U.S. ONE DOLLAR / U.K. 60p THE LARGEST MODEL HOBBY MAGAZINE IN THE WORLD FEBRUARY 1973

AMERICAN aircraft modeler

THREE NEW FF, RC AND CL–

Foam Techniques

FOR LEARNING AND WINNING IN C/L STUNT–

Mustunt I, II, III

FOR THE TENDERFOOT–

Clodhopper

SUPER DESIGN CONTEST!

DETAILS ON PAGE 18

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Look like real planes!

Perfect for control-line beginners

solid balsa construction withstands hard landings time after time

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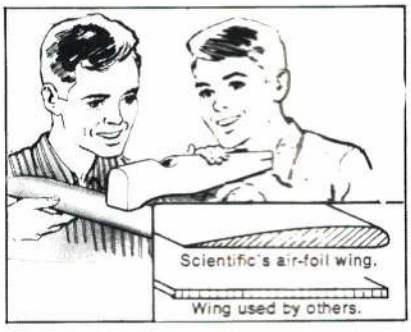

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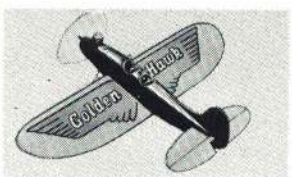
Kit 95 **PIPER CUB TRAINER** 18" Famous private trainer



Kit 48 **GOLDEN HAWK** 18". A great model for fun flying

Kit 25 **STUNT MASTER** 18" One of America's most popular stunt models.

Kit 30 **RED DEVIL** 18" Great training model for beginners

Kit 6 **CESSNA BIRD DOG** 18" Scale model U. S. "Flying Jeep"

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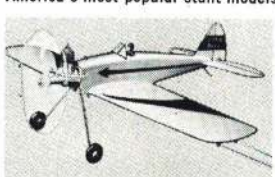
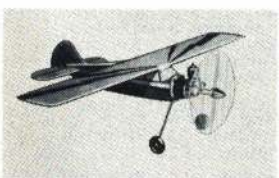


Kit 28 **LITTLE DEVIL** 18" Fast, easy to fly, great performer

Kit 7 **CESSNA** "180" 18" Model has good looks, great speed



Kit 53 **RED FLASH** 18" Model has sleek looks, good control

Kit 8 **PIPER CUB CRUISER** 18" Most famous of all Piper Cubs

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AMERICAN aircraft modeler

COVER PHOTO

Bob Lopshire's oil painting of a typical RC aerobatic plane. See page 18 for details on our contest to design and build this plane—for money!

VOLUME 76, NUMBER 2—FEBRUARY 1973

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ACADEMY OF MODEL AERONAUTICS

DEPARTMENTS

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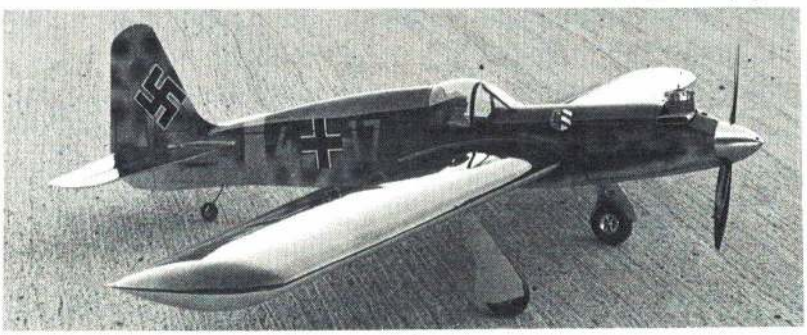

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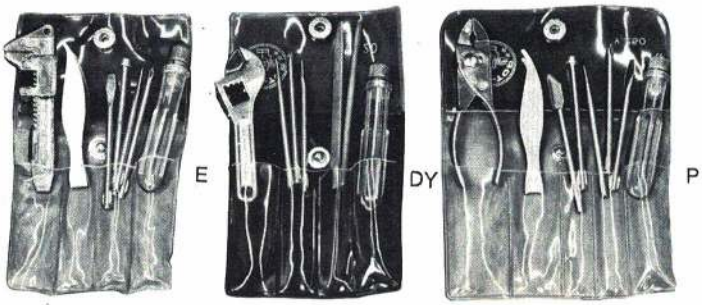

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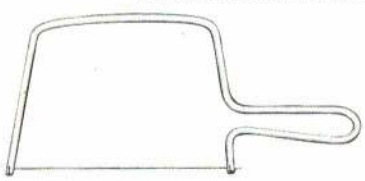

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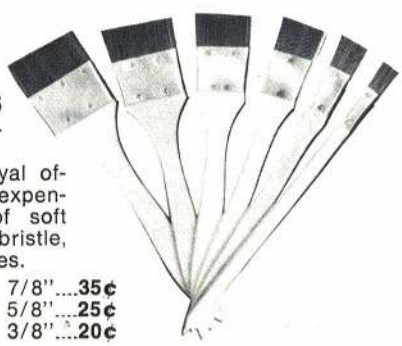

EDITORIAL

ED SWEENEY

IN SUPPORT OF AMA

The AMA is the Academy of Model Aeronautics. It is the world's largest sport aviation association with a current membership of over 47,000 modelers. You find their Model Aviation, the academy's official news to members, in every issue of this magazine. Read that part of the magazine and see what the AMA's doing.

Today an adult membership costs $15. For this the benefits are many, and certainly a bargain. By joining the 47,000 present members you become part of an association that helps you enjoy the hobby of building and flying model airplanes through insurance of your modeling activities, communication with and about other members' activities, representation in Government, being a part of the National Aeronautic Association and thus being a part of the *Federation Aeronautique Internationale*. The association has over 800 active model clubs throughout the country. These clubs are chartered by the academy and by being chartered offer even more insurance protection, activities, flying sites and friendships.

Suppose you are a loner. Have you been asked to leave your favorite flying field because the owner thought you were a hazard? Showing the owner your AMA flying license and the insurance program is usually enough to please the field owner and allow you to continue to enjoy flying at that site.

Model aviation is an expensive activity for some and quite inexpensive for others. A FF modeler can get along quite well on less than two hundred dollars per year, yet the avid RCer spends $800 or over. A free flighter needs little in the way of facilities for flying, a control liner needs a 70 ft. circle, and an RCer needs at least a grass runway and wide-open spaces. The indoor modeler needs a big room, preferably an open auditorium, yet he spends nearly nothing on this hobby. All these groups are handled within the AMA. There are special organizations with the Academy, several RC groups and some FF organizations—AMA tries to offer something useful to everyone including those with very special interests in model aviation.

The AMA sanctions over 700 flying events annually, most of them club sponsored. Some of these are fun-flies but the majority are contests. There are very few model flying contests which are not AMA sanctioned because of the need for date and location coordination, site insurance and indemnity to the host club and sponsors. All entrants in the meets must be AMA members. Also, some of these offer an opportuntiy for establishment of national and international records. There are many specific requirements for record attempts, lots of planning and paper work—all handled by AMA. The Academy is part of the National Aeronautic Association which is chartered by the Congress of the United States and is responsible for recognition and sanction of all American aviation world records and achievements. The NAA is recognized by the international aviation group, the *Federation Aeronautique Internationale*. So, when AMA sanctions an attempt on a world record and approves it, application is forwarded through the NAA to the FAI. The FAI then in turn passes on the application for World Record recognition. Whew!

To have meets and records, there must be events. Each AMA member receives as part of his membership an Official AMA Contest Rule Book. In it are rules for FF, RC, CL and Scale events including those being tried out on a provisional basis. These rules are refined each year. AMA's role is to determine which events are the most popular and important, develop rules for them, publish the rules, keep the rules up-to-date and make sure that the rules always promote safety. There are about 50 regular AMA recognized events in FF, CL and RC. There could easily be twice as many, but they would be only of regional or local interest. When new nationally active events develop, AMA studies them and determines which are the best rules being used, refines them, and endorses them after a provisional period.

Through control and strict rules for the competition events, AMA has been a great help to the model industry. Kits are offered which fit events over a long period of time. By keeping the pace of rules changes in the events under check, the kits have long-term usefulness. Needless to say, the same goes for engines. There are events for almost every engine available today. The events promote great competition between manufacturers to have available the best kit, or

(Continued on page 13)

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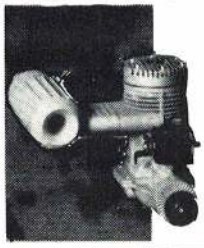

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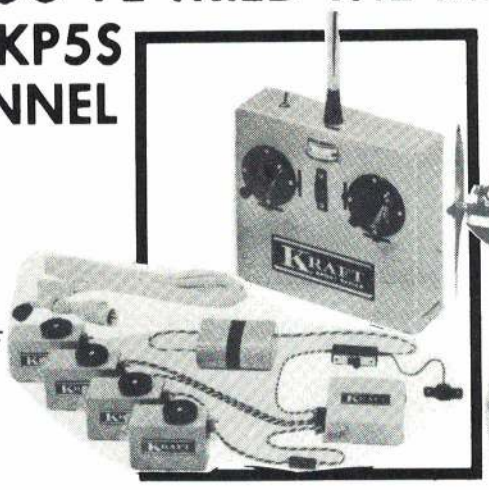

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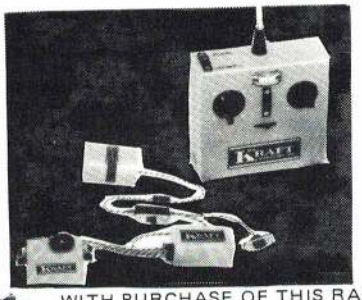

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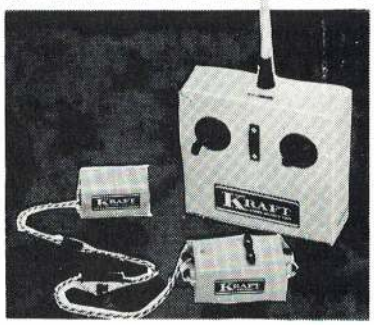

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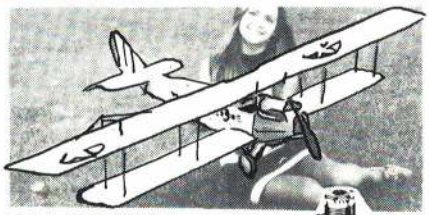

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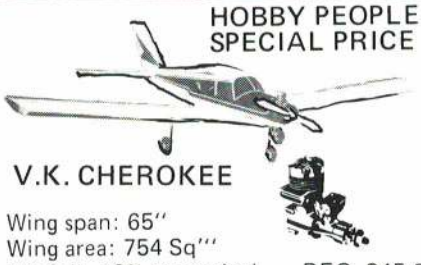

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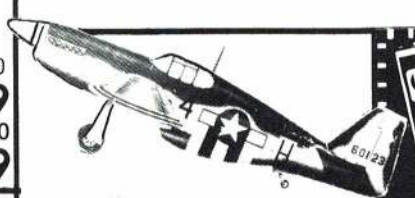

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Modeler Mail

Film source for clubs

I am interested in knowing any sources for 8 or 16 mm movies on model aviation or full-scale aviation. I am program chairman for our club, and would appreciate any leads on films you can offer.

Dennis Patera, 1028 Kendall, Geneva, Ill. 60134

The AMA has a film library. Contact them at 806 Fifteenth St., N.W., Washington, D.C. 20005. We are publishing your address so that other readers who know of any other film sources may contact you directly.

—Editor

Airship formula addendum

In the November issue of AAM you published two responses to my letter (September issue) concerning Airships.

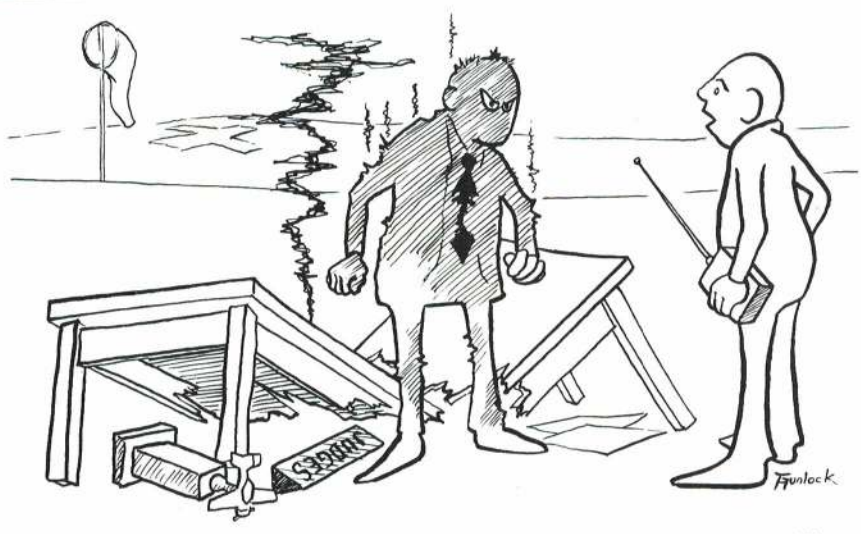
Robert Jones included a formula in his letter which he states proves that Airships are practical. He also includes a P.S. which says, "The formula was derived by the head cryogenic engineer for Scott Paper Co., so it is correct." Before Mr. Jones, or anyone else, builds an Airship based on this formula, they should know why it is *not* correct.

Being a pilot, I am not in the habit of disputing with head engineers; but, the error in the formula is in the 1.2 factor, which Mr. Jones says is the weight of material lifted by 16 cu. ft. of gas at atmosphic pressure. While it is true that displacing 16 ft.^{3} of air at standard conditions displaces 1.2 lb. of air (the Archimedean principle), the lift generated depends on *what* the air is displaced with. The actual resultant lift is 1.2 lb. minus the weight of 16 ft.^{3} of the displacing gas, in our case helium. 16 ft.^{3} of helium weighs 5.3368 oz., so we have 1.2 lb. or 19.20 oz. minus 5.34 oz., or roughly .87 lb. lift. Replacing the 1.2 in Mr. Jones formula by .87 will give more accurate results. Of course, even this formula assumes such perfections as standard conditions and being able to purge the air-bag so that it contained pure helium with no air intermixed.

Also, Mr. Jones says that the dimensions given approximate the scale of the Hindenburg. His formula is that for a cylinder flat on both ends, which the Hindenburg was not. The formula I originally used was quite similar in concept, but included the displacement volumes of a hemisphere and a right circular cone, because a cylinder with a hemisphere attached to one end and a cone to the other comes closer to approximating the size *and shape* of most dirigibles. (The formula for the actual shape of a real dirigible gets into mathematics that most of us prefer to avoid when possible.)

I was surprised that in addition to the two letters, two persons contacted me locally. There may be more interest in Airships than is commonly believed. What is the possibility of AAM doing an article on the practicality of R/C Rigid Airships and bringing all of us up-to-

(Continued on page 13)



"Guess this sorta knocks me out of the Precision Bombing Event, huh?"

Our new 1973 radio is for the RCer who wants the very best, even if it costs him less.

RC MODELER MAGAZINE SAYS . . . (December 1972 issue)

"Our (Hobby Lobby 5) has performed flawlessly under all conditions and its performance has equalled or exceeded systems selling for twice the price.

. . . If you want an extremely precise system that will offer you years of reliable service, then we seriously recommend the Hobby Lobby 5 to your consideration."

- Unsurpassed Reliability
- Extremely Long Range
- Smallest, Lightest Servos Made
- Extra servos cost only $12.00 each.
- I.C. FULL-POWER servo amplifiers
- Full 90 day Warranty—backed by the manufacturer and by Hobby Lobby
- A complete system: Transmitter, Receiver, 4 servos, all n-cads, charger, 27 or 72 mhz.
- PRICE: About HALF of what you'd expect to pay for a top quality 5 channel system.
- Improved Airborne Battery pack with ONE-CELL-OUT flight capability
- Only 11½ oz. airborne weight

Series III

HOBBY LOBBY 5 Digital Proportional

Series III Hobby Lobby 5 will be available January 30, 1973. Please call or write for our free brochure on the Series III.

$209.

SPECIAL! SOLARFILM

List Price $6.60 per roll
SPECIAL PRICE $4.38
(this month only)

Opaque colors, 26" by 6 foot roll. Colors: Bright Red, Dark Red, Orange, Yellow, White, Silver, Tropic Blue, Midnight Blue, Black.

NEW! Dremel No. 210 DRILL PRESS $19.95

Dremel used to have a sort of funky little drill press that didn't turn me on very much. But, this new drill press is a beauty. It doesn't come with a Moto-Tool, by the way, that's just in the picture to show how it works. The drill press takes Models 260, 270, or 280 Moto Tools. The table raises & lowers, and has slots for guides and hold-downs. The drill press is particularly handy in our hobby for routing and grooving.

Blue Max Mark II 6 CHANNEL SEMI KIT

with 4 FULLY ASSEMBLED SERVOS

EXTRA SPECIAL!

$168.00

Outfit includes semi kits for transmitter, receiver-decoder, charger, and 4 assembled servos. Complete n-cads, factory warranty on all factory assembled P/C boards. Your choice of 27 or 72-75 mhz. frequencies.

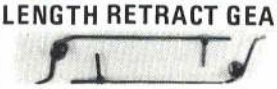
HOBBY LOBBY BRAND X WHEELS

2" pair	$1.00
2¼" pair	$1.15
2½" pair	$1.30
2¾" pair	$1.45
3" pair	$1.55

NEW! Sullivan 12 VOLT ELECTRIC FUEL PUMP $11.95

12 volts-operates directly off of your starting battery! This pump has everything: One year guarantee, a mounting bracket, filters, fuel lines, switch, insulated battery clips, one ounce per second capacity.

NEW! Goldberg ADJUSTABLE LENGTH RETRACT GEAR STRUTS



$3.00 pair

For Carl Goldberg retract main gears.

NEW! DuBro Whirly-Bird PRACTICE LANDING GEAR $3.95

I hesitate to show you a picture of this because it looks sort of hokey, but the idea is good—it's a wide-spread landing gear to help you out while you're learning to fly your DuBro 'copter.

NEW! DuBro "MUFF'L AIRE" Engine Mufflers
2 types: For Webra 61 only $7.50
For all engines .29-.60 $7.95

These highly ingenious mufflers look to me like they may take over the now-complicated muffler business. They have some interesting advantages:
1. By varying the number of baffle plates you can adjust the noise level (and also the exhaust back pressure.)
2. The mufflers are small and INCONSPICUOUS on an engine.
3. The $7.95 muffler has very clever tab device to assure "no drift" alignment on any engine.

HOBBY LOBBY ILLUSTRATED CATALOG $2.00

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master charge THE INTERBANK CARD

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MODELER MAIL

(Continued from page 10)

date on whatever accomplishments have been made in this area recently?

Dennis J. Lenahan
Wichita Falls R/C Club
Wichita Falls, Texas

AAM would welcome an article or a true heavier-than-air dirigible. Should have 3 controls minimum.

Please limit it to the internal capacity of an average family station wagon.

—Editor

Successful Junior

This is a picture of my son Guy, age 9, with part of his collection of Driftwoulds, built from plans in Bob Meuser's September Free Flight "Where The Action Is" column.

Junior HLG is a highly competitive event here in the Southwest, yet Guy has placed no lower than third with his Driftwould 15", including two first place trophies. At a recent NIMAS Indoor meet CDed by Bud Tenny, Guy did 56.3 with his Indoor version.

Simplicity of construction and outline makes this a fine design for the Junior builder.

Victor Larsen, Roanoke, Tex.

Many thanks

I would like to thank you for printing my letter regarding the Gee Bee racer plans. I have had many, many offers and now have the plans I want.

It wouldn't have been possible with-

out your printing my letter in Dick Burkhalter's column in **Junior American Modeler**. My greatest thanks to your fine magazine and Mr. Burkhalter.

David A. LaPrade
Roanoke, Va. 24018

DON'T MISS OUR GREATEST DESIGN CONTEST TO PUT BUCKS IN YOUR POCKET!

Hire the handicapped.

PAS

PUBLIC ADVERTISING SYSTEM
A DIVISION OF THE SCHOOL OF VISUAL ARTS

EDITORIAL

(Continued from page 7)

best engine, or best hardware for these activities. Those who are winning are usually flying with these products.

The vast majority of AMA members are adults in the Open membership category. About 10% are Seniors and Juniors. These younger members compete in events against others of the same age category. Some events are specifically for them, too. A great effort is made by the Academy to attract new young people to modeling and keep them. With the average age of members in the upper 20s and the average age of competition fliers in the 30s, you'd think there were no youngsters in modeling. Not so. They are there and they need our attention. That's why the AMA has a very determined public relations department. Reach out and bring them into modeling while young and they will probably be modelers again after college. Not many kids feel such a need to be members, but it is encouraged by very low membership rates —Juniors and Seniors pay only $3.00. No monthly news reaches them as with the Open members, but all other membership privileges are included.

How does AMA attract new members and keep them? One way is that part of the membership privileges is a monthly nationally distributed magazine. You are now reading this magazine—AAM. The AMA news comes to the members through the AMA News Section (see pages 94 through 101). This Section has been in AAM since 1966. By publishing the section in every issue, every copy, every month, the

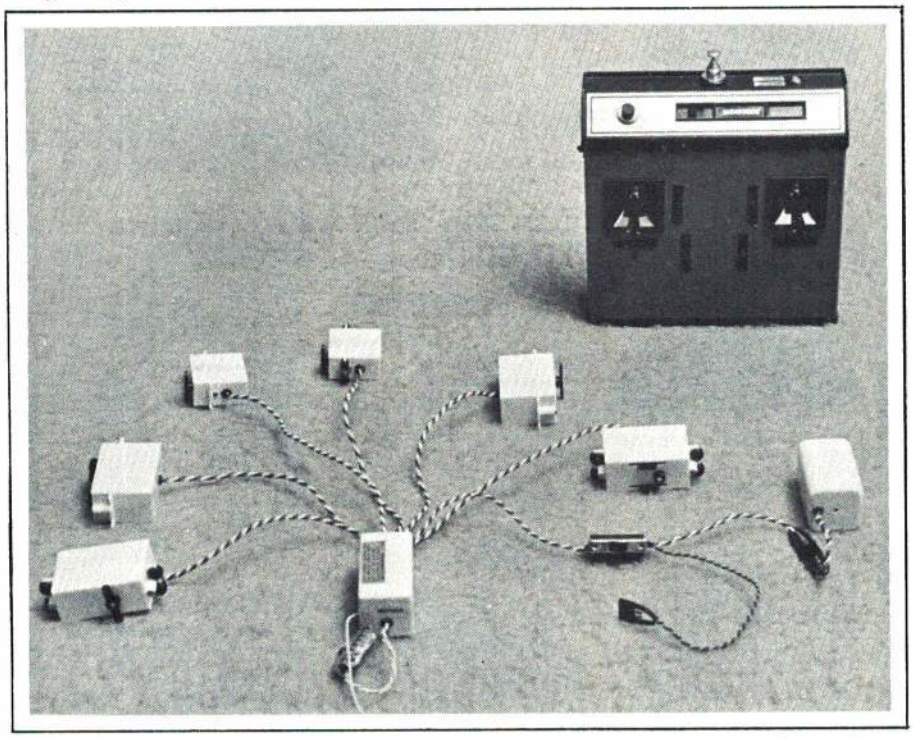
(Continued on page 105)

Blue Ribbon Review

PART I

HEATHKIT'S VERY UNIQUE EIGHT-CHANNEL SYSTEM

FRED MARKS



Perhaps the transmitter is the first human-engineered configuration. A standard feature is the dual-frequency switch at top right and auxiliary functions on the side of the transmitter.

The system tested this month is one of the most unique to come along in some time and is produced by the equally unique Heath Co. The Heath Co. began in the 1930s with production of a kit type airplane, powered by a modified Model-T engine and capable of carrying one person.

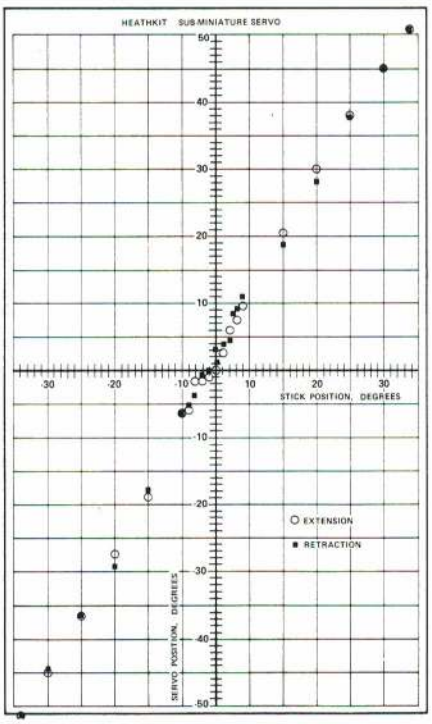
Heathkit over the years has become almost a household word in this country, primarily because their kits are designed and instructions written in such a manner that anyone who can read can put one together. It seemed quite natural that Heathkit should produce kits for RC systems. I personally recall filling out warrantee and information cards for Heathkit equipment (having built over ten kits from Heath although having constructed only parts of their RC systems), which requested new kits their customers would like. In all instances RC systems were listed and, hopefully, helped lead to their kitting RC systems.

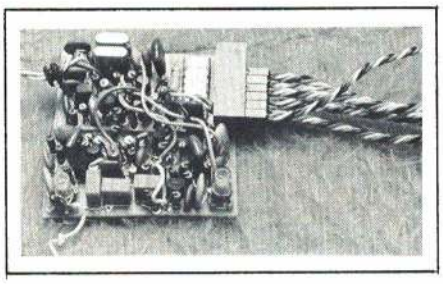
It has been interesting to watch the growth of Heath's product line and the changes in design. The RC projects are guided by Bill Hannah. This latest system features maximum use of integrated circuits, including an IC encoder, decoder, and servo amplifiers.

The GDA-405-D is available on all 27, 50-54, and 72 MHz frequencies and may be fitted with either the miniature servo (KP-11 mechanism) or the subminiature servo KP-12 mechanism). As built, the system has all eight channels functional. However, four servos are provided with the complete system and additional servo kits must be purchased to permit a full complement of eight. It is a little hard to think of things to do with eight channels.

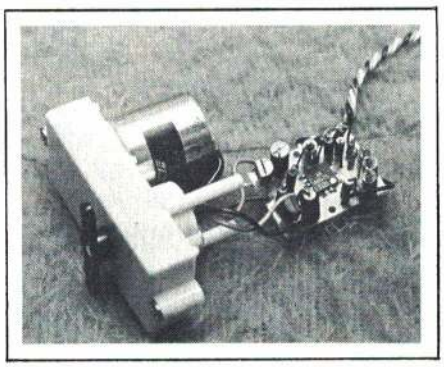
The transmitter is all new and completely different from past sets both physically and electronically. The case is a composite of vinyl-covered aluminum

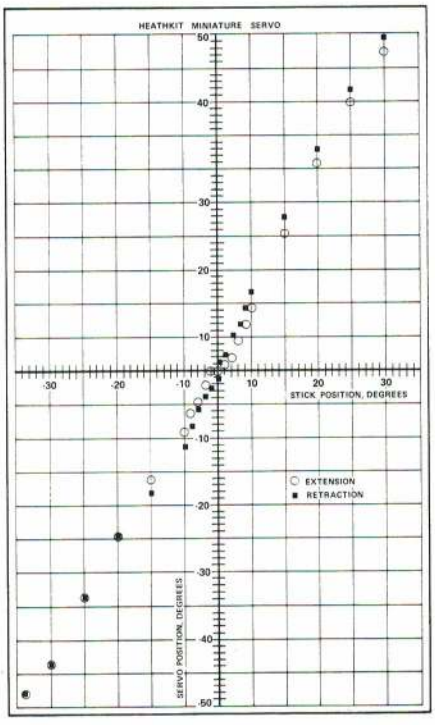
(Continued on page 92)





Preferred by Heath is the crystal filter IF stage in the receiver. Several components and one tiny IC in the servos make assembly relatively easy, even in the KP-12 mechanism.





CARL GOLDBERG

The Solid Evidence on C G RETRACTS

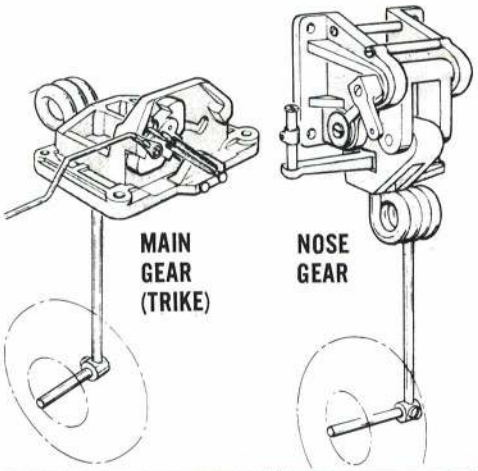
Now after more than a year's use by thousands of modelers, we'll bring you each month solid evidence on CG Retracts. Proof of dependability and durability. How they carry heavy airplanes working off of grass fields and last for hundreds of flights. Practical and almost service-free, they work for experts and average flyers—and they'll work for you!

For instance, read what nationally known expert flyer Dave Brown says:

Dave Brown Comments:

Dave says:
I chose CG Retracts over others because of 3 factors: (1) Reliability, (2) Longetivity, and (3) Economy. Installed the gear January 1972, using one World Engines S-5 Retract servo to work all 3 units. I fly off of rough grass a lot, and by March 1 was putting in 7 or 8 flights practically every evening and, of course, more on weekends. Flew in 20 contests and won 6, including first in C-Expert at the Winter Nationals. My Phoenix 5 now has made more hundreds of flights than you would believe (125 gallons of fuel!), and the gear has given no trouble of any kind. I've never even taken it out of the plane. That's what I call good performance.
Dave Brown

TWIN GEAR Retracts—RG2—$14.95
TRI-GEAR Retracts—RT3—$24.95
NOSE GEAR (Only)—RG1—$10.00



UNIQUE SNAP-LINK! Patent Pending. Now for the first time—you can buy a truly safe link—the SNAP-Link!

- Tiny 45° shoulder snaps through arm, prevents accidental opening. So unique it's Patent Pending!
- One-piece design—no separate pieces that might come apart.

Snap-Link, Regular, with rod } 29¢ each
Mini-Snap-Link, with rod }
Snap-Link or Mini-Snap, less rod 2 for **40¢**

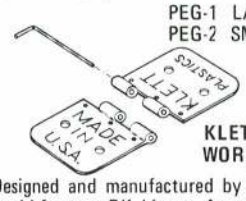
NEW—MAJOR R/C FITTINGS SETS

Here's the economical way to buy the major fittings for your multi-ship. In one set, you get all the horns, links, keepers, bellcranks, or strip aileron linkage, and hinge material—and at a saving.
R/C Fittings Set No. 1 for ship with standard ailerons—**$3.50**
R/C Fittings Set No. 2 for ship with strip ailerons—**$3.50**

NEW! KLETT PUSHROD EXIT GUIDES

To protect your fuselage and insure smooth operation of your pushrods. Precision made of tough nylon. Easy installation. Large for 5/64" wire, small for 1/16" wire.

PEG-1 LARGE 4 per pkg. **75¢**
PEG-2 SMALL 4 per pkg. **75¢**



KLETT HINGES – WORLD'S FINEST!

Designed and manufactured by Roy Klett, originator of world-famous RK hinges. An exclusive with Carl Goldberg, these hinges are made with exceptional care and attention to detail. The small RK2 hinges are so thin all you need is a knife slit. The regular size RK3 hinges are the slickest you've ever seen – try holding one leaf and waving the other! And both have **removable music wire** pins. Ask your dealer for the best – Klett hinges.

RK2-7	7 for **$1.10**	RK2-15	15 for **$1.95**
RK3-7	7 for **$1.25**	RK3-15	15 for **$2.35**

STEERABLE NOSE GEAR

Versatile – steering arm can be to either side, or slightly up or down, or mounted on bottom with extra collar in slot. Steering arm is nylon, stiff enough for good control, yet can flex under shock to protect servo. Collar is hardened steel – won't strip like brass. Screw is hardened steel, too. You can really torque it and get good grip on music wire strut without a flat.

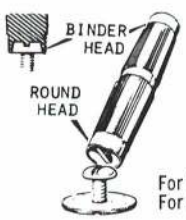
Complete steerable nose gear with nylon bearing, 5/32" plated music wire strut, extra collar, blind nuts, screws and washers – **$2.50.**

NYLON STEERING ARM
Hardened steel collar and screw—**75¢.**

NYLON BEARING
One-piece design mounts to firewall without alignment problems. Includes blind nuts, screws and washers—**75¢.**

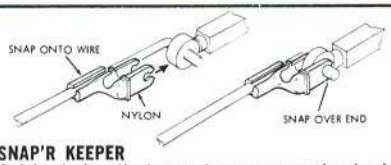
CONTROL HORNS
Our new horns have the upright part rising from the center of the base for maximum stability. Holes are right size for 1/16" wire; nut plate for simplest mounting. Long horns or short horns, with screws—**50¢** for 2.

NYLON REINFORCING TAPE
This nylon reinforcing tape is extremely tough when applied with epoxy around the center when joining wing halves. 2½" wide x 5 ft.—**50¢.** ¾" wide x 5 ft.—**25¢.**



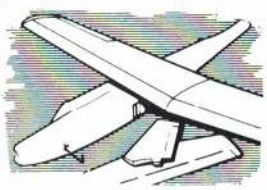
NEW KLETT SAFETY DRIVER SOCKETS DOWN ONTO SCREW HEAD – CAN'T SLIP OFF AND DAMAGE YOUR WING!
Takes Round Head Screws and Binder Head.

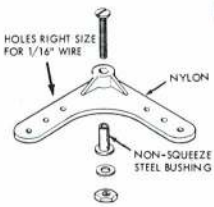
KLETT SAFETY DRIVER
For ¼" Nylon Screws } 98¢ each.
For #10 Nylon Screws }



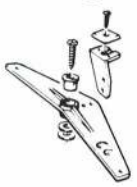
SNAP'R KEEPER
Quickest, handiest way to secure pushrod wire end to servos, horns, etc. Works on wire 3/64 to 5/64" diameter—**50¢** for 4.

REPLACEMENT FOAM WINGS, ETC.
To go with your own design fuselage. Proven efficient Ranger 42 foam wing gets you in the air quickly – **$3.95.** Stab and vertical fin, set **$1.95.** Assembled Ranger 42 fuselage. plus bearers, nosegear, etc., **$8.95.**





AILERON BELLCRANK
Bellcrank has steel bushing of proper size, so crank can be screwed firmly in place without binding. No electrical noise—all metal parts are screwed tightly together—**50¢** for 2.



½A BELLCRANK and HORN
Made of nylon, this new set provides smooth ½A control line operation. Easy on dacron lines, too –**25¢.**

SHEET METAL SCREWS
Like wood screws, but better. Sharp, clean, full-depth threads, hard and strong. Excellent for mounting servos, etc. Includes washers—#2 x 3/16—**30¢** for 10; #4 x 3/8—**30¢** for 8.

P.S. For best service, see your dealer for items you want. If not available, write direct; add 50¢ per item ($1 outside U.S.). Minimum order $1.

MANUFACTURERS—All our accessories are available at excellent O.E.M. bulk prices.

Available in Canada

Carl Goldberg Models Inc.
2545 W. Cermak Rd., Chicago, Ill. 60608
I am sending 25¢ for 8 pg. Illustrated Catalog with, "Recommendations in Starting in R/C," Basic Explanation of R/C Equipment and Radio Control Definitions.

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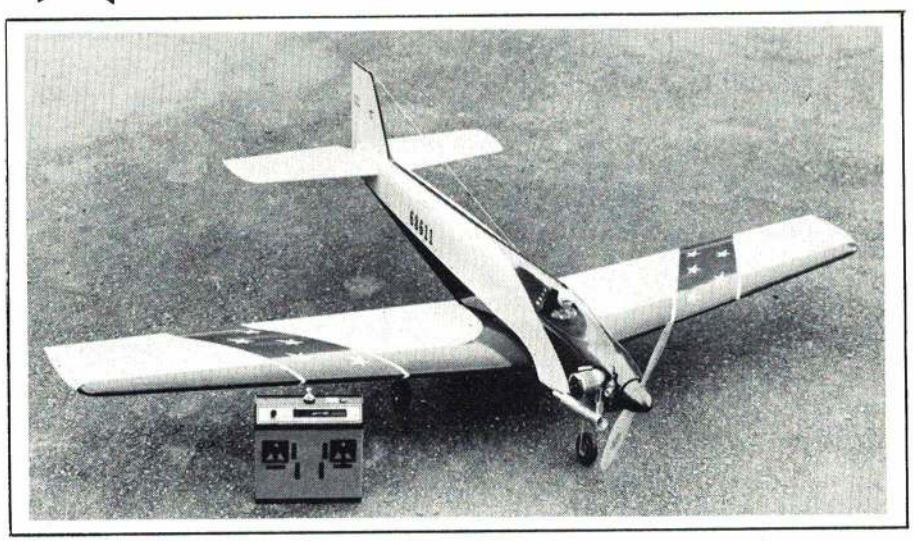
CARL GOLDBERG MODELS INC.
2549 WEST CERMAK ROAD • CHICAGO, ILLINOIS 60608

Blue Ribbon Review

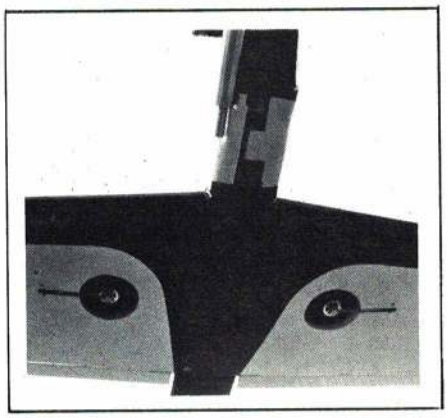
PART II

SIG'S KOMET WITH RETRACTS REALLY GOES WITH THAT SUPERTIGRE BLUEHEAD.

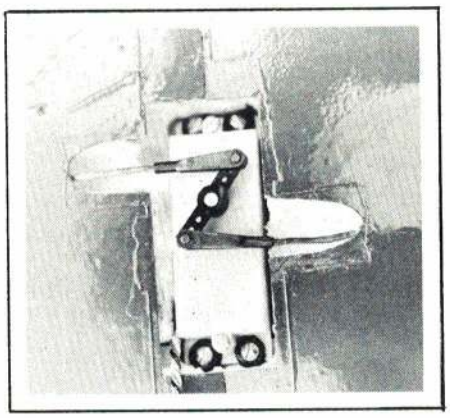
DUANE LUNDAHL



Author's first try with surfacing resin and acrylic lacquer came out beautifully. Nice color lines.

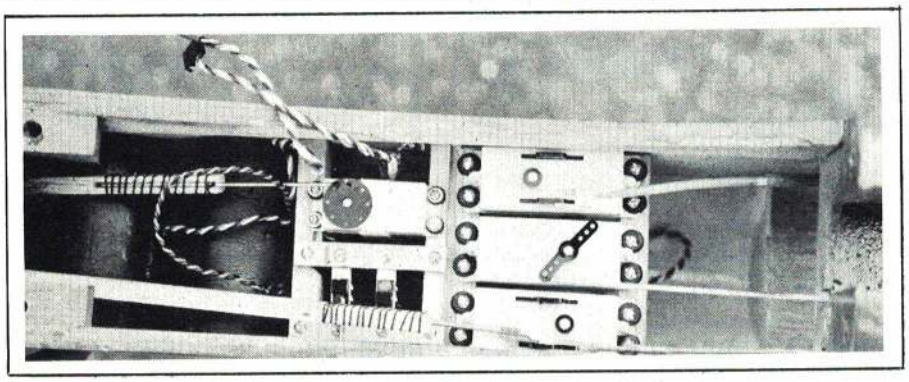


Goldberg's retracts with latest improvements make a very neat installation even without wheel cores.



Pushrod system for main gear retracts (only) works fine from a 90 degree servo. Another servo for nose gear.

Receiver and battery are positioned behind servos, it is safer and balances better. Note second switch is for frequency change. It requires removal of wing to operate. (See text.)



It's easy to write an article about a product you have thoroughly enjoyed and which has performed well. In this case the airplane is a Sig Komet designed by Maxey Hester, and is powered by a Supertigre Bluehead. Goldberg retracts are utilized and, of course, the Heathkit eight-channel radio serves the guidance purposes. The combination has been all that I would ask for and has performed beautifully to date.

The accompanying article by Fred Marks details the operation and performance of the radio as all Blue Ribbon articles do. However, in this case, since I built the radio I feel certain comments are appropriate. The first question I am asked by everyone who has seen the radio is the relative difficulty of building the new eight-channel radio as opposed to Heath's previous eight-channel. I have built all the projects, and I think that as a total project, the new eight-channel radio is slightly easier to build than the previous Heath radios. This is primarily because of the extensive use of integrated circuits in the encoder and decoder sections, as well as the servoamplifiers. There are perhaps a few tighter spaces in the transmitter than previously, but all in all the Heath system goes together extremely well, and, as usual, the Heathkit instructions are perfect. The particular radio that was built was an early production model and some minor problems were encountered when the system was completed in the form of nonlinear servo-response. This subject was discussed with Bill Hannah at Heathkit and, due to the prompt and exceedingly helpful attitude taken, immediate efforts were made to trace the problem and corrections have been incorporated in all of the subsequent production radios.

I'm supposed to be writing about the airplane not the radio, so let's get on with it. Frankly, this project was the first time I have built a 60-powered ship and was approached with a combination of enthusiasm for the project, and trepidation over what my fuel bills were to become if I flew as often as I have my smaller aircraft. One of my first reactions to the airplane was relative to the immense amount of room for equipment installation in the fuselage. The other general impression I have yet to get over is the overall size. This thing is barely transportable in my Pinto, but that's not the Komet's fault—that's just how big 60-size airplanes are.

My general impression of the kit was very positive. In addition to being my first 60-powered ship, this is one of my first exposures to foam wings—at least from the standpoint of putting the skin on myself. The kit that was ordered had the plywood wingskins which I highly recommend over the balsa, if for no other reason than they are tremendously more resistant to the usual dents and nicks that airplanes seem to attract like magnets. Don't be afraid that it's plywood. You might think that it is not flexible, etc., however, in this case the plywood is but 1/64" thick even though it is three-ply, and is basically as flexible as the cardboard on the back of a paper

(Continued on page 87)

Power play.

That's when you have the advantage. And use it.

It's when you're one up.

And we've built the Champion to get you there. The Champion's our workhorse, designed to give you the power and control.

It's reliable. It's fun.

The Champion has adjustable sticks, allowing you to regulate stick tension to your own individual preference.

The Champion has a highly selective, solid state receiver.

The Champion has the smallest, lightest servos available anywhere.

All Champions have six channels. And you can choose either one or two sticks.

What price, power?

$349.95 for the two-stick, six-channel Champion.
$369.95 for the one-stick, six-channel Champion.
That includes transmitter, receiver, 4 servos, battery pak and charger. Reasonable.

EK-logictrol Champion.

Try it. Price it. Fly it.

And if you mean to stay in the air, take the controlled approach.

EK-logictrol
The controlled approach

For our full-line brochure, write: EK-logictrol, 3233 W. Euless Blvd., Hurst, Texas 76053

SUPER DESIGN

A **SUPER DESIGN CONTEST** with a pocket full of money. . .that's what it is! All you have to do is design a 60-powered RC aerobatic aircraft from Bob Lopshire's drawings. The top side of the aircraft is our cover for this issue. The underside is the four-color picture on the next page. The design must be completely functional, i.e., it must fly. General requirements for the design are on the next page under the picture.

This contest is open to everyone, But be careful 'cause you'll have to build the aircraft later. The winner of the design stage will receive $100 and go on to the second and third stages. You can win $700 all together! So isn't it time to pick up a pencil and start sketching? The rules are simple and easy to follow.

STAGE 1
$100

DEADLINE: February 28, 1973

Your drawings will be judged on the following points.

- Functional—will it fly.
- Attention to detail—complete drawings
- Neatness—drawings must be neat and clean.

The winner will be notified by April 15th and at that time the winner will begin stage 2.

In order to win and qualify for the last two stages the following simple rules must be adhered to. Deviation from these rules will mean disqualification.

1. To enter, send in a complete set of full-size pencil drawings. These must be construction drawings.
2. The design must be completely functional, i.e., it must fly. All retract gear, etc., must be operable.
3. All hardware used must be included in the drawings.
4. All hardware has to be from advertisers in AAM. Each piece of hardware must be indicated in the "List of Materials" block on your drawings (see the sample Materials list block on opposite page.)

STAGE 2
$400

DEADLINE: June 30, 1973

After the story and pictures have been accepted you will receive the second part of the prize. But the final stage is the best.

Designing an aircraft is only part of the fun. Now you get to build your creation and fly it! But that is still only part of it. You will receive $400 after completion of this stage. Three things must be done.

1. From your design drawings construct the aircraft. Paint the model in either red or orange with black and white.
2. Perform various tests on the finished aircraft. We will send you the test requirements.
3. Write a story and furnish pictures. Guidelines for story construction will be furnished.

STAGE 3
$200

DEADLINE: Appearance at the 1973 Nationals in July.

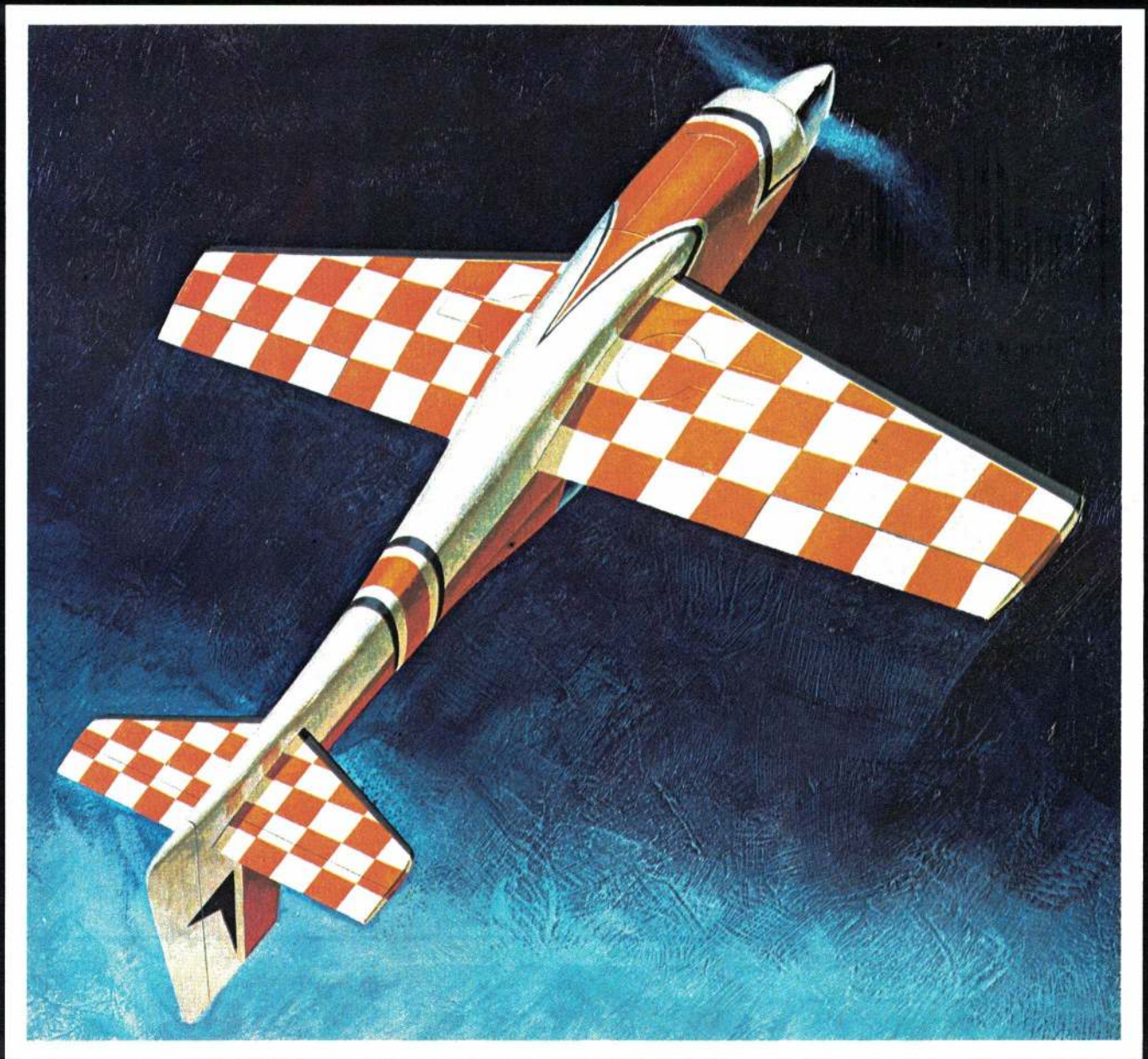
1973 Nationals

Competing is where it's at. This is when you get to pit yourself and your aircraft against all comers. The grandfather of all competitions is the Nationals. Last year there were almost 2000 competitors from the U.S., Canada, and Mexico. Why not join the group in 1973?

Come to the 1973 Nationals with your aircraft and compete. For your appearance we will pay all your expenses up to $200. Upon registering to compete with your super designed aircraft you will receive the final prize.

You've got to agree. This is a **SUPER DESIGN CONTEST!**

CONTEST !!



When preparing your designs, keep in mind that the details listed below must be included. The ommission of any of these details not marked "Optional" will disqualify the entry.

DESIGNED BY:	DRAWN BY:	DATE
LIST OF MATERIALS		
QTY	SER. NO.	PART	MFG

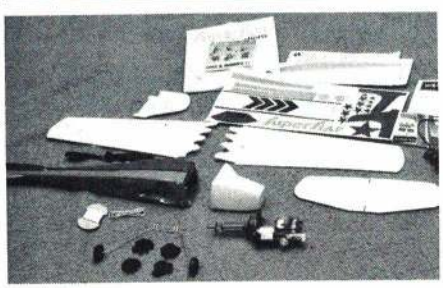
- PILOT OPTIONAL
- AIRFOILS OPTIONAL
- RETRACT GEAR
- INVERTED COWLED ENGINE
- WHEEL DOORS
- ENCLOSED LINKAGE AND INSET AILERONS
- WINGS MAY BE REMOVABLE
- SIZED AND POWERED FOR A 60 ENG.
- CLEAR CANOPY
- SILVER/ALUMINUM SPINNER
- PAINT JOB IN RED OR ORANGE

NEW PRODUCTS CHECK LIST

FRANK PIERCE

DuraDix/Polymer cement. An incredibly strong adhesive capable of supporting 5000 psi, can be used to bond similar or dissimilar materials. Sets rapidly without heat or catalyst. Use sparingly, one drop per sq. in. 100-drop two-gram tube, $2. William Dixon Co., Carlstadt, N.J. 07072

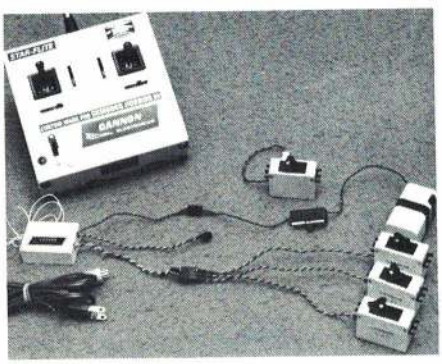
WD-40 Co./Aerosol lubricant. Next to electricity, WD-40 is about the handiest thing around the shop. Sprays a light, even coat of penetrating lubricant. Safe to use around plastics, protects metal, frees rusted parts, can even dry out a wet ignition system. Leaves no sticky residue. Available in small pocket size shown or in larger spray cans. WD-40 Co., 5390 Napa St., San Diego, Calif. 92110



Mattel/*Super Star*. A real flyer with built-in flight programmer system. Plane may be flown on a simple tether line for circular flight path or controlled with one of four plastic rotating program disks which provide a pre-determined complex flight path. Programmers are connected directly to rudder, control time and amount of deflection. All-electric operation, charges from 6-volt battery. Mattel, Inc., 5150 Rosencrans Ave., Hawthorne, Calif. 92050

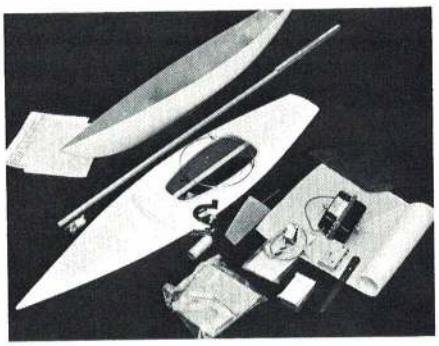
Hartman Fiberglass/Charger. Now available, 61" fiberglass-hulled power boat is driven by three hp *Tecumseh* inboard engine which will turn close to 30 knots. Also shown in foreground, model tug, soon available in kit form. Complete catalog available for 24 cents in stamps. Hartman Fiberglass R/C, Argenta, Ill. 62501

RC Helicopters/Bell Jet. Now, more on Jet Ranger, first covered in December Check List: 60" motor, recommended for 60 power, upright engine mounting, weight without RC gear, approximately 8½ lb. 58" prefinished fiberglass fuselage with plywood formers. Positive-lock centrifugal clutch provides direct, sure rpm control. Most detailed manual of any copter kit. All parts made in USA, designed by Len Sabato. $475. R/C Helicopters, 4550 White Plains Rd., New York, N.Y. 10470



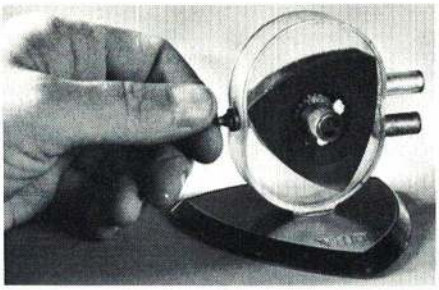
Dembros/Low-cost basic full house. By Cannon exclusively for Dembros, four-channel system includes charger and all NiCads, IC receiver decoder and bridge servo amplifier, choice of servo types, Buddy-Box. With C-E1 servos on 27 MHz, $269.95, 72 MHz $279.95. For C-E2 and -E3 servos, add $3 per unit. Dembros Hobbies, Inc., 58 Lake St., Nashua, N.H. 03060

Colbert/PanaVise. A unique tool. PanaVise can be used in dozens of applications where a conventional fixed vise would not work. Pan heads can be rotated, swiveled, extended to take the pressure to where the job is rather than visa-versa. Many different models too varied to list. Write Colbert Industries, 10107 Adella Ave., South Gate, Calif. 90280



Vortex/RC sailboat. Shown constructed in December Check List, photo shows *Soling-M* kit with fiberglass hull, separate deck, mast, sail control unit (SCU) and finished rolled sails. Decks available in white only, and sails in five colors and white. SCU available separately for $75, can be specified for 2- or 3-channel radios. *Soling-M* can be ordered either as a dry kit for $125, assembled with SCU installed for $350, or with both SCU and Kraft KP-2BX for $510. Vortex Model Engineering, 210 E. Ortega St., Santa Barbara, Calif. 93101

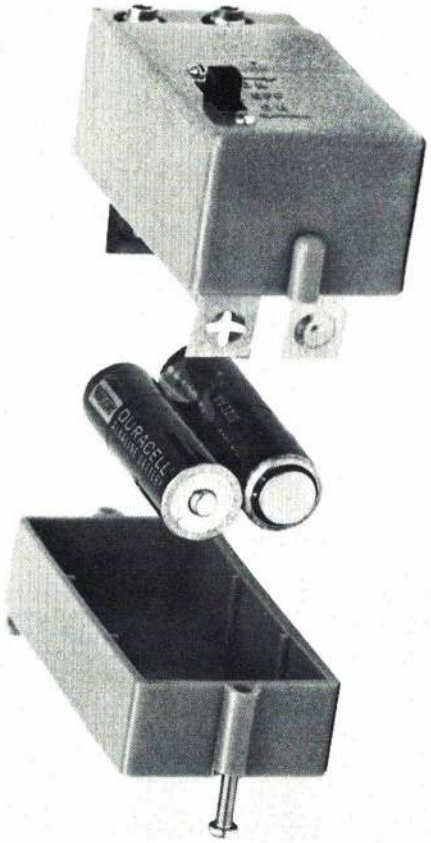
Mattel/Signal Command RC. A new approach, beautifully packaged ARF kit uses electric motor, comes complete with pulse proportional RC system. 40" span high wing kit has 280 sq. in. wing area, vacuum-formed rigid vinyl fuselage, high-strength polystyrene wing and tail. Transmitter available on five 27 MHz frequencies, has out-of-sight range capability. Motor and receiver NiCads charged simultaneously from same source. Engine automatically killed before batteries die, ensures safe landing. Quality engineering throughout. Mattel, Inc., 5150 Rosencrans Ave., Hawthorne, Calif. 92050



Vettco/Wankel. For display, teaching, desk ornament, door prize, this beautiful little simplified model of *Wankel* rotary shows operating principles without obscuring everything by superfluous details. Made of smoke-gray transparent plastic, can be assembled or disassembled as often as desired. $2. Vettco, Box 23, New Almaden, Calif. 95042

Brookstone/Catalog of hard-to-find tools. One of the most interesting catalogs of hard-to-find quality tools we have seen. Specializing in tools and accessories for the advanced hobbyist and professional worker, catalog contains 65 pages of precision woodworking, metalworking equipment. Vices, files, punches, saws, knives, electric control equipment. No cut-rate, only things you'd be proud to own or give. Write Brookstone Co., Dept. C, 12 Brookstone Bldg., Peterborough, N.H. 03458

Paul R. Matt/*Historical Aviation Album.* Volume XI contains articles on the *LWF* Butterfly and Owl series, "family tree" coverage on *Douglas* observation aircraft of the 20s, recollections of the old Cicero flying field. 68 pages, five outstanding scale three-views. $5. Also, inquire about reprints of famous Paul Matt scale drawings from previous issues, now available. Historical Aviation Album, Box 33, Temple City, Calif. 91780



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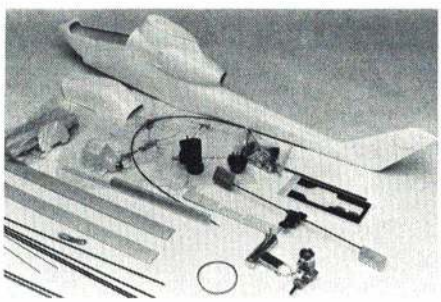
Paasche/Airbrush. Precision made for the hobbyist, brush has adjustable head for spraying all types of patterns, nickel-plated for easy cleaning. Can be used with small compressor or aerosol-type cans. Useful for all lighter media such as dyes, water colors, thin tempras and lacquers. Write for additional information to Paasche Airbrush Co., 1909 W. Diversey Parkway, Chicago, Ill. 60614

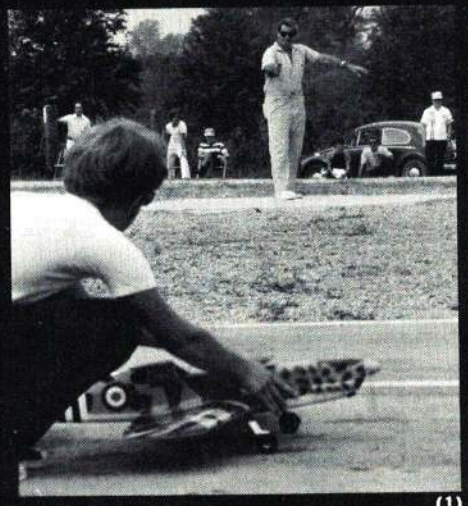


Polk Hobbies/Kalt Helicopter. Beautifully packaged kit has 53" fiberglass fuselage, 50" main rotor with hardwood blades. Fully assembled transmission with control linkage, designed to operate on four-channel system. Enya 45 with muffler included in kit. Complete spare parts stocked for repairs if needed. $369.95. Polk's Hobby Dept. Store, 314 5th Ave., New York, N.Y. 10001

House of Balsa/*Shoestring.* Quarter midget stand-off scale kit uses either 37" or 35" clipped wing. All-balsa construction, fiberglass cowl and formed canopy, detailed plans and three-view scale data sheets. For 15-power, kit is nicely packaged, shows quality in all details. Decals included. House of Balsa, 2814 E. 56th Way, Long Beach, Calif. 90805

Cannon/Six-channel RC system. *Grand Prix* system available in single- or twin-stick (shown) versions. In all 17 RC frequencies on 27, 53, and 72 MHz bands, 750 mw output on 27, 350 on 53 and 72. Fully compatible with present and earlier Cannon servos. 500-mah NiCad receiver battery with charger. As supplied, all channels are operational and require only servos to be plugged in. With dual linear rotary CE-2 servos. $399.95. Cannon Electronics, 13400-26 Saticoy St., N. Hollywood, Calif. 91605

Heuer/Digital stopwatch. If you must have easy-to-read precision times for almost any application, this quartz-controlled direct-digital readout unit is worth the money. ±0.10-second accuracy at normal temperatures, readout is via light-emitting diodes. Mercury cell-powered, from $295. Write Mr. Von Gunten, Heuer Time and Electronics Corp., 960 South Springfield Ave., Springfield, N.J. 07081



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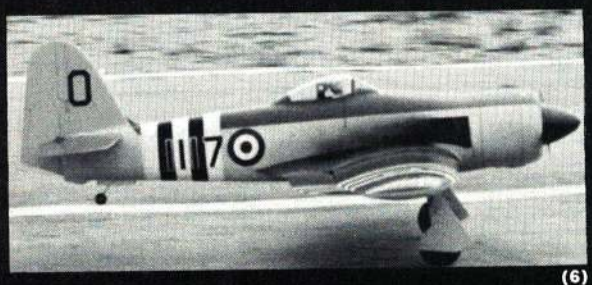

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(1) Art Adamisin's takeoff on an ill-fated flight with the DeWoitine fighter. (2) Scale-like models dominated the circles. Left to right: Dennis Adamisin, Charles Reeves, Keith Trostle, Al Rabe and Lew McFarland. (3) Jerry Soloman placed sixth with his metal flake green, gold and white trimmed SIG Chipmunk. (4) Event winner was Gene Schaffer using his year-old "Stunt Machine." (5) Miami's Les McDonald placed third with the Tropicaire a two-year-old plane. (6) Rabe's big Sea Fury on landing. It never bounces with that shock absorbing gear, and note the down elevator, too.

ON THE SCENE

EASTERN FAI STUNT TRIALS AT LEXINGTON.

WYNN PAUL

Photos by Wynn Paul

The Eastern FAI Stunt Semi-finals were held at Lexington, Kentucky on the 15-acre field of the Lexington Model Airplane Club September 2 and 3. Nineteen entrants from New York to Miami to Dallas showed up to try for the nine slots to make the trials next year. The first round on Saturday started with virtually no wind and a hot 87 degrees. Jerry Pilgrim of Dallas led off with a 2482 to start the five judges on their marathon performance.

Art Adamisin ran out of fuel and totalled his beautiful French DeWoitine fighter; Les McDonald (Miami, Florida) then followed with a good 2836, and Jim Silhavy scored 2862. The Sea Fury man, Al Rabe, then whipped out a 3088 to settle a lot of questions about whether the British carrier plane can fly tighter than at the '72 Nationals. Lew McFarland then zipped his Akromaster to a 2900 to move into second place.

New Yorker ("I live in Queens") Gene Schaffer flew his usual tight pattern to an outstanding 3129 to move into first place. Gene was flying last year's "Stunt Machine" as his new "Air Boss" disintegrated shortly after the Nationals. The Stunt Machine still flies very well. Don Bambrick, flying his three-year-old Titan, flew a 2572 after solving some engine problems. Jerry Soloman then jumped into third place with a well executed 3032. Senior National's Stunt winner Dennis Adamisin then finished up the first round with a 2849 which was good for sixth place.

The second round started after a 15-min. break for the judges (who included 1972 FAI team member Jerry Phelps). Les McDonald led off and improved his score to 3114. He then drew number one flying spot again for the third round. What luck! "It felt better, although my outsides were giving me some trouble," said Les of the flight. McFarland upped his score to 3116 and Pilgrim improved considerably to a 2773 as the judges got over their initial cold scores. Newcomer to the Stunt circles, Mike Ditrick (Erie, Pennsylvania), then flew a better pattern with his black and gold Argus to score 2688. Jerry Soloman (Cincinnati, Ohio), flying his metal flake Chipmunk, again served notice that he is very much back in town as he powered his 46 Supertigre to a 3035. Said Jerry, "After the Nationals I decided to go with the muscles and use the 46 instead of the 40 Max. I did have some trouble with propwash on this flight."

Al Rabe then flew "as tight as I can for a good pattern" and compiled a 3106. The Sea Fury's appealing shock-gear bounceless landings shared the spotlight with Al's ballet steps as he tried to keep his 70-ft. lines on the 65-ft. circle. Rolland MacDonald flew his Harlequin better the second time and improved to 2856; Wynn Paul also bettered his score to 3006. Dennis Adamisin had a slightly rich run at the start which hampered his wingover, but then settled down to a good run and scored 2857. Jim Silhavy flew a fast pattern with his 46 Gypsy to score 3096. Jim said, "I messed up my first few maneuvers and this hurt the overall pattern." Keith Trostle had engine problems again and was forced to withdraw. The top nine after the first two flights: Schaffer, Rabe, Soloman, McFarland, Silhavy, Les McDonald, Paul, Adamisin, Bambrick.

Sunday morning started with rain. After a half-hour intermission, Les McDonald led off with a 3131. "The pattern felt okay, not great, but it should be competitive with the other fliers." Gene Schaffer then flew a 3139 to have a best two-score total of 6405 which looked pretty solid. Said Gene, "I felt it was the best of my three flights. The judges are very consistent and fair. I'm not just saying that because I'm on top, they are doing a fine job." Jerry Soloman finished up with a good 3056½. "That was better than the second flight, but not as good as my first."

Rabe had to score 3300 to beat Schaffer, but scored 3181 to wind up in second place. "I might have lost some shape but it was small," said Al. Lew McFarland followed with a 3104½, then Silhavy, 3100; Paul 2990 and Adamisin 2921.

The final standings and the nine qualifiers for the FAI finals next year: Gene Schaffer, 6405; Al Rabe, 6287; Les McDonald, 6257; Lew McFarland, 6220; Jim Silhavy, 6196; Jerry Soloman, 6091; Wynn Paul, 6004; Dennis Adamisin, 5778; Rolland McDonald, 5750.

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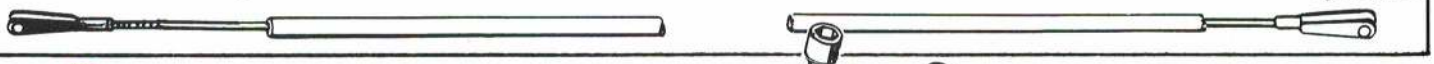

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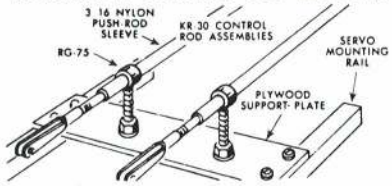

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MASTER QUALITY MACHINED BRASS FITTINGS . . . USED WHERE ADUSTABLE ROD OR CABLE CONTROL CONNECTORS ARE REQUIRED . . . 1/16" DIA. x 5/32" L MOUNTING SHAFT . . . EC-98 WILL ACCOMMODATE ALL DU-BRO PUSH-ROD AND FLEX-CABLE ITEMS. EC-98 IS THE FINEST FITTING AVAILABLE. FOR STOCK SIZES 1/16" TO .074" IN DIAMETER . . . SIMPLY PEEN OR SOLDER RETAINER RING TO THE MOUNTING SHAFT FOR QUICK, POSITIVE ATTACHMENT. EC-98. EC-98. . .2 SETS **98c**

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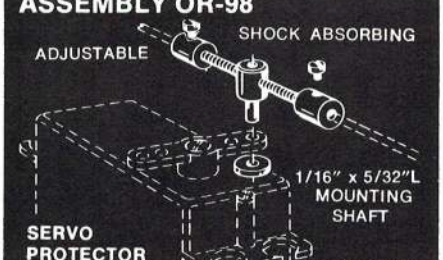

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PRE-FLIGHT PROCEDURES FOR YOUR RC MODEL

Here we are with a completed RC model. The plane is covered and finished, all hardware is installed, the radio and engine are installed and we're ready for the acid test. Let's take a little time, run some checks and make sure we're really ready. Before you leave for the flying site there are eight important requirements.

(1)—Test the linkages and control surfaces for looseness or "slop." Tighten any excessive play.

(2)—Check servo throw in both directions—make sure the controls aren't hooked up backward. See if the control surfaces return to neutral when moved from either direction.

(3)—Check plugs for security—no bent pins, loose sockets or frayed wires.

(4)—Set the engine idle and high speed ends. Make sure the engine will accelerate and decelerate without sagging or quitting.

(5)—With the engine at high throttle, operate all functions. Note if there is any tendency to glitch or drive controls hard over.

(6)—Run a range check with engine off. This is often better done at home than at the field. With other radios radiating on adjacent frequencies you will often get a false indication of short range.

(7)—Have a full (overnight) charge on your radio before you leave for the field.

(8)—Check your field box for props, fuel, a good ignition battery, spare glow-plug, tools, epoxy, etc.—don't forget the transmitter.

At the field there are further preparations as follows:

(1)—Make sure the aileron servo plug is secure before you install the wing. This goes for retracts, too (if installed).

(2)—Top off the fuel tank.

(3)—When you have the clothespin (or other authority to use your frequency), turn on your radio and check operation. If you didn't do it at home, you can try a range check but beware as noted above.

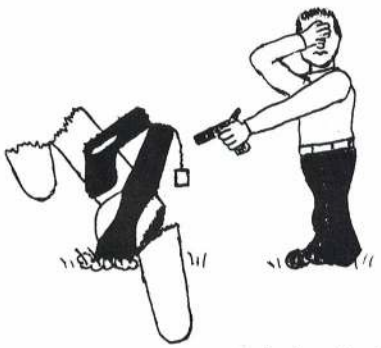
(4)—Obtain an instructor pilot if this is your first go. Let him become familiar with your equipment and ask him to test fly the bird.

(5)—Start the engine. Check radio operation. Taxi out. Taxi around to get the feel of the plane.

(6)—Check wind direction and traffic pattern, and if all is clear, take off.

(7)—Gain sufficient altitude to check straight and level flight. Re-trim if necessary. If you run out of electronic trim, land and re-set the mechanical trim by turning in or out on control clevises.

The following are a few of the common mistakes made by novices and old-timers alike. Forgetting to hook up the aileron servo, or hooking it up backward (dying swan maneuver). Forgetting to turn on either the receiver or transmitter—or both. (Be sure to put your name and address in the model so a finder can identify the crash.) Overleanout of the engine. (Short flight and short engine life.) Forgetting to extend the transmitter antenna. Allowing the "clunk" in the fuel tank to go forward. This usually occurs as a result of a hard landing. Improper or inadequate linkage hookup. This can result in slop, disconnections or servo stall. Use of inadequate hinge material or failure to anchor hinges properly. This can cause premature termination of a flight as one or more control surfaces part company from the aircraft.



Everyone in the RC fraternity has committed one or more of the above goofs, some because they didn't know any better, but more because they were in a hurry.

The cardinal rule for RC flying is to take your time and check everything. Enough hazards await you when you try to sort out right from left, up from down, and watch wind, turbulence and the other eight guys vying for the same airspace. You don't need to stack the cards against yourself by lack of preparation. The second rule of RC flying is that you spend an awful lot of time building and fixing and not nearly so much time flying. But those moments when the plane is in the air, obeying your commands and you are painting a glorious picture in the sky, are worth every minute in the shop and on the ground preparing.

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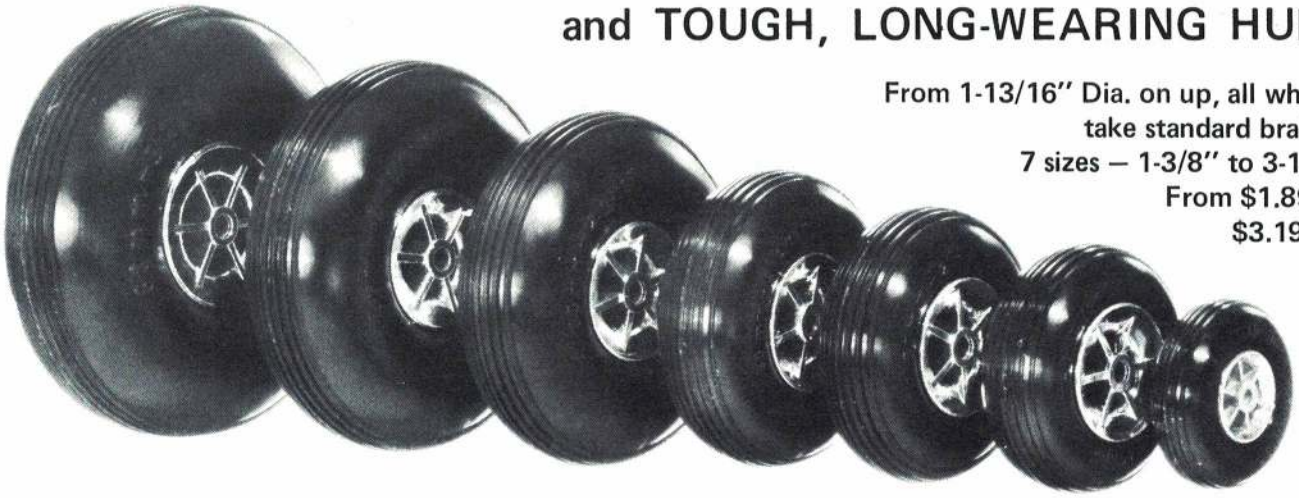

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E-Z LINK, complete with 10" Rod —
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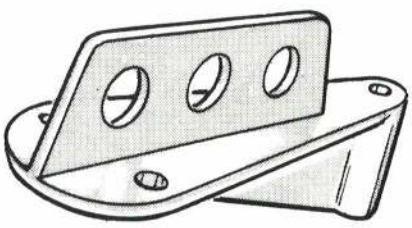

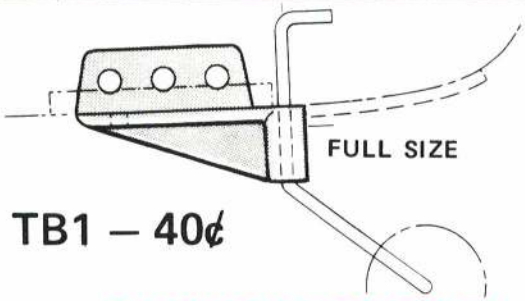

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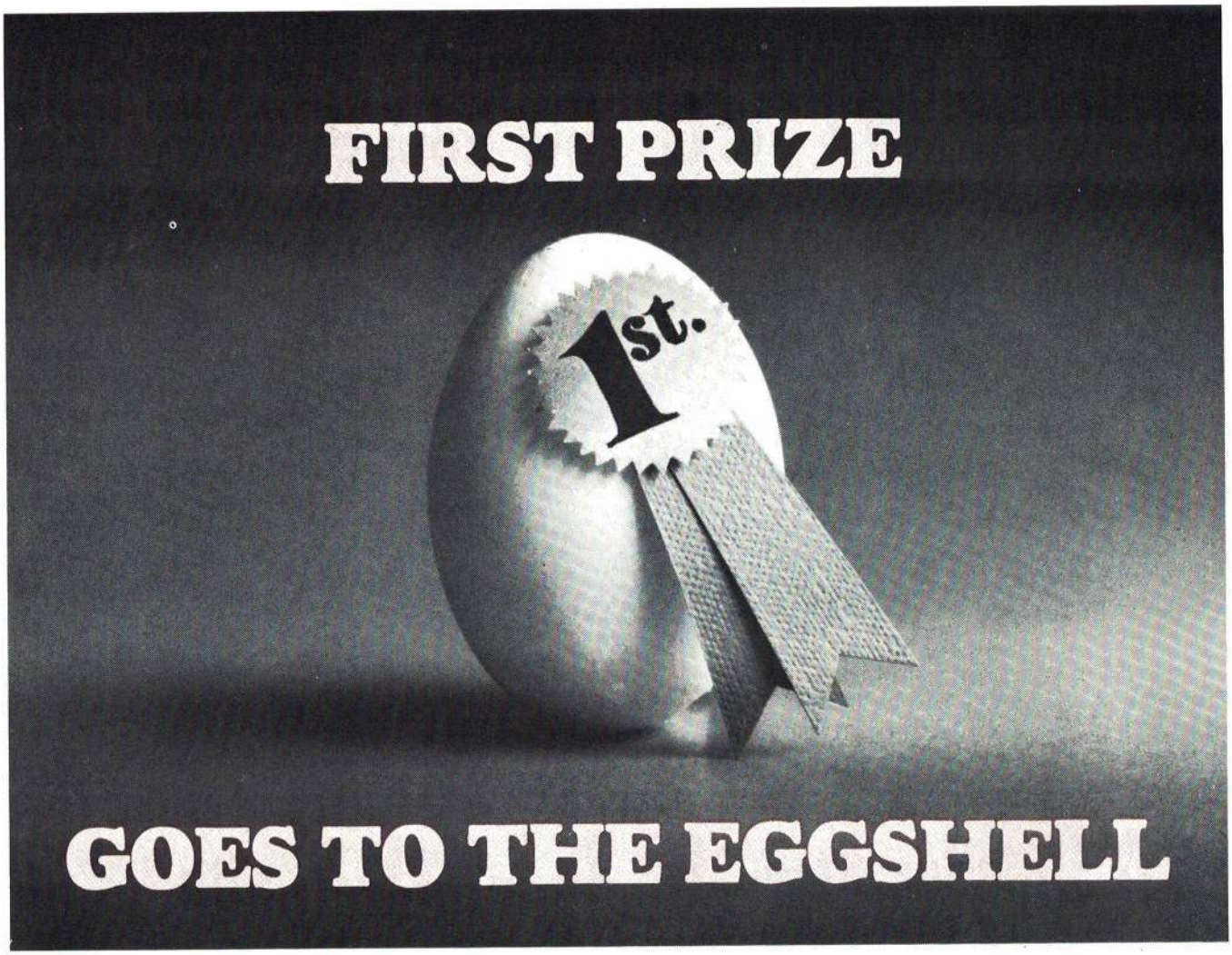

MOTHER NATURE DID A TOP-NOTCH JOB WHEN SHE CREATED THE EGGSHELL.

IT'S WATERPROOF. COMPLETELY SEALED. LIGHTWEIGHT, BUT STRONG. SMOOTH AND UNIFORM. IT'S MOLDED TO CONFORM PERFECTLY TO WHAT IT COVERS. IT WON'T PEEL OR FADE. AND IT PROTECTS THE EGG FROM HEAT AND COLD.

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FIRST OF ALL, YOU CAN COVER YOUR MODEL WITH MONOKOTE IN A LOT LESS TIME THAN IT TAKES A HEN TO MAKE A SHELL.

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THEN, OF COURSE, AN EGG ONLY COMES IN TWO COLORS (EXCEPT AT EASTER). BUT, MONOKOTE COMES IN 18 COLORS, INCLUDING METALLICS AND PAINTABLE CLEAR.

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SUPER GOOSE

Ripe for something different that really flies? Forward wing sweep has many advantages in construction and flight.

BRENT REUSCH

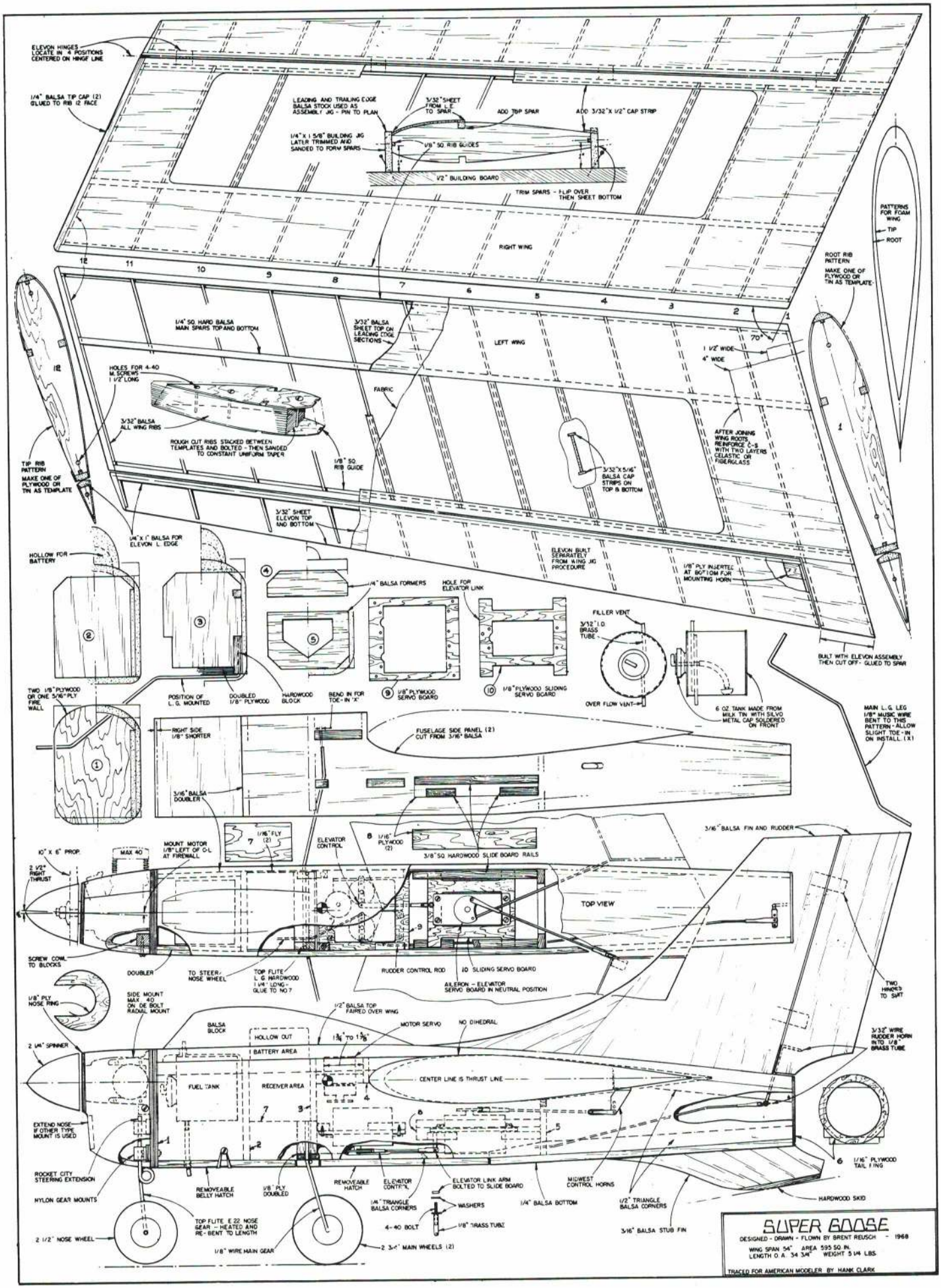
This is the final development in the Goose series of designs. The Super Goose is a larger and better-looking machine than my previous design. This aircraft has more room for your radio and has improved flight performance.

The Super Goose was a third place design winner at Toledo in 1968. This design was not flown until a year after the Toledo show because the old Goose was flying quite well. The old Goose would go with us to every meet and put in a flight or two. I did not have enough time nor radios to go around for the Super Goose, so consequently the delay in flight testing. This year I decided to get rid of the old Goose and give the new aircraft a try. (The old one is still in flying condition, but I just got tired of it.) Test flights of the Super Goose went alright and no adjustments were needed. It flew faster and in a superior manner to the old Goose. Landings and takeoffs are easy and the Super Goose has displayed no tricky characteristics or vices. While I would not recommend this model to the rank beginner, anyone who has put in a season of successful proportional flying will have no trouble with this design. If you are ripe for something different, something that really flies, try the Super Goose.

This model is quite at home either inverted or upright—the thrust line is directly through the wing centerline. The airfoil is symmetrical and there is no dihedral. The odd wing shape and the lack of dihedral can lead to some difficulty in orienting yourself to the Super Goose the first few times the model is flown. The fin and rudder is conspicuous enough so you can tell if the model is right side up or not.

The elevator and aileron control as shown on the plans to actuate the elevons has worked very satisfactorily on the two designs over the past 3½ years, and has never given one moment of trouble. I know there are other systems, both electronic and mechanical for actuating the elevons, but this one has been proven. With this system of elevon control, the elevator servo moves the whole aileron servo; the aileron servo is on a sliding tray.

The original Super Goose has a foam wing covered with three-ply cardboard or bristol board obtained from an art supply store. For those who must build balsa wings, construction details are shown on the plan. If you go the foam and bristol board route, use only a water-base contact cement brushed onto the foam and cardboard as an adhesive. The spray-on types are satisfactory for balsa-covered foam wings, but will not hold the bristol board on in damp or wet weather. Also, the regular spray-on contact cements allow penetration of solvents from the first coat of paint or dope to damage the foam wing and also weaken the bond. Water-base contact cements are immune from this action and seal the penetration of the first coat of dope from the foam. The brand of water-base cement that I use is called "Safe Bond." Other brands of water-base contact cement are also available and work satisfactorily. Allow a full 45 min. for curing of the cement before joining the cardboard to the foam. The only disadvantage with the water-base contact adhesive is that it weighs slightly more than the spray-on solvent type. When using bristol board as a wing covering, leading and trailing edge spars should be used. I make these from 1/4" sheet balsa and glue them to the foam with white glue or Titebond. Also 1/4 x 1/4" spars are set into the wing, top and bottom at the airfoil high point. If you cover the foam wing with 1/16" sheet balsa, no spars or leading edge piece


ELEVON HINGES LOCATE IN 4 POSITIONS CENTERED ON HINGE LINE
1/4" BALSA TIP CAP (2) GLUED TO RIB 12 FACE
LEADING AND TRAILING EDGE BALSA STOCK USED AS ASSEMBLY JIG - PIN TO PLAN
1/8" x 1 5/8" BUILDING JIG LATER TRIMMED AND SANDED TO FORM SPARS
3/32" SHEET FROM L.E. TO SPAR
ADD TOP SPAR
ADD 3/32" x 1/2" CAP STRIP
1/8" SQ. RIB GUIDES
1/2" BUILDING BOARD
TRIM SPARS - FLIP OVER THEN SHEET BOTTOM
RIGHT WING
LEFT WING
PATTERNS FOR FOAM WING
TIP
ROOT
ROOT RIB PATTERN
MAKE ONE OF PLYWOOD OR TIN AS TEMPLATE
1/4" SQ. HARD BALSA MAIN SPARS TOP AND BOTTOM
3/32" BALSA SHEET TOP ON LEADING EDGE SECTIONS
1 1/2" WIDE
4" WIDE
HOLES FOR 4-40 M. SCREWS 1 1/2" LONG
3/32" BALSA ALL WING RIBS
ROUGH CUT RIBS STACKED BETWEEN TEMPLATES AND BOLTED - THEN SANDED TO CONSTANT UNIFORM TAPER
FABRIC
1/8" SQ. RIB GUIDE
3/32" X 5/16" BALSA CAP STRIPS ON TOP & BOTTOM
AFTER JOINING WING ROOTS, REINFORCE C-S WITH TWO LAYERS CELASTIC OR FIBERGLASS
TIP RIB PATTERN
MAKE ONE OF PLYWOOD OR TIN AS TEMPLATE
3/32" SHEET ELEVON TOP AND BOTTOM
1/4" X 1" BALSA FOR ELEVON L. EDGE
ELEVON BUILT SEPARATELY FROM WING JIG PROCEDURE
1/8" PLY INSERTED AT BOTTOM FOR MOUNTING HORN
BUILT WITH ELEVON ASSEMBLY THEN CUT OFF - GLUED TO SPAR
HOLLOW FOR BATTERY
1/4" BALSA FORMERS
HOLE FOR ELEVATOR LINK
FILLER VENT
3/32" I.D. BRASS TUBE
OVER FLOW VENT
6 OZ. TANK MADE FROM MILK TIN WITH SILVO METAL CAP SOLDERED ON FRONT
TWO 1/8" PLYWOOD OR ONE 5/16" PLY FIRE WALL
POSITION OF L.G. MOUNTED
DOUBLED 1/8" PLYWOOD
HARDWOOD BLOCK
BEND IN FOR TOE-IN "X"
1/8" PLYWOOD SERVO BOARD
1/8" PLYWOOD SLIDING SERVO BOARD
MAIN L.G. LEG 1/8" MUSIC WIRE BENT TO THIS PATTERN - ALLOW SLIGHT TOE-IN ON INSTALL. (X)
RIGHT SIDE 1/8" SHORTER
FUSELAGE SIDE PANEL (2) CUT FROM 3/16" BALSA
3/16" BALSA DOUBLER
1/16" PLY (2)
ELEVATOR CONTROL
1/16" PLYWOOD (2)
3/8" SQ. HARDWOOD SLIDE BOARD RAILS
3/16" BALSA FIN AND RUDDER
10" X 6" PROP.
MAX 40
MOUNT MOTOR 1/8" LEFT OF C-L AT FIREWALL
2 1/2" RIGHT THRUST
TOP VIEW
SCREW COWL TO BLOCKS
DOUBLER
TO STEER. NOSE WHEEL
TOP FLITE L.G. HARDWOOD 1 1/4" LONG - GLUE TO NO. 7
RUDDER CONTROL ROD
10 SLIDING SERVO BOARD
AILERON - ELEVATOR SERVO BOARD IN NEUTRAL POSITION
TWO HINGES TO SUIT
1/8" PLY NOSE RING
SIDE MOUNT MAX 40 ON DE BOLT RADIAL MOUNT
BALSA BLOCK
HOLLOW OUT BATTERY AREA
1/2" BALSA TOP FAIRED OVER WING
1 5/8" TO 1 7/8"
MOTOR SERVO
NO DIHEDRAL
3/32" WIRE RUDDER HORN IN 1/8" BRASS TUBE
2 1/4" SPINNER
FUEL TANK
RECEIVER AREA
CENTER LINE IS THRUST LINE
EXTEND NOSE IF OTHER TYPE MOUNT IS USED
1/16" PLYWOOD TAIL FIN
ROCKET CITY STEERING EXTENSION
REMOVEABLE BELLY HATCH
1/8" PLY DOUBLED
REMOVEABLE HATCH
ELEVATOR CONTROL
ELEVATOR LINK ARM BOLTED TO SLIDE BOARD
MIDWEST CONTROL HORNS
HARDWOOD SKID
NYLON GEAR MOUNTS
1/4" TRIANGLE BALSA CORNERS
WASHERS
1/4" BALSA BOTTOM
1/2" TRIANGLE BALSA CORNERS
TOP FLITE E-22 NOSE GEAR - HEATED AND RE-BENT TO LENGTH
4-40 BOLT
1/8" BRASS TUBE
3/16" BALSA STUB FIN
2 1/2" NOSE WHEEL
1/8" WIRE MAIN GEAR
2 3/4" MAIN WHEELS (2)
SUPER GOOSE
DESIGNED - DRAWN - FLOWN BY BRENT REUSCH - 1968
WING SPAN 54" AREA 595 SQ. IN.
LENGTH O.A. 34 3/4" WEIGHT 3 1/4 LBS.
TRACED FOR AMERICAN MODELER BY HANK CLARK

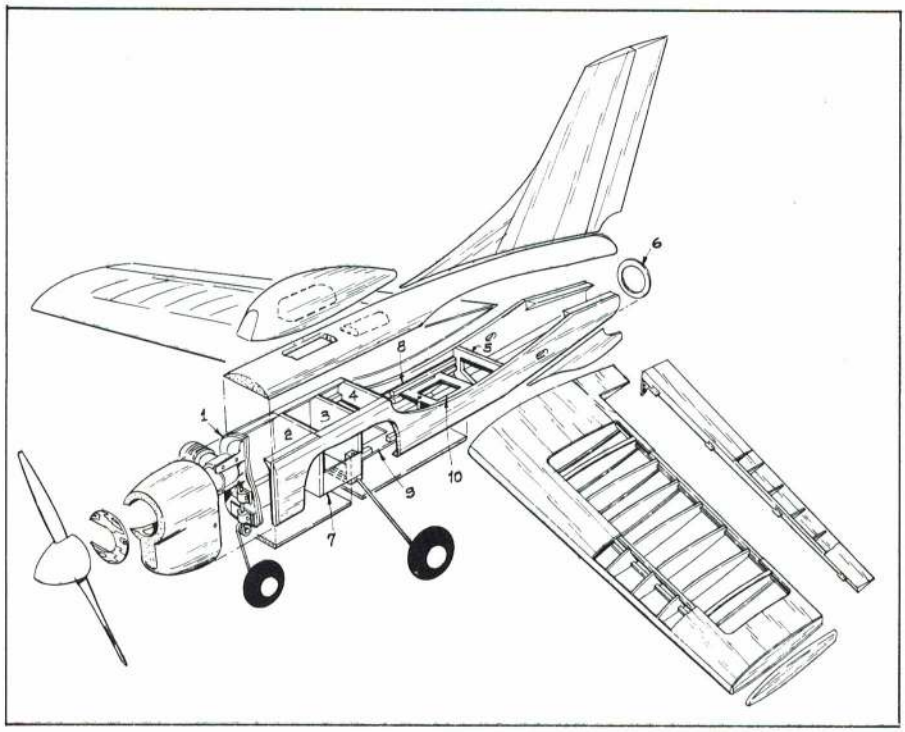
would be required. Butt join the two wing halves together with epoxy glue. Block up one wing tip about 3/8", this will give the desired zero degree of dihedral. No wing joiners are required. Cover the center section with two layers of celastic as detailed on the plans. The wing center section could also be reinforced with a layer of glass cloth and resin in place of the celastic.

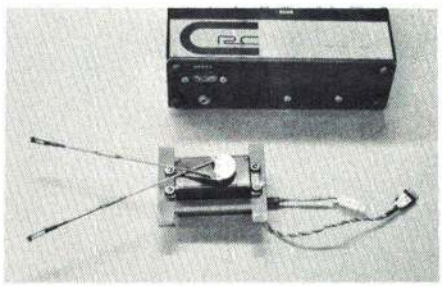
The fuselage is a conventional balsa and plywood structure. Cut out all formers and glue the two 1/8" plywood firewall pieces together with epoxy cement. If you have 1/4" ply, cut the firewall directly from that. Cut out sides and doublers from 3/16" sheet balsa. After the sides have been cut out, mark the location of all formers and servo rails on the inside of both fuselage sides with a ball-point pen. Glue former 7 to the fuselage sides. Glue landing gear blocks to former 7. Glue in 1/2" triangular stock and then add all formers except firewall to one side of fuselage. Glue the 5/16" square hardwood servo guide pieces to former 8 and then glue former 8 to the fuselage sides. When gluing the 5/16" square servo rails to former 8, use the servo board former 10. Add motor servo rails to fuselage sides and also elevator and rudder servo rails to take servo tray former 9. If you use other than PS 2 servos, modify the servo trays and mountings as required. This should be easy, as most servos are much smaller these days. Join fuselage sides. When dry, epoxy glue firewall to fuselage. You may have to score the 1/2" triangular stock at former 2 to get the sides of fuselage to bend in to match the width of the firewall. Add tail former 6, score the fuselage sides at former 5 to get the sides to bend in. At this point glue on the wing and then add top and bottom fuselage sheeting; carve and sandpaper to shape. Fill any holes or surface flaws in the balsa fuselage with instant Polyfilla, let the Polyfilla dry and sand. The two bottom hatches on the fuselage are made from hard 1/4" sheet balsa. The hatches are held on to the fuselage with rubber bands stretched between screws on the fuselage sides.

Build the cowl with the motor bolted in its proper position on the firewall. Have a 2¼" dia. spinner installed on the motor, this will help to locate the 1/8" plywood nose ring. The cowl is constructed from 3/8" or 1/2" sheet balsa. Carve and sand to shape. Use instant Polyfilla from the tube to fill any large holes in the cowl. The cowl is held to the fuselage with several 4/40 machine screws that pass through the cowl into hardwood key blocks glued to the firewall.

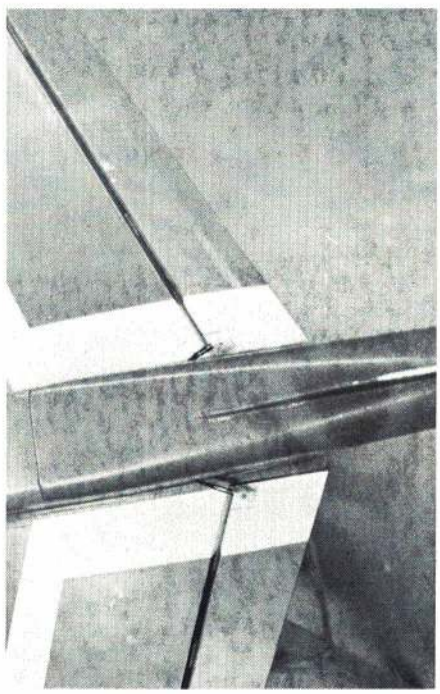
The main landing gear is built from 1/8" dia. music wire and has proven strong enough for the 5¼ lb. weight of the Goose. If you don't have 1/8" wire, use 5/32" wire. The nose gear utilizes a standard TopFlite strut that is shortened. I broke my first nose gear trying to bend it. The Top-Flite gear appears to be hardened after it is formed and will not take a 90 degree bend without first heating the metal. Use a propane torch on the strut at the desired bending

(Continued on page 74)



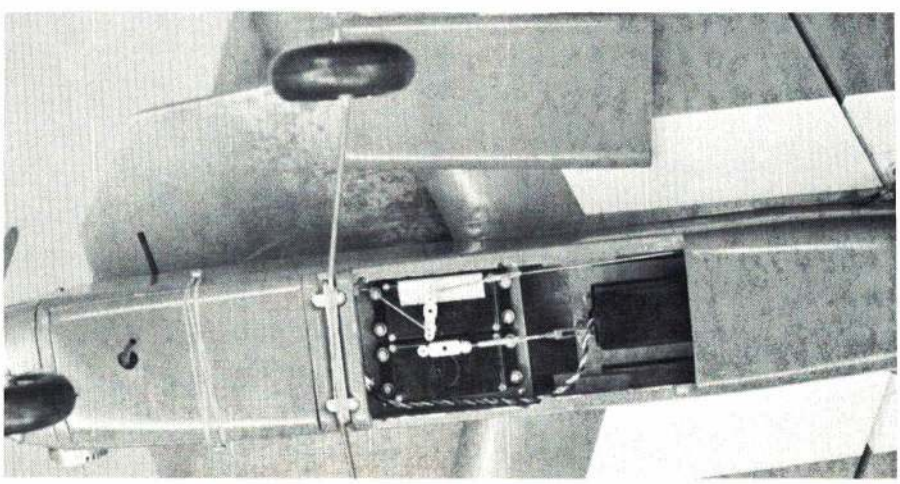


Above: Control of elevons is via sliding tray for aileron-function servo. Crossed wires give no-differential movement.



Right: Again, drive to elevons gives no differential and is nearly perpendicular to hinge line.

Below: Equipment and tank access from two hatches. Note drive from elevator servo to the aileron tray.




28
N1077

MUSTUNT

Variations of one basic model offer precise handling stunt trainer, advanced trainer, and all-out Nats-level competition machine. Many innovations.

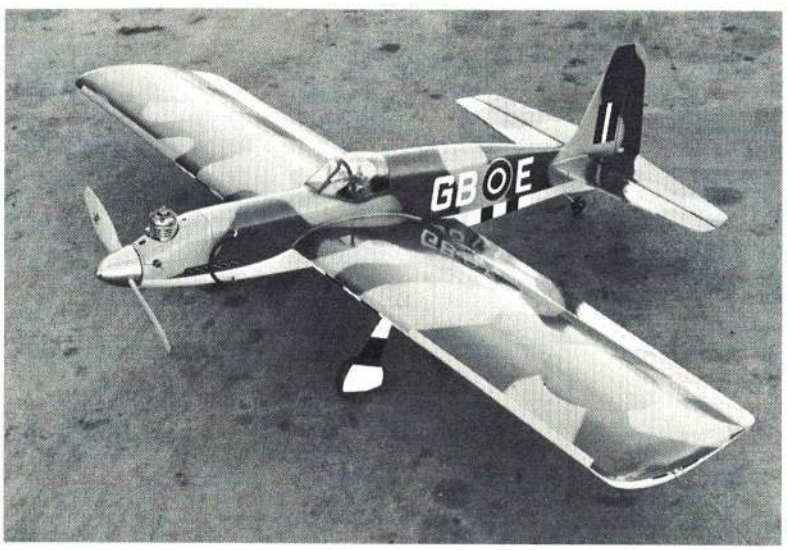
AL RABE

Learning to fly Stunt is a difficult and sometimes frustrating experience. I clearly remember tearing the rudder off of my Magician five times by hitting the ground inverted while struggling to master the outside square loop. Luckily, I managed to buy a couple of good Stunt ships before I was able to build one sufficiently well myself. These airplanes hastened my learning process and helped to hold the mortality rate low enough that I learned to Stunt before reaching the point of quitting from frustration. If you want to fly Stunt and don't have the help and encouragement of an experienced Stunt flier, then you need (as I did) a couple of good airplanes, preferably simple ones which can be quickly replaced.

I'd like to help if I can. Instead of using my theories and experiments solely to develop more realistic semi-scale stunters, I decided to try to apply the same effort to a simple airplane for the beginner. I also wanted an airplane sophisticated enough in concept and performance that it literally MUST STUNT, even in the hands of a beginner.

The first Mustunt had a built-up fuselage and a wing-mounted landing gear to improve its appearance. This configuration is now called the Mustunt II. Reflecting later on the theme of simplicity, I decided further simplification was possible without hurting performance. As long as I retained identical moments and areas, a Profile airplane could have nearly identical flying qualities. Visualizing the perfect basic stunter, I threw out the Mustunt II's built-up fuselage, shaped wing tips and wing-mounted landing gear. The engine had to be retained in either an upright or inverted configuration to keep all elements of the fuel system in the same geometrical plane. This insures a competition type engine run which is difficult, if not impossible, to obtain with a horizontally mounted engine. The only aerodynamic feature or adjustment not retained was the inverted bellcrank for a forward up leadout. While desirable, the forward up leadout was deemed less important on a Profile airplane than conventional control arrangement. The result of this extra work is a competition quality Profile Stunt ship which I call the Mustunt I.

1



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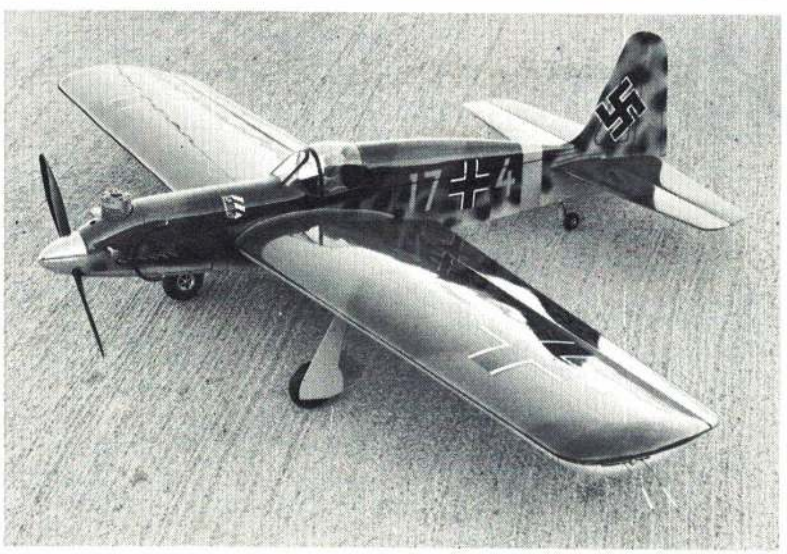

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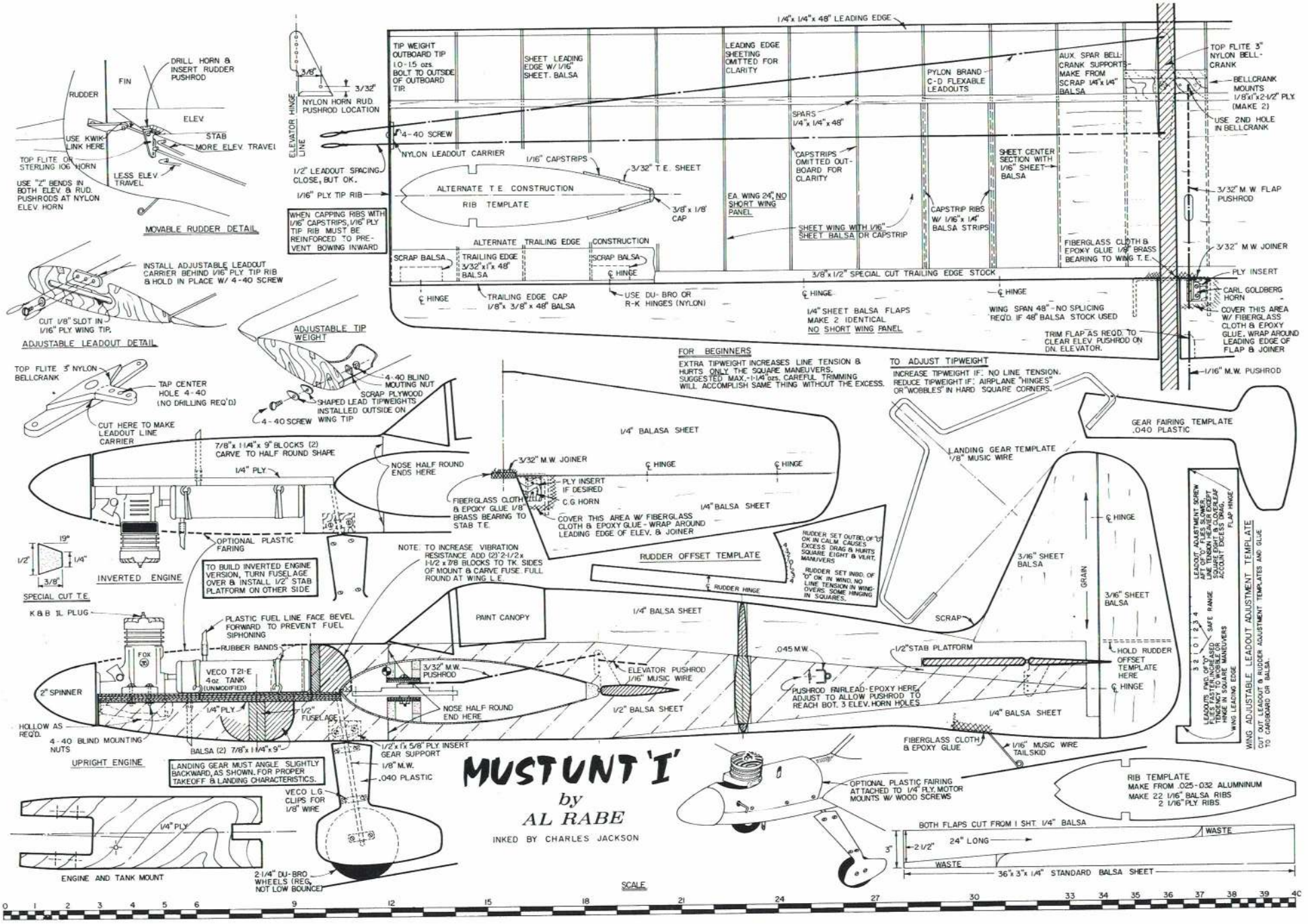
Photos by Al Rabe


MUSTUNT 'I'
by
AL RABE
INKED BY CHARLES JACKSON
MOVABLE RUDDER DETAIL
ADJUSTABLE LEADOUT DETAIL
ADJUSTABLE TIP WEIGHT
INVERTED ENGINE
UPRIGHT ENGINE
ENGINE AND TANK MOUNT
RUDDER OFFSET TEMPLATE
WING ADJUSTABLE LEADOUT ADJUSTMENT TEMPLATE
RIB TEMPLATE
FOR BEGINNERS
TO ADJUST TIPWEIGHT
SCALE

To make either Mustunt fly well, you don't have to understand the reasons for its odd (ugly) layout. In fairness, however, I should be allowed to explain (alibi) how the demands of simplicity and performance left little opportunity to add glamour. While the explanations below occasionally refer to the Mustunt II, the aerodynamics apply equally to both Mustunts as their moments and areas are, in fact, nearly identical.

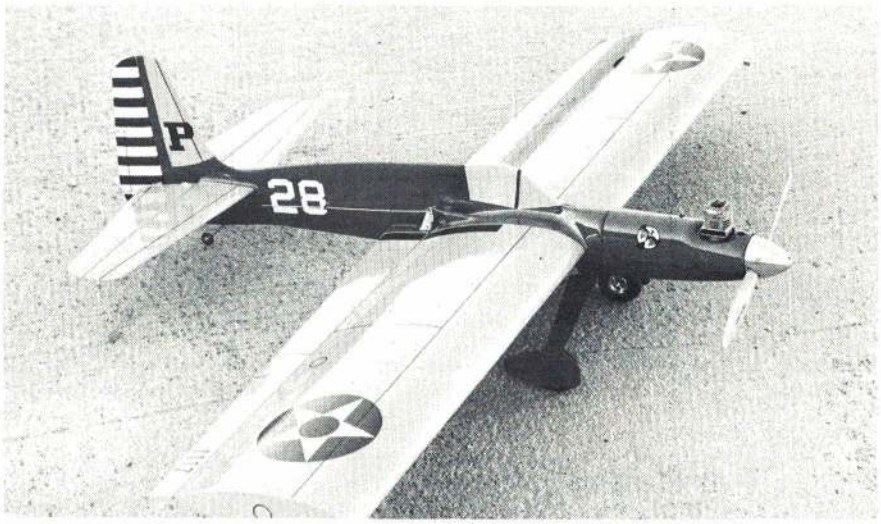
For good vertical performance and extra line tension, a Stunt ship should have a high power/weight ratio. To obtain a high power/weight ratio with an average Fox 35, or for that matter, any Stunt .35 to .40, the Mustunts were made smaller than most other similarly powered airplanes. Their smaller size also tends to keep the weight down somewhat and makes the Mustunts very easy to transport.

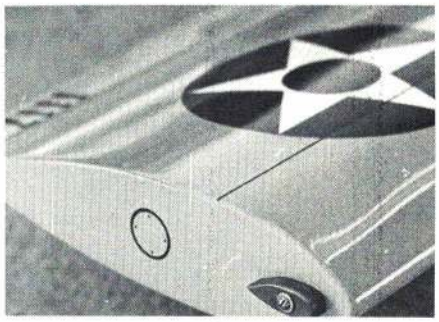
To improve the Mustunts' turn, I shortened the noses a little. The short nose Mustunts have lower moments of inertia which enable them to turn more easily and stop turning more smoothly with less chance of bobble than our longer nose airplanes. The short nose of the Mustunt II is practical because the tail builds naturally light due to its short tail moment, molded turtle deck and 1/16" sheet belly. The shorter nose also builds a little lighter, contributing to overall weight reduction and fun flying characteristics.

Being something of a WW II buff, I personally like the appearance of the nose of the Mustunt II because its shape is characteristic of several WW II fighters such as the Me. 109, He. 100D, Macchi 202 and the Tony, all of which had inverted "V" engines. This characteristic nose appearance invites a WW II military treatment to the airplane which is both nostalgic and a relief from prop-driven "Jet Style" Stunt ships. Also, the selection of an upright engine position seemed logical for this type of airplane. The upright engine is certainly easier for the beginner to start quickly as it considerably reduces the chance of flooding. For the expert, the upright engine facilitates easy engine handling for intensive practice flying where a stooge is used to hold and release the airplane.

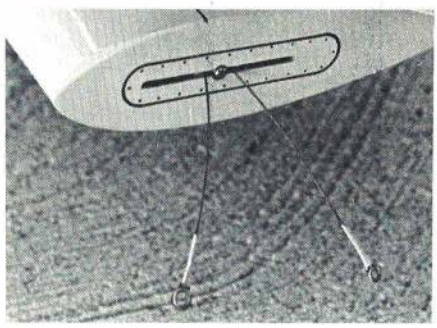
To provide extra longitudinal stability to give the Mustunts groovy, easy flying characteristics, the stabilizer and elevator areas and the tail moment arm were computed to give approximately a 15% greater tail volume coefficient than my Mustang or Bearcat. The elevator hinge line is placed to provide the right amount of elevator area which, together with adjustments available in the nylon elevator horn, can provide a range of turning characteristics from too slow to too fast for most Stunt flyers. Changing either the elevator area or the tail moment will bias the available sensitivity adjustments and may make it impossible to adjust the airplane's turn to suit individual tastes.

Finally, since most new Stunt builders have difficulty controlling the weight of their ships due to building inexperience or lack of lightweight material in their area, I designed an ex-

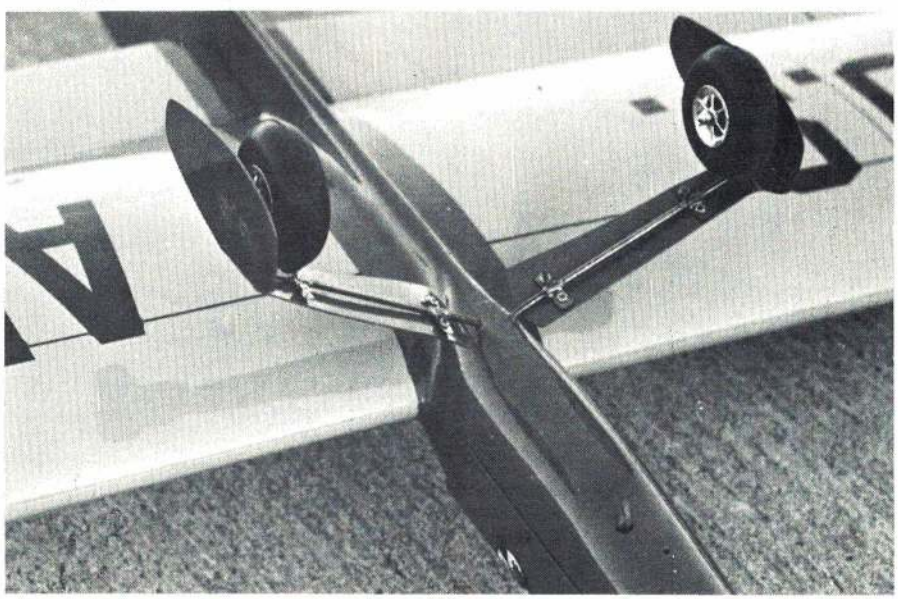


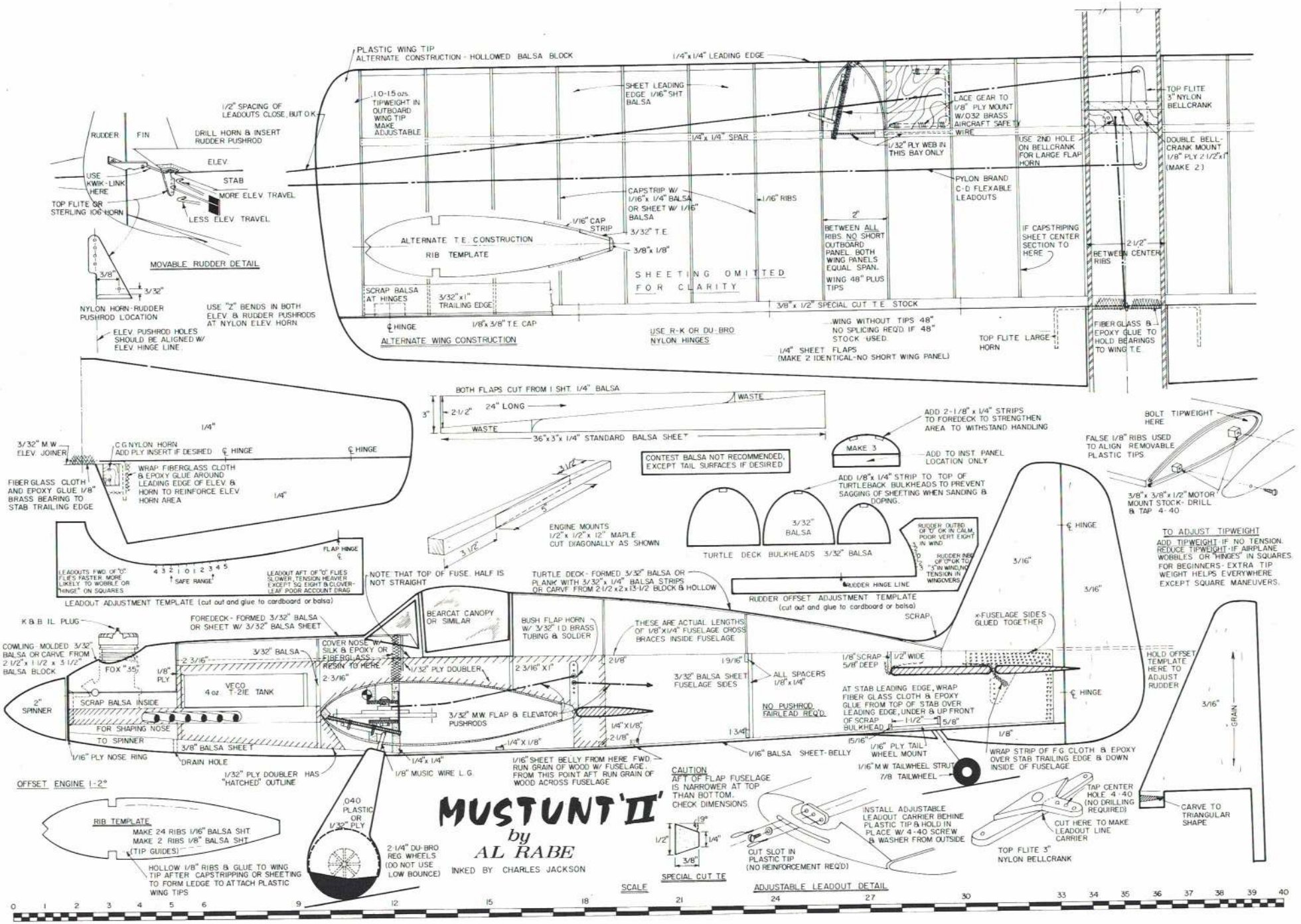


Above: The Mustunt I with quickly built profile fuselage and old Army Air Corps colors. Right: External tip weight simplifies and encourages experimentation and adjustment. Below right: Slotted plywood tip is easy way to obtain adjustment of line sweep. Square tip works just as well as rounded. Below left: That upright engine never floods and engine runs are contest smooth. Wheel fairings look neat.



Fuel tank vent cut at an angle to gain some ram air. Regular Du-Bro wheels used, not low-bounce types.




MUSTUNT II
by
AL RABE
INKED BY CHARLES JACKSON
PLASTIC WING TIP ALTERNATE CONSTRUCTION - HOLLOWED BALSA BLOCK
1/4"x 1/4" LEADING EDGE
SHEET LEADING EDGE 1/16" SHT BALSA
1.0-1.5 ozs. TIPWEIGHT IN OUTBOARD WING TIP MAKE ADJUSTABLE
1/4"x 1/4" SPAR
1/32" PLY WEB IN THIS BAY ONLY
LACE GEAR TO 1/8" PLY MOUNT W/.032 BRASS AIRCRAFT SAFETY WIRE
USE 2ND HOLE ON BELLCRANK FOR LARGE FLAP HORN
TOP FLITE 3" NYLON BELLCRANK
DOUBLE BELL-CRANK MOUNT 1/8" PLY 2 1/2"x 1" (MAKE 2)
PYLON BRAND C-D FLEXABLE LEADOUTS
CAPSTRIP W/ 1/16"x 1/4" BALSA OR SHEET W/ 1/16" BALSA
1/16" RIBS
1/16" CAP STRIP
3/32" T.E.
3/8"x 1/8"
ALTERNATE T.E. CONSTRUCTION
RIB TEMPLATE
SHEETING OMITTED FOR CLARITY
2' BETWEEN ALL RIBS. NO SHORT OUTBOARD PANEL. BOTH WING PANELS EQUAL SPAN. WING 48" PLUS TIPS
IF CAPSTRIPING SHEET CENTER SECTION TO HERE
2 1/2" BETWEEN CENTER RIBS
SCRAP BALSA AT HINGES
3/32"x 1" TRAILING EDGE
3/8"x 1/2" SPECIAL CUT T.E. STOCK
℄ HINGE
1/8"x 3/8" T.E. CAP
ALTERNATE WING CONSTRUCTION
USE R-K OR DU-BRO NYLON HINGES
WING WITHOUT TIPS 48" NO SPLICING REQ'D IF 48" STOCK USED.
1/4" SHEET FLAPS (MAKE 2 IDENTICAL-NO SHORT WING PANEL)
TOP FLITE LARGE HORN
FIBER GLASS & EPOXY GLUE TO HOLD BEARINGS TO WING T.E.
1/2" SPACING OF LEADOUTS CLOSE, BUT O.K.
RUDDER
FIN
DRILL HORN & INSERT RUDDER PUSHROD
ELEV.
STAB
USE KWIK-LINK HERE
MORE ELEV TRAVEL
TOP FLITE OR STERLING 106 HORN
LESS ELEV. TRAVEL
MOVABLE RUDDER DETAIL
3/8"
3/32"
NYLON HORN-RUDDER PUSHROD LOCATION
USE "Z" BENDS IN BOTH ELEV & RUDDER PUSHRODS AT NYLON ELEV. HORN
ELEV. PUSHROD HOLES SHOULD BE ALIGNED W/ ELEV. HINGE LINE
BOTH FLAPS CUT FROM 1 SHT. 1/4" BALSA
3"
2 1/2"
24" LONG
WASTE
36"x 3"x 1/4" STANDARD BALSA SHEET
ADD 2-1/8" x 1/4" STRIPS TO FOREDECK TO STRENGTHEN AREA TO WITHSTAND HANDLING
MAKE 3
ADD TO INST. PANEL LOCATION ONLY
BOLT TIPWEIGHT HERE
FALSE 1/8" RIBS USED TO ALIGN REMOVABLE PLASTIC TIPS
3/8"x 3/8"x 1/2" MOTOR MOUNT STOCK- DRILL & TAP 4-40
1/4"
3/32" M.W. ELEV. JOINER
C.G. NYLON HORN. ADD PLY INSERT IF DESIRED
℄ HINGE
℄ HINGE
WRAP FIBERGLASS CLOTH & EPOXY GLUE AROUND LEADING EDGE OF ELEV. & HORN TO REINFORCE ELEV. HORN AREA
FIBER GLASS CLOTH AND EPOXY GLUE 1/8" BRASS BEARING TO STAB TRAILING EDGE
CONTEST BALSA NOT RECOMMENDED, EXCEPT TAIL SURFACES IF DESIRED
ADD 1/8"x 1/4" STRIP TO TOP OF TURTLEBACK BULKHEADS TO PREVENT SAGGING OF SHEETING WHEN SANDING & DOPING.
3/32" BALSA
TURTLE DECK BULKHEADS 3/32" BALSA
RUDDER OUTBD. OFF 1/8" OK IN CALM, POOR VERT EIGHT IN WIND
RUDDER INBD OF 1/8" TO 3/16" IN WIND, NO TENSION IN WINGOVERS
RUDDER HINGE LINE
RUDDER OFFSET ADJUSTMENT TEMPLATE (cut out and glue to cardboard or balsa)
℄ HINGE
3/16"
3/16"
TO ADJUST TIPWEIGHT
ADD TIPWEIGHT IF NO TENSION. REDUCE TIPWEIGHT IF AIRPLANE WOBBLES OR "HINGES" IN SQUARES. FOR BEGINNERS- EXTRA TIP WEIGHT HELPS EVERYWHERE EXCEPT SQUARE MANEUVERS.
3/16"
ENGINE MOUNTS 1/2"x 1/2"x 12" MAPLE CUT DIAGONALLY AS SHOWN
FLAP HINGE ℄
LEADOUTS FWD. OF "0" FLIES FASTER, MORE LIKELY TO WOBBLE OR "HINGE" ON SQUARES
4 3 2 1 0 1 2 3 4 5
SAFE RANGE
LEADOUT AFT OF "0" FLIES SLOWER, TENSION HEAVIER EXCEPT SQ. EIGHT & CLOVER-LEAF. POOR ACCOUNT DRAG
LEADOUT ADJUSTMENT TEMPLATE (cut out and glue to cardboard or balsa)
NOTE THAT TOP OF FUSE. HALF IS NOT STRAIGHT
TURTLE DECK- FORMED 3/32" BALSA OR PLANK WITH 3/32"x 1/4" BALSA STRIPS OR CARVE FROM 2-1/2 x 2 x 13-1/2" BLOCK & HOLLOW
SCRAP
x-FUSELAGE SIDES GLUED TOGETHER
K&B II PLUG
FOREDECK- FORMED 3/32" BALSA OR SHEET W/ 3/32" BALSA SHEET
BEARCAT CANOPY OR SIMILAR
BUSH FLAP HORN W/ 3/32" I.D. BRASS TUBING & SOLDER
THESE ARE ACTUAL LENGTHS OF 1/8"x1/4" FUSELAGE CROSS BRACES INSIDE FUSELAGE
COWLING- MOLDED 3/32" BALSA OR CARVE FROM 2 1/2" x 1 1/2 x 3 1/2" BALSA BLOCK
FOX "35"
1/8" PLY
3/32" BALSA
COVER NOSE W/ SILK & EPOXY OR FIBERGLASS RESIN TO HERE
2-3/16"
2-3/16"
1/32" PLY DOUBLER
2 3/16" x1"
2 1/8"
1 9/16"
3/32" BALSA SHEET FUSELAGE SIDES
ALL SPACERS 1/8" x 1/4"
1/8" SCRAP 5/8" DEEP
1/2" WIDE
VECO 4 oz. T-21E TANK
2" SPINNER
SCRAP BALSA INSIDE
FOR SHAPING NOSE TO SPINNER
3/8" BALSA SHEET
1/16" PLY NOSE RING
DRAIN HOLE
3/32" M.W. FLAP & ELEVATOR PUSHRODS
1/4"x 1/8"
2 1/8"
1 3/4"
NO PUSHROD FAIRLEAD REQ'D.
AT STAB LEADING EDGE, WRAP FIBER GLASS CLOTH & EPOXY GLUE FROM TOP OF STAB OVER LEADING EDGE, UNDER & UP FRONT OF SCRAP BULKHEAD
1-1/2"
5/8"
1/8"
15/16"
1/16" PLY TAIL WHEEL MOUNT
1/16" M.W. TAILWHEEL STRUT
7/8 TAILWHEEL
WRAP STRIP OF F.G. CLOTH & EPOXY OVER STAB TRAILING EDGE & DOWN INSIDE OF FUSELAGE
HOLD OFFSET TEMPLATE HERE TO ADJUST RUDDER
3/16"
GRAIN
1/4"x 1/4"
1/8" MUSIC WIRE L.G.
1/16" SHEET BELLY FROM HERE FWD. RUN GRAIN OF WOOD W/ FUSELAGE. FROM THIS POINT AFT RUN GRAIN OF WOOD ACROSS FUSELAGE
1/16" BALSA SHEET-BELLY
1/32" PLY DOUBLER HAS "HATCHED" OUTLINE
OFFSET ENGINE 1-2°
CAUTION AFT OF FLAP FUSELAGE IS NARROWER AT TOP THAN BOTTOM. CHECK DIMENSIONS
.9"
1/2"
1/4"
3/8"
SPECIAL CUT T.E.
INSTALL ADJUSTABLE LEADOUT CARRIER BEHIND PLASTIC TIP & HOLD IN PLACE W/ 4-40 SCREW & WASHER FROM OUTSIDE
CUT SLOT IN PLASTIC TIP (NO REINFORCEMENT REQ'D)
TAP CENTER HOLE 4-40 (NO DRILLING REQUIRED)
CUT HERE TO MAKE LEADOUT LINE CARRIER
TOP FLITE 3" NYLON BELLCRANK
ADJUSTABLE LEADOUT DETAIL
CARVE TO TRIANGULAR SHAPE
RIB TEMPLATE
MAKE 24 RIBS 1/16" BALSA SHT.
MAKE 2 RIBS 1/8" BALSA SHT. (TIP GUIDES)
HOLLOW 1/8" RIBS & GLUE TO WING TIP AFTER CAPSTRIPPING OR SHEETING TO FORM LEDGE TO ATTACH PLASTIC WING TIPS
.040 PLASTIC OR 1/32" PLY
2 1/4" DU-BRO REG. WHEELS (DO NOT USE LOW BOUNCE)
SCALE
0 1 2 3 4 5 6 9 12 15 18 21 24 27 30 33 34 35 36 37 38 39 40

cess of lift into the Mustunts in an attempt to eliminate weight as a probable reason for failure to fly well. To bring about this improvement in load-carrying ability, possible improvements were considered for each of the wing's five most important characteristics.

First, to obtain this excess of lift, the wing was laid out with a constant chord which would add considerable wing AREA to the tips while also simplifying the structure and making it possible to be built straight, on a flat surface, without jigs.

Second, the airfoil THICKNESS was increased to 25% of the wing chord (without flaps) because this thicker wing would have approximately 30% more lift than conventional 18 to 20% airfoils.

Third, the wing of a Stunt ship loafs in level flight and lifts significantly *only* when the airplane corners *and* the flaps are *deflected*. To make the wing work better with a deflected flap, the aft portion of the wing rib was PROFILED for smooth transition into a deflected flap. This reduces or eliminates the discontinuity at the hinge line. To visualize this, if you will sketch on the plans the flaps in a 25 degree down position, you will notice a smooth, unbroken curve from the wing leading edge to the trailing edge of the flap. The angle between the deflected flap and aft wing surface on a conventional stunt wing tends to promote separation of airflow and premature loss of lift due to flap stall.

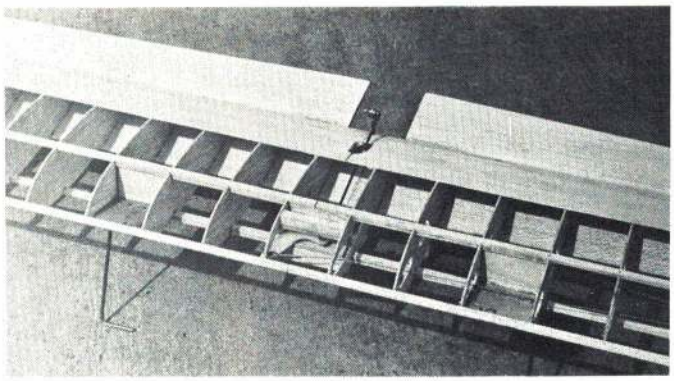
Fourth, the leading edge of the wing is made very BLUNT which helps to delay the stall to a higher angle of attack which in turn produces more lift.

Fifth, the FLAP area is increased greatly at the wing tips to increase the lift of the wing tips by as much as 50% and permits a slightly smaller flap travel which further reduces the possibility of flap stall. The flaps should not move more than 30 degrees up or down.

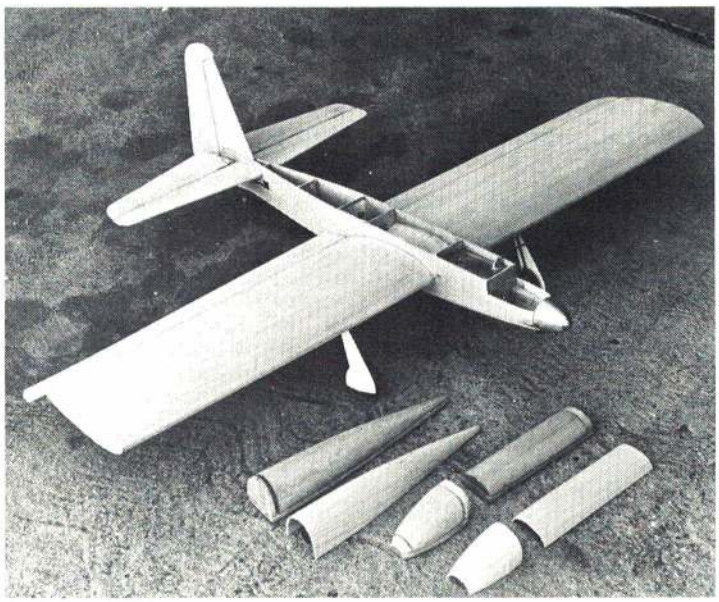
The heart of the Mustunt's simplified sophistication is the external elevator horn. Putting the elevator horn on the outside of the fuselage makes it possible to vary many of the airplane's most critical adjustments, quickly, in the field, to achieve optimum trim.

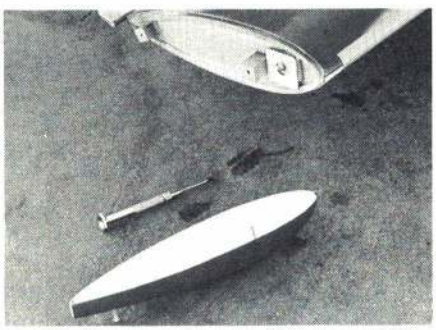
For example, the nylon elevator horn can be removed and reinstalled with the elevator pushrod in a different hole, changing the elevator-flap ratio. This alters the airplane's turning characteristics to suit your individual taste without resorting to improper balance through unnecessary nose or tail weight. Simply balance the Mustunts one in. ahead of the wing spar during construction and add elevator travel at the field, for increased sensitivity. The Mustunt's moments and areas permit control sensitivity adjustments ranging to both sides of my own personal taste.

Also, elevator neutral can be adjusted by inserting triangular shims under the elevator horn to make the airplane turn identically on both inside and outside maneuvers. When the stab and elevators on a Stunt ship are set higher on the fuselage than the wing, the elevators tend to operate differently on inside and outside maneuvers. On in-

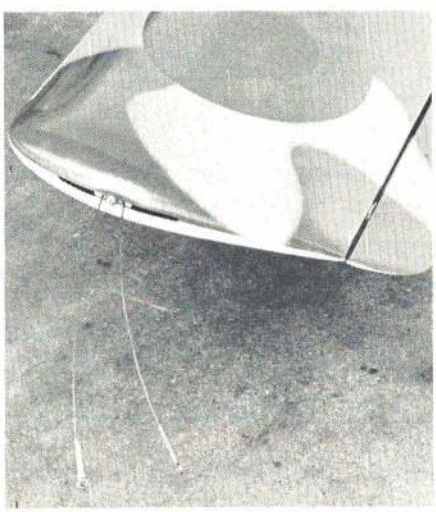


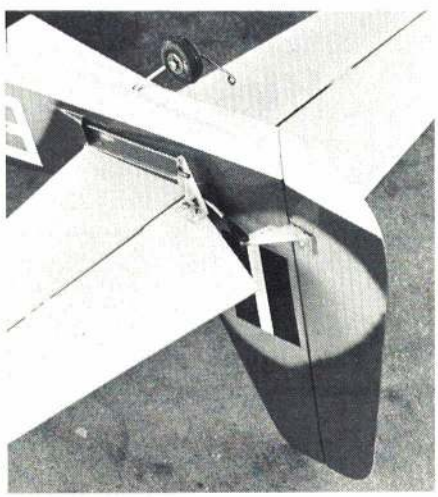
Landing gears firmly mounted to plywood insert backed up by plywood between the spars.

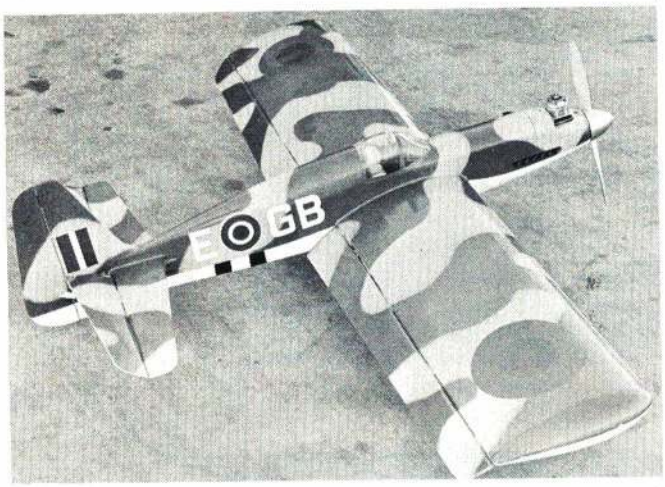




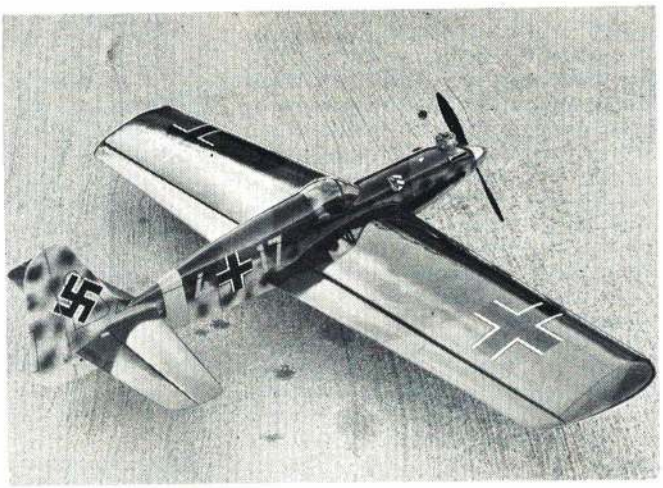
Above: Mustunt II with molds and molded balsa parts for fuselage top decking. Very lightweight. Right: Adjustable weight is enclosed in plastic cap. Note false rib to align tip. Hollowed balsa is fine, too. Below right: 50% of Mustunt's unique trimming capability is at the tail. Note double purpose of elevator horn and triangular shim under the rudder horn. Below left: Another plastic tip—this on the inside wing. It is slotted for adjusting line sweep.







An important objective of the Mustunt design is the fully deflected flaps blending smoothly with wing airfoil.

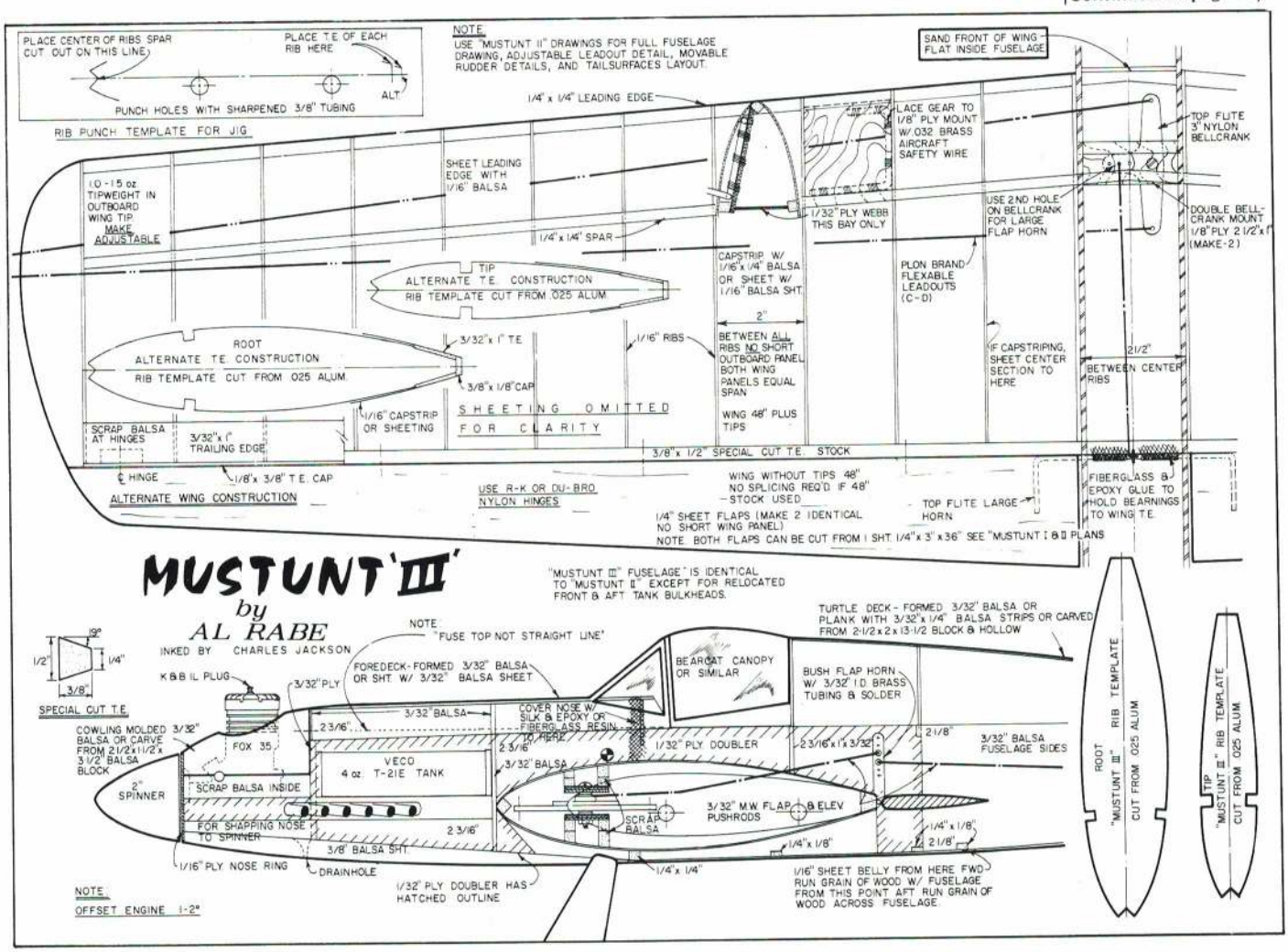


Tapered wings and cockpit detail convert the Mustunt II into the Mustunt III. It is ready for Nationals competition.

side maneuvers, the flaps are down and the turbulence from the wing is deflected by the flaps down under the stab, permitting the elevators to work efficiently in smooth air to produce a sharp turn. On outside maneuvers, the flaps are up and the turbulence of the wing is deflected toward the stab and elevators, reducing their efficiency and causing a slower turn. To offset this effect we can either build the stab on the wing centerline or, for better looks, locate it normally and rig in a little down elevator (about 3/16" at the trailing edge), and provide for adjustments to achieve precise trim. Do not use Kwik-Links in any part of the Mustunt's control system except for the rudder pushrod. To make a Mustunt turn better on outside maneuvers, at the expense of inside maneuvers, place a triangular shim under the front of the elevator horn to drop the elevator slightly.

As a bonus, the external nylon elevator horn can be drilled to provide a convenient mounting for the rudder pushrod which operates the new asymmetric rudder. The location of the drill hole determines rudder sensitivity and asymmetry of travel. The vertical location of the drill hole determines the rudder sensitivity and should be placed close to the elevator surface to obtain the proper range of adjustments from the rudder horn's four holes. The horizontal location of the drill hole determines the rudder asymmetry. If the drill hole is placed under the elevator hinge line, the rudder will move equal dis-

(Continued on page 76)



Anatomy of a '72 Champion.

Of 85 winners in seventeen classes of the 41st annual meet of the National Model Airplane Championships held in 1972, Cox contest engines scored 68 victories! Right. 68 out of 85 winners were planes powered by Cox engines. And a good share of winners in other classes also used Cox engines.

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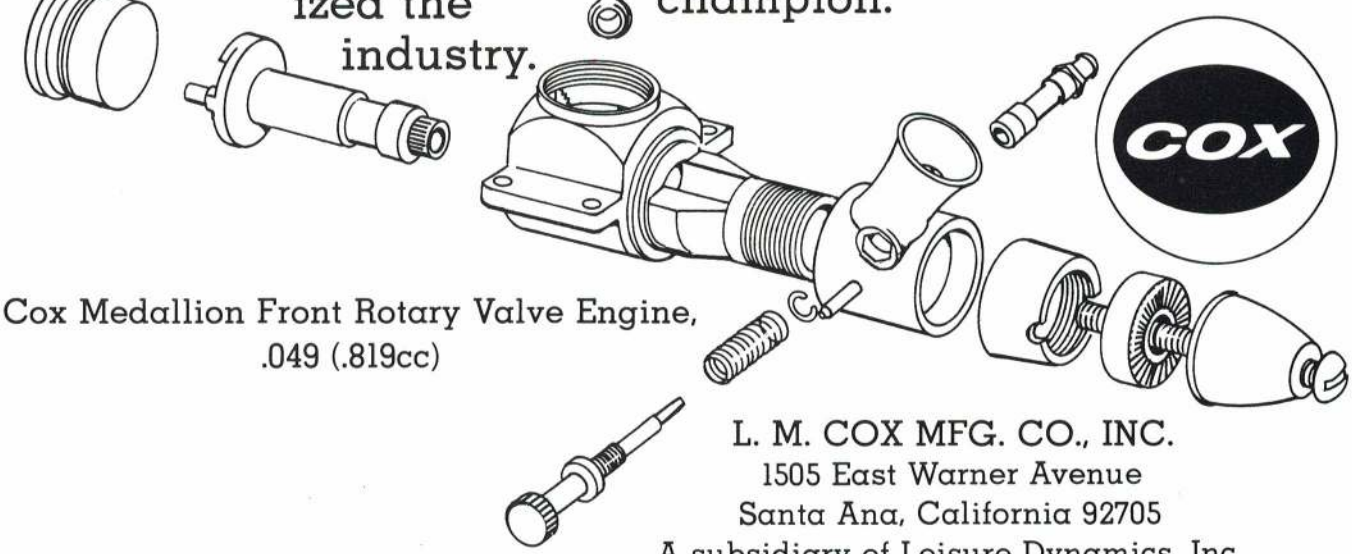
It's the anatomy of a champion.



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Finest Quality materials include Prime Grade, Density-Selected Balsa sanded to micrometer tolerance. Imported Birch Plywood, etc. Fuselage features Die-Cut one-piece full-length sides, Plywood doublers (that go past wing for maximum strength), five Bulkheads — accurately Die-cut; combined with shaped Nose and Cowl blocks, quickly go together to make a sleek strong fuselage; Topped off by a jet-shaped Canopy. Rugged custom made Aluminum Engine Mounts make engine installation a pleasure and formed music wire Tricycle gear includes fully-sprung stress relieved Nose gear.

Unique table-top construction insures a warp-free wing, a must for top performance. Wing parts are Die-cut, shaped, etc., to insure fast accurate assembly; and Balsa Sheet covering keeps warps out, resulting in a light rugged wing. Tapered strip Ailerons provided, are simple to install using the new ready-to-use simplified Aileron linkage units. Wing assembles to fuselage with nylon screws in hardwood nut-block provided, in the unusually complete Hardware pack which includes all the special nylon R/C fittings required. Rudder and fin are sheet, Stab is built up and sheet covered to keep it permanently flat.

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12 Pack — 15 lbs.

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FOLKERTS SPEED KING

Racing great, Harold Neumann, and the Folkerts Special "Toots." Small even when compared with a Formula One racer, this powerful machine demanded the finest of piloting skill.

DON BERLINER

For almost as long as there has been air racing, there has been a battle between radial and in-line engines. The prettiest, sleekest machines have packed straight or V engines into their graceful cowlings. . .but most of the big winners have carried bulky, round engines up front.

No doubt about it, an in-line engine is a lot easier to cowl in, and the result is a much cleaner and faster airplane. . . if the comparable radial engine has about the same power, and that's the catch. Engine manufacturers have long made far bigger and far more powerful radial engines than they have in-lines. And as any racing person knows, you can't beat cubic inches!

It was true back in the 1930s, when the fat GeeBee was faster than any of its slimmer rivals. And it's just as true today, when you pit Bearcats and Sea Furys against the slender-but-less-potent Mustangs and Cobras. What chance does a 1650 cu. in. Rolls Royce V-12 have against a 2800 cu. in. Pratt & Whitney? Attempts to even the odds have usually resulted in V-12s so souped-up that they won't hold together long enough to finish, let alone win.

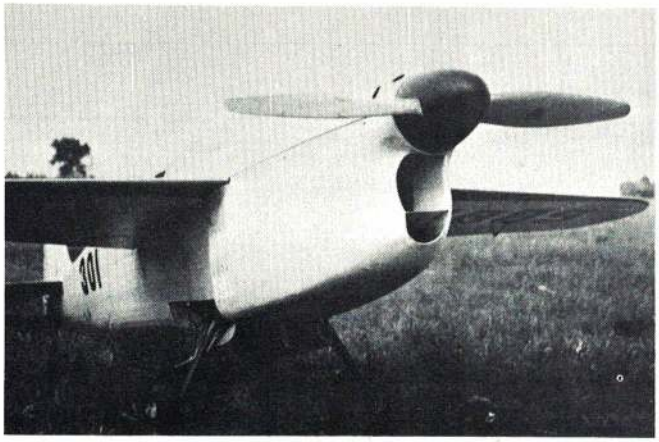
It was equally as one-sided back in the Golden 30s, when eight of the ten pre-World War II Thompson Trophy Races were won by Pratt & Whitney-powered airplanes. Of the other two, one was a French government-sponsored airplane that simply "out-monied" everyone else. And the other was a slick little Menasco straight-six job with 1/3 the cubic inches of the next three racers that followed it across the finish line. And no more than half the horsepower.

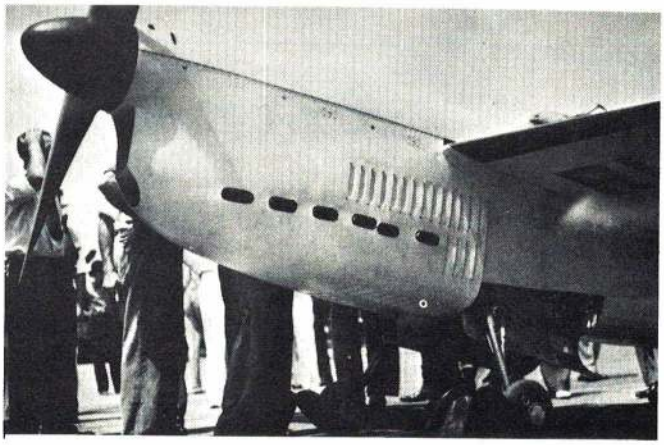
How can it be done with such a handicap? Well, for one thing, a sharp engineer can create a much cleaner, smaller airplane behind a slim in-line engine, and any designer knows the shortest route to speed is streamlining, not power. So, while a powerful streamlined airplane is better than an underpowered streamlined airplane, the edge goes to streamlining. At least that was the way Clayton Folkerts saw it.

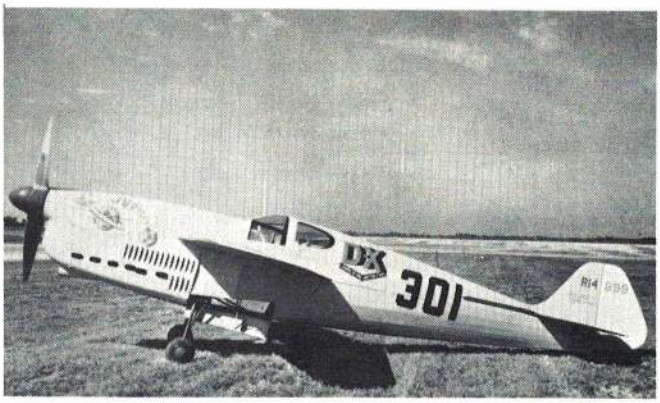
Build an airplane as small as possible and give it the biggest engine that will fit. And if you do it right, you should win a few races. For Folkerts, of Bettendorf, Iowa, and later Lemont, Illinois, it started in 1930 with the Mono-Special, later called the Folkerts SK-1 Speed King. Powered by a four-cylinder, in-line 310 cu. in. American Cirrus engine rated at 90 hp, it was a strut-braced mid-wing with rather crude landing gear. Careful work brought its speed up from 142 mph at Chicago in 1930 to 187 mph at Cleveland in 1935, though by then it was called the Fordon-Neumann Special and was being flown by Harold Neumann. It raced until 1937 as the Whittenbeck Special and then simply vanished.

But Clayton Folkerts didn't. His second racer appeared in 1936 and was a major improvement over the first. The SK-2 "Toots" firmly established his concept of a racing airplane: Minimum wings (50 sq. ft., compared with 66 sq. ft. required of today's Formula One racers), maximum power (supercharged 363 cu. in. Menasco C4S Pirate four-cylinder, rated at 185 hp), and one of the earliest, simplest retractable landing gears. With 1935 Thompson winner Neumann at the controls, the tiny SK-2 outran several more powerful rivals to place fourth in the 1936 Thompson at 233 mph. Roger Don Rae got its speed up to 243 mph in 1937, and the airplane ended its brief career when Gus Gotch crashed in it at Oakland in 1938.

With his theories pretty well proven, Clayton Folkerts moved ahead. His 1937 racer was simply more of the same: A few inches more length and wingspan, considerably greater weight . . .and lots more power. The little Menasco was replaced by its big brother, a six-cylinder, 489 cu. in. C6S-4 "Super Buccaneer" souped-up to deliver some 400 hp at 3300 rpm. It had three times the power of a Formula One, yet only 3/4 the wing area. This had to spell "performance," but it could also spell "trouble."







Opposite: This early Folkerts exemplified its designer's concept—minimum airplane with the biggest engine that fitted and careful attention to streamlining.

Above and right: By 1937, Folkerts was up to 400 hp. Had three times the power of today's Formula One with 3/4 the area. Competition more than doubled its displacement. The six-cylinder Menasco Super Buccaneer was shoe-horned into this tight cowling, in Thompson winner. Simple retractable gear was a masterpiece of engineering.

Specifications of the SK-3

Dimensions:
Length—21'0"
Wingspan—16'8"
Wing Area—51 sq. ft.
Height—4'0"
Empty Weight—840 lb.
Gross Weight—1385 lb.

Performance:
Top Speed—over 275 mph

But Folkerts knew enough about designing an airplane to keep it within reasonable handling characteristics. In fact, the pilot chosen to handle the new baby, Rudy Kling, had fewer than 200 flying hours when he sat on the starting line for the Greve Trophy Race at Cleveland, on Sunday, September 5, 1937. Lined up alongside Kling were six other Menasco-powered airplanes, in what must have been one of the classiest collections of racers ever seen. And at the end of ten laps of the ten-mile race course, they were almost as closely bunched as they had been at the start: Kling beat out Steve Wittman by 1.9 sec. and Gus Gotch by 4.5 sec., as they averaged 232.27 mph, 231.99 mph and 231.59 mph, respectively.

In competition with the best small racers in the world, Folkerts and Kling had proven that their team was a most effective one. But the big test was yet to come. Prior to the Thompson Trophy Race, Kling entered the SK-3 "Pride of Lemont" in a qualifying race against Wittman in his big Curtiss-powered "Bonzo," Roscoe Turner in the Laird-Turner "Meteor," a Ray Moore in a Seversky military prototype. Giving away 600-1300 cu. in., Kling was not expected to do very well, and he placed third at 240 mph, behind Wittman's 259.1 mph and Turner's 258.9 mph. But he was less than a minute back at the finish of the 50-mile race, and began looking forward to the Thompson with growing enthusiasm.

That race was for 20 laps of the ten-mile course: 45 minutes of hard, fast, on-the-deck flying. With insufficient power and insufficient experience the Folkerts-Kling combination was seen as a dark horse, at best, because they were pitted against the best in the business—Wittman, Turner, Earl Ortman and others.

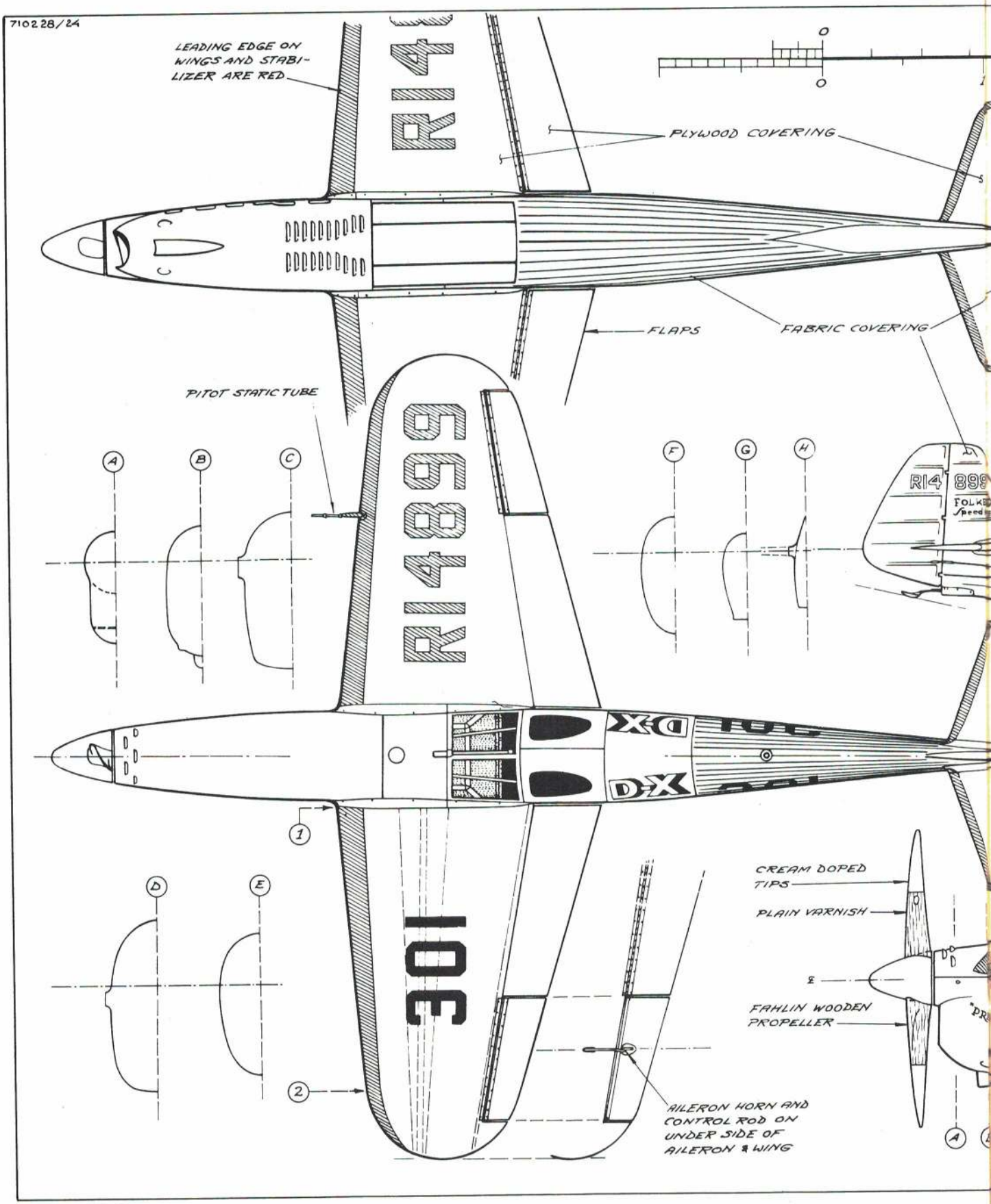
At the takeoff, Kling's heavily loaded little airplane found itself in eighth place in a nine-plane field. By lap five, however, he had moved up to fifth place and was in striking range of the leaders, if only a few of them would slow down a bit, please! At the start of lap 15, he started to make his move, and quickly advanced to fourth, behind Wittman, Turner and Ortman. On lap 17, Wittman ran into engine trouble and had to pull back on the power, moving everyone up a notch. Then, on the final lap, another piece of good fortune, as Turner swung around to circle a pylon he thought he had cut, and let Ortman and Kling go by.

As Ortman in the big Marcoux-Bromberg, and Kling in the Folkerts, roared toward the finish line, Rudy Kling took advantage of his excess altitude and dove to gain speed. He passed Ortman as they approached the wire, and crossed it a mere 50 feet in the lead. His margin was but .57 seconds, as he averaged 256.910 mph to Ortman's 256.858 mph, in what is still the closest finish of any "unlimited" air race in history.

The joy in the Folkerts camp was as great as befits a long-shot victory. They had taken on all the horsepower that American air racing could muster, and they had won. And they had even topped the speed record set by the great Jimmy Doolittle in his immortal Gee-Bee. All this was only 489 cu. in. and 400 hp. Indeed, it was a great day for the little guy.

But it was the last great day for a Folkerts racer. At Miami, a few months later, Kling was rounding the first pylon of a race when a violent gust of wind caught the SK-3 and flipped it into the ground. Neither survived. In 1938, the fourth and final Folkerts appeared at Cleveland—the SK-4. It didn't race that year because of wing flutter, but returned the next year and crashed on a qualifying flight.

And so it was over, this tale of the Folkerts racers. They had won and they had lost. They had lived and they had died. And what remains is the knowledge that on one glorious day, David had again beaten Goliath.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LEADING EDGE ON WINGS AND STABILIZER ARE RED
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FLAPS
FABRIC COVERING
PITOT STATIC TUBE
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CREAM DOPED TIPS
PLAIN VARNISH
FAHLIN WOODEN PROPELLER
AILERON HORN AND CONTROL ROD ON UNDER SIDE OF AILERON & WING
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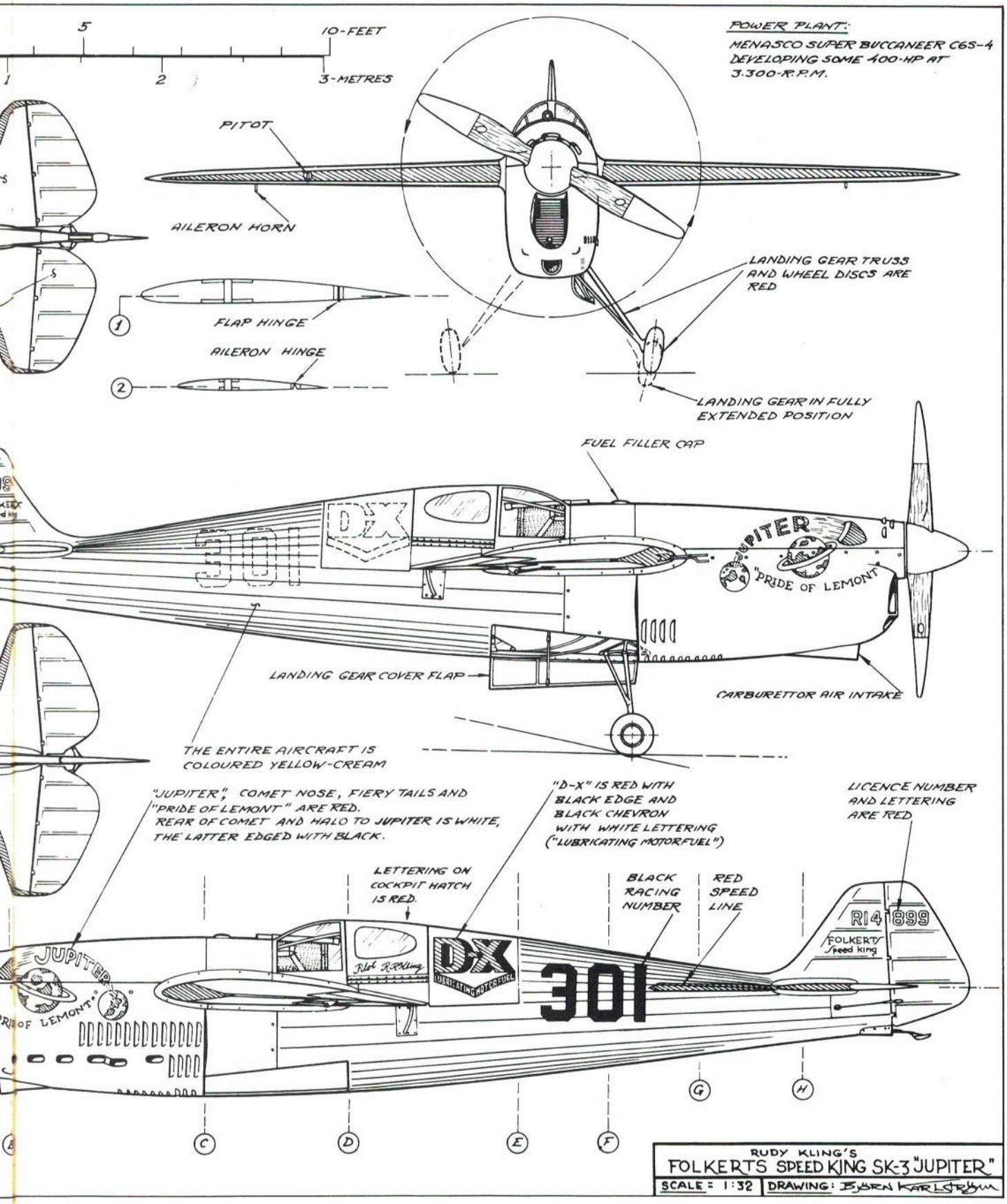
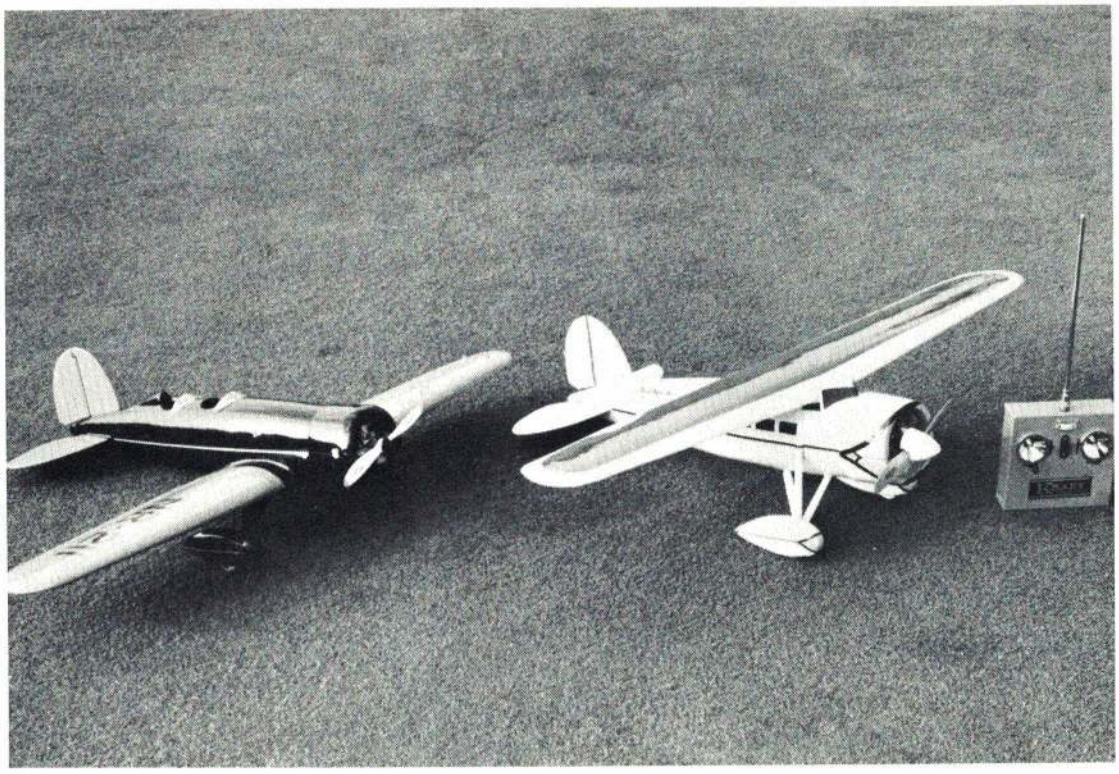


RUDY KLING'S
FOLKERTS SPEED KING SK-3 "JUPITER"

SCALE = 1:32 | DRAWING: BYRON KARLSTROM



PART ONE

FOAM TECHNIQUES

High density "Pro-Foam" easily carves and sands to make quick small RC or CL models.

ERIC MEYERS

Pro-Foam, a rigid polyurethane foam material, has many qualities that make it ideal for model airplane construction. A close look at the foam reveals a structure of minute egg-shaped cells of an extremely uniform density. The material is grainless and has a density, ideal for modeling, of about two lb. per cu. ft. This structure is quite different from the bead-type polystyrene foam and can be sanded and cut with ease and precision. Pro-Foam will accept any type of finish that can be applied to balsa including dope, finishing resins and epoxies. The material is almost noncombustible so that a MonoKote type finish may also be applied. Pro-Foam can be bonded with many different adhesives—white glue, epoxies and Ambroid—as they all work well.

The biggest advantage of Pro-Foam is the fast construction time. As the material can be rough-cut with a sharp knife and shaped with sandpaper, an entire wing or fuselage can be built in several hours. The Stand-off Scale Lockheed Vega I built took only ten hrs. from start to finish. This reduced building time puts so much more enjoyment back into modeling by eliminating all the headaches involved in making a complicated balsa airplane.

The model chosen to be fabricated in Pro-Foam was a small Stand-off Scale Lockheed Vega, better known as the Winnie-Mae. The ship has a 42-in. wingspan and is designed to be used with a three-channel radio control system and 19 engine. The plans for this little fun ship were eyeballed from full-scale plans. The Winnie-Mae was chosen because of the multiple compound curves in its fuselage and wing pants.

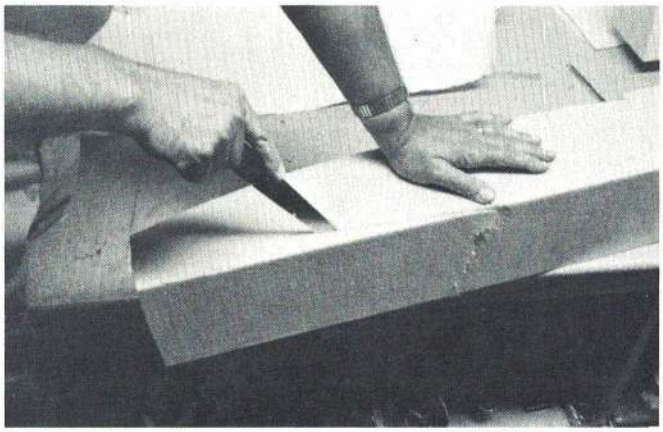
When using balsa, one would have to plank the fuselage—a process which requires much time and effort. Templates are made up from the plans to act as guides in sanding the fuselage curvature and alignment, although it is quite easy to eyeball these shapes.

The wing is double-tapered and uses the flat bottom Clark Y Airfoil. Wings are very easily made from Pro-Foam. Hot wire wing core cutters are not needed nor recommended—the wire will usually not cut the material because of its self-extinguishing qualities. The easiest way to make a wing is to carve and shape it with a knife and sandpaper.

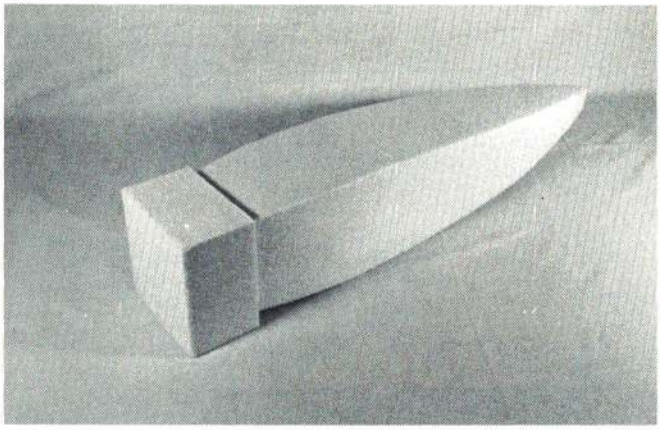
First, cut an exact outline of the top view of the wing in a block of suitable thickness. This can be done by using a template and then cutting the foam with a knife and straightedge. If the wing has rounded tips, cut them off square, temporarily. Next, prepare airfoil templates from plywood or formica and spot glue them to the wing root and tip. Use a 60-sec. glue gun for fastest results. Obtain a good straight board and spot glue the templates to it. A sharp knife with about a six-in. blade is used to slice away the "fat." Don't take a chance on gouging because you can sand just about as fast as you can slice. If you should happen to slip and make a mistake, square off the error and glue in a new piece. That's simple enough!

A nice straight piece of hardwood about three-in. wide with very coarse grit sandpaper glued to one side is used in sanding the wing. The board should be about four to six in. longer than the wing panel. Once the wing is rough-shaped and the sander is ready, go sand! A swift back and forth stroke with the heavy sandpaper cuts an airfoil very quickly. I formed two sets of wings (four panels) in an hour and fifteen minutes. Slots are then cut in the bottom of the wing for a full-length 1/8" pine spar. Epoxy in the spar along with the center section doubler to create a very rigid wing. This spar was full-length because the panel curled slightly after sanding. The spar corrected for the curl 100% and the wing came out true. The final step is to add the wing tips and shape them to blend with the airfoil.

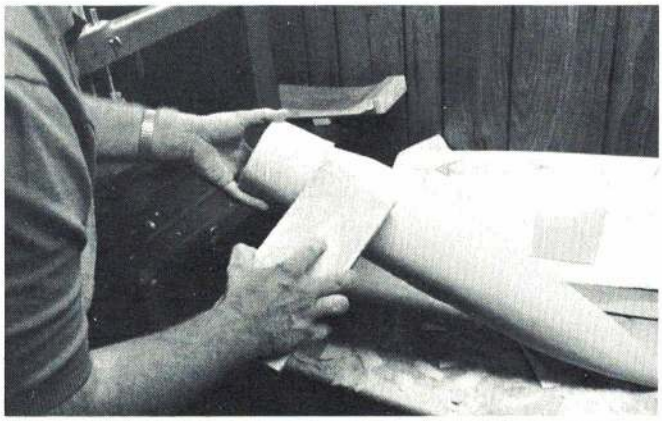
The fuselage is cut to the proper square shape with a band saw, although a long-bladed knife works just as well. The cowl is shaped first by drawing a



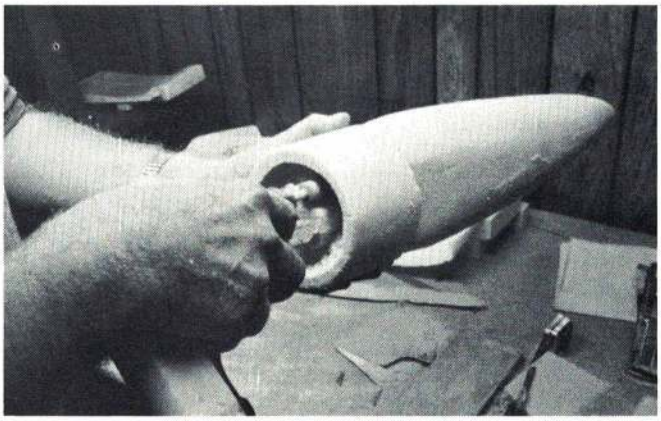
Hand saw does well roughing out the fuselage profile.



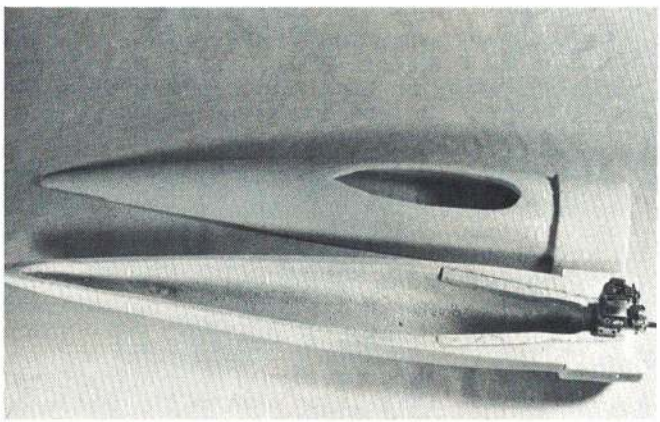
Saw job finished. With many old planes, this stage would nearly complete the fuselage work.



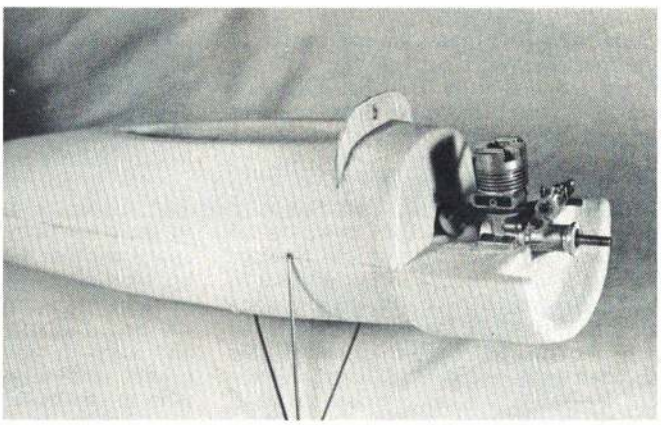
Block sanding with coarse paper gets approximate shape. Later, final-sanding done with paper in hand.



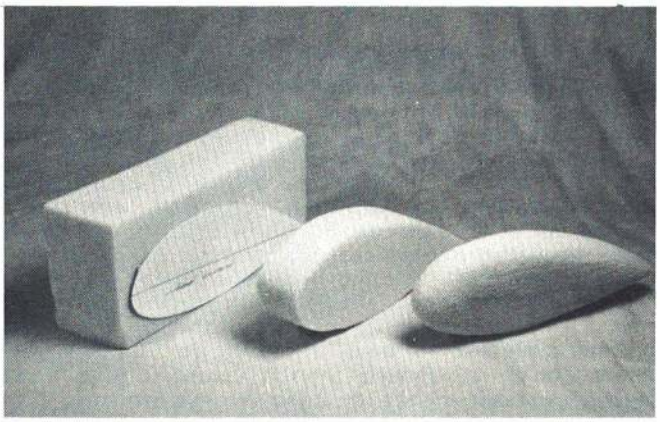
Dremel tool or electric drill gouges out engine compartment, shaping the cowl interior.



The foam is quite strong even after hollowing out the insides. Long engine mounts carry landing gear attach points, too.

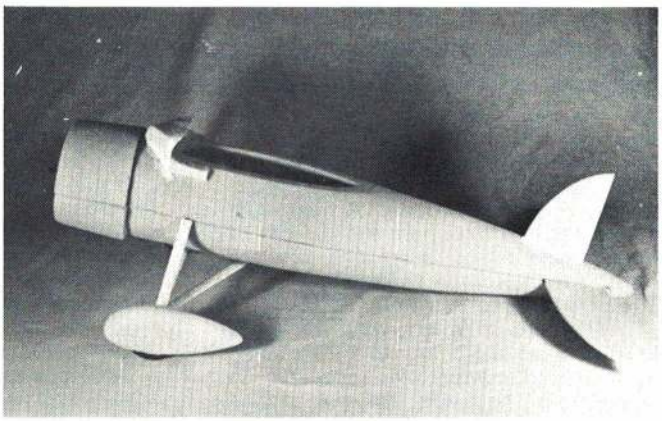


Fuselage halves joined again. Plywood wing keeper backs up the cockpit, too. With epoxy, the nose will be completely fuel-proofed.

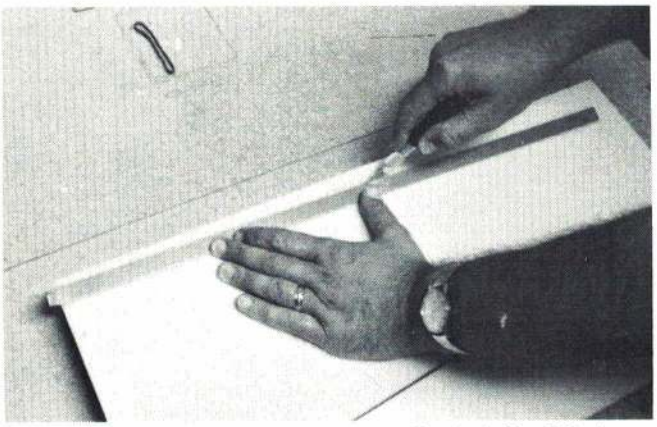


Wheel pants made like the fuselage, then split and hollowed. Can be coated with glass cloth and epoxy if rough treatment is expected.

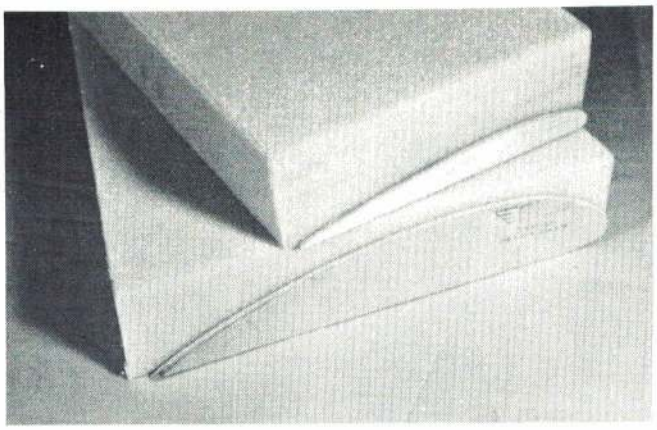
Photos by Eric Meyers



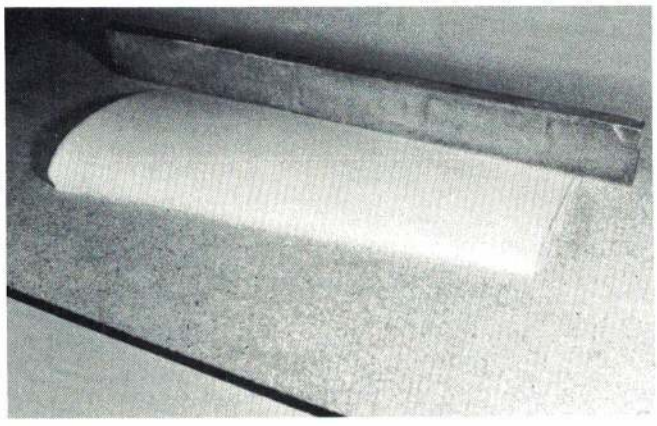
Small blocks of Pro-Foam used here for wheel pants and cockpit shaping. Balsa rudder and stabilizer.



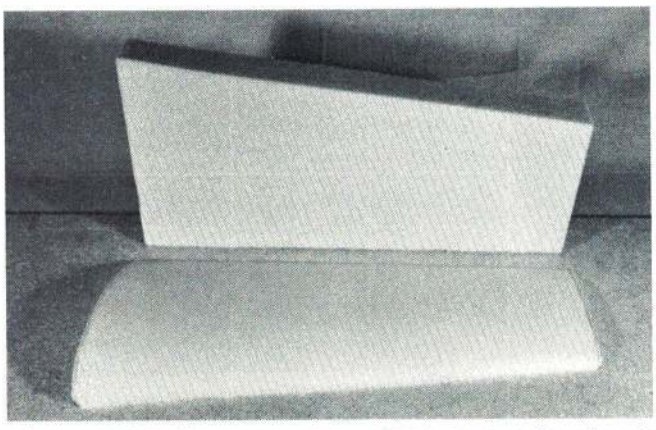
Wing construction starts with planform cutting by knife. Hot wire can be used, but not worth the trouble.



Plywood templates glued to wing root and tip. Now carve and sand to make the wing.



Final sanding is done with a long rigid sanding block. A perfect wing in no time.



Before and after. No spars are needed. Finishing technique imparts sufficient surface strength.

circle with a compass in the center of the fuselage. Next cut the "fat" off the fuselage and sand it to shape. A sanding block is used to make the sides as smooth as possible. At this point the fuselage is all rounded, except for the wing saddle. A centerline is drawn and the fuselage is sliced into two halves so that it can be hollowed. At this time cut slots in the lower half of the fuselage and epoxy 1/2" maple motor mounts in place. The radio installation is also done at this time. With everything installed and hollowed out, the halves are epoxied back together. Cut slots in the tail for 3/16" balsa empennage surfaces. A vertical slot is cut just in front of the wing for a 1/8" former to act as a base for the wing dowel. No formers are really necessary for this fuselage because its structure is quite rigid especially after being finished with a polyester resin.

Now add landing gear struts and tail skid, as well as the empennage. The front "windows" are made from a block of Pro-Foam and epoxied to the fuselage to conceal the former. A final sanding and a little filler here and there is all that is needed to make the fuselage ready for finishing. The total time required is three to four hours.

There are as many ways to finish Pro-Foam as there are to finish balsa; they are all compatible. I decided to MonoKote the wing to give added strength. Care must be taken to see that the wing is sanded very flat; this should be no problem when using the method previously described. The MonoKote adheres very well to the foam, especially if the wing is dust free. MonoKote, combined with a wing spar, makes for a very strong wing. Paint the fuselage with Frances Products Surfacing Resin to add rigidity to the framework. The method employed here is to apply a heavy coat to fill in the pores, sand lightly and then apply another heavy coat and finishing by sanding smooth. The added weight of resin was not more than three or four oz. and the foam becomes rock hard and very durable. A coat or two of primer sanding in between coats and on with the K&B Super Poxy. Two coats of white are sprayed on for a glossy and bright finish. Aero Gloss dope is used for trim on the fuselage. Use MonoKote trim with the wing. Another very effective way of finishing Pro-Foam is to use the talcum powder, dope and Silkspan method. Manufacturer Bob Hayman used this method on his U-Control Lockheed Sirius to produce a very fine finish. Total time of building and finishing this ship was under six hours.

Pro-Foam has excellent applications in building airplanes as well as all aspects of hobbying because the material can be quickly and easily shaped for building cowls, wheel pants, canopies, etc.

Wheel pants are a prime example. With balsa one must laminate or plank, or with fiberglass a mold must be made. All that need be done with Pro-Foam is to rough-cut with a template and knife, and then sand. Total time spent on each wheel pant is less than five min. and the weight was about 1/2 oz. How can you beat that? With a resin or silk finish, these are durable and nice-looking accessories.

Pro-Foam is also a favorite among boaters as it has a moisture absorbency of less than 1%; boats can be built in only a few hours. With airplanes, the material is terrific for creating fun, quick-to-build ships. Although the manufacturer and I have not attempted to make either a pattern ship or pylon racer from this material, we mutually agree that the tail sections would most likely be too weak for these fast flying airplanes. However, if spruce and balsa were added to make formers and stringers, the structural strength would be greatly enhanced.

It was observed that although the material is self-extinguishible (meaning that it will not continue burning after igniting), it will burn slightly under such extreme temperatures as those produced by a heat gun. This slight burning caused a small amount of discoloration in the MonoKote, but was hardly noticeable. This occurs only under such high heat temperatures as encountered with the heat gun and the material is not effected with lower settings on selector or MonoKote-type iron. This material is strictly for the moderate modeler who is looking to have fun in building and flying his airplanes. Pro-Foam is available from Model Materials Co., 119 Mariposa, Waukegan, Ill. 60085.

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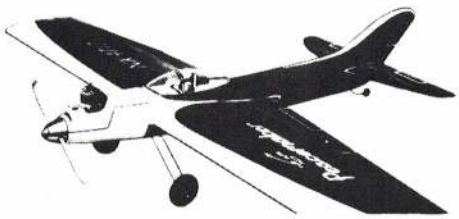

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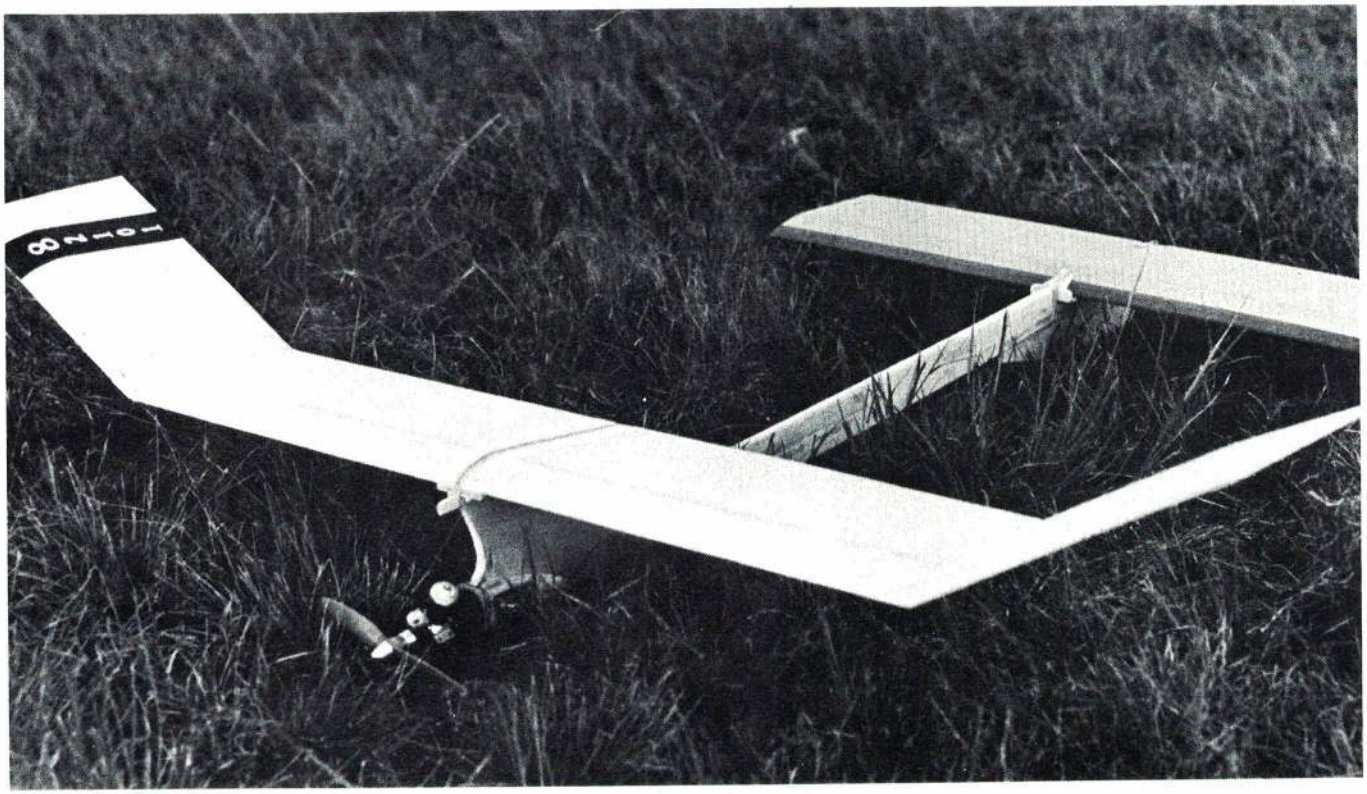


PART TWO

FOAM TECHNIQUES

Competition FF models made from very light foam with spars and tissue covering are quick to build and surprisingly durable.

MIKE ATWOOD

The foam free flight era is upon us. From Texas, the heartland of the world's hottest chili, comes the hottest brand going—the all-foam free flight.

This is a process I have worked out over the last two years, progressing from some scungy-looking beginnings to several attractive and quite flyable models.

Foam—one lb. density, expanded bead polystyrene—has its applications in all phases of free flight. It's inexpensive, easy to work and has no unpleasant odor. The little woman will love it until she tries to sweep up the foam dust. The foam I refer to is not the kind you find at the florist, but that used for insulation (in beer coolers, for example) and packaging.

I know there will be many questions about the weight of foam planes, so let's get that settled right here. *There is no weight disadvantage with foam.* Proof: Nordic wings, 6 x 74" at 4 oz.; Nordic stabs, 75 sq. in. at 9.3 grams; Coupe d'Hiver wings at 18 grams; 75 sq. in. HLG with a foam wing at 1-1/3 oz.; Class A power, OS 19 on a 450 sq. in. wing at 17 oz.

The initial attempt to use foam came with my first Nordic A2. To a chorus of "It won't work," I enlisted the aid of a friend to hot wire cut a set of foam wing cores. Fiberglass arrow shafts were epoxied in place for the spar and it was covered with Top-Cote. Weight? About 6½ oz.

The simple things come the hardest. Without sanding, this resulted in a rather rough and wrinkled finish. This model was nevertheless flyable and absolutely unbreakable. I even lucked into a first place trophy at my second contest, mainly because the 35 mph winds and biting cold defeated most of the other planes and/or fliers.

Further development lay in limbo for a month or so while I went to Australia. I was very impressed with Gordon Burford's Taipan plant and the fine fliers in the Adelaide area. When I returned from Australia, a light bulb clicked on in my head and a tiny voice said "use paper and Elmer's glue." Since I had already constructed my own hot wire cutter before my trip "down under," it was a matter of twenty minutes until I found I had a set of wing cores in my hot little hands. I swiped the Elmer's glue from my kids' desks and started build. . .er. . .covering.

This is when I made the discovery that foam can be sanded easily to a velvet-like finish. Then I mixed the Elmer's half and half with water, dug out some 00 Silkspan, and. . .Presto! Beautiful wings that weighed about a pound. Four to six hours later, when the wings were completely dry, they weighed about 4½ oz. This plane has never failed to place in a contest—except at the Semis.

From here on in it was smooth sailing all the way. A friend, Dr. Dan Gabriel, then actually got the first power ship flying. He has guinea-pigged a lot of ideas on his ships—some worked, some didn't.

Now down to the nitty-gritty about "how to do it." First, let me detail cutting and shaping procedures. Two methods of cutting can be used—hot wire or band sawing.

The hot wire method has long been used by the RC fraternity, but for those not familiar with it, a hot wire cutter consists of a length of nichrome wire (available from BK Model Products) stretched in a frame and heated with current from a variable transformer.

The frame consists of a stick of pine about one inch square. It should be about 40" long with a 1/8" hole drilled through each end at about a 30° angle one in. from each end. Get a stalk of 1/8 music wire and cut off two pieces about eight in. long, pushing them through the holes so that they extend about four inches. (See Figure 1.)

Now install the 1/8 wheel collars. Tie a loop in each end of the nichrome wire making the wire about an inch too short. Now when you flex the 1/8 wires toward each other, the nichrome wire will reach resulting in the proper amount of tension.

The upper end of the 1/8 wires are then attached to the transformer. I use a cord with alligator clips on each end for easy removal. There are several transformers available in the $15 to $20 price range from electrical or electronic supply houses. See the Allied Radio Shack catalogue No. 273-Bo43.

The first step in making the core is to lay out the selected airfoil on a piece of masonite or plywood. Stack two blanks together so you can get two templates and cut on a jigsaw. Sand template smooth and, if you used plywood, seal edges with dope.

Drill two or three small holes in each template for finishing nails to hold them into the foam block. Lay them side by side and mark them at ½" intervals.

Now take a block of foam cut roughly one in. larger chord and spanwise than the finished model will be, and lay on a flat table. Weigh it down with metal plates, wood blocks, or whatever, so it lays flat and doesn't slide.

To attach the templates in proper position, use a straight board laid next to what will be the leading edge. Lay a 1/8" thick piece of material chordwise at the end of the foam. Space it ½" back from the LE board. This will locate the templates properly. Set the template in place and push finishing nails through it to secure. Repeat procedure for other end.

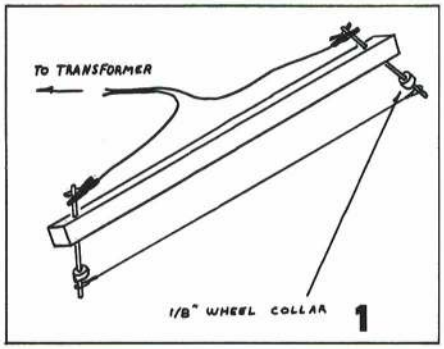
The next step is to locate another warm body, for it takes two people to handle the cutting. Set the transformer to heat the wire just above the point that will begin to melt the foam. First make a vertical cut at the TE. Then start at the top of the TE with someone acting as "caller." Proceed slowly, calling out each mark as you pass it. It is quite important to stay even, especially going around the LE. Don't lead the wire. Let it cut at its own pace. Go over the top of the airfoil, slowly around the LE, then on to the bottom and back to the TE, in one continuous cut. Instant wing!

The second or third attempts should net you some respectable cores. Tapered wings are a cinch. Just use a large and small template, but make sure there are the same number of marks on each or you will have some weird airfoils.

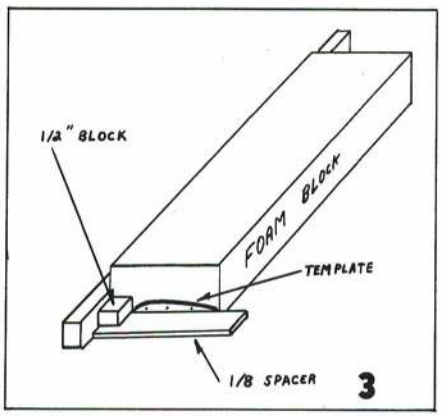
If a jig or band saw is handy, you can rough-cut flat bottom airfoil sections and finish shaping with sanding block. (See Figure 2.)

Full- or semi-depth spars may be used. Split the wing panels for a full-depth spar by placing them upside down in the top part of their jackets, positioning vertical cut templates and making a single cut. If a semi-depth spar is desired, use a notch template. Semi-depth spars should not fit too tightly as panel warping may result. Install spars using a liberal amount of Elmer's or Titebond applied to the spar itself, rather than to the foam.

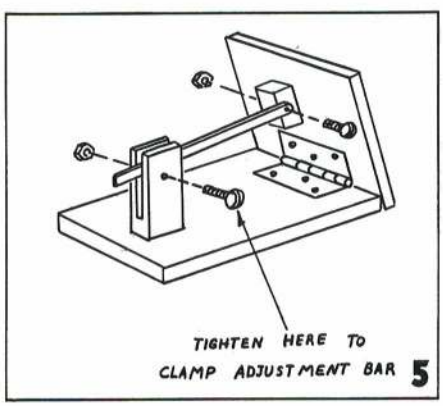
Now to cover your new space age free flight wings. Covering materials are as follows: 00 grade Silkspan or Jap tissue; Elmer's glue as the bonding agent. What else? Oh, a couple of mason jars, and a one in. wide paint brush, and lots of water. Mix Elmer's and water as indi-



Hot wire cutting of airfoils requires a bow and some thin Nichrome wire (from ACE RC).

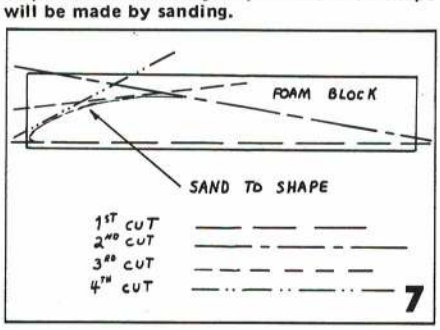


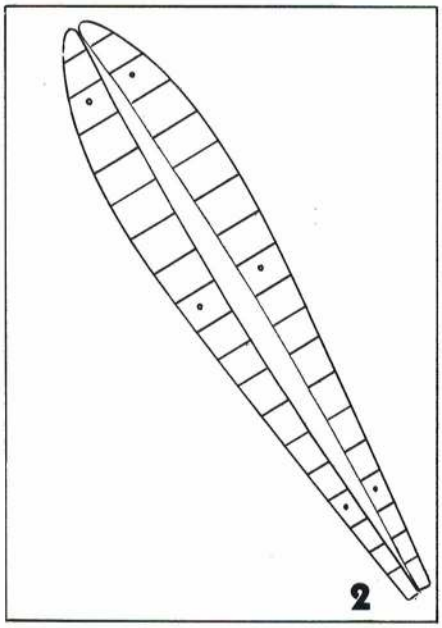
Here's one way to jig the foam for hot wire cutting. Several wings can be made from that foam block.



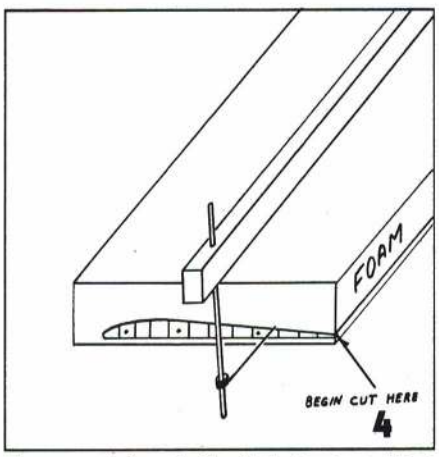
To cut foam foils on a saw, you would need this adjustable mount. Obviously easy to make.

Sequence of cuts very important. Final shape will be made by sanding.



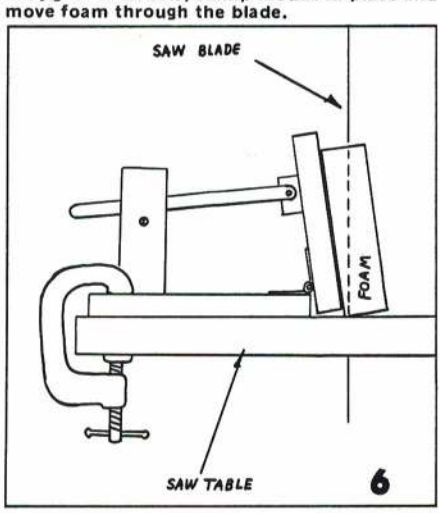


Layout of a typical airfoil. Vertical lines for simultaneous movement through the foil shape.



Jig removed for clarity. Make lower cut first then top of foil. Bow keeps wire tight and straight.

On jig or band saw, clamp mount in place and move foam through the blade.



cated in Figure 3 in one jar, and fill the other with water.

Just as I was putting the finishing touches on this article, the last real breakthrough was made. Credit Frank Perkins of Dallas with this one. To achieve a perfect seal for the finish, use gelatin in the glue mix. If properly done this will allow the use of almost any type of paint or finish to be applied with a brush. Use a ratio of glue mix as shown in the chart. Boil some water, add one packet of Knox unflavored gelatin to every three oz. of water. Allow to cool or buy some asbestos gloves. Then add the water/gelatin to the glue.

Until you become an expert, always cover a scrap of foam at the same time using the same procedure. This will allow you to test your finish without damaging a good wing if something goes wrong.

Cut the Silkspan or Jap tissue covering a ½" or so oversize all around. Brush on a coat of bonding mix on the top side of the wing panel. Lay on the covering and smooth out with a water-filled brush. (Tissue is easier to apply in 12" sections as it "expands" considerably when wet.) If the covering begins to dry and gets hard to work, brush on more water. After covering the top, gently lift the panel and turn upside down; then brush a coat of glue on the bottom. Now wrap the excess covering around the leading and trailing edges and smooth into place. Now you can apply the covering to the bottom panel.

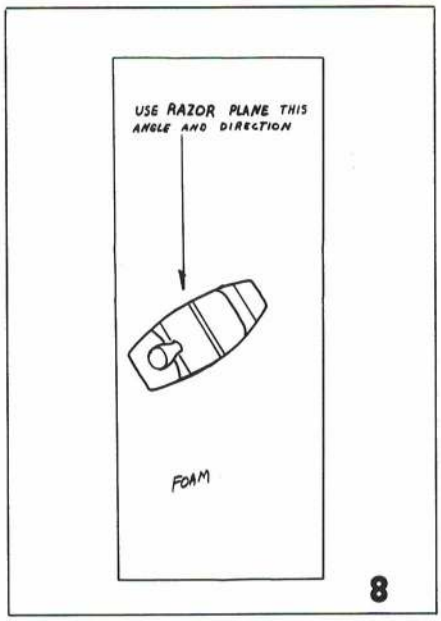
After covering the bottom, gingerly slide panel off of table and smooth bubbles that may have occurred on the top side. Place panel leading edge down to dry. Prop it up as nearly vertical as possible. After your panel is thoroughly dry, usually overnight, cut in any dihedral breaks, then use saw or sanding block to bevel, and glue together. Use Elmer's, Titebond or epoxy for these joints.

Now you would like to put on a finish. . .Beware! Most paints, dopes, etc., will melt the foam and leave you holding a paper sack with a lot of goo inside if you don't use gelatin in the glue mix. Don't apply any finish that you have not tested on a scrap first.

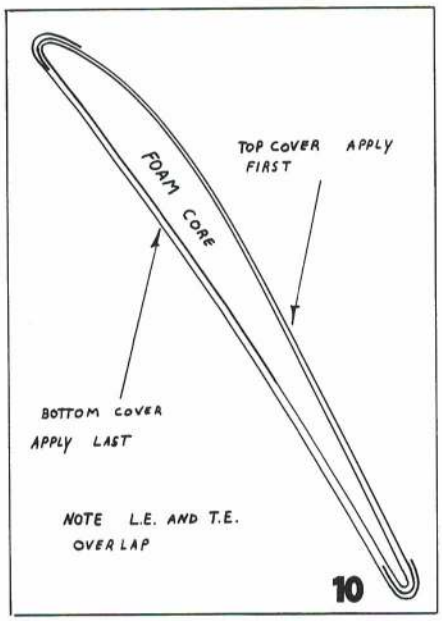
I have found several acceptable finishes, and as development continues, hopefully you will find more. If you're not using gelatin, the most practical is spray dope. Do not apply a wet coat, as you will be left holding the aforementioned bag. Several light fogged-on coats will do. Between coats, do not be tempted to use sandpaper. Use only a coarse paper towel. Sandpaper will ruin the filling qualities of spray dope by picking up fibers. Use only a paper towel for final rub. (Is this where the rub comes in?)

Foam and Elmer's are fuelproof materials, so the surface needs sealing from moisture. On parts subjected to high concentrations of fuel, such as wing center sections, I recommend using Hobbypoxy Formula II not an epoxy paint, or Sig Plasticote enamel. Both should be used with discretion.

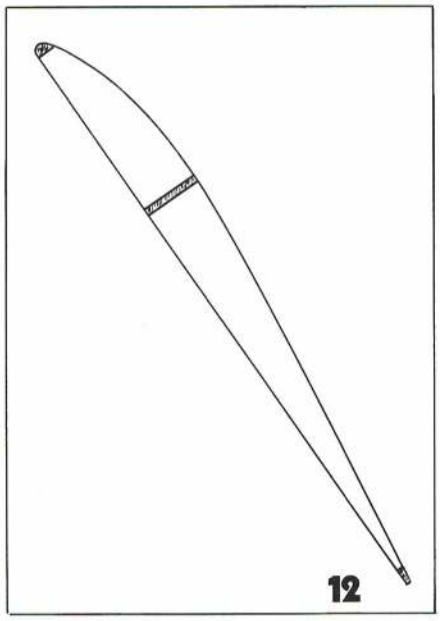
(Continued on page 86)



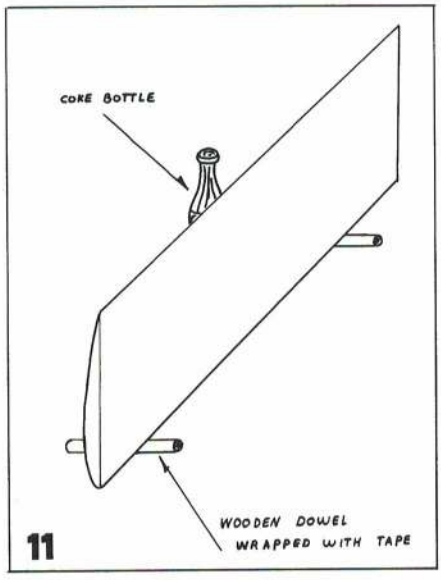
It is also possible to make the airfoil using a razor plane. Very very sharp blade is needed.



Wrapping the wing is easy but tedious. Control your use of the glue mixture, spread it out evenly.

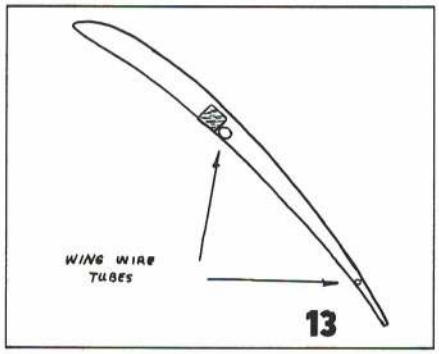


For wings on power jobs or for any wing where air loads are high, add a few spars. Leading edge protects from stiff weeds, branches, and the like.

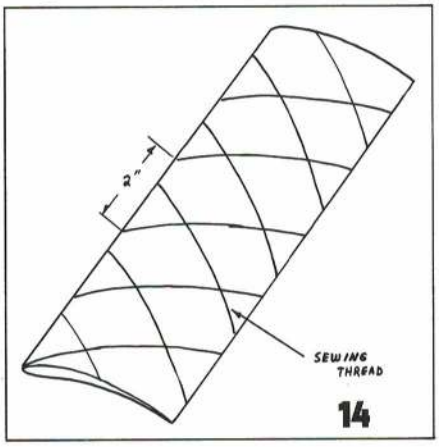


After covering the core with water-based glue and Silkspan, set up to dry as shown.

On Nordics where the wing is often wire mounted, locate tubes next to spar when possible.



Here's another trick. Foam wings are not torsionally stiff but sewing thread glued to the core before covering can add torsional strength. Acts like diagonal ribs.



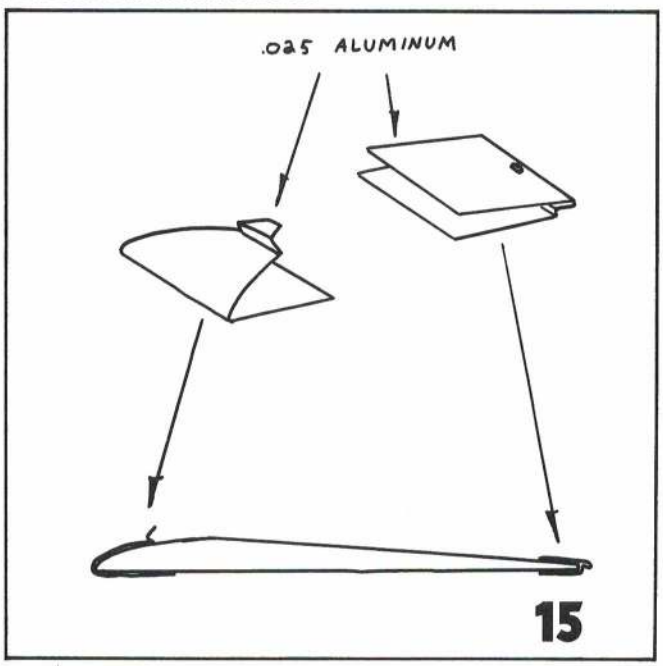
Airplane	Surface	Covering	Glue %	Water %
Power ships				
Large	Wing	OO SS	50	50
	Stab	OO SS	50	50
Small	Wing	OO SS	40	60
	Stab	OO SS or	40	60
		JAP Tissue	30	70
Nordic	Wing	OO SS	40	60
A1 & A2	Stab	JAP	15	85
Coupe d'Hiver	Wing	JAP	40	60
and Wakefield	Stab	JAP	15	85
Hand-Launch	Wing	JAP	40	60
glider	Stab	JAP	10	90

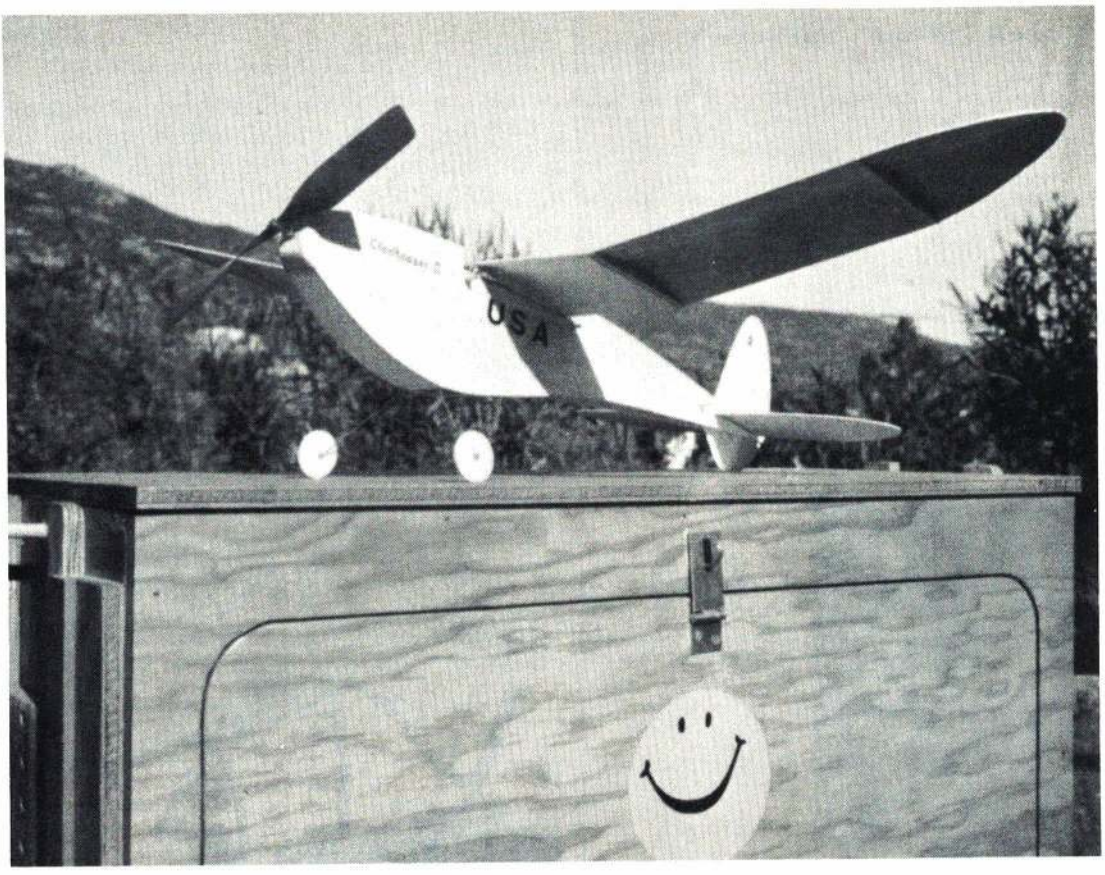
These values are for guidelines. More glue adds to filling qualities. Less glue reduces weight. Experiment a bit to find your own best compromise.

Glue and tissue add strength to the wing. Vary mixtures to suit the size of model. Less glue, less weight.

Foam is ideal for smaller, lighter models. Author holds model which can be made in one evening.

On wings with no leading or trailing edge balsa, thin aluminum gives protection from the rubber bands.





CLODHOPPER

An Old Timer
sized and simplified for
novice balsa choppers.

PAUL DENSON

Ever since I can remember, when the talk got around to rubber-powered models someone would say, "There never was nor will there ever be a plane that can fly like the Clodhopper," or, "With that underslung fuse, you can recognize the Clodhopper as far as you can see it." Someone else would take off with a bunch of technical jargon about how the low center of gravity coupled with the shoulder wing was the thing that really made the Clodhopper fly. I personally feel there is something asthetically beautiful about the curves along the bottom of the fuselage that first attracted my attention.

Wanting to build something unusual in these times, I ordered the plans for Jim Cahill's International Champion to build and enter in one of our local Old-Timer contests. But, like quite a number of good intentions that everyone has, other things became more pressing and this idea got pushed back on the shelf. So, rather than building the full-scale model, I settled for this little, small-field 1/2 scale model of the Clodhopper.

Construction

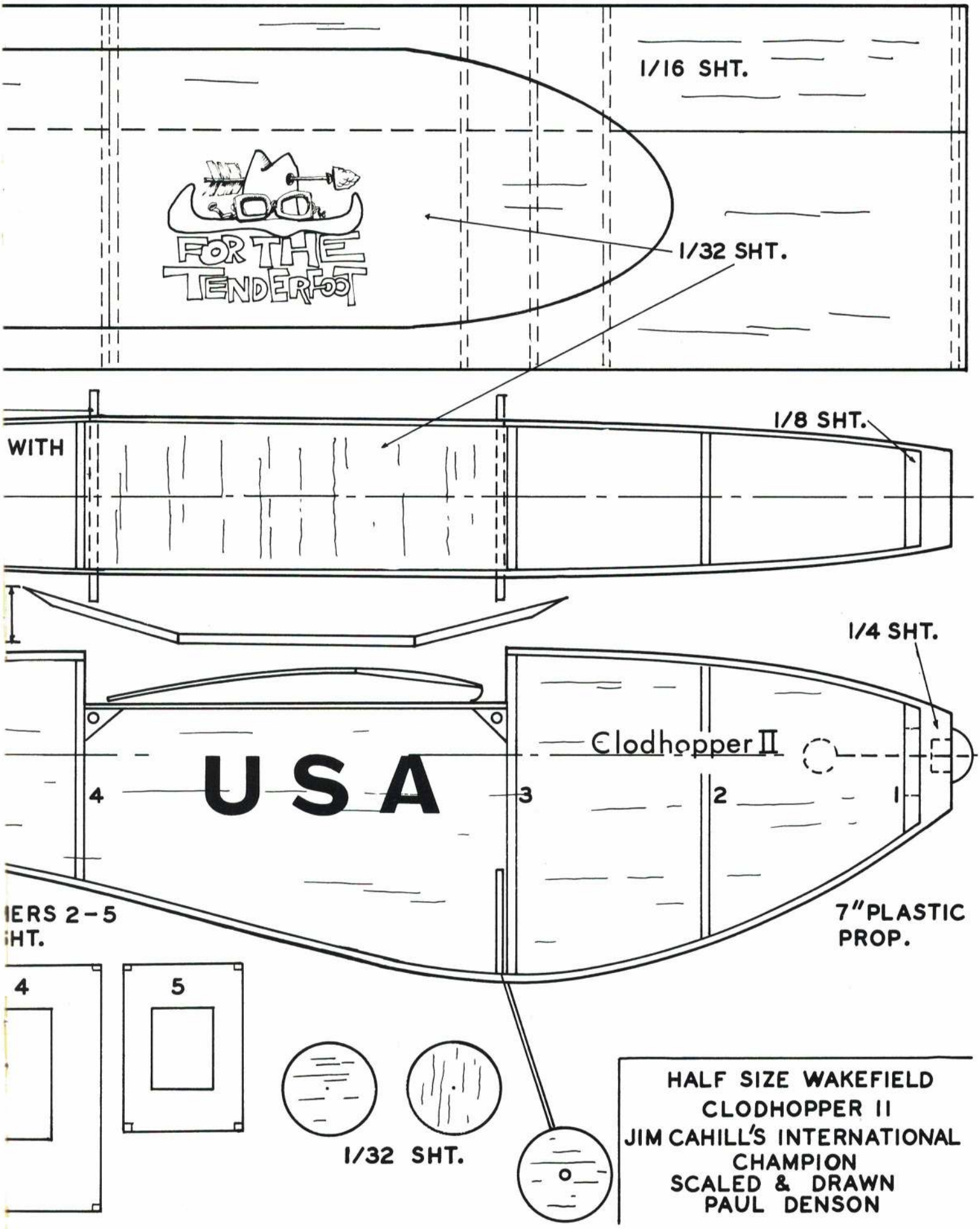
Start construction by cutting two fuselage sides from medium weight 1/32 balsa. Cut the rudder from pieces left over. The back section of the wing and the stab are cut from lightweight 1/32 sheet. The leading edge section of the wing is cut from medium weight 1/16 sheet. Cut the formers from sheet balsa as indicated on the plans, making sure the grain is vertical. After cutting the opening in the center of each former, glue a scrap of 1/16 sq. strip crossways near the top and bottom of each former. This adds very little weight, but strengthens the formers when side pressure is placed upon them. Don't forget the wheels—these are made by laminating, cross grain, two pieces of 1/32 sheet. Do not throw away the cutout of former No. 1, it will act as a key so the nose will go back on the same way each time it is removed for winding the rubber motor.

I usually extend the former lines ½ in. on each side of the fuselage on the plans before I start construction, then, when the fuselage half is pinned to the plans, you can see the exact position of the formers. The first step of construction is to pin the left half of the fuselage to the building board and completely outline the half with 1/16 square strips. (Soak the bottom stringer in hot water for a few minutes before bending it around the extreme bottom curve.) When you have the outlining completed, put in the two vertical strips just forward of the tail surfaces. Allow this to dry while you are making the opposite side. By very careful to insure that you are making two sides, one left and one right. The way I do it is to pin them flat to the working surface top edge to top edge. Then, when I outline the halves, I have one left and one right side.

Pin the left side to the plans directly over the outline and glue former No. 4 in place, making sure it is at right angles to the building surface. Repeat with former No. 2. Allow these two formers to dry thoroughly. Place the right side of the fuselage on top of formers 2 and 4, check for fit and if everything seems to mate well, remove, apply glue and replace. Allow this to dry for at least two hours. While waiting, bend the landing gear from a piece of 1/32 wire and sew it to the bottom of former No. 3. Remove the fuselage from the plans, check to see that former 3 fits, then coat your sewing with glue, put some on the edges of former No. 3 and glue in place. Add former No. 5 in the same manner. After placing some glue on the insides of the tail end of the fuselage halves, hold them together with a clothespin or small scrap of masking tape.

The placement of former No. 1 is simple if you plan ahead. Place two six-in. strips of masking tape on one side of the fuselage—one at the top, the other at the bottom. Put glue on the edges of former No. 1, hold in place then squeeze the two sides of the fuselage

(Continued on page 72)


1/16 SHT.
FOR THE TENDERFOOT
1/32 SHT.
WITH
1/8 SHT.
1/4 SHT.
Clodhopper II
USA
4
3
2
1
IERS 2-5
HT.
7" PLASTIC
PROP.
4
5
1/32 SHT.
HALF SIZE WAKEFIELD
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(3) Complete flying in

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* SIG Contest Rubber Str and High Flight Perfor
* Die Cut SIG Balsa Par
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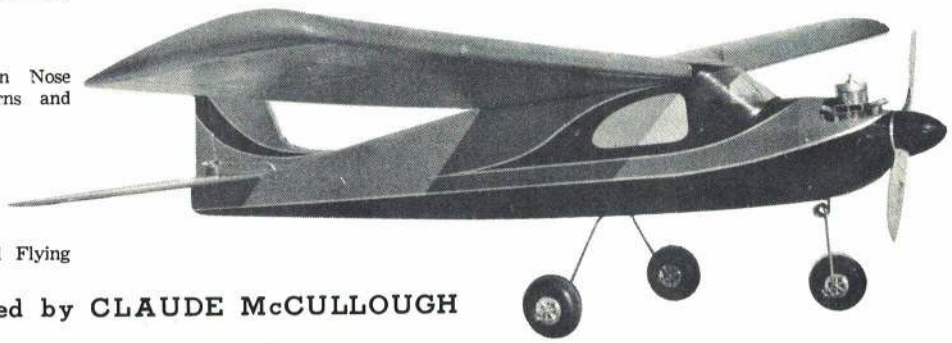
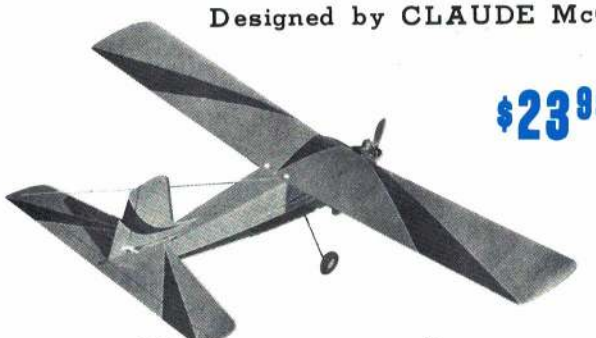


Designed by CLAUDE McCULLOUGH



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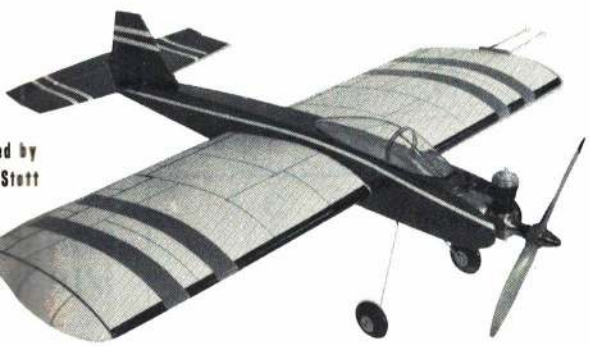

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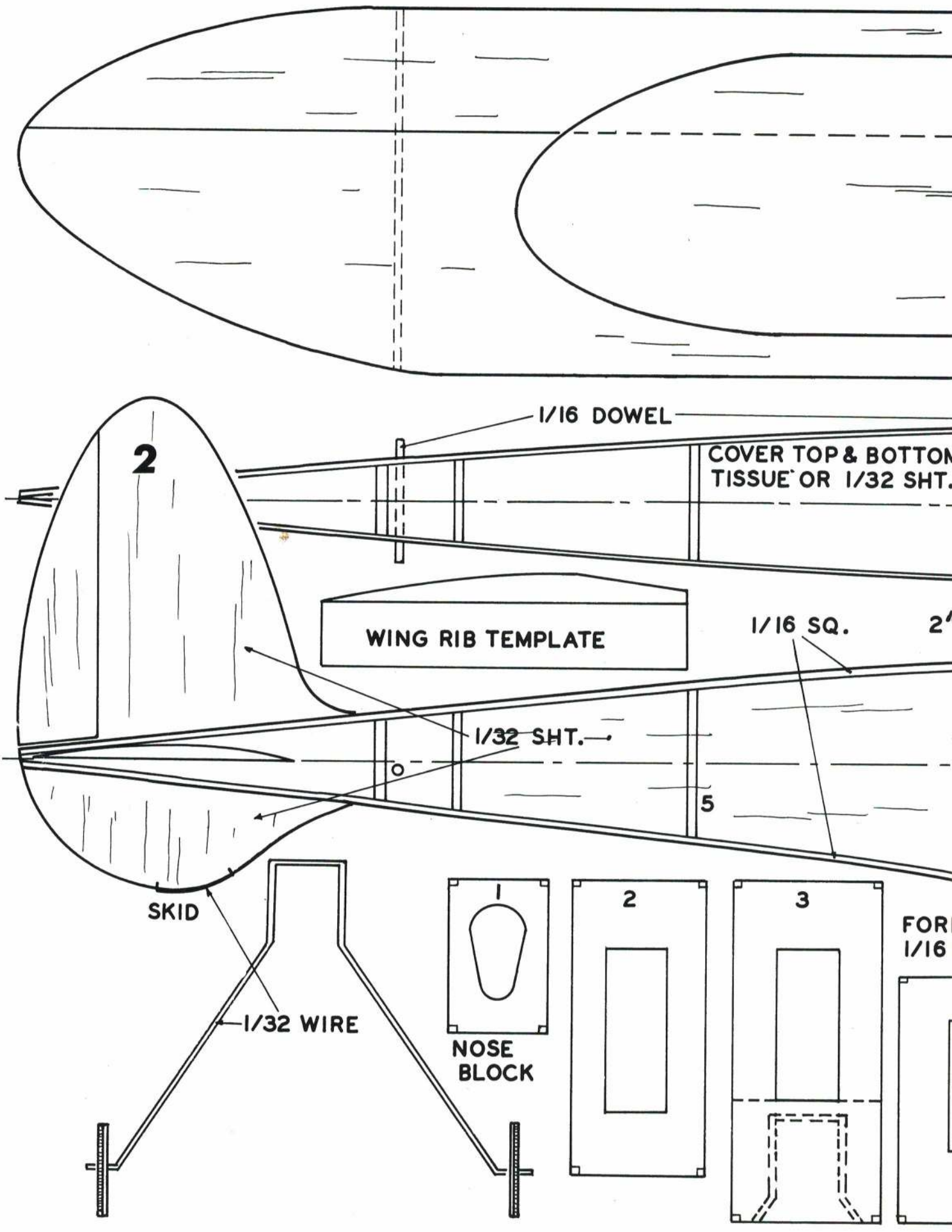
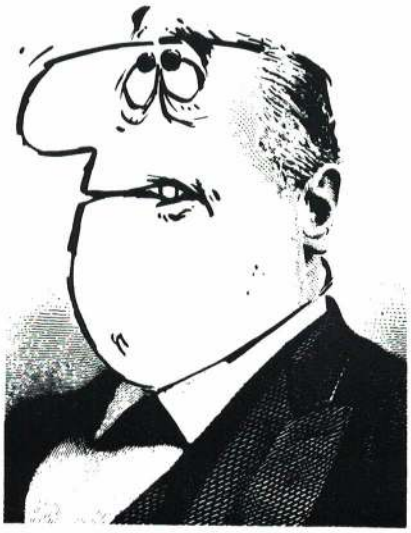

1/16 DOWEL
2
COVER TOP & BOTTOM
TISSUE OR 1/32 SHT.
WING RIB TEMPLATE
1/16 SQ.
1/32 SHT.
5
SKID
1/32 WIRE
1
NOSE
BLOCK
2
3
FOR
1/16



I used to cover all my models with silk...

and I looked like this.

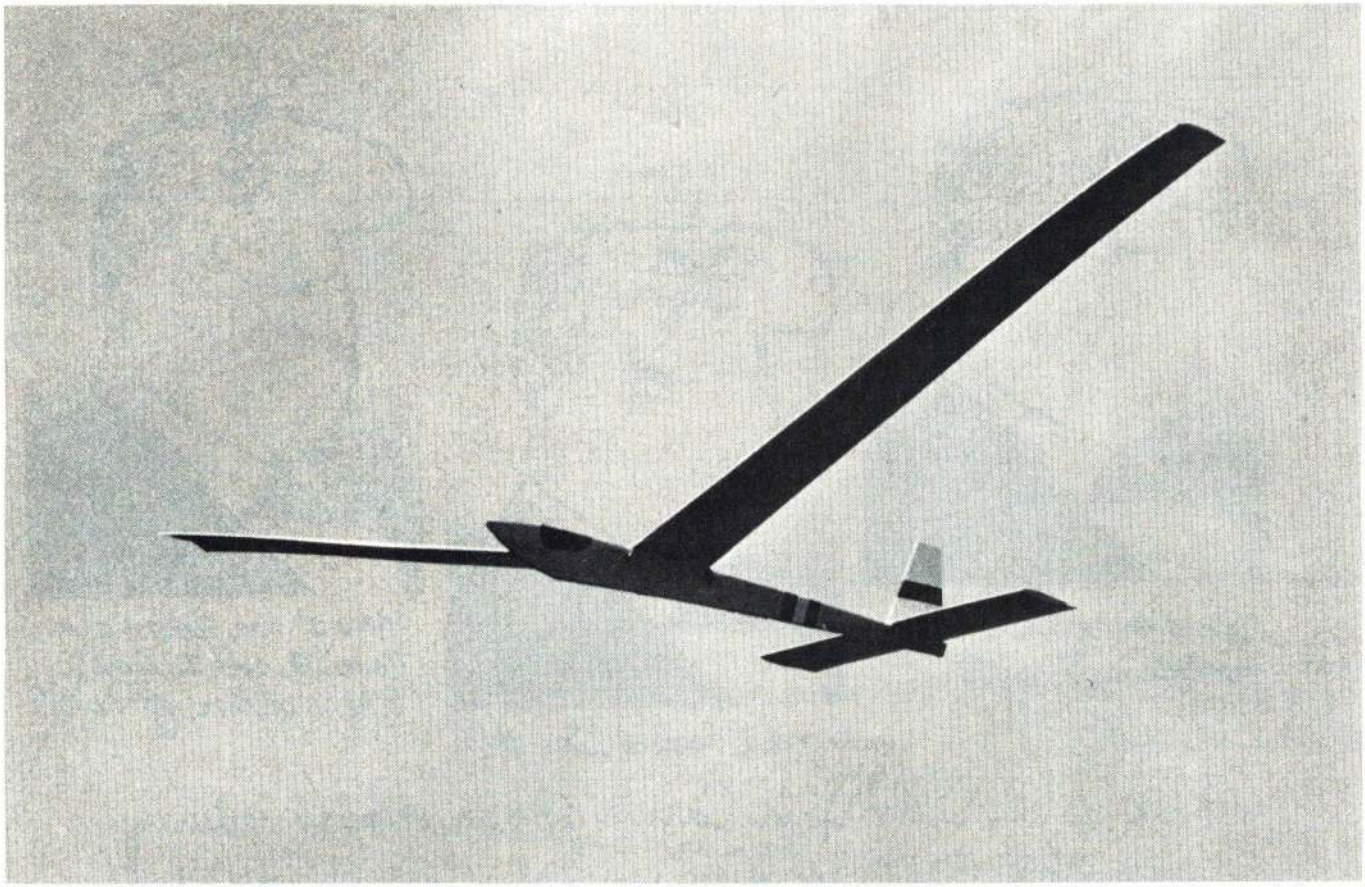
Now I use Silk-Spun Coverite and I smile like a blithering idiot!!!

First of all, Silk-Spun Coverite goes on with an ordinary iron. That takes care of the usual gluey mess. Second, it finishes like glass with only 2 coats of paint. Third, it's tougher than any other covering except our own original Super Coverite. Fourth, it's light enuf for every type of aircraft. Fifth, Silk-Spun is now available in 4 translucent colors. Sixth, it's packaged in the biggest "twice-as-much-for-the-money" size you ever saw. Seventh, if you haven't tried Silk-Spun because you think it's gimmicky, you're dead wrong. Champions like Walt Mooha, Josh Titus, Ernie Weiss, Ed Ellis, John Roth, Bryce Peterson and Harold Vanderver have won major contests with Coverite covered planes!

Coverite

Jenkintown, Pa.

Photos by the author



PART THREE

FOAM TECHNIQUES

No finishing needed on models made from thin sheet polystyrene foam. Build this glider in two hours.

MARTIN CARBONE

Models made from foam plastic are certainly not new. An article in the March 1963 *Popular Science* describes a 24" solid-foam power-driven plane in an article entitled "Fastest Way To Build a Model Plane."

Three-dimensional flying models made of sheet materials are not new either. An article in the September 1930 *Popular Science Monthly* tells about an 8-1/2" wingspan rubber-powered, rise-off-ground flying model completely made of writing paper.

Why is it then that we say Charisma is something really new in flying models? This is why: Charisma has a 72" wingspan. . .weighs just eight oz. (with a single-channel radio). . .is made almost completely of .090" thick polystyrene foam sheet. . .has a glide angle of approximately 19 to 1. . .a flying speed of ten mph and a sink rate of less than one ft./sec. It can be constructed from scratch in less than 90 minutes! The plane needs no finishing and is completely waterproof. As far as we know, the ribless double-curve wing construction used in Charisma is absolutely unique and has never before been tried. I'd be happy to hear from any readers who disagree on this. In any event, this double-curve construction is easy to build and results in wings which are amazingly straight. The flight characteristics seem to be extraordinary—resulting in slow speed and high lift.

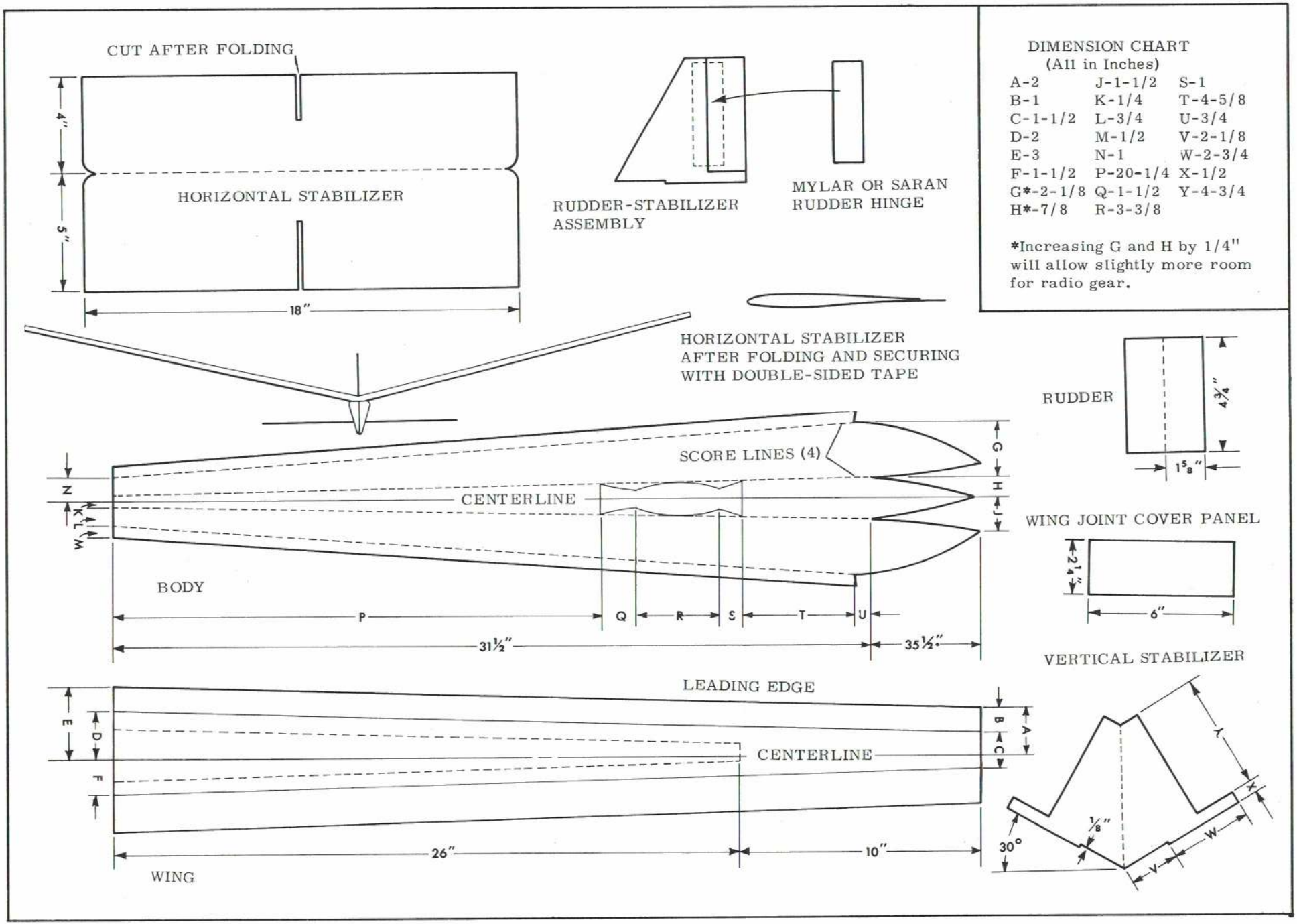
The ribless double-curve wing construction was comparatively tested against the standard wing being used on the Eldon Giant Styro-Glider (designed by the author). The planes shown in the photo were flown together a number of times in relatively still air from a 60-ft. towline. The standard wing resulted in flight time averaging 20 sec. while the double-curve wing averaged slightly over 38 sec. This can be viewed as an almost 100% improvement in performance.

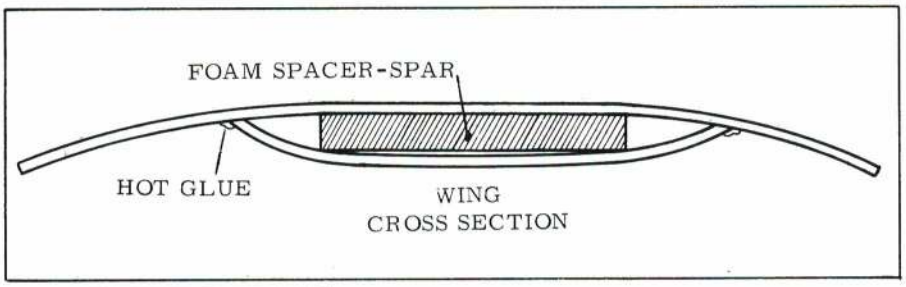
The specifications and design features listed above result in a plane that is extremely durable and one which can be flown under a wide variety of conditions. Because of the low flying speed, the light weight and the natural resiliency of foam, the plane seems quite able to absorb the energy of even the most violent crashes. Charisma can be flown with or without a single-channel radio unit. (We used an ACE rudder-only Baby). It may also be equipped with an auto-rudder and a dethermalizer.

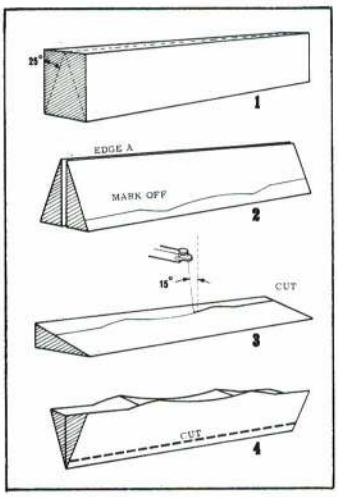
The low flying speed is a big plus for towline launching—even the oldest of us can jog along at ten mph for 20 or 30 yards. Charisma will go directly overhead on a towline with ease. Our test flying has been done exclusively off the cliff behind our factory which overlooks the Pacific Ocean. The steep cliff and the ocean breeze add up to virtually ideal conditions not unlike those enjoyed by the early glider pilots at Torrey Pines along the California coast. Day-long flights are often possible. The only problem is that the slow flying speed of the plane means that it flies backward if the winds get over 10 mph. Theoretically, we should be able to add ballast at the center of gravity to increase the flying speed and penetration on windy days.

Construction

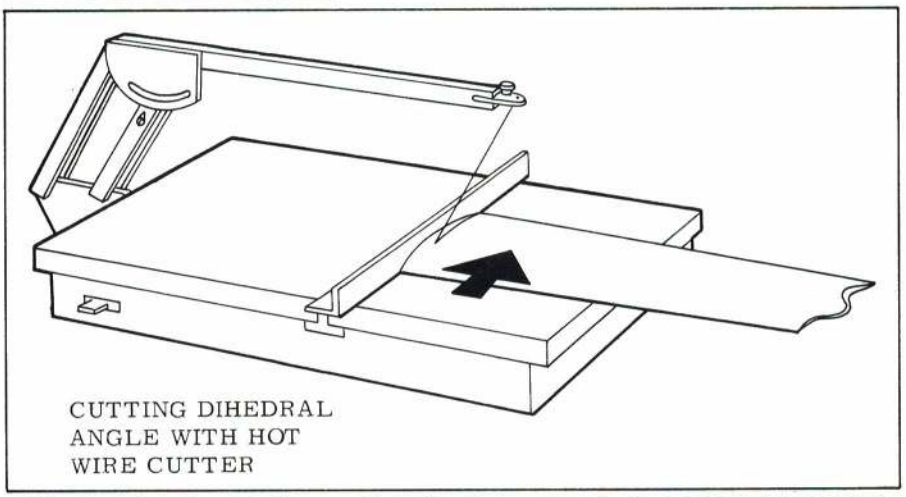
Draw the full-size pattern for the body and wing. Draw a light centerline on the foam and lay out all dimensions


CUT AFTER FOLDING
4"
5"
HORIZONTAL STABILIZER
18"
RUDDER-STABILIZER ASSEMBLY
MYLAR OR SARAN RUDDER HINGE
DIMENSION CHART
(All in Inches)
A-2 J-1-1/2 S-1
B-1 K-1/4 T-4-5/8
C-1-1/2 L-3/4 U-3/4
D-2 M-1/2 V-2-1/8
E-3 N-1 W-2-3/4
F-1-1/2 P-20-1/4 X-1/2
G*-2-1/8 Q-1-1/2 Y-4-3/4
H*-7/8 R-3-3/8
*Increasing G and H by 1/4" will allow slightly more room for radio gear.
HORIZONTAL STABILIZER AFTER FOLDING AND SECURING WITH DOUBLE-SIDED TAPE
RUDDER
4 3/4"
1 5/8"
SCORE LINES (4)
CENTERLINE
BODY
WING JOINT COVER PANEL
2 1/4"
6"
P
Q
R
S
T
U
31 1/2"
35 1/2"
VERTICAL STABILIZER
LEADING EDGE
CENTERLINE
26"
10"
WING
30°
1/8"

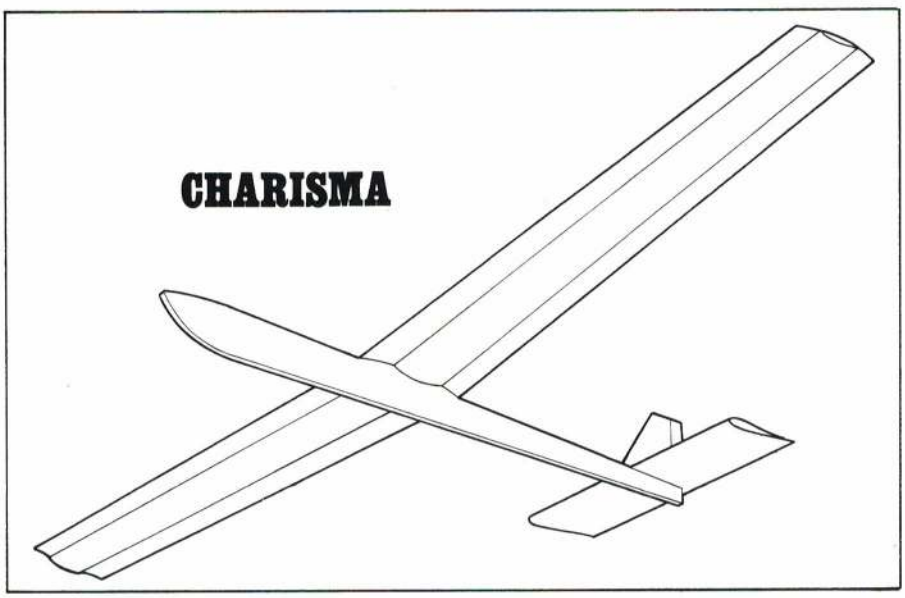




(1) Using hot wire cutter cut triangular section from 3 x 3 x 12" foam block. (2) Line up edge A of triangular section against bottom edge of body and mark off outline for wing platform section as shown (do this for both sides). (3) Cut along marked-off outline with wire set at angle of 15 degrees (for dihedral angle). (4) Glue halves back together as shown. This shapely foam block will be located in the folded-up fuselage.



Cutting the dihedral angle in the assembled wing. Note, same hot wire cutting tool used on wing platform shaping.



perpendicular to the centerline as indicated on the drawing. By using the centerline as a reference, all of the angles fall naturally into place and do not have to be specified or measured.

The body is a triangular construction, folded from one piece of sheet. Cut outline with scissors. Use craft knife to cut out area for wing platform using cross section of wing as a template. Score fold lines with smooth round edge of paper clip and fold with these lines inside, then flex fold lines gently in both directions to soften material before making final fold. If desired, put any kind of tape on unscored (outside) side along fold lines. This will strengthen corners and absolutely stop tears on the fold lines. Double over 1/2" wide stiffening edges and hold with double-sided tape. Fit body block to body and join together with hot glue gun, double-sided tape or epoxy. Close bottom seam with hot glue gun, epoxy or tape. Cut two 1/8" dia. dowels about 2-1/2" long, sharpen one end and push through side of completed body assembly just before and after wing platform area. Secure crossed rubber bands to these dowels to hold wing on and in place.

Cut out horizontal stabilizer, with scissors score and fold as in body construction. Join top and bottom with double-sided tape. Elevator is built in. Trim as desired.

Next, cut out the vertical stabilizer and rudder; score and fold as above. Use double-sided tape to secure, with a piece of mylar or Saran as the hinge. Glue complete tail assembly to body.

Use expanded polystyrene foam of one, two or three lb./cu. ft. density for the body block. Cut 3 x 3 x 12" block in 25° angles. Cut in half lengthwise from top to bottom. Cut in wing platform shape using cross-section of wing as a template, including 15° dihedral angle. Glue halves back together and join to body.

The wing is a ribless, double-curve construction. Cut outline with scissors. Note the foam has a natural curve in the span direction. You can arrange the parts to have this curve sweep up or down or you can have the tops one way and the bottom another which will tend to balance the curves and result in a straight wing. We're not sure which of these works best, so take your pick. Form curvature into wing tops and bottoms by drawing the wing over a table edge in the chord direction with the heels and palms of both hands. Check for symmetry of the curve by placing the pieces on a flat table with the convex side up. The edge of the pieces should touch the table along the entire edge. Glue foam spacer spars in place. Glue top piece to bottom piece—a hot glue gun works well here. Cut 15° dihedral angle. Glue wings together, then glue on joint covering panel. The foam spacer-spar may be made from expanded polystyrene bead foam, styrofoam, or any lightweight expanded polystyrene.

Two relatively new tools were used in the construction of Charisma. The

(Continued on page 104)

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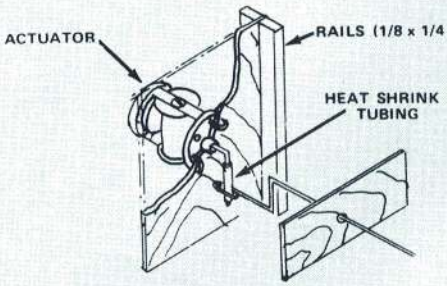
THE SIMPLE SYSTEM--



pulse commander

--WITH Nicads and Charger
--From 2.5 to 4.8 oz.

RUDDER-ONLY PULSE IS:

* **LIGHTEST WEIGHT--2.5 oz. for Baby.**

* **LOWEST COST--WITH airborne nicad batteries and charger--begin at $69.95!**

* **SIMPLEST--only one moving part, easily serviced and maintained; noise free.**

* **VERSATILE--Arrange to suit your particular installation. You can go up or down in size without obsoleting receiver or transmitter. Simple changes of battery pack and actuator allow change. Or add Motor Control to Standard or Stomper--using same battery pack.**

* **FULLY PROPORTIONAL**

* **GREAT for Beginners--FUN for Experts.**

PULSE COMMANDER R-O SYSTEMS

Completely wired, tested and guaranteed with airborne battery pack and charger, but less transmitter battery.

10G15—Baby System	$69.95
10G15T—Baby Twin System	$72.95
10G16—Standard System	$71.95
10G17—Stomper System	$74.95

26.995, 27.045, 27.095, 27.145, 27.195

Please Specify Frequency

Flite Pak Weights & Recommendations

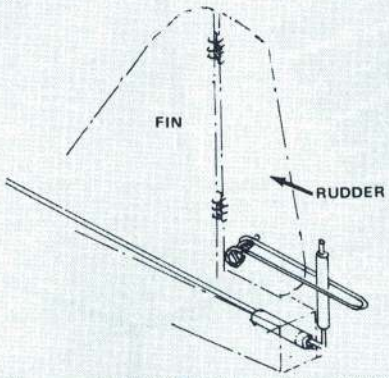
Unit	Weight	Recommended
Baby	2.5 oz.	Pee Wee .020 Up to 48" gliders
Baby Twin	2.7 oz.	Tee Dee .010-.020 Up to 72" gliders
Standard	4.4 oz.	.049 to .10
Stomper	4.8 oz.	Tee Dee .049-.23

R-O PULSE HANDBOOK WITH UPDATED CATALOG
Only $1.00
Refundable First Order

Handbook has expanded data on How Pulse Works, Installation, How to Fly - and much more. Most complete information on Pulse Rudder Only available anywhere.

New catalog is completely updated. Includes many items from major manufacturers.

Price is $1.00 via THIRD CLASS BULK MAIL. If you wish faster delivery, add 50¢ for turn around FIRST CLASS service.



New small PRACTICAL flying machines. These designs really fly--and fly well; not in the novelty class. Easy to build, low in cost, inexpensive to fly. For use in limited areas.

DICK'S DREAM KIT
Highly Recommended for Beginners

† 34" Foam Wing sections. † Top grade die-cut wood parts. † For .020 engines. † Commander Baby or Baby Twin. *Owen Kampen design.

13L100—Dick's Dream Kit $6.95

ACE HIGH GLIDER KIT

† 70" Foam Wing sections. † Precision machine cut and sanded wood. † For .049--Power Pod parts supplied. † Recommended for Rudder-Only--Standard or Stomper. *Owen Kampen design.

13L104—Ace High Glider Kit $14.95

Watch for New Rudder-Only Plane Kits

TRY YOUR DEALER FIRST—if he does not have it, order direct using coupon for fast and courteous service.

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QUANTITY	STOCK #	NAME OF ITEM	PRICE	TOTAL

Master Charge or Bank Americard No.

Add $1.00 shipping-handling for direct mailorders except catalog

MEDALLION 12 VOLT 1 AMP CHARGER

This unit is just it for charging your 12 volt all purpose battery. While designed for car use, its use for modelling is great--will not overcharge. Price is very low considering the high quality. Large alligator clips on battery leads. Newly manufactured--not surplus. Not recommended for charging starting batteries or any other transmitter or receiver batteries.

34K13—Medallion 12 V 1 amp Charger $6.95

Also available in the charger line are our Vari Chargers designed primarily for flite paks (also may be used for transmitter paks), our Dual Vari Charger, designed for low rate and also heavy duty charging, such as starting batteries, and our H-D Charger, designed for heavy duty applications, such as starting batteries. See our latest catalog for further information and prices.

APOLLO GLIDER
"Adjust-tow" Hook

Here is the neatest little gadget that we've seen in a long time. Features instant adjustability for gliders from 2 pounds up. Has keeper to hold the positionable plastic hook. Keeper slides out of the way so you can make instant "on-the-spot" adjustments on the field.

36L335—Apollo Adjust-tow Hook, ea. $1.75

NICKEL CAD STARTING BATTERY

We have located a sizable supply of surplus 7 ampere hour nickel cadmium starting batteries. These are in good condition. Convenient small pocket size, 3/4" x 2 5/8" x 4 1/2" overall. Are 1.25 volts.

To put into operation charge at 500-700 milliamps for 12 to 16 hours before use. Also recharge at this same rate.

May be used with any glo plug type connector for engine starting.

No. 38K7—Surplus 7 ampere hour wet Nickel Cad Battery $3.95

LYNAR TOTE-BOX KIT

Easy 15 minute assembly. Handy size--8" by 12". Very strong plywood material. Dividing material included with all box parts precut. Smooth finish easily obtainable. A surprisingly good value considering the price.

13L18—Lynar Tote-Box Kit $2.98

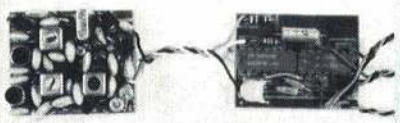
ALL STAR BIPLANE KIT
For Up to .15 Engines--2 or 3 Channels

By Roman Bukolt. Uses two sets of Ace Taper Foam wings for ease of construction.

13L200—All Star Deluxe Biplane Kit $21.95

digital commander KIT

* Two channel system using IC's and latest state of the art; may be expanded to 4-6-8 channels.
* Receiver-Decoder (2) will work with most modern 4-6-8 channel digital transmitters on same frequency! Reads aileron and elevator signals--ignores the rest.
* Receiver-Decoder (2) works modern digital servos.
* Receiver-Decoder (2) offer inexpensive way to go with your present system for glider, plane, boat or car: use with extra servos you already have. Or use our combo flite pak: receiver-decoder, two servos, etc.
* Available on the following frequencies: 27.995, 27.045, 27.095, 27.145, 27.195 53.100, 53.200, 53.300, 53.400, 53.500



digital commander RECEIVER DECODER (2) KIT

IC's simplify wiring and set up of 2 channel decoder. Receiver is exceptional double tuned front end using discrete components. Complete with detailed step by step instructions.

No. 12G20—Digital Commander Receiver-Decoder Kit (2) $27.95
(Less case, connectors, switch)

Please Specify Frequency

No. 19L50—Deans gold plated 4 pin connector set .95
(NOTE: See D & R connectors elsewhere)
No. 40L252—CW DPDT Slide Switch .59
No. 30L21—Switch Guard for above .39
No. 21K30—Formed plastic Case for Receiver-Decoder. (All models) 2.00

digital commander SERVO KIT

Housed in the D & R Bantam DS3P mechanics, uses WE 3141 IC for ease in assembly. Kit contains motor, pot, wiper and all components required, with step-by-step manual.

No. 14G20—Digital Commander Servo Kit $19.95
No. 14G20L—As above, except with D & R DS2P Linear Mechanics (Less connectors) $20.95

digital commander FLITE PAK KIT COMBO (2)

If you intend to use Commander Digital (2) with your multi digital transmitter, all you need are the receiver-decoder and 2 servo kits. Combo offers savings over kits purchased individually. Includes 3 connectors, switch, hookup wire for cabling. Everything you need to make complete 2 channel-2 servo pack for your sailplane, boat or car, except batteries.

No. 12G30—(2) Flight Pak Combo $59.95
No. 12G30L—As above, but with D & R DS2P Linear Mechanics $61.95

Please Specify Frequency

PIGGY BACK 4 CHANNEL KIT

If you've been successfully using your Ace Digital Commander 2 channel receiver-decoder combination, you can inexpensively convert this to 4 channel operation for use with your 4 channel digital transmitter.

The conversion consists simply of adding another IC, and "piggy backing" it on top of the present IC 2 channel unit.

By slight readjustment of the packing, this will fit into the present Ace case (metal or plastic). When you consider that our 2 channel receiver-decoder kit is $27.95, and the additional components and instructions required for converting it to 4 channel are only $3.25, you can see that you have quite an effective saving.

Our piggy back contains the additional IC, complete instructions, and extra hook-up wire. No connectors are furnished. You have the option of going to additional Deans 4 pin units, or going to the D & R Block type.

We recommend the Ace Digital Commander Servo because of high resolution, fast response, low current drain, and light weight. Kits are available as listed elsewhere.

No. 12K22—Digital Commander Piggy Back 4 Channel Conversion Kit $3.25

digital commander 4-6-8 CONVERSION KIT

You have been asking for this--a kit to let you convert your Digital Commander receiver and 2 channel decoder or 2 channel Flite Pak to more channels. Here it is!

The 4-6-8 Decoder requires a new PC board, new IC and some additional components. Simple to wire. An 8 bit chip is used (Cost is a bit more than a 4) but you are not limited to just a 4 channel expansion. You can go up to 8, if your transmitter will!

Use your Digital Commander Flite Pak for 1, 2, 3, 4, 5, 6, 7 or 8 channels--depending on your transmitter. Unused signals are simply ignored.

Kit consists of basic components. New IC, PC board, all other required electronic components with complete instructions. No connectors supplied.

No. 12G8—4-6-8 Channel Conversion Kit $12.95

DIGITAL SERVICE CENTERS

In addition to our service center located at the factory at Higginsville, Mo., two independent service centers have been established. One is on the East Coast, and is designed for customers living in the eastern half of the United States; the other on the West Coast is designed for customers in the western portion. Central states still will be serviced from the factory. This will expedite service, and return to you, and should eliminate as much down time as possible. We recommend either of these service centers very highly.

They are as follows:

Ace Service Center EAST
Electronic Model Systems
103 Bannister Drive
Hampton, Virginia 23366

Ace Service Center WEST
Hillcrest Hobby Craft
3921 Fifth Avenue
San Diego, California 92103

TRY YOUR DEALER FIRST—if he does not have it, order direct using coupon for fast and courteous service.

ACE R/C INC.
HIGGINSVILLE, MO. 64037

Dear Friend:

The ME-109E above is another of the "sort of scale" Warbirds designed by Roman Bukolt. We showed you one last month. The Warbirds will definitely be an Ace kit to be released early 1973. Our kit will let you make any one of three types--plans will give you full size drawings where you have the options for the different tail assemblies. You have your choice of the above ME, Hurricane Mk II or P-51B. There will be several unique wrinkles in the kit so you can make plane of your choice with a minimum of cutting. The balance, and most difficult parts of the kit, will be precision band sawed and sanded.

They use foam wings for easy wing construction--several unique features, here, too. Designed for .049 to .09, they may be used for Pulse Commander Rudder-Only or for Digital Commander 2 channel flying. Add up to a lot of fun!

Pre-production models were shown at the Hobby Fair in Oklahoma City--and the reception was on the terrific side. Big question was "When?" We'll show the production jobs at Toledo in February and have details as to price and deliveries. We'll also have announcements in our ads and newsletter.

Photo above shows some of Ted Strader's new designs. These feature "Hollow-Foam" construction. You'll be hearing more about this technique and the planes in the future. Ted's son is shown with several planes that are planned for market in 1973. Again, keep watching our ads and newsletters for release date information.

We've got a new Piggy Back 4 channel conversion for our Digital Commander 2 Channel. Lets you go to 4 channel on receiver-decoder or flight pack for a basic minimum price of only $3.25. To this you need to add connectors and servos, but even with this--it's a great and inexpensive way to go. See ad copy.

Keep 'em flying.

Yours sincerely,

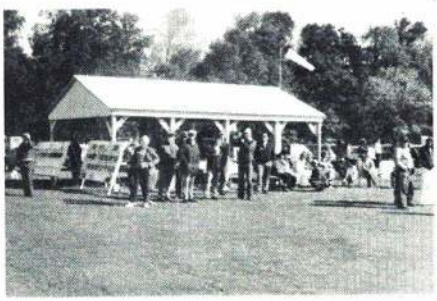
Paul F. Runge

Where the Action is

Radio Control

DON LOWE
SPORT AND PATTERN

The Toledo Affair: By October the contest season for this neck of the woods had come to a screeching halt after a breakneck pace all summer. It was a most enjoyable contest season for me since I've taken in more events this year than ever before. One of the most enjoyable was an almost impromptu affair arranged by the Toledo Weak Signals Club. These are the same guys that put on the world famous Toledo RC Conference. This was their first RC contest in my memory and it gave us an opportunity to see their new flying site. They purchased a 30-acre field last year which they have improved by adding a 80 x 200 ft. blacktop runway surrounded by smooth grass, plus a picnic shelter, gravel parking and drive, and other accessories—very nice. It was paid for out of hard-earned profits from many years of running the Toledo RC Conference. It is truly one of the nicest club flying sites in the country.



We go to Toledo each year for a trade show, but we miss the Toledo Club's magnificent flying site, picnic shelter, smooth runways, nifty transmitter board.

The contest itself was different. Freestyle events, Classes A, B and C were derived by each contestant selecting and organizing a given number of maneuvers from a large list of standard maneuvers out of present and past AMA and FAI patterns. Class A selected 6, Class B, 9 and Class C picked 12 maneuvers. Each contestant picked a different combination and made things more interesting for flier and spectator alike. Al Dupler picked the toughest combination with maneuvers woven into the turnarounds to make a continuous pattern such as the "Kraft" pattern. I feel that the "continuous" pattern has a lot of merit for the top Pattern class and merits serious consideration for the future. The Toledo affair was topped by every entrant enjoying a free steak dinner paid for out of his nominal entry fee. In addition, every contestant received a trophy—now, how about that!?

The Masters Tournament, Huntsville, Ala.: The Masters Tournament in September, held at Huntsville's beautiful flying site was, of course, the peak Pattern competitive event of the year. It was there that the three-man team was picked for the World Championship 1973 competition in Italy. Thirty-two of the top fliers in the country, selected by virtue of NATS placing and points accumulation during the year, met to do or die. Flying conditions were excellent, producing outstanding flying and creating a tough job for the judges. Most contestants had worked hard to get there, flying in contests over the year and practicing. Some fliers even arrived a week early and flew from dawn until dusk to sharpen up. We understand that Doc Brooke burned 14 gallons of fuel in this final tuneup! Now that's dedication!

Flying went off very smoothly with six flights being every flier's due. During the two days of formal competition there was not one crash or any evidence of serious radio problems; a testimony to the skill of the fliers and quality of equipment. There were some minor difficulties, particularly with engines which appear to be the weak link in RC competition. For the most part the aircraft were the same as used by contestants all year. This seems to be one of the keys to top flight competition, i.e., the modeler who keeps one airplane together all year and flies nothing else is going to fare pretty well. Most of the fliers were flying ships that had accumulated hundreds of flights. There were exceptions, of course, such as Jim Whitley and Jim Kirkland who both had new ships because of bashes at the NATS.

Norm Page started out strong and finished very strong with beautiful consistent flying and truly earned the number one spot. I've been competing against Norm for several years now and have seen him mature into a consistent, tough competitor. He should do well in the World Championships. The other top spots eventually nailed down by Jim Martin (second) and Jim Whitley (third) were not secured until the final two rounds. Up until then Ron Chidgey, this year's NATS champ, and Steve Ellison were making a strong bid for the team. Jim Martin came through in spectacular fashion in rounds five and six. He improved his score in round five by 1000 points over round four and by almost that much in round six, to jump into second position. Jim Whitley, similarly, came on strong in the end to squeeze out Ron Chidgey to fourth position. Young Steve Ellison did an outstandingly consistent job of flying, and would also have made the top three except for the very strong finish by Martin and Whitley. So, it ended with Page, Martin and Whitley constituting the team. Chidgey and Ellison are first and second alternates.

The Pattern of Success: So you want to be a top-notch competition pattern flier? The road to success is paved with a lot of work and concentration these days. Today's top-level flying has reached a level of perfection undreamed of several years ago. Requisites for competitive status are approaching Olympic proportions. Most top-level fliers practice several times a week and fly complete pattern flights one after another. It is also best to stick with the same airplane and learn it intimately. Sometimes this takes a hundred flights or more. Practice must encompass all kinds of flying conditions with maneuvers being flown crosswind as often as possible. The aircraft itself must unfortunately be fast to accommodate medium to high wind conditions which are almost always encountered at contests. This latter requirement is easily discerned by noting that the higher the aircraft speed, the higher the aircraft-wind differential velocity and the resultant reduced influence on the aircraft's flight track. A typical aircraft may be gleaned from the 1972 NATS finals and the Masters events: High-low wing configuration; a strong engine (some using up to 28% nitro!); retract landing gear for higher flight speed and *impression;* around 650 to 700 sq. in. of wing area; around 7½ lb. empty weight; very tight and smooth control system; particularly important for the high flight speeds.

O.K., so this is what we have in competition and machines—how do we improve? How about flaps? This has been tried by some but not too seriously for competition. It sure would help, however, to be able to slow the sleek beast down, steepen the approach angle and thereby increase the probability of hitting the spot. How about eliminating the torque effect? Torque from the engine requires a compromise airplane trim condition which varies in effect on flight track as a function of speed. How about contra-rotating props? It's been tried but not too seriously or successfully. A good, simple gear box should be no sweat for a capable machinist. How about adding impression points by a smoke generator? All full-scale aerobatic pilots use one—why not models? I tried one a couple of years back but I couldn't find a material that really smoked at the exhaust temperatures available. Let's hypothesize the Super '73 pattern ship: A high-low wing of 700 sq. in.; a strong en-

Sally and Dave Brown were at the Masters where he flew a Phoenix 5.

Jim Whitley helps young Steve Ellison fire up the "Tiger Tail."

Doc Edwards fix'em. Guess who is napping at the Masters? When you race fast, you gotta slow down and rest, right? Those dentists!

Midwest contingent at the Masters—Dave Brown, Mike Meuller, Norm Page, Jim Grier, Bill Richards, Jerry Worth, Al Dupler, and Don Lowe (l to r).

gine turning control-rotating props; wing flaps to lower landing speed and steepen the glide angle; super smoker that we can turn on and off with the last little bit of throttle travel; retractable landing gear, of course! When you get this one built, let me know how it flies!

C[illegible] MARONEY
G[illegible]ERS AND FAI

M[illegible]Henon Tops LSF Tournament: The 1972 [illegible]oaring Tournament, claimed as Amer[illegible]iggest and the world's most challenging [illegible]hermal Soaring Competition, was tri[illegible]d for two days by Barbara Henon from [illegible]c Palisades, California. Competing ag[illegible]t 100 seasoned contestants, Barbara [illegible]ner "Cumulus 2800" to final victory in t[illegible]st round of the eight-min. precision time [illegible]with an almost dead center landing at s[illegible] min. 43 sec. Throughout the tourna[illegible] Barbara demonstrated her expertise by ta[illegible]g the lead in the Duration Task with 29[illegible] points out of a possible 3000, and gain[illegible]igh scores in other tasks which contri[illegible]d to her overall win.

This year's tournament was produced by the San Fernando Valley Silent Flyers and was held on August 26 and 27, 1972 at Fountain Valley, California. The top glider commanding the most wins out of the first three places in the four categories of Precision, Duration, Speed and Scale was Soarcraft's "Kestrel" taking three out of 12 places and Mark's Models "Windfee" vs. Richard Walter's "White Trash" design, both taking two places. Other winners were Randal Holzapple, flying his "Cirruzapple" in the Precision task, Richard Walters piloting his "White Trash" in the Speed task, who by the way, was just 14 points off of a perfect score and Stan Powell captured the Scale event with his beautiful Hegi ASW-15.

The Tournament Committee this year commissioned sculptor George Popa to create a series of trophies especially for the Tournament. Mr. Popa's creative genius provided silver wire replicas of famous sailplanes, mounted by a single wire to a mahogany base. Each contestant was presented with a commemorative jacket patch with "'72 LSF Tournament" embroidered in red and blue over a white triangular field.

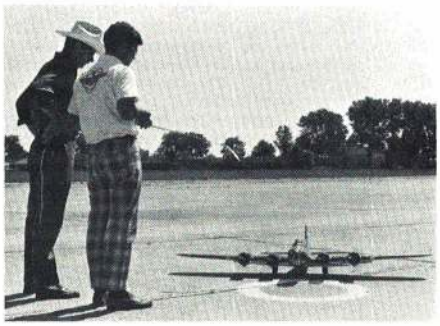
Contestants were evenly matched with launching devices as the sponsoring club provided six identical winches which were designed and fabricated by W. C. Whitney. Realizing last year's mass of entries the Tournament implemented Frequency Availability Registration (FAR). The 17 available frequencies were limited to eight entries each. The club trophy was claimed by the South Bay Soaring Society of the Santa Clara Valley, California, and consisted of pilots Rick Walters, Paul Christian and Stu Horton. Through the courtesy of Col. Dean Wilker, Commanding Officer, Marine Corps Air Station (Helicopter) and through the cooperation of Capt. Jan T. Sakert, Liaison Officer, the famous Mile Square Station was the setting of this year's site. Officiating was Tournament Director, Lee Gray (current president of LSF); Tournament Manager, Jack Seeley; Flightmaster, Perry Neuschatz; Scoremaster, Jim Hale; Winchmaster, Don Powell; Fieldmaster, Dick Shilling; Registrar, Jeanne Seeley; Security, Orville Schertz and Services, Cliff Benjamin.

The League of Silent Flight is a worldwide organization of RC Soaring enthusiasts. Membership in the League is open to any serious sportsman. Information about the LSF may be obtained by addressing queries—with 16 cents return postage included—to the League of Silent Flight, P.O. Box 2606, Mission Station, Santa Clara, Calif. 95051.

AAM's First: Unbelievable as it may seem, the 1972 Soaring Nats Contest Director, Dan Pruss is this magazine's only CD who ever took the time to send a thank you letter for **American Aircraft Modeler's** participating sponsorship of a contest. Future RC Soaring Nationals can be assured of **AAM's** continued support.

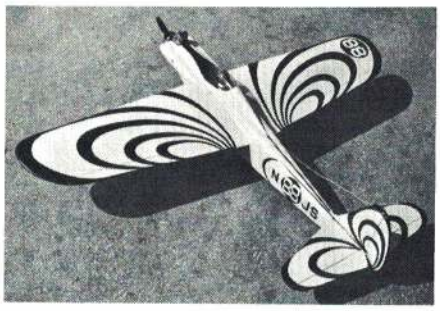
CLAUDE McCULLOUGH
SCALE

Easy on the Flat: Time was when too many scale models that should have been matte finished were painted glossy from lack of a suitable finish material. Now a wide variety of products—flattening agents for dope, military flat colors, matte hardeners for epoxy paint, polyurethane flat varnish, etc.—are available to the builder. So the pendulum has swung to the other extreme and the matter of flatness is often overdone. Overuse of flattener can actually change the color of dope. Too flat a paint job on a model has an unnatural appearance. This is particularly true in the case of WW I subjects, since most of the original finishes used on them bordered on the semi-gloss. But even brand-new WW II paints do not look as dull or as coarse grained as it is possible to mix. WW II jobs soon weather eroded to a slight sheen. In specific instances they were even deliberately made glossy to cut skin drag and increase speed. In his book *Thunderbolt*, U.S. ace Bob Johnson relates how he and his ground crew sandpapered, waxed and buffed his olive drab P-47 until "it gleamed like a new car." Nor are all camouflage jobs even planned to be flat. In the immediate post-war period, such airplanes as the Tempest, Sea Fury, Mosquito, Firebrand, Spitfire, Barracuda, Seafire and Firefly were given a high-gloss camouflage pattern described by an observer of the time as "magnificent mirror finishes." So if you want to start a good discussion at a scale contest, show up with one of these polished jewels. The moral of this story is to spend some time looking closely at photos of your subject and evaluating the particular glow or lack of it coming from the surface of the aircraft. The right finish texture is the most necessary requirement for that realistic look.



Tom Cook parks the fine flying B-17G Fortress in the "hangar" after a Nats official flight.

Goldberg Shoestring is colored like a real Shoestring racer. Bill Parker did it in MonoKote.



Stable Seams: When it is necessary to glue blocks of wood together to make a large canopy pattern for stretch or vacuum molding, the seams have a nasty tendency to bulge under the hot plastic and leave a mark. 1972 U.S. Scale Team member Ralph Burstine says this problem can be minimized by gluing them together with the same fiberglass resin used in filling and finishing the block. The heat can also raise the wood grain through the resin film if it is too thin, so build up a reasonably thick skin with three or four coats of resin, sanding smooth after each application.

Gold That Glitters: Art supply stores have bronze powders in a variety of shades that can be used to mix a gold dope to perfectly match your prototype's color scheme. Only a small amount of powder in clear dope is necessary for good coverage. Straining through fine silk is advised to get out lumps or specks. To get a good, even, unmarked job it is essential to spray on either gold or silver. A top coat of clear should always be applied since both will corrode or tarnish in time if left exposed.

Hand Me a Bigger Hammer: Best method of application for the instrument rivets, small brads and pin heads that are becoming more popular for detailing is to mark out the pattern with a pin point, making a hole in the skin smaller than the rivet shank diameter. Using a fine pointed pair of needle nose pliers, push rivet into the guide hole and into the wood. When we first started doing this, the rivet end was dipped in aliphatic resin glue or epoxy before inserting which really does keep them in place. However, it was tedious and time consuming and continual cleanup of the residue squeezed out around the heads was necessary. Pressure to speed up the job led to the seemingly desperate measure of not gluing them in but just pushing into the wood, relying on two coats of color dope and two coats of clear to stick them down. Now, after a number of flights, this seems more than adequate, and not a single rivet has come out. While the dope does not actually stick to the metal rivet very well, it does form a small skin-of-dope cap over each one and you must actually cut around the head to remove the rivet. More than four coats of dope will start to lose the rivet edge so fillercoat and prime the surface with white dope before applying the rivets.

Super Scheme: Bill Parker's hornet-winged Shoestring proves that difficult scale color markings can be done with Super MonoKote on top of Super MonoKote. From reference to photos of the prototype aircraft, the black patterns were sketched on the plan of the model, then traced onto cardboard and cut out. The cardboard outline was used as a template to cut the black Super MonoKote with a sharp X-acto knife. The design is tacked onto the model around the edges before ironing it on the rest of the way. Bill thinks it makes for a better decoration job than the usually recommended application of Regular on top of Super.

BOB STOCKWELL
PYLON

1972 Recap: Though as I write this the 1972 racing season is not over, this issue of the magazine will appear in the middle of the winter and a few comments about the season just past and the season coming up are perhaps in order.

1972 was the year of the K&B Schnuerle's incredible success. New records were made at virtually every contest where it was entered, and it seemed to get better as the season went on, with the 1:24.6 posted by Bob Smith and also by Kent Nogy at the Western States Pylon Championships being the record as of mid-October. It was the year of considerable unhappiness and dissent among those who did not get one of the 102 minimum-production engines, with the end of the season filled with proposals about "claiming races," about setting up different classes of events that would separate the "experts" from the "standard" fliers, about slowing down Formula I with big propellers and mufflers. As of this time, I haven't the foggiest idea what will happen to all these proposals—very little, I suspect. But 1972 was also the year of the rebirth of the NMPRA, and it is very likely that 1973 will be an even better year, with incoming officers who are as energetic and competent as the outgoing ones. I don't think they'll let Formula I go the way of certain Control Line Speed events. It may take a little time and experimentation to determine what the best

A family affair, Garry and Mrs. Korpi fix something on his FAI racing machine.

Jeff Bertken was third at the Internats. He finished every heat but won only a few.

controls are, but *some* controls are needed to keep the event within the means and capacities of the average RC flier.

1972 was also the year of some disappointments. The RAF engine was one of them. For a lot of guys at the beginning of the season, it was the best hope of getting an engine that would run against the K&B. The hope never materialized, and there's still a lot of money tied up in development. Maybe 1973 will be the RAF year. Or maybe Supertigre will produce a Schnuerle-ported engine to run against the K&B. The production K&B Schnuerle will be out early in the 1973 season, available in quantity. I will be much surprised if almost everyone is not running it. The best Supertigres will stay with it for rpm but not for torque, and the very best times posted by the best Tigre fliers—Violett, Prather, Wagner, Owens, Rankin, and Stockwell (through the middle of the season)—were off the K&B pace by at least five seconds.

But engines are still not everything. With the extraordinary exception of Kent Nogy, who matched Bob Smith's time at the end of the season, no one flies quite as tight as Smith does, nor as consistently. Larry Leonard comes close, as do some others, but Smith is really in a class by himself. In fact, if there were anyone else flying the same course so consistently, we would see a good many mid-air collisions. The Miss DARA he flies, designed by his brother Chuck, proved itself an extraordinarily good airplane during the 1972 season, and I reckon I have to eat my early-season comments about its pot belly. I still think balsa ought to fly better, providing a more solid engine mount, but the evidence provided by the epoxy fiberglass fuselage of the Smith DARA sure makes my position look weak.

What does 1973 hold for us? Perhaps some new engines, certainly an adequate quantity of the production K&B Schnuerle, hopefully a lot of new blood coming into racing, hopefully a continuation of the streamlining of contest administration with excellent new flying sites like the Oklahoma City one. RC pylon racing is a beautiful, exciting, and rewarding sport: It takes dedication, energy, time, and perseverance of a high order to succeed in it, and I believe it's worth all that it costs.

Korpi's still smiling after loss of his plane at a Tracy, California meet.

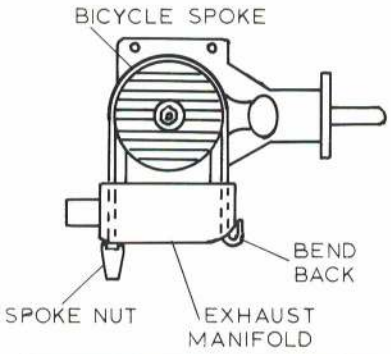
Control Line

BILL BOSS
SPORT AND SCALE

Muffler Hold-Down: Are you having trouble keeping that muffler on your engine because of mounting bolts coming loose? Will Harris, Sr. tells of having this problem with a Tatone muffler on an ST35 engine. With a little thought and ingenuity, Will came up with the following solution.

Use a bicycle wheel spoke for a clamp. The first step is to drill the tapped mounting holes out and through the body of the muffler. The drill should be of sufficient size to provide clearance holes for the bicycle spoke.

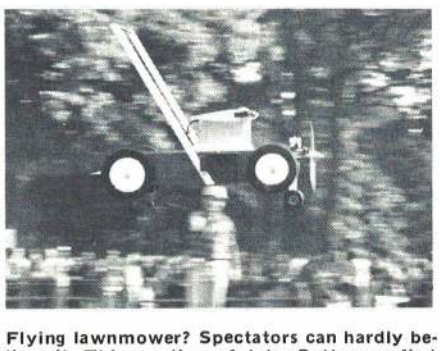
After the holes are drilled, hold the muffler in place on the engine. Pass the threaded end of the spoke through the muffler allowing enough of the thread to stick out of the muffler for the spoke nut. Bend the spoke to the shape of the engine cylinder. You now have a U-shape that can be passed through both holes in the muffler. Allowing enough stock, cut off the excess and bend the unthreaded end of the spoke so it can't be pulled through



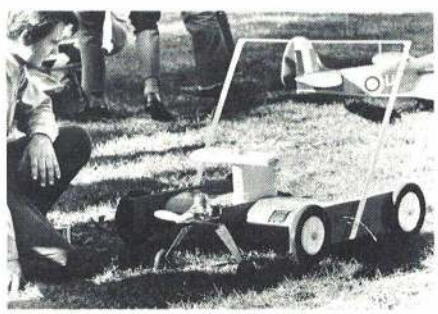
MUFFLER HOLD-DOWN

the muffler. Add a star type locking washer to the threaded end, put on a spoke nut and tighten, and the muffler is permanently in place.

While on the topic of mufflers, another problem sometimes encountered is the leaking of engine residues from the seal between the muffler and the engine. The residues run down the engine and into the engine compartment requiring removal of the engine for a proper cleaning job. The seal between the engine and muffler can be improved considerably by applying a small bead of Silicone (GE or Devcon) to the parting surfaces of the engine exhaust stack and muffler before assembly. Paul Zinc, originator of this teck tip, indicates that this is a good way to "Keep the engine out of the engine compartment."



Flying lawnmower? Spectators can hardly believe it. This creation of John Potts won first place in Novelty event at Garden State Circle Burners meet.



New Club Fun Event: While reviewing the many newsletters that come across the desk, I have found that almost all organizations are talking about some form of Scale type racing events using 049 to 015 engines. The intent of these events appears to be a move away from the development of very expensive racing engines and planes with a great emphasis on the use of *stock* equipment and fuels. All of which is being done to give themselves a relatively inexpensive competitive event.

A recent copy of the Sky Rebel's Yell Newsletter (Marietta, Georgia) ran an outline of one of these new racing events popping up all over the country.

Event Rules: *Unlimited Racing.* Engine: *Stock* Cox .049 "Babe Bee" (No changes allowed). Lines: Dacron 28 ft. Fuel: *Stock* "Out of the can." Airplane: Profile scale of

any aircraft which participated in an Unlimited Racing Event since WW II. Size of plane is to be 1/2" = 1', finish should be representative of the racing aircraft finish and markings, but not necessarily scale. Racing numbers on the wing and vertical tail or fuselage are encouraged. The only types of modifications allowed in the shape of the model are those actually used on the full-scale racing aircraft, such as clipped wings and small bubble canopies as used on Bearcats and Mustangs. Examples of the type of aircraft that can be used in this event are: Bearcat F8F, Mustang P-51, Aircobra P-39, King Cobra P-63, Sea Fury, Corsair F4U, F2G, and any others that actually participated in the Post WW II Unlimited Racing.

Sounds like a great event for club or inter-club competition. The article on this event did not spell out any particular number of laps to be flown—you can decide that for yourself should you try this new event. While the use of dacron lines is suggested, I believe it would be in the best interest of all if AMA rules on line sizes for 1/2A engines were followed. Winners are determined by good pit crew action and the fliers' skill, and not the brute force of a well hopped-up engine.

John Glab, Senior Nats Scale winner, checks over his 60-powered SE5-A before winning flight.

Nats CL Scale Winners: During the coming months I will (space permitting) feature one of the '72 Nats CL Scale winners. This will be an effort to show Scale buffs who could not be at the Nats some of the planes and those who flew them.

To start off this feature I would like to introduce the Senior Class winner John Glab (Chicago, Ill.). John flew an SE5-A made from a Top Flite kit, weighed in at about eight lb. and was powered by a Supertigre 60 swinging a 12-6 prop. The plane was covered with Coverite and finished in a dull brown Sig paint. The plane flew very well and was stable at full throttle as well as low engine rpms for landing. Throttle control was the only operational feature on John's plane.

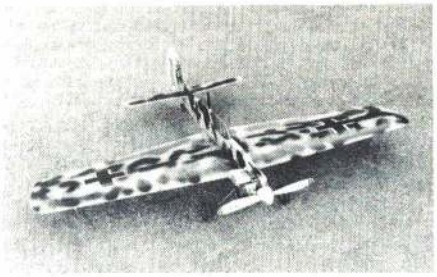
JOHN BLUM

CARRIER AND STUNT

The Throttle System: Picking up from last month, the advantage of the three-line system over any other is the ability to adjust the throttle setting from the handle. If the flying model starts to load up when approaching slow-speed, a few "burps" to open throttle and the engine cleans out the excess fuel. This facet represents the largest primary problem in a one- or two-line system.

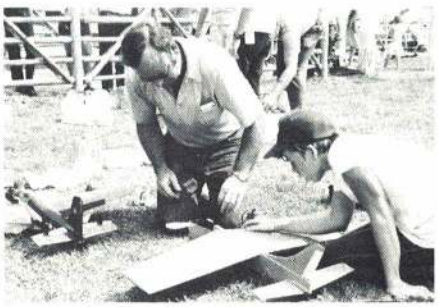
Early setups were not unlike the three-line throttle setup, except the model was flown on one or two lines and the throttle actuating system was preloaded using rubber bands or springs as a motivator, and a release mechanism triggered by extreme elevator movement, similar to the hook-release, a fuel shut-off, etc.

The model was started with the throttle in the high-speed position and the needle set. The throttle was then actuated manually to a slow-setting, and a stop-belt or similar gadget was set to restrict a slower setting. Thus, the sequence of starting engine, flying high-speed, hitting extreme elevator to release throttle mechanisms, the spring would advance the



Midwest ME-109 stunter by Neil Nelson goes with Fox 36X and has nylon covering.

throttle to the pre-set slow-speed coming to rest against the "stop," and the pilot would fly slow speed. This could be accomplished with two-lines or monoline. If everything went right, a good flight ensued, and the extra mph were experienced as a result of less drag. If the engine died or wasn't slow enough, that flight was scratched and more readjustment was necessary. So, the process started all over—adjust and fly, adjust and fly, etc. Next, the "burper."



Dumas Crusader by Jim Riley (14) gets Dad's help at Yellow Jackets Contest. A popular model.

More on Rules: This month it's rules comments in both Stunt and Carrier. In strict accordance with the AMA rule book, a Scale Carrier model is not valid unless proof of an actual arrested landing by the prototype is in evidence (rule 20.10, page 28). This presents problems due to many books and manuals referring to the prototype as "designed for carrier operation." Latest thought is that this is sufficient proof. The rules are also interpreted to say that Scale models of Jet-type aircraft must be powered by a jet engine. Several sources propagate the idea that Scale-Jet-type be permitted in Scale Carrier using internal combustion engines. This would permit a larger choice of models to be built. Thought provokers aren't they? It is clear that the majority of Carrier fliers want to broaden this facet as a flying event, yet keeping it Scale-Carrier.

Beginner entries at St. Louis contest are (l to r) Bob Mezo with a Fokker D-VII, pitman Tony Crew, and David Blum with Shoestring stunter.

In Stunt, it's a pleasant change from the historical appearance-point controversy. The thought this time is that the pattern is obsolete and needs renovation. The long-existing present pattern, which has given a number of high caliber competition fliers a chance now to near perfect it, should be changed to make it more of a challenge. The promoter suggests free-style maneuvers and offers a plan to judge it. Several ways it can go: Set sequence of maneuvers plus several electives; or all electives. This should bring some comments if we have any thinkers!

German Carrier Models: Joseph Tappainer (Rockford, Ill.) relates several German aircraft from WW II that were built for Carrier operation, and documents this from the book "Warplanes of the Third Reich": Fiesler F-1 167; BF 109T Messerschmitt; A-R 195; JU 87-CO; Me. 155. As he says, appealing choices, but no proof of a carrier or arrested landing. He also promotes a rule change.

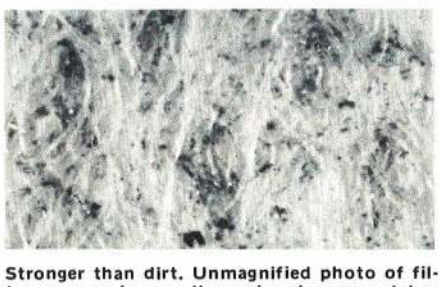
New UC Club: If you fly UC in the Kansas City area and are looking for a club, contact David Ellis, President of the Johnson County Aeronuts, 8301 W. 92nd St., Overland Park, Kan. 66212.

JOHN SMITH

SPEED AND RACING

An Opinion of Sorts: In past issues I have passed on the feelings of people who have written me regarding many things, mainly Rat Racing. Those of you who read this column are interested in competition, be it pure Speed, Goodyear, or Rat Racing. To keep any sport alive, new blood is needed to help perpetuate the sport and bring new competitors into the fold. Or when we grow old and are no longer able to trip around the pylon as we have been accustomed, without younger people to take our place, our sport will die. Holding on to a 180 mph speed model or trying to keep up with a 150 mph Rat racer in traffic is about as silly as sending a local stock car driver to Indy with an STP Turbine car and expecting him to qualify it in the front row.

This is exactly what we are expecting our Junior or beginner fliers to do! We need more beginner type events—"Slow Rat," 049 or Formula V racing (as they call it in Cleveland), Sport Speed—something that the beginner can get started in with half a chance of winning. 1/2A Profile has filled the gap for beginner Speed fliers but we need more events like this, with rules that can be followed all over the country. I'm not advocating the abolishment of competition events that are being flown today (Rat Race, Speed, etc.), but we should all look ahead and try to make our hobby/sport grow by devising new and easier events that will interest the beginner flier so that when he has the experience he can graduate to our more expert type events. It is up to all of us to get them interested and then keep them interested. If we don't, in a few years we'll be a vanishing breed. Think about it.



Stronger than dirt. Unmagnified photo of filter paper in a ultrasonic cleaner catches machining leftovers in a BRAND NEW racing 15.

Stronger Than Dirt: How many of you have bought a new engine, put it in the test stand and run it, only to find out that after "break in" the engine didn't put out like you thought it should? Maybe it felt "funny" when you turned over by hand. And maybe it put forth much black looking exhaust residue when you ran it. Listen close kids, and become educated.

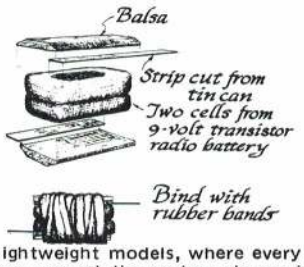
Tests just completed by some top modelers, in conjunction with a major manufac-

turer in the Cleveland area whose metallurgy staff ran the tests, have confirmed what many of us have thought for years. Some of the engines are shot even before they reach the dealers' shelves. Design? No. Just that old bugaboo *dirt*. The photo shows the dirt that was removed from a 15-sized engine built by a major manufacturer. The engine was completely disassembled and cleaned in an ultrasonic cleaning machine. Simply stated, we were told that 80% of the potentially damaging particles remaining on the filter cloth shown is abrasive material left from the machining and honing operations. The other 20 percent is residual metallic particles from these same operations. A one-in-a-hundred case? Not on your life. Every engine cleaned showed these same basic results. This was in addition to the big pieces that simply were picked out of the engine during disassembly. Please notice that there were no indications of any test running by the manufacturer prior to packaging (although their ads indicate this). If they had run the engine, all this "garbage" would have been run through it during the first few minutes of running, resulting in a super hone job. Another engine that was tested had so many shavings, burrs, etc. it would have been ruined by simply turning it over dry! I know that everybody doesn't have access to an ultrasonic cleaning machine, but a word to the wise should be sufficient if any of you have been listening very close. When a new engine has been purchased, and before you even turn it over, carefully take it completely apart including pulling out the bearings, and give it a good bath. Use an old stiff toothbrush to reach every cavity. Check especially the inside of the piston. We have found large pieces of burrs and shavings caught in there. For cleaning solvent use trichlorethylene, lacquer thinner, and good old soap and hot water. Just make sure you hit every part. You'll be amazed at what you remove. Dry completely before assembly and give it a light coat of oil. If you feel your particular engine was as dirty as the ones tested, drop a note to the manufacturer. Maybe, just maybe, someone will take note and clean them up before they are assembled.

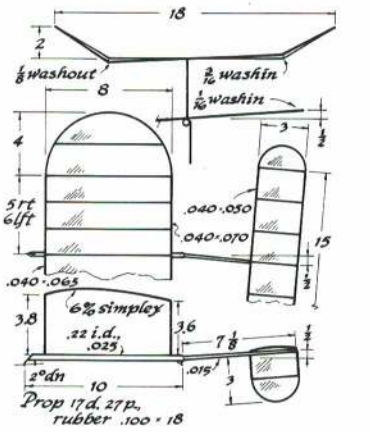
Free Flight

BOB MEUSER
SPORT

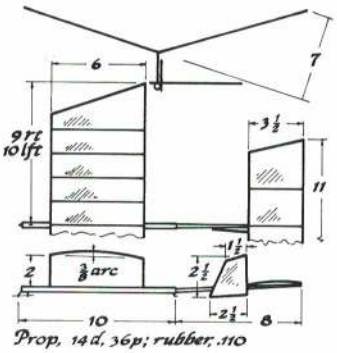
Buzzer Bats: We have pointed out usefulness of the Projects Unlimited electronic buzzer for finding models in tall weeds, cornfields, etc. (October 1972 **AAM**, page 61). The buzzer weighs only 7.7 grams, so it seems a shame to use 36 grams worth of penlite cells to drive it. Alternatives are AAA cells (17 gm. per pair) and N cells (12 gm. per pair) if you can find them. For a touch of class, try the Metair zinc-air cells distributed by Midwest Products. They weigh 12 gm. per pair, will crank out the required 25 ma for more than 50 hours, and for loads up to 250 ma they put out more energy for their weight than any bats in the business. Small NiCad button cells are available, but the recharging is an unnecessary nuisance.



For lightweight models, where every gram counts, we suggest the system shown in the sketch. The two cells from a six-cell 9 V transistor radio battery will run the buzzer all day, and weigh only 7.6 grams. We also tried two cells from a 15 V photoflash battery, which total only 2.1 gm., but they only lasted 15 min.; we suspect we had a dud. Construction could be improved by using some sort of electrically conducting goop between cells, and between the terminals and the cells, such as a paste of pencil-lead grindings in water. The mounting of the buzzer is quite important—clamp it too tight or too loose and the sound power drops. Held against a Nordic spar it radiates sound from a large area of the wing, and the distance it can be heard is doubled.



2¢ Dennis Jaecks' First Place, 72 Nats'
Lawrence Cailliau Second Place, 72 Nats'



Two Cents Worth of Pennyplanes: Demonstrating that the Pennyplane event is a long way from getting stuck in the look-alike rut, the Jaecks and Cailliau models represent a study in contrast. Dennis's model, an extrapolation of the model with which he won in 1971, represents the extreme consequences of a limited span rule. The eight-in. chord is up two in. from last year. Dennis tried props having 31, 32, and 34 in. pitches, but used his 1971 prop with a 27-in. pitch for his winning flight of 12 min. 25 sec.—more than a minute greater than his 1971 time.

Larry used a much smaller prop than Dennis—14 in. dia. compared to 17—but one having an extremely high pitch of 36 in. The only thing the props have in common is their ability to handle lots of torque, essential for achieving a high rubber-to-airframe weight ratio. Larry's more conventional model, having only a six-in. chord—that would have been considered extreme two years ago—turned a time of 11 min. 36 sec., a shade above Dennis's 1971 time and almost two min. better than his own third-place time in 1971, for which he used the same model. Dennis's wide-chord model is pushing the limits of stability, and is not recommended for a beginner.

Superglider Revisited: The Superglider (December 1972 **AAM**) does not qualify for AMA competition, of course, because of the builder-of-the-model rule. But there is no reason not to have a separate event for foam hand-launch gliders. The San Valeers Club of Southern California did just that at their recent Annual. Good way to give newcomers and Juniors a taste of competition free flight with little fuss and bother on their part.

BUD TENNY
INDOOR

Beam Scale Calibration: The beam scale described in this column in the January '73 **AAM**, can be used to measure changes in weight as small as .000001 (ten one-millionths) of an ounce. That small number is the *sensitivity* of the balance—the smallest change which can be detected. The *accuracy* of the measurement will depend upon three things. First, how accurately have the notches been cut into the beam at the calibration points described in the January column? Second, how carefully has the beam been balanced? Finally, how accurate are the weights?

Construction Accuracy: A careful worker, using sharp dividers, should be able to construct the beam to .1% accuracy. If the vertical weight (which sets the sensitivity) is correctly adjusted, the beam can be balanced to closer than .000005 (five one-millionths) oz. With weights constructed as outlined below, accuracy of the weights can be better than 1%. If a friendly chemist or scientist will check the weights for you on a sensitive laboratory balance, they can be corrected to .1% or better.

How Many Weights?: The average indoor builder who plans to build PennyPlane and Easy B can do good work with the beam balance described previously and two weights—.01 oz. and .1 oz. These two weights will give a *resolution* (smallest unit of measurement) of about .0002 oz. and a maximum *capacity* (heaviest object that can be weighed) of .165 oz. Indoor Scale builders and HLG fliers might want a stronger beam and would need a .5 oz. weight for a capacity of .765 oz. Indoor fliers who fly microfilm models would also need a .001 oz. weight to allow measurements to about .00002 oz. resolution.

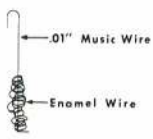


FIG. 1

Build The Weights: Fig. 1 illustrates a typical weight. It has a center shaft of .01" dia. music wire with enamel covered electrical wire wound on it. This chart shows the weight of various lengths of enamel covered wire:

Wire Gauge	In./oz.	Wire Gauge	In./oz.
10	28.58	22	380.7
14	59.55	26	956.25
18	150.6	30	2415.85

To make a .01 oz. weight, cut 24.16" (2415.85 x .01 = 24.16") of No. 30 wire and wind it on the shaft. However, the wire shaft should be about 1.5" long, and that much .01" music wire will weigh about .0005 oz. To allow for that weight, cut the enamel wire about 1/2" shorter. Similarly, 15.06" of No. 18 wire will make a .1 oz. weight. With the shaft weight considered negligible unless the weights are checked on a laboratory balance.

How To Read The Weight: Balance the beam carefully and hang the object to be weighed on the pan of the balance. Fig. 2a and 2b show examples of objects being weighed: Hang the .01 oz. weight in the first notch which doesn't quite tip the beam. Do the same with the .01 oz. weight, then hang

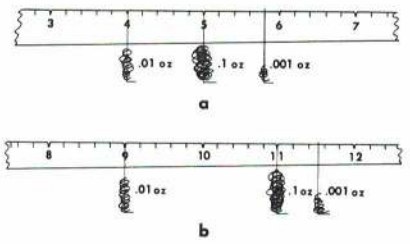


FIG. 2

the .001 oz. weight for beam balance. Compute the weight as shown:

FIGURE 2a .58 x .001 = .00058
.4 x .01 = .004
.5 x .1 = .05
.05458

FIGURE 2b 1.15 x .001 = .00115
.9 x .01 = .009
1.1 x .1 = .11
.12015

How Accurate?: If the beam construction and weights are accurate to .1%, and the beam has been balanced to .000005 oz. (typical for careful work in a draft-free room), the maximum error will be about .2%, or about .000011 oz. for Fig. 2a and about .000024 oz. for Fig. 2b.

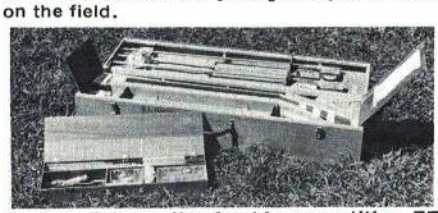
Indoor Flying Opportunities: *Miami, Florida:* Contest dates January 14, February 11, March 18, April 15 and May 20, 1973. Contact Dr. John Martin, 3327 Darwin St., Miami, Fla. 33133. *Union, New Jersey:* Indoor flying sessions January 11, February 8 and March 8, 1973. Contact Dan Domina, 1229 S. Long Ave., Hillside, N.J. 07205.

BOB HATSCHEK

GADGETS AND EQUIPMENT

Boxing Day: Just after Christmas is a traditional holiday in England called "Boxing Day," on which presents are given to delivery boys, postmen and others of similar employ. Originally the gifts were the fancy family Christmas boxes, which nowadays generally contain additional goodies for non-family members, the holiday has changed in other ways as well. It's also a holiday all free flighters could make good use of by building a model box.

Most modelers don't consider a box—other than a tool box—to be a necessity, and it isn't in most cases. But a well-planned container for your free flights can prove to be such a great convenience after you've built it that you'll wonder how you ever got along without one before. Really! Most obviously it's the safest place to store and transport models. It gains considerable utility when it's planned and built to hold everything else you'll want on the field.

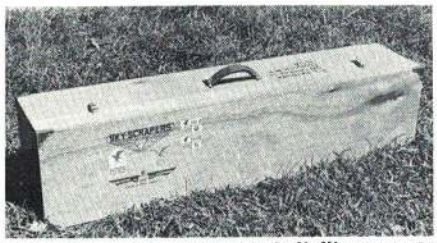


Box used by writer for his competition FF models houses every normally needed tool and accessory for flying in a meet.

There are four principal considerations for such a container. In order of importance, these are: (1) protection for the contents, (2) convenience of access, (3) smallest practical size, and (4) lightest practical weight. These were the design criteria for the box shown in the photos, which carries four Nordic A/2 gliders, tools, spare parts, sufficient supplies for virtually any possible field repair, three towline winches, a pair of binoculars, a compass, suntan cream, pipe and tobacco, a lightweight rain suit (jacket and pants), and such paperwork as a rulebook, processing vouchers, and notes on the adjustments of each glider.

Overall dimensions are 9½ x 11 x 45" (one of the gliders has a span of 88"), and the fully-loaded piece of luggage weighs about 30 lb. While that weight might seem somewhat excessive, consider again the contents; consider also that the box is rugged enough to sit on without endangering the models inside. As for convenience, any one of the four models can be removed from the box without disturbing the other three. The tools and supplies are kept in a separate compartment box (2¾ x 6½ x 23½") that is independently removable. And all other items are as easily accessible.

Fuselages are cradled in the lid, each held in place by two rubber bands. Everything else is secured in position by the act of clamping the lid down, which blocks a pair of hinged flaps (that trap the wing panels and act as lids for three internal compartments) and which blocks the relatively heavy toolbox in its position. Stabilizers live in their own compartment with a latching lid. Nothing can get loose to rattle around and do damage, yet everything is conveniently accessible.



Ready for a trip, even by air it fits cargo or luggage requirements as to size and weight.

The basic box, lid, flaps, partitions and separate toolbox were all built of 1/8" Luan mahogany plywood with ½" square pine framing and reinforcements. This type of plywood is excellent for such purposes. Principally used for cabinet backs, it's attractive on one side (you put the other side in), it's light in weight, it takes glue beautifully, and it's cheap. A single 4 x 8' sheet was plenty, but it took a surprising amount of the ½" square—about 50 ft. of it. Assembly was with Titebond aliphatic resin glue and 3/8" staples. While the staples don't add any glamour to the appearance of the cabinet work, they certainly speed the assembly job—and there are no points for appearance. Two coats of urethane varnish, inside and out, make a durable finish that is attractive over the mahogany.

A visit to a good hardware store should produce the other assorted necessities. Full-length aluminum piano hinge was used, but ordinary butt hinges (at least three or four) would cost less. A good handle is a must (this one is leather), and it has to be solidly anchored to reinforcements inside the box. The spring-type clasps are also bolted (using blind nuts in internal reinforcements), so they're unlikely to pull off at the wrong time. And further protection against baggage handlers (or mishandlers) is provided by eight brass corner reinforcements. To prevent crushing, the fuselage cradle in the lid and another block affixed to the lid (to hold down the inner flaps) transmit loads directly through lower partition reinforcements right to the bottom of the box.

While this box is intended specifically for four particular models, a few modifications could be incorporated to make a similar box adaptable to a changing variety of models. Foam-padded ½" squares with hooks spaced every inch on the sides would allow for quite a variety of fuselages. And a looser arrangement of lower partitions would allow for a greater variety of wings. With one-piece wings, the box will probably grow in length, but polyhedral invariably results in some spaces that can accept tool compartments, fuel cans, winders, thermal sensing rigs—maybe even a couple of sandwiches. Just about the only item that defies convenient packaging is a stabilizer with a rudder or permanently two affixed to it.

BOB STALICK

GLIDER, RUBBER AND POWER

Trimming Birds with Auto-Feathers: Last month, this column dealt with the subject of rigging and typical power model with auto-stab and auto-rudder. By now, you've accomplished this task and are waiting for the weather to give it some initial flights. As a preflight check, see that the center of gravity is located around the 70% to 75% mark and that the wing is free from warps. Actually, the wing can be warped a slight amount if it is the right warp (a slight amount of wash-in—trailing edge down—on the right main wing panel is acceptable).

Check to see that the stab has a bit of right tilt for glide. Next check the timer so that the following sequence is set: (1) Engine flood off at 9.5 to 9.8 sec. (2) Auto-rudder actuates at flood off or no more than one second after flood off. (3) Auto-stab actuates between one and two sec. after the auto-rudder does. (4) Dethermalizer actuates tail pop-up at three min. plus a few sec.

Some other things to check are: A 3/32" to 1/8" differential exists between the power setting and the glide setting; auto-rudder is set straight ahead for power and has about 3/32" to 1/8" right setting for glide.

Good weather arrived? Grab the ship and try some test gliding. Set everything in glide position. Hand glide to a spot 100 ft. ahead. The model should glide with no stalling or diving tendencies with a slight right turn. If it dives, increase the stab glide differential setting with the screw adjustment and try again. If it stalls, decrease the stab glide setting. For more right turn, tilt the stab more. Don't fiddle with auto-rudder at this time, as it is primarily a power adjustment.

Now for the power phase. Set everything so that you have an engine run of around four sec. and a dethermalizer time of around 10 sec. Run engine at peak rpm, launch the model straight ahead and up at about a 45 degree angle into the wind. The power phase should be straight ahead gradually increasing the climb angle with a slight right turn. If it is, then proceed to a full engine run. Trim final glide circle and you're set except for practicing with it. If it doesn't do such good things, then the following adjustments are in order.

Tries to loop: Shim under the leading edge of the stab or move the center of gravity forward. Dives: Shim under the trailing edge of the stab or move the center of gravity back. Loses altitude in transition from power to glide: Actuate auto rudder sooner or increase rudder deflection. Makes more than one right turn in power pattern: Deflect the auto rudder slightly to left under power. Flattens out in the climb pattern: Add a thin shim under the stab leading edge.

After each power adjustment, it will be necessary to recheck the glide trim and possibly adjusting it accordingly. Whatever you do, do it with caution and in small amounts—power adjustments are very critical. Care here will forestall straightening out too many bent feathers.

Northwestern O.T. Champs is his scene where a Thunderbird by Elmer Roth takes off. Model is actually 35 years old!

Old Timers' Old-Timer: Antique models, nostalgic memories of gas and oil fumes, ROGs, Ohlsson and Rice, T-56, and bamboo paper—all are part of the Old Timer scene. Many of us can only imagine what those days were like, others were there and flew the same models they recreate today to relive those times. A few, such as Elmer Roth, who celebrated his 72nd birthday the day before the Northwest Old Timer Championships, show up with a model built and flown then. Elmer, who still runs a hobby shop in Salem, Oregon, was a real contest hound back then, but he hasn't competed since 1952. So, here he appears, with a 1972 AMA license complete with his old reissued four-digit number and a Mighty Midget powered Thunderbird first flown on January 1, 1938. And how did he do at the contest? Placed first in the Antique event. To top if off, the contestants paused at noon and sang Happy Birthday. Old Timers and the people who fly them are the greatest!

Special Interest

FRED MARKS
AERODYNAMICS, ELECTRONICS

Clever Switch Actuation Idea From Clyde Shelton: Most of us who mount switches internally use the old idea of drilling a hole through the "tang" of the switch, i.e., sliding part. This is fine so long as no crash occurs. Since Clyde crashes once every few years, he needed something better! Figure 1 shows the idea. Nylon pieces are used for guides to hold a piece of 1/16 wire just on top of the tang. Two Midwest No. 10-20 nylon retainers pressed onto the 1/16 wire actuate the switch. Another on the outside of the fuselage serves as a finger hold. In a crash, pieces are free to fly in all directions without tearing the switch to pieces.

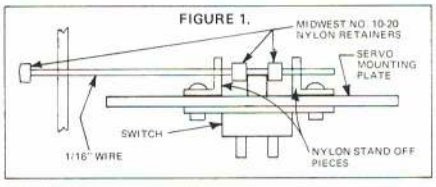
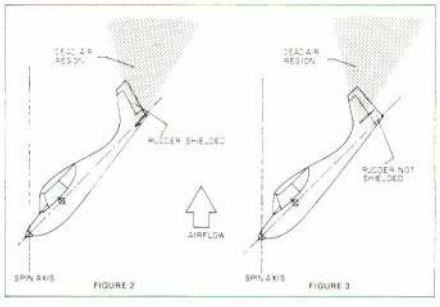


FIGURE 1.

From Jim Watson—An Explanation: Every now and then the RC modeler runs into a model with flight characteristics that prove baffling, if not downright discouraging. Especially when one contemplates the remains of that once-loved pride and joy that nad seemed to be flying so well. The phenomena to which I'm referring is the spin recovery, better known as "will she or won't she?" Many times a plane will enter a spin and, after two or three turns, recover perfectly. Hold it in for another turn, and she may tighten up the spin and not respond to any control movement, or go into a flat spin with the same result. The flier can move sticks and throttle all over the place with no apparent results, except for a basket of splinters. Believe me, blaming the radio is not the answer! The problem is one of control effectiveness, in most cases a loss of effectiveness of the rudder. What really happens is that the rudder is blanketed by the horizontal tail and possibly the wing, so that the airflow across the rudder is destroyed and it loses effectiveness. Figure 2 shows this blanketing effect and the cure for the problem is shown in Figure 3. It is not so much a matter of increasing the rudder area as it is shifting of the rudder into a position where it is placed in a favorable position not completely blanketed by another portion of the horizontal tail. As the man says, "try it, you'll like it!" This effect is predominant on a model with the horizontal tail (stabilizer and elevator) located at or near the bottom of the fuselage or where the rudder is located only above the horizontal tail.



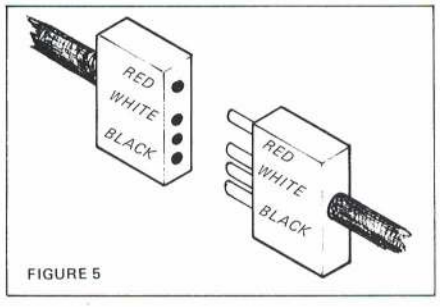


FIGURE 5

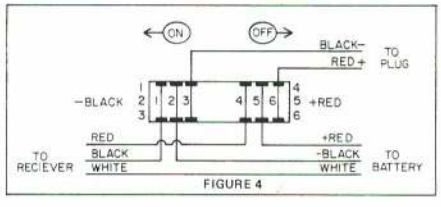


FIGURE 4

For those of you who are interested in the detailed aerodynamics of the spin problem and the formulae for precise calculations of the tail-damping power factor, as it is called, may find it in the following NASA publication: NASA TN D-6575, by James S. Bowman, Jr. Summary of Spin Technology As Related to Light General-Aviation Airplanes.

This report may be obtained from National Technical Service, Springfield, Virginia 22151 for $3.00 for a full size report or 65 cents for a miniaturized (microfiche) format.

Three Good Ideas From The LIDS Flier: An easy and helpful modification to radio sets not so equipped is an external charging connector on the receiver on-off switch (Figure 4).

Examine the switch and make sure the positive and negative wires from the battery go to No. 2 and No. 5 lugs. Keep the same color code on wires added to No. 3 and No. 6 lugs. Match the Red (positive) and Black (negative) wires on the external charging plug (female) with the plug on the charger (male) to insure correct polarity (Figure 5).

With the switch in the off position the battery will charge. After you have finished modifying the switch, pot it by squirting silicone rubber over the contacts to prevent vibration from shaking the contacts loose.

Cutting hinge slots can be a problem, but by heating a No. 19 X-Acto blade over a propane or butane torch a perfect sized slot for most hinges can be burned.

Checking a battery pack with a voltmeter is not a good indication of whether the batteries are good or not due to the uneven power curve of the nickel cadmium cells we use. The batteries must be tested under load. So to check or just cycle an airborne battery pack use a No. 5 bulb across each half of the battery as shown in Figure 6.

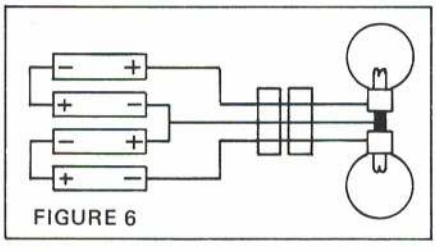


FIGURE 6

This bulb will draw a current of 300 M.A. A good 500 M.A. battery pack should keep both bulbs at the same brilliance for one hour and ten minutes. A dim bulb will indicate a weak or bad cell. Recharge and test battery pack again. If your battery pack will not keep both bulbs lit for at least one hour after cycling a few times, DO NOT USE THAT PACK IN AN AIRCRAFT. Find the bad cell with a volt meter while the bulbs are connected and *replace the bad cell.* Recharge and test again for your own good.

JOHN BURKAM
HELICOPTERS

L.I.D.S. Helicopter Event: On September 17, the third helicopter event in the U.S. drew four competitors and four non-competitors. Horace Hagen won first place with his Hueycobra and fifth place in an airplane event, making him grand champion. Faye Peoples was second, Gene Rock third, and Ray Jaworski fourth. Three Japanese Hueycobras and a 19-powered original design by the event director, Norm Rosenstock, did not compete due to the high winds or inexperience, or both. The objective of the contest was to complete four missions in the shortest possible time. Score was based on distance flown minus time, as in the German contest described by Maynard Hill in *Flying Models*, September 1972.

Contest Rules: We have had three helicopter events in the U.S. The first one, at Glenview, was a "show what you can do" type. The second, at Orange, Massachusetts, was a list of 22 maneuvers, of which the pilot attempted as many as he thought he could do. Then the L.I.D.S. contest helicopter event was a solo pylon type contest, a race against time from takeoff to spot landing. In the Orange meet and the L.I.D.S. meet, the pilots were allowed to follow their helicopters through the maneuvers, reminiscent of early RC airplane solo pylon races. As skills improve, the pilot will be able to finish the course while standing in one spot. Next, several helicopters will be on the course at once! On the other hand, there will be model helicopter pilots who would rather develop new precision maneuvers. Still other modelers will spend months, even years, making fabulous scale helicopters. There should be contests for all these modelers. More and more people are pushing for the AMA to adopt a set of helicopter rules. Any rules written this early in the game should be written with the understanding that they will be changed often. And the rules should accommodate at least the two flying types of meets, maneuvering and pylon "racing." The scale helicopters can enter existing RC Scale events, since propellers or rotors may be non-scale without costing scale points. For the maneuver or pattern contests, time and space for optional maneuvers should be allowed. In another year there will be dozens of RC helicopter pilots practicing maneuvers. Some of them will come up with some good ones to introduce at contests. Let's not stifle initiative with contests limited to prescribed maneuvers only.

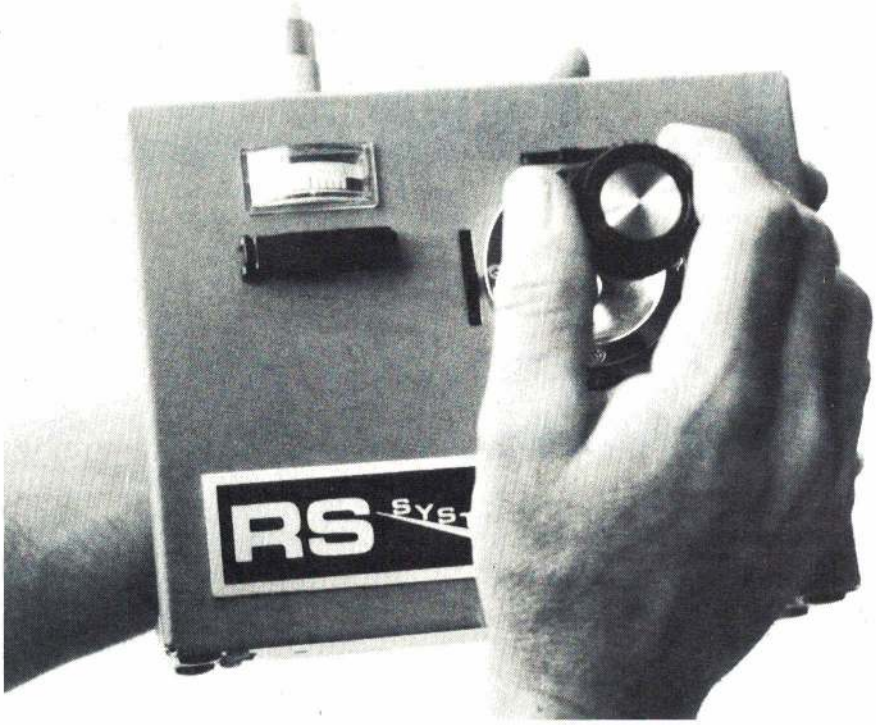
Professional Help Needed: Where are the engineers from Sikorsky, Bell, Kaman, Hughes, Vought, Enstrom, Hiller who may be experimenting with model helicopters? These are the men who can advance the state of the art in this country the fastest. Almost every problem model helicopterites encounter has already been solved on full-scale choppers. Some of the remaining problems are as follows: What is the best collective pitch setting of the servo paddles on a Hiller rotor (1) for good control and stability and (2) for high speed flight? Are cambered or symmetrical airfoils better for the servo paddles? How big and how heavy must the paddles be for good control? Needed is a good, simple design for incorporating collective pitch control on a Hiller rotor. Needed is a practical method of predicting more accurately than my nomograph (March 1971 **AAM**) the hovering and forward flight performance of model helicopters. Needed is a way to estimate the drag of a model helicopter for forward flight performance calculation. What other stabilizing and control systems can be made to work on RC helicopters, e.g., Bell, Lockheed, hingeless rotor such as Bolkow BO-105?

Perusal of the U.S. Patent Digest for aircraft from the mid-forties on will uncover many an idea applicable to model helicopters. For instance, the yaw rate gyro used on the tail rotor of Gene Rock's SSP helicopter is an improvement on a Lockheed patent. The spring acting about the teetering hinge of the Hiller type rotors which greatly steadies the flight of most of the scratch-built helicopters in this country was suggested by a Hiller patent.

Readers: "Where the Action Is" is *your* part of **AAM** each month. The correspondents are experts in their fields, but they need to hear from you. Please keep them well supplied with your ideas, model photos, activities, club news, and newsletters. We pay $5 for modelers' ideas if used in a column; clubs are given credit.

Have a problem? If it is not too complicated write to a WTAI correspondent. He'll know a useful answer and may even cover the question in his column. Write to the correspondent, c/o **AAM**, Potomac Aviation Publications, 733 15th St., N.W., Washington, D.C. 20005.

You Just Put Your Hands On A Winner!



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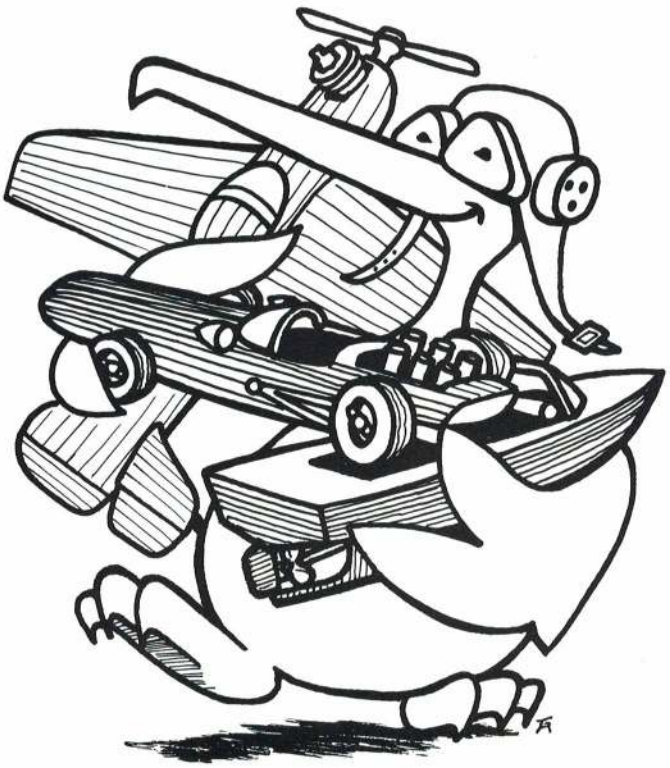

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CLODHOPPER

(Continued from page 52)

tight against it and wrap the two pieces of masking tape around to the other side, pull tight and press down. While this is drying, cut the slot for the stab in the tail end of the fuselage.

The wing also is not difficult to build. From 1/16 balsa, cut nine ribs. To make the wing rib template, cut the shape shown on the plans from stiff cardboard or aluminum metal from a soft drink can, glue a strip of 1/16 balsa to the back side of the template, the wood parallel to the line on the template. This acts as a stop which butts against the edge of the material used for the ribs. Butt the template against the edge of a piece of 1/16 balsa and cut around the edge of the metal or cardboard.

Place the plans on your building board and pin nine ribs on the dotted lines. Put a pin through the leading edge end and trailing edge end. Put a small amount of glue on the leading or sloped edge of each rib. Temporarily remove each leading edge pin. Very carefully place the 1/16 leading edge sheet on the top of the lined-up ribs. Then replace the pins through the sheeting—it is good to pin the back edge of this sheet down, too. Remove the trailing edge pins. Place the 1/32 sheet against the rear edge of the 1/16 sheet and check from wing tip to wing tip for fit. Sand where necessary. Put a bead of glue on the front edge of the 1/32 sheet where it will butt against the 1/16 sheet. Put in place, making sure the two sheets fit together from end to end and are flat. Pin the glue joint down firmly and replace the trailing edge pins. When the wing is dry, cut it into three pieces at the dihedral joint. Cut between the two ribs. Sand a slight bevel on the ends of each part, block up the tip of the wings two in. and glue the ribs together. This completes construction unless you wish to cover the top and bottom with 1/32 sheet. If you do, be sure and run the grain crosswise—this adds strength.

Temporarily glue the nose block in place to former No. 1 making sure the key is in place. Sand the whole fuselage and round the corners slightly. Glue the stab in place, add the rudder, put in scrap balsa doublers in the corners of the fuselage where the wing hold-down dowels go through and double up the fuselage where the rear motor dowel is located. It is now ready for papering top and bottom.

Give the fuselage, wings and stab one coat of diluted white dope. When dry, sand and apply one coat of diluted clear dope to all surfaces. Cut white tissue to fit the top and bottom with 3/4-in. margin around. Lay the paper on the surface to be covered, and with a brush full of thinner moisten the paper where it comes in contact with the wood. It will penetrate and soften the dope which will act as a glue. Spray with water to tighten and give one coat of clear dope for protection.

There are two adjustments you can make when you are test flying your Clodhopper—they concern the wing and nose block. If the plane stalls during the test glide, place a sliver of 1/32 balsa under the trailing edge of the wing. Try again. If she dives during the test glide, then a sliver of 1/32 balsa under the leading edge will help. The thickness of wood may be increased until a smooth, flat glide is obtained.

I started with one 14" loop of 1/8 flat rubber. (You may go to two loops if the plane is too heavy to fly on one.) Wind in a few turns and launch the plane with a smooth horizontal thrust. If she moves right out and up into a right-hand turn and when the prop stops she transitions into a left gliding turn, it is all set. If not, a sliver of 1/32 balsa between the nose block and former No. 1 will cause Clodhopper to turn one way or the other while the motor is unwinding. If your plane glides perfectly, but attempts to climb too steeply, the sliver of 1/32 may be placed between the top of the nose block and the top of former 1. These adjustments are critical so be careful—not too much at one time. Experiment adjust and fly her again. The Clodhopper is a tough little plane and will bounce off most objects she runs into. To get a long life from your plane, find an open field to fly her in, away from houses and trees.

Proper launch technique demonstrated by Tenderfoot. Never throw the model at a sharp upward angle.

SUPER GOOSE

(Continued from page 29)

point, heat until red hot, then bend. You will note from the plans that the nylon nose gear bearings are on 1/8" ply stand-off pieces, this is to allow the nose gear steering arm more clearance.

"Easy-Does-It" finish is used on the fuselage of the original aircraft with Ditzler acrylic lacquer sprayed over all the fuselage and bristol board wing. The bristol board should first be given a very light sanding with 320 paper to give it a tooth for the paint to hang on. Bristol board is almost too smooth for paint to adhere properly. You can get away without sanding the cardboard, as long as you do not intend to mask off any designs on the wing. The best policy is to sand the cardboard lightly.

O.S. Max 40 proved to be an ideal amount of power for the Goose, but any 35 to 50 should do a good job. In the prop department, a 10 - 6 seems okay with the 40. I haven't tried it yet, but a 9 - 7 or 9 - 8 prop could prove to be an even better choice.

Stick with the center of gravity location shown on the plans. The original Super Goose center of gravity came out at this spot as built. No ballast was required either front or rear.

The aileron servo tray must slide free and easy on the 5/16" sq. servo rails so as not to overload the elevator servo. Any binding of the aileron servo tray will run the receiver NiCads down at a higher than normal rate. Note that the

aileron servo output wheel has been re-drilled with a 1/16" dia. drill so that the power takeoff from the aileron servo to the elevon horns are at 90 degrees. This will help to eliminate any elevon differential that would otherwise be in the system. Differential movement in the elevon is not desirable as the aircraft is designed to be at home either upright or inverted. As you can see, a wheel output servo is a must for the aileron control. When all the controls are installed, check the system by applying full down elevator and simultaneously apply full left and then right aileron; do the same with up elevator. There should be no jamming or binding of the elevons at the extreme control positions. Use the end hole in the Midwest elevon horns. (The plans show the second hole from the end in use and this is not correct.)

Flying

Now that you are done, take it out to the field. Remarks from the gallery at the field will run something like this. "Hey, you got the airfoil on backwards." "Are you sure you know what direction to fly it?" "Is that a pusher or a tractor?" "Biggest tail-wheel I ever saw." Most people there will not believe that it will fly, so crank up the motor and show 'em. Have all flight controls set at neutral, with the elevators set at an almost undetectable amount of up trim, hit the throttle and go!

Author with 40 power-foam wing version.

MUSTUNT

(Continued from page 36)

tances left and right of any neutral elevator position (rudder should have slight offset to outside at neutral elevator). Moving the drill hole aft will cause the rudder to travel farther to the outside than the inside. This is desirable. The drill hole should be located to provide about four times greater right rudder travel on down elevator than left rudder travel on up. This occurs at the approximate position shown on the plans. Moving the drill hole too far aft will produce outboard travel on both up and down. This is both unnecessary and undesirable.

The new asymmetric rudder is the result of an attempt to improve the movable rudder to make it more generally acceptable. The early movable rudder installations did cause a noticeable wobble in some maneuvers. It also increased overall line tension which I thought was more important (and still do) even though it was obvious that part of the improved outside line tension was gained at the expense of some inside tension. Theoretically, this shouldn't have happened.

After the '69 Nats I decided to use the original Bearcat as an experimental "goat" to find the reason for the visible yaw and to restore full inside line tension. I progressively introduced asymmetry into the rudder linkage by trying five different elevator attachments for the rudder pushrod. All flying characteristics improved as asymmetry was increased, until little left rudder travel remained. While rudder movement is used primarily to stop inward yaw and loss of line tension on outside maneuvers, we shouldn't ignore the lesser effects of the asymmetrically small left rudder travel either. An airplane with too little left rudder travel will yaw outward on the top of an inside square loop. This outward yaw is particularly noticeable in a dead calm and results in a reduction of line tension, regardless of wind. With proper rudder asymmetry and a little dampening effect from the side area aft, the resulting yaws become invisible (equal to or less than rudderless ships) and the line tension is greatly improved.

In addition to modernizing the aerodynamic design of the Mustunt II, I wanted to also incorporate new materials and techniques which would expedite construction and hopefully, help to control weight. For example, the cowl, foredeck and turtle deck were molded from balsa which reduces overall weight, speeds building, and lightens the tail while maintaining a desirable shape and bulk. The wing tips are molded from ABS plastic which results in light, strong wing tips and facilitates the simplified installation of adjustable leadouts and tipweight. While these structural innovations aren't practical on airplanes built from plans, we used them on our original Mustunts to verify the concepts. When built from plans, alternate methods are indicated.

To illustrate the Mustunt's only peculiarity and hopefully, to demonstrate a systematic method of trouble-

shooting trim problems, let me relate some of my experiences in trimming out the first Mustunt, a Mustunt II built by Bill Rutherford.

When I first flew Bill's Mustunt, I was somewhat disappointed to find that it "hinged" severely in tight corners. "Hinging" is an exaggerated wobble with a rolling motion in which the bottom of the airplane is seen on hard inside square maneuvers and the top of the airplane is seen on outside maneuvers. I hadn't expected this as I have owned several other straight wing Stunt ships that didn't have any particular trouble with squares.

My initial reaction was the rudder must be out of adjustment so I systematically adjusted the rudder on each of the next 30 flights in an effort to find some combination of rudder offset and travel which would stop the hinging. This got me a lot of practice but little improvement in the hinging. Next, I thought the vertical fin and rudder might be oversized, and over effectiveness of the rudder might be causing the hinging. In an attempt to correct this, the size of the fin and rudder were reduced, also with little effect.

My next effort to stop the hinging motion was to add a tab to the outboard flap to produce extra lift from the outboard wing. It seemed likely the extra lift from the outboard wing might offset the airplane's tendency to drop the outboard wing in a square maneuver. This helped, but it was obvious it was only a partial solution. By this time I had 60 flights on the Mustunt and it seemed about time to quit flying and start thinking.

There are four things which will cause or intensify hinging. They are: First, leadouts too far forward; second, high lift wing tips which exaggerate normal yaw; third, too much tipweight; finally, asymmetrical wing area (long inboard wing panel). Of these, the last two, tip weight and asymmetry, create line tension and one or the other, or sometimes a combination of both, is always used.

If the leadouts are too far forward, the airplane flies in a strained attitude with the rudder offset forcing the inboard wing tip forward against the tension of the leadouts. In a square maneuver, the lines tighten, jerking the in-

board wing tip backward, causing hinging.

Extra wing and flap area at the wing tip exaggerate normal yaw because the very high lift wing tips are very sensitive to speed change. When the airplane yaws from normal propeller forces, the wing tip which moves forward gains a great deal of lift, and the wing tip which moves relatively rearward loses much lift. The two combine to cause a large rolling motion. This effect can be virtually eliminated by tapering the wing and/or narrowing the flaps at the tips to reduce tip lift. The movable rudder is also useful for controlling this type of hinging as it reduces yaw from propeller effects.

Tip weight is straightforward. It always produces a positive rolling moment, that is, always in a line tautening direction. An excess of tip weight will always cause hinging, even in an airplane with low lift tips.

The asymmetrical wing is more interesting. First, what does asymmetry do? Since the Stunt ship flies in a circle, the outboard wing travels two to three mph faster than the inboard wing, producing more lift per square inch than the inboard wing. To balance the lifts, the outboard wing area is reduced by shortening the panel by about one half inch. I happened to have some airfoil test data gained from measuring lift of several airfoils at various speeds, angles of attack and flap settings on a simple test rig. I plugged in typical areas, measured lift data and "G" loadings from

one to 15, and found, to my surprise, that with one-half in. of asymmetry the lifts are approximately equal and proportional at all loadings and speeds. Second, I drew enough sketches to convince myself that the rolling tendency produced by extra asymmetry (inboard wing more than 3/4" longer than the outboard wing) is, like tip weight, always positive. Bob Palmer's differential flap travel is, incidentally, a case of EXTRA asymmetry of lift.

Now, back to the field with the Mustunt to compare line tension and hinging effects as asymmetry and tip weight are varied. Asymmetry was reduced, creating extra lift from the outboard wing by adding a tab to the outboard flap. This reduced hinging. Then, reducing tip weight in a series of flights further reduced hinging to the point that final rudder adjustments controlled it satisfactorily.

The Mustunt was now flying smoothly but with a tab on the outboard flap. To get that tab off I would have to do one of two things. Either reduce the area of both flaps by removing the tab from the outboard flap and trimming the trailing edge of the inboard flap by one eighth inch, or remove the tab from the outboard flap and further reduce tip weight. Through flight test, I determined that I personally find tip weight more effective in creating line tension than asymmetry, so I trimmed the inboard flap and resolved to build all future airplanes without any asymmetry to better utilize tip weight for tension. Also, tip weight is easier to adjust than asymmetry.

Lest the above sound discouraging, let me point out first that a complete AMA Stunt pattern was accomplished on each flight so the time was hardly wasted. Second, I found out that Mustunts are sensitive to tip weight due to the unusual wing design and established, approximately, the amount of tip weight required. Third, approximate trim settings were obtained which enabled us to set up my own Mustunts and trim them out easily, with only a few flights each. These settings are shown on the plans.

After giving due consideration to my initial trimming difficulties, I still think that the straight wing Mustunt is optimum for all Stunt fliers up to national competition level. I feel that the wing's lifting ability and the advantages of building the straight wing easily, without complications, jigs or warps, far outweigh the problems of adjustment (particularly with adjustment templates and adjustable tip weight). Finally, I'm glad that I had the experience of dewobbling that Mustunt. The lessons learned are valuable to me because each new trimming experience makes it easier to trim succeeding airplanes to fly with increased smoothness, thereby picking up those extra points which win contests and separate nationals finalists.

To trim your Mustunt, first set the adjustable leadout screw head to "O" on the leadout adjustment template. Second, install the elevator pushrod in the next to bottom hole on the elevator horn. Third, install the rudder pushrod Kwik-Link in the next to outside hole on the rudder horn and adjust the Kwik-Link to place the rudder trailing edge at "O" on the rudder offset template. Fourth, check the balance. Mustunts fly best when they are nose heavy, so be sure to get the balance point at least as far forward as shown on the plans. Finally, install 1¼ oz. of weight in your wing tip. That's all.

If you are a Stunt flier, the airplane is ready for patterns. It is now in trim equal to or better than airplanes built from plans or kits having fixed leadouts, offset and tip weight. If you don't want to experiment with adjustments, you don't have to. If you would like to learn to trim, don't worry about any Mustunt becoming unmanageable when out of trim. If changes are made one unit at a time, the airplane's performance deteriorates slowly and it becomes definitely doggy before it gets critical. Excepting tip weight (easily the most straightforward adjustment), the Mustunts are unusually tolerant of mistrim. If you are a novice, resist the temptation to build the Mustunt II first. There is little difference in the flying characteristics of the Mustunts I and II.

Interested in improving your trimming technique? Here are a few tips which should apply to any Stunt ship. First, add tip weight until the airplane hinges, then back off slightly. Always carry the maximum tip weight the airplane will tolerate for maximum line

tension. Second, for more tension overhead, try moving the leadouts forward. This may aggravate any tendency the plane may have to hinge. You may have to reduce tip weight when moving the leadouts forward. Third, leadouts too far forward may cause the airplane to "hunt" in level flight and "lurch" drunkenly in the corners. Fourth, leadouts too far back and too much rudder offset cause more problems than leadouts forward and too little rudder offset. Fifth, for more tension on reverse wingovers add rudder offset. Sixth, bend flaps to balance inside and outside line tension. Do it by feel; don't worry about what the attitude of the airplane looks like. When the tension is even, the attitude will be level unless the airplane is warped or has improper dihedral. Seventh, movable or not, make the rudder adjustable as its offset is a critical adjustment. Always fly with minimum offset. Eighth, if the airplane lands poorly, try bending the landing gear back. Ninth, add power and prop diameter. (Avoid wide blade props.)

To adjust the improved rudder linkage, first, in a calm wind, observe the point where inward yaw is most noticeable. That point is the top center of the square eight where the airplane pitches nose down from a vertical climb to level flight across the top left half of the eight. Adjust the Kwik-Link to find the rudder position with full down elevator which makes the airplane groove through that corner without any wobble or bucking felt in the lines. This is your "key" right rudder position. Make a template and mark this position because whatever else you do to the rudder linkage, the rudder must return to this "key" position on full down. Second, observe again the top center of the square eight, but this time note the inside corner where the airplane pitches over to the inverted position. Now, adjust the Kwik-Link again to find the "key" left rudder position on full up which makes the airplane groove through that corner tight and smooth. Mark this position also on your template. Third, select a hole on the rudder horn which will allow the rudder to move exactly from "left key" position on up to "right key" position on down. Fourth, utilize asymmetry to adjust your overall (neutral elevator) rudder

offset position without changing your "key" positions. (Note the fourth, fifth, and seventh trimming technique suggestions.) To simplify your asymmetry adjustments, drill several additional holes in the elevator horn directly ahead of the one shown on the plans. If little offset is required for your particular airplane, use one of the rearward holes. If a larger offset seems to work best, use one of the forward holes. By all means, try them all to determine certainly which hole gives the best overall tension and smoothness throughout the entire pattern. For optimum results, changes to the movable rudder must be systematic. Find each "key" position separately before you attempt to adjust asymmetry. This linkage will now provide improved line tension in maneuvers with minimum drag in level flight.

For the more experienced builder and competition flier who likes the Mustunt concept and appearance except for its "beginner's" wing, I rounded off the Mustunt series with a third Mustunt design. The Mustunt III is simply a tapered wing version of the Mustunt II. The tapered wing sacrifices some of the straight wing Mustunts' lift capability and simplicity of construction but achieves full competition smoothness of maneuvers. To minimize the tapered wing's loss of lift, I used a newer airfoil based on the Sea Fury series of airfoils. While the new airfoil is an improvment, I don't recommend any attempt to retrofit the Mustunt I or II with this airfoil as they are very satisfactory flying machines as presented. As the Mustunt III is intended more for the expert than the intermediate Stunt flier, I strongly recommend the wing be jig built and fully sheeted. In addition to improved appearance and smoother flying characteristics, the Mustunt III retains the Mustunt virtues of light weight, simple fuselage construction and unparalleled trimming versatility.

Every effort has been made to make the construction drawings completely self-explanatory. There have been many notes added and changes made to the plans to simplify or clarify construction details. Please read the plans very carefully before attempting to build any Mustunt.

There is still some confusion about Mustunt II and III fuselage construction where I altered its basic boxlike configuration to improve the Mustunt's appearance. For example, I drooped the nose of the Mustunt II and III by trimming the top of the fuselage sides forward of the wing. To restore a basic squareness to the fuselage so that it will lay flat, bottom up, for accurate installation of the wing, either tack glue a piece of ¼" sq. balsa to the top of the plywood firewall or leave the top of the balsa fuselage sides uncut and trim them later, after wing installation, to match the shape of the fuselage side plywood doublers.

To add an interesting shape to the turtle deck and to blend the 3/16" sheet vertical fin into the aft fuselage required the fuselage sides be "pinched" in the area of the stab leading edge. Proper assembly sequence will eliminate prob-

lems in this area.

(1) Assemble rectangular portion of fuselage to aft end of ply doubler. (2) Pull fuselage sides together at tailpost and join with glue. (3) Fit *bottom* spacers *only* and install tailwheel mount. (4) Plank bottom of fuselage from flap trailing edge to tailpost. (5) Install wing. (6) Push stabilizer-elevator assembly into place, don't glue. (7) Pull fuselage sides together at stab leading edge to 1/2" and install spacer there. (8) Spread fuselage sides under stab as much as possible to stiffen aft end of fuselage and glue stab. (9) Install vertical fin as shown. (10) Install 1-9/16" top fuselage spacer. This "pinched" fuselage shape can be eliminated and the fuselage built rectangular with a 15/16" spacer at stab leading edge by modifying the shape of the turtle deck or top block so that it is at least 1/2" high at this point.

I recommend all Mustunts use a fully sheeted wing. Here are some suggestions for full sheeting of non-jig-built wings. To minimize the stresses built into the wing by adding sheeting, first, sheet both the top and the bottom of one leading edge before doing the other wing half. Next, complete the sheeting of the top of the wing leaving the bottom uncovered for now. DON'T SAND ANY PORTION OF THE WING UNTIL THE SHEETING IS COMPLETE. Now, we have a three quarters sheeted, bowed and warped wing. No sweat, turn it upside down on a flat surface with the ribs exposed and proceed to weight the structure with five to ten pounds of scrap iron. Block the wing absolutely straight, then soak the wood with a spray bottle filled with water. When the wood is completely dry (24 hours), it will remain straight when the weight is removed. Now sheet the bottom. A sheeted wing when complete is tough and warp resistant—well worth its negligible extra weight and work.

Addendum: Now that the '72 contest season is over, I've been flying some Mustunts again. Since one of the express purposes of the Mustunt concept is to provide an excess of lift for the novice, I decided to verify the Mustunt's lift capability by flying some practice patterns with my 36 oz. Mustunt I carrying

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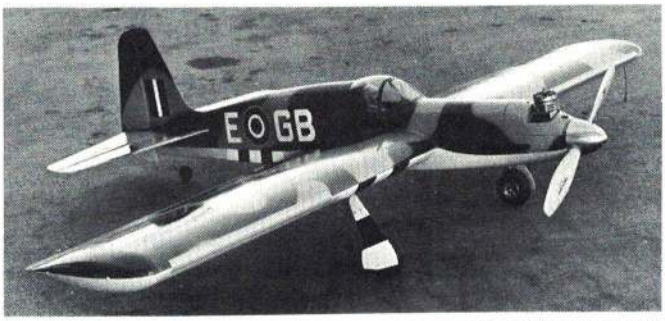

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a full pound of lead ballast in a cavity in the fuselage under the fuel tank. These flights uncovered an easily corrected shortcoming of the Mustunt design which I should have anticipated and allowed for.

First, my heavy Mustunt flew fine with slightly improved line tension and good, tight, buffet-free corners. No problem there.

Second, I burned up a perfectly good Fox 35 trying to drag that heavy Mustunt around. The key word here is, of course, drag. When you make lift, you make drag. Within reason, the only difference between a light Mustunt and a heavy one is the extra horsepower required to offset the increased drag. If you are a novice builder and unsure of your ability to control weight in the construction or finishing of your Mustunt, then I suggest you plan to use a larger engine of the 40 class. A Fox 40, O.S. 40 or S.T. 40 would be a good choice. Use an 11-5 or 11-6 prop and run the engine fast enough to keep lap time down to five sec. or a little less. For more tips on trimming heavy airplanes, watch for the coming article about my Sea Fury.

In the past year I have met a number of experienced modelers who also built Mustunts. Some wanted them for practice flying. Others wanted them for contest back-up. They all selected Mustunts because Mustunts build quickly and offer unparalleled opportunity to fine tune their trimming techniques. We agreed that well-built Mustunts average about 40 ozs., and at that weight performance could be improved by using a thinner wing rib to reduce excess lift and drag.

For you experienced modelers who also want a Mustunt but don't feel like building the Mustunt III's tapered wing, I am enclosing here a new, thinner wing rib template for the Mustunt II Advanced. In addition to the Mustunt IIA, this thinner rib should also be a good choice for novice-built Mustunt Is as they invariably build four to six oz. lighter than Mustunt II's and could also probably do with a little less lift.

Now, did I miss anybody? Let's see, maybe we could get the receiver and aileron servo into the thick wing and. . . . ●

FOAM TECHNIQUES II

(Continued from page 50)

Trim colors can be added with Jap tissue or spray dope and outlined with a wide felt marker. I usually spray a dark color on the bottom surface and leave the top white, using spray clear dope with some decorative trim.

At this point, let me describe some of the details applied to different types of planes. Power ships should definitely use a full-depth spar. Less than full depth in the wing will sometimes result in wing failure on a DT landing. . .ask Dr. Gabriel about that. The size of the spar need only have a cross sectional area of about half to 2/3 the area of all spars in a wooden wing. Only one spar is generally needed and should be located at the high point of the airfoil.

Use hard balsa or spruce, depending on how heavy a plane you want to fly. Thin plywood dihedral braces are recommended for models above the ½A size.

Ah, Nordics, those beautiful foam eagles of the sky. Here we have a different set of circumstances than power ships. I have been quite satisfied using only one spar and no leading or trailing edge wood. I find ¼" square spruce is sufficiently strong, and full-depth spars work even better.

I cover Nordic stabs with Jap tissue and use a full-depth 1/16 medium hard balsa spar.

Back to Nordic wings for a moment. On high aspect ratio wings (over 75" span) you can glue on sewing thread at 45° angles, criss-crossed geodetically on top and bottom before covering. This greatly adds to torsional rigidity.

On Coupe d'Hiver and Wakefield models, cover wing and stab with Jap tissue to save weight. Generally speaking, foam wings seem fairly resistant to warpage. One of my Nordics spent five minutes in a lake (it floats, too) and, after 45 minutes drying time on a hot summer day, I flew it again with absolutely no trim changes. I got a max before and after.

In some sections, such as Nordic wings, there may be a longitudinal bow after the panel is dry. It usually bows toward the under-cambered side. This does not seem detrimental to performance; and in fact, when the ship is flying, will disappear due to the load it's carrying.

When the inevitable funny-sounding whump comes to visit your airplane, you will notice the pieces will all fit back together with very few splinters. For on-field repairs, use five-minute epoxy. At home, when you have more time, the curtain climbers have gone to bed and momma is out of the kitchen, glue your bird back together with Elmer's. Give it a few minutes to begin to set, then grab the steam iron, setting it at the lowest heat that will produce steam. Now pretending that the beautiful squenched wing tip is a shirt, iron the wrinkles out. Surprisingly enough, most will come out leaving a smooth wing again.

A word here about attaching your hardware to the finished foam wing or

stab. The secret is to spread the load to a large area. Use aluminum sheet up to .025 thick, wrapping it around the leading or trailing edge, and bend to form DT hook. The aluminum also saves the leading edge of the stab from smashing against the stab rest. On the wings, a piece of aluminum will keep hold-down rubber bands from denting the foam.

To obtain a supply of foam, look in the Yellow Pages under "plastics" or "insulation materials." Most large cities should have several suppliers. In the Dallas area, contact Sales Co., 600 E. Arapaho Rd., Richardson. Be sure to ask for one lb. density expanded bead polystyrene. Also, check your local motorcycle shop for the foam packaging the bikes come in. I pay $3.20 for a 4' x 8' x 1" slab of foam, and that makes a lot of wings.

You will find a list of basic rules with this article that are a product of trial and error experience. Some experimentation on your part might turn up some new ones. As this is written, it is the sum total of knowledge of foam free flight as I know it. Maybe you can add something more. Good luck and happy foam flying.

BLUE RIBBON II

(Continued from page 16)

tablet. It works very easily and makes a beautiful covering for the wings.

Unique to the Komet kit is the use of a vacuum-formed plastic turtledeck for the fuselage. The basic fuselage structure is conventionally built with sheet balsa sides and various bulkheads and crosspieces. The plastic turtledeck is then glued to the balsa frame and forms the entire top surface of the fuselage from the canopy to the tail. It also provides fillets around both the stab and rudder.

The fuselage is a very deep design with the canopy far forward and looks rather European to me. This type of fuselage lends itself well to the installation of retractable landing gear, since there is plenty of room for both the nose gear retract and a fuel tank in the conventional position.

There are two areas which I think some modifications to the basic kit are in order, one of which I feel strongly about, the other may be merely a result of my own conservativism. The first is the need for a plywood doubler in the wing saddle area. The kit provides 1/8" fuselage sides and an 1/8" balsa doubler for this area which seemed to be much too flexible when the fuselage was completed. I added a 3/32 plywood doubler from the leading edge of the wing to just past the trailing edge of the wing which greatly increased the rigidity of the fuselage. In actuality this probably should be done before the two fuselage sides are joined and the doubler should be carried somewhat beyond the point of the trailing edge of the wing—something you can do before you join the fuselage sides, but not afterwards.

The other area where I made a modification stemmed from the fact

that I was going to install retracts rather than conventional gear in the aircraft. The wingspar supplied with the kit does not extend spanwise to the landing gear strut. This is satisfactory with conventional gear, since the mount block for the conventional gear can basically transmit the loads. However, with a retract installation it seems advisable that the wingspar and landing gear mounting structure be tied together directly rather than only through the wingskins via the foam. My solution was to make a new wingspar which extends a couple of inches beyond the landing gear strut position, in a spanwise direction. The spar is equal to the wing thickness (as is the one furnished in the kit) and, therefore, ends up being directly attached to the wingskins. The Goldberg main gears were then mounted to 3/8" sq. hardwood blocks which were epoxied into the wing in a cordwise direction and extended far enough toward the leading edge so that they interlock with, and are epoxied to, the main wingspar. This gave me a structure which distributes the load over a large area of foam and also, in the case of a severe impact, will transmit loads through the wingspar, thus distributing them over an even greater area. I frankly don't know whether all this is necessary or not, but I haven't had any problems yet and it certainly doesn't add enough difference in weight to be worth talking about. Again, this particular modification is only necessary if retracts are used. It should not be required with the conventional gear.

In the photo of the installation of the radio in the fuselage, you'll note there are apparently two on-off switches. Actually, one is the frequency selector switch, the other the on-off switch. The on-off switch can be operated after the wing is installed, but I purposely left the frequency switch without an external link so that there would be no chance of inadvertent switching of frequency. The reasons were many: First, if someone helpfully goes and retrieves my plane after a dead-stick, he won't "turn-off" my radio by switching frequencies and secondly, the temptation to switch frequencies to make a flight in between others at the field is reduced by the effort involved. I think switchable frequencies are great, but we must be careful or someone is going to get shot down. If switching is too easy, control of frequencies gets difficult. I try to stay on one frequency during a day's flying unless it gets too crowded and then I take off the wing, change frequencies, change antenna flags and stay on the new frequency.

It seems as if each new subject I come to in this article is a first for me, but nevertheless, I did use a brand-new technique, at least to me, for finishing this airplane. It was the first airplane that I have painted in over four years, as I have been a great advocate of Monokote. The plastic turtledeck and plywood skinned wings scared me off from the use of MonoKote in this case (I am sorry, Sid, but I never can seem to do a good MonoKoting job over plywood). So, I decided to go back to paint.

Many people in DCRC have recently experimented with the use of automobile type finishes for their airplanes, and so I thought maybe I would give it a go myself. As you know, there are basically two kinds of automobile paints that are applicable to models, both being acrylics, and your choice is between an enamel or a lacquer. I decided to go the route of acrylic enamels. The surface was prepared with two coats of surfacing resin, the entire model wet sanded, and then one coat of the acrylic enamel applied. Fantastic is the only way I could describe the results. That's probably overstating the case a little bit if looking at the finish as a professional, but having never sprayed a model before, having never used any of the materials I was using, I was absolutely amazed at the way it came out so beautifully. This first coat of paint was white and the final airplane is red, white and blue, the paint job being done in three successive evenings. In using the acrylic enamel in multiple colors, one must use a catalyst to prevent bleed through of one color to the other. This catalyst also adds to the fantastic gloss that you get with an enamel and makes the surface almost glass hard. The resultant paint job is very glossy and is impervious to most everything, including fuels.

Brief mention was made of the retracts above, and I think a little more detail on the installation in this case and in general on the Goldberg retracts are in order. I had previously used the main gears in a Lanier Colt which was written up last year in AAM with great success and look forward to equal success with the entire tricycle gear set this time around. In fact I probably anticipated success to the point that I decided that I could go ahead and install it my way and not pay that much attention to the instructions which Carl furnishes with his retracts. In the nose gear installation, I utilized a straight pushrod from the servo to the landing gear without any spring tensioning (a Z bend is adequate) as Carl recommends. The result is that I have broken a number of props because the nose gear has collapsed on me both on landing and a couple of times even when just taxiing around. Inspection of the installation shows that the servo is rigidly enough mounted and that the linkages are of the right length, the throw is alright, and that you can pound on the gear with your hand and it won't collapse. But darn it, when you get out there on the field and start taxiing around or land a little hard, bingo, down goes the nose. Well, I finally went back and put a Z bend into the link so that the servo is experiencing a slight load when the nose gear is down and the problem has gone away. I really can't explain why it happens, but it is obvious that either the servo "twitches" or vibration of one form or another allows sufficient slack in the system for the gear to fold. Pay attention to the instructions and do it the way the guy who designed the thing tells you to do it. There is certainly nothing wrong with the Goldberg retracts if you install them the correct way, and I am sure that many of the other retractable nose gears

on the market will experience similar kinds of problems if you do not follow the instructions precisely.

To make the assembly of the wing and fuselage a lot simpler, I used a separate servo in the fuselage for the nose gear and a second one in the wing for the main gears. My experience with the previous installation had indicated that there should be no real necessity for 180 degree servos to operate the Goldberg retracts. Since I didn't have two 180 degree servos, I decided to utilize conventional 90 degree units and to make an electrical adapter so that I could parallel the two servos off the same channel. All of this has worked well and though a 180 degree servo would probably give more mechanical advantage and, therefore, more force margin, I think that a properly installed set of retracts can be very adequately handled by a conventional 90 degree servo. The use of separate servos for the nose and main gears certainly adds to the mechanical simplicity of the installation.

The new Supertigre Blue Head used in this airplane is simply a fantastic engine. The latest version of the Supertigre Blue Head has had various clearances opened up slightly to give it a higher power output. The particular engine I have must be the epitome of the results that are available. The engine will easily turn 12,700 rpm on a 11-7½ super M prop using a 12% nitro fuel. This is with a muffler installed (of the flow-through type) and with the same

combination the engine idles beautifully at 2400 rpm. Response to throttle is instantaneous and the engine just doesn't seem to even get loaded down, whether you are going straight up or even if it has too big a prop on it. With an 11-7 the thing almost gets to sound like an 049. The engine is easy to start, reliable, and has turned a lot of heads in a club that is very Webra-oriented.

The result in all of the above is an airplane engine radio landing gear system which I have been most happy with and which, though I am not a competition flier, I think would satisfy anyone in its performance. If this were a different magazine, I'd end up by saying, tested, approved and recommended by me, but then Ed Sweeney wouldn't let me do that.

Taurno Carb: An opportunity arose during this review to evaluate a new carb which has recently appeared on the market—the Taurno Carb from Tarno Aero Eng., 942 Grou, Montreal 379, Quebec, Canada. The unit offers some noteworthy features. First, the throttle may be actuated by means of a manual lever which is located just below and on the same side as the main needle valve, allowing adjustment and checkout of the engine without your radio. This is accomplished by having a slip clutch on the drive arm. A second benefit results from the clutch in that the servo cannot stall if the servo throw is greater than the carb throw.

Throttling of the airflow is accomplished by a butterfly plate much like

an automotive carb and the spray bar/needle valve is mounted above the butterfly rather than on the axis of rotation as in rotating barrel carbs. Adjustment of idle is through an idle stop screw and an idle mixture screw. There is no idle air bleed adjustment nor an idle needle valve as I know them. Exactly how fuel is fed during idle is a mystery, as the unit cannot be disassembled (though the entire main needle valve assembly can be removed for cleaning).

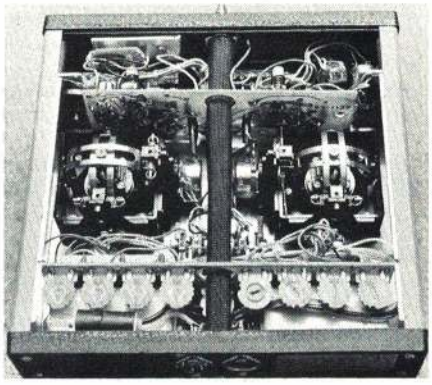
The performance of the carb was every bit the equal of the current Mag III carb which comes on the Blue Head and that means excellence in every way. Both idle and top end were identical and both have excellent transition. If you have an older air bleed type carb, the Taurno would add greatly to the versatility of your engine and the manual operation capability is certainly convenient.

BLUE RIBBON PART I

(Continued from page 14)

and molded plastic that gives a distinctive appearance. The top of the case is sloped at 45 degrees and carries a flight trainer switch, power switch, and the meter. Each system has two selectable RF frequencies on adjacent channels. Selection can be made only with a screw driver at the top right of the case, thus inadvertent switching is almost impossible.

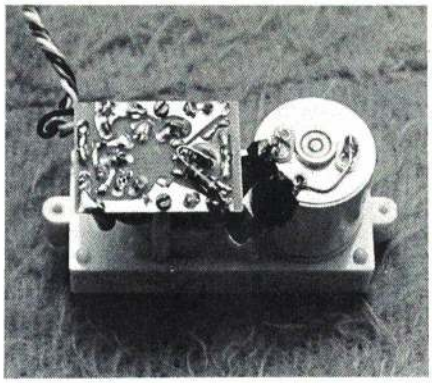
As may be seen in the photos, the set tested uses two sticks of the popular closed gimbal style. Function trim for



aileron, elevator, rudder and throttle are located immediately below or to the side of the appropriate control. Two auxiliary functions are located at the left and right ends of the case. The fifth channel is a switched function, rather than continuously variable for control of retractable gear or other two-position functions.

The transmitter antenna is completely retractable within the case when not in use. Charging receptacles and the charging indicator lamp are located on the bottom of the case.

Electronically, the heart of the transmitter is a new integrated circuit encoder which we will attempt to describe because it is quite unique and interesting. In addition to the integrated circuit, a free running multi-vibrator forms the other active circuiting. A free running multi cycles on and off continuously as long as power is applied, without bene-



fit of any external "clocking" and in itself is used as the clock which sets the frame rate in most encoders.

The lengths of "on" time and "off" time for a free running multi may be equal or widely different, fixed, or independently variable. The ratio and amount of control are established by the value of timing capacitors and resistors in each half of the multi. Assume for the moment that the capacitors are fixed and the time constant for on and off time may be varied by a potentiometer in each side. If the on and off times were set at 1.5 plus or minus 0.5 millisecond, variable independently, two channels of digital encoding are practical. This technique was used in the more than two channels are available. Heath performs that switching function with a ten-bit shift register which they have had designed and manufactured for

(Continued on page 102)

Editor
Carl Wheeley

MODEL AVIATION

Official magazine

A.M.A. NEWS

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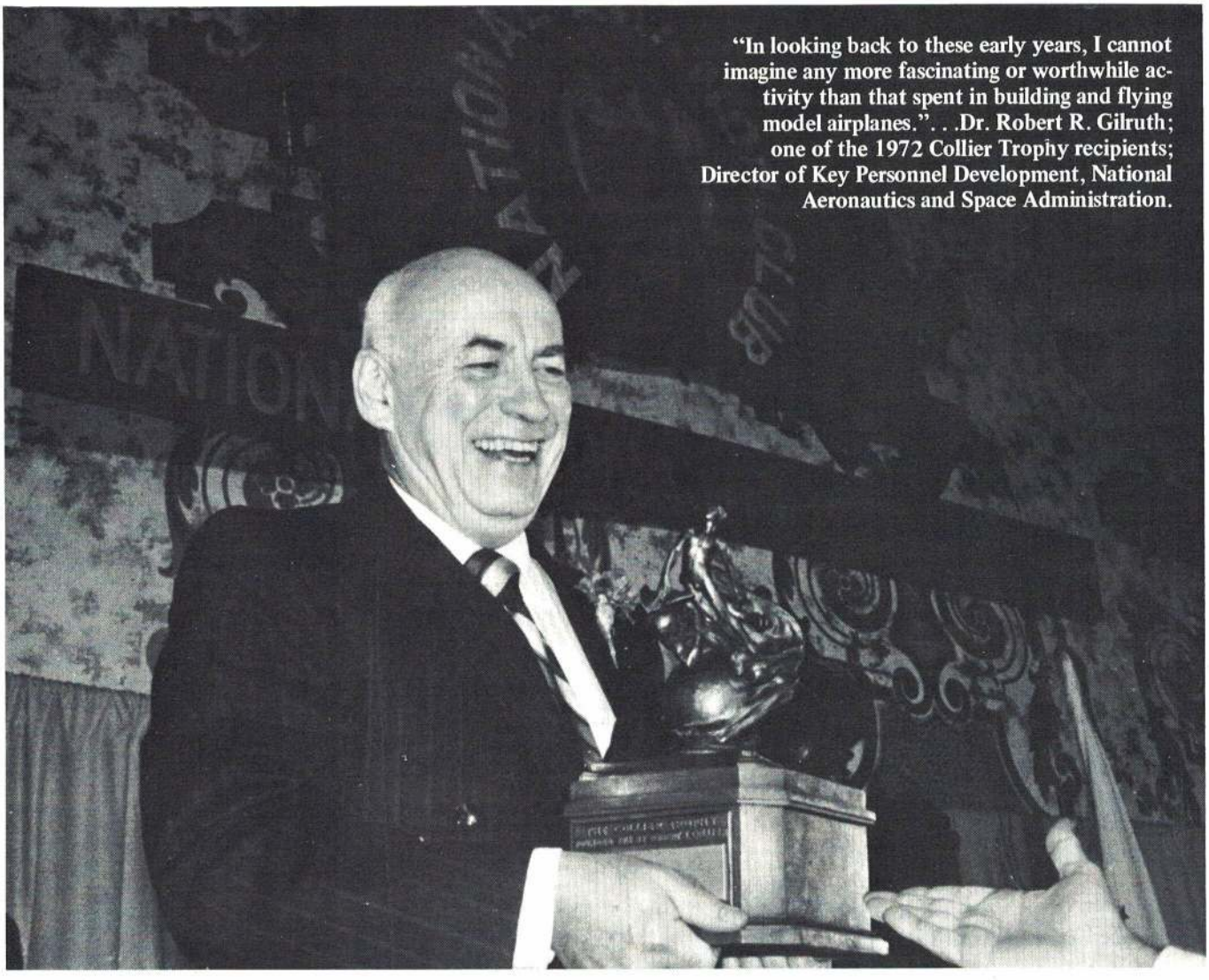
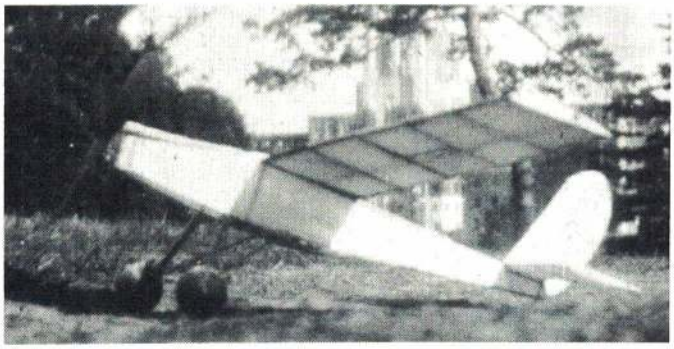
Collier Winners Credit Model Airplanes



"In looking back to these early years, I cannot imagine any more fascinating or worthwhile activity than that spent in building and flying model airplanes."...Dr. Robert R. Gilruth; one of the 1972 Collier Trophy recipients; Director of Key Personnel Development, National Aeronautics and Space Administration.

America's most prestigious aviation award, the famed Collier Trophy, was presented in 1972 for achievements every model builder and flyer can relate to. The trophy winner, in an exclusive story for the Academy of Model Aeronautics, credits his youth and background of model aircraft experimentation for the career development which led to his leadership of the effort to land men on the moon. Here's the story by Dr. Robert Gilruth as given to AMA Historian Willis C. Brown.

Since I was a very small boy I have been fascinated by all kinds of high-speed vehicles, especially airplanes. At the age of five, I can recall seeing pictures of flying machines of World War I and of the German Zepplins. I saw my first real airplane a year or so later when a barnstorming pilot reached Duluth,



Lindbergh Spirit of St. Louis influence shows in Bob Gilruth's 1928 rubber power model design. This was when he was age 14.

Right: Dr. Gilruth, at lower level, with Charles Mathews (L) and Dr. Faget viewing first Mercury capsule to reenter the atmosphere—September 1959. Charles "Chuck" Mathews is currently Associate Administrator for the Office of Applications; Max Faget is Director of Engineering and Development. Both are now at NASA's Manned Spacecraft Center, Houston, Tex. This picture was taken when all worked at the NACA labs at Langley Field, Va., along with many modelers who were employed on aeronautical and space research projects, including AMA Executive Director John Worth. Worth worked with Mathews in the Flight Research Laboratory; he and Faget were among members of the Brain Busters Model Club.

Minn., and I saw him do acrobatics while carrying people at $5 a ride.

My early airplane models were constructed of spruce and used strips of rubber cut from inner tubes of old tires for the power supply. I built flying models of the NC-4, the SE-5 Scout, the Curtiss Hawk, and many others of that vintage. From these early experiences, I learned that the center of gravity of the model had to be well forward on the wing if it were to fly in a stable fashion. This was difficult to achieve using rubber for a power plant, without large amounts of ballast in the nose.

I remember the stimulus the American Boy Magazine gave to my model building career when articles by Merrill Hamburg were published giving plans and directions for building such delightful models as the Baby ROG (rise-off-ground) and others. I learned from these articles about balsa wood, piano wire and Japanese tissue—materials which made model building a lot more fun.

About the same time, the Duluth News Tribune sponsored a model building class and indoor contest. Mr. Rappold, from Chicago, led the group. We built identical models of a single propeller tractor design. I placed 2nd or 3rd in the contest, but I learned a lot about model building techniques.

A year or so later Colonel Lindbergh made his famous flight from New York to Paris. This event gave a great impetus to aviation the world over, and it was also effective in stimulating interest in airplane building. Of course, I built models of the Spirit of St. Louis. My main interest, however, was in the theory of flight and in devising better ways of designing and building models. I sent away to the NACA for technical reports on wing sections. I can recall using the median line of airfoils, such as the Clark Y, as a basis for the camber of my model wings. I tried to find the best structural arrangements for my models by asking my high school science teachers difficult questions, and I invented items like feathering propellers to increase the glide endurance.

All my model building experience occurred before the introduction of gas-powered models. Rubber band motors were inexpensive and within the reach of all. Even a poor boy could build and fly model airplanes. It was also true that the models were simple enough so that a research-minded lad could try many types of wings, tail surfaces, and propellers to determine which were the best. I built many models, including twin pushers, single pushers, single tractors with and without landing gears, as well as model seaplanes.

Model building proved to be an inspiration to me in my studies and influenced me to major in aeronautical engineering at a time when most people said that airplanes would never be of much importance. Subjects like mathematics, physics, and mechanical drawing took on a new meaning because I felt that these subjects would be invaluable in design-

NASA's Dr. Robert R. Gilruth, who led the research team which began developing the program for this nation's first venture into manned spaceflight, and the Apollo 15 crew, were designated as the recipients of the Robert J. Collier Trophy for significant achievement in aeronautics for 1971.

The Robert J. Collier Selection Committee, headed by Frederick B. Lee, Chairman of the Board of the National Aeronautic Association, while recognizing the superb skill and courage of the astronaut crew, honored Dr. Gilruth as representative of the engineering genius of the manned spaceflight team which culminated in Apollo 15—"Man's most prolonged and scientifically productive lunar mission."

The trophy was established in 1912 by Robert J. Collier, publisher and pioneer aviation enthusiast, as the Aero Club of America Trophy. In 1922 the Aero Club of America was incorporated as the National Aeronautic Association and now has aero clubs throughout the United States as chapters. NAA is the official U.S. representative of the Federation Aeronautique Internationale, the organization responsible for the authentication of all official aviation and space records on a world-wide basis, and is composed of more than 60 member nations.

In 1944 the association renamed the award the Robert J. Collier Trophy. It is awarded annually "for the greatest achievement in aeronautics or astronautics in America, with respect to improving the performance, efficiency or safety of air or space vehicles, the value of which has been thoroughly demonstrated by actual use during the preceding year."

The first two awards went to Glenn H. Curtiss, for development of the hydroaeroplane in 1911 and for development of the flying boat in 1912. The following year the recipient was Orville Wright, for development of the automatic stabilizer. More recent recipients have included Vice Admiral William F. Raborn, James E. Webb, Hugh L. Dryden, James S. McDonnell, Lawrence Hyland, the Apollo 8 and 11 crews, and in 1971 The Boeing Company as leader of the industry-airline-government team which successfully introduced the 747 into commerical service.

Astronaut Neil Armstong and the crew of Apollo 11 received the Collier Trophy for 1969's first landing of man on the moon. Picture is from the 1964 AMA Nats—Armstrong was honorary CD. He's a modeler—see reproduction of letter at right.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS 77058

IN REPLY REFER TO: CB

APR 2 0 1970

Mr. John Worth
Executive Director
Academy of Model Aeronautics
1239 Vermont Avenue
Washington, D.C. 20005

Dear Mr. Worth:

The following are the answers to the questions in your letter of 10 April:

1. I flew in model aircraft competitions during the years 1946-1950.

2. I was a member of the U. S. Navy team at the 1949 Nationals (control-line, speed), but was not a winner.

3. I was an AMA member for a number of years in the 40's, but do not have the dates.

4. My model building and flying activities significantly contributed to my interest in aeronautics and was a primary force in directing my education toward aeronautical engineering.

I was honorary control director at the 1964 Nationals at Dallas and also 3 or 4 years earlier at Glenview while I was in the X-15 program.

I look forward to seeing you at the Collier event.

Best wishes,

Neil A. Armstrong

USAF Col. Frank Borman, 4th from left, and the crew of Apollo 8 received the Collier Trophy for the 1968 first manned lunar orbit mission. Borman, another former AMA member, was also the recipient of AMA's Distinguished Service Award—the plaque having just been presented by John Patton (3rd from left) who was AMA president at the time. A bevy of former AMA presidents was present for the joint occasion. L-R: John Worth, Al Lewis, Walt Good, Willis Brown, Maynard Hill, Howard Johnson, Frank Bushey.

ing full-sized airplanes. My ambition was to design and build superior aircraft—not just to fly them. After graduation from college, I did design work on several aircraft, the most notable one being the Laird Watt Racer of Rosco Turner's with which he won the Thompson Trophy. I was not the chief designer of this airplane, but I did a large part of the aerodynamic design and much of the structural design. This experience was excellent preparation for the years I was to spend in flight research.

In those early days I could not have believed that someday man would fly to the moon and that I would have a part in the design and flying of the lunar vehicles. However, it was the same driving interest in flight that guided me all through my early years in

PRESIDENT'S MEMO

The Flying Site Problem

As I soberly reflect (best done here at the typewriter at about 2 AM!) on the problems which seem to touch all builders of model airplanes I believe that the biggest one is probably that of finding suitable and acceptable flying sites. Suitable and acceptable, that is, in the eyes of both the community and the active modeler. And this is a problem which affects not just one category or group, but is universal, whether it be just good old sport (or "Sunday") flying, competition flying, Free Flight (indoor or outdoor), Control Line flying, or Radio Control flying. I guess that to the active model flyer the finding of a flying site closely parallels the "common cold" as an ailment for which there is no universal remedy!

Of course the problem is often our own fault–we have lost many flying sites due to noise or safety problems we ignored. Also, because the hobbiest himself has taken to our sport so enthusiastically, the manufacturers have furnished us with such excellent materials, and the "image builders" (PR types) among us have boosted the image-acceptance of our activity to where we need a lot more sites than seem to be available. We have had a hand in building ourselves a "Frankenstein!"

But many of the modeling clubs, or groups of clubs, have done a beautiful job of solving the flying site problem in their communities, and we are sure going to "lean on them" for help for the rest of us. But please know that where there has been success in developing suitable flying sites, it has only been done after a heck of a lot of "LEGWORK," CONTACTS, COMPROMISE, and just plain old HARD WORK on the part of somebody or a group of these "somebodies!"

I have visited a bunch of fine flying facilities around the country and I think that we need now to ask the groups who have been successful to do a little "chest pounding" and let us in on their secrets of success. It would be a beautiful gesture of cooperation if they would tell us their stories of how-they-went-about-it so the rest of us could use this for guideline purposes. We need information on both success and mistakes in order that we have a well rounded picture.

AMA presidents surround Collier Trophy winner Dr. Robert Gilruth following the awards dinner. L-R: Willis Brown, first AMA president; Gilruth; John Clemens, current AMA president.

Considering this, if your club or group has been in any way successful in obtaining flying sites, please send your story or information to AMA Headquarters, identified as for this purpose. If possible I would like to be copied direct on this information, it being one of the areas where AMA can be most effective. Please include your planning, leadership, number of modelers affected, contacts made, funding, policing, maintainance, qualifications for use of facilities, the physical layout, any photos available, the problems you face, and how you solved them.

That sounds like an awful lot to ask, but this could easily be one of the most important things that you, your club, and AMA ever got together on. This could easily be the vehicle that would furnish a tremendous boost to the accepting and dignifying of air-modeling nationwide, and a wonderful "help your buddy" gesture. This can be something that everyone can enter into, because you may have already SOLVED YOUR PROBLEMS and can help others do likewise, or you might be HURTING because you HAVE THE PROBLEM and need help.

If your problem is such that you can't wait for help to be relayed to you, your quickest way to get action is a DIRECT APPROACH within the community and TO ITS LEADERS. Backing-off sure won't get you anything! Air-modeling is certainly as important and dignified an activity as any other sport or hobby, and DESERVES TO BE EAGERLY RECOGNIZED AND ENCOURAGED BY THE COMMUNITY. If community recognition is not readily gained, then I think you have every right to be insistive. OTHERS HAVE BEEN! This will only work where the modelers have gone to the trouble to gather together and organize so that a concerted front is offered.

Along with your approach to the community leaders goes a burden of responsibility on the part of the modelers to agree to act in consideration of the general public. The reward for this thoughtfulness should be public acceptance of this fine leisure time activity.

With a glance at the calendar, I sincerely hope your Holiday Season has been a joyous one, and that you have a HOBBY NEW

John E. Clemens
AMA President

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research with aircraft, then into the guided missiles, and finally on into space flight and the voyages to the moon.

Model airplane building has been important to others in the space program. Max Faget, who has contributed so much to the design and development of the Mercury and Apollo spacecraft, used to build and fly model airplanes. So did Caldwell Johnson, chief of the design department of the Manned Spacecraft Center. Hewitt Phillips, head of the Flight Dynamics Division at Langley Field, who has made many contributions to the spacecraft problems, was a highly successful model builder as a boy and continues in the activity to this day.

In looking back to these early years, I cannot imagine any more fascinating or worthwhile activity than that spent in building and flying model airplanes.

BACKGROUND. Three officers of the Academy of Model Aeronautics were guests of the National Aeronautic Association at the 1972 Collier Trophy presentation: Willis Brown, the first AMA president (1936) and currently AMA historian; John Worth, 13th AMA president (1963) and current AMA executive director; John Clemens, 18th and current AMA president.

The presentation, hosted jointly by the National Aeronautic Association and the National Aviation Club, was held at the Sheraton Park Hotel in Washington, D.C., with Vice-President Agnew as featured speaker. Other notables present were many of the NASA astronauts, previous Collier Trophy winners, senators and congressmen, and aerospace industry leaders.

This was not the first time that AMA officers had been present at Collier Trophy presentations in honor of modeler recipients. In 1969 and 1970, former AMA members and astronauts Frank Borman and Neil Armstrong, respectively, had been presented the award–Borman for being the command pilot of the first crew to circle the moon and Armstrong for being command pilot of the first crew to land on the moon.

At the 1969 Collier event Dr. Gilruth was a spectator, seated at the same table with Willis Brown and other AMA officers. From this association developed conversations and correspondence which led to the story presented here.

RC/WC Charter Flight to Italy

Gorizia, in northeastern Italy, right on the border of Yugoslavia and only 60 miles from Venice, the legendary city of gondolas and streets of water, is the locale for the 1973 Radio Controlled Aerobatic World Championships. Only 50 miles from Austria, just over 100 miles from Germany and 150 miles from Switzerland, Gorizia is also only 10 miles from the resort city of Monfalcone on the Gulf of Trieste, near the Adriatic Sea. What a setting for a fabulous vacation!

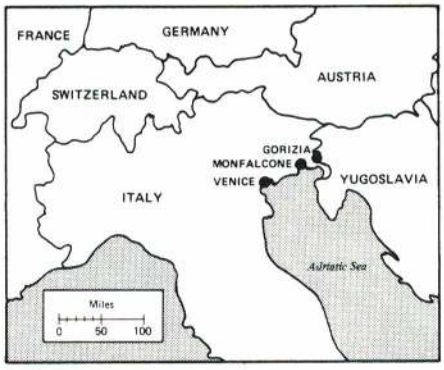
Many AMA members and their families who attended the 1971 RC World Championships in Doylestown, Pa., have been making plans ever since to visit the scene of the next event. Their requests to AMA officers have resulted in a special charter flight being arranged, the details of which follow; also see accompanying ad.

The flight package is planned to combine attendance at the World Championships and also time for visiting others parts of Italy and nearby countries. For the first nine days all transportation and lodging arrangements are included, plus full breakfasts. The last few days are unplanned, to provide for maximum freedom of vacationing.

Here is the current package being offered:

Depart U.S. on September 7, 1973 via chartered jet, 2 days in beautiful Venice, 7 days in the coastal resort of Monfalcone on the Gulf of Trieste, 5 days of unplanned itinerary. Return to U.S. on September 22 via chartered jet.

INCLUDED: Round trip air fare between Washington, D.C., and Venice, hotel accommodations and full breakfast daily. Transfers



between airport and hotels. Private coaches daily to/from the field in Gorizia (10 miles north of Monfalcone: two coaches at 7 am and 8 am to Gorizia, and at 5 pm and 6 pm from Gorizia to the hotel in Monfalcone. Hospitality desk in each hotel. Professional tour escort to assist in all travel matters throughout the tour.

All taxes, service charges, gratuities, and tips for the first nine days included in the package price of $360 per person (including new $26 tourist tax for Italy), based on 2 persons sharing a room; standard accommodations with private bath. For first-class accommodation add $25 per person; for superior accommodations add $60 per person.

NOTE: Lodging, breakfast, and ground transportation for the last five days are not currently included in the $360 package; this is to permit maximum flexibility for other travel or sightseeing. However, a special package at extra charge may be arranged for these five days for those desiring same—who should make note of this when sending the coupon in the ad accompanying this information.

OPTIONAL: Car rental available from $32.35 - $82.43 per week, unlimited mileage. Tax, insurance, and gas not included in above rates. Rates quoted are for five Fiats ranging from small to large sizes; the first category (smallest $32.35 plus mileage per week, category five (largest) $82.43 plus mileage per week. Extra days may be added to the weekly rate at pro-rata charges.

How you can get on board: For more information, write or call now to AMA HQ, 806 15th Street., N.W., Washington, D.C. 20005; phone: (202) 347-2751. Give name and address and number of people interested. Better yet, to be sure of getting a reservation, send a $50 deposit—full refund will be made if you cancel out before June 1.

JIM KIRKLAND
1924-1972

Jim Kirkland, one of the nation's top RC competitors, died of a heart attack on November 4, 1972.

Kirkland was an active modeler for 36 of his 48 years, winning over 200 trophies. As a competitor he was extremely cool under pressure, liked by all, and successful—a high placer at many National Contests, including Nats RC Pattern Champion in 1963 and 1970, a member of the 1969 RC World Championships team, and participant and high placer at the 1970 and 1972 RC Masters U.S. Team Selection Tournaments. He was an administrator, also, having served as AMA District V vice-president.

Kirkland was a superior designer/builder whose creations in airplanes and equipment will continue to influence modelers for years to come.

He is survived by his wife, Mignon, and son, James, Jr., to whom we extend our deepest sympathies.

This Is the Last Issue For 1972 AMA Members

Only those who renewed memberships by December 16 can be assured of receiving continuing issues of American Aircraft Modeler without interruption. 1972 AMA members who didn't pay 1973 dues by this date likely will miss the March issue. It's simply the mechanics of magazine ordering and mailing. The March issue is mailed in January, but it's December when copies have to be ordered and the mailing tape of addresses has to be prepared.

Similarly, for subsequent issues, it's necessary to get membership processing initiated as soon as possible—it's too costly and complicated to do anything else. If you haven't signed up for 1973 AMA membership yet, do it now in order to avoid losing any more service—if your dues payment is received by January 15th, you will receive the April issue which is mailed in February.

AMA News Extra. . .

CLEMENS RE-ELECTED AMA PRESIDENT

With only scant opposition in the form of ballots cast for others, Johnny Clemens has been re-elected AMA president for the 1973-74 term. In a way it is not surprising that Clemens won so handily; he was the only candidate for president on the ballot, a tribute to the effectiveness of his first term as president. Yet the possibility of a big write-in vote was present because of agitation during the voting period by some AMA members who were unhappy with policy decisions made earlier by the Executive Council (AMA's board of directors) which is headed by Clemens as president.

When all of the 5,087 on-time ballots had been counted, the tally was 4,652 for Clemens versus 207 for write-ins (228 others voted only for district vice-president). The top presedential write-in was for Don Dewey who received 71.

Two district vice-president contests were much closer. In District VI, Glenn Lee won out over Art Johnson by only 12 votes, and Bob Vojslavek, a write-in candidate, was not far behind with 173. Alex Chisolm, the incumbent in District X, kept his seat by collecting 70 more votes than challenger Jim Scarborough.

Following is a tabulation of voting by AMA district. Those elected are shown in capital letters.

AMA Dist.	Votes for Clemens	Write-Ins P	Write-Ins VP	Vice-Presidents
I	304	11	-	J. TITUS--598; J. Droesch--273
II	806	25	13	
III	474	10	-	J. SPALDING--434
IV	391	16	20	
V	337	30	-	G. LEE--284; A. Johnson--273
VI	640	28	183	
VII	300	16	-	M. FRANK--367
VIII	373	10	6	
IX	154	12	-	A. CHISOLM--489, J. Scarborough--419
X	802	46	4	
XI	71	3	-	
Total	4652	207	226	

Note that the election in 1972 was only for about half the AMA officers: the president and V.P.'s for even-numbered districts. In 1973 the election (for the 1974-75 term) will be for national secretary-treasurer and V.P.'s in odd-numbered districts. By staggering the election in this manner there is always about half the Executive Council with prior experience.

OCIE RANDALL

It is with deep regret that we advise of Ocie Randall's death on November 15 from a heart attack. Ocie was a prime mover of the Fresno Gas Model Club in California, a group sponsored by that city's Exchange Club--active since formation in 1940. The club is famous for its Monthly Free Flight Contests, many of which were directed by Ocie, and for its monthly Fresno Model News, "The Voice of the West Coast Modeler". Some time ago the AMA Executive Council recognized Ocie's extraordinary service to modeling by bestowing upon him the title of AMA Fellow.

The newsletter's 31st anniversary occurred in April 1972. For all except a few months of those 31 years the paper was put out by Ocie and his wife; and his job didn't stop at writing--he typed stencils, did mimeographing, stapling and mailing. His was a devotion and dedication which virtually is unparalleled.

Ocie's voice has been quieted, but his ideals and principles will remind us all of the good things about modeling for years to come.

NEWS bits

Secret to Successful Auction

A successful club auction, according to the Northern Conn. RC Club Newsletter (Bernice Williams, editor), requires a low asking price for bids to start. The club learned from experience that the unsold goodies in most cases were simply priced too high. The newsletter suggests that it is folly for a seller to expect to get paid for his labor or to get all his money back. Instead, set a low starting price and then "watch the club enthusiasm take over," where the bidding often goes well over what the seller expects.

Maybe It Stalled

How many times have you heard an RC pilot blame his radio equipment for a takeoff crash? The situation we're talking about is when the airplane takes off with just barely enough airspeed, climbs out on the ragged edge of a stall, starts left-hand turn–and suddenly the left wing drops and the plane tucks under and spins in. Then comes the anguished cries of the flyer: "I lost it! I didn't have anything! This [foul language] radio quit, just went dead. I tell you I didn't have anything!"

This was the subject Don Henry wrote about in a recent issue of Contacts, newsletter of the AMA chartered Kansas City RC Assn., under the subtitle of "If you had paid attention last time I told you, you would still have an airplane."

In the situation Henry describes, the fault isn't the radio at all; rather, it is the failure of the pilot to let the plane obtain sufficient airspeed before beginning the turn. Henry explains that several things happen shortly after takeoff which the pilot should realize, but all too often temporary amnesia sets in. The takeoff and straight-and-level flight are good because, being into the wind, sufficient airspeed is easily obtained. But when the cross-wind turn is made, the first and most obvious thing that happens is loss of the head-wind, reducing the airspeed to close to the stalling point. And other things are happening during the turn. The wing loading of the plane is being increased due to centrifugal force–which also increases the minimum speed at which a stall will take place. Furthermore, the inside low wing is traveling slower than the outside wing.

The moral is to not be too quick in blaming the radio. The whole problem might just be a stalled airplane.

Club Size–Food for Thought

Several years ago Stew Vance (AMA 30476), editor of the District of Columbia Radio Control Club Newsletter, all but stopped flying RC planes. Although he had "years of outstanding pleasure from the RC game/hobby/sport," he also said he didn't want to get back into that "rat race."

Why does Vance as a part of the 200-plus member DC/RC Club consider RC flying a rat race? Too many pilots, too few frequencies. His experience in a large club has caused him to stand in line waiting too long for the "pin." With so many people involved, RC became "one of the most emotional lines I had ever been in in my life," he said.

Vance, however, does suggest a solution for those who may have a similar problem–smaller groups/clubs. He reasons that a handy sized flying group of about 50 members is not confronted with the impersonality of the stranger. Furthermore, a smaller club from the same neighborhood will be able to deal with their problems more efficiently simply because they are a smaller and closer unit. The advantages of a smaller group, Vance said, also include the chance for better relationships with authorities, more space, and more individual flying time.

Historical Note: About 94% of the more than 800 AMA chartered clubs have 50 members or less.

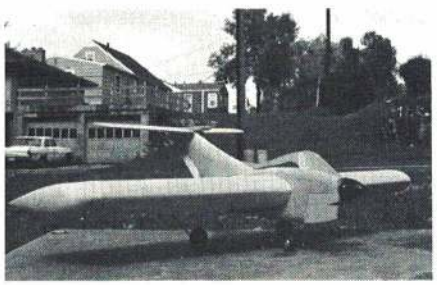
Need for Identification

"All flyers at the flying site will prominently display their current AMA membership card (either original or copy) on their person," is now a regulation of the AMA chartered Southern Alameda County (Calif.) Radio Controllers' General Operating Rules.

The motion was initially introduced by the club's newsletter editor, Dick Franco (AMA 54801), and passed by the assembled membership at a club meeting.

Franco's reasoning is this: AMA chartered club insurance is protection for a club in which all members are also AMA members. Any accident caused by a non-AMA member belonging to the club results in the voiding of the club insurance. Furthermore, because of the club status, individual members may be held responsible for club liabilities. So one who breaks the rules may jeopardize all.

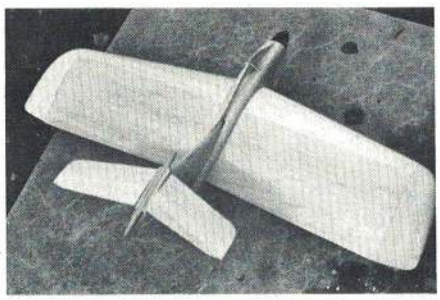
Franco continues to reason that with new members joining the club so frequently, call-



"Teal" is the name of this CL Stunt model by designer/builder Pete Simonson. Built for competition flying, it has features not common to most such models: very short coupling, ultra thick (25%) wing airfoil thickness, T-tail "stabilator". Simonson is the energetic editor of the Minneapolis MAC's newsletter.

Above: Simulated bombing by an RC plane of the foundation line for a new shopping center in Wichita, Kans., the idea of developer/modeler/Dist. IX AMA V.P. Stan Chilton. Pat Jones, AMA 65165, flew the plane (not in picture) at 10-ft. height while A.D. Coe, AMA 2514, kneeling, sequentially detonated flour-loaded blasting caps.

Left: First RC plane for Jim Boydston, Renton, Wash., a Skylane 62, logged 237 flights in six months for 33 hours of stick time. Member of the Boeing Hawks.



ing each by name would certainly make them feel more comfortable.

Specifically, he suggests that each member plasticize his membership card or a copy of it and simply pin it to his hat or flying jacket. This will assure 100% AMA membership and prevent many unnecessary hassles.

News for All

No time to read all the news? Ray Jarvi (AMA 63780) of the AMA chartered Propbusters, Rapid City, S. Dak., suggests that, at club meetings, each member be given an exchange newsletter to read (to himself) from which he would be asked to pick the most interesting article for reading to all the other members. In this way, relates the club newsletter, all of the club members could benefit from the dozen or so exchange newsletters the club receives. Previously it was possible for only a few of the Propbusters to read the newsletters; the new system is hoped to be an improvement.

Instinctive Correction

Gleaned from the Signal Squeakers, newsletter of the AMA chartered Signal Seekers RC Club, Lansing, Mich., is information about a club flight instruction program being developed by Pete Waters (AMA 56911). The key, he feels, is to locate those members of the club who are good instinctive flyers, enroll them as instructors, and provide them with proper identification so that the fledgling flyer will be able to know who to ask for help.

Waters stresses the need for the instinctive capability of instructors. "Just think of helping a beginner, and suddenly he has it spinning down so that, by the time the box has swapped hands, the model is really close to creaming itself. Instinct pays off!"

Another aspect of the Signal Seekers' proposed program is the issuing of cloth patches denoting three pilot levels: Novice (not able to fly solo), Pilot (soloed but still learning) Instructor (good competent flyer).

Class A Pattern Split

The Crescent City RC Club of New Orleans has received glowing comments from their contests in which the standard Class A Pattern was divided into two divisions, A-1 and A-2. According to Flyaway II, the club's newsletter edited by Bud O'Brien (AMA 10700), A-1 is for those who have never flown in an AMA contest while A-2 entries have flown in a contest before but have not placed higher than fourth.

Those who commented thought that the CCRCC's approach was something needed to encourage more novice flyers to try competition.

Send Pictures

Readers tell us that they enjoy seeing what other AMA members are doing and flying through the pictures printed in the AMA News section. It's a service we enjoy providing, but it is dependent upon photo submissions by the readers.

Won't you help? All types of photos are needed: RC, CL, FF, Indoor, Scale, Action, posed, construction, gimmicks, etc. All types of prints are acceptable, black-and-white or color—including the instant development type. On the back of each print write the name of the photographer, the names of the persons and models shown, and a brief description of each model's features. No payment possible for photos used, but photographers will be credited. Send pictures to Publications Director, AMA HQ, 806 Fifteenth St., N.W., Washington, D.C. 20005.

Contest Calendar

Official Sanctioned Contests of the Academy of Model Aeronautics

JAN. 6-7—VAN NUYS, CALIF. (AAA) Western States CL Championships. Site: Sepulveda Basin. B. Cohen CD, 7323 Amestoy Ave., Van Nuys, Calif. 91406

JAN. 20-21—BUCKEYE, ARIZ. (AAA) Southwestern FF (Cat. I), CL & RC Regionals. Site: Buckeye Airport. E. Hagerlin CD, 8331 E. 3rd St., Tucson, Ariz. 85710.

JAN. 27-28—BEARDSLEY, ARIZ. (AA) 2nd Annual Southwestern RC Championships. Site: Beardsley. W. Cranston CD, 6823 N. 38th Dr., Phoenix, Ariz. 85019.

FEB. 4—GREEN BAY, WISC. (A) Polar Bear FF (Cat. II) Meet. Site: Frozen Green Bay. R. Cowles, Jr. CD, 2424 Ducharme Ln., Green Bay, Wisc. 54301.

APRIL 28-29—FT. WORTH, TEX. (AA) 3rd Annual RC "Lone Star Airobatic Convention." Site: Benbrook Lake. L. Stanfield CD, 1813 Montclair, Ft. Worth, Tex. 76103.

MAY 5-6—HUNTSVILLE, ALA. (AA) 13th Annual Rocket City RC Meet. Site: Old Huntsville Airport. G. Martin CD, 3412 Hutchens Ave., Huntsville, Ala. 35801.

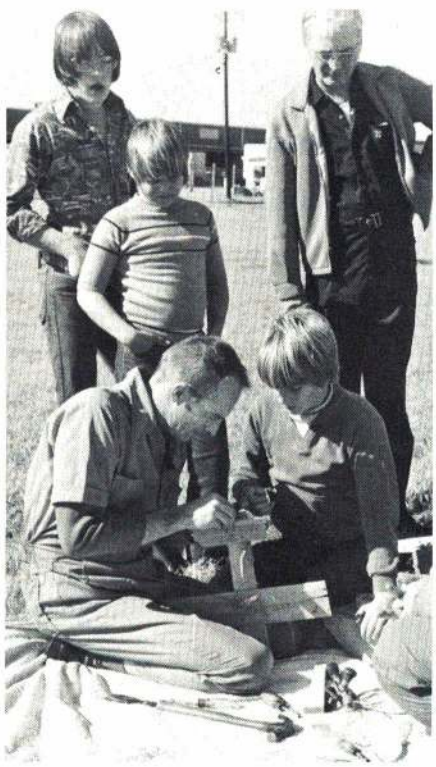
MAY 19-20—JACKSONVILLE, FLA. (AAA) 1973 FF (Cat. II), CL & RC Rebel Rally. Site: Whitehouse N.A.S. F. Carney CD, 1839 Loyola Dr., Jacksonville, Fla. 32218.

JUNE 2-3—BATON ROUGE, LA. (AA) "Cajun Classic" Baton Rouge 12th Annual RC Meet. Site: Kleinpeter Field. H. Roberts CD, 9243 Hampton Way, Baton Rouge, La. 70814.

AUG. 12—PIKE, N.Y. (AA) Western New York FF Society Meet. Site: Pike. D. Evans CD, 175½ South First, Bolivar, N.Y. 14715.

Hobby Dealers—Clubs—Leaders: need AMA application blanks? For a free supply write to AMA HQ, 806 Fifteenth St., N.W., Washington, D.C. 20005. Specify how many are wanted.

Right: Jim and Mark McEndree, kneeling, were winners of the Irving (Tex.) Model Club "Tomato Crate" Race by being first to put their .35-engine plane together from crate pieces and then successfully fly 10 laps. Innovations such as C-clamp tip weights and plastic tape control hinges were seen. Wonder if the New England CL clubs hold "Cranberry Crate" Races? Photo by Will Rathke, submitted by George Taylor.



It's not often that a flying model is accepted for exhibition in the National Air and Space Museum in Washington, D.C.; when it is, you can be sure that it is truly exceptional. Such is the case with Bill Harney's Control Line B-25H, 11 years in the making—later stripped down to bare wood and completely rebuilt. Shown at the presentation (L-R) are Frank Ehling, AMA technical director; Harney; and key museum officials Lou Casey, Robert Mikesh and Mel Zisfein. Smithsonian Institution photo.

BLUE RIBBON PART I

(Continued from page 93)

them. Each time the free running multi Kraft KP-2B reviewed in AAM some time ago. However, it was limited to just two channels. Suppose now for the moment that we may select another control pot with each cycle so that shifts from one half to the other, the shift register moves one position and connects a new control pot to the multivibrator until all eight channels are commutated. At the last shift, the register connects, not to a control pot but to a register of much higher value that produces a much longer on time of approximately four milliseconds for the synchronization pause. When the synchronization pause is complete, the free running multi assumes cycling at the nominal controlled 1.5 millisecond half-period for eight more cycles and so on.

Each shift of the free running multi is differentiated to produce the required "spike" for modulation. The "spike" is amplified, shaped, and expanded slightly by the modulator. In this case, the modulator is a one-shot multi-vibrator which turns on for a nominal 350 milliseconds each time it receives a "spike" at the input. The encoder circuit board contains the encoder and modulator and acts as the wiring terminus for all the eight control pots and the range control for each. In addition, the battery charger components are located on this board. A voltage dropping register and a diode provide series charging of the transmitter's 9.6 V supply and the 4.8 V airborne pack at a nominal 50 milliampere-hour rate. The operator of any of these type chargers is cautioned to avoid operating the charger with the transmitter cover removed and to avoid handling the equipment when barefoot if the system is being charged.

A trainer or "buddy" arrangement is provided and connection is made at the bottom of the case. The trainer button is at the top of the case. The selection of trainer and master transmitter is determined by selection of the proper end of the connecting cable. The student has control as long as the instructor depresses the trainer button.

The transmitter RF section is prebuilt and pre-tuned so that the modeler need not have it tuned by a holder of a second class FCC license. A master oscillator, with either of the two adjacent-channel crystals selected via a rotary switch, generates the RF. A stage of modulation and amplification then feeds the final amplifier. The output is coupled to a base-loaded antenna. A small amount of output power is capacitively coupled to the meter circuit and rectified to drive the meter.

The receiver design is about the same as the previous Heathkit receiver. However, the same IC used in the transmitter is also used for decoding. The major departure from most current receivers is the use of crystal filters instead of IF transformers. These crystal filters operate at 453 MHz instead of the familiar

455 MHz IF. Thus, the local oscillator crystal is ground for a frequency 453 MHz removed from the transmitter frequency. Don't attempt to substitute Heathkit crystals for others and vice versa!

Because of the use of crystal filters, an autodyne converter is used for mixing of local oscillator and received frequency to create the 453 MHz IF. The receiver has two crystals, selected via a slide switch, which match the transmitter frequencies. There is one peculiarity the author has experienced in the past with this arrangement—almost all the AGC takes place at the converter. If there is a receiver problem, it is nearly impossible to determine whether the problem is ahead of, after, or in the crystal filters. The only foolproof way to find out is to inject the proper signal, starting at the output end of the receiver and working backward.

A clipping network at the output from the receiver reduces the possibility of impulse noise and provides a clean set of pulses to the decoder. The decoder contains a two-transistor pulse amplifier which amplifies and squares the pulse train to form the clock pulses for the shift register decoder. An added internal bit of circuitry in the IC, coupled with an RC pulse stretcher, forms the required sync pulse for the IC. We have described the functioning of shift register decoders in a number of previous receivers.

The servo amplifiers for the two servos are the same except for minor differences to optimize feedback for the differing motors and mechanism characteristics. A ten-pin flat pack IC, produced by Motorola for Heathkit, is used in both. Complementary silicon output transistors are used in addition to the ICs, thus a center-tapped battery pack is necessary. In addition, 16 other discrete components are used for amplifier optimization. Physically, the pc board for the larger servo offers a bit more space for construction.

A 500 mah battery pack and power wiring complete the airborne unit. All

connections to the receiver are made via an integral plug block which is mounted on the decoder board. An external charging socket is provided off the back contacts of the power switch. I must say that everyone should use this approach —it is undesirable to have to disconnect the power plugs whenever one wishes to charge the battery.

The physical and performance characteristics for the set are presented in Table 1 and in Figures 1 and 2. End-to-end resolution, servo thrust, torque and transit time and temperature stability for the system were checked. Performance in general was excellent. The only deviation noted was in the thrust available from the subminiature servo. Our measurements indicated an average thrust of two lb. at the innermost hole of the output disc or a torque of .57 in.-lb. while the specification for the servo states "three lb. at rotor." On the other hand, the miniature (KP=11 mechanism) servo produced a rather phenomenal five lb. of thrust at a radius of 0.25 in. for a torque of 1.15 in.-lb.

End-to-end resolution, as shown in Figures 1 and 2, is good but not outstanding, owing primarily to some deadband in the stick bails. Temperature checks at 0°F and 150°F were excellent with no servo drift or slowdown.

During the test program, the servos were found to have approximately 10% more travel in one direction than the other, irrespective of time baseline and travel range alignment. A quick review of the situation and our own checks revealed that the servos were quite linear with the previous Heathkit systems with which they were introduced. It was also found that the previous transmitter had an opposing nonlinearity which had produced a sum linearity end-to-end. Heathkit promptly reviewed the situation and introduced a correction which now permits complete linearity. This was greatly appreciated.

Our evaluation of the system, which was received as a completed system from Duane Lundahl, is that it is an excellent system which introduces some outstanding new features. Carefully built, the set will provide all the capability that could be asked of any system.

FOAM TECHNIQUES—III

(Continued from page 60)

hot glue gun used to join most of the parts is unlike most of those now on the market—it is equipped with a temperature control. The gun must be turned to the coolest position. *Do not* use glue guns without a temperature control—the hot glue will melt the foam. Standard glue guns *can* be used if a light dimmer, rheostat, or variable transformer is used to drop the power to the gun. The hot wire cutter used to cut the body blocks and the wing dihedral angle is the only cutter available with an angular positioning device. Information on both of these tools may be obtained from PK Engineering (5728 Thornwood Dr., Goleta, Calif. 93017).

All of the materials to make

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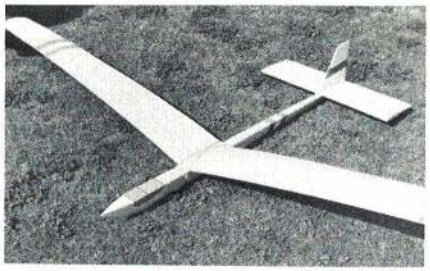

Cost of balsa has gone up while cost of foam has come down. Charisma is an inexpensive glider with flexible wings. Flies slowly for long distances.

Charisma are available at your local hobby shop with the exception of the foam sheet. Up to ten 36 x 16" samples of the sheet foam may be obtained from the author at P. O. Box 445, 6315 East Coast Highway, Carpinteria, Calif. 93013, at a price of $1.50 per sheet (two sheets are required for Charisma). Please add $1 an order for shipping. The foam has a density of 3½ lb./cu. ft.—about half the weight of balsa.

Follow manufacturer's recommendations and standard techniques for the radio installation. We used an ACE rudder-only Baby. The complete radio gear fits snugly into the nose of the plane. The "H" and "G" dimensions could be increased 1/4 to 3/8" if more room is desired.

EDITORIAL

(Continued from page 13)

AMA gains tremendous public exposure. Through this exposure the Academy has grown from a low of 17,000 members to presently over 47,000. Also during this time many modelers dropped out of the AMA, but a much greater number of people were attracted to the AMA. If you are either a new or long-time member, you have directly benefitted by this growth. You are a part of the world's largest aviation association. Certainly this strength is a benefit of membership. Not all of the growth is just because of the nationwide distribution of AMA's news in AAM, but most of it is. Presently, AMA members receive this news as part of the whole magazine for only $3.60 per year. That's 30 cents per copy. Not a bad deal at all.

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Soooo - As you have in the past, keep up the fine work.

Sincerely,

Don Pinckert

Don Pinckert

P.S.: Since the above letter was received, Don has set the new R/C speed record of 73.529 M.P.H.

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