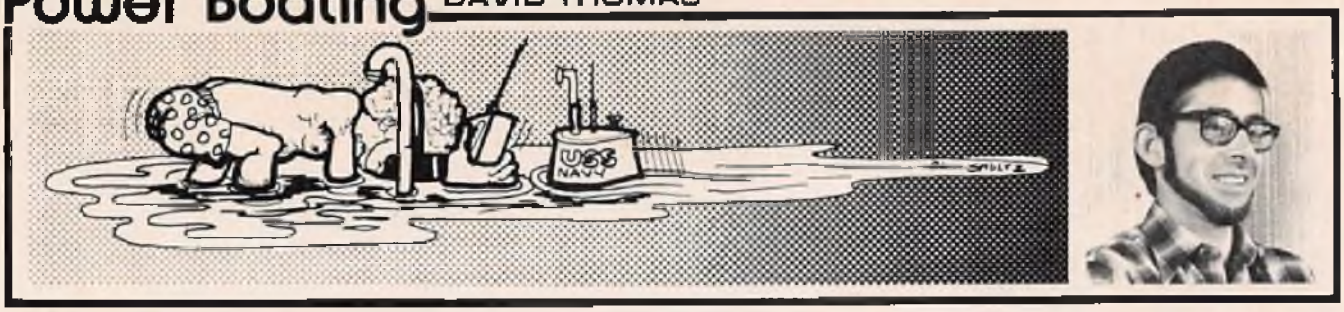


As I have said before, we get letters. I just got a bunch, and among them was a real dilly, from a guy called Joe Baldwin of Florence, Mississippi. Mr. Baldwin jumps right in with both feet and says that the R/C boat coverage in RCM is the worst of the four magazines on modeling that he buys. Apparently, I only write on electric boats, and how to crash them into balloons!

He goes on to say that I never talk about the K & B outboard, and its many design faults (I don't think John Brodbeck, the President of K & B, would be too pleased to hear that one). Then Joe goes on to give a list of things that I should write about. It's a long list, and covers eleven categories, many subdivided, and he thinks I ought to tell everyone about them.

Now, there are two points here that I would like to make before getting down to answering this question — or should I say attack? The first is that while this letter initially got me quite hot under the collar, it would be invidious in the extreme, and very bad, if I started a form of polemique in this column, mainly because Joe can't answer back! The second point is that while I — and I think all my fellow columnists — welcome constructively critical letters, we would appreciate it a lot if the people who read them would take the trouble to read back issues of RCM and check on their facts, before blazing away at us. Let's face it, we are just modelers, too, and we do the best we can when writing these columns — which, incidentally, take up quite a lot of good modeling time; and I can assure you that we don't do it for the money!

Okay, Joe, here she comes! Without going into details, I have mentioned the K & B outboard on several occasions, but if I keep on hammering it, what are the other manufacturers who advertise in this magazine going to say? Let's try to keep things inpartial. Right, now your points: (1) Check needle valve setting — back issue. (2) Write articles on the dozens of new boats on the market — sure, if I had 30 hours a day, and didn't have to teach to earn a living. (3) Info on the science of props — fine, who is going to write it? I don't pretend to be an expert in every field (who does?). (4) Info on drive shafts, water pick-ups, rudders, etc. — back issues. (5) How to put which strut, stuffing box, rudder, and strudder, on all different hull types — again, fine, where do we find the time and space? (6) More hints on boat construction — that's in hand.

And so it goes on, too long to quote here. Well, Joe, a lot of this stuff I have already dealt with in detail in back issues. Some of it is so specialized that it will only appeal to a very limited number of people, and we do try to appeal to as wide a spectrum of readers as possible, whereas your questions go only for power boats, a subject that I hammered into the ground not so long ago.

Anyway, I have an idea. How about you writing in with some of this specialized knowledge, Joe, do a few articles on it. I am quite sure that Don Dewey would be only too pleased to have some supplementary articles, written by someone who knows what he is talking about - - - but, if you do, you'll have to be prepared to spend a lot less time running your boats, and quite a lot of time typing, taking photos, checking on information, phoning people and answering letters; not to mention testing new equipment, building models and, generally, keeping yourself up to date on everything.

Don't think that this is bitter, Joe, I've just tried to put you, and all the other guys out there, in the picture. A lot of what you say is quite reasonable, but the fact remains that physically, there is just so much to be done, and not enough time to do it all. Don't shoot the guy, he's doing his best!

In the same mail, a letter from Albert Prince of B.C., Canada. He has a Merco .49 marine engine, and wants to know what sort of porting it has, and would a tuned pipe work on it. To the first part of the question — I am afraid I don't know. To the second — yes. Technical information: Literally any engine, except those that have sub-piston induction, and they are pretty rare, will benefit from the addition of a tuned pipe. I explained the working way back, but did not at that time mention optimizing. This means quite simply modifying the engine to work **better** with a tuned pipe.

For those of you who read the article, you will remember that the principle of the pipe is to super-charge the engine by pushing fresh mixture back into the combustion chamber through the exhaust port. The longer this port is open, the more power the pipe will add. Most sport engines have an exhaust period of about 140°, although this figure varies enormously. Such an engine will give quite a decent increase in power when fitted with a tuned pipe. Therefore, you can go right ahead, Albert, and fit one to your Merco. As for what size pipe, since the engine is a sports job, it doesn't really matter, but I would go for a .60 size. However, if you want a big power increase, it will be necessary to increase the exhaust period of the engine, by milling away some material from the upper edge of the exhaust port. A good figure for a tuned pipe is about 165°. This means that the piston will close off the port later in the cycle, and the pipe will have more time to stuff extra mixture into the engine. But, 165°, to my mind, is a maximum, because after that, you start getting all sorts of problems, like difficult tuning, going off song as loads change, engine overheating, blow-ups, and so on. So keep to 165°. A word of warning — the milling operation is not an easy one, particularly on ABC engines such as the K & B .21, so unless you are absolutely sure of what you are doing, don't! Get an expert to do it for you. And if you do do it, and make a mess of a good engine, don't tell me about it, I'll only say: "I told you so!"

Albert also presents another problem concerned with the boat itself, which is a wooden Dumas Deep Vee 40. He was traveling fast towards a rock, and slammed on hard right rudder. The boat did a flip-turn through 180° and set off back the way it had come. He tried repeating this and each time the boat did the same thing, but only on right rudder. Why?

Okay, let's try and rationalize this one — but I warn you that not having seen the actual model, it is difficult to diagnose accurately. First of all, let's take a look at the underwater configuration of the boat, seen from the rear. A V-shape, and at its apex a prop turning in a counter-clockwise direction. It is a well-known fact that on full size boats with Vee hulls, the boat leans into the turn at speed, and that the lighter the boat, the further over it will go. The same applies to models. But in a model, the power/weight ratio is much better than in a full size job, or, in other words, we often have too much power.

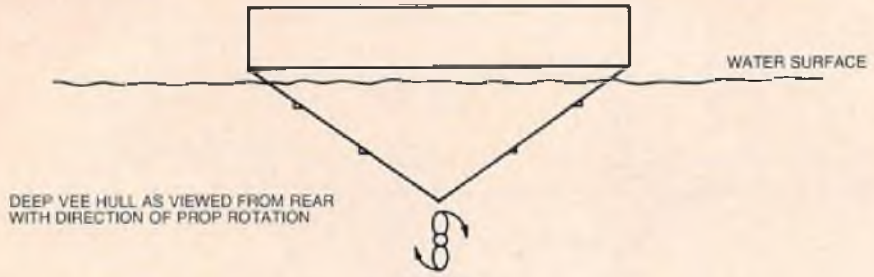
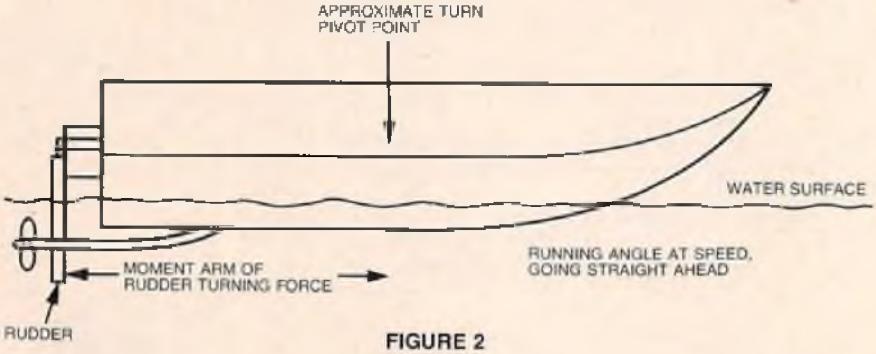


FIGURE 1



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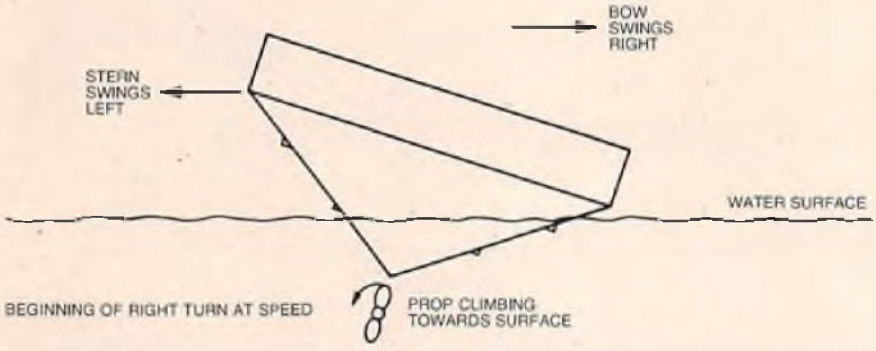

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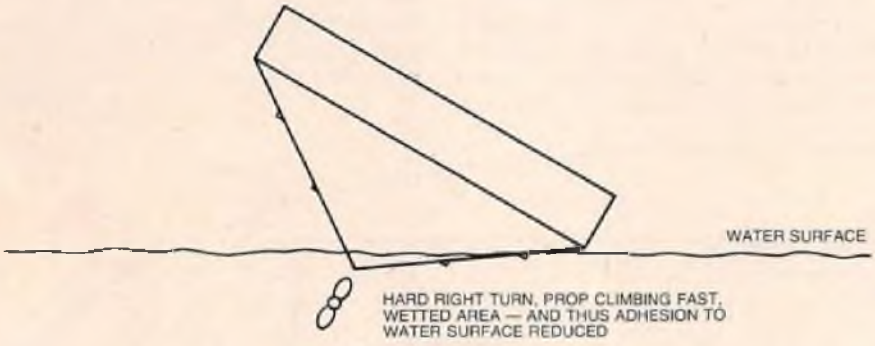

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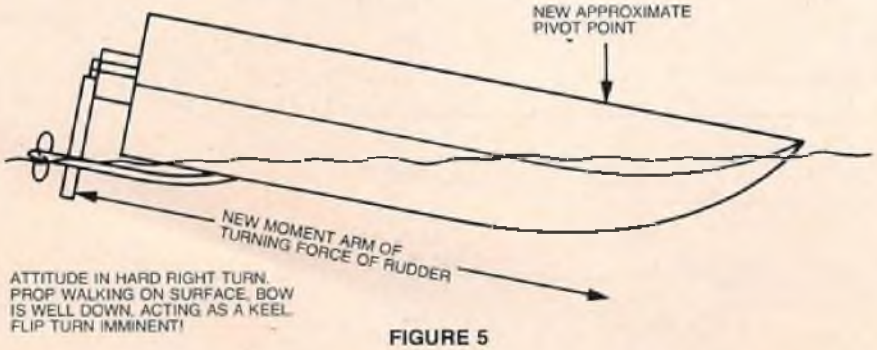


FIGURE 5

Now, if we put on right rudder, seen from the rear, the hull will lean over to the right, and the prop will come up closer to the surface of the water and the lighter the boat, the higher she goes! At the same time, the boat is pivoting around a point somewhere about half way along its length. And at the same time, the bows are beginning to drop, because the hull is rapidly losing the lift it has when it is flat. So there are three factors working on the model. In addition, as the prop gets nearer the surface, the water density lessens, and it speeds up. Because it is being driven by a two-cycle engine, the power goes up with the revs, and the torque increases. This can happen to such an extent that the prop climbs right up onto the surface, and walks the boat sideways, increasing the effect of the rudder, and whipping the rear of the hull over to the left. With me so far?

Remember that the hull in question is a Deep Vee. The bow is very sharp, and as the natural lift is lost, due to the banking effect in the turn, the bow drops, and the sharp edges dig into the water, and acts as a keel, resisting any lateral movement of the front end of the boat. At this point, with the stern lifting and the bow digging in, the pivot point of the boat moves right forward, increasing the power of the prop's turning action. In extreme cases, the model does a 180° flip-turn, the rear end actually leaps out of the water. By the time it drops back in, the phenomenon has so frightened the pilot that he lets go the rudder, and the boat blasts off along the way it came! This prop-walking effect is all too well-known by modelers who run hydros with surface piercing props, and nothing is more annoying than a hydro that grabs because of it. We have actually filmed this flip-turn on a scale model of a Fletcher Arrowbolt driven by a Rossi .60 Speed F, at 56 frames a minute, and then watched the film shown in a projector with a 2 frame per minute slow-motion action.

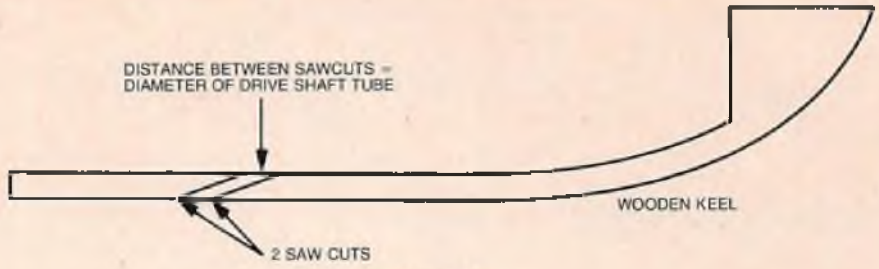
The reason that it doesn't happen on left turns is that, if you think about it, the rear of the hull, swinging right, is moving against the prop torque, so it can't climb up onto the surface. And there you are Albert - - - sorry about it being a bit technical, but it is a difficult one to explain. If you want to stop it happening, put some weight in the boat — this trick cured the Arrowbolt.

A letter from Bradford Wentzel of Reading, Pennsylvania, asks how to drill the hole for the shaft in the keel of a Jupiter 65. Well, I haven't built a Jupiter 65 — time again — but there is a simple way to drill the hole. On the side-view of the plan, check the angle made by the shaft tube with the apex of the Vee in the bottom of the hull. Then make a plywood template of this, and tack glue it in the right place with the hull upside-down. Put the appropriate size drill-bit in the

drill, and start boring the hole, using the template as a guide to get the right angle. After a bit, the template will be in the way of the chuck and the chuck will knock the template off. The hole already drilled will be a sufficient guide for the rest of the operation. If you can get an extension bar for the drill bit, this will make the job easier.

However, this is an awkward solution, and there is a much easier one, providing that you make provision for it while building the hull. Check the plan for the position of the shaft tube where it covers the keel, and saw the keel in two at this spot, as indicated in the sketch. Next, lay the keel flat on top of the plan, and glue a doubler across the gap. When quite dry, turn it over, and glue a second doubler in place. Now go ahead and build the boat normally — you have a hole all ready for the tube. there is one point - - - the edges of the two doublers must be chamfered so that the skins can lay flat when put in place; (also, so must the chine stringers) in order to offer a sufficiently large gluing surface. As far as I can remember, just about every wooden hulled boat that I have built from a kit has figured this kind of construction. And don't forget to use good quality water proof glue, otherwise the first time you put your boat in the water, you will end up with a kit!

Bradford's second question refers to a remark of mine in a previous article, saying that the inside of the hull should be water proofed, and he wants to know what to use. Well, if an i/c engine is used, it must be something which will not be affected by the chemical action of the fuel, and I would suggest a polyester resin, which is pretty easy to obtain. Alternately, a wood filler, several coats of high quality paint and a polyurethane varnish will do the job. The same things can be used for an electric powered model, but the resin is not really necessary. The varnish alone would do a good job in this case.



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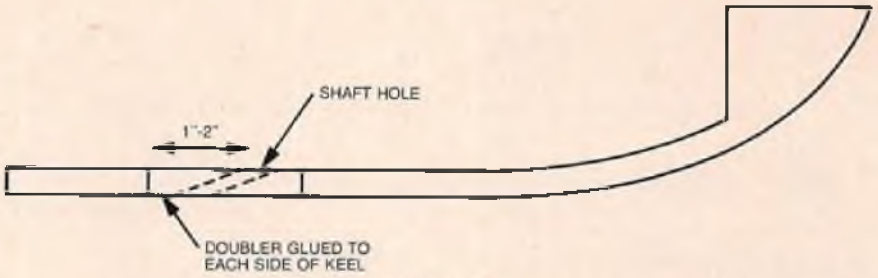

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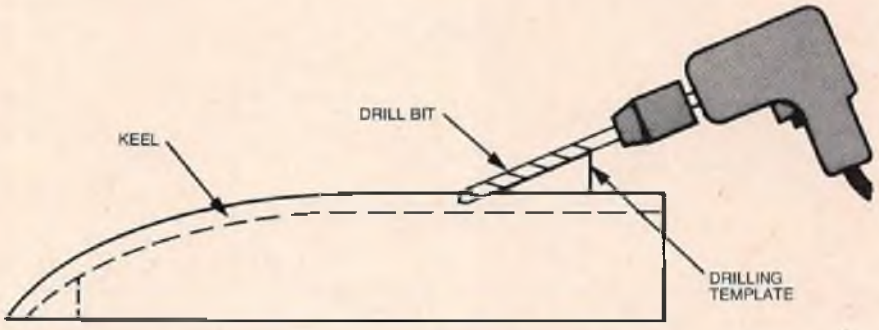

FIGURE 8

Finally, Bradford asks how to wire up the boat. Wow! Quite honestly I could write a book on this one! However, let's try a brief answer, concerning an electric boat. We start off with an electric motor, the power pak, and the radio. First, the radio receiver must be as far away from the motor as possible, preferably right at the back of the boat. Keep the antenna back there, too, to avoid interference — though most modern electric motors are pretty "clean" and won't cause trouble, even without suppression. The power

to page 109

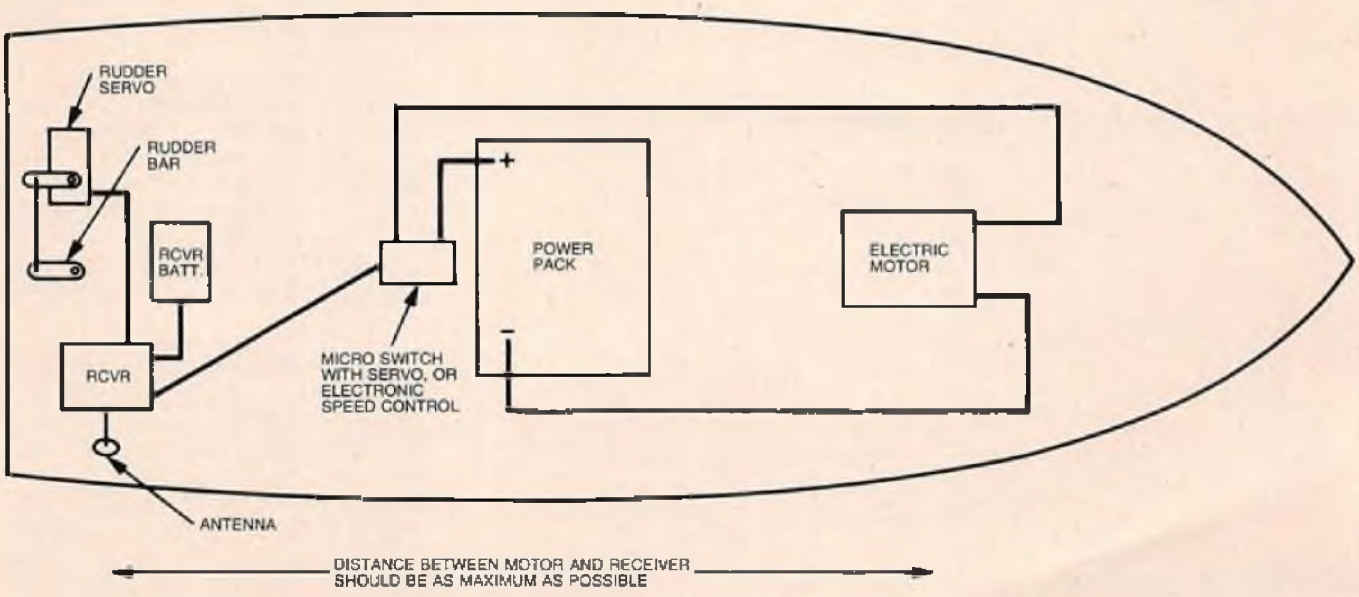

FIGURE 9

RADIO SPECS

CANNON MINI-SPORT MODEL 810

FEATURES

TRANSMITTER Model 810

- Number of Channels: 2, 3, 4 or 5.
- Case Material: Hi-Impact ABS plastic.
- Type Gimbals: Dunham open-gimbals.
- Type Pots: CTS 5K ceramic.
- Power Supply: Dry cells (4) or 9.6v nicad.
- Type Meter: RF and battery condition indicator.
- Modes Available: Two stick, Mode 1, Mode 2, and single stick — also special order stick arrangements.
- Frequencies Available: 27, 29, 35, 40, 53, 72, including four new Canadian.
- Weight: 19 oz. with antenna & nicads, (5 channel).
- Size: 1-23/32" x 4-27/32" x 5-11/32" (43.5 x 123 x 136 mm).
- Unique Features: "Max-Powr" RF section provides nominal 750 mw output.

RECEIVER Model 520 (R) 5 (4)

- Case Material: Nylon.
- Size: 23/32" x 1-19/32" x 1-27/32" (18 x 40.5 x 47 mm).
- Weight: From 1.13 oz. (32 gr.) for 2-channel to 1.24 oz. (35.1 gr.) for 5-channel.
- Type Decoder: C-MOS 8-bit shift register.
- Type Front End: Double tuned, dual FETS.

SERVOS Model CE-4

- Case Material: Nylon.
- Size: 3/4" x 1½" x 1½" (19 x 38 x 38 mm).
- Weight: 1.25 oz. (35.4 grams).
- Output: Rotary type.
- Output Controls: Arms.
- Type Amplifier: I.C. amplifier, utilizing T.I. 28604 I.C. chip.
- Motor Size: 8Ω, 16 mm.
- Servos: CE-4 (others available at extra cost).

SYSTEM

- Airborne Power: 500 mah (also choice of 100, 250, 450 mah).
- Type Connector: Deans 3-pin.
- Type Charger: Dry Basic system, none; Standard system, single output charger; Deluxe system, dual nicad charger.
- Servo Trays: Full set.
- Shipping Container: Plastic outer, foam plastic inner.
- Service Available: Cannon Electronics and all Cannon Authorized Service Centers in U.S.A., France, and Spain.

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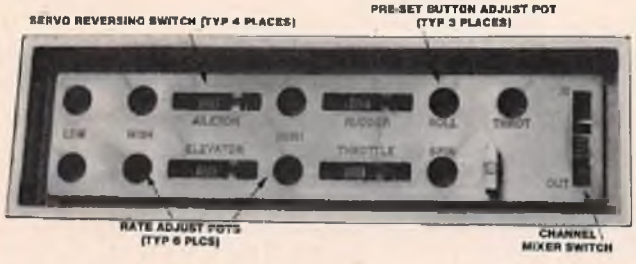
RADIO SPECS

MILLCOTT 8-CHANNEL COMPETITION RADIO SYSTEM



MANUFACTURED BY
MILLCOTT CORPORATION
1420 VILLAGE WAY, UNIT E
SANTA ANA, CALIF. 92705

FEATURES

TRANSMITTER

- Number of Channels: 8 Channels, 6 proportional, 2 switched.
- Case Material: Grained vinyl-clad aluminum case.
- Type Gimbals: All metal open gimbal.
- Type Pots: All potentiometers sealed conductive plastic.
- Power Supply: 8 AA ni-cad 500 mah power supply.
- Type Meter: Expanded scale voltmeter, also monitors airborne.
- Frequencies Available: All 72 MHz and 6 meter frequencies.
- Weight: 2 lbs. 8 oz.
- Size: 8.2" x 6.2" x 2.2".
- Unique Features: Electronic trims, adjustable dual or exponential rates on aileron and elevator, servo reverse, 3 adjustable maneuver buttons, gimbal orientation adjustable, auxiliary rudder control optional, electronic mixer optional — 2 or 3 channels, front panel adjustments, airborne check without RF operations.

RECEIVER

- Case Material: Grained vinyl-clad aluminum case.
- Size: 1.5" x 2.5" x .8".
- Weight: 2.2 oz.
- Type Decoder: Double-tuned front end, 3 IF stages, half-frequency crystal.
- Type Front End: 3.5 volts regulated, will operate on 3 cells.

SERVOS

- Type: MC-3; MC-5.
- Size: .72" x 1.5" x 1.44"; .72" x 1.95" x 1.6".
- Weight: 1.2 oz.; 1.35 oz.
- Torque: 19.5 oz. in.; 50.0 oz. in.
- Output: Rotary ±45°.
- Custom matched for throw, linearity, deadband and resolution. All arms supplied.
- Idle Current: 7 ma
- Optional 180° high power retract.

SYSTEM

- Airborne Power: 4-cell 500 mah AA ni-cad pack. Optional small size 225 mah, and vibration resistant 450 mah packs.
- Harness connectors: ITT Centiloc and Deans.
- Dual charger, with LED indicators, Tx and Rx independent, c/10 charge rate.
- Servo Trays: 2 + 1 + sw, and single, w/mounting hardware. Other configurations optional.
- Shipping Container: Shock-resistant fitted styrofoam container.
- Warranty: Six months warranty on system, one year on batteries. U. S. manufacture, factory service.

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DISCOUNT PRICES - Tower Hobbies is the most competitive company in the hobby. Your hobby supplies cost you less from Tower because our volume purchasing and sales allow us to work closer than anyone else in the business. We would rather sell 10 radios at $10.00 profit each than to sell one radio at $100.00 profit - and that means super savings for you! Tower sells only brand new, brand name merchandise and we sell it at super discounts. Can you think of any reason why you should pay more for exactly the same product elsewhere?

FAST SERVICE - Tower Hobbies is the home of fast service! As soon as we receive your mail order or take your order over the phone we begin to process it immediately. We check your file (or make a new one for new customers), check over your order, computer process it, check it again, pick it, pack it, and then ship it within 24 hours. You receive exactly what you ordered in a carefully wrapped package that is courteously delivered by United Parcel Service (or Parcel Post if requested) within 1 to 5 days depending upon where you live. You never have to leave home - no heavy traffic, stuffy crowds, or discourteous salespeople when you deal with Tower Hobbies!

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

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

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

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

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

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

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

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

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TOWER HOBBIES SIX & THREE CHANNELS

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

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

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

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

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

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

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

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

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

ORDER NOW ! ! Both systems are in stock for immediate delivery on the 72 mHz frequency of your choice. Call Toll Free right now for immediate COD delivery or send your order in the mail along with purchase amount plus $1.50 for postage. If you are not 100% satisfied with your Tower radio after receiving it then simply send it back in original condition within 10 days for a full purchase price refund.

TOWER SIX

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

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

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

Retail $350.00 Stock #TOW88462

ONLY $199.95

TOWER THREE

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

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

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

Retail $210.00 Stock #TOW88231

ONLY $119.95

TOWER

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SPECIALS GOOD UNTIL MAY 15th, 1978 ONLY

ZAP ZAP ZAP ZAP 44% OFF

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

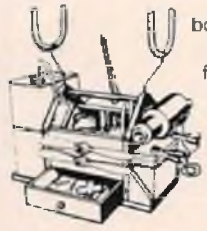
RETAIL $3.50 — NOW ONLY $1.98 — Stock #SOR32050

ROBART SUPER PUMPER 40% OFF

This "in-line" fuel pump is a simple, easy, and reliable way to pressurize any engine. Fits into fuel line. Limit of 2.

RETAIL $17.95 — NOW ONLY $10.78 — Stock #ROB54000

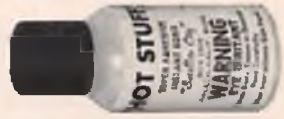
GOLDBERG HANDI TOTE 34% OFF



This flight box is compact yet has room for everything you need. Limit of 1 per order.

RETAIL $14.95 — NOW ONLY $9.98 — Stock #GBG90000

HOT STUFF 44% OFF HOT STUFF



Hot Stuff is an instant bonding cyanoacrylate super adhesive that is a must for modelers. Stock up now at this super price. 2 bottles per pack. Limit of 12 packs.

RETAIL $3.50 — NOW ONLY $1.98 — Stock #HOT32001

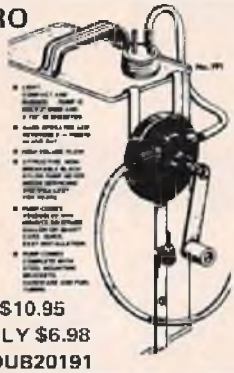
K & B .40 RC ENGINE 40% OFF

The most popular .40 ever made! Features a Perry carb.

Quantities are limited. Limit of 1 engine per order until sold out.

RETAIL $62.50 — NOW ONLY $37.48 — Stock #K&B01040

DU-BRO KWIK FILL FUEL PUMP 36% OFF



RETAIL $10.95
NOW ONLY $6.98
Stock #DUB20191

HOUSE OF BALSA P-51D (.29-.40) 30% OFF

This all-balsa sport, stand-off scale ship is absolutely outstanding. The hottest new seller of the year.

RETAIL $54.95 — NOW ONLY $38.48 — Stock #HOU73000

K & B .61 R/C ENGINE 40% OFF

Limit of 1 engine per order.

This outstanding engine features a Perry carb and muffler.

RETAIL $85.00 — NOW ONLY $50.98 — Stock #K&B01161

TOWER HOBBIES R/C LONG GLOW PLUGS 50% OFF

These excellent glow plugs feature an idle bar. Made by the world's finest plug manufacturer especially for Tower. 6 plugs per package. Limit of 2 packages per order.

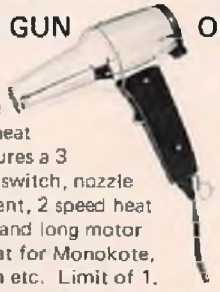
RETAIL $7.20 — NOW ONLY $3.58 — Stock #TOW15006

STERLING 1/2 A CORSAIR 40% OFF

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

RETAIL $29.95 — NOW ONLY $17.98 — Stock #STE72036

TOP FLITE HEAT GUN 36% OFF



This fine quality heat gun features a 3 position switch, nozzle attachment, 2 speed heat control, and long motor life. Great for Monokote, Solarfilm etc. Limit of 1.

RETAIL $27.95 — NOW ONLY $17.98 — Stock #TOP45301

DUMAS 24" HOT SHOT TUNNEL HULL 40% OFF

This die-cut mahogany and birch plywood kit is designed for a 3.5 cc outboard like K&B's.

RETAIL $26.95 — NOW ONLY $16.18 — Stock #DUM70400

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SPECIALS GOOD UNTIL MAY 15th, 1978 ONLY

12 VOLT MOTORCYCLE BATTERY — 50% OFF

These are high quality, heavy duty motorcycle batteries that are perfect for all electric starters. Brand new. Limit 1/order.

RETAIL $26.95 — NOW ONLY $13.48 — Stock #TOW19000

12 VOLT BATTERY CHARGER

To go with your 12 volt motorcycle battery, or any other 12 volt battery, we now have this high quality charger that does a perfect job. Safe and easy to use. Works great with battery at left. UL approved. Limit 1 per order.

RETAIL $13.95 — NOW ONLY $6.98 — Stock #TOW19100

COX READY TO FLY CESSNA CENTURION

This all molded foam scale model comes complete with a Cox .049 engine, prop, push rods, horns, and all other fittings already installed. 36" span. Cox 2 Ch. recommended.

RETAIL $54.95 — NOW ONLY $38.48 — Stock #COX72401

The Cox/Sanwa 2 channel radio fits perfectly into this model. Buyboth and be in the air within one hour!

RETAIL $109.95 — NOW ONLY $69.98 — Stock #SAN88522

DREMEL MODEL 381 MOTO-TOOL WITH FULL ACCESSORIES — 37% OFF

The Model 381 is the ultimate in hand grinders. It features variable speed control, ball bearings, and full accessories. Limit 1 per order.

RETAIL $69.95 — NOW ONLY $43.98 — Stock #DRE34381

SEALECTOR CUSTOM MODEL SEALING IRON — 33% OFF

This custom model is great for covering with Monokote, Solarfilm, etc. It features adjustable temperature, teflon shoe, and a handy stand. Excellent quality.

RETAIL $22.40 — NOW ONLY $14.98 — Stock #SEA45202

MILLER No. 2017 SPRAY SET — 40% OFF

Complete set includes a 12 foot air hose, compressor, spray gun, air brush, and nozzles.

RETAIL $73.95 — NOW ONLY $44.38 — Stock #MLL62017

SULLIVAN ELECTRIC STARTER — 35% OFF

The Sullivan electric starter is a high torque, high R.P.M., 12 volt starter. Limit of 1 per order.

RETAIL $33.95 — NOW ONLY $21.98 — Stock #SUL12200

KRAFT KP-4A 4 CHANNEL — 35% OFF

4 Channels, open gimbals, 4 servos, ni-cads, trays, harness, charger, and 1 yr. warranty make this all new Kraft radio a super value.

RETAIL $299.95 — NOW ONLY $194.98 — Stock #KRA88242

DEVCON 5 MINUTE EPOXY IN ECONOMY 9 OZ. SIZE — 40% OFF

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

RETAIL $5.80 — NOW ONLY $3.48 — Stock #DEV32209

DREMEL 572 MOTO SHOP — 33% OFF

This deluxe saw features a complete accessory set of blades, discs, etc. and flexible shaft. Limit of 1.

RETAIL $87.95 — NOW ONLY $58.88 — Stock #DRE34572

GOLDBERG FALCON 56 — 40% OFF

This all time best seller is now re designed with ailerons. 56" span, 15 - 35 engine, all balsa construction. An excellent trainer.

RETAIL $39.95 — NOW ONLY $23.98 — Stock #GBG72015

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SPECIALS GOOD UNTIL MAY 15th, 1978 ONLY

BRIDI RCM TRAINER 60 — 34% OFF

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

RETAIL $62.95 — NOW ONLY $41.58 — Stock #BRI74002

BUD NOSEN TRAINER — 28% OFF

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

RETAIL $79.95 — NOW ONLY $57.58 — Stock #NOS74008

MIDWEST CARDINAL A.R.F. — 35% OFF

This all foam trainer has a 46" span and takes a .049 - .15 size engine. Rugged and flies great.

RETAIL $29.95 — NOW ONLY $19.48 — Stock #MID72125

HOT STUFF BLUE LINE — 40% OFF

Now you can see each drop bond as it is blue rather than clear. Prevents waste. Same great instant bonding as clear Hot Stuff. Net wt. 14.2 grams.

RETAIL $4.95 — NOW ONLY $2.98 — Stock #HOT32100

STERLING PUDDLE JUMPER — 34% OFF

This R/C Air boat/Amphibian is designed for 2 channels and an .049 engine. Plastic hull and cabin make for easy construction.

RETAIL $16.95 — NOW ONLY $11.18 — Stock #STE70026

S&O BATTERY TESTER — 35% OFF

Test all aspects of your batteries with this high quality tester.

RETAIL $24.95 — NOW ONLY $16.18 — Stock #BRI86100

BOLINK ELECTRIC CAR — 20% OFF

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

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

X–ACTO No. 87 KNIFE & TOOL CHEST — 30% OFF

Limit of 1

Contains Nos. 1, 2 and 5 knives, complete asst. of blades, gouges, routers, punch ; plus X-acto planer, sander, hobbycraft saw, spoke-shave, balsa stripper, pin vise, screwdriver, asstd. drill bits. In large fitted wood chest.

RETAIL $29.95 — NOW ONLY $20.98 — Stock #XAC36087

BRIDI SUN FLI 4-20 — 34% OFF

All balsa kit has a 48" span and takes a .15 - .25 engine.

RETAIL $29.95 — NOW ONLY $19.78 — Stock #BRI72008

PACER X–30 ADHESIVE — 44% OFF

X-30 is super glue like Hot Stuff,Zap,etc except that it has a 30 second set time that allows for last minute fittings & adjustments. Also, its higher viscosity enables it to make fillets. Limit 6 per order.

RETAIL $3.50 — NOW ONLY $1.98 — Stock #PCR32030

LANIER COMET II — 36% OFF

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

RETAIL $58.50 — NOW ONLY $37.48 — Stock #LAN74105

MIDWEST ATTACKER — 35% OFF

This all molded styrofoam kit builds fast and flies great. 48" span and .19-.35 engine. Very popular.

RETAIL $39.95 — NOW ONLY $25.98 — Stock #MID73134

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DA ENTERPRISES SERIES IV POWER PANEL — 36% OFF

The all-in-one power panel !

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

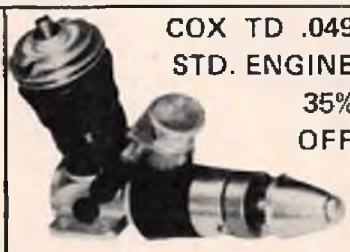
RETAIL $34.95 — NOW ONLY $22.48 — Stock #DAE90000

BRIDI RCM TRAINER 40 — 34% OFF

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

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

COX TD .049 STD. ENGINE — 35% OFF



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

RETAIL $20.95 — NOW ONLY $13.68 — Stock #COX01049

FUN BUGGY — 22% OFF

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

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

MRC–TAMIYA 1/12 SCALE RC PORSCHE — 20% OFF

This outstanding electric RC car features 2 forward and 1 reverse speed. 14" long, ABS plastic body, and full instructions.

RETAIL $54.95 — NOW ONLY $43.98 — Stock #MRC91201

CRAFT-AIR FIELD BOX NEW — 33% OFF

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

RETAIL $29.95 — NOW ONLY $19.98 — Stock #CRA90100

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

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

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

AIRTRONICS OLYMPIC II — 30% OFF

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

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

ZINGER WOOD PROPS — 35% OFF

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

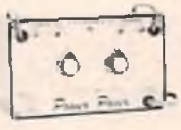
10X6 WOOD PROPS(6)

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

11X7 WOOD PROPS(6)

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

POWER PACER BATTERY TESTER — 20% OFF



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

RETAIL $59.95 — NOW ONLY $47.98

9.6 volt — Stock #PWR80096

6 volt — Stock #PWR80060

KRAFT KP-6A 6 CHANNEL NEW — 34% OFF

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

RETAIL $339.95 — NOW ONLY $224.98 — Stock #KRA88262

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

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

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

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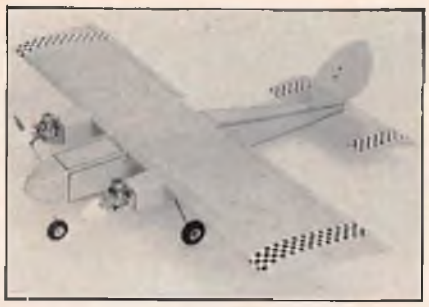
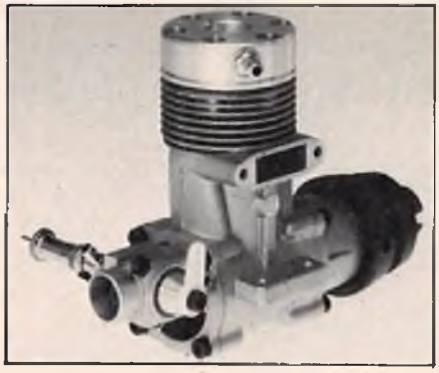


TWIN STIK TRAINER

We know modelers are always looking for something different to try. Here's a twin that will get you in the air fast. The Twin Stik Trainer can be flown with .19-.30 size engines. Single engine performance is exceptional. The kit contains 2 lightweight aluminum engine mounts and nylon blocks! All wood construction featuring Micro-Cut balsa; preformed landing gear; comprehensive hardware package containing hinges, machine screws, clevises; and molded nylon steerable nosegear bearing. Specs for the Twin Stik Trainer are: Wingspan - 54"; Engines - two .19-.30; Radio - 4 channel. The price is $49.95. For further information, contact Midwest Products, 400 South Indiana St., Hobart, Indiana 46342.

MASTER POWER CONVERSION UNIT

Master Climb Products announces the availability of the Master Climb Power Conversion Unit. Developed over a three year period, the unit is designed to increase the output of .60 and larger engines for use in the larger size model aircraft. The conversion unit is precision machined and uses sealed ball bearing construction throughout. A reduction of 2/1 is achieved through the use of cogged drive belts. A flywheel is employed to dampen vibration and reduce impulse loading on the belts. The drive belts require no adjustment and have been test flown for over 100 hours with no evidence of wear. Designed to drive a 16.5/10 or 18/8 propeller (available through Kolbo Korp., 9202 W. Bradway, Anaheim, California 92804). 7000 to 7500 rpm output is in excess of 10 pounds thrust, and has flown models from 15 to 26 pounds at 75 mph depending upon engine used. The unit will accept any size model engine from .60 to .91 with fuel pump or rear rotor. Engine shaft size must be specified when ordering. The unit weighs 1 lb., 10 ozs., and measures 3¼"W by 3"H by 6¼" to propeller hub. The price is $99.95 from Master Climb Products, 564 Smith Avenue, Xenia, Ohio 45385. Engine and prop not included. Dealer and distributor inquiries invited.



O.S. 45 MARINE RV R/C

A new item from World Engines Inc., 8960 Rossash Ave., Cincinnati, Ohio 45236, is a a new dykes ringed engine designed to compete in the .47 limited class. This engine comes complete with marine head, flywheel, and u-joint.

BRASS CONNECTORS

K & S Engineering, 6917 W. 59th St., Chicago, Illinois 60638, introduces their new Brass Connectors with bondable, solderable, and precision machined features. They are great for use in model boats and airplanes and other crafts and hobbies. A pack containing three connectors and twelve plugs is priced at $1.00.

MINI DOLPHIN

A new boat kit, designed for the low budget two channel radios, has been released by Steve Muck's R/C Boats. The Mini Dolphin uses .09-.15 R/C marine engines. The Mini Dolphin kit comes with all bulkheads, deck shears, cabin sides pre-cut out. Also included is aircraft quality plywood sheeting, plexiglass radio box cover, turn fin, motor mount plate, engine bearer blocks, and screws. Building instructions include excellent photos depicting the different phases of the boat construction. The Mini Dolphin is 22" in length and carries a width of 7½". This boat will keep up with the best .10 size boats on the market today. The kit uses Dumas Hardware Set No. 2326 or No. 2327. Kit No. 57 is manufactured by Steve Muck's R/C Boats, 6003 Daven Oaks Drive, Dallas, Texas 75248.

LIGHT PLANE WHEELS

Fox Mfg. Co., 5305 Towson Ave., Fort Smith, Arkansas 72901, announces that they now have in stock and are shipping all sizes of their light plane series wheels. Sizes are available from 1" through 4" by quarter inch increments. These wheels feature cast aluminum hubs, the same as real airplanes, and are quite realistic in appearance. The cast aluminum hub runs truer than most plastic hubs, is much more resistant to wear, and is not damaged by fuel or heat from a soldering iron. The tires are realistic in proportion and pattern. The tread is to scale. The tires themselves are made in their plant in molding machines of their own invention and manufacture. Although the manufacture

is a variation of the rotational mold system, Fox has worked out a technique which results in almost perfect material distribution, which is not true of most R/C wheels. The final result is a wheel which runs much truer, is better balanced, and more realistic in appearance than most wheels in use today. Fox also now has smooth hub, Cub style, private plane series wheels in stock. These wheels utilize the same tire as their cast hub series, but feature a polished, machined aluminum hub. The hub is somewhat more expensive than the cast hub, but is very realistic, and has all the truer running, durability, and low bounce characteristics of their light plane series. Cub style wheels are available in sizes from 1" to 4" in quarter inch increments, and from 4" to 6" in half inch increments. Supply is somewhat limited, but delivery is being made on most sizes. For further information, contact Fox Mfg. Co.

PRECISION-ENGINEERED DETAILING KNIFE

Uber Grafic Instruments, Inc., introduces a new Precision Engineered Detailing Knife with instrument-quality construction and the ingenious draw-bar collet that has revolutionized blade security and release. There are five various shapes of stainless-steel blades available. Also available is the Industrial Kit, which comprises the knife and a selection of nine blades, all housed in a safe and convenient wooden case. For more information, write Uber Grafic Instruments, Box 4, Palo Alto, California 94302 and request Form H-2-977.

PIONEER MODELS R/C A.R.F. TOP CAT

Pioneer Models & Accessories, P.O. Box 31, Ona, West Virginia 25545, is introducing the Southwestern Top Cat as an A.R.F. sailplane. Pioneer Models has hand built, hand sanded, and fine sanded it to exacting specification. Just join wings and stab and it's ready to finish or fly as is. Buy it today and fly tomorrow. With all hardware included, the Top Cat is an all balsa and plywood sailplane which is very, very easy to fly and repair for the beginner. Without modification, the Top Cat A.R.F. won 6th place in 2 Min. Precision at the First Annual Mid-America Soaring Championships (July 24, 1977) in Lexington, Kentucky, in the hands of a novice. With its high performance undercambered 6' wing (area 486 sq. in.) and a low weight of approximately 15 oz. (less radio), it is a smooth floater which makes it an excellent trainer for thermal flying, slope soaring, and optional power assist using a power pod. As an introductory offer (for a limited time only) Pioneer Models is including a free roll of covering with each A.R.F. Top Cat sailplane for only $54.95 (prepaid). If not at your dealer, you can order the Top Cat A.R.F. direct from Pioneer Models & Accessories.

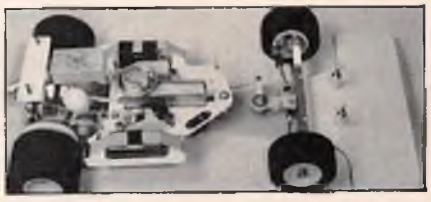
NEW DREMEL CATALOG

The new 20-page catalog from Dremel offers an enticing hobbyist's dream-array of creative power tools. Just out and jam-packed with exciting Dremel Moto-Tool kits, accessories and attachments, Moto-Shop Scroll Saw/Workshops and accessories, Moto-Lathes and accessories, plus the Moto-Flex tool, new "D-Vise" and Electric Engravers. The new 20-page catalog from Dremel Mfg. Co., 4915 21st St., Racine, Wisconsin, is a comprehensive buying guide for hobbyists, do-it-yourselfers, experimenters, lab technicians and industrial tool room personnel. Over 250 photographs and illustrations vividly display each of six power tools, their many uses, and a complete line of accessories that makes any cutting, shaping or finishing task easier . . . and more creative. The new catalog is in stock at leading hardware and hobby dealers, or direct from Dremel Manufacturing.

CHARLIE'S R/C GOODIES

The newest product of Charlie's R/C Goodies is a complete selection of Proportional Control Radio Kits as well as Component Kits for items such as separate Transmitters, Receivers, Servos, Batteries and Chargers. Units are competitively priced and all materials are of the highest quality.

Detailed illustrated instructions simplify assembly and checkout. Test equipment is not required. System kits start with two channels (dry) at $99.95 and range upward to five channels at $199.95 (full nicads) with Standard Flite Pack. Prices are slightly higher with 3-axis Single Stick or Sub-Mini Flite Pack. A best buy might be the Special 3-channel system with 2 standard servos at $109.95. This provides the beginning flyer with two basic flight controls; addition of a third servo gives throttle or spoilers. Later the system can be easily converted to more channels, if desired. Conversion kits are available. Charlie's R/C Systems have two outstanding advantages over most other makes: First, all Transmitters and Receivers are easily convertible up to five channels, even to 3-axis Single Stick, if desired; Second, even the two channel transmitter employs a two-axis open-gimbal stick. This means the student pilot can learn to fly with the same control arrangement he will use later with three, four or five channel equipment. Re-learning will not be necessary, as with transmitters having single-axis sticks. For complete brochure on Charlie's Goodies, send .25 (coin or stamps) or $1.00 (Foreign) to: Charlie's R/C Goodies, P.O. Box 192, Van Nuys, California 91408.



1/8 SCALE R/C CAR KIT

Associated, 1928 E. Edinger, Santa Ana, California 92705, presents their new 1/8 scale R/C car kit. It features new aluminum front end, new fiberglass chassis plate, new servo saver with ball joint tie rods, disc brakes, fuel tank kit with "Flip Top" filler cap, new rear pod plate, stronger gear and extra large 8mm rear axle. Available at your hobby shop or direct from Associated, it is priced at $195.00

to page 96

WORLD
ENGINES
EXPERT
1st '77 NATS
2nd '77 INTERNATS

EXPERT DUAL STICK

Contest quality at popular prices. Open gimbal sticks—tight dead band servos. All nicad plus charger. IC Tx encoder (W.E. special tooling) insures voltage regulation for no servo drift.
5 Ch 4 Servos . . . $399.95
7 Ch 4 Servos . . . $432.95

EXPERT SINGLE STICK

A single stick Expert has been flown by Mark Radcliff to fly off position in 2 World Championships and several Nats. Trim location human engineered for the right feel.
5 Ch S/S - 4 s,. . . $415.95
7 Ch S/S - 4 s,. . . $449.95

CATALOG **$1.00**

New 1978 World Engines catalog. A four-color cover with 64 pages. Features OS and Supertigre engines with special emphasis on parts and catalog numbers. World Expert systems plus accessories. Send $1.00—postpaid.

LAST MINUTE

Supertigre has sent new X-60, X-46 and a new 15 for Toledo plus 60 pipe. OS is sending a new 90 FSR plus twin 120 four cycle for show. World will have a new Aeronca Champ on display along with OS Live Steam Locomotive.

World Engines

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

WORLD'S BEST HOBBY DEALERS

CALIFORNIA

Authorized Radio Control Ser.
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Orange, CA 92667

Covina Hobby Center
140 N. Citrus Ave.
Covina, CA. 91722

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

Franciscan Hobbies
1935 Ocean Ave.
San Francisco, CA 91127

Hobby Co. of San Francisco
5150 Geary Blvd.
San Francisco, CA. 94118

Hobby Warehouse
41284 South St.
Lakewood, CA 90712

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

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

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

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

COLORADO

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

Tom Thumb Hobby Center
7020 E. Colfax Ave.
Denver, CO 80220

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

Bristol Hobby Center
841 Farmington
Bristol Plaza
Bristol, CT. 06010

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

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

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

Field's Hobby Shop
602 S. Edgewood
Jacksonville, FL. 32205

Garand Hobbies
605 Wood Rd.
Seffner, FL. 33584

The Hobby House
350 Hgwy. 17-92
Maitland, FL 32751

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Honolulu, Hawaii 96816

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Al's Hobby Shop
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Elmhurst, IL 60126

M o M Radiomodels
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Oak Forest, IL. 60452

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

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

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

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Pierre-Moran Mall
Elkhart, IN 46514

Hauberger's Hobby Shop
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Bremen, IN. 46506

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343 Lincolnway West
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Lafayette, IN. 47905

Mutchler's Hobbies
107 E. Market
New Albany, IN. 47130

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

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

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Manhattan, KA 66502

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1726 S. Hillside
Wichita, KS. 67211

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Fisher R/C
17 Salmi Road
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Worcester, MA. 01610

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Grand Rapids, MI. 49509

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7845 Wyoming Ave.
Dearborn, MI. 48126

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33419 Grand River Ave.
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NEW RADIO - NEW CHAMP

World 4 Channel - $229.95

What have we here? Two new products! First, we have a new airplane at World Engines. This time the ever popular Aerosca Champ. This is an excellent companion to the new popular World Engines Cub. Power - 19, 21, 23, 25, maybe 30. Construction - balsa tail, balsa rib, hardwood spars, die cut plywood bulkheads and fuselage sides and wing tips, formed gear, die cut wind overs.

We are introducing a new 3 Ch./4 Ch. R/C System each with rechargeable flight pack, dry Tx. 4 Ch. with three servos, S-11A's - $229.95. The 3 Ch. with two servos - S-11A's $169.95. Both radios include a coupon so that the customer can buy the odd servo for $18.00. OS closed gimbal sticks with metal bales. This is an introductory price.

SERVICE EXPERTS

ARIZONA

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

CALIFORNIA

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

GEORGIA

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

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Stanton Hobby Shop
4734 Milwaukee
Chicago, IL. 60630

MICHIGAN

Pete Watats
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Livonia, MI. 48150

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Raytown, MO. 64133

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Glen Rock, N. J. 07452

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Mr. G.s Hobby Shop
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Warren, OH 44483

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Warren Hobby Shop
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Warren, OH 44483

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Columbia,SC 29204

TEXAS

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

CANADA

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

ENGLAND

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

ITALY

G 2 Models
Via A DA Mestre, 31
Mestre, Venice, Italy

GERMANY

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

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

NEBRASKA

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

NEW HAMPSHIRE

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

NEW JERSEY

Hobby Hut
567 Rte. 23
Pompton Plains, NJ 07444

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

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Brown's Hobby Center
6031 Broadway
Bronx, NY 10471

Mardel Hobbies
351 Altamont Ave.
Schenectady, NY. 12303

NORTH CAROLINA

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

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McGiffins
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Grand Forks, N.D. 58201
701-772-5311 or 772-5380

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Airport Hobby Shop
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Akron, OH. 44312

Hobby Stop
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Toledo, OH. 43611

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Willow Grove, PA 19090

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York, PA. 17404

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Plano, TX. 75075

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Burlington Square Mall
Burlington, VT. 05401

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

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Bob's Hobby Center
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Richmond, VA. 23221

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Portsmouth, VA 23707

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Spokane, WA. 99207

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10611 - 136th St., E.
Puyallup, WA 98371

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16661 Redmond Way
Redmond, WA 98052

Stewart Enterprises
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Wenatchee, WA. 98801

WISCONSIN

Pope's Hobby Land
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Wausau, WI.54401

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Calgary, Alberta, Canada

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SUPER TAPE

Super Tape — the answer to all our balsa, greenskin, etc. Used to bond skins to foam; it is instantaneous, clean, no mess; surplus sands away beautifully and easy. Super Tape is practically weightless. Super Tape features include: High initial adhesion, easy liner removal, good shear strength and holding and acrylate adhesive. The advantages are many and include: Fast strong bond, adhesive will transfer to surface, strong consistent bond, excellent roll stability and temperature resistance, permanence, and it won't bleed through most materials. There are many benefits in the use of Super Tape such as instant bond for flying splices, instant holding, and versatility in bonding many types of surfaces and materials. Super Tape meets Government mill specs: Mil-P-19834B; Mil-P-6906B. It has a shelf life of 2 years and holds elastimeric quality for over 10 years as opposed to the brittleness of most adhesives. It is completely shock resistant. Tensile strength after a 72 hour dwell period (that can be accelerated with heat), 30 oz./inch width (33 N/100mm) ultimate: exceptional. Total thickness: .0005 in. (.013mm); adhesive thickness: .0002 in. (.005mm); bond strength improves with dwell time; adhesive to surface contact is very important. Super Tape is a permanent adhesive that does **not** degrade with age when sandwiched between two substrates in normal use. Super Tape can be purchased only through Super Wings, 11015 Glenoaks Blvd., Pacoima, California 91331. Dealers inquiries welcome. No distributors or disc. houses. The price is $6.95 ea. roll - 1" wide, 2160" long; $2.95 ea. roll - 1/4" wide, 2160" long.

FUEL CAN CAP FITTINGS

Du-Bro's Fuel Can Cap Fittings are for those who already own a fuel pump that they are satisfied with but want to update their pump-to-can hook up. These universal cap fittings will fit any standard cap of 1¼" or larger and require large size fuel tubing. Easy to install — no soldering — no leaking. Even includes a nylon fuel can filter. Price: $1.75 each. For more information write: Du-Bro Products Inc., 480 Bonner Road, Wauconda, Illinois 60084.

DREMEL MERCHANDISER

The new Moto-Tool Accessories merchandiser just introduced by Dremel Mfg. Co., 4915 21st St., Racine, Wisconsin 53406, offers 48 of the most popular accessories used to carve, grind, sand, clean, polish and cut. Also featured is Dremel's "Easy-Pickin" merchandiser header that simplifies customer selection of the proper accessory for the job. Each of eleven accessory groups is described by function, specification and card numbers. Each accessory is attractively bubble packed on 2" x 4" cards, which can be sight-checked for proper location with illustrations on the merchandiser. The cards are also virtually pilfer-resistant. For futher information on the new Dremel "Basic-48" Moto-Tool Accessory Merchandiser, contact Dremel Manufacturing.

NEW STERLING MODELS KITS

Sterling Models, Inc., 3620 G St., Philadelphia, Pennsylvania 19134, introduces three exciting new model kits. The Puddle Jumper Mark II, a beautiful Air Boat/Amphibian, follows the "showstopper" of last year! Designed for 2-channel R/C (or tether control) and .15 to .35 engines. A cinch to build, the kit contains a precisely formed plastic hull and cabin, main inner-structure and deck are accurately die-cut plywood and balsa. Included are decals for racing version or Coast Guard version, as well as clear step-by-step plans and hardware. This big, beautiful Puddle Jumper is sure to be part of everybody's Springtime line-up! Sterling's Six-Way Stick Models, so successful everywhere in the world, will be enhanced by the addition of two kits also sure to be favorites, a Piper Cherokee and the Black Widow. The Piper Cherokee, one of the most popular light plane designs, manufactured by one of the greatest names in American aircraft, Piper Aircraft Corporation, is a familiar sight at airports throughout the country. A basic 2-seater with optional two-family seats, powered by 150 h.p. Lycoming engine and equipped with wheel speed fairings, its top speed is 142 mph. Their model of the Cherokee is a faithful reproduction, in miniature, of the full-size aircraft, parallel in beauty, durability and excellent flight performance. The "Black Widow" pioneered the "eerie" new manner of warfare in 1944 "night fighting". This unique aircraft, a dream design of John K. Northrop, carried a three-man crew that flew in a central fuselage pod (with separate compartment for Radioman) between two large tail booms. The "Widow" became feared by enemy aircraft because they were never sure of her presence in the blackness of night flying, and knew of the devastating effect of the four 50 calibre machine guns, coupled with four 20mm cannons. These two fine kits, expertly engineered, will feature accurately die-cut balsa, precisely vacuum-formed parts, complete hardware and detailed plans and instructions.

BOLINK ELECTRIC CAR

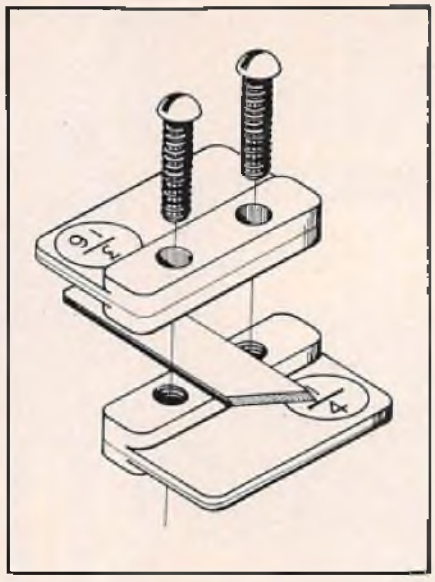
BoLINK's newest electric car has gone electronic. BoLINK combines that famous BoLINK quality with JoMAC's electronic speed control and radio for an unbeatable duo. The car features wide racing slicks, D.C. charge cord, painted Tuffak body, powerful 05 motor (ROAR Class D legal), Lexan chassis, Kydex full protection plate, quick charge GE batteries, injection molded front and rear wheels, speeds up to 30 mph. Radio features full proportional speed and steering, 1000 M/W transmitter, adjustable torque and braking, changeable crystals. Radio and speed control made for BoLINK by JoMAC. For further information contact Kieve Enterprises, P.O. Box 80653, Atlanta, Georgia 30341.

FLYLINE MODELS KITS

Flyline Models, 2820 Dorr Avenue (B-2), Fairfax, Virginia 22030, introduces two new kits: Luton Minor: A beaufiful little .020 powered, radio control model of the classic British lightplane, destined to be a popular sport and "Schoolyard" scale flyers. The model has a 34½" wingspan, and is one of the easiest radio control models to build and fly currently available. An excellent model for the beginner, as well as for the sport flyer who wants to relax and fly in small fields close to home on long summer evenings. The kit reflects Flyline's usual high quality, containing top quality printed balsa, decals, cylinders, rolled plans, etc. Price: $12.95. Inland Sport: Another beautiful classic from America's Golden Era. A 37½" wingspan scale radio control model for .020, electric, or .049 power. Excellent for the "Schoolyard Scale" events for the coming flying season. The model, a Herb Clukey design, was developed with the cooperation of the son of the Inland Aircraft Co. test pilot who had access to many of his father's files and data. The kit is typical Flyline high quality, with decals, printed balsa, rolled plans, proof of scale data, etc. Price: $13.95.

MAGNUM GLOW PLUGS

A plug specifically designed for each type of engine and flying. Aldrich Products, P.O. Box 1426, Mission, Texas 78572, offers two types of R/C Plugs to better fill your needs. The Narrow Bar R/C — Long Reach which works well in all engines — particularly good for Schnuerle's and piped pattern engines; the Wide Bar R/C — Long Reach which works well in all engines but specifically designed for the .40 and smaller cross-flow engines; the Standard Heat Range with long and short reach. The finest general purpose plug for stunt, combat, and racing events; and the Cool Heat Range for long and short reach — A special purpose plug for 25% nitromethane and higher fuels. Element is designed to vaporize under overlean conditions, avoiding damage to the cylinder assembly.



GAPLESS HINGE SLOTTER

Fourmost Racing Products, 4040 24th Avenue, Forest Grove, Oregon 97116, introduces their Gapless Hinge Slotter. This tool will make accurate, centered slots in four popular sizes of balsa sheet 3/32", 1/8", 3/16", and 1/4". To use the cutter, place the sheet against the guide and run the tool back and forth along the edge until the blade has reached the full depth. Slip in the Gapless Hinge, Hot Stuff, and presto! — the neatest closed hinge line you have ever seen. At your hobby shop or direct from the manufacturer, the price is $1.95.

TARNO THROTTLE CONVERSION

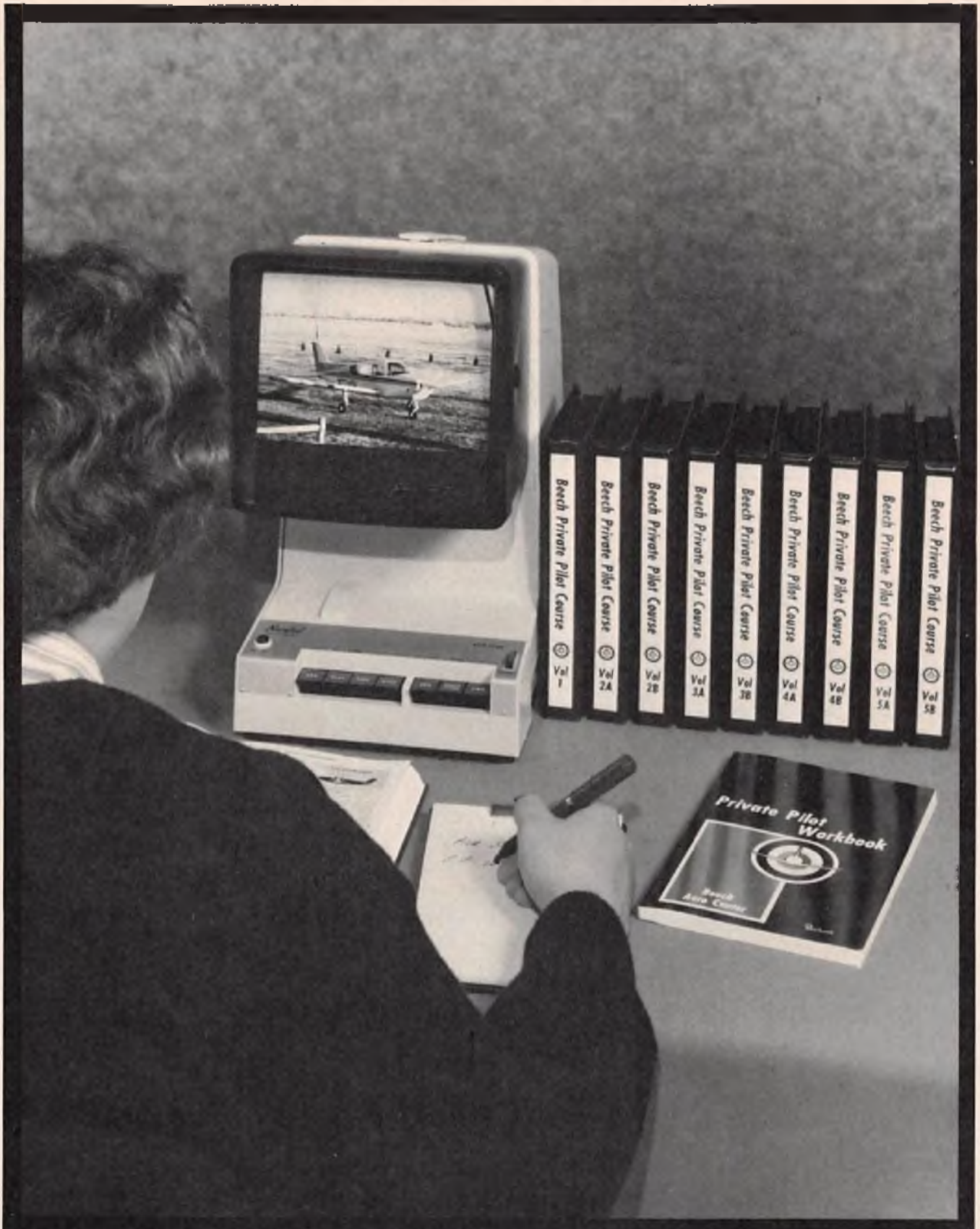
Not all diesel engines are manufactured with a throttle for R/C use. When properly converted, however, most will operate quite well. Shown in the photo is the English-made M.E. Heron diesel engine of .059 cu. in. disp. with a Tarno throttle installed. For the smaller R/C models, the Heron is a fine first engine. With a 7/6 nylon prop it shows a full throttle speed of 10,000 rpm, while a 7/4 prop will allow a bit more, and idle down to near 4,000 rpm. An 8/4 prop will slow it down a little but the idle is still smooth. Dave Shipton custom fits the Tarno carb to the M.E. Heron diesel on order. Price for the complete engine with carb is $33.00 plus $2.50 postage and handling. Check with him at Hobby Hideaway, R.R. 2, Box 19, Delavan, Illinois 61734.

LSF AND NSS T-SHIRTS

Through arrangement with the National Soaring Society and League of Silent Flight, William F. Mueller, Jr., 43225 Whittier Avenue, Hemet, California 92343, is producing both LSF and NSS T-shirts and heat transfers. The LSF shirts are navy with a four color LSF emblem and iron on level numbers. The NSS shirt is white with red trim and has a two color NSS emblem. The LSF shirt sells for $4.95 and the NSS shirt $4.50. Also available are heat transfers, as used above, (LSF $2.50 and NSS $2.00). There is a 50¢ donation to the League of Silent Flight for each LSF shirt or transfer sold. Shirts are available in small, medium, large or X-large.

"PEPPERMINT PATTIE"

Master Kit's "Peppermint Pattie" . . the last word in a sleek, high performance .15 powered plane. Great fun for the experienced sport and competitive flyer. Designed by "Nick" Damuck, Jr. for three or four channels. This little beauty will do most maneuvers of the Master's pattern — and then some too! Kit features: matched balsa fuselage sides; select balsa wing sheeling; precision die-cutting; hardware package: full size plans; and construction photos. Endorsed by Pete Reed of national pylon fame, for those modelers with a bit of experience who wish to have a "ball" — and go fast! Modelers are encouraged to see their dealers first. If unavailable, direct orders accepted. Kit price is $39.95. Dealer and distributor inquiries welcomed. Master Kit, 6 Fox Road, Plainville, CT 06062. This kit is not recommended for the inexperienced pilot or beginner. □



TRANSITIONING

R/C Piloting To Full Scale Flying

PART II

PHOTOS COURTESY OF BEECH AIRCRAFT CORP.

By Arthur J. Sabin

In the first article of this series, the theme was that the transition from piloting radio controlled models is as "natural" an extension of our involvement with airplanes and piloting. Just as this transition has been made by so many licensed private pilots of full scale aircraft into R/C piloting, so many have also gone on the other route, from R/C piloting to full scale flying.

What is being attempted is a realistic appraisal of what is involved, an appraisal that puts aside the advertising slogans and gimmicks that would entice a person into pilot training and, instead, seeks to convey an honest understanding of what the undertaking involves. Certainly there is no group more "susceptible", so to speak, to the lure of flight than those who are engaged in radio controlled piloting. Our planes are real, our flying those planes becomes a way of life for many, if not most of us, and therefore the transition to undertaking full scale aircraft piloting holds a particular and special interest for us. The theme of this series is that "natural" interest should be balanced by a "hardnosed" assessment of what is involved. Of course, there are limitations to this attempt; there is nothing that substitutes for actually undertaking pilot training. On the other hand, it makes good sense to explore just what that undertaking will involve, and to spend some honest time considering whether this is an undertaking you really want to be involved with before making the attempt. As indicated in the first article, you certainly won't get an even handed appraisal from the voice of those who sell airplanes or pilot instruction; in fact, if you have a friend who is a private pilot, you may not get a realistic appraisal from that individual either for the simple reason that the human mind has a marvelous way of forgetting all of the difficulties, pains and problems involved in reaching a plateau of proficiency and competency. Remember that the person who is speaking as an active private pilot is one who has "paid his dues" in the same way that you have paid your dues in order to reach proficiency and competency as an R/C pilot. Thus, if you are asked about what it takes to get into the hobby, unless you make a definite attempt to be honest and objective, to talk about the costs, not only in dollars, but in time, effort, sweat and tears (real or swallowed), the chances are that you will speak in glowing terms of the pleasures and joys and forget the other side of the coin.

In the last article I indicated that undertaking pilot training is a major and difficult process. This needs further elaboration. Writing about the experience of becoming a licensed private pilot has been the theme of a number of articles and books. The problem is that so often these materials are literally promotional in their approach and perspective. They try to convey the idea that anyone can fly, meaning that anyone and everyone has the ability to pilot an aircraft, and that it's nothing but pure joy to acquire the skills required for competent flying. The fact is, that just as there is a very real and often difficult process involved in modeling and then piloting R/C craft, so is there substantial difficulties, hardships and demands of a variety of nature involved learning to fly full scale airplanes. Success in becoming a proficient private pilot takes a combination of basic abilities and capabilities, some of which are innate, some of which must be learned, together with a great deal of perseverance and willingness in the learning process. To those who take the matter seriously, to those who really want to succeed in the sense that they

1978 Beechcraft Sport 150

become proficient, competent and in turn confident pilots, there is almost an overwhelming amount that must be learned and problems that have to be overcome. The question as to whether it's worth it, is an individual matter that only the individual involved can answer. It should be remembered that many, (perhaps a majority), people who undertake radio controlled flying never succeed in reaching a decent level of proficiency or competency; they simply give up. This is true even though they have made a substantial investment in their radio system and in building that trainer type airplane. Statistics I have seen indicate that no more than 4 out of 10 individuals who undertake a regular flight training course ever finish it. I would rather suspect that the same statistics would hold for flying radio controlled models to the point of being able to solo and fly confidently. Interestingly, the high dropout rate isn't because of the cost in either piloting adventures. The cost of being in the R/C modeling hobby to the point where you have built and flown 2 or 3 planes and have a couple of radios is about the investment comparable to that necessary to get a private pilot's license, roughly around $1,500.

To specifically list the demands upon an individual undertaking obtaining a private pilot's license would include the following:

(1) Becoming familiar with basic aeronautics, some of which the R/C pilot will have, but most of which are simply unknown and unimportant because the R/C pilot is on the ground and not **in** that cockpit. Thus the theory of flight must be studied and its basics understood.

(2) While R/C pilots have a working knowledge of the functioning surfaces in their interaction in an aircraft, the full scale plane has to be understood in another dimension, one that includes an understanding of its power plant, its structural limitations and potentials.

(3) Flight maneuvers are one thing on the ground, in the air they are something quite different and the demands for physical coordination and perspective are both intense and very different from that required in controlling an R/C model. This is not to slight those of our R/C brotherhood who exhibit tremendous ability in precision maneuvers; rather it is to emphasize that it's a whole different ball game when you're up there controlling the world around you in the dimension of flight with you **in** that plane.

(4) You have to diligently study and practice the rules of flight which are highly regulated by the Federal Government and where the safety of you and others are crucially involved. Let's face it, it is terrible to be guilty of pilot error, or to have for any reason, our plane go out of control, but I know of no one who has died from having lost their plane in a crash. On the other hand, the persistent danger to life and limb must be contended with when flying full scale. Safe flight is competent flight and competent flight is not easily gained. It takes a tremendous amount of practice and persistence where literally your life is on the line. It is probably that factor, more than any other, that comes across with such glaring glarity as a student pilot. This is paticularly true after you have soloed, because then it's you and only you against the force of nature, your own inexperience, the unforgiving nature of flight itself as well as the potential incompetency of others that have to be dealt with successfully because the alternative is pure tragedy. The problems we face as experienced modelers, trouble with engines, trouble with radios, propellers, fuel tanks and the like are basically not the troubles to be faced as a student pilot. The propeller will not fly out during flight, the fuel tank will not burst nor will the engine go dead in the middle of maneuver; indeed one of the aspects of full scale flying that will come across is the incredible reliability of the aircraft. On the other hand, the need to conquer a seemingly unending, overwhelming series of demands on our physical and judgmental processes in flying full scale aircraft pose entirely different and graver possibilities.

(5) Besides learning to pilot the plane with competency there is the necessity of dealing with other planes in the air,

with air traffic control on the ground and of finding your way to and from where you ought to go. None of this is really present in radio controlled flying. Thus, as a student pilot you're going to have to not only pay attention to your plane, but be in charge of navigating it, dealing with entry into areas of air traffic control, operating the radio communication system with proficiency and otherwise dealing with countless variables which persist as you fly.

(6) The whole field of navigation is an entirely new challenge with no comparable experience in R/C flight. For most it is not at all easy and for some it constitutes an insurmountable challenge. Navigation training includes pilotage, dead reckoning and radio aids to navigation. You've got to learn it all and learn it well, not only to get through the private pilot's license examination but in order to fly safely and confidently.

(7) The world of meteorology must be entered, understood and conquered in terms of understanding what weather phenomena is like, how to recognize what's happening and deal with weather in flight. Are you ready to spend many, many hours studying cloud formations, ceiling and visibility limitations and in fact a good chunk of the whole world of meteorology? Are you ready to undertake the study of weather maps, weather reports and forecasts and be able to put it all together into constructing a flight plan that will take you to your destinations without encountering weather that could make the flight hazardous?

If your response is to the effect that training is what's supposed to impart all this knowledge, certainly the answer is that it is designed to do that. But its design is, in turn, dependent upon your willingness to spend a tremendous amount of time, literally weeks of study in what is known as "ground school" at home or in a formal setting in order to learn, absorb and use this knowledge. You can't learn it in the air; you're busy flying. You have to learn it on the ground and the learning process is long, often difficult and time consuming. Certainly it is exciting and gratifying to learn about new areas in world of flight. Attitude and willingness make all the difference in the world, but even the right attitude and right amount of willingness do not spell success; you can be a great ground pilot and flunk out in the air and vice versa.

Youth will help you, assuming that you've got that precious commodity. There is no question that it's going to be rougher if you're over 40 than if you're, say, 18 to 25. You can begin training at age 16 and get what is known as a student pilot's license and you can become licensed at age 17. While there are no upper limits, when you're over 40 it's going to be slower. That's no reflection on intellect but rather on the natural aging process of the body and mind because both are involved, the one in the physical coordination and perception necessary to handle flying and the other in the ability to absorb the great deal of unfamiliar and quite foreign information in quick fashion.

Another reality that has to be dealt with in transitioning to full scale piloting is something that every R/C pilot is well aware of, the limitations imposed by Mother Nature on the best of our plans. With the exceptions of those of us in the R/C fraternity who are lucky enough to live in areas of the country where you can fly most of the year round, adverse weather severely limits the learning process when you are a student pilot. Even with only modest luck the chances are that weeks go by during the fall and winter when the lessons will be cancelled because the weather is bad. At least for the R/C modeler he's got the chance to continue building that new one for the spring as well as hitting the books in the continued ground school learning procedure.

Another reality about the weather is that the private pilot's license is gained through flight instruction and ground school training allows you to fly by what are known as visual flight rules. Candidly speaking, these visual flight rules limit your flying pretty much to better-than-average type weather both at the point at which your flight commences and to which it is destined. Now you must ask yourself how much of that kind of weather does your part of the country allow. Well, what about instruments, you say. An instrument rating is the next step up and requires a great deal more in the way of training and flight instruction than does the pilot's license. For those who are truly serious about being able to fly long distances and in marginal or literally bad weather, the only way you're going to achieve that is through instrument reading which, again, means much more time and money and flight training and ground school. Statistically, about 35% of all private pilots are instrument rated. The Sunday pilot of R/C models is even more constricted in many respects than our Sunday full-scale pilot.

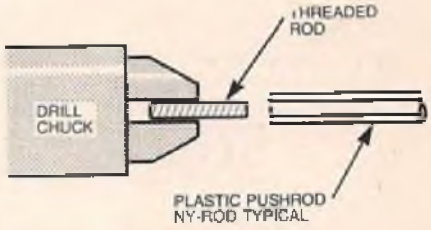
If, after you've read all of this, the thought of undertaking pilot instruction still is there, then in the next installment we'll deal with where you go to get that training and other areas pertinent to becoming a private pilot. □

HELPFUL HINTS

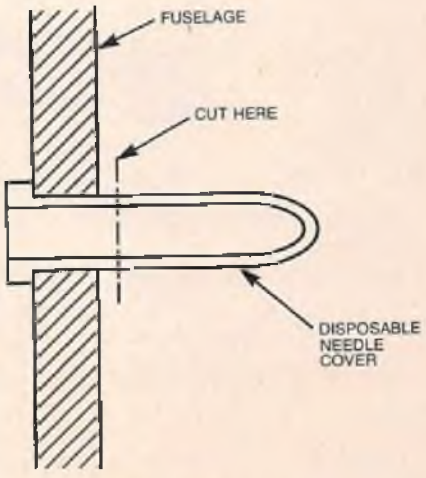
By Earl Hartgrove

Here's a way to minimize sanding of fiberglass tape wing joints, without any sacrifice in appearance. Put epoxy (or fiberglass resin) on your fiberglass tape as usual, covering the wet epoxy with wax paper or plastic wrap. This covering will not stick to the hardened epoxy and can be easily removed, leaving a relatively smooth finish. Most people will have some ridges and air bubble-holes in the finish. Sand lightly then cover these imperfections with spackling compound. When the compound is dry, sand the joint with the same ease as the rest of the wing. Cover the wing as usual.

Here is a quick way to put threaded rods into plastic pushrods. Put the threaded rod into your electric drill chuck. Tighten the chuck, allowing only the portion of the threaded rod that is to be screwed into the pushrod to extend out of the chuck. With a few short bursts of the drill, the threaded rod will screw itself into the pushrod up to the chuck. (See sketch.)



Disposable syringe needle covers make excellent exit liners for antenna wires or switch wire extensions. In addition, the syringe, itself, makes an excellent glue gun. (See sketch.)



to page 104

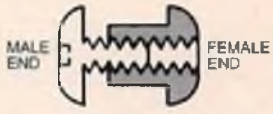
HELPFUL HINTS

from page 103

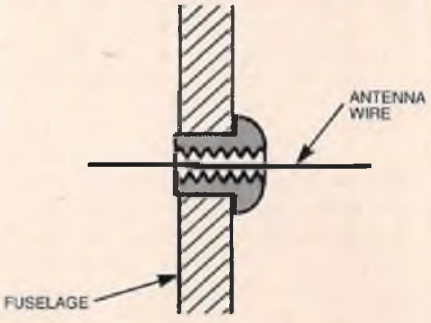
For those RC'ers who are connoisseurs of Chinese or Japanese food, the free chop sticks used at most restaurants come in two sizes, 1/4" and 3/16", and make an excellent source of wooden dowels for model construction.

The aluminum report binding screws available at most dime stores make excellent exit liners for antenna wires or switch wire extensions. (See sketch.)

CUT VIEW OF BINDER



FEMALE END USED AS LINER



□

SOFTGLAS

from page 77

first, then add the mixture. Don't use more than about 10% micro-balloons though, or the mixture gets too soft and will crack when setting up. Of course, any cracking can be easily filled by painting on some more Softglas.

In discussing the application of Softglas with the manufacturer, they suggest brushing on a coat about 1/32" thick, letting it set up, rough sand, apply another 1/32" brushed on coat, sand with 100, 240, then 400. Finally, spray

to page 109

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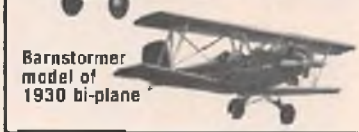

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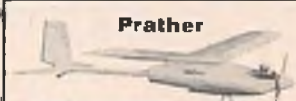

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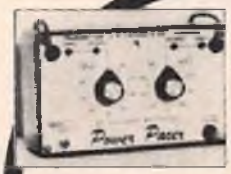

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CONTEST DIRECTOR: Jerry Farr, 2802 Robertson Dr., Abilene, Texas 79606

SOFTGLAS

from page 104/77

on a light coat and sand with 600. With our experience in applying only one coat to balsa, that job ought to end up super smooth.

According to the manufacturer, Softglas will bond to materials other than balsa and polyester resin fiberglas such as hardwood, metals and cardboard. What a neat way to seal cardboard covered foam wings. They have also used it on open areas covered with silk, silkspan, and Super Coverite and report that it works well in those areas because it is flexible. Watch out when sanding at the edge of the open areas though, so you don't sand through the silk, etc. It is not recommended, however, for use on epoxy-glass products because polyesters don't bond well to that type of fiberglass.

Softglas can be used under polyurethane, epoxy, lacquer, dope, or enamel paint. We tried painting it with a spray can of Pactra's polyurethane, which gave a very good finish in one coat! Dope, on the other hand, took a second coat to get a good gloss. That's right, only two coats!

When all of the sanding dust had settled, we were very pleased with this new elbow-saving, time-saving product. A quart will normally finish one aircraft. It goes on easy with only a light presanding of the wood to get rid of the high spots, sands about as easy as balsa, and takes any paint you'll want to used. What more could you ask? □

POWER BOATING

from page 84/82

pak can be moved around to get the Center of Gravity about right. Using two channels, one servo works the rudder, and the second a switch for the motor. Alternately, you can buy a radio with one servo and one electronic speed controller. If you do this, try to get a controller that gives both forward and reverse. For the Jupiter, a Vantec Model RET-4 would be fine. Alternately, if you have a second servo, the servo arm can be used to actuate a couple of microswitches and give ahead/stop/astern, but I must say that if this is done, a lot of the fun of an electric boat is lost. I say this because you can get a lot of enjoyment with a slow electric model, equipped with reversing, by putting a couple of pieces of wood lying out into the water, and practicing bringing the boat in-between them in reverse, and stopping it, without touching them — just like the

to page 110

POWER BOATING

from page 108/82

real thing. Plus the controller will give you all the speeds between stop and full ahead, whereas the micro-switches will only give one speed, unless they are banked. I would go for the controller every time: the extra cost will be compensated for by the fun it provides.

Another letter, this one from Brian Dodge of Summit, Illinois, says that there are a couple of rules that should be added to the balloon bursting game: (1) The balloons should be inflated to about the same size, otherwise the team with the smaller balloon will have an advantage, because it will be harder to hit. (2) The balloon should be fixed on every boat at exactly the same place.

Well, Brian, I agree entirely, and hadn't thought of these points. For the first, the circumference of the balloons could be measured simply, by using a piece of string. As for the second, the best place would be the center of the transom, with the ends of the clothespins jaws flush with the transom — i.e., no overhang. Thanks Brian, good points.

The last letter comes from England, from Jim Kinney of the Marine Dept. of Jim Davis Models. Jim wrote in reply to my request for information about a suitable glue to use on ABS plastic. He says that the correct thing is Methyl Ethyl Keytone (commonly known as M.E.K.). In fact, this is not really a glue, but a solvent, and can be applied with a brush. A good alternative is a German two-part epoxy glue called Stablit Express, and having used the latter myself, I do know that it works pretty well. M.E.K. should not be difficult to find — if anyone knows where, perhaps they would let us all know. Thanks for the information, Jim.

One thing I have not mentioned is a request from Albert Prince for information on how to build model skiers to tow behind a boat. Here I must apologize; for some time I have been meaning to write an article on my own outfit, where I not only tow the skiers, but take them over a jump, I also have one which flies, using a delta wing. The truth of the matter is that I do not have a boat suitable for towing at this time, and have been waiting until I get one, before writing the article. However, it is obvious that there is quite an interest in this subject, so I promise that I will get on and let you have all the information as soon as possible, even if I can't supply photos of them working. However, don't worry about the authenticity of the information, when you eventually get it. These skiers have been running for the last seven years, and they work just fine. (My original ski boat, made of wood, got used so much that the fuel soaked into the wood, de-

to page 112

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POWER BOATING

from page 110/82

spite fuel-proofing, and it eventually just fell to pieces from overwork!). I guess that when I get the time, I shall have to get down and design a suitable boat myself.

And that's it for another month. Get busy with the building, the season's about ready to start! □

PIT STOP

from page 71

type rubber which will give the maximum traction for R/C car use, under given circumstances. This hardness can be accurately measured with a Durometer. As the rubber gets harder there will be less traction, and as the rubber gets softer than the ideal Durometer measurement, the traction will also be less. There are times when it's actually better to run a harder rear tire than normal. If you have a track that has good traction, or a track that wears tires fast, then a slightly harder rear tire is better. A good example of this was at the World Championship race. The Italian Team was asking me what tires I was running. I told them it was the Associated #2401 which Thorp had for sale in his showroom. They checked on this and thought it couldn't have been the same because they were firmer than the tires they were using. So then I had to get my car and the whole 9 member Italian Team all squeezed the tires before they could believe it. But for that particular track the firmer tires were better.

I can't think of any instance that we've run under where the super soft tires are better. They simply do not give as much traction, they wear out faster and on high traction tracks they can make a car chatter in the corners. We had some of this super soft rubber at the shop and National Champion Bill Jianas came over, saw it and said, "Gene, I've got to run this rubber." I said "Don't waste your time, Bill. We've tried it and it doesn't work. It feels fantastic, but it doesn't have traction." Being the inquisitive racer that he is, Bill had to try it anyway. A few days later at the track, I saw Bill, who was already running when we got there. I asked him about the tires and he said, "You're right, they didn't work. But they feel so good!."

There are a whole lot of things that can affect a tire's performance. There is an

to page 114

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PIT STOP

from page 112/71

unlimited amount of variations in rubber compounds. The front molded tires that Associated makes contains 17 different ingredients. Various rubbers are rated as to their resilience, durability, uniformity, tensile strength, abrasion resistance, elongation, compression set, weight, etc. The same basic type rubber made by two different companies, comes out entirely different. Even different batches of rubber from the same company will vary. I know exactly what kind of rubber I would like to order, but the rubber manufacturers cannot guarantee delivery of an exact Durometer measurement, with exact resiliency, exact elongation, exact abrasion resistance, etc., etc. They have a tolerance, and it seems no matter what they make, it falls within that tolerance.

The basic rear rubber we're working with is the highest traction material that we've found, but, for front tires, we have a lot more to work with. For front tires, we don't need the highest traction we can find, but rather a compound that will give a certain amount of traction, with a certain amount of slip and all the wear we can get. And, as you might guess, there is a wide variety of front rubbers used. The front tires chosen, will depend on how much traction the track has and how smooth or rough the track surface is. Some front tires are super hard — they feel rock hard. The are used on slippery tracks and will have a very long life. There are also medium hard front tires, made from a similar material giving a little more traction and a little less life. Sponge tires are also used which give the most steering but also wear out the fastest. The Associated molded front tires are kind of a compromise. They give good traction on a wide variety of tracks, yet last quite a long time. It's just a question of trying the different tires to see which works the best on your track.

Another thing affecting rear tire traction is tire diameter. The vast majority of racers prefer small tires, it seems the smaller the better. I'm not sure how this thinking got started. It's a well-known fact with tire engineers, that a larger tire patch will give more traction that a smaller tire patch. The patch is the area of the tire that touches the track. A good example of this is the fuel dragster and funny cars. They run large diameter, wide, wrinkle wall slicks in an effort to get the largest tire patch possible — to a point, that is. A tire that is larger than necessary, will waste too much horsepower in turning the rotating weight.

The tests that we have run with rear tires have shown that the large 3¼" rear tires have given the Associated cars the

to page 116

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PIT STOP

from page 114/71

most rear traction. Even at a high traction track as Thorp's, the Associated cars used the 3¼" tires to win the first seven places, so they must work fairly well. On the other hand, the winner of the "B" Main, Phil Booth, used 2¾" rear tires on his P.B. car, which were actually smaller than the molded tires he had on the front wheels! Different approaches. Maybe what works for someone doesn't necessarily work for someone else. So, do your own testing for your own particular car and track combination and run what gives the best results. Good luck in your racing. □

VIKING

from page 67/64

(*14) through (18) Same as Mark I.

(*19) Remove the wing from the board and install the bottom sheeting. Type A. Repeat these 19 steps on the other wing half.

(*20) Same as Mark I.

(*21) Epoxy the dihedral wires to the upper and lower main spars.

(22) Install the root section sheeting. Type A.

(*23) through (28) Same as Mark I.

Final Assembly & Trim:

(1) Paint or cover the fuselage with the covering of your choice.

(2) Cover the fin, stabilizer, rudder and wings.

(3) Mark the location of the fiberglass wing rod tubes on the fuselage. Be careful to get the wing incidence correct. Install the tubes. Type E.

(4) Cut oval shaped holes in the fuselage sides for the screw eyes and the spoiler cable. Drill a 1/4" diameter hole in F-3 for the spoiler cable. Put a flat washer on a #2 x 5/16 sheet metal screw and install in the last hole in the spoiler servo arm. Slip the looped ends of the dacron lines over the screw and check that both spoilers start to open simultaneoulsy.

(5) Make the tow hook and install it where shown on the plans. Type E or C with filler. Adjustable tow hooks are not needed nor desired on the Viking. A captured, releasable tow hook may be used, although the advantage gained is very small with a high C/L airfoil, and, in addition to complicating the ballast installation, it adds weight and is something else to go wrong — to each, his own.

(6) Initially — use a 7/16" servo arm on both the elevator and rudder, and a 9/16" arm on the spoiler.

(7) Balance is very important. Initially, set the C.G. under the center of the spar.

to page 118

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VIKING

from page 116/64

For light air thermalling move C.G. back until just before it starts to become squirrely. This will vary from plane to plane and especially from pilot to pilot. For speed, add as much weight as you wish (maybe 5 or 6 lbs.) in the ballast compartment a little ahead of the C.G. to move the C.G. to about 25% — 28%.

Check your wings for warps after covering. Make sure the covering is tight and adhered to every rib. **No wash out!**

Good Flying! And may your Viking help you to become the World's Grand Champion — but look out — you'll have me to beat!

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Set (4 pc.) plastic spoiler horn	.50
Set (4 pc.) Alnico magnet	1.00
A-1 bellcrank	.95
SP-513 .046 I.D. x 25 nylon tube	.25
SP-312 .076 I.D. x 30 antenna tube	.25

□

AEROMASTER "TOO"

from page 63

more balsa blocks to the nose, installed the engine with a 2" Fox aluminum spinner, and shaped the front of the plane to what we felt was a pleasing configuration. You can do the same. Covering was done using World Engine's heavy duty silk, Randolph's clear nitrate and clear butyrate dope, Sig's and Randolph's colored butyrate dope. Sherwin Williams #R7K-203 or #R7K-6231

to page 120

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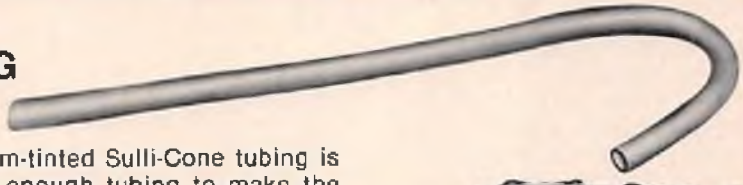

A full 12-inch length of exclusive cream-tinted Sulli-Cone tubing is now included with every tank. That's enough tubing to make the pick-up and connection from tank to engine.
Cream-tinted because it's the cream of all tubing, new Sulli-Cone is stronger, fuel-proof, and won't tear or slip off even if there's a crash. Heat won't bother it, either. Best of all, it lasts and lasts and lasts.

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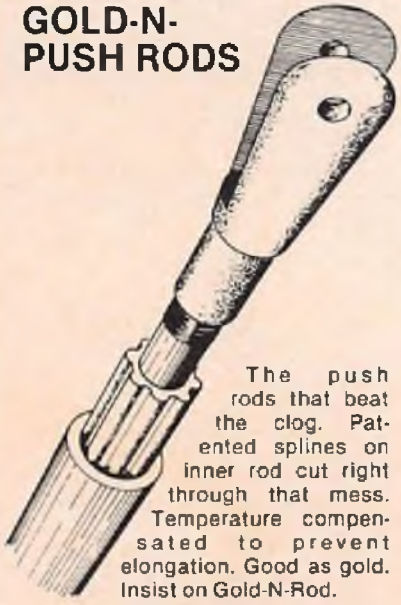
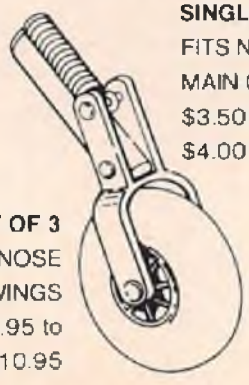


The push rods that beat the clog. Patented splines on inner rod cut right through that mess. Temperature compensated to prevent elongation. Good as gold. Insist on Gold-N-Rod.

Clevis not included.

SMOOOTH LANDINGS



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AEROMASTER "TOO"

from page 118/63

acrylic lacquer thinner was used. Both are top of the line, slow drying, high gloss, and blush resistant. For the finishing touch, we used a heavy duty silicone car wax and cleaner.

Lou Andrews kits produce planes that will make you the envy of your club, group, family, and an occasional passer-by, as we found out when the big day arrived. To be honest, we had so much fun building , it was almost anti-climatic to get on with the flying. But get on with it we did, and it was nothing but fun.

Ailerons and rudder trim were left neutral, and approximately one or two degrees of down elevator were used for the initial flight. A short run brought the tail up in very scale-like performance, and about the same time the rudder control began to take effect. After that, it was back on the stick, and we had hold of one of the most responsive flying general sport models it has been our pleasure to fly in a long, long time. We flew with all the aileron and rudder throw we could get, with just a fair minimum throw on the elevator. With this much control, when you move the stick — things happen — now. Ever try a snap roll at **full** throttle? If the idea has some appeal to you, rest assured that the Aeromaster "Too" is the plane that can do it. Try it - - - you'll like it. □

FLYING IN JAPAN

from page 62

Lunch was followed by a speech about flying and modeling in the United States. Many of the Japanese modelers had questions about new designs and the F.A.I. program. There enthusiasm was amazing. many of the modelers tape recorded the whole session. This meant recording the English sentence followed by the Japanese translation — so much tape was used, and again much patience was practiced by all. But from the expressions on their faces, everyone was enjoying this memorable day. It was only when the announcement came that the tramway would be closing for the day, that the modelers reluctantly packed up for the final descent down the mountain.

Some eleven hours had passed since some of these fliers had left their homes for a day of flying — and now it would only take five more hours to return to their homes! Dedication to the hobby and love of this great sport was very evident that day. It was an honor to be with such a marvious group of fliers, and to share the hobby with them. Is this a typical day of flying for the Japanese flier? From what we could learn from the individual fliers, it is quite typical. We were amazed that the modelers went to such great lenghts to go flying — they were amazed to think we might even feel that they were doing anything out of the ordinary! The honor of being a part of this group for just one day will long be remembered. To our Japanese friends "Aregato Gozaimas" (thank you). To our fellow American modelers — you never had it so good! □

New Lamborghini Countach from Cox.

A car called Lamborghini Countach better be spectacular. And this one is. You start with a full 2-channel radio system packed right in the box. Then, speed. Any speed. Because the Lamborghini Countach has fully proportional speed control, forward and reverse. No "hi/lo" only.

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1505 East Warner Avenue, Santa Ana, CA 92702

DUCTED FAN DESIGN

from page 61/58

162 will also be offered by Midwest since the .40 model is such an excellent performer.

Corrections to typographical mistakes in Parts I and II of Ducted Fan Design are provided below:

Part I; October 1977
P. 82

$$T = 13.13\left[\eta_F \, BHP \, D_o \left(\frac{D_e}{D_o}\right)\right]^{2/3}$$

η_F = Fan Efficiency

P. 84

$$D_o \left(\frac{D_e}{D_o}\right) = D_e$$

Which shows that, in the thrust equation, thrust really depends only on exit diameter, De. The more complicated expression is used because the designer is generally most interested in fan diameter, Do, and the tailpipe contraction following the fan (D_e / D_o).

Part II; November 1977
None

□

REVENGER

from page 57/48

has dried (approximately 8 hours), apply another strip of 1/4" masking tape on top of the previously applied tape. This will provide a guide to cut the upper surface of fillet. Using caution, cut through epoxy using the tape as a guide. Remove both strips of tape from canopy. Trim as required to provide a smooth edge. Apply another strip of tape around canopy next to the fillet edge, then mask off entire canopy. Fillet can now be sanded to a feather edge without scratching the canopy.

to page 124

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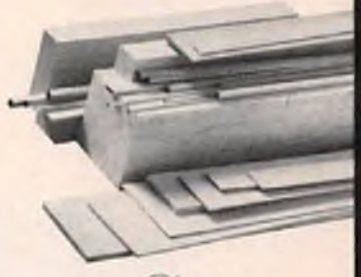

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AMA-SP

from page 122/48

Rigging:

Rigging is academic for the seasoned builder but for those who are relatively new, I'll briefly tell you how I install my radio gear.

First of all, install the servos in the fuselage as far aft in the fuselage as possible. Install the servos or servo tray on pine rails 3/8" square. Mount rails across fuselage and secure in place using Devcon 5-Minute Epoxy. Cut four reinforcement strips from 1/8" balsa in the shape of a "U" and epoxy on fuselage sides at end of each rail.

Assuming you are using pneumatic actuated landing gear, I recommend you install the fill valve and storage tank at this time. Be sure the ends of the tubing are new (cut back if using used tubing) to prevent line leakage or possibly blowing off. Experience has proven that one time or another the tank will have to be removed. If you epoxy the tank to a couple of pieces of hard or firm foam, the tank can be readily removed by breaking away the foam.

Fabricate pushrods from 5/16" square spruce. The pushrod for the elevator(s) should be a dual output to enable elevators to be adjusted independently.

Balancing:

I recommend that the radio be installed in the relative location shown on the drawing. The CG should fall within the forward and aft range as shown on drawing, if not, use Allied Hobbies stick-on weights, (or equivalent) to bring it into the above mentioned range. **Do not** fly until the CG is correct.

Next check the lateral balance of the wing/aircraft. Place the airplane on a flat table. Using an X-Acto knife, slowly pick the nose up (using knife edge on end of spinner) and observe which way (if any) the wing falls. Install finishing nails nailed in end of light wing until balance is perfect.

Flying:

Almost every construction article I've ever read makes the statement "If this is your first high performance airplane, get someone with experience to help you on your first flight." I must admit this information is sound advice.

Prior to the first flight, check controls for ease of movement and freedom of binding. Make sure the ailerons are rigged properly, i.e., right aileron is up and left aileron is down when right aileron is commanded. Check elevator, aileron and rudder throws to verify they are as called out on drawing.

Triming:

Trimming can be a very long and tiring process. If the plane has been built true, the trimming will be relatively easy.

to page 128

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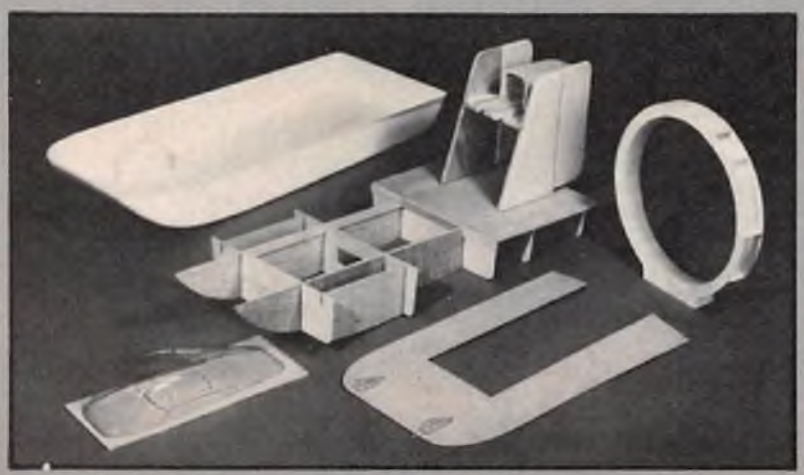

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The "Black Widow" pioneered the "eree" new man ner of warfare in 1944—"night fighting".

The "Widow" became feared by enemy aircraft be cause they were never sure of her presence in the blackness of night flying, and knew of the devastating effect of the four 50 caliber machine guns coupled with four 20mm cannons.

About The Kits:

Unique because such amazing scale detail is achieved with these kits that are relatively easy to build. They can be built many ways, such as: Rubber Powered (as supplied), Electric Motor, .020, .049 Engine Power, For Free Flight, Control Line, R/C (Single or 2 channel) or Static Scale. Any version makes a museum-like model. Frame members are accurately Die Cut from the finest quality Balsa Wood, and every part is numbered to insure fast and accurate assembly as clearly shown on the easy step-by-step plan. Highly detailed Plastic Parts simplify assembly adding a touch of realism-in-miniature. Covering material, formed wire parts, Wheels, Decals, Hardware that includes Control Line parts is a partial list of the contents of these fine kits.

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

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

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

P-61 Black Widow

Kit E-15

Wingspan: 37 1/2"

$19.95

Sterling MODELS INC.

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REVENGER

from page 124/48

Before going into the fine trimming, let's check to see if the throws are adequate or too much. After take-off, trim the plane for straight and level flight and check your trims on your transmitter. If the trims are approaching full throw to one side or the other, land the plane and adjust the throws accordingly.

I'll assume the plane is now trimmed for straight and level flight, now let's check CG location, with airplane flying straight and level, introduce a reasonably sharp bank to the right or left and then neutralize the controls (with hands off) and watch the plane. It should continue in the bank for some distance without gaining or losing altitude. If the plane climbs, it's tail heavy, and if it dives or loses altitude, it's nose heavy.

Now let's check for aileron position; with plane flying straight and level, pull up vertically and neutralize controls (hands off). Observe if the plane continues straight vertically or pitches forward (as in an outside loop) or back (as in an inside loop). If the plane pitches back, raise both ailerons until plane climbs straight vertically. If plane pitches forward, lower both ailerons until plane climbs vertically up.

Now let's check for yaw. Fly the plane straight at you, pull back on the elevators, as plane climbs vertically, observe if plane yaws right or left. Re-trim plane until plane climbs vertically without using rudder.

Next we'll check for proper thrust angle. Again with plane flying straight and level, chop throttle, plane should continue straight and level for a hundred feet or so. If plane climbs, the engine has too much down thrust. If the nose drops, the plane doesn't have enough down thrust.

Now let's take a look at the loops. First of all, how much elevator do you need? The most important thing is to have enough to make the size of loop you want without running out at the bottom. Pull up into a nice big inside loop using elevator only. Watch the wing tips, does it track through or does it pull out with a wing tip low? Repeat this several times and observe which wing tip is low. Add weight to the light wing tip a little at a time until the plane will track true.

As with any plane, each has its own flight characteristics. The Revenger is no different, it has its own. I have found the preceding to work well for me, but you might have some ideas of your own.

I have found the Revenger to be a true and honest airplane that not only is enjoyable to build and fly, but also attracts a lot of attention at contests, especially with the competition. Good luck with your new Revenger. □

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BOX FLY BIPE

from page 47

. . . . airplane crashed in a corn patch damaging the bottom wing only. The Box Fly Bipe is definitely a durable airplane.

In conclusion, the Box Fly Bipe is a Fun Plane to Fly, not difficult to build and able to withstand a few hard bumps. □

MAGIC MOLDER

from page 45/44

(11) Turn off the vacuum and let the plastic cool.

(12) After the parts have cooled, remove the formed part from the frame (see Photo 4). Trim as required, and there is your part.

Photo 5 shows an example of what happens when the plastic is not heated enough to form, and an example of a part formed with proper heating. If you do goof and the plastic did not pull loose from the frame, put it back into the oven and try it again. I did this three times on one item before I got it right.

Photo 6 is a canopy pulled from a piece of .030" thick plastic (about 1/32"). Photo 7 is the same canopy pulled from a piece of clear plastic .020" thick (a little more than 1/64").

Photos 8 and 9 show the depth of the plastic that was pulled. 2⅛" for the cowl and 1⅞" for the canopy. 3" depths are no problem and 4" is possible if you work carefully.

Photo 10 shows the vacuum formed parts and their molds. I was able to get the center of the cowl to pull in by drilling a hole in the center and making runners. Another way would be to drill very small holes around the center of the cowl.

Now that we have gone through how to vacuum form using Wing Mfg. Magic Molder and Forming Machine, let's discuss preparing a mold for vacuum forming.

Balsa is the most adaptable and easily worked material for a mold, but other materials such as basswood, plastic, metal, rubber, epoxy or ceramic, to name a few, may be used. Hollow objects must be filled with modeling clay or plaster so the mold will not collapse during the forming process. A vacuum forming mold must have a flat bottom with no undercut, because once the part is formed it cannot be removed.

First, glue two balsa blocks together with fiberglass resin. The seam will be used as a centerline. The mold will be finished with fiberglass resin and other

to page 132

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Size: 2.2x1.25x1.25 Wt. 4 oz.

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	S5442K	Kit of S5442 servo	544 IC	19.00	
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NRCHA ANNOUNCEMENT

Dear NRCHA Member:

It is with extreme regret that we must inform you that effective with this letter, we will no longer be able to continue with the NRCHA program. We have found that in the past year it has taken a full time girl and one part time helper, over 40 hours a week to keep up with the correspondence, membership requests, Grade Level forms, etc. Although, the NRCHA funds have never been able to pay the salaries for these people, or for the printing and postage costs associated with the NRCHA, RCM has always been more than happy and willing to absorb the costs. We have now reached a point where it would take an additional full time person to handle all of the necessary paper work involved, and we feel that this is just not possible to do.

We do hope that a helicopter group will be able to form and hopefully continue with the principles that the NRCHA has had. And be assured that RC Modeler Magazine will do all in its power to promote any group of helicopter enthusiasts who wish to start such a program.

Any helicopter correspondence should be addressed to Don Chapman, our Hover editor, care of RCM.

There is no way to thank all of the many people who have given their time and assistance to the NRCHA, but please be assured that thank them we do, for without their help the NRCHA could never have gotten started.

We wish all of you the best, and thank you all for your support over the past years.

Sincerely,

Don Dewey
NRCHA President

MAGIC MOLDER

from page 130/44

glues are liable to be non-compatible. This incompatibility causes the glue seams to bulge when subjected to heat during the vacuum forming and shows up on the finished part.

Second, prepare cardboard templates of the cross-section at several points and carve the mold very carefully to these contours.

Third, use sandpaper during the final stages of shaping. Fill nicks and low areas with spackling compound.

Fourth, finish the mold with fiberglass resin. Apply at least two coats, well sanded with successively finer grades of sandpaper, finishing with 400 wet paper. The finished formed part will be an exact duplicate of the mold, so if the mold is rough, then the finished part will show the same irregularities.

If the mold has a good tapered shape, it will come out of the formed plastic part fairly easily. If there is a tendency to stick, dust the mold, before forming, with a brush dipped in talcum powder. Any haze of powder that shows on a clear plastic part can be removed with aircraft windshield polish. This polish will also remove other small imperfections in the plastic. Do not use wax or spray mold release; they will cause air bubbles when vacuum forming due to the heat. Remember that the material you use to make or finish the mold must be heat proof or it will be destroyed.

Okay, there you have it - - - how to use the Wing Forming Machine and how to make the molds for vacuum forming. It may sound complicated and time consuming, but after it is done, you will find it is not that complicated and definitely worth the time. Have fun and good luck. □

OBLIQUE WING AIRLINER

from page 43/40

a manned pilot riding inside. The next oblique wing research airplane will be a manned aircraft, weighing about 1,500 pounds, and having a length and wingspan of approximately 30 feet. It will be powered by two small jet engines that will give it a maximum speed of about 300 mph. This will be the AB-1 and it will be constructed of foam covered fiberglass. It should fly in about a year and a half.

Any aircraft development program is a long and costly process, especially if it incorporates anything as radical as a pivoting wing. However, unmanned models such as the oblique wing RPRV can play an important role in reducing the cost and the risk. □

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DEALER INQUIRIES INVITED.

HERE'S HOW

from page 38

say the least; the smooth response to the throttle and the aircraft coming up to speed took my thoughts back to my first solo flight; the climb-out was one of wonder as this aircraft weighed 33 pounds and it was climbing like a homesick angel. After trimming on flybys, it had such a realistic sound and is so large and impessive that it really leaves one in a state of awe. Landing this bird was another thrill as it certainly didn't set down where I had expected it to! The size had thrown me a real curve as to judging the distance.

"The finished kit looks like a Bellanca Decathlon, small tail dragger glass aircraft, a little over 6' long with 109" wingspan. The 1/4" balsa fuselage sides come sub-assembled and laminated with 1/16" aircraft grade plywood from the nose to just aft of the cabin. These are precision router-cut to size and shape and the bulkhead braces are applied while the sides are in a jig, insuring the accuracy of the location of the bulkheads and firewall. All the rest of the parts for the fuselage have been precision cut for ease of assembly and to insure a straight and true aircraft. The firewall has been sub-assembled and drilled for the Quadra engine. The parts for the vertical and horizontal stabs have been pre-cut so they can be glued up readily. The 3/16" piano wire gear assembly is self-jigging once the fuselage has been assembled. Push/pull controls are used on ailerons and rudder; fiberglass shaft with a special fitting for the split elevator is used for ease of hook-up and maximum control. Bulkheads are 5-ply aircraft grade birch plywood which are also precision cut. Landing gear

plates are 7-ply aircraft grade birch, pre-slotted for wire gear. Aluminum gear hold-down plates and aluminum strut supports are finished pre-drilled. All ribs for the wing are precision router-cut birch plywood with lightening holes. Aluminum spars, 1" main and 3/8" trailing — 6061 — .058 wall no less, with a 7/8" insert at the center section, are the integrity of this plane's ruggedness. 3/16" x 1/2" aluminum struts capped with balsa, pre-slotted for 3/16" aluminum rod, are used for the wing support struts. Aileron hinges specially designed for this large bird are aircraft grade aluminum and are unique in their smooth and easy operation. All aluminum and special parts, bolts, nuts, etc., are supplied with the kit. The only extras that the builder need supply are glue, covering, wheels, engine, radio and tank. We've really tried to do a bang-up job on both the design and construction of this kit as well as the instructions and plans. The anticipated price of this quality kit is $249.95. This aircraft is not be be compared to model airplanes, as it is truly a first in its field and is designated a miniature aircraft (remote piloted vehicle). We are taking orders on this kit now."

There you have it, gang. If you have any questions, give the nice people at E.W.H. a call. They will talk to you! □

FLUTTER

from page 37

to flutter. Several other factors affect this relative springiness of the installation and I'll mention a few, briefly before we go on

(a) Thick servo tape has a lot of give to it. Thin servo tape, or the servo tray with rubber and metal screw mounts, will give a desirable increase in the stiffness of the installation.

(b) Some long servo output arms are springy, whereas an output disk is quite stiff.

(c) Most elevator and rudder horns are stiff, but mounting the pushrod in the hole nearest to the hinge line gives the

vibratory forces an undesirable mechanical advantage against the pushrod that can really lower the overall natural frequency of the installation.

(d) Some aileron torque rod assemblies are too flexible. This is especially true if they are extended very far out into the wing. But even if the torque rod is short and stiff, a long flexible strip aileron can give conditions favorable for flutter at the tip even though it is quite stiff at the root.

(e) A split elevator with a good stiff pushrod installation going to one side, and a flexible torque rod going from that side to the other elevator, can produce conditions where flutter will not occur on the side held by the pushrod, but will occur on the side connected by the torque rod.

With helicopter blades and glider wings, the stiffness that we're talking about isn't what we feel when we try to deflect a control surface about its hinge axis. With these surfaces, the stiffness that affects susceptibility to flutter is its torsional stiffness. That is, if it is held by the root, and the tip is twisted, a resistance will be felt. If the wing or rotor blade is relatively stiff for its size, the natural frequency of torsional vibration, and thus its ability to resist flutter, is correspondingly high. The main problem in dealing with flutter in glider wings and helicopter rotor blades is, as I said before, in attempting to increase the torsional stiffness, we are also likely to increase the moment of inertia of the unit about its torsional axis. The increased stiffness is valuable for delaying the onset of flutter to higher speeds, but, unfortunately, the structural techniques that can be used to give the increased stiffness also increase the moment of inertia thus, to some extent, offsetting the advantages of the increased stiffness.

Now, back to the guy who wants to make sure that he never gets flutter again. "That's great, but I'm not really

to page 138

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from page 136/37

satisfied. I checked my controls, and they're as stiff as I can get them without tearing my whole plane apart. Also, I really don't want to completely rebuild my control surfaces to make them lighter." Well, friend, there is a better way. Lightweight and stiffness have their place, but it seems that once you've had flutter with a model, you just can't get over the feeling that it's going to happen again. This is especially true if you haven't found anything that was really loose, or sloppy, or flexible that you could make a big change in. A little bit faster in the next dive, or a little more power as the engine comes in, and all that time spent rebuilding goes down the tubes. I know - - - it has happened to me. Well, I said at the beginning of this installment that there are two basically different ways of dealing with flutter. In the first segment I attempted to describe the process of delaying it so that it won't occur within the speed range that your model can reach. Now I'll try to describe the second technique that will eliminate it at any speed that any model can attain. In an attempt to keep my discussion clear and simple, I showed that flutter is principally affected by the force and frequency of an aerodynamic force, and the inherent natural frequency of the control installation. That is accurate as far as it goes, but it assumes a control surface that is hinged along its leading edge, as almost all models are. (Gliders, helicopters and others, hang in there, I'll get to you later.) If you take a thin 3" x 36" sheet of balsa, hold it by the center of one of the long edges and drop it, you will notice that it rotates as it falls to the floor. That's because the sheet is aerodynamically unstable. This same instability is inherent in a normal model control surface. Even though it has a hinge along the leading edge that tends to keep it in line, it is inherently unstable. This instability is actually an essential ingredient for flutter to occur. Again I'm simplifying something that is really more complex than what I'm saying, but I want to keep it that way because I'm actually heading toward practical applications for modelers, rather than full theoretical understanding. For the models you see at the field, this unstable condition is always present because of the way that we've learned to install our control surfaces. That's why I felt free to say earlier that all of our models are susceptible to flutter. If, however, you can cure the instability, and do it properly, you can, for all practical purposes, eliminate the possibility of flutter completely. Even though the frequency of the aerodynamic driving force reaches the natural frequency of the control installa-

to page 144

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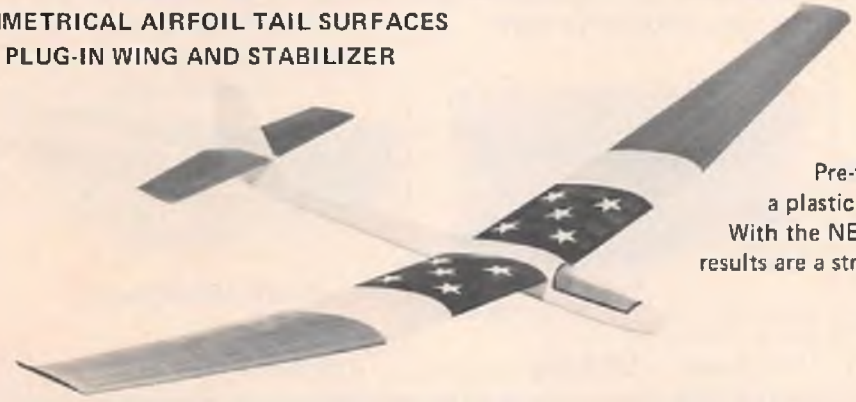

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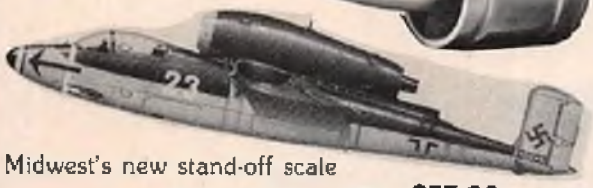

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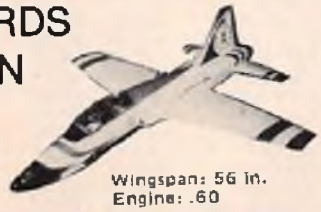

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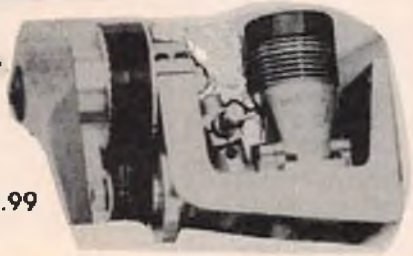

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FLUTTER

from page 138/37

tion, a stable control surface exchanges energy with the airstream in such a way that when something starts the flutter, it quickly damps itself out.

Take the same 3" x 36" balsa sheet, and put a row of paper clips along one of the long edges. Now, if you've put on enough weight, dropping it will result in a straight stable dive to the floor. Even if you release it in such a way that it rotates, the rotation will quickly stop and a straight stable flight will follow. This is the second method for flutter control. By taking an unstable control surface and balancing it, you can create stability that effectively prevents flutter. Helicopter rotor blades and glider wings are usually not much more stable than the 3" x 36" sheet that I described above. They too can be modified to prevent flutter with complete assurance only by balancing them properly. For rotor blades, this balance doesn't refer to the teetering balance that any helicopter builder is aware of. This is the chord-wise balance of the blade so that it is much heavier at the leading edge than it is at the trailing edge. In full scale helicopters this balance is sometimes achieved by building a heavy steel bar into the leading edge and extending along the entire span of the blades. Other helicopters use a heavy walled metal extrusion in the leading edge, with lightweight honeycomb, or fiberglass construction for the rear two-thirds of the blade. However it is done, the outer portion of a glider wing or helicopter rotor blade can be prevented from fluttering by adding weight in such a way as to cause the wing or blade to balance at its one-quarter chord point.

For a well built model that has a flutter problem, there is no really good solution except balancing. The techniques for **delaying** flutter are useful in avoiding construction errors or for detecting deficiencies in finished models. Where a really unsatisfactory condition is found to be present, correcting it should give as much freedom from flutter as similar models have. But, where there is no obvious error in construction that can be corrected, and on models that have shown that flutter problems are inherent in the design, balancing of the control surfaces is the only really effective solution short of complete re-design. To be effective, this balancing must be done properly. Next month, I'll go into practical model methods for balancing in specific applications. I'll also talk about more specific ways to stiffen control linkages, the role that control surface shape plays in flutter, the real problem of distinguishing between ailerons flutter and wing flutter (which can really trip you up if you aren't careful), and a little bit about aileron reversal at high speed. ☐

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MASTERCHARGE BANKAMERICARD

from page 32

structure, apply the 1/16" balsa sheet to the top and bottom of the leading and trailing edge. Next add 1/16" x 1/4" balsa capstrips to each of the ribs as noted on the plans. Be sure you fill in the area where you will drill for the 1/4" nylon wing bolts with hard balsa block before applying the rear top center section plywood.

The wing tips are cut from 1/2" light grade balsa sheet. Taper as shown before applying. I lightened my tips by drilling out some of the wood with my X-Acto hole cutter. The tips are covered top and bottom with 1/16" balsa sheet.

Wing Fairing

Using a good grade of carving balsa, shape the front and rear fairings that blend the top of the center section to the fuselage. The front fairing is glued to the wing leading edge area as shown on the fuselage plan. The rear fairing is made removable in order to gain access to the aileron servo and the nylon mounting bolts.

Tail Surface Construction

The complete tail assembly is made from 1/4" x 4" balsa sheet. This is one place where you will want to select the very best grade of lightweight balsa available — something that will hold its shape after you have formed it to the cross section shown on the plans. The trailing edge of the fin and stabilizer has a 1/8" basswood or pine strip for added strength. I found that the Goldberg Hinge Slot Cutter works very well with the basswood.

Be sure all of the tail surfaces work free and easy before assembly to the fuselage. Place the wing securely in position and line up tail assembly before gluing. The final step is to add the small soft balsa fairings in the area where the fin meets the stabilizer.

Landing Gear

The landing gear is a practical design for taking the abuse inherent in a training plane application. The two main legs are bent from 5/32" piano wire and the center support is made from 1/8" wire. Use the full size layout on the plans for accurate bending as required. Fine brass wire wrap all joints prior to soldering.

In order to mount the completely assembled gear on the fuselage, it is necessary to cut out the lower stringer in that area. As the final step, replace the stringer and complete the 1/16" balsa covering on the lower fuselage.

to page 148

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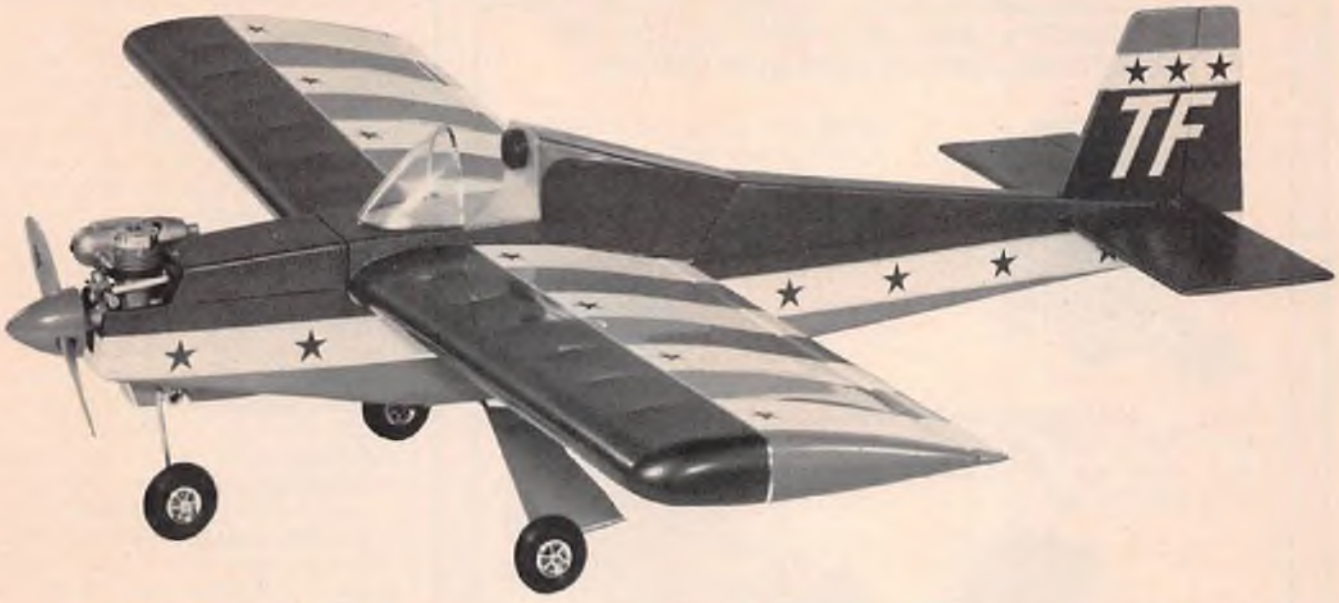

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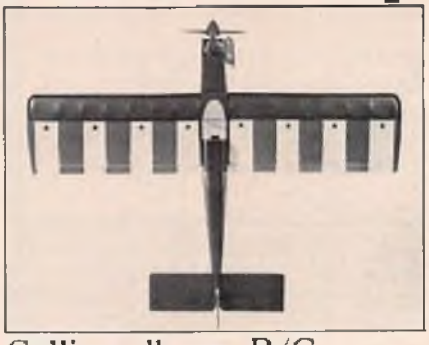

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from page 146/32

Engine and Cowling

I suppose one of the main reasons this trainer appears to be early vintage is because of the engine cowling. Most of the free flight gas models in the 1930's had a similar layout. Keep it simple but protect the engine which, by the way, was the major investment in those days.

As shown on the plans, the engine is mounted upright on the center line of the fuselage. I used a Kraft rear rotor type mount in order to get the engine as far forward as possible. Engine selection ranges from .35 to .45 with an OS .40 shown on the plans. My trainer has an Enya .45 which is enough power to maintain altitude on half throttle. A good feature to have on a trainer.

The cowl is formed from four pieces of medium hard balsa block. Rough shape each part before assembly to the firewall. Make a cardboard template of each cowl side and use it to superimpose the cutout for your particular needle valve and muffler. I installed a Semco exhaust extension, although most any muffler will work. A small extension adaptor will usually be required so that the muffler will clear the right side of the cowling.

After assembly of the cowl to the firewall, do your final sanding so that it blends in nicely with the fuselage. The last step prior to admiring your new cowl is to apply a coat of Hobbypoxy Formula 2 throughout the inside area of the cowling. While you have the glue mixed, coat the entire inside of the fuselage, back to bulkhead F5, and also the aileron servo box in the wing center section.

Covering and Finishing

Following my usual procedure for tail-draggers, I decided on Permagloss Coverite for the "fabric look". Two rolls will do the job, although there is no room for careless cutting.

I thought long and hard on selecting a color scheme until a good friend informed me that most early trainers were painted blue (fuselage) and yellow (wings). The numbers on the wing and tail, as well as the fuselage striping, were cut from 6" wide Goldberg DJ multi-stripe. I found the overall color combination to be very striking in appearance and easy to see in the air.

Flight Controls

The servo installation and flight controls in this trainer are pretty standard. Careful thought has been given to easy access for adjustment or removability when required. The aileron servo can be adjusted without removing the wing, which I found handy during the initial flight tests.

The control travel is normal and not overly sensitive on rudder and elevator. The ailerons need full travel in both directions which seems to be inherent with

to page 150

TMTT

from page 148/32

this sort of design. Actually the trainer would probably be a good three control airplane although I have not experimented with it as such. In the good old days, we flew them like this with the only control being a hard toss and a quick prayer.

The Center of Gravity should be a little forward of one third of the way back from the leading edge of the wing. It is better to have this airplane a little nose heavy than tail heavy. My completed model weighed in at exactly 6 pounds.

Good luck with your "Taildragger Trainer." If you build this plane and master its flight, the day will come when you take your place at the head of the class and they will call you "Ace". □

WINDFREE

from page 30

than we do and really don't need that extra insurance! Another modification was the use of a cut-down nylon control horn to replace the wooden one specified in the plans. A very important point should be made before going further — **do not** make any modifications to the wing. On first examination, it may appear that the wing will be too weak if built according to instructions. Do not, repeat, do not add or leave out any sheer webs, or otherwise fool around with the wing design. It was meant to flex and distribute stress throughout the entire wing. By adding extra, uncalled for sheer webs, the wing could become too rigid and this, of course, could result in the concentration of loads in an unstressed area — with some very spectacular results! So, pay attention and build like Mark says. After all, Windfree has been getting around pretty good with this design for a spell now, so why fool with it? We covered our glider with MonoKote, gave it some fancy trim on the wings and fuselage, and then proceeded to find out what kind of a bird we had on our hands. Well, the first thing we learned was that the adjustable tow hook was not necessary. We set it up on the recommended location for the regular fixed hook, and never had to move it, regardless of flying conditions later. Like we said before, these are good instructions and plans, and tow hook locations are not something to make any theoretical guess at. It appears that some flying with the prototype was done before that insignificant little line was put on the plans that told us to install our tow hook "here". We bring this out not because it's any big thing but, on the contrary, it's typical of the attention

paid to all the little things. Back to the flying. At the start of this review, we mentioned that this glider would fare best for those of you with a little stick time under your belts. This wasn't intended to make any of you Jonathon Livingston types shy of it. On the contrary, it's a plane that goes where you tell it, and no fooling around. You just have to know about some of the little things like what control stick to move in what direction when it's coming straight at you with the right wing low - - - and **don't ever slow up on a downwind turn**, and other similar stuff. Seriously, we found Windfree very responsive to our commands, and a straightforward flying sailplane. With a little experience, extended thermal flights are a reality. It has been designed to fly fast — faster than most gliders in its class, and it is this speed that gives it the fine performance it enjoys. With the speed, comes penetration, and who among us has not found himself (herself) at the downwind end of things with zero lift, and **everybody** catching lift at the upwind end? Well, Windfree can't do the impossible, but it'll get you further upwind than most, and that can be the difference between flying or not. As a matter of fact, we have flown her in approximately 25 mph winds with no worry — and no extra ballast. Try that on your floater. With the controls set up for quick response, the performance is sparkling. Windfree has been around for a spell - - - we suspect she'll be around for a whole bunch more. □

SUPER SCALE NEWS

from page 27/24

ture, although there aren't too many lightly built areas in the larger models. After this has dried, I use an ordinary metal or enamel primer coat sprayed on, either using the pressurized spray paints of your paint spray outfit. The primer fills the material better than anything else I've found so far. I then paint over the primer with the paint I've chosen for the eventual finish. It both looks good and is quite inexpensive.

My use of the above method has been for the Quadra engine and the exhaust from a gasoline fired engine is not nearly so destructive to paint as is glow exhaust. The exhaust isn't that much different than the exhaust from your car and many paints will withstand it that might not resist nitro exhaust. The acrylics, however, seem to be hot fuel proof and there is a primer that can be used with the acrylics and it should do as good a job as the ones I have been using. So there may be a solution to the costly covering of the larger models that will withstand glow fuel exhaust without disappearing in flight.

to page 154

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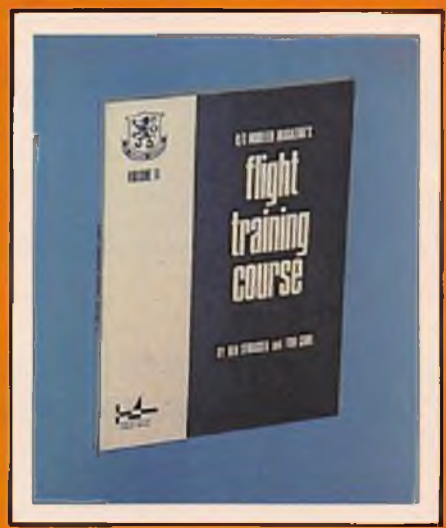

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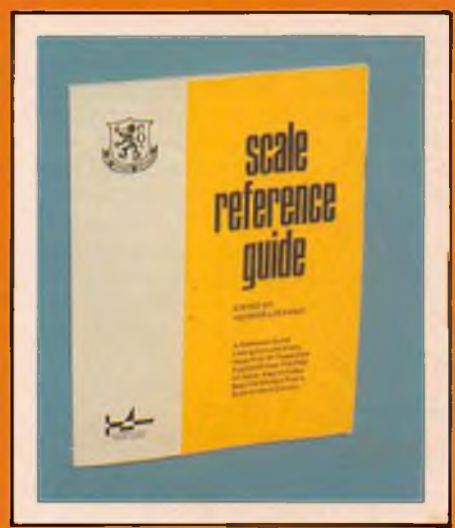

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SUPER SCALE NEWS

from page 151/24

★

I had some information recently on an engine being manufactured and marketed in Sweden. It is the Damo FS 218 and is available through Marketing Consulting Corporation AB, P.O. Box 240 11, S-750 24, Uppsala, Sweden. The Damo is a twin cylinder opposed engine of 1.1 cubic inch displacement and is a four cycle engine. It weighs in at 19 ounces and has a compression ratio of 8.5:1, producing 1.25 h.p. Maximum rpm is in the 11,000 range and idle is at 1200 rpm. This is a glow engine but differs in that it will run on straight methanol with the addition of 10% nitro, no oil, which solves the problem of all that goo all over the outside of the airframe. The addition of 5% oil is suggested in a tightly cowled installation.

Construction is as follows: crankcase, cooling fins, pistons and heads are cast, machined aluminum. The liners, valve train, cam, crank shafts, and timing gears are hardened steel. Valve guides and seats are bronze and the rings are cast iron. Crank runs in four ball bearings and the camshaft in two needle bearings, conrods are needle bearings on both ends. Carburetion is provided by either a modified Perry or OS carb. Mounting is by four lugs on the base of the crankcase.

The above material is from an advertising piece received from the marketing agent. I have not seen the engine, nor have I had any information from anyone who has used it. The claim is that it will swing props from 14/6 to 18/6, depending on the aircraft in which it is mounted. These people have an information package available for $6.00 U.S., which includes a glossy photograph and more

to page 156

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from page 154/24

information. They claim they will have adequate parts available for immediate shipment should repairs be necessary and they maintain they will stock parts on a "break even" basis. Deliveries were to have begun in December of '77, and the cost as originally announced was $495.00 U.S. with a $20.00 surcharge for air shipment from Sweden. Normal U.S. import duty on the Quadra is 4% but I'm not certain that this applies to a glow engine.

★

Several kit manufacturers are rushing production on large kits for the big engines and especially for the Quadra. Andy Sheber's 1/3 scale Pitts S2-A was flown at the Tournament of Champions in Las Vegas last fall and was quite impressive. One of the big Pitts was the only aircraft flown the first day in winds that were estimated at 50 mph. A fairly impressive feat, to say the least.

Bud Nosen's new P-51, which Bud flies on a .60 and a prop reducer was also in Vegas and has been reported to me, by one who was there, as "flying like a trainer". I know that sounds pretty far fetched, but my correspondent is usually a pretty accurate reporter, and I'm prepared to accept his word on it. I have an advertising piece on the model in color and I must say, I'm impressed. It is a real beauty at 2.75 inches to the foot. There is 1800 squares to support the brute and flying weight is 16.5 pounds. Decals and the scale spinner are not included in the kit; the spinner is available for $16.95 (U.S.). Bud doesn't mention the decals, but it is large enough that authentic paint schemes (including the markings) would not be beyond the capable modeler. Judging from the photo in the advertising piece, the 51 has working flaps but whether the gear is retract or not is not stated. Bud describes it as 'spectacular' in the ad and even in the picture, it sure is! The word I have is that Bud himself figures it's the best to date of his big birds, and he has about as much experience with them as anyone. Rumor has it that he has another WW II fighter aircraft in the works, but no further details are available as this is written.

★

Judging by what I hear from correspondents & suppliers all over the world, there are some pretty great things on the way. In addition, as more and more items become available for the larger models, and there is a larger demand for them, unit costs decline and we should be able to anticipate more reasonable prices as the demand increases - - - a pleasant change in this day of ever in-

to page 158

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T-578

SUPER SCALE NEWS

from page 156/24

creasing prices! Most needed at the present time are wheels, especially for antique and vintage models. Weight isn't that much of a problem, prices have been high due to low production runs. Hopefully this will change as more and more of us get into building the large models and the demand for such items increases.

Both Grish Brothers and Top Flite have production scheduled for large props (up to 20 and 24 inches) and this is good news. At the time this is being written, I don't have any further information as to availability or prices, but this may be available by the time this reaches print. The English Punctilio props have been popular and run up to 18/6 in size. The 18/6 sells at around $4.00 in Canada. These are wooden props and need a bit of care in balancing, but they work well and Punctilio is apparently working on some additional sizes and shapes.

The guys at Zinger are also working on some larger props, in correspondence they advise me that they expect 80% to 85% efficiency which is quite outstanding for model props and they come out of the box trued and balanced, ready to mount and run. They will be bit higher priced than we are used to, but like the saying goes, "if you want fresh oats, they cost more than the ones that have been through the horse!"

★

The next Super Scale News column will cover another method of enlarging plans and some more detailed information on materials, especially wood for large models. In the meantime, if there are any questions that you feel I might be able to answer, drop me a line, we'll print answers to any questions of general

to page 160

Lanier Ready-to-Fly* Models

...every one designed and flown by the experts!

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4. Install engine and equipment (not included).

NOTHING to cover or paint.

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- Better value. Prices of Lanier models have gone up, but they haven't skyrocketed like balsa kits. Even if you don't count your labor, a Lanier kit costs less.

the straight story

- Lanier planes fly better because automatic machines mold every wing accurately and true. Wings and stabilizers are molded from styrofoam and pre-covered with special hard skin. Elevator, rudder, and ailerons are balsa covered with Air-O-Skin.
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- Models have nose and main landing gears pre-formed and aileron linkage ready for installation.
- Models are fuel resistant.
- Interchangeable spare parts are available.
- All kits come with step-by-step instructions and Air-O-Cement & hardware.

LEARNING R/C?

We have found that leaving off the wheels on our Comet 35 & Transit (and others) is a big help for beginners.

A landing in short grass is easy where wheels can snag and cause a bad spill. Use a nylon prop & hand launch the model.

Len

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Area: 630 sq. in.
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For .50-.61 engines

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DELUXE KIT NOTHING TO BUILD. . .

LA 159

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Power: .60
Wt. with std. Radio 6#-0

PRE—CUT FUSELAGE TRIM & SUNBURST DESIGN FOR WINGS.

Transit

LA 108

$44.50

Span: 65 in.
Area: 520 sq. in.
For .35 or .45 engines

Flies with motor, rudder, elevator control. (No ailerons).

Wing, Stab & Fin covered with "Toughskin"

SCAMP $52.50

LA153

50" PATTERN/SPORT

Span: 50 in.
Area: 350 sq. in.
For .25 or .40 eng.
Wt. Complete: 3 lb. 10 oz. with standard 4 ch. radio

Flies with rudder, elevator, aileron and motor control.

- Pre-Hinged Rudder and Elevator.
- Complete Push Set included (not wheels)
- Bolt or Rubber Band wing hold down
- Steerable nosegear
- Ample fuselage room for 4 channel radio
- Plywood reinforced aft fuselage.

Comet 35 Smaller Size Lanier Model

50" SPORT/TRAINER

LA 154

$52.50

Span: 50 in.
Area: 350 sq. in.
For .19-.35 engines

Flies with rudder, elevator, aileron and motor control.

- PRE-HINGED RUDDER & ELEVATOR
- COMPLETE PUSH SET INCLUDED (NOT WHEELS)
- BOLT OR RUBBER BAND WING HOLD DOWN
- STEERABLE NOSE GEAR
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- PLYWOOD REINFORCED AFT FUSELAGE

Comet II

LA 105

63" SPORT/TRAINER

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Span: 63 in.
Area: 630 sq. in.
For .50 or .61 engines
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Span: 48 in.
Area: 480 sq. in.
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48" - 3 CHAN. TRAINER/SPORT

LA 146

Flies with rudder, elevator and motor control.

Span: 48 in.
Area: 480 sq. in.
Wt. complete: 3 lb. 8 oz.
For .23 or .35 engines

Mr. R. A. Kreuzinger
P.O. Box 103
Salem, Oregon 97308

To: Satellite City
Arleta, California

Gentlemen:

I am enclosing a print of my PBY-2 "CATALINA" built from RCM plans. The plane was begun in January '77, when my workshop temp. averaged 40 degrees. Without HOT STUFF and baking soda as per your suggestion, I don't think I could have built the model, as the entire hull is planked with 1/64" plywood and at 40 degrees, conventional adhesives would have been nearly inoperative. Your idea about piercing a hole every 1/2" or so in the plywood and dropping HOT STUFF through the hole is analogous to "BLIND RIVETING" in full scale aircraft and worked very well. In some sections of the hull, this was the only method that could have been used. Upon completion in June, (the winters are long up here) the plane and I won the first stand-off scale contest we ever entered. (Northwest Seaplane Championships) So, I want to thank you for a great product in HOT STUFF which I feel was a prime factor.

Very truly yours,

Robert A. Kreuzinger

Bob,
We're pleased
That HOT STUFF
was a part of This
fine piece of craftsmanship!
Congratulations-
Bill & Bob
Hunter
S/C

SUPER SCALE NEWS

from page 158/24

interest and I'll do my best to answer all letters of enquiry.

★

LATE FLASH:

As a result of the Quarter Scale Show put together by well known Quarter Scaler Ed Morgan which took place last October in Las Vegas, a new Association has been formed, specifically aimed at those of us interested in the larger models.

To be called Quarter Scale Association of America, the organization was founded at the meet in Las Vegas by those attending. The organization has a bulletin, Volume 1, which went out in January 1978. Membership is $10.00 annually (which may be decreased as funding becomes available) and should be sent to: Quarter Scale Association of America, c/o Lee Taylor, 329 C St., Roseville, California 95678.

The meet in Las Vegas was well attended and a good deal of flying of the big birds was done. There is a complete write-up in the Association Bulletin called 'Monster News'. Bill Bennett of Circus-Circus and Tournament of Champions fame was again aiding and abetting the fellows interested in large models. The more I hear of Mr. Bennett, the more I feel all R/C modelers owe him a significant debt.

Anyway, the first Monster News is out and is 14 pages long. The intent is to provide us all, on a quarterly basis, with information on the larger models, accessories and information on all things **big** - - - just as Super Scale News is doing here in the pages of RCM. □

SOARING

from page 20

have it here in the U.S. The important thing now is to get the Team Selection

Program squared away. So, if you want to participate just follow the procedure outlined above and be sure to let me know if you have scheduled a Quarter Finals Contest.

•

At the CIAM meeting in Paris on December 1-2, 1977, some changes were made in the rules which govern FAI R/C Soaring. Briefly they are as follows: Tasks A (duration) and C (speed) remain unchanged. Task B (distance) now has a 12 lap maximum.

A round shall consist of tasks AB or AC, but the rounds shall be scheduled so there is a balance between B & C tasks, e.g., AB, AC, AB, AC, AB, AC. There will be no throw-away rounds. However, flyers can relaunch within working time as long as they have not flown through plane A towards plane B on the speed or distance courses. These changes should lead to a better balance between the tasks and also make the contest easier to run.

If you have any questions about the program, please feel free to write Ray Marvin, 2781 So. Garfield, Denver, Colorado 80210. The Team Selection Program Committee members may also be contacted for information about the program. Their names and addresses are a follows:

District I: Dwight Holley, 151 Chestnut Ridge, Bethel, Connecticut 06801

District II: Leon Pike, Rd. #1, Lowman, New York 14861

District III: Dave Burt, Apt. #4 180 So. 8th St., Indiana, Pennsylvania 15701

District IV: Brian Foster 1757 Latomia Rd., Winston-Salem, North Carolina 27107

District V: Jim W. Lenoir, 6017 Ellington Rd. NW, Huntsville, Alabama 35810

District VI: John Nielson, 3744 Lake, Wilmette, Illinois 60091

District VII: Warren Tiahart, 1086 Ashley, Troy, Michigan 48098

District VIII: Dale Nutter, 7935 So. New Haven, Tulsa, Oklahoma 74136

District IX: Skip Miller, 655 Maxwell, Boulder, Colorado 80302

District X: Dave Thornburg, 3635 Mt. Vernon Rd., Sebastapol, California 95472

District XI: Don Burt, 4001 So. 275th Place, Auburn, Washington 98002

•

"Super Wings" - - - this is the title of Hi Johnson's new seven page catalog on foam core replacements for all of the popular sailplanes - - - thirty-three of Hi's own design wing profiles. Most of all it tells and shows foam techniques and the accessories needed, like pins and tubes for wing joining, ASA fuselage kits, Greenskin covering sheets, and wing turning. If you are interested in his work, drop a note to Hi Johnson, 11015 Glenoaks Blvd., Pacoima, California 91331. It is well worth the $1.50 cost.

•

Something should be said about banding wings. Lee Lowary of Southern California, flew his Olympic II in a recent contest and caught a winch line at the leading edge of wing at the fuselage. The friction of the line severed the rubber bands. If he had not criss-crosed his wing band, guess what would have happened? Think about that. By the way, Lee finished his flight, maxed with a landing. When he picked up his ship from the landing circle, that's when he got the Hot Flashes.

Good Lift. □

RADIO SPECTRUM

from page 19/15

that Heathkit got the capacitors C-3 and C-103 reversed when the assembly manual was published.

When I tried to switch the capacitors, I discovered the switcheroo was done before the P.C. board layout was designed. It was near impossible to get that fat little 15μfd capacitor on the decoder board . . . but it will fit if snuggled in.

Next stop, Torrey Pines!

The radio performed perfectly. And now I can point the antenna straight at

the aircraft with no loss of control. I haven't had a glitch since and that was several airplanes ago!

Thank you,
Lynn W. Graves

C-3 of enclosure one is a 15μf capacitor on the AGC line in the GDA-405-2 receiver, the one he was having trouble with. C-103 is a 2.2μf capacitor across the power supply of the GDA-405-2. The GDA-19-2 (enclosure 3) has 2.2μf on the AGC line and 33μf across the power.

What Lynn did by switching them was to make the AGC act faster, thereby compensating for the sudden change in signal strength. Maybe this will solve someone elses problem too.

•

Dear Mr. Oddino:

Please explain to me what is going on. I fly on 72.08. After getting my frequency pin, I turned on my receiver to check out my plane and the control surfaces immediately began moving erratically and at random. I turned on my transmitter and they stopped. I was curious to find out what was going on and checked around. Two other transmitters were in operation. They were on 72.24 and 72.40. We ran an experiment.

We turned on my receiver and no other receivers. Then each transmitter was turned on separately – no interference. Then the two were turned on together – random movement again. I turned on my transmitter and the movement stopped. With my transmitter on, I walked away and collapsed the antenna – random movement again.

We then tried the same experiment with different radios on those frequencies and got the same results. Apparently the combination of 72.24 and 72.40 puts out a signal that a 72.08 receiver will listen to if the 72.08 transmitted signal is weak enough. It seems possible that given certain relative distances and antenna orientations, this could cause some trouble in the air.

to page 166

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RADIO SPECTRUM

from page 163/15

Why is this happening and is there any solution other than changing frequencies? Are there any frequencies not subject to problems of this sort? Thanks for your help.

Nick Aracic
Piedmont, Calif.

This is a complicated subject, but it can be shown mathematically that if two frequencies f_1 and f_2 are placed at the input of an amplifer, distortion will cause outputs not only at f_1 and f_2, but at $(2f_1 - f_2)$ and $(2f_2 - f_1)$. If we try the two frequencies you mentioned, we get:

$2 \times 72.24 - 72.4 = 72.08$
and,
$2 \times 72.4 - 72.24 = 72.56$

You can see that the 72.08 is going to go right through your receiver. Disastrous? NO! Not if your receiver is designed half way decent. Normally, the response to distortion products is way below the response to the desired signal and there is nothing to worry about. You have created a unique situation where your receiver is going to maximum gain (your transmitter is off) and then you are putting relatively strong signals at the other two frequencies in the front end. This is equivalent to flying at the edge of your range over or near the other two transmitters. An unlikely case. You will notice this relation holds true on the other 72 MHz frequencies as well. If you are worried, go to 75.64 MHz, but I wouldn't worry. □

SUNDAY FLIER

from page 31/12

Cox .049 TD with Ageno glow head and Tarno carb.

solution. More later.

The Tarno is also quite sensitive to

mixture settings. If you get it just right, fine. Otherwise, the rpms are erratic. One solution is to use the fine threaded Kirn type needle valve. The other — and this one really works — is to modify the Cox glow head by drilling it out and tapping it to accept a regualr glow plug. That isn't as easy as it sounds, because the clearances are critical. No cause for worry, though. If you want to try it, and I highly recommend the modification, get in touch with Gene Ageno, 632 East Olive Ave, #4, Sunnyvale, California 94087. He has a set-up to make the modification and assure the right clearances. I've been using one of his modified glow heads for some time now, with the Tarno carburetor, and it has been very reliable.

To close out this discussion of 1/2A throttling, I have left what, at least to me, seems to be the best, to the last. And that is the Hotchkiss throttle. It really isn't any more than a form of update of the old Cox Medallion throttle, but it is far more flexible in speed range, and seems to have very little effect on the top rpms. Response is excellent throughout the speed range, and low idle is outstanding. It does not need the additional crutch of an idle bar glow plug, but with it, the reliability of the 1/2A to perform at all speeds is virtually as good as that of a good .40. And that should be a real shot in the arm for 1/2A buffs. Scale enthusiasts, using the ultra small receivers and servos, can now have 1/2A models with retracts and still not be underpowered. I look forward to that, because one of the developments of late is the tendency to change 1/2A Scale to "Schoolyard Scale," a class that permits the use of .09 or .10 engines. To me, that is an admission of defeat on the part of a modeler, to the effect that he can't design a 1/2A model that will perform satisfactorily unless he goes up one class in power to the .10. Now I ask you - - who wants to try and compete with a good Max .10 if he only has a 1/2A? It doesn't make sense; they're just two different classes of power plants.

So I hope to see a strong upsurge in interest in 1/2A Sport and Scale contests. The lightweight receivers and servos, together with a reliably throttled 1/2A engine, certainly should do it.

•

R/C model contests went professional in recent years. Witness the Las Vegas event as the outstanding example - - both in the quality of contestants, and in the amount of the cash prizes. Now the trend has reached the club level on an increasing scale. There's no question about it - - merchandise is fine, but money talks - - in R/C as in any other sport. The Wavemaster 1/2A pylon races show that; where prior contests had around ten entries, the last one, with a $100.00 First prize in Unlimited, and $75.00 in Honker Class, drew a total of over 60 entries.

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FOR CONTEST INFORMATION, CONTACT

CONTEST DIRECTOR:

DON HUTCHESON
268 KENMORE AVE.
COUNCIL BLUFFS, IOWA 51501
712-322-0038

CONTEST COORDINATOR:

BUD KILNOSKI
133 WEST BROADWAY
COUNCIL BLUFFS, IOWA 51501
712-322-1378

Will that amount attract pattern fliers? We'll see, on May 6 and 7, when the Pioneers have their annual pattern contest at the P.A.L./Pioneers Skyport in Santa Clara. The have set up $700.00 in prize money for the four Classes - - Masters, Expert, Sportsman, and Novice, with $100.00 going to the winner in each class, and the lesser cash prizes in each class for second and third. If you like to fly pattern, and would like to win a few bucks at it, head for Santa Clara. If you get any static about leaving the family at home while you have a good time, bring them along. The Skyport is about 1/2 mile from Marriott's Great America Amusement Park. The wife and kids can go there while you try to win enough money to pay for their fun. Also, you'll like the Skyport - - a four hundred foot runway, one hundred feet wide, all paved, with clear approaches in both directions, safely fence for the pits, bleachers for spectators, and there'll be a refreshment stand if you're hungry or thirsty. Lou Piro, of the Santa Clara Police Activities League, has been working closely with the Pioneers R/C Club to provide one of the best R/C flying facilities in the country. Also, the Pioneers assure me that the judges for the Pattern maneuvers will be fully competent and fair. If you want to join the fun, call Bob Fish, the Contest Manager, at (408) 265-6992. He can give you all the details.

And after the event is ended, it will be interesting to see if the cash prizes bring out a larger entry than last year, since they say that money talks.

But all it says to me is "goodbye." □

ENGINE CLINIC

from page 10

the engine. The engine was quite "oily." There was a good film of oil present. This film was not "sticky" or "gummy." You pointed out while here, that the carburetor linkage seemed somewhat stiff or sluggish in operation. This was true and was the result of the build-up of viscous oil. After cleaning, reassembly and squirting with WD-40, the mechanism worked beautifully. This is a predictable occurrence on small, light delicate parts. The viscosity of the lubricant will add some resistance to the operation of the mechanism, but, of course, without any lubricant at all, the parts will seize and break. There was no sign or indication of corrosion anywhere on any areas or parts of the engine. There were a few greenish spots on the brass areas. These were not stains or corrosion of brass, but discoloration of oil itself where it had built up on the brass parts. It was easily wiped off.

Your engine is now reassembled and

you may pick it up next time you are in San Diego. Thanks again for the opportunity to inspect this engine.

Very truly yours,
Glenn G. Agnew
Technical Director
WD-40 Company
San Diego, Calif.

I had not heard any rumors or had any reports of WD-40 causing corrosion in model engines. Any corrosion in a model engine is more than likely being caused by leaving raw fuel in the engine — not by the WD-40! Although some R/C flying takes place at Lake Elsinore (sea plane) it is mainly a free-flight site. A lot of free-flighters use flood off timers, and to kill an engine by choking off the air loading it with fuel is asking for corrosion. Most free-flighters are running 40% nitro and higher fuel. Nitro-methane, in itself, is extremely corrosive. For some reason, fellows just do not seem to be aware of the damage that leaving raw fuel in an engine can cause. When they find it they naturally blame it on any additive they may have used. Although it is possible that something in the WD-40 could be reacting with the Nitro-methane in the fuel, it is doubtful.

However, getting back to the use of WD-40 and other additives of this type — LPS, etc., I personally do not recommend their use in model engines. I know this will upset a lot of people and cause a lot of static as many experts are using and recommend their use. WD-40, LPS, etc., are excellent products when used for their intended purposes but they were never intended to be burned in the combustion chamber of an internal combustion engine. These additives are used as rust preventatives to dry out wet ignition systems, loosen stuck parts, etc., However, this can work against us in a model engine. Most model engines, after having been run any length of time, accumulate a considerable amount of carbon, varnish and rust — especially with the use of mufflers and tuned pipes. When you add the WD-40 to an older engine, it performs its function — loosens the old rust, varnish, etc., holding it in suspension in the oil. The first time you fire the engine up, this goop is burned in the engine. Rust is iron oxide which is used commercially as a lapping agent. So guess what happens when you let this mixture run through your engine? Parts get lapped away real quick. In the process of servicing and repairing hundreds of engines a year, I get to see the results of the use of different types of oils, additives, etc. I discovered several years ago that fellows using WD-40 and LPS in their engines were going through rings and pistons at an alarming rate.

In your own case, Harold, you used the WD-40 in an engine that was stored without use. If used in this manner, there would be no problem. I imagine if a

to page 172

lean the engine for a good running at full idle and idle rpm and then open the carb to 80%, the engine becomes very rich and stops while fuel comes out the carb.

Very truly yours,
Franz Maier
Feilnbach 2, Germany

Franz, your note is not quite clear whether you are trying to run the engine with the needle valve open 3/4 turns or just mention this to let me know the pump is putting out sufficient pressure. If you are trying to run the engine with the needle valve open 3/4 turns and then adjusting the mixture with the pump pressure regulator screw, this is not correct and should never be done. Turn the pressure screw back in until it is about 1/32" from the back of the plastic housing. Then use the needle valve to set the mixture — the same as if the engine did not have a pump. You are not concerned with how far the needle valve is open as this will vary with weather, rpm at which the engine is run, amount of nitro in fuel, etc. The only thing here to be concerned with is that the engine can be richened up by backing the needle valve out two or three turns. If not, the pump pressure should be increased until the engine can be run rich. Then you lean the engine in by turning the needle valve back in the normal manner. Then, if through the mid-range the engine is slightly lean, increase the pump pressure very slightly — or if slightly rich through the mid-range, decrease the pump pressure very slightly. The pump pressure being used to set the mid-range only — never the high speed.

If, with the needle valve and pump pressure adjustments properly set, you cannot get the engine to run lean enough through the mid-range, it is probably your fuel, glow plug, or both. If you are using FAI fuel with no Nitromethane there will be a tendency to richen through the mid-range. The addition of 5%-10% nitro will improve acceleration considerably, as will the use of a hotter heat range glow plug. Unlike some parts of Europe, I understand Nitro is available there in Germany.

Dear Mr. Lee,

I would like to use a Robart Super Pump with my O.S. Max .60 FSR and have had a problem deciding where to tap for pressure. According to the directions which came with the pump, I should tap either in the center of the back plate of the engine, or in the lower portion of the induction port. After looking at the back plate, I soon came to the conclusion that the tap would probably interfere with the rod movement if it were placed at that location. Some of the more experienced members of the club cast doubt on tapping "just anywhere" in the lower portion of the induction port.

to page 178

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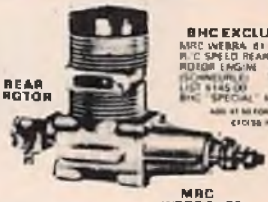

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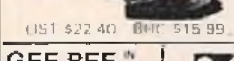

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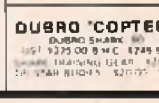

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DELUXE	34.95	24.95

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ZERO	145.00	109.99
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SKYLANE 42	13.95	11.00
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BOX FLY BIPE	39.95	29.95
PIPER C UB	34.95	27.95
PIPER CHEROKEE	42.95	34.40
CARDINAL, OLYMPIA	42.95	34.40

WEBRA-MRC	BHC
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#1020 61 RC	83.99
#1034 40 RC F.I	72.99
#1024 61 F.I. SR	96.99
#1026 61 R.I. SR "SPECIAL"	72.50
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WEBRA TUNED PIPE	54.95
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ENYA ENGINES	LIST	BHC
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ENYA .19 RC	40.98	28.70
ENYA .35 RC	47.98	33.60
ENYA .40 RC	81.98	57.40
ENYA .45 RC	81.98	57.40
ENYA .60 RC Schneurle	179.98	126.00
ENYA .60 RC BBIII	166.98	74.90

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from page 175/10

The question then - - - does it matter where on a Schneurle ported engine you tap for pressure to run a Robart Super Pumper? I will appreciate any information you can give me.

Thank you,
Raymon A. Hooper, DDS
Tyler, Texas

It does not matter where you tap the crankcase for pressure as long as the fitting does not interfere with any internal moving parts. You can tap right through the bottom of the case, through the side of a mounting lug, etc. The easiest place is the back plate as this can always be replaced if you decide later you do not want to use the pump. There should be no problems with tapping the back plate on your O.S. Max. Screw a 6-32 nut on the Robart pressure fitting. Screw the fitting into the back plate until the end of the fitting is just flush with the inside and then tighten the jam nut. A little Loctite on the threads and nut will make an air tight seal and keep vibration from loosening the fitting.

Our last letter this month is the type that I always like to receive in that the writer sends along the solution to the problem which doesn't require any brain work on my part.

Dear Clarence,

Oh Boy!! I've wanted to write this kind of letter to you since before book one! (The R/C Engine.) But, until now, I didn't have an experience where I solved a problem!

Since I started in R/C some ten years ago, I've used the trim to adjust idle and shut down the engine from the Tx. This always entailed backing the idle adjusting screw (rpm) out of the body of the carb until it was ineffective.

When I started using Perry carbs, I removed the screw entirely. Until about a week ago, I had no problems with this system.

I have a small .45 Enya, scratch-built 'chopper' that evolved from a Du-Bro 'Whirly-bird'! The engine is fed by a Perry carb (with that screw backed out, or removed). I had a bit of trouble finding why it began to develop poor performance, since it's only about 2 months old. I couldn't believe there was dirt in it, because I had a new filter in the fuel line, but after removing the idle barrel two or three times, that's what I found. Okay, so much for that.

But, after reinstalling it in the carb, the engine started fine, but wouldn't build up enough power to pick up the chopper. It had been running fine before. It would not adjust in either idle or high speed.

to page 180

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any of these issues

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ENGINE CLINIC

from page 178/10

I'll spare you the agony · · · after about three days of head scratching, I finally got the message . . . I had the throttle arm upside down . . . or 180° out of order.

So, now you know.

I enjoy your column immensely, especially the old, odd-ball engines.

Tom Waller
Bronx, New York

□

CUNNINGHAM ON R/C

from page 7

ment, and so on. For gosh sakes, guys, if you don't know why a design has certain features, and you're not knowledgeable enough on your own to make any changes, then please don't. In the Fokker D-VII, for example, the down thrust is used to counter the possible zoom effect of the top wing. The positive in the stab is to lift the tail up off of the ground on take-off, and the side thrust is to help the aircraft track straight ahead at low speeds on take-off and landing, to counter the torque of the prop. If you see fit to change these settings, then the aircraft will not fly as intended. I purchased a completed Sig Liberty Sport from Joe Butlers Hobby Barn a few years ago. The builder of the aircraft did a fine job of construction and finishing, but on test flights he had a terrible time with the aircraft, and so he decided to sell it because it just wouldn't fly well. When I got hold of it, I started to look it over to see what the trouble might be, and quickly found out that it had almost no aileron movement at all. The builder just hadn't managed to put enough movement into the aileron controls. Well, a bipe needs lots of movement, and to try to fly one with almost no up or down would scare the pants off of me too. So, here is another example of change (though in this case, the change was not realized) made by the builder with the result that after long hours of hard work he finished up with an airplane that to him was a dog. Don't make changes in plans unless you really are an expert in the field. You will be much better off in the long run.

Another letter that I recently received, raises a question that I have not answered for some time:

Dear Chuck,

To put things into their correct perspective, I would like to start this letter by saying that I am a novice to R/C aircraft and have a few questions on paint schemes. I would like to know if there are any functinonal paint schemes that I could apply to my Sr. Falcon that

would tell me, as I'm learning how to fly, just what my airplane is doing up there and whether it is coming at me upside down, going away from me, or any other attitude the a/c may be in. It would seem to me that disorientation is the biggest obstacle to overcome while learning how to fly and control an R/C aircraft. If I could tell what the a/c is doing by sight, I feel it would be much easier to learn reflex control. Up till now I have gone through several airplanes which met with Mother Earth the hard way, and each and every time it is because I am trying to bring back the a/c to me because I did not know which way it was going. This may seem quite dumb to a qualified R/C pilot, but to me it is a problem which is getting very frustrating and expensive, not only in money but building time as well. Please advise.

Charles Watson

Well, Charles, you're correct, the largest problem in learning to fly R/C is in orientation. If I haven't been flying for some time and then go out, I have to think orientation on the first flight or so, 'cause it's darned easy to get mixed up and turned around. The location of your flying field, the prevailing wind, the location of the sun, and the time that you fly all have a lot do with your orientation. For example, if you can do all of your flying with the sun at your back, you will have a good chance to see what your aircraft is doing. But, if you're flying with the aircraft between you and the sun, it becomes quite hard to see what is happening, no matter what the paint scheme may be. Let's try to help out on the paint, and by juggling your flying time you may be able to do more flying with the sun at your back, or at least over your shoulder.

The wing of your aircraft is the largest part of the structure, and the easiest to see, so let's begin here to color code it for visibility. On the leading edge make a white stripe all along the leading edge of the wing, about 2" wide. Wrap this stripe from the bottom of the wing around to the top of the wing, so that when the aircraft is coming toward you, you see this very bright white leading edge. The easiest way to do this quickly, and simply, is to go to the hardware store and pick up a roll of white vinyl tape 2" wide. Stick this tape to the leading edge. It is fuel proof, and won't hurt the flying ability of the aircraft at all. Now, with the leftovers of that roll of tape, lay a white line along the top of the wing, at about the high point of the airfoil from one wing tip to the other. Next, turn the wing over and on the bottom, near each tip lay a couple of strips of tape chord-wise (from leading edge to trailing edge). Separate the strips about 2" to 3" on wing. Step back and take a look. Imagine that the wing is flying out away from you at a hundred yards. Bank the aircraft (wing) toward you. You see a long white stripe running from tip to tip. Now, bank the wing away from you. You

see several short bars of white. Now, you can tell if the aircraft is banked toward you, or away from you, and you can see the wing leading edge easily when it is flying at you. If you haven't covered your wing yet, then use a dark color for the top of the wing, and a light color for the bottom of the wing. Use red on the top and white on the bottom. Same for the horizontal stab. It may not look too pretty, but you can sure tell which way it is going.

•

And now before winding down for this month, I'd like to mention a new building aid just introduced by Stanfield Manufacturing Co. It is called the Super Sander, and that is just what it is. It is a long aluminum tube with handles mounted on it that look like they might have been swiped from the local casket factory.

The bottom of the tube has E-Z Flex Metalite Cloth bonded to it. The Super Sander comes in lengths of 1, 2, and 3 feet. It can be used for sanding just about anything because the grips (handles) make it easy to guide and the long lengths allow you to sand surfaces to a new degree of trueness. It also makes a very good non-slip straight-edge for stripping out balsa. The Super Sander is the brain child of my old friend, Oscar Slaughter. For more information on the Super Sander, write to Stanfield Manufacturing Co., P.O. Box 6333 Fort Worth, Texas 76115.

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That's it for this month - - - hope to see you all at the Jumbo RC Fly-In, or at least out at the flying field if the winter ever lets go. □

FROM THE SHOP

from page 2

mast and fell into the water. I helplessly watched it crash. When it started to dive 50m from the shore, I couldn't stand it and I jumped into the water of temperature of approximately 1°C and I swam to save the ship and radio set too. In spite of my endeavour the ship dived 2m in front of me. I swam back, frozen, to the shore. Thanks to my 17 year old son, I was saved. Following investigation was impossible due to the frozen water. After one month, because I couldn't reconcile myself to the loss of the radio, I

used the help of my two friends –divers, who tried to find it. Under the thick cover of ice, it was impossible. Only this year at Easter, that's after five months, I have found two new courageous friends who helped me to find the lost radio and ship. I have sent you some photos of the saving action. Of course I wondered what had happened. With the help of my friend who is an assistant at our technical university, CVUT, we have made some tests of your apparatus. The results were surprising.

to page 184

FROM THE SHOP

from page 183/2

Receiver – after the change of crystal and some small repair, operates faultlessly. Battery – which showed 0 on the digital voltmeter, after some loading cycles, works normally and has normal voltage. Servo part KPS 15 are OK too. The result of this accident is surprising for us and will be published in our special magazine "Modelar".

I am glad that I am an owner of that apparatus which after 5 months under water operates faultlessly. I must confess that I did not count on the fact that we'd find your radio in the water and, because of this, I have ordered the new one (type KP 7Z) by mail from Messrs Carlisle Europe. But I hope that it will be useful for my son in the future.

I send you my sincere wishes for the further development of your radio sets and hope you will gain in the future many further owners of your apparatus.

Yours faithfully,
a friend of yours,
Ivo Simanek
Czechoslovakia

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We're always interested in improving your vocabulary as you can see from the following useful glossary:

GLOSSARY OF AERONAUTICAL TERMS

Airfoils — swords used for dueling in flight.
Airstrip — in-flight performance by exotic stewardesses.
Cockpit — area where chicken pilots are kept.
Dive — pilots lounge.
Downwind Leg — when a girl is standing sideways to wind, skirt will be lower on this leg.
Elevator — device that raises runway thus preventing pilots from "dropping it in".
Final Approach — last pass pilot makes at girl before giving up.
Flaps — birds do it, but recommended for fixed-wing aircraft.
Gross Weight — 350 lb. pilot.
Nose Wheel — device sometimes bent by pilot.
Pilots Nose — Usually bent just after nosewheel.
Propeller — fan that keeps pilot cool — turn it off and watch him sweat.
Roger — most popular name on radio.
R.P.M. — initials of large corporation that builds tachometers.
Piper Cherokee — flying Indian musician.
Runway — place where exotic stewardesses start the airstrip.
Skyjack — device for changing tires in flight.
Slip — apparel worn by some pilots.
Stall — place where plane is kept.
Supercharger — pilot with a wallet full of credit cards.
Taildragger — pilot who lost bout with bottle last night.
Thermal — student pilot's description of a container for hot coffee.
Zulu Time — used by African pilots.

(Reprinted from the Madison Area R/C Society newsletter "MARKS SPARKS".)

□

1978 NMPRA QM EASTERN CHAMPIONSHIPS

Philadelphia, Penn. — July 15-16

- Warminster Naval Air Development Center, Pa. Turnpike to Willow Grove Exit — North on Route 611 to Route 132 East to site.
- 15% Ro Go Fuel by World Engines — No slot required. NMPRA Membership required — applications accepted here.
- Hosts — Valley Forge Signal Seekers, CPPRA & MARA.
- Trophies to 15th Place.
- Cox Engines Fast Time Awards.
- World Engines Flyoff Event — Top 12 contestants qualify.
- Terry Prather Grand Champion Award.

Schedule:
July 14, 1978: Registration and Social Hour 8:00 p.m.*
July 15, 1978: Processing 8:00 a.m.
July 15, 1978: First Race 10:00 a.m.
* George Washington Motor Lodge
Pa. Turnpike, Exit 27, Phone: (215) OL9-7200

For Further Information, Contact:

Joe McDermott, C.D.
275 Bryn Mawr Avenue
Bryn Mawr, Penn. 19010
(215) 527-0508

Al Grove
1431 Woodford Drive
Wayne, Penn. 19087
(215) 688-8622

LOFT WEEKEND SAILPLANE CONTEST

FT. WAYNE, INDIANA
JUNE 3 & 4, 1978

Great Lakes Soaring Leage Championship Circuit Contest #1

SATURDAY:
Registration: Until 9:00 a.m. 1st launch at 9:30.
Entry Fee: $6.00 per class.
Event: 3 flights for 30 minutes cum. No time limitation per flight, but 3 flights must be flown.
Classes: Trophies for: 1st place - Jr./Sr. combined.
1st thru 3rd - Std. (open age).
1st thru 3rd - Unlimited. (open).

SUNDAY:
Registration: Until 9:00 a.m. 1st launch at 9:30.
Entry Fee: $6.00 per class.
Event: Precision Duration with landing bonus.
Task duration time to be announced at pilots meeting.
Classes: Trophies for: 1st place - Jr./Sr. combined.
1st thru 3rd - Std. (open age).
1st thru 3rd - Unlimited. (open).
1st and 2nd - Sport Scale.

FOR FURTHER INFORMATION, CONTACT: **Frank Wren, 1606 Third St., Ft. Wayne, In. 46808**

SAN FRANCISCO MODEL YACHT CLUB SCALE CONTEST

SPRECKLES LAKE — GOLDEN GATE PARK
SAN FRANCISCO, CALIFORNIA
JULY 22 & 23

Saturday, July 22nd
Registration, Practice, & Judging.

Sunday, July 23rd
Operations, Judging & Awards

CLASSES:

Military Scale: The definition of this class is a scale model of any warship of any navy present or past. "Proof of Scale" documents required.

Civilian Scale: The definition of this class is a scale model of any civilian vessel of any registry. "Proof of Scale" documents required.

Freelance Scale: The definition of this class is "What Could Be." It must be scale-like in appearance and no "Proof of Scale" required.

FOR INFO AND ENTRIES, CONTACT:
H.L. Duvall, 745 Shelter Creek Ln., #101, San Bruno, Ca. 94066
(415) 873-3459 (evenings)

RCM PRODUCTS

RCM WING JIG II — PRICE: $34.50

The original RCM Wing Jig, first published in the August 1967 issue of this magazine made it possible for many modelers to build their airplane wings warp-free and in far less time than it had previously taken. The RCM Wing Jig II offers many design improvements on the original version that greatly extends both its versatility and the accuracy of the wings produced. It is now used exclusively in the RCM shop for all building projects.

Since the accuracy of the jig depends almost completely on precise fabrication and fit of the parts, RCM has made arrangements to have a limited quantity of these Wing Jigs manufactured which are now available through the RCM Product Division.

The RCM Wing Jig II consists of two sections hinged in the middle. Each section consists of a front and back "L" shaped base piece. A jig rod support is located at either end of each wing jig section to mount the rods that support the wing ribs.

The switch to a double length jig that's hinged in the middle makes it possible to build an entire wing, complete with the dihedral called for in the plans, in one operation. Or, the Wing Jig II can be set up flat to use both sections to build up a wing panel for one of those big powered or glider jobs. Or, with the dihedral set, a polyhedral wing can be accurately built. It can even be used to join foam wing halves to get the dihedral as it should be.

A uniquely designed rod end support makes it possible to true the wing jig rods to order. A simple protractor device makes it possible to set the dihedral even when it is given in degrees. The addition of adjustable end legs make it possible to set the dihedral accurately for each wing panel. New "L" shaped base pieces assure a warp free jig to start with. A yardstick attached to the front of the base pieces helps in spacing the ribs when the wing is set up on the jig. A bubble leveling arrangement assures both wing panels will be true to each other. A new design rod support makes it possible to move the two wing jig rods from as close as you'd want them to 6½" apart. And, a new technique makes it possible to build those small cord wings with ribs too narrow for two wing jig rod holes.

To use the Wing Jig, holes are drilled in the wing ribs, the proper dihedral is set on the jig, and, the ribs are slid onto the wing jig rods. The rods are aligned and clamped down, the ribs are properly spaced, and, the spars, leading and trailing edge and top sheeting is glued in place. The wing is removed from the jig and the bottom sheeting is glued in place. Finally, glass cloth and resin is applied to the center section, and, the wing tips are installed.

That's it, the RCM Wing Jig II — the most versatile, easy to use and convenient wing jig ever designed. Assembly time is approximately one hour and you'll be ready to build your next wing faster and with more accuracy than you ever dreamed possible. **This is the only Wing Jig endorsed and manufactured by RCM.**

RC NIGHT FLYING!

Now, with Cyalume® Lightsticks you can fly your R/C aircraft at night for up to eight hours. Used extensively by RC'ers on the West Coast for night flying of R/C sailplanes, one Cyalume® Lightstick is mounted on the bottom of each wing, near the tip, and another on the Hi-Start just below the chute. Originally designed by the gamerican Cyanamid Company for use by the U.S. Navy, Cyalume® chemical lights are far higher in visibility than conventional electric light sources. Completely non-toxic or hazardous, simply bend the external plastic case which breaks the internal glass tube. Shake vigorously, and the flourescent green liquid material glows brightly and can be seen further than any normal light source or emergency marker. The light source lasts up to 20 hours with maximum brilliance for R/C usage diminishing after 6 hours. Simple capacitor clips can be used to mount them to your aircraft. A cellophane, or plastic, sleeve or a different color can be slipped over one, if so desired, in order to differentiate aircraft direction. Cyalume® Lightsticks are also excellent to carry in the car or camper as emergency light sources. Price is $4.75 per box of three Cyalume® Lightsticks and includes postage and handling.

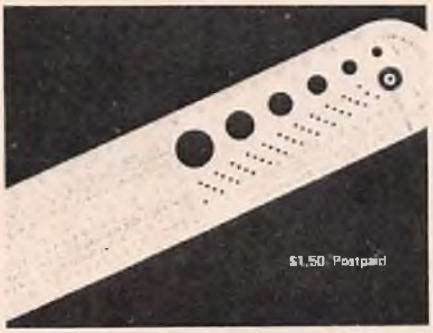
FOAM CUTTING WIRE

Now available from RCM Products is the finest quality Nichrome wire for foam wing cutters. Available in packaged 5 foot lengths for $2.00, this is the finest material of its kind available. It is designed for extremely precise and smooth cutting of foam wing cores, and can be used with any commercial or home-built foam wing cutter.

WANT AN RCM DECAL?

Send a self addressed stamped envelope to: RCM Decals, P.O. Box 487 Sierra Madre, Calif. 91024.

Lay the decal face down with enamel side on a table top. Peel the backing paper away. The plate will have the sticky side up & will adhere to your finger. Holding it flat, apply in position. After application, wipe hard with a soft cloth, then with squeegee, tie down all the edges. After 48 hour set up at room temperature, decal will adhere permanently.



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WANTED ADDRESS for pusher propellers for .60 engines. John Smith, 417 Colo. No.4, La Junta, Colo. 81050.

WANT SINGLE channel radio gear and escapements such as C & S, Centerlair, O.S., Minature, working only. Rev. Gary R. Toomer, 552 5th St., Imperial Beach, Calif. 92032.

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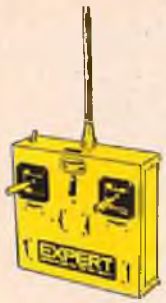

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OS 60 RSR	137.	105.95
OS 65 RSR	137.	105.75
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OS 20 R/C	38.	29.25
OS 25 std.	34.	26.25
OS 25 R/C	40.	30.75
OS 25 FSR std.	50.	38.50
OS 25 FSR R/C	57.	43.95
OS 30 std.	41.	31.50
OS 30 R/C	46.	35.50
OS 35 std.	42.	32.25
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OS 45FSR	90.	69.50
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ST 23 R/C	43.	34.00
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ST 35 R/C	46.	36.00
ST 46 R/C	56.	44.00
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K&B 40 R/C	62.	44.00
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K&B 5.8 FR std	95.	66.00
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Questor	34.95	26.50
Grand Espirit	129.95	95.00
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Aquila	69.95	54.00
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Dicks Dream	11.95	9.50
Ace High	19.95	15.95
Up Start	17.95	14.00
All Star	24.95	19.95
Whizard	18.95	15.00
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ANDREWS

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A-Ray	44.95	35.95
H-Ray	39.95	31.95
Sportmaster	69.95	55.95
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Trainmaster	52.95	42.95
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ASTRO FLIGHT

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Bushmaster	44.95	33.75
Fournier RF/4	44.95	33.75
Malibu	29.95	22.50
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BRIDI

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Trainer 20	34.95	27.00
Trainer 40	54.95	42.00
Trainer 60	62.95	49.00
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Sun Fli 4-20	29.95	23.00
Quickest 200	24.95	19.00
Quickest 500	42.95	33.00
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Super Kaos 60	69.96	54.00
Kaos	66.95	52.00
Sirius Lockheed	134.95	102.00

KITS
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Skylane 62	55.95	44.00
Jr. Falcon R/C	11.95	9.95
½A Skylane	13.96	11.00
Skylark 56	34.95	26.00
Jr. Skylark	12.95	10.00

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ME-109	27.95	21.95
P-39	27.95	21.95
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Devcon 5 mn. lg.	2.50	1.85
Devcon 5 mn. sm.	1.35	1.00
Devcon 5 mn. 9oz.	5.80	3.98
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Std. Hi-Start	34.95	25.00
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We started this franchise dealer page with about ten dealer names. In this issue it is close to one-hundred. These dealers can buy Indy's exclusive items from Indy. Also, the Indy dealers are awarded a county of exclusivity. Many counties are left.

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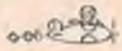

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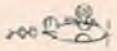

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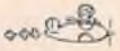

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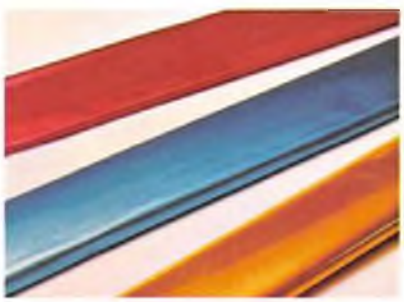

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