radio control
RC MODELER
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RC MODELER

FEATURES

DEPARTMENTS

PRODUCT REPORTS

VOLUME 10 1973 NUMBER 8

AUGUST

THIS MONTHS COVER

A magnificent shot of a Proctor Antic on floats. Ektachrome transparency taken at Port Angeles, Washington by Richard Owens, Jr.

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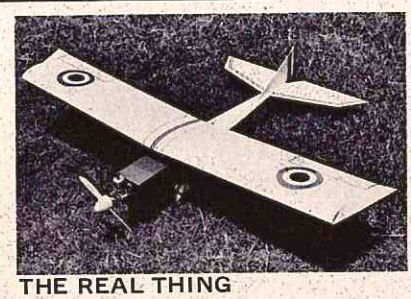
FROM THE SHOP

DON DEWEY

SAIL YACHTS

WAVEMASTER

KAVAN JET RANGER



THE REAL THING

BARRACUDA

For those of you who like put-on's, The Real Thing by Paul Bender and Bob McVickar is just the ticket. While written in a tongue-in-cheek style, The Real Thing is a quickly built, .10 powered parasol wing designed for 2 or 3 channel operation. Extremely easy and economical to build, The Real Thing is a very docile flyer but, surprisingly enough, will perform outside as well as inside loops. Flying low and slow around yourself at half throttle it is so easy you feel like taking a whack at it with a fly swatter! Cutting the engine to full idle will produce one of the longest glides you have ever seen. And, if you are game, you can even snag a thermal or two. The purpose of this model is to provide the newcomer to R/C with an inexpensive trainer that will utilize some of the low price 2 and 3 channel proportional systems now on the market. And, even if you are not a novice, you'll enjoy flying this machine as a relaxing change of pace. You might even consider passing the transmitter to your wife and 10 year old - - - I doubt if they could get into too much trouble with it!

* * * *

Another construction feature is Bob Steele's Barracuda, a Standard Class competition sailplane that can be built in a remarkably short time when compared to some of the more complex kits on the market today. This is a lightweight, agile machine that can really rack up the points for the Standard Class competitor in competition events. With its large V-tailed control surfaces it is quite responsive yet throws can be reduced so that it can serve as a first sailplane for the novice soaring pilot.

* * * *

For helicopter fans, Bernie Murphy has completed one of the first prototypes of the Kavan Jet Ranger helicopter which will be distributed in the United States by Model Rectifier Corporation. Part 1 of our step-by-step construction procedure for this beautiful scale helicopter is being presented in this issue and we hope you enjoy it. By the way, when we say scale, we mean it - - - the Bell Helicopter Co. even provided several cans of urethane paint in the exact colors of one of their Jet Rangers for use on our prototype!

* * * *

We have been asked many times just how RCM product reports are prepared. And, many letters we receive ask why we are not more critical of the products under review as well as why we select the items we do for presentation in the pages of RCM.

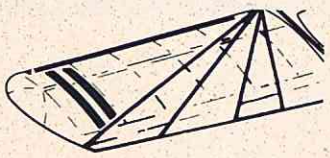
To begin with, there are four individuals primarily concerned with product testing and evaluation. In addition to myself, they are Bernie Murphy, Dick Kidd, and Bill O'Brien. Occasionally Dick Sonheim and Ken Willard are asked to prepare a review of a particular product. These individuals are asked to test and evaluate several hundred items per year from simple packaged accessories to scale kits to complete radio systems. We rarely enlist the aid of outside assistance in preparing kit reviews since, by utilizing the same individuals each month, they have a frame of reference for comparison to similar products and, in addition, each is familiar with the basic methods for producing the item under evaluation. As an example of how a review is accomplished, let's follow a hypothetical kit through from the time it is received by RCM until the time it may, or may not, appear in these pages as a published review.

Assuming that this kit is a production item, that is to say it is in the

to page 114

CARL GOLDBERG MODELS

W! **J's MULTI-STRIPE**

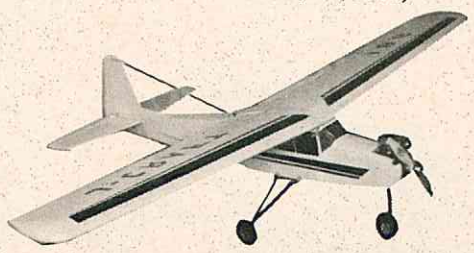


e's an item
t's in such
nand that
I can tell
about
that we've
it.

foot rolls. Colors: RED, WHITE, BLACK, LD, DARK BLUE. Widths and prices r roll): 1/16"—$1.98, 3/32"—$2.69, 1/8" 69, 1/4"—$3.69.

SPECIAL! SPECIAL

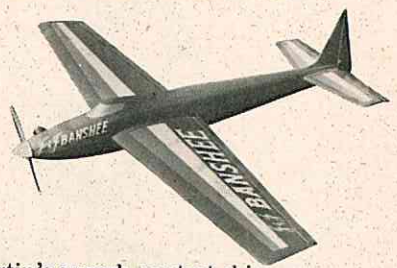
J & J "J-CRAFT" TRAINER
List price $45.95
(Price in effect until July 30, 1973)
$29.97



65" span, quick building, easy-flying plane for .29—.50 engine, 3 or 4 channels.

SPECIAL! SPECIAL

J & J "BANSHEE"
List Price $54.95
(Price in effect until July 30, 1973)
$33.97



Jim Martin's superb contest ship.
62" span for .60 engine, 4 channels.

LMOST READY-TO-FLY" COMBINATIONS

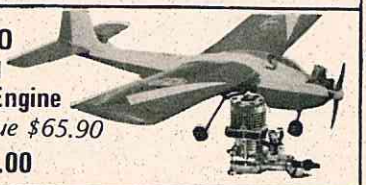
ier SPRINT 25
and
oy 19 R/C Engine
al list value $65.90
LE **$47.00**

von SCHWEIZER 1–26
oam A-R-F glider)
and
R Power Pod
and
T.D. 049 Engine
al list value $48.55
E **$34.00**

von's new "U–2"
oam powered
ler)
and
Medallion .09 RC Engine
al list value $49.15
LE **$35.00**

vest CESSNA All Foam
DINAL A-R-F
and
Medallion .15 R/C
Engine
al list value $40.45
LE **$28.00**

ld Engines
LF DIAMOND
foam "disposable"
ARF–)
and
oy 35 R/C Engine
al list value $44.98
LE **$30.00**



ier PINTO
R-F and
25 RC Engine
al list value $65.90
LE **$45.00**

Bee CARDINAL A-R-F
and
oy 19 RC Engine
al list value $62.90
LE **$42.00**

SAVE $$ ON THESE MATCHED COMBINATIONS

World Engines HAWK 460 Foam A-R-F
52" Span, 4 channels
and
Fox 36 R/C Engine
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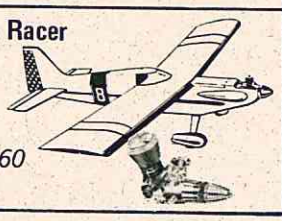
SALE **$35.00**

Midwest TRI-SQUIRE
and
McCoy 19RC Engine
Total list value $41.90
SALE **$29.00**

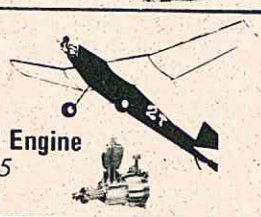
Midwest SWEET STIK
and
Fox 40 RC Engine
Total list value $59.90
SALE **$39.00**

Carl Goldberg FALCON 56
and
McCoy 19 RC Engine
Total list value $42.90
SALE **$30.00**

Ace UPSTART ½ A Racer
34" span, hot 2 channel and
Cox Tee Dee .049 Engine
Total list value $25.60
SALE **$19.00**



Ace 2T KIT
50" span, stable, 1 or 2 channel
and
Cox Golden Bee .049 Engine
Total list value $22.65
SALE **$17.00**



RCM BASIC TRAINER
50" span, 2,3, or 4 channels
and
McCoy 19 RC Engine
Total list value $50.90
SALE **$38.00**

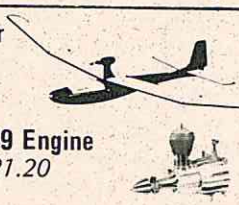
Bridi RCM TRAINER
and
K & B 40 R/C Engine
Total list value$81.95
SALE **$59.00**

Sig PIPER CUB J-3
71" Span,
4 Channels and
McCoy 35 R/C Engine
Total list value $48.90
SALE **$38.00**

Du Bro "Whirlybird" HELICOPTER
and
K & B 40 RC Engine
Total list value $162.00
SALE **$109.00**

Ace ALL STAR Biplane
34" span, .049-.15 engine, 1 to 3 channel
and
Cox Medallion .09 RC Engine
Total list value $38.15
SALE **$28.00**

ACE HIGH Glider
70" span, 1 or 2 channels
and
Cox Babe Bee .049 Engine
Total list value $21.20
SALE **$16.00**



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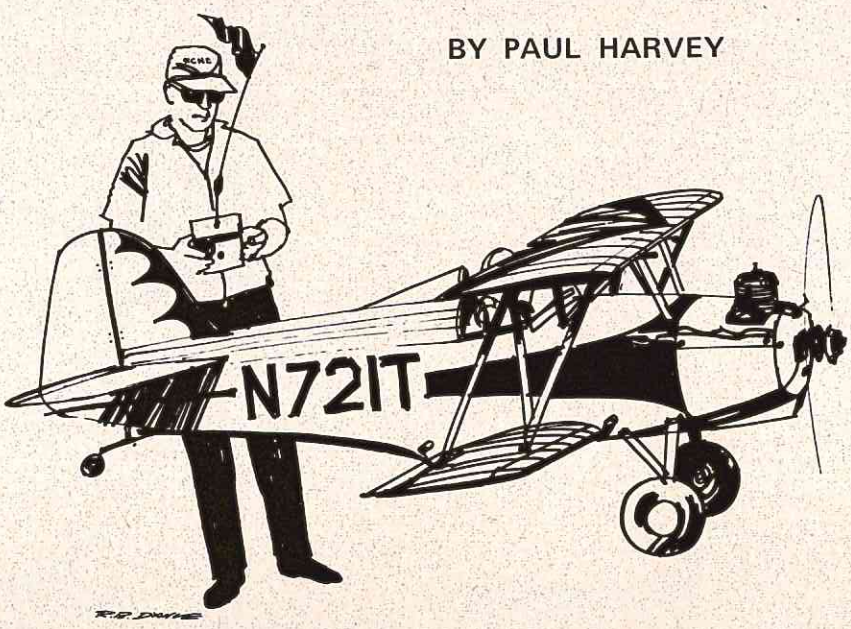
BY PAUL HARVEY



IT TAKES THREE TO TANGO.....

The Experimental Aircraft Association is what's left of flying.

Today's hot-rock jet jockeys don't fly. This is rocketry. Today you strap a flying blowtorch onto your britches, light the fuse and a tin brain takes over.

Today's airline captain is a puppet, not a pilot. He's manipulated by electronic strings.

Those strings pull him away from the ramp, into the lineup, onto the runway, into the sky and – from omni station to omni station his jet leapfrogs whole states from wherever he is to wherever he wants to go, pulled along by those electronic strings.

Whatever that is, that's not flying.

Flying was wind stinging your face and gravity mashing your bottom and destiny in your hands.

The Experimental Aircraft Association is what's left of flying and that Association is flying toward Oshkosh, Wisconsin.

Some of us who were flying when flying was fun, wearied by the regimentation aloft, have found some of the old excitement in radio-controlled miniature aircraft.

When you undertake to learn to fly these planes – with a wingspan of four-to-seven feet – you practice aviation's evolution backwards.

You start with a stable, high-wing aircraft which tends to stay wheels down, straight-and-level . . . .

Maneuvering these in fancy aerobatics is awkward – you have all that stability to overcome when you want to fly anything but straight and level.

It's like dancing with a poor dancer.

So, as you become adept – and wish to fly what's called "pattern" maneuvers – you graduate to a streamlined, low-wing airplane with retractable wheels so that it is equally "at home" at any attitude . . . wrong side-up it's as graceful as right-side up . . . and utterly responsive to your slightest nudge.

It responds to you as a smooth dancer would.

In the evolution of man-size airplanes we started out with fabric wind machines that were maneuverable – and graduated into gigantic tin birds which are stressed to be flown only conservatively.

So the fliers – including airline pilots – who want the old feeling of one-ness with their machines . . . who want wings on their feet . . . have reverted.

Now they are building in their garages replicas of some of those classic old piston planes, biplanes, whatever – and flying them. The Experimental Aircraft Association is their

to page 114

engine clinic

By Clarence Lee

For the past two months I have been testing a new carburetor that will most certainly be giving the Perry and Kavan serious competition in the replacement carburetor field. The new carburetor is called the Tarno-Carb and is manufactured in Canada by B. Tarnofsky.

This carburetor has several design features different from the Perry or Kavan or any of the carburetors that come as stock equipment on various makes of model engines.

In an effort to develop a more efficient carburetion system, Mr. Tarnofsky took some ideas from full size automotive carburetors. Although the idea of utilizing automotive carburetor principles is not new (Duke Fox has always based the principle of his carburetors after automotive carburetors) the manner in which the Tarno-Carb operates is different. Instead of using the conventional rotating barrel with the hole through the center that is common to most of the model carburetors, the Tarno-Carb utilizes a valve more closely resembling the butterfly valve of an automotive type carburetor. This is actually a round barrel or drum, but, rather than the normal hole drilled through the center, the sides of the drum have been milled away leaving a thin vane in the center which becomes the butterfly valve. The valve is made of steel and is sealed in the carburetor body by two 0-rings to prevent air leakage. The carburetor utilizes a conventional spray bar and needle valve assembly which is mounted above the butterfly valve. This, again, is quite similar to an automotive carburetor where the fuel is admitted to the airstream above the butterfly by fuel jets. A series of passages through the carburetor body supplies fuel to a secondary idle jet below the butterfly which is adjustable by a small screw adjustment on the front side of the carburetor. Again, this is in keeping with automotive practice. By admitting the idle fuel below the butterfly full manifold vacuum, as it might be called, is utilized, resulting in extremely strong fuel draw at idle. The only other carburetor to my knowledge to use this principle in the past has been the Fox. Due to the extremely strong fuel draw at idle the idle mixture and speed will be less affected by variations in tank position and fuel level as the tank empties. Most of your conventional carburetors admit both the high speed mixture and idle mixture in the center of the rotating barrel. As the barrel is rotated to idle position the fuel/air mixture is regulated. However, full manifold vacuum is not maintained due to the idle fuel being admitted above the part of the barrel that is closing off the venturi. Mixture strength could be increased by having the top edge of the barrel close slightly ahead of the bottom edge. This, in turn, resulted in a rich mixture that was regulated with a small needle adjustment on the side of the carburetor as with the H.P., Webra, and Super Tigre, or regulated with the mixture adjusting disc as with the Perry. The Kavan, and others, utilize an air bleed which simply bleeds air into the carburetor, weakening the fuel draw which results in a leaner mixture. Closing the air bleed would richen the idle mixture by bringing the fuel draw back to normal. When R/C engines were in their infancy this was accomplished by using a file and notching the top of the carburetor barrel to lean the mixture by reducing fuel draw, or notching the bottom of the barrel to richen the mixture by increasing fuel draw. With the idle mixture admitted below the closed butterfly full vacuum is present at all times and mixture then controlled by regulating the fuel flow.

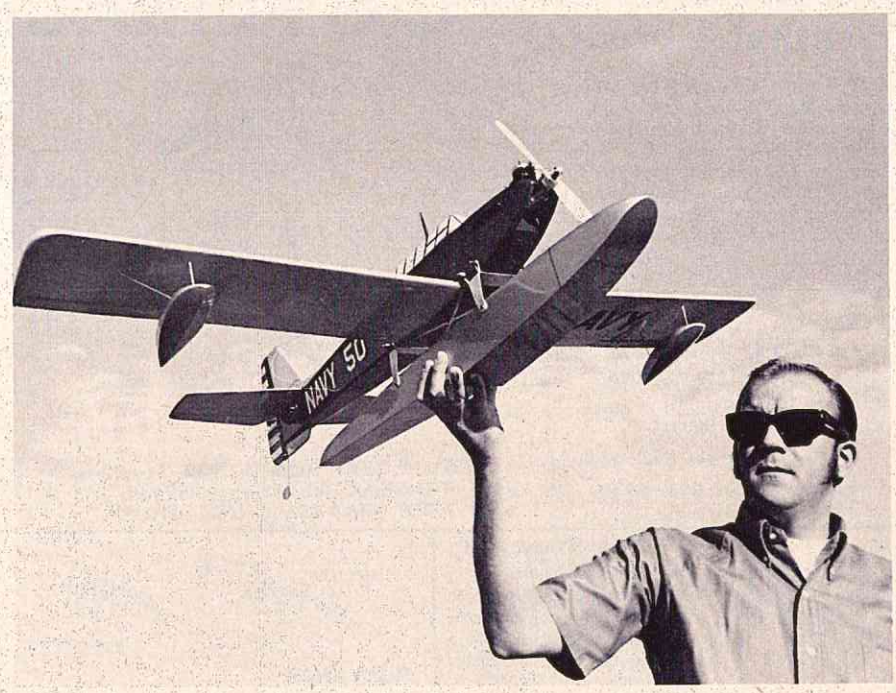
As stated earlier, the spray bar is one of the conventional types and is threaded into the carburetor body and retained with a lock nut. The needle valve tension is adjustable by a collet type lock nut. This, in itself, is a very good feature in that the wearing of the threads and the resulting sloppiness can be compensated for by simply tightening the lock nut. I, personally, still prefer the old spring clip and ratchet type of needle myself. I like to be able to turn the mixture one or two 'clicks.' A ratchet spring could easily be installed on the Tarno-Carb spray. The needle already has a small knurled disc so that the modification could easily be accomplished.

The Tarno-Carb has two other features not found on other model carburetors. The first is a simple slipping disc clutch device that retains the throttle or servo arm. This works as an over-ride so that if your servo has more travel than the carburetor has throw, the arm will slip and not stall the servo. This same slipping disc clutch allows the throttle to be opened or closed without turning the radio on and operating the throttle servo. This manual operation is achieved by a needle valve type lever on the side of the carburetor. This is the heavy wire

to page 76

SUNDAY FLIER

KEN WILLARD



Scott Christensen and single float Islander. Note water rudder.

Let's talk about seaplanes and flying boats. I sort of got the bug again when I designed and built the Puddlejumper and, in the course of test flying it, I was highly impressed with advances in the state of the art – at least on the local scene.

A couple of years ago, when I was developing the Wavemaster, I'd take it out to the local pond where the fellows were flying their seaplanes, and the scene was something like this: There'd be four or five enthusiasts there, most with twin float seaplanes made by modifying some landplane design. Then there was one modeler who had one of the old Berkeley nine foot Super Privateers. He'd fire it up, taxi out, make a stately take-off, fly majestically around for five minutes or so, then carefully bring it in for a landing, wipe it off, and settle down to watch the others. Maybe a little while later he might fly it again.

The others would be skittering around on the water, breaking loose and climbing out (and sometimes not) to fly around for awhile, occasionally doing a mild maneuver before landing.

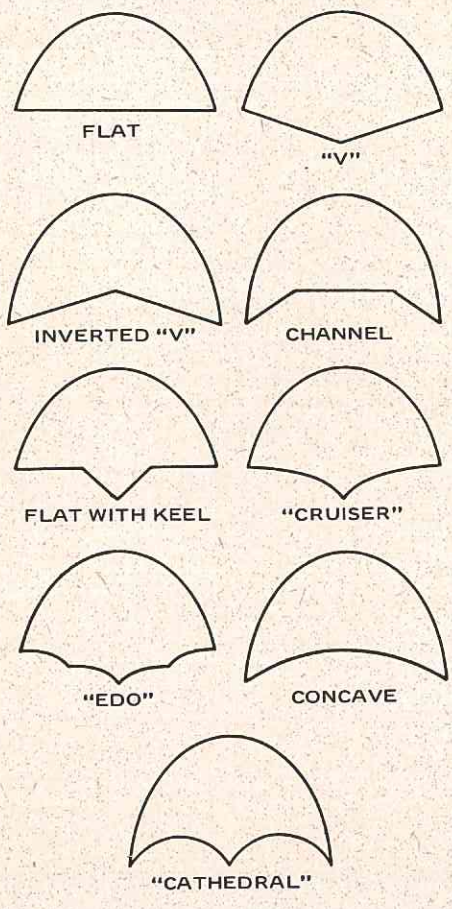
As time went on and the experience and confidence grew, the fellows became quite proficient, and were doing many of the pattern maneuvers.

Then I got away from it for a while, as the soaring bug bit me hard. But I never lost interest in water flying; there just wasn't time to do both. Then the Puddlejumper brought me back to the water activities. I had heard that things were really humming, but when I went out to Calero Reservoir to test fly the little Puddlejumper, I was really surprised. As I got out of the car, I heard three engines singing away; I looked over, and there were two seaplanes and a flying boat scatting around a pylon course at about sixty or seventy miles an hour. I watched briefly, then asked about the business of seaplane racing. Scott Christensen, one of the organizers, wrote a brief description for the Wavemaster's Newsletter, that pretty much tells the story. Here's the item, courtesy of the San Jose Wavemasters:

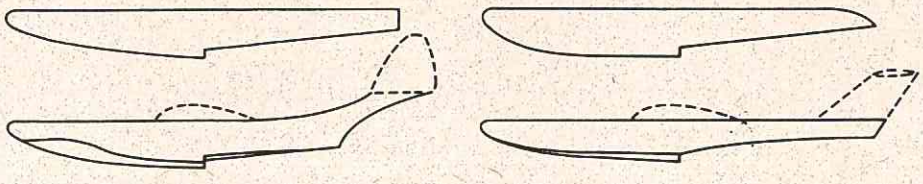
On the 3rd of March, 1973 at Calero Resevoir, the Southbay Seaplaners added yet another dimension to R/C Pylon Racing by conducting a race over water using R/C seaplanes. This was an experimental contest to explore the feasibility of this kind of activity. Because it was experiments,

to page 109

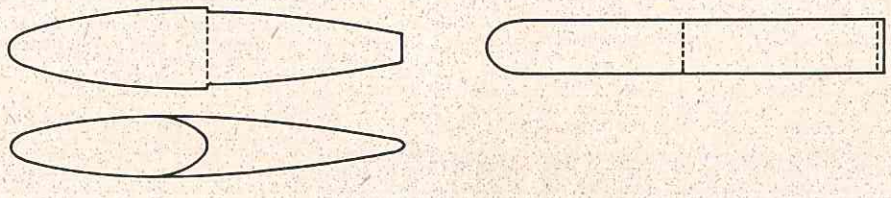
TYPICAL FLOAT (AND HULL) CROSS-SECTIONS SHOWING VARIOUS BOTTOM DESIGNS



SCHEMATICS OF FLOAT PROFILES (AND HULLS)



PLAN VIEWS OF VARIOUS FLOAT LINES



PRACTICAL AERODYNAMICS

PART II

BY MIKE ILYIN

● If we are to become skillful RC pilots, we should strive to discover all of the factors involving our airplanes in flight. An important thing to understand is load factor. Newton's Law of Motion, briefly stated, says that "a body at rest will remain at rest, and a body in motion will remain in motion, in a straight line, unless acted upon by an outside force." Any force that causes an airplane to deflect its flight from a straight line produces a stress on its structure. This stress is called a load factor.

Load factor is expressed as the ratio between the gross weight of the airplane and the load acting upon it. For example, a load factor of 2 means that the stress on an airplane is twice the gross weight of the airplane. A load factor of 2 could also be expressed as 2G's. The term "G" stands for gravity units.

There are two important reasons for RC pilots to understand load factor. First, it is possible to overload the structures of our airplane if excessive loads are imposed on them. Second, increasing the load factor increases the stall speed alarmingly. Let's consider an airplane supported by its wings with saw horses. Its load factor is now 1, or one G force is being exerted on it. If we start piling bricks on it near its Center of Gravity, we can simulate an increasing structural load factor. It would be simple to continue adding bricks until the structure failed and then weigh the bricks to determine the amount of weight necessary to cause structural failure. Dividing the weight of the bricks by the weight of the airplane would give us our structural limit load factor. (This is an expensive way to find out.) If the airplane weighed 5 pounds and could support 30 pounds of bricks, then the structural limit load factor is 6, or 6G's. That is, 6G's would cause structural failure.

Loads are put on an airplane in flight by changes in direction. Abrupt changes in direction cause high load factors. RC maneuvers that impose high load factors are steep turns (pylon racers) and loops (pattern ships). Actually all aerobatic maneuvers are just variations of turns and loops. In a level turn the load factor is small until approximately a 45 degree bank angle is achieved. Increasing the bank angle beyond 45 degrees causes the load factor to increase at a terrific rate (Figure 1). Notice that the chart shows that a 90 degree bank angle cannot be achieved. (Before all the pattern boys climb on this one remember the chart is for bank angle vs. load factor in a **turn.** A knife edge or slow roll is not a maneuver where the airplane turns.) It can be easily seen that it is possible to exceed the structural limitations of an airplane quite easily. Our sample brick loaded airplane that could withstand a load factor of 6G's could only go to 80 degrees of bank in a level turn before structural failure would occur.

Structural failure, however, is not as significant in most models as the increase in stall speed associated with load factor. Most models can withstand any structural loads imposed on them, but no model can be **controlled** when it is stalled. As mentioned in the preceeding article, a stall occurs when airflow over the airfoils of an airplane separates. The stall phenomena is a function of an airfoil's angle of attack. We know that lift is the force that supports an airplane in flight, and that lift can be increased by increasing an airfoil's velocity or angle of attack (up to the stall angle). Now let's take our super duper 7 pound pattern ship out for a flight. We take off, trim up, and roll into a 60 degree banked turn at full throttle. At 60 degrees we find (from chart Figure 1) that the load factor is two. Our plane now weighs 14 pounds. The wings now need more lift to support the airplane so we increase the angle of attack, right? We steepen that angle of bank to 80 degrees. Now the airplane weighs 42 pounds. More lift is added by increasing the angle of attack, but now we are operating just below the stall angle of attack. You can see that any further increase in angle of bank would require an increase in angle of attack which would cause us to **exceed** the stall angle of attack. Incidentally the speed of an airplane has no bearing on its stall. **Any airplane can be stalled at any air speed.** The trouble is that unintentional high speed stalls can

to page 108

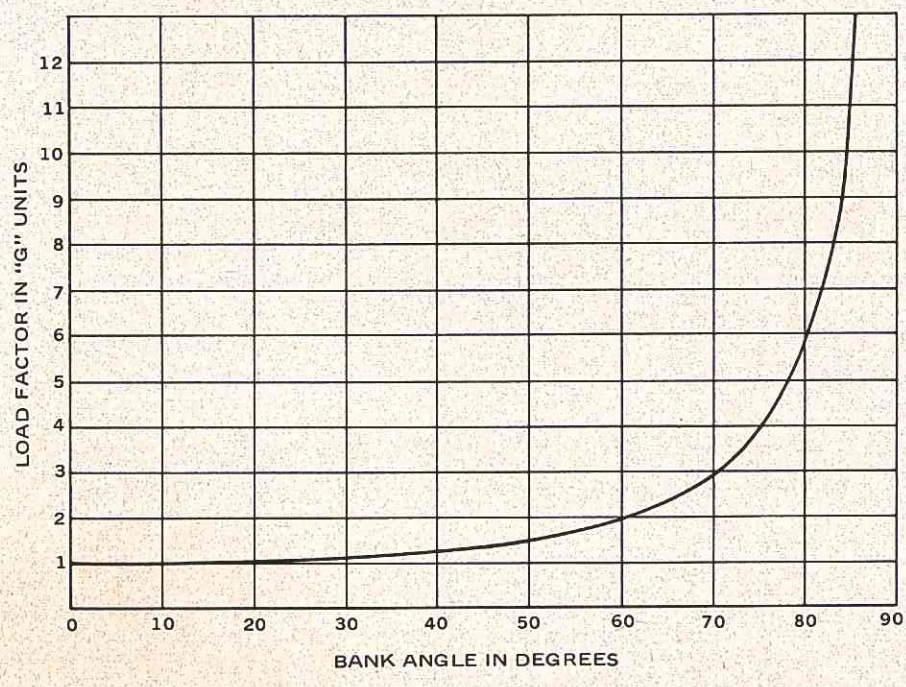
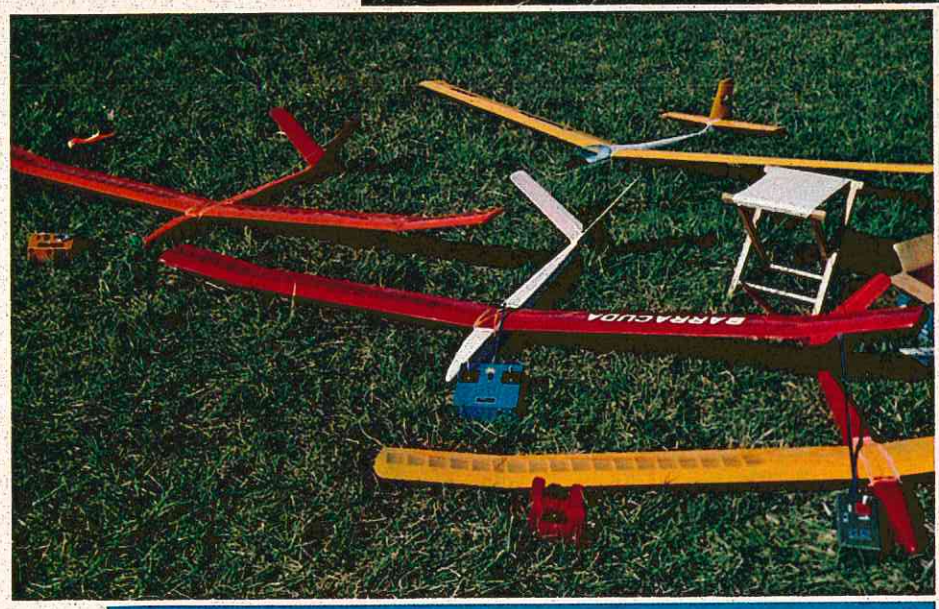


FIGURE 1. LOAD FACTOR VS BANK ANGLE IN A LEVEL TURN

BARRACUDA

A simple to build, light weight, easy to fly Standard Class competition sailplane of maximum allowable size. Although highly competitive for the proficient flyer, the Barracuda can easily be trimmed out as an ideal soaring trainer. If you're bored with roaring .60's and the greasy kid stuff, step up to the world of Silent Flight.



BY BOB STEELE

To me (and apparently many others) there is nothing so beautiful in the world of modeling as a sailplane floating gently in a sun-drenched summer sky.

I had known this thrill from having flown free flight models some twenty years ago but having switched to R/C in the early fifties, I had somewhat forgotten it. Eventually I became bored with roaring .60 engines and the sameness of every pattern flight. When this happened I cast around for something new and discovered R/C soaring. I built a home-brew special with a free flight wing and an .09 engine up front (no one told me about electric winches) and rediscovered the pleasure of thermal hunting.

The next winter I built a Cirrus and learned a lot about R/C soaring. Learning how to make a Cirrus go where you want it to is an accomplishment in itself. I finally flew the plane to fourth place in Open Class Precision at the 1972 Nats. This contest, incidentally, taught me that it is much easier to win in Standard Class than in Open since two thirds of the contestants enter Open Class.

In order to have a competitive plane to fly in Standard Class contests, I designed the Barracuda around certain parameters.

1. Simple to build.
2. Light in weight, yet strong.
3. Easy to fly.
4. Proven flat bottom airfoil.
5. Maximum allowable size.

All these criteria were achieved and a truly great model developed. The plane is truly competitive in Standard Class yet is simple to build and fly for the beginner making it an ideal trainer. The vee-tail was used for several reasons, including lightness, ease of installation (no flying stab to worry about), simple construction, and ease of transportation. The fuselage is just a reinforced box with no formers needed, wing mounting is by rubber bands for simplicity sake, the wing is strong enough for any type launch (we use Soaring Enterprises electric winch and reel), yet is easy to build since all ribs start from the same pattern.

Several of the planes have been built by modelers in the area and all have performed well.

To start construction, order the full size plans and then go to the hobby shop and get the following:

BALSA

10 – 1/16 x 3 x 36
1 – 3/16 x 3 x 36
5 – 3/8" triangular stock
3 – 1/4 x 1/4 x 36
6 – 1/16 x 2 x 36
6 – 1/8 x 1/4 x 36 spruce

MISCELLANEOUS

1 – 1/8 brass channel
1 – 1/4 hardwood dowel
1 – 3/32 plywood
1 – 3/16 I.D., 7/32 O.D. brass tubing
1 – 3/16 music wire pushrod hardware to suit.

Start by cutting the root ribs from 3/32" plywood. Drill these for the 3/16" I.D. brass tubes. Make rectangular rib blanks from 1/16" sheet and stack them between the two ply root ribs, and carve and sand enough ribs for the two wing panels. Now take a piece of 1/16" x 3" balsa sheet and split it down the middle for the trailing edge. Pin the bottom leading edge and trailing edge sheet to the plans and glue the main spar (¼" x 1/8" spruce) to the sheeting. Glue in all wing ribs and the top spar, glue on the top trailing edge sheet and let the whole thing dry overnight on a flat surface. A flat wing is of paramount importance in a glider. Now, install the brass tubes in the wing with epoxy, using scrap balsa to fill between the brass tubes and the wing spars. Put the shear webs and fill blocks in before the epoxy dries. Now, install the rest of the shear webs in the wing. Never omit these from any glider as they contribute immensely to the strength of the wing, yet add almost no weight.

To build the outer wing panels, trim a standard W-1 wing rib from the bottom spar notch to the point shown on the plans for the particular rib you are making. These trimmed off ribs give ¼" of washout to the wing tips and improve the appearance of the wing by giving tip taper. When building the tip panels, build flat on the leading edge sheeting to insure proper washout. Join the tip panels to the main panels with a scrap spar joiner. Don't bother with shear webs in the tip panels as strength is not needed here. When bending the 3/16" music wire joiners, use a vise and hammer and bend it without heat. Now, the hard part is over.

Start the fuselage by cutting out the sides and side doublers from 1/16" sheet. Glue on the triangular stock and, using contact cement, glue the fuselage doublers to the fuselage sides. Make 4 or 5 X-Acto saw cuts in the triangular stock where shown on the plans to facilitate the front fuselage bend. Now, carefully cut out the servo trays from 3/32" plywood. You may use the sliding servo arrangement, as shown (don't be afraid, in gliders it works just great) or use one of the new ruddervator "mixers" such as the Airtronics Vector Director.

Cut to length the ¼" balsa spacers and glue these to the fuselage sides. They can be removed later if in the way. Using fast drying epoxy, glue the brass channels in as shown. Now check for a good sliding fit on the servo tray. Too loose is better than too tight.

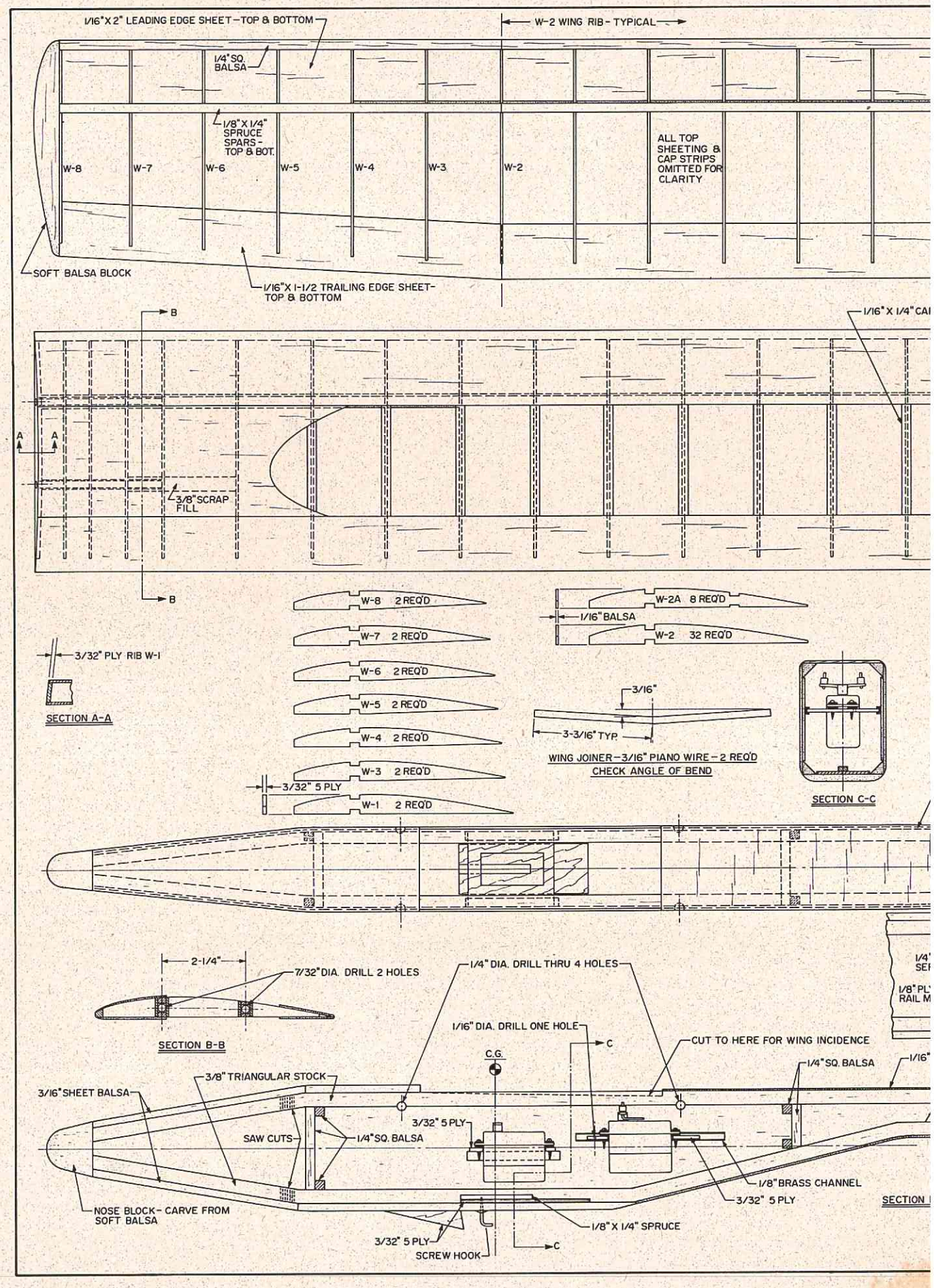
Install the bottom and top fuselage sheeting in the widest part of the fuselage before pulling the fuselage sides together at the nose and tail. This insures that the slider rails will stay parallel. When the sides have been pulled together and glued, add the rest of the sheeting and the nose block. Now, sand everything well, install the hardwood tow hook mount and birch dowels, cut in the wing incidence as shown on the dotted line, and install your radio. Since there is no hatch to worry about, just slide your battery pack and receiver as far into the nose as you can get it.

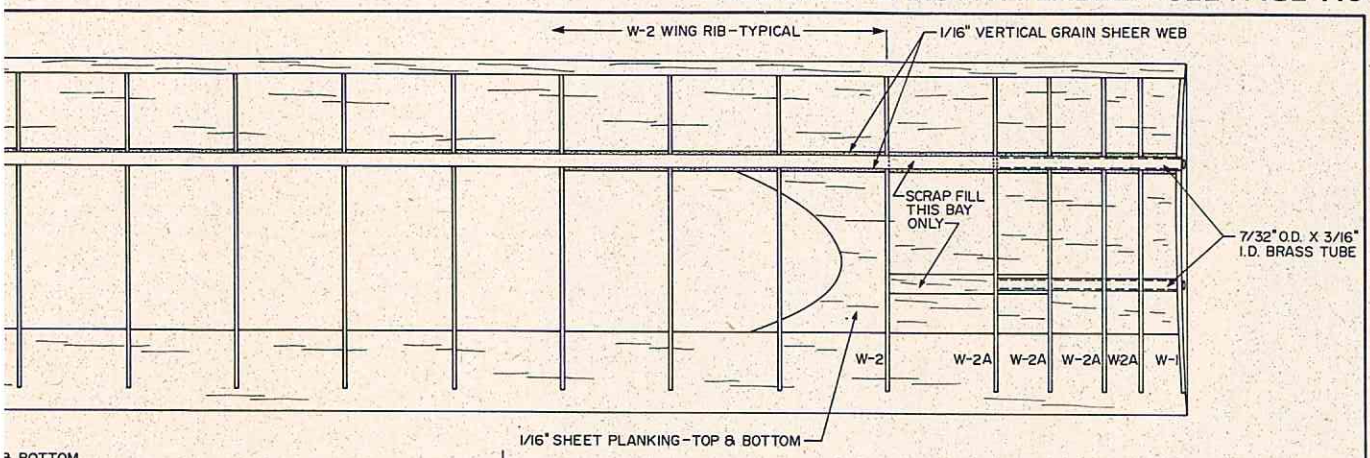
Start the ruddervator construction next. Cut these from 3/16" soft balsa and glue to a piece of scrap 3/8" triangular stock. Be sure to line them up squarely. Use epoxy glue here. Split a piece of 3/8" triangular stock down the middle, glue one of these pieces to either side of the ruddervators as shown in the rear view. You should now have a nice flat bottom surface to glue to the fuselage. For hinges I always use mylar strips pinned and epoxied in place.

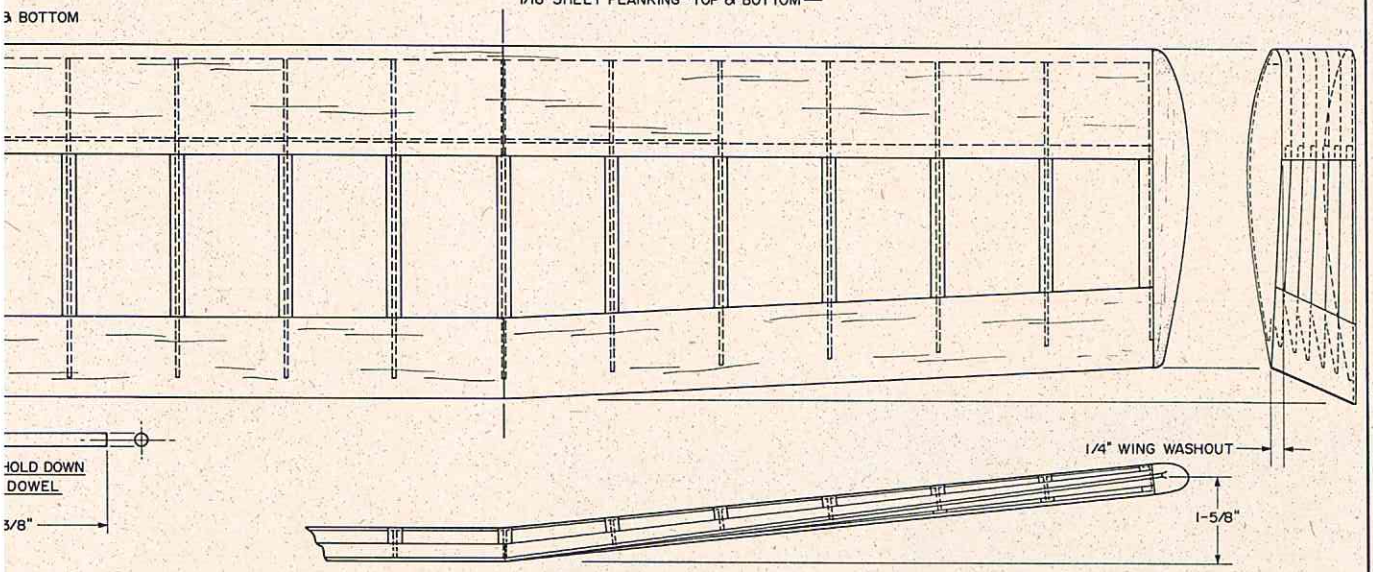
Glue the whole assembly to the fuselage and cover with MonoKote or Solarfilm. Make up pushrods to length and install the control horns. In this set-up you will want all the rudder throw you can get and a minimum of elevator throw. Install your tow hook and skid at this point. Now you're ready to fly.

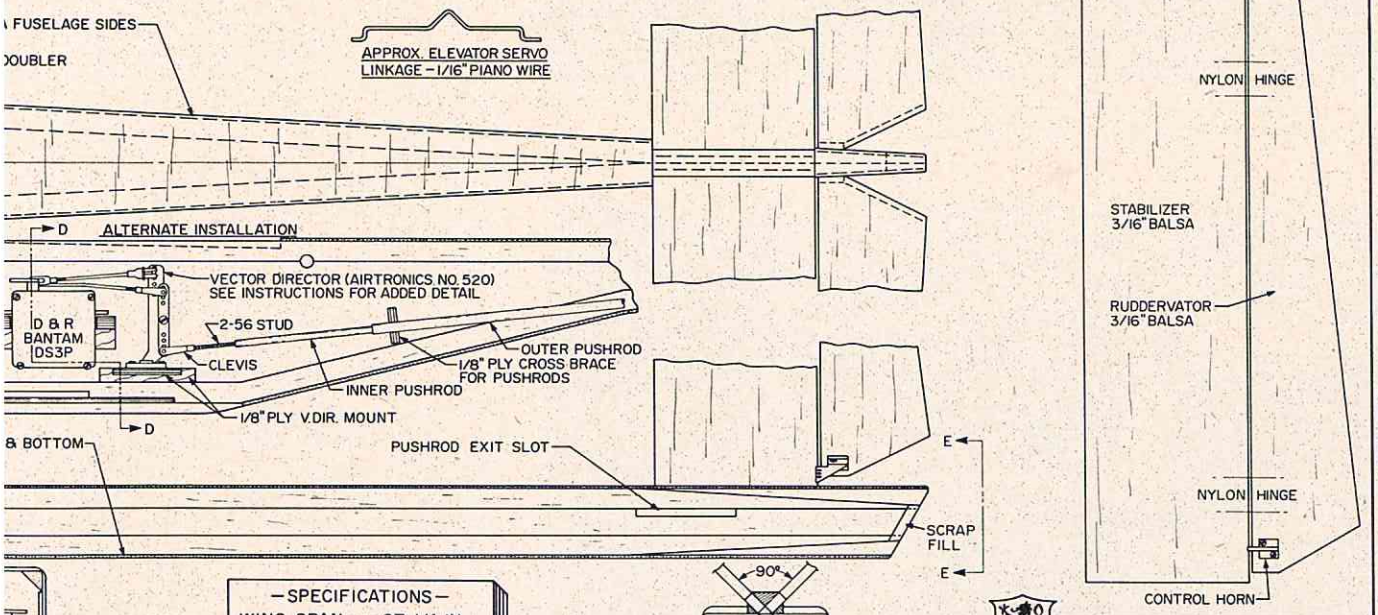
As shown on the plans the C.G. is rather far forward. Start hand glides with the C.G. as shown and adjust wing incidence and C.G. for the best glide. Remember, the best glide is not the one that goes the farthest, but rather the one that stays up longest. Once past the hand glide stage you are ready for the winch. The tow hook location shown on the plans is the dead-air location. You may wish to move it forward for windy conditions. When using a winch (or Hi-Start) the

SEE PAGE 116 FOR INFORMATION ON CENTURION SEMI-KIT









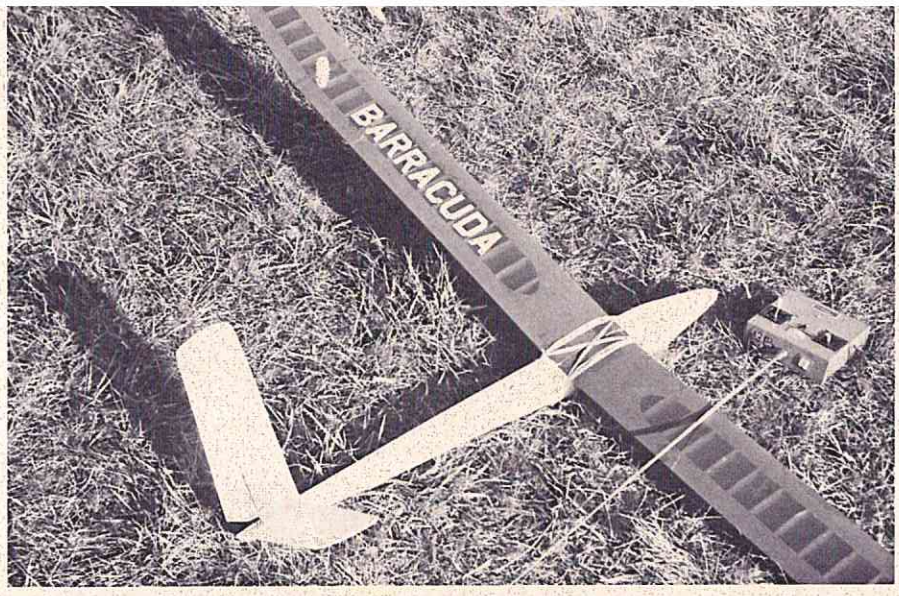
– SPECIFICATIONS –
WING SPAN ..... 97-1/4 IN.
WING AREA ..... 600 SQ. IN.
LENGTH ..... 43 IN.

BARRACUDA

DESIGNED BY	R. A. STEELE	INKED BY	DICK KIDD

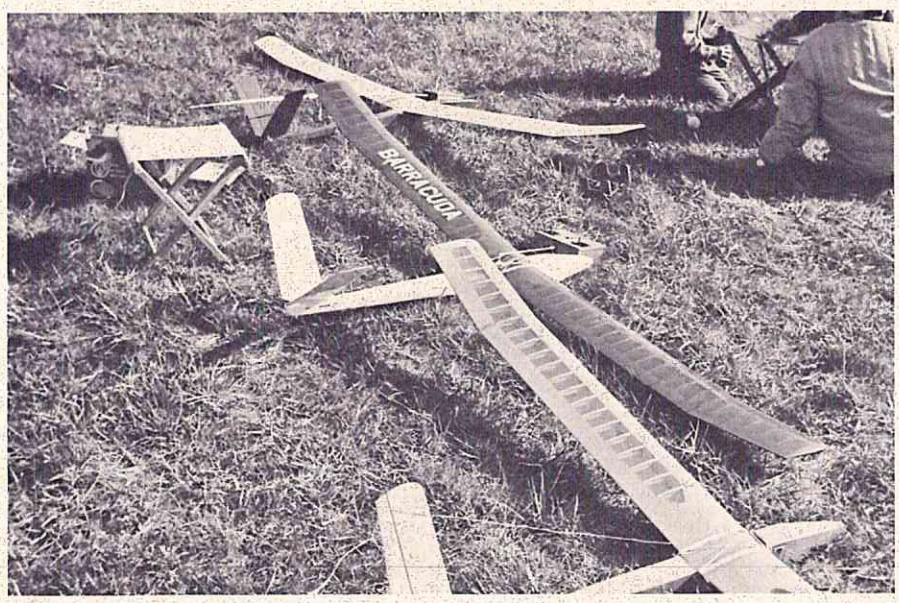
0 1 2 3 4 5 6

536



The author's original Barracuda prototype. Radio is old F & M Quasar.

ABOVE: John walking with his Barracuda. Note proper launch angle. BELOW: One of many Barracuda's flying - - - this one has hundreds of flights.



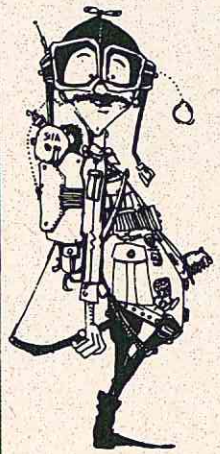
most critical moment is that just after the model leaves your hand. If anything bad is going to happen this will be the time! To prevent all these bad things, do this: Turn on the radio and check all controls; hold the airplane in one hand and the transmitter in the other with your foot on the winch switch. Point the nose of the airplane up at an angle of 45 degrees and run the winch till the plane nearly pulls out of your hand. Now, let the plane go and grab the transmitter stick, hold about two-thirds up elevator and steer a straight course with the rudder. If the plane veers off to the side, remember to keep on the winch and steer back to a straight course.

Running the winch too fast during the launch only wastes your line, while running it too slow will result in stalling out and separating from the tow line too early. Either of these situations is bad since you do not get maximum height from your launch. Run the winch so as to keep the tow line stretched tight. It is actually this stretch in the line that you are using to launch your ship.

On a good launch, on an average day (5-10 mph wind) you should use no more than 150 feet of line, thus getting over 840 feet of altitude. Really it's not hard and it's not magic, it does take a little practice and it helps to know what to expect. (Which is why I wrote all this, since there are thousands of sailplane modelers who are using power-pods simply because they have no idea how any other launch works.)

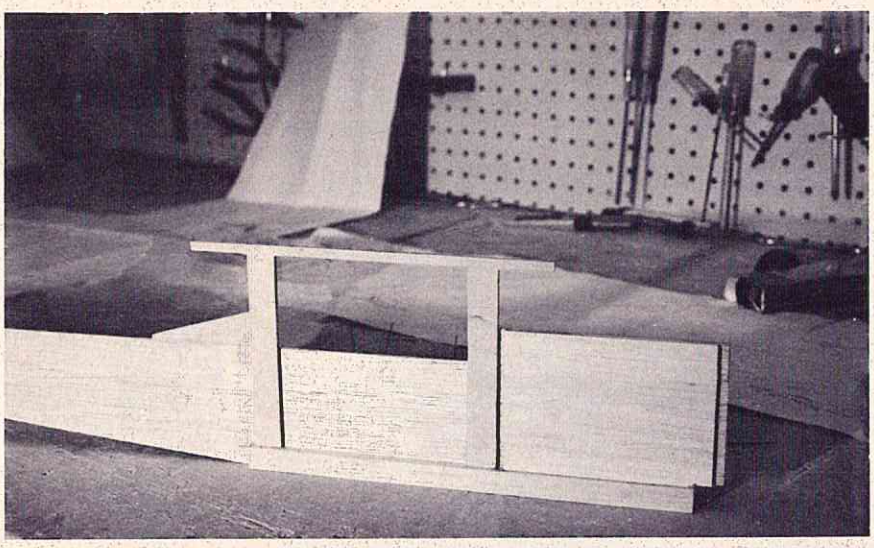
Let me say this – once you've flown using an electric winch you'll never want to use anything else.

But back to the Barracuda. Once you're up, if you're flying in dead calm evening air, you should get around three minutes air time from a good launch. Much more than this and you've run into some lift. Less than this indicates your Barracuda is not properly trimmed. You want to fly just on the edge of a stall, but never actually stalling out. When you do hit some lift (indicated by a sudden turn or a sudden stall for no apparent reason) just start circling in it. The thermal will take you up. These are the flights you will really enjoy. You'll find that your Barracuda will outfly most of the competition and at least keep up with the rest. Good luck and good lift. □

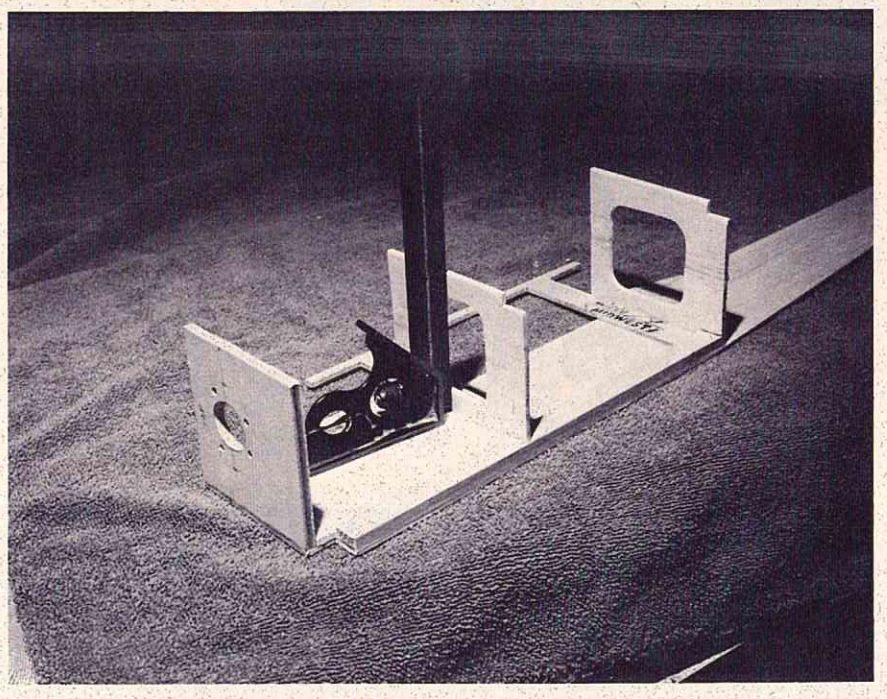


ALMOST SORT-OF-GENUINE STAND-WAY-OFF SCALE OF

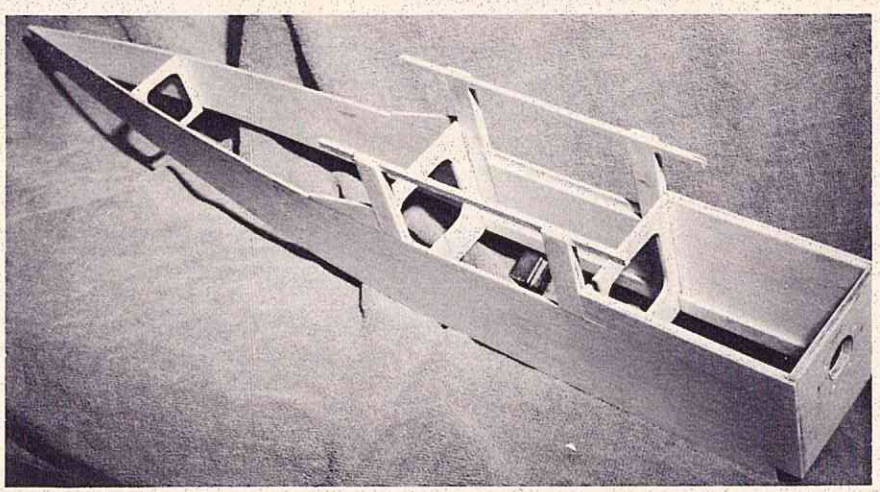
REAL THE THING



The basic fuselage side with doublers, bottom stringer, ply cabanes and spruce wing rail in place.



ABOVE: Firewall and two bulkheads glued in place using straightedge for alignment. BELOW: The fuselage, ready for top and bottom sheeting.



Let me say at the outset that this design represents yet another attempt by RCM to bring to you, our readers, historical data concerning aircraft designs that have virtually been forgotten in the course of writing aviation's history. No effort was spared on the part of the research staff of RCM to ferret out every available detail of the one and only full-size Real Thing.

Our long search in tracking down sketchy rumors concerning the origin of the original aircraft ended in the hills of Kentucky where the rotting hulk of the full-size aircraft had come to an ignominious end as a chicken roost behind a farmers dilapidated barn.

The history of the Real Thing, as the story goes, is that it was built in those very hills where it had finally come to rest, and was used during the days of Prohibition by the moonshiners as an aerial observation post for spotting the impending arrival of Federal Revenue officers. Working with the rotted remains, our intrepid staff reconstructed in minute detail this almost-sort-of-genuine stand-way-off scale R/C model of The Real Thing, one of the forgotten aircraft in aviation's history. The design of the model is by Bob McVickar with the prototype having been built by Paul Bender. The RCM drawings are by Jonathan Bull, one of the few surviving Kentucky mountain men who had actually witnessed the early flights of this magnificent aircraft.

CONSTRUCTION

We have tried to include as many details on the plans as was humanly possible due to the complexity of this competition scale aircraft. In order to aid you in the construction of this model, the following is a step-by-step construction sequence:

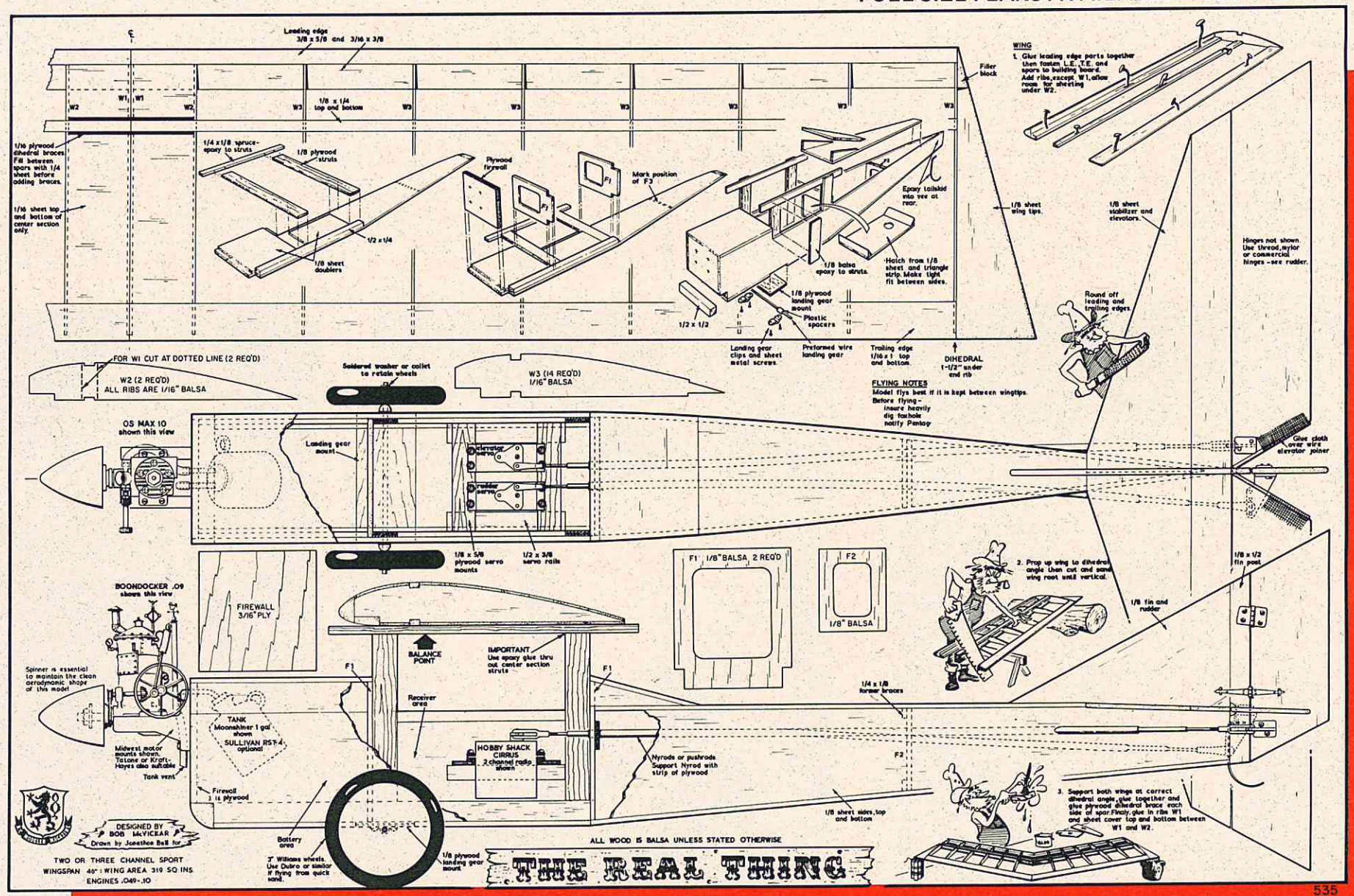
1) It is necessary to build a wing, tail, and fuselage.

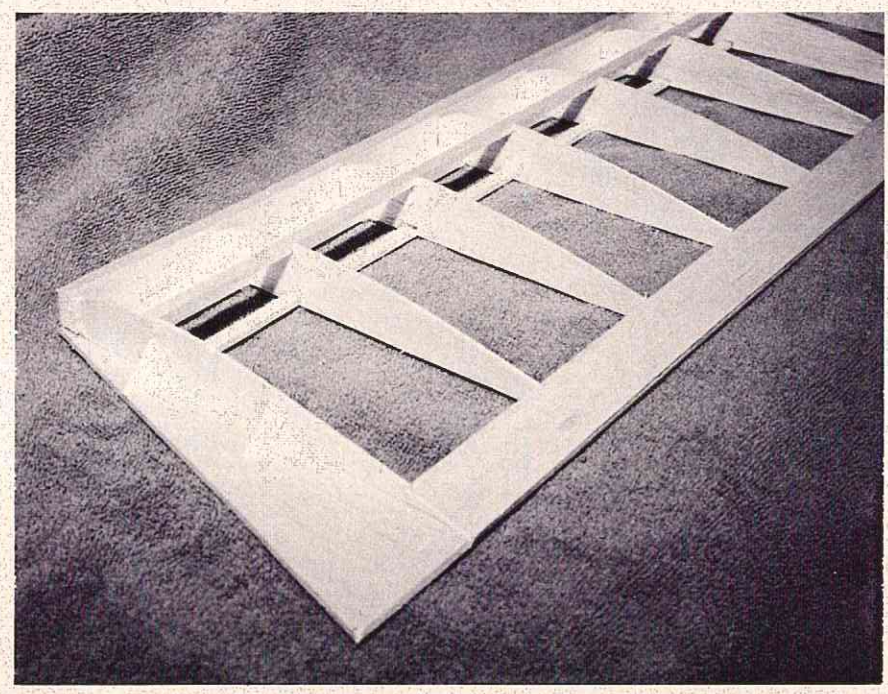
2) Build the front and back of the wing and glue a whole bunch of ribs in between, after pinning the leading and trailing edges to the building board with ten penny nails.

3) When dry, prop up wing to dihedral angle then cut and sand wing root until vertical.

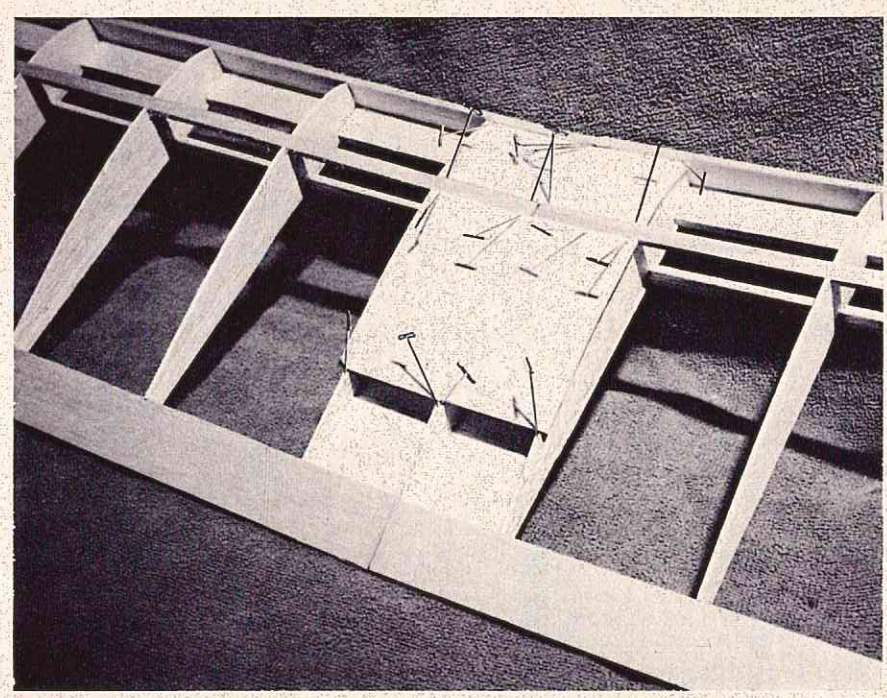
4) Support both wings at correct dihedral angles, glue together, and glue the plywood dihedral brace to each side of the spar. Finally, glue in ribs W1 and sheet cover the top and

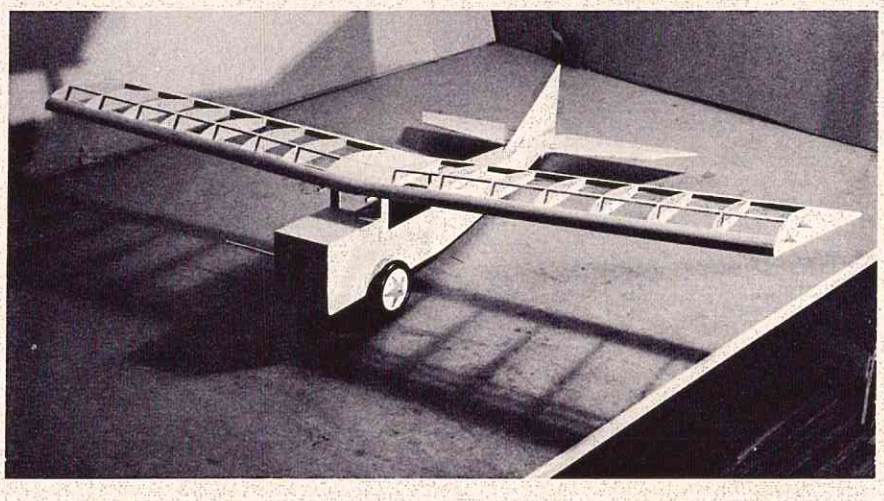
FULL SIZE PLANS AVAILABLE – SEE PAGE 118





General wing construction. Note smooth, flowing graceful lines of completed framework, below.





bottom between W1 and W2.

5) Cut the tail surfaces from 1/8" sheet balsa and join the fin to the fin post and the elevator halves together with the wire elevator joiner.

6) Build the fuselage by gluing the 1/8" sheet doublers to the 1/8" sheet fuselage sides. Add the ½" x ¼" bottom spar, 1/8" plywood struts, and ¼" x 1/8" spruce wing rest.

7) Epoxy in place the plywood firewall and two formers F1. Mark the position of former F3.

8) Add the ½" x ½" balsa nose block, top sheet, bottom sheet, 1/8" plywood landing gear mount, 1/8" balsa strut fillers, head rest pieces, and epoxy the tail skid into the Vee at the rear of the fuselage.

9) Make up the hatch from 1/8" sheet and triangular strip and make certain it is a tight fit between the sides.

10) Pre-form the wire landing gear by taking a conventional steerable nosegear and straightening it out with your wire bender. Mount pre-formed wire landing gear with landing gear clips and sheet metal screws. Add Midwest or Kraft-Hayes motor mount and install Boondocker .09 engine or equivalent. Install any 2 or 3 channel radio system and make up all necessary pushrods.

11) Remove the engine, engine mount, radio system and pre-formed landing gear. Sand the entire airframe to final contours and you are ready for covering.

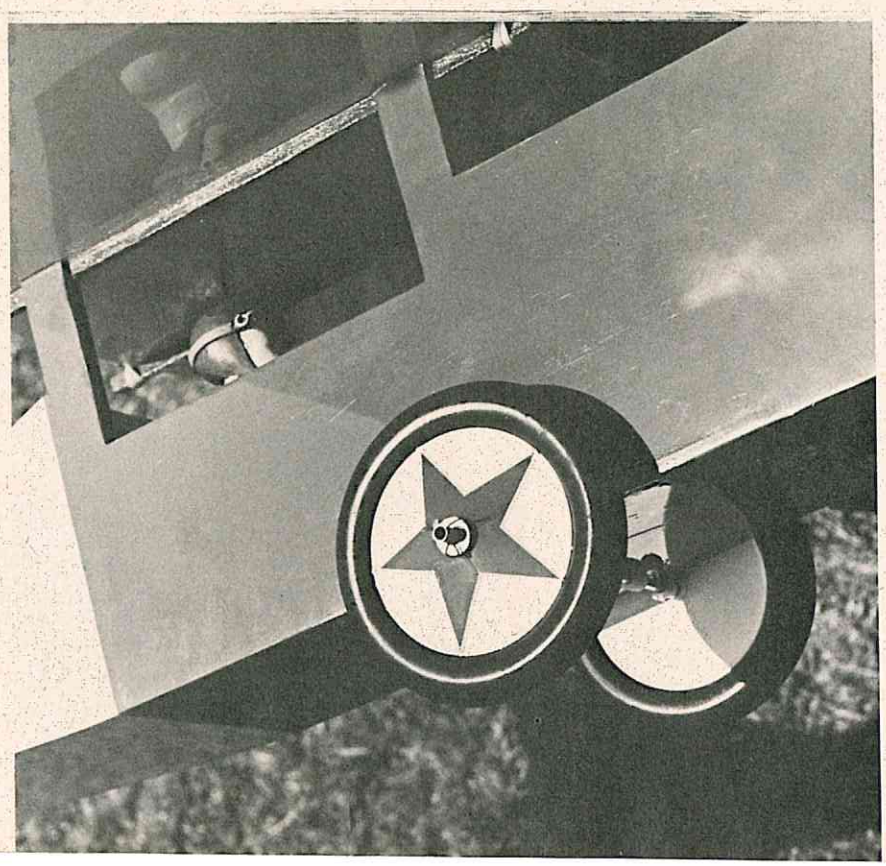
12) Cover. Since it would be difficult to duplicate the covering on the full-size aircraft since it consisted of pages of a Sears catalogue stretched tightly over the framework, followed by several applications of Sheep Dip, we recommend the use of Solarfilm or MonoKote.

13) Glue the tail surfaces in place, engine mount and engine. Install landing gear, radio system and pushrods.

14) Mount the wing and check the balance point. The balance point should be between the leading and trailing edge of wing at the approximate position shown on the plans. If not, don't worry about it, it will just fly funny.

This completes the construction of The Real Thing. With an OS Max .10 engine the model flies quite well and will do inside and outside loops. It doesn't do those extremely well but since it won't do anything else either we thought we would mention it. What it does do is putt around and

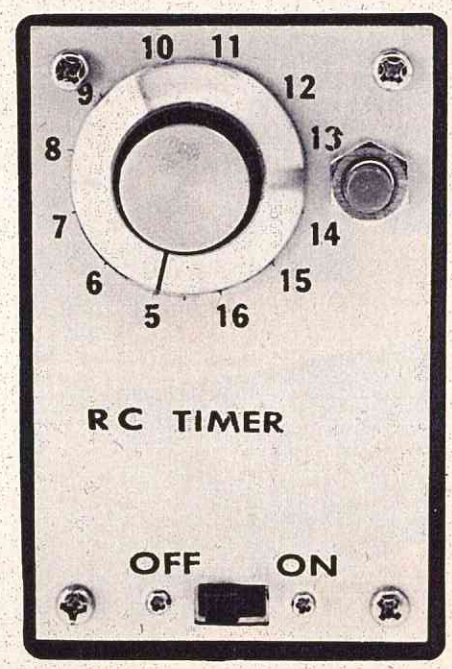
ABOVE: The Real Thing - - - ready to go. RIGHT: Close-up of MonoKote trimmed Williams Bros. wheels. Close attention to detail necessary for scale points . . . . .



glide a helluva' long way when the engine quits.

The Real Thing can be built and covered in three evenings or one weekend, looks cute, and can be flown by just about anybody. And, if the plans and instructions are too complex for you, arrangements have been made with Sureflite Products to produce a kit of The Real Thing which will be distributed in the United States by Hobby Shack and priced at $9.99 including pre-formed wire landing gear.

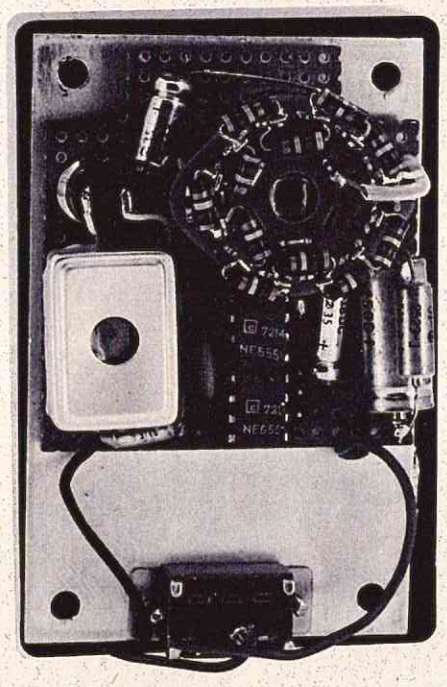
So, if you are looking for something to beat Dave Platt's FW-190 in the next big Scale competition, try building the Real Thing. They're all going to laugh at you when you bring it out to the field, but one thing is for sure – they will all want to fly it! □



ELECTRONIC FLIGHT TIMER

A SOLID-STATE SELF-RESETTING ELECTRONIC TIMER VARIABLE FROM 5 TO 16 MINUTES

By Richard Piety



PREFACE

If you have ever guessed at your engine run, missed, and landed dead stick, then crashed in the boondocks because you missed the field or if you have ever hauled your wife's kitchen timer to the flight line, this timer is for you. The mechanical timers are (in this writer's experience) hard to find and highly inaccurate. The recent development of the Signetics NE/SE555 monolithic timing circuit makes a small compact solid-state timer possible and within easy financial reach of every R/C flier. The simple operation and self-resetting features require only an initial setting of the device to your time requirements, a press of the start

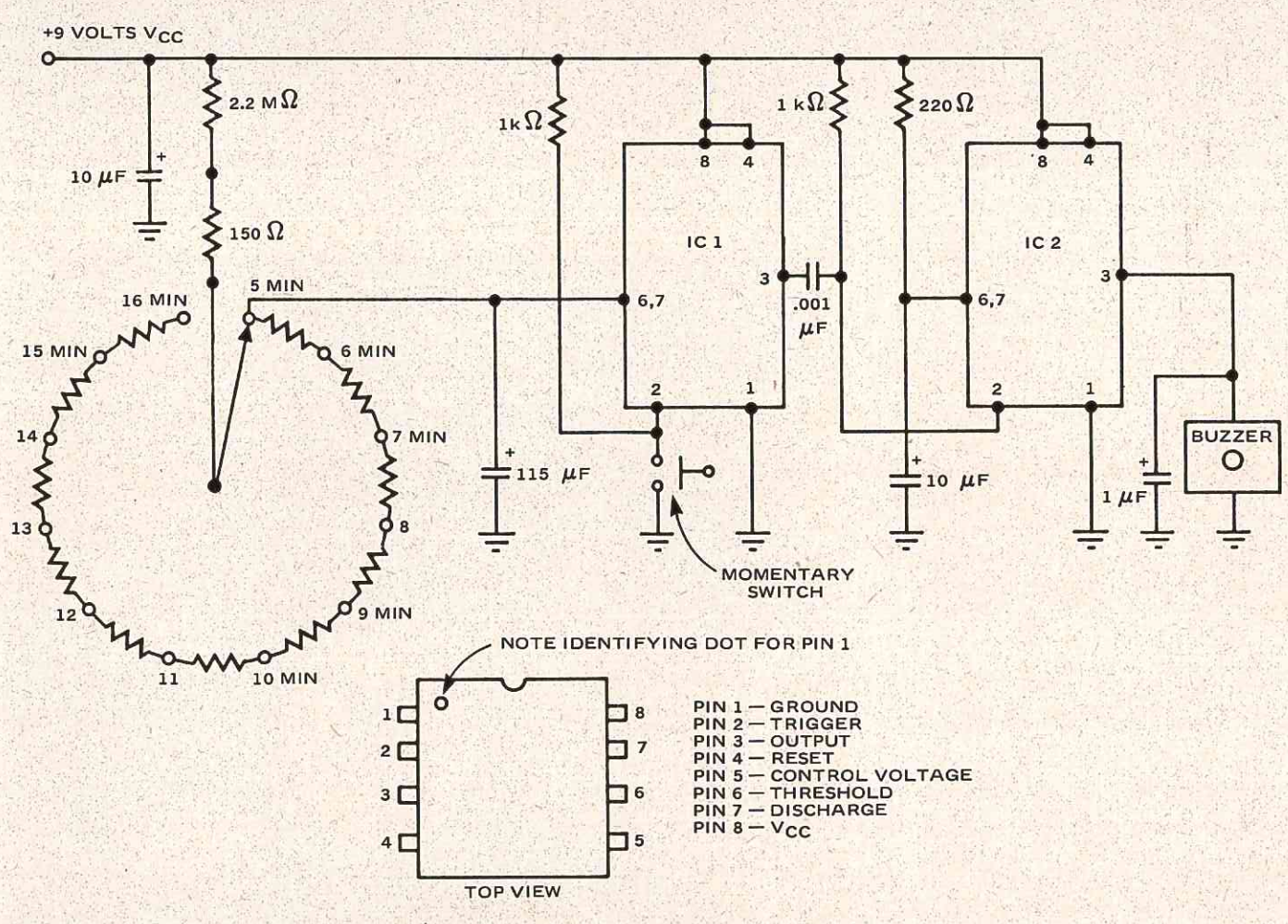


FIGURE 1. CIRCUIT SCHEMATIC

button, and the solid-state buzzer will then notify you in plenty of time to land and taxi back to the pits, then resets itself for the next flight.

Since the size has been held to cigarette package dimensions, the timer can be stuck in your shirt pocket or fixed to your transmitter with double-sided tape. The majority of the parts were purchased from Radio Shack, however, you should be able to obtain them from any electronic supply house without a problem. The two possible exceptions to this are the integrated circuit and the electronic buzzer. The integrated circuit can be purchased from any Signetics distributor; I bought mine from G.S. Marshall Company, 9674 Telstar Avenue, El Monte, California. The Electronic buzzer can be purchased from Projects Unlimited, Inc., 3680 Wyse Road, Dayton, Ohio 45414.

CIRCUIT DESCRIPTION

The schematic of the circuit is presented in Figure 1 and a top view of the integrated circuit is included for pin number location. Figure 2 shows

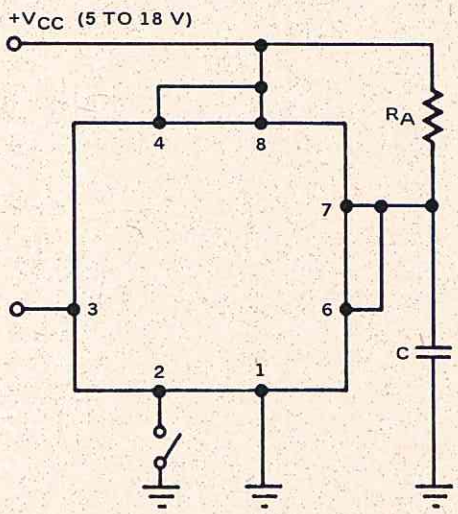


FIGURE 2

the NE555 connected as a manually-started timer. In this mode, the timer functions as a one-shot. Referring to Figure 2, the external capacitor is initially held discharged by a transistor inside the timer. Upon application of a negative trigger pulse to pin 2, the flip-flop is set which releases the short circuit across the external capacitor and drives the output high. The voltage across the capacitor, now, increases exponentially with the time constant $\tau = R_A C$. When the voltage across the capacitor equals 2/3 V_{CC}, the comparator resets the flip-flop

to page 107

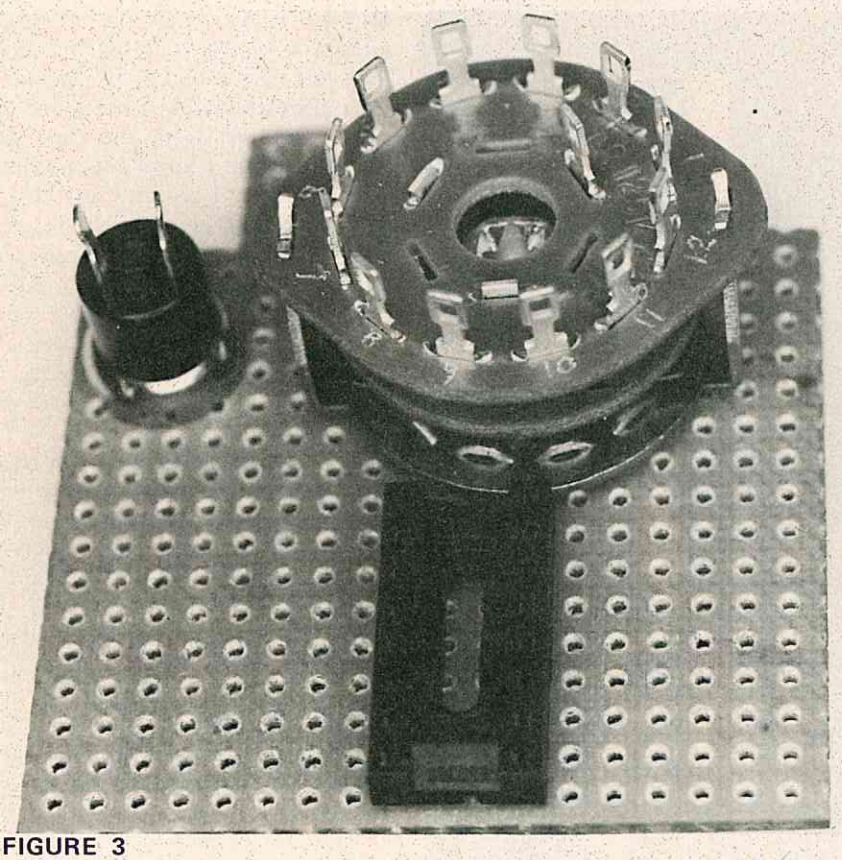
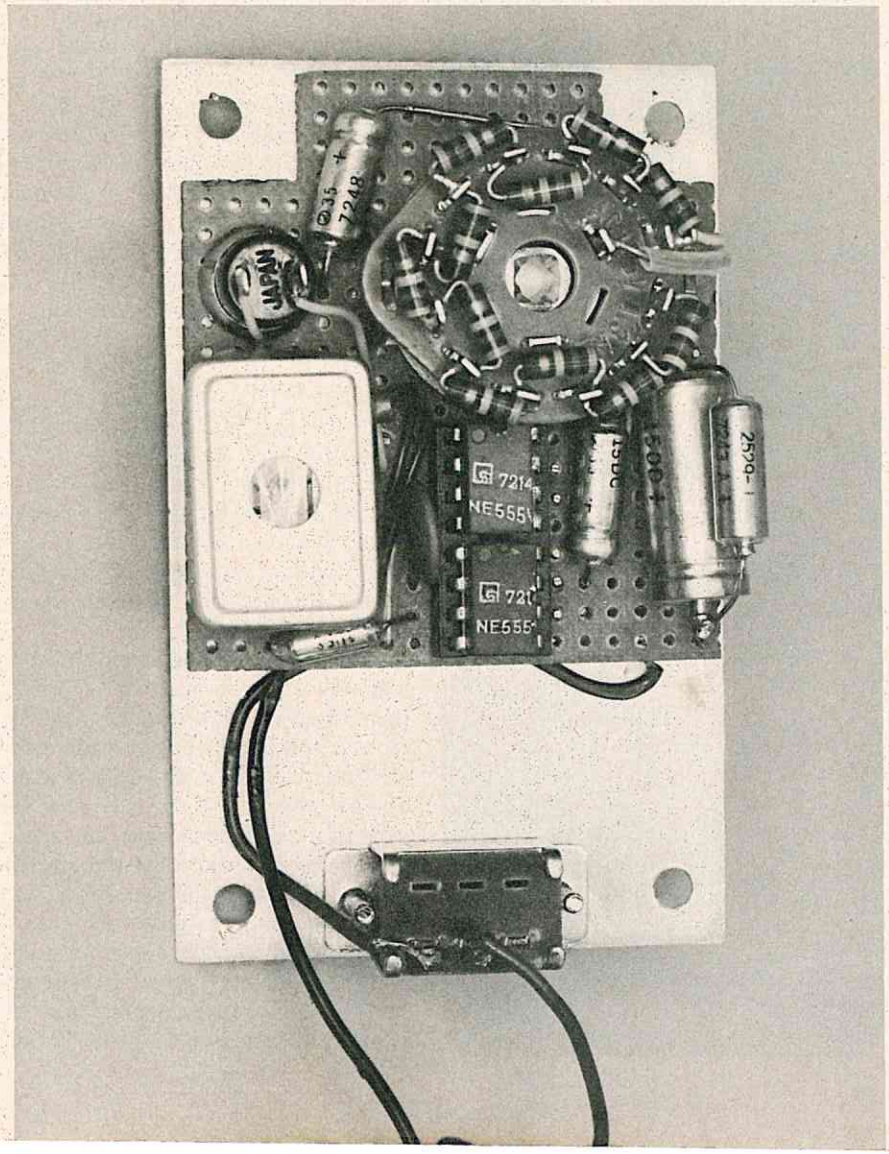


FIGURE 3

FIGURE 4



RETRACTS

BY DUBY MC GUIRE

Reprinted From The
Rocket City Radio
Controllers Newsletter

● Two seasons ago, as I traveled around to various contests, I could not help but notice one or two people at each meet who worked and toiled on a set of retracts from the time they arrived until they drove out of sight on Sunday night. I sat back in the cool shade and told everyone within hearing that I would never be caught with those stupid things. This article is directed to those who are now saying the same thing I was, or to those who have just recently quit saying, "I would not have those things if you gave them to me."

First, determine where the main struts on your aircraft exit the wing skins. On a tricycle geared system, this is normally 8" to 8½" from the center of the wing and ¼" to 3/8" behind the C.G. (on the bottom side). At this time make sure that the wing, at the location chosen to mount the gear, is thick enough for mounting a retract system. It is very frustrating, as you tighten the mounting screws, to watch the gear housing crunch through the skin on the top side!

Most systems provide a template to mount the main gear, usually made from 3/16" plywood. However, if no template is available, make sure enough area is in the plate to secure it to the wing and that it will take the abuse of landing. If you are not sure, look at some installations. Normally a plate with a total area of 7 square inches (before the cut out for the mechanism is made), will do the job. Now, lay the plate on the wing skin placed so that, when mounted, the strut will exit in the proper place. Scribe and make an opening so that the plate will mount into the wing and leave the gear housing flush with the wing skin. Cut the plates out for the gear housing and epoxy the plates in the wing. When preparing the opening in the wing for the gear housing, make sure that no part of the system that moves touches any part of the air frame.

Now it is time to determine how long the struts need to be and bend them. You will note that, if your gear retracts toward the center of the wing, the strut will be on the outboard side of the wheel. Use the LG measurements for the gear in your kit, or if it is an original, make sure the airplane will set level with the gear down. Now is the best time to make the cut-out for the wheel well. The gear is mounted in the wing, the strut is bent and cut to the proper length, and the wheel is mounted on the strut, but has no place to go yet. Cut out the well, making sure it is large enough to allow for any bending that will occur as a result of hard landings. In fact, I would make it at least 3/8" over size. We should now be able to check the free fall of the two main gears. If you are using a servo-mechanical system, it is very important that the gear hang at 45 degrees in the free fall position, i.e., no pushrods, etc., attached. We can now also check to make sure that the gears are, in fact, even with the bottom side of the wing and that the front of the strut points toward the leading edge of the wing.

Most nosegears mount on the back side of the No. 1 bulkhead. Use No. 6 x 32 screws with blind nuts and aircraft lockwashers. Your planning here should include fuel tank size and location and space for a wheel in the well. Make sure the gear, when retracted, does not go through your battery pack! With the gear mounted, strut and wheel mounted, and any other items to be mounted on the strut such as a brake, check the free fall of the nosegear. It should fall to 45 degrees. If it doesn't, you must adjust your spring. Take a straight edge and mark a location on the top side of the wing at the center line that makes a straight line between the two main gear struts. This will be the location of the servo output shaft that retracts the gear system providing you have the wings on the bottom. You may, if you prefer, move this location left or right limited by the width of your fuselage. The purpose would be to clear the nose wheel since it is also in the center of the fuselage. I, personally, put the output shaft of the servo on the center line of the wing. The servo should be mounted so that the output wheel is just below the wing skin and tilted in relation to the nosegear pushrod connect point to permit a straight line to all main gears. (Very important.) Add the servo rails.

Now that the servo is mounted, you have noted, I am sure, that it is a 180 degree servo, especially if you tried it on your aileron and they stood erect with only a slight movement of the transmitter stick! The gears will retract by a push-pull method. Determine if the extending of the pushrod retracts or extends the gear system. In other words, determine what position the servo should be in order for the gear system to be down and locked. Route out a route for your pushrods. Again, make sure the three pushrods do not

to page 106

SCRATCH BUILDING R/C

SAIL YACHTS

BY MEIDAD ABIR

PART I

R/C yachting is a fascinating phase of our hobby but not too many modelers are giving it a try mainly because of the lack of available information. The average modeler might also shy away due to the price tag on some of the commercially available yachts and, perhaps, some think that a 26 lb., 6 foot boat is a bit too much.

The A.M.Y.A. (American Model Yachting Association) recognizes 7 classes of yachts, two of which are most suitable for home construction. The 36/600 is for boats up to 36" long that can carry up to 600 square inch of sail area. The 50/800 is for boats that are 50" long and a maximum sail area of 800 square inches. Both classes are small enough to be easily constructed and present little problem in transporting to and from the water.

In this series of articles we have chosen the "Soling" full size design as our prototype in building a 36" and a 50" boat. Some deviation from the prototype will be necessary but both models will qualify as "Stand-Off" Scale, especially in the water!

Let us then start on your choice, be it the 36/600 or the 50/800. They will be built identically with the obvious demand for more material for the larger boat.

The boat is built using the "plank-on-frame" method, so the first step will be to construct the "frame". Lay a sheet of wax paper over the profile view and using ¼" x ¼" medium balsa, construct one backbone (those of us who have been around for awhile will have to resist the temptation to build another one for the other side of the fuselage!) you can pin directly through the wood as strength is not a factor.

While the "one-sided fuselage" is drying, cut the frames from 1/8" sheet. Each frame should be traced and cut as accurately as possible and used as a template for the other side to ensure symmetry. You are now ready for some assembly work! Cement the frames to the pinned-down backbone checking that they are vertical and most important that the deck edge of the frame matches the backbone. This will leave 1/8" at the keel edge. (Figure 1.)

After all frames are cemented, and you can use any type of glue or cement (I use Ambroid), check again for alignment and let dry. Looking at your half-boat, you can see the beautiful flowing lines of your "Soling".

After eating (or drinking . . .) dinner, take all the pins out and lift the frame from the building board. The assembly is pretty flimsy so handle with care. The idea now is to present the other side of the backbone to the frames and it gets a little tricky. I use some blocks of wood inserted between the frames but, actually, you

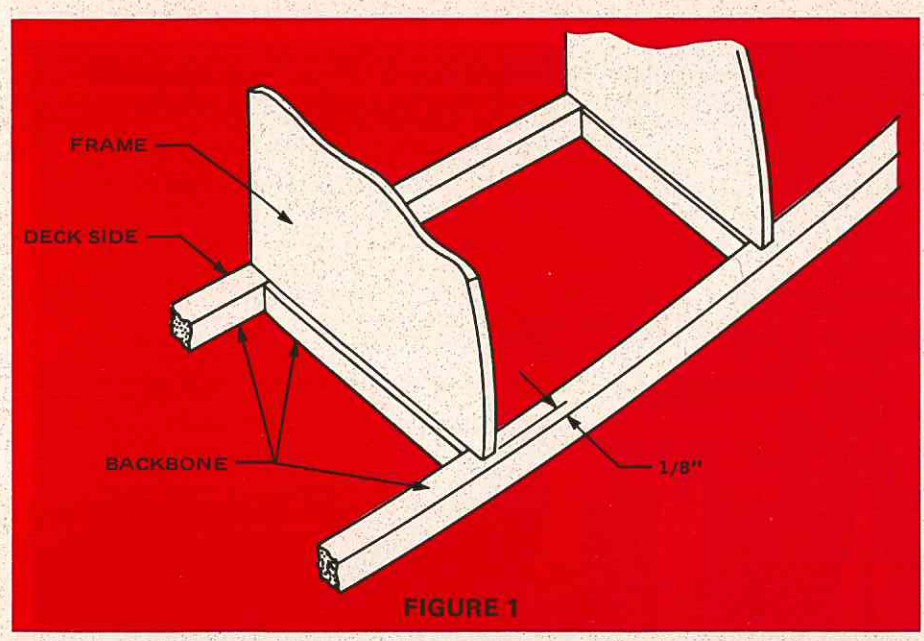
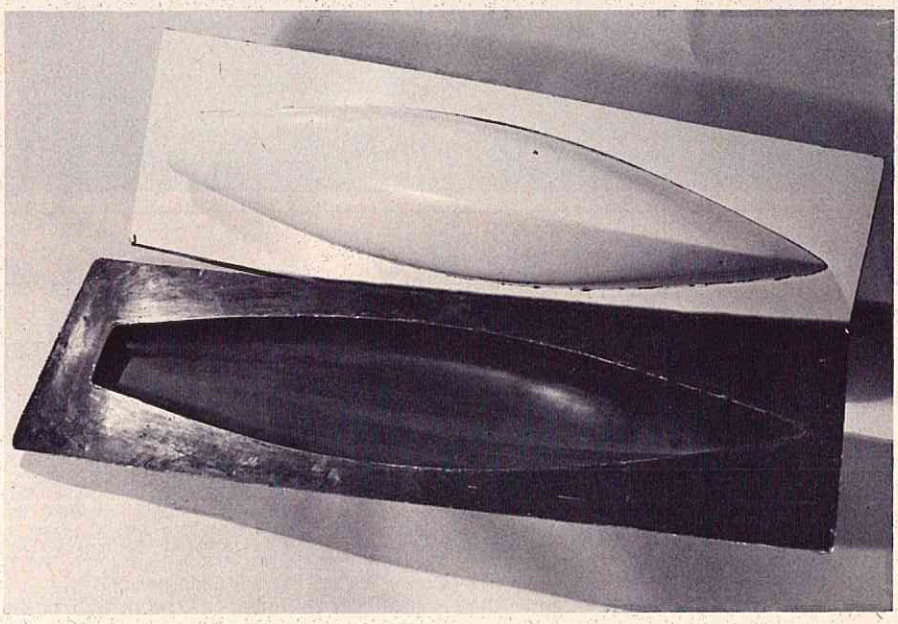


FIGURE 1



The author describes, step-by-step, how to make a mold and use your own creation as a pattern or "plug," for producing duplicate fiberglass hulls. Shown above is the hull mounted on a flange plate along with the fiberglass mold as described in the text.

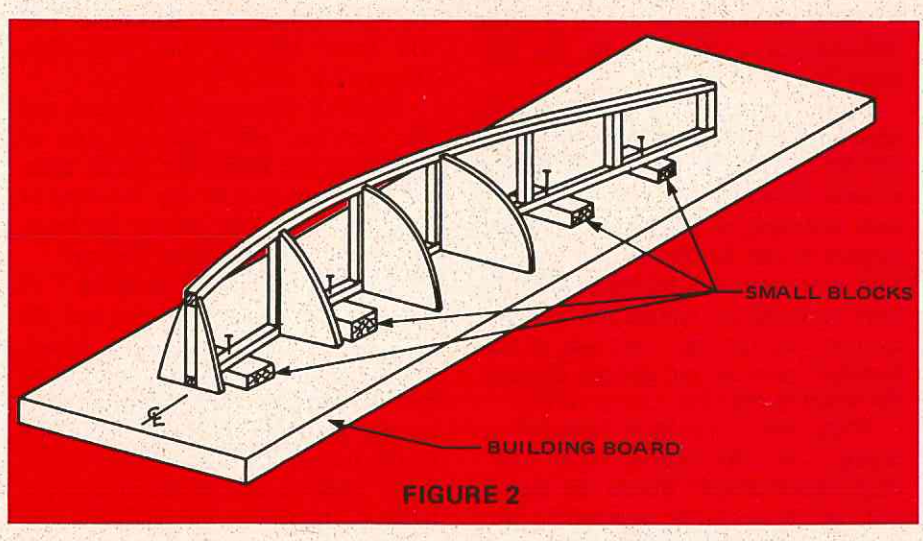


FIGURE 2

can cement the frames to an unsupported backbone as you don't have to worry about it curving, at least for now! Set aside to dry while getting ready for planking.

For planking, use medium 1/8" x 3/8" balsa strips. You can strip them yourself or buy them, as the end results will be the same. The first strip is the most difficult to do and also the most important so listen carefully!

Mount your frame upside down on the building board making sure the backbone is straight! Use small balsa blocks to support the curved deck edge and pin to the board. (Figure 2.) This will ensure that the planking will not distort your perfect frame!

The first plank is now pinned and glued to the frames, following the deck lines curvature. Sight along it to make sure it follows a smooth curve and make adjustment where necessary. If your frames were installed correctly, there should not be any problem but . . . repeat for the other side without undue delay to eliminate any stresses from forming in the hull. Since we are going to use balsa blocks in the bow and transom (or is it stem and stern or maybe nose and tail? How 'bout front and rear?) at any rate, the planks should extend for about ½" from the bow and transom frames.

Once the shear planks (that's what they are called) are in place, planking is fairly easy. Make sure that the next plank butts against the first and bevel slightly, if necessary, planking both sides at the same time. You will notice that, after the first few planks, they will require a greater bend in them as you reach the widest point in the hull. The first indication would be a cracking sound and a broken plank. It is difficult to predict when exactly this will happen as the wood density and the width of the planks vary, but as a guide this will be the 9th plank on the 50" boat and the 7th on the 36" boat.

When this point is reached, you can, if you wish, remove the boat from the building board and you will find that it will be very rigid and easy to handle. You now lay a plank along the keel. This plank will have a nice twist in it as you approach the bow and will require a certain amount of beveling and tapering to fit correctly. Don't worry about small cracks and gaps as these will be treated later. Fit in the rest of the planks from the bottom up noticing that they will have to be tapered where they meet the planks coming from the top. Once the last plank has been installed, you will

realize how beautiful the boat is!

Trim all the overhanging planks and glue the bow blocks on each side of the backbone. Repeat the procedure for the transom. Pre-gluing is advisable here as a certain amount of pressure is applied while curving and sanding to shape. Sand the entire hull smooth; fill in any cracks and pin holes with your favorite filler (mine is Ambroid and balsa dust) and get ready for an important decision!

By now your friends are probably contemplating one of those boats, anyway. So why not make a mold and use your beautiful creation as a pattern or "plug?" The process is not difficult nor is it expensive and you can produce duplicate fiberglass hulls for your friends and neighbors for a slight fee!

If you decided to join me in converting your boat into a plug, listen carefully and you might be able to convert your plug into a boat again **after** you have made the mold!

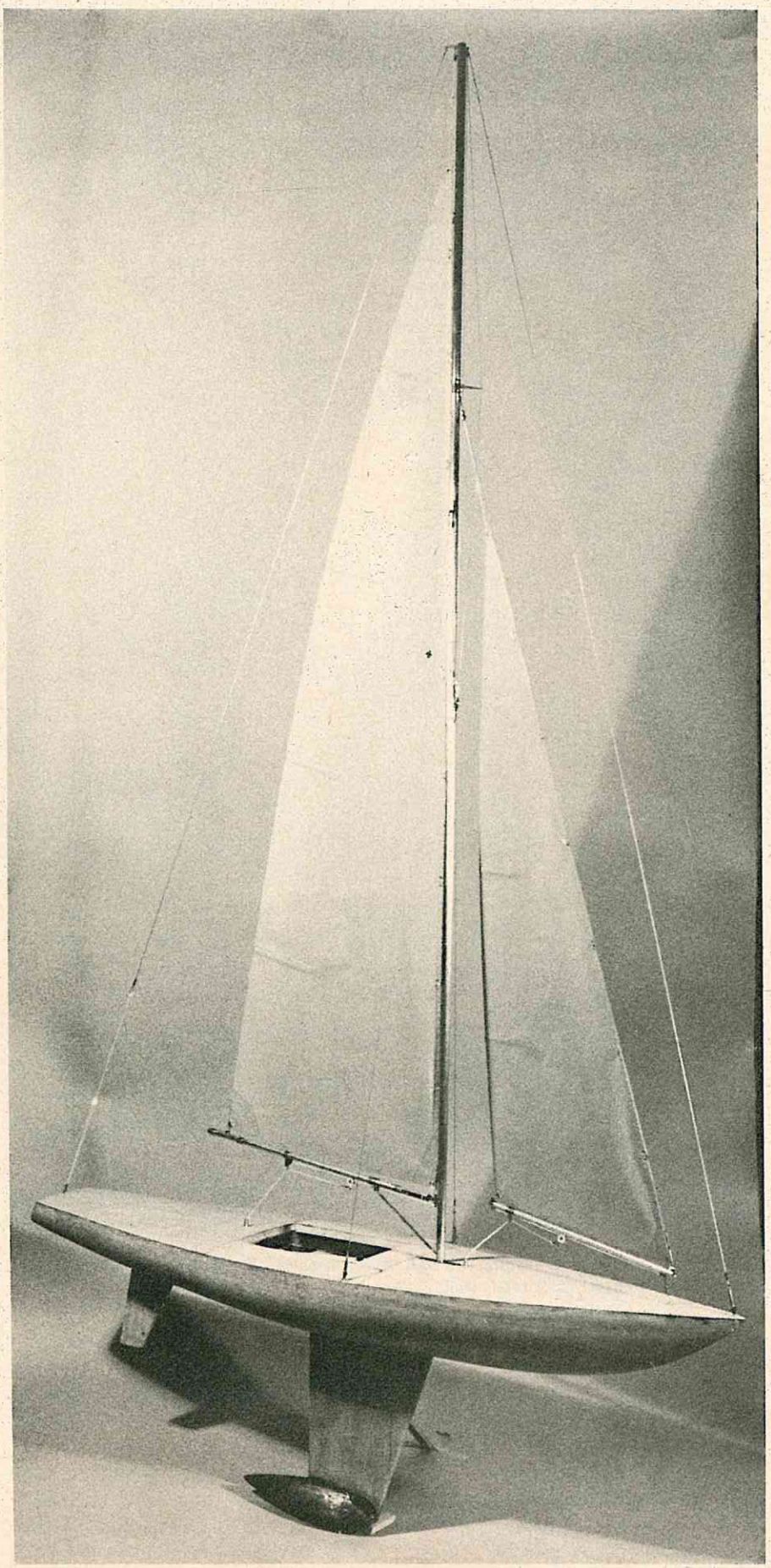
The first step is to finish the surface using whatever method you prefer; sanding, sealer, dope, epoxy, polyester, whatever! Remember that the mold will be as good as the plug so careful finishing here really pays off. I used 2 coats of polyester resin wet sanded. Then 2 coats of primer topped by 2 coats of automotive lacquer.

Mount the hull to a flange plate. 1/8" masonite works beautifully. Apply cement to the top of the frames and the edge of the shear planks and glue to the flange plate, using some heavy weights and tape to ensure the plate follows the shear line and no gaps are left. Let dry thoroughly. The flange plate should form a flange around the boat. Dimensions are not important but make sure it is at least ½" all around.

The joint between the hull and the plate should be treated with respect as it will represent the "trim line" in the mold. I use wax which I work with a soldering iron to fill in the gaps and ensure no undercuts are present. The assembly is then painted as a unit, wet sanded and polished!

When satisfied with the finish of the plug we proceed to the next step – that of making a mold! Materials are available at most hardware stores, paint supply stores, boat dealers and builders, etc. You will need the following:

1. Gel-Coat
2. Resin – finishing
3. Fiberglass matt or cloth
4. Parting agent



The larger 50/800 yacht. Length 50"; height 87"; beam 12"; sail area 798 sq. in.; keel weight 10 lbs; total weight 16 lbs.

The smaller 36/600 yacht features a length of 34"; beam 8"; height 60"; sail area 400 square inches; keel weight 3.5 lbs.; total weight 6 lbs.

5. Paint brush
6. Acetone
7. Mixing cups
8. A sharp knife

I will dwell shortly on each of the items for the benefit of those who are not familiar with the process.

Gel-Coat is a polyester resin that, when set, becomes very hard and has a shiny surface. It is thicker than regular laminating or finishing resin. Gel-Coat is available in many colors - - - choose the darker colors for your mold; you will need only about a pint!

Resin – finishing – again, a clear polyester resin which flows very easily and will dry hard. Both Gel-Coat and resin use a catalyst prior to mixing. 1 quart will be more than enough.

Fiberglass – the "backbone" of your mold and molded parts – use either matt or cloth whichever is easier to obtain – the end results will be identical. 6-7 oz. weight is perfect! You will need a piece about twice the beam of your boat and about 12" longer.

Parting Agent – P.V.A. (poly vinyl alcohol) is your best bet. It is a greenish liquid that can be diluted by water for spraying and will form a film between your plug and mold and also between the mold and molded hull. As mentioned, it is best sprayed on but can be brushed on with a very soft brush so as not to leave any streaks.

Paint brush – is required to apply the Gel-Coat and consecutive coats of resin. A 1" nylon brush is all you need provided the bristles will not pull out.

Acetone will be used for cleaning the brush and also your hands! Buy a quart, the stuff is cheap!

Mixing cups – paper cups are best for mixing the resin prior to application. You can obtain these in paint stores or use Dixie Cups.

Trimming knive – used to cut cloth to size before laminating in place. Also used to trim excess material when the resin is setting. I use X-Acto blades and throw them away after use.

Now that all the stuff is neatly organized, we can start the actual process. Once mastered, you will come back to it time after time and you'll probably wonder how you managed without it!

The plug is coated with 2 coats of parting agent. The P.V.A. is best sprayed on but can be brushed with a soft brush. After coating, check the whole surface for complete coverage and correct and re-apply, if necessary. Take no short cuts here because if the Gel-Coat sticks to your plug . . . well, that's it! Molding or parting wax can also be used but the application is a bit more complicated and the surface will have to be buffed once the wax hardens. Which ever method you choose, follow instructions!

Mix the Gel-Coat per instructions and apply over the plug. Make sure coverage is complete and coating is uniform. Gel-Coat will not run as easily as regular resin and you should have no difficulty with the exception of the transom area where you might choose a smaller brush or apply the Gel-Coat with a Q-tip. Work in a ventilated area as the whole process is rather smelly, but then again, your family is used to that by now!

If mixed properly, the Gel-Coat will be tack free in 30 to 45 minutes. It

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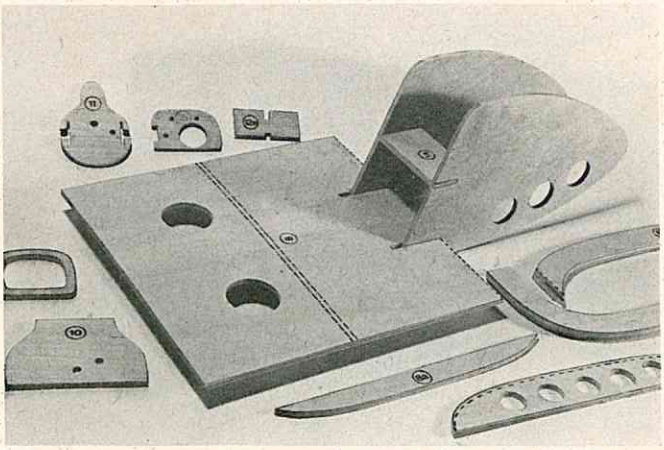
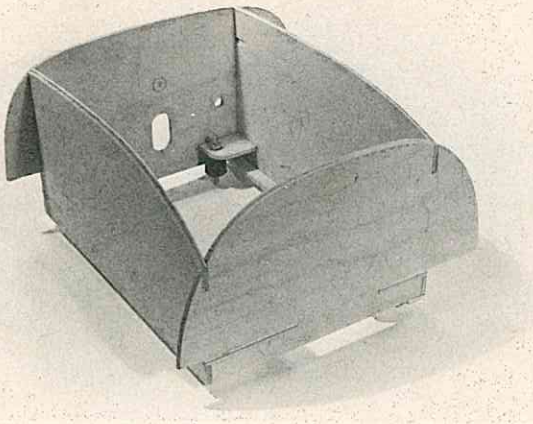
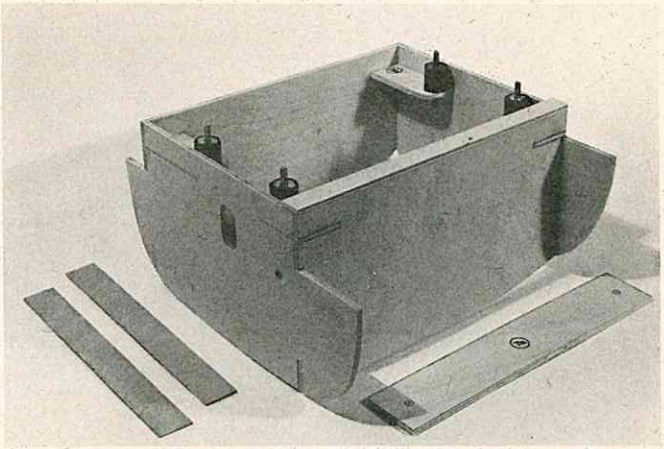


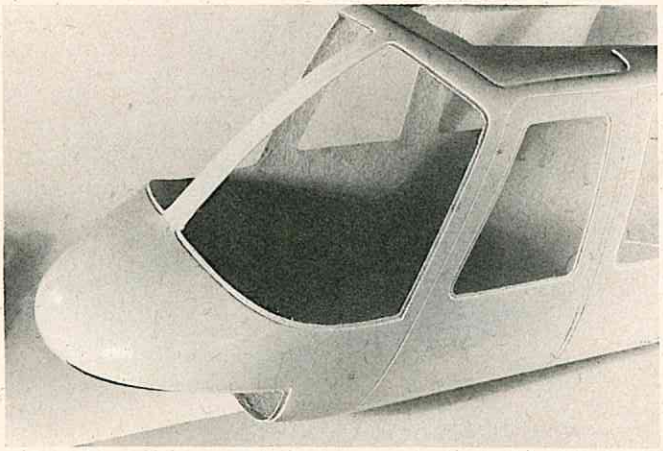
Plywood formers are clearly marked and easily cut. Here, forward floor has been assembled — floor No. 8 not glued yet.



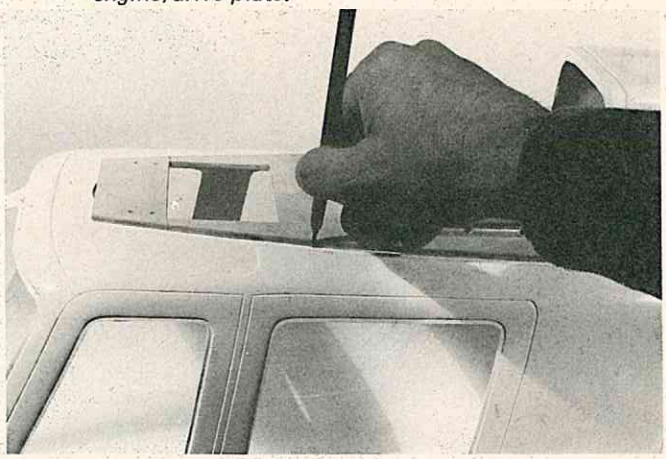
Bottom of transmission housing fits into fuselage with only minor trimming - - - edges to be angled are well marked.



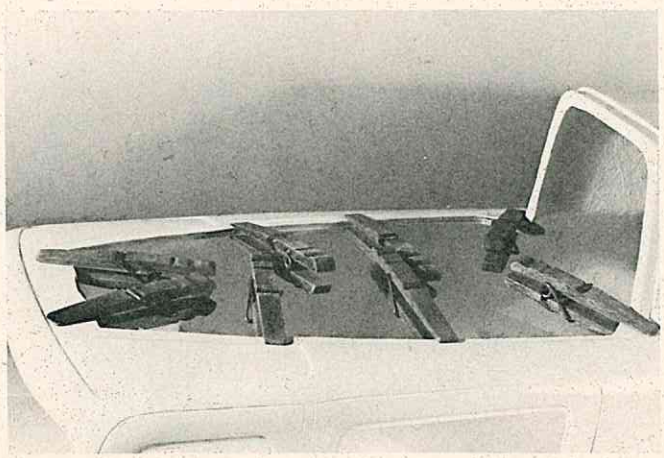
Top of transmission housing. Note clearance for glow plug and hole for fuel line. Thin ply strips are used to cap off ends to keep cooling air over cylinder. Strip No. 7A is removable to clear muffler. Shock mounts support entire engine/drive plate.



All windows must be trimmed out — Dremel tool handy — overhead windows cut out after top hatch has been fitted.

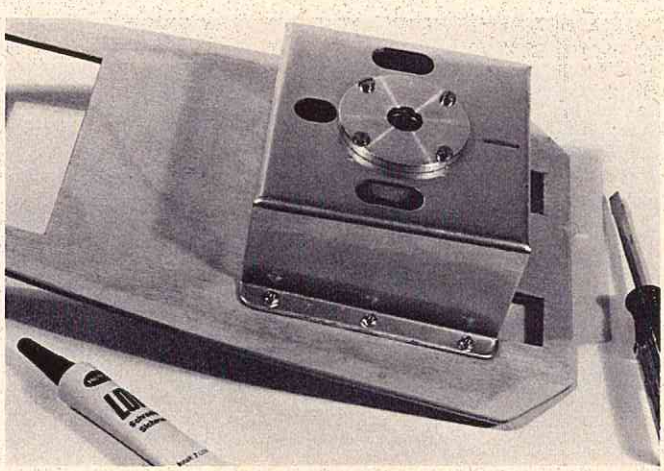


Former No. 9 is used to outline the cutout in the fuselage top — assuring an accurate fit.

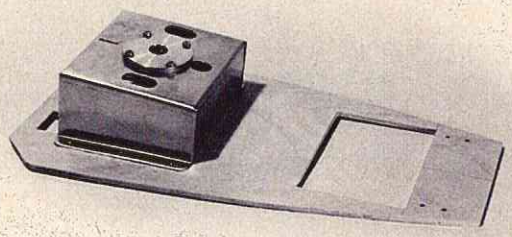


Former No. 9A is epoxied on the inside of the top cutout. The four blind nuts which hold the top hatch install into former No. 9A.

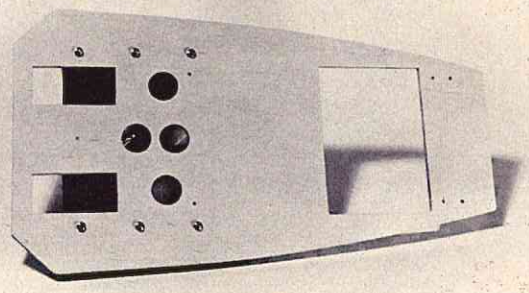
The main rotor bearing plate is assembled to the bearing bracket with the screw heads on top of the plate — LOP a must!



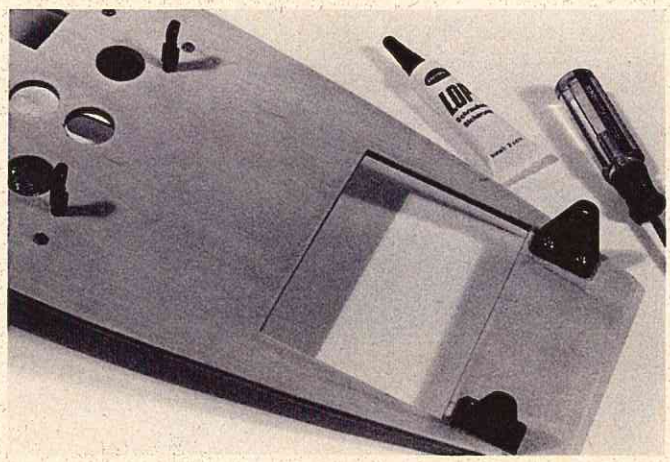
The bearing bracket is attached to former No. 9 with nuts and washers on the bracket side.



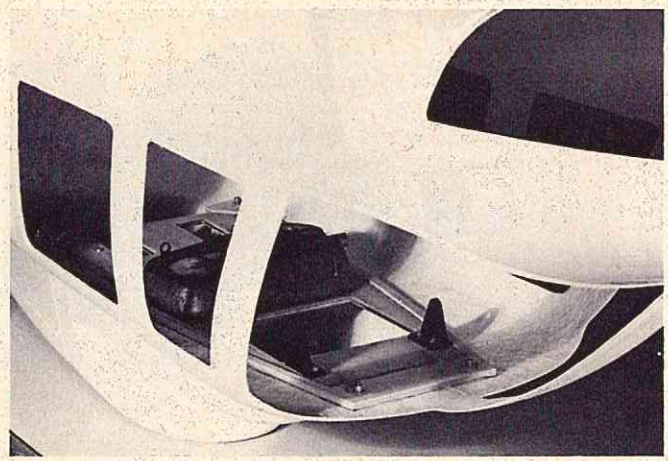
Bearing bracket on former No. 9.



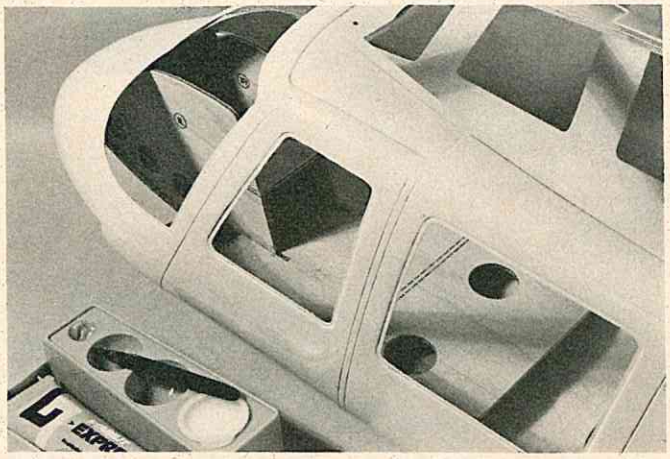
Underside of former No. 9 showing cutouts for servo mounting, pushrods, etc.



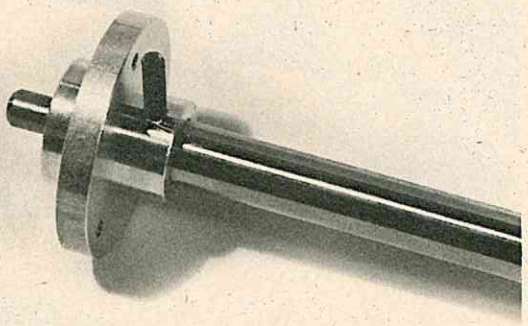
The servo tray angle bearings and collective pitch ball links in place on former No. 9. Ball links would be easier to install if mounted prior to adding the bearing bracket.



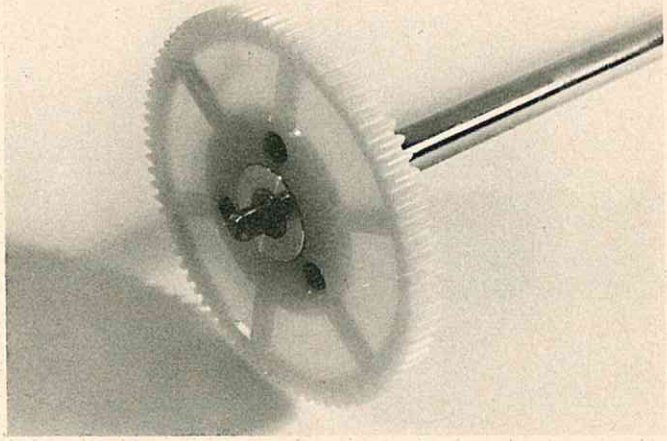
After the top hatch has been fitted, former No. 9 is tack-glued to it, installing through a front window into the inverted fuselage. Note that the blind nuts have not been permanently installed.



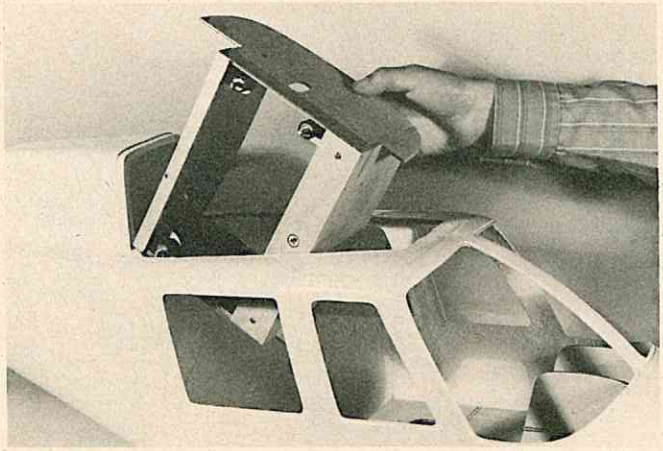
Stabilit Express is used to glue the forward bulkhead/floor into the fiberglass fuselage.



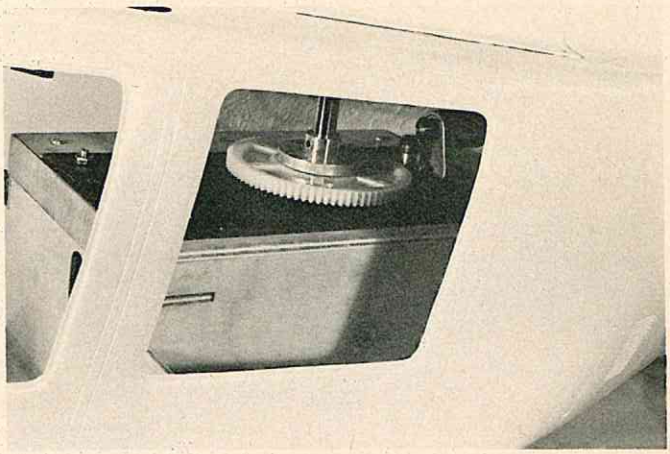
The gear bushing is held in position on the main rotor shaft by a split dowel pin which is driven through the shaft.



The main rotor drive gear is held to the gear bushing with three screws and is added only after the bushing is pinned to the shaft.

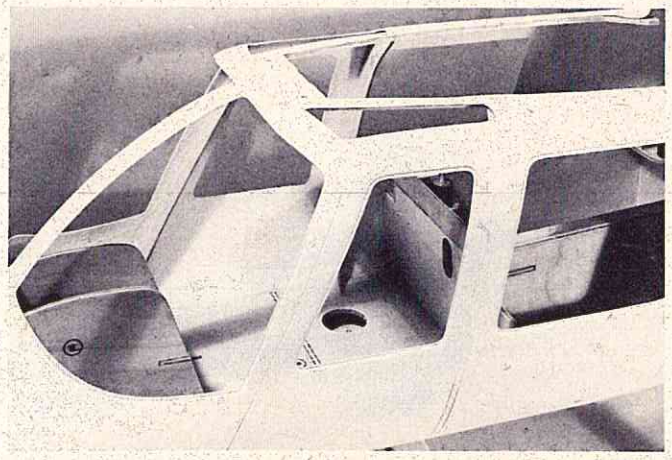


The plywood transmission housing is fitted through the top opening and after positioning glued with Stabilit Express.



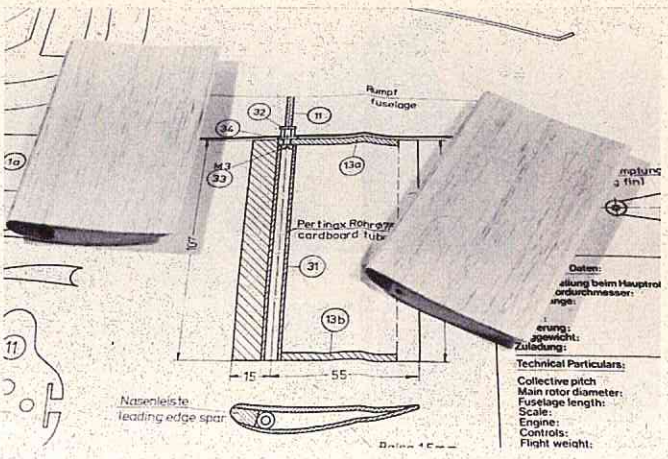
Top hatch and main rotor shaft in place — transmission is shifted until rotor shaft aligns with bearing and gear is parallel to top plate.

Addition of wall formers and top windshield former.

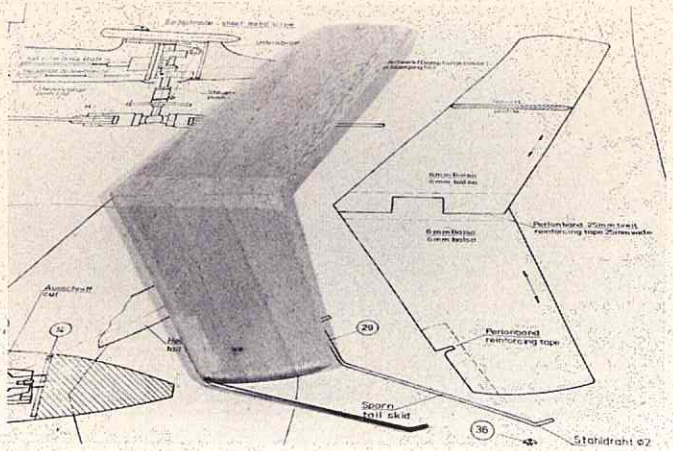


Completed cabin interior framework. Once everything is in place, all joints are securely glued.

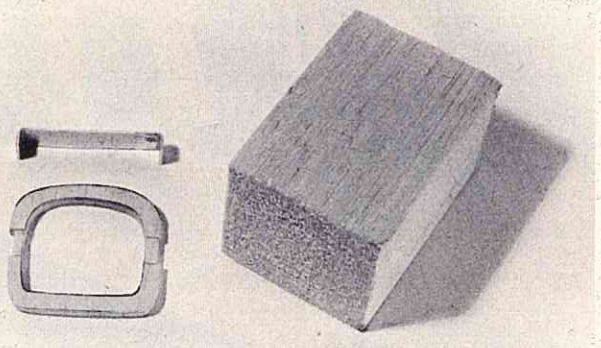
Addition of landing gear and skids serves as a base to work on the fuselage.



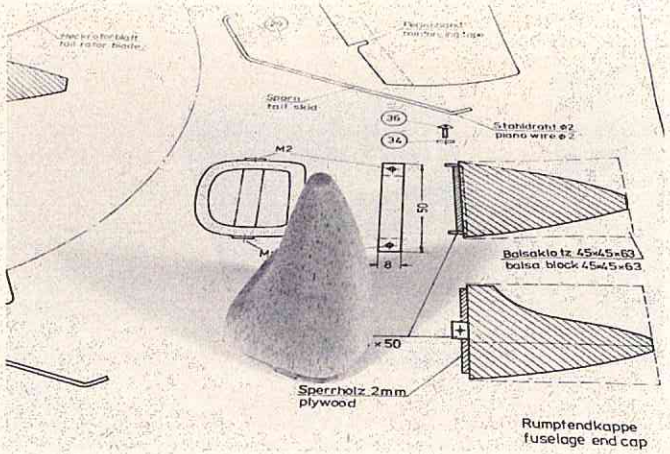
Horizontal stabilizers are a simple fabrication, but must be made in pairs — one left and one right.



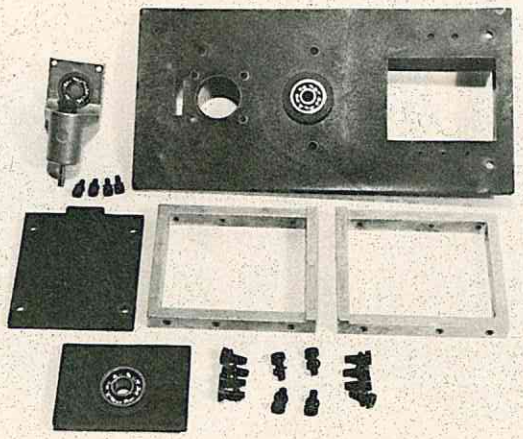
The vertical fin shaped from balsa sheet. Center section and skid area are tape reinforced.



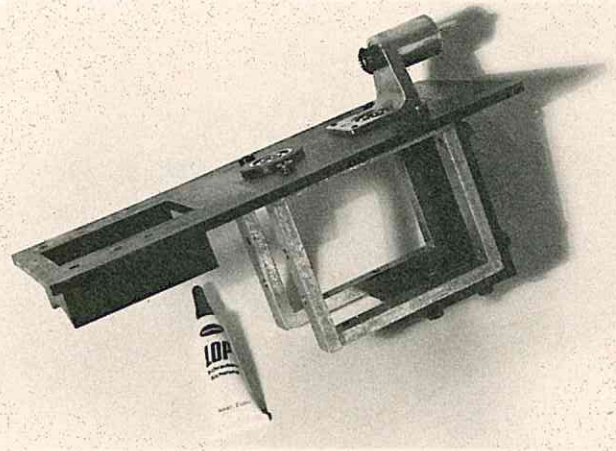
Tail cone is built up of tail block, former, and aluminum strap.



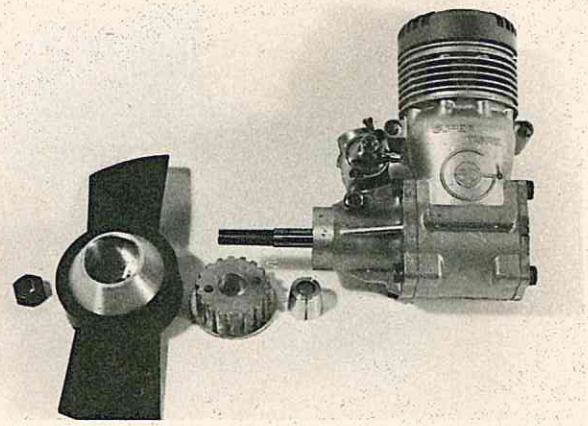
The completed tail cone — simple carving required.



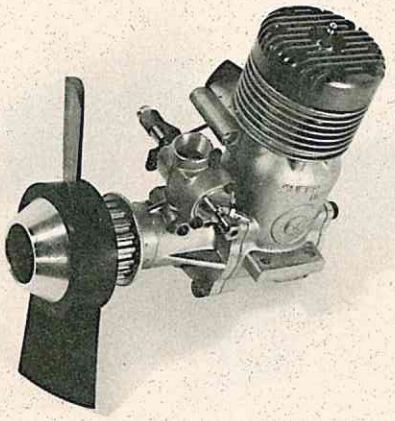
Transmission frame components. Bearings are factory installed.



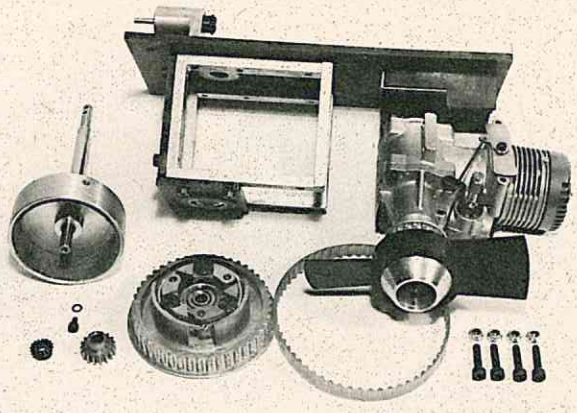
Basic transmission frame assembly – engine frames may be reversed for varying engine widths.



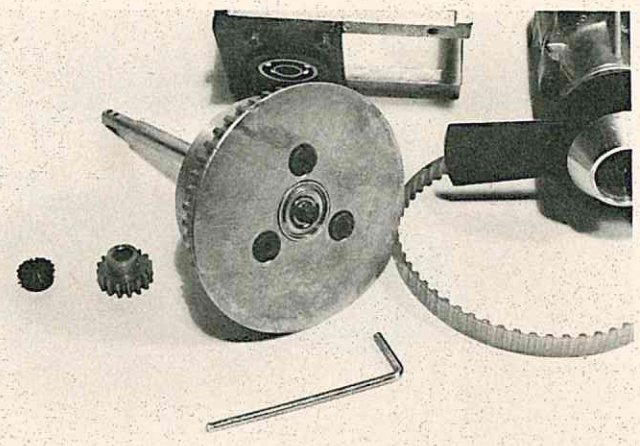
Drive washer removed from Super Tigre .60 – replaced with split cone and timing belt drive gear. Fan replaces prop.



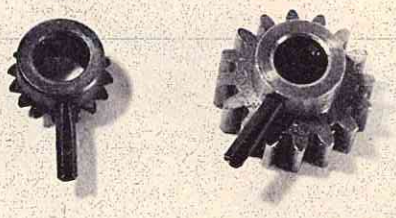
Completed engine assembly. Note large lugs beside exhaust stack. These had to be removed in order to use the supplied muffler.



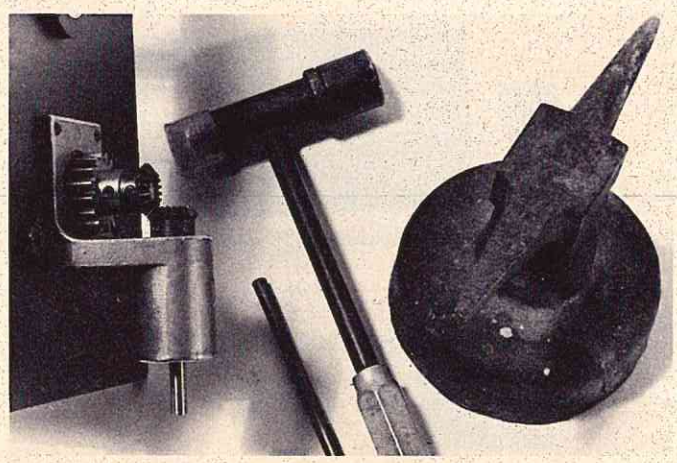
Transmission sub-assemblies – clutch is factory assembled.



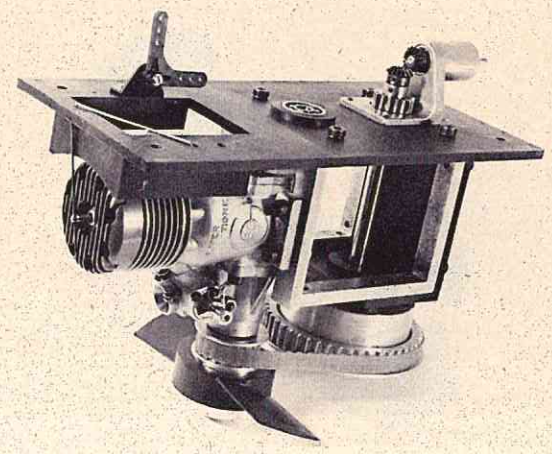
Clutch mounts directly to the bell housing shaft.



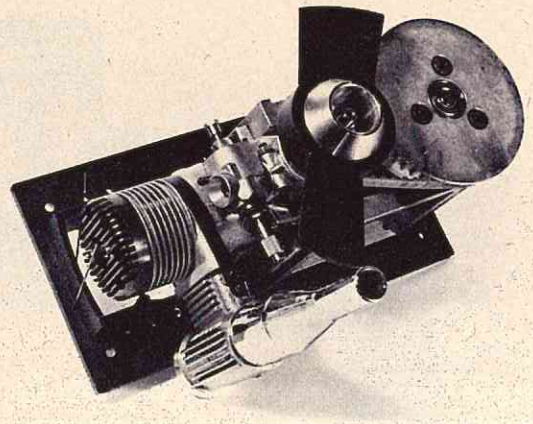
Spur and bevel gears which must be pinned to the top of the bell housing shaft. Pins should be started into gears prior to assembly.



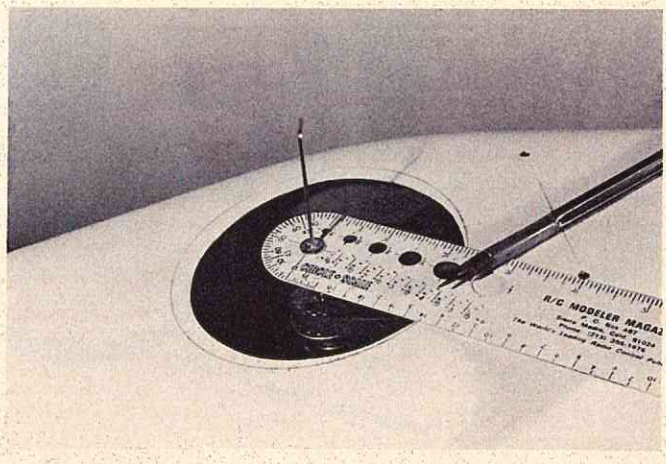
Gears pinned in place. Tricky job, but small hammer drive pin and modelers anvil will serve well. Requires care to avoid damaging gear teeth.



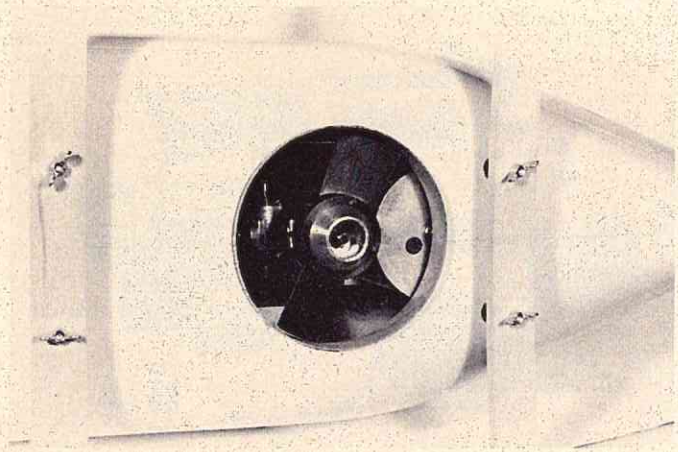
Assembled transmission – note simple spring wire glow plug connection.



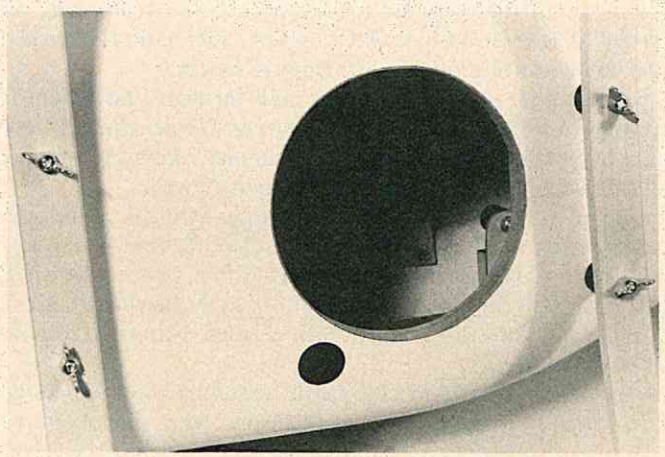
Engine ears removed and muffler installed.



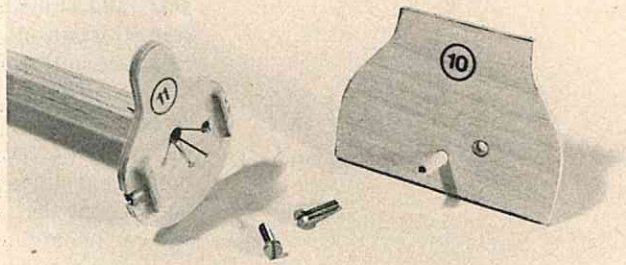
RCM's rule doubles as a compass. Here it is used to lay out the 118mm circular fan cutout. Engine shaft provides accurate center.



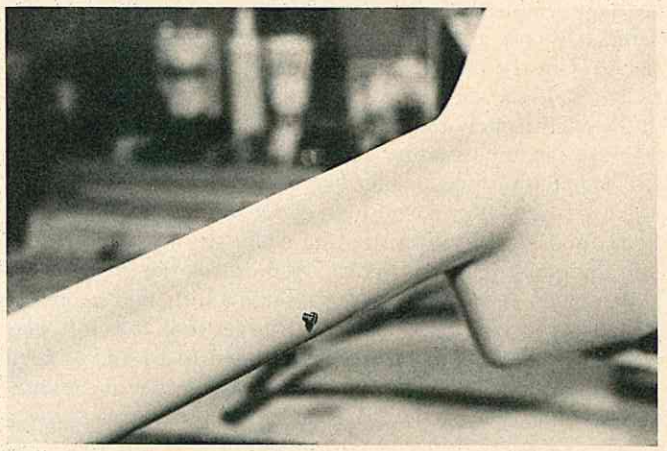
With the transmission in place, the fan should be a close fit in its opening. Plywood lining fitted.



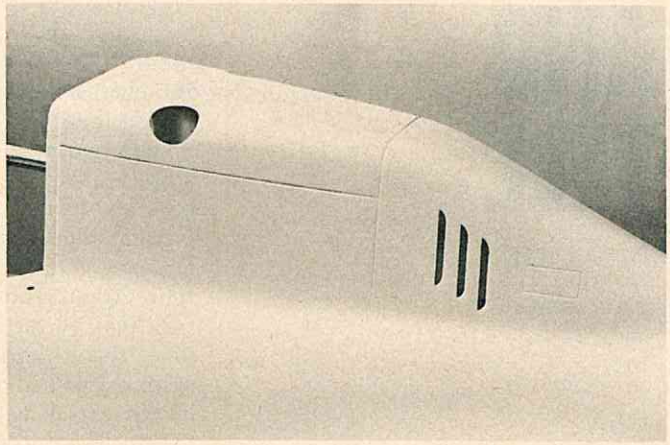
Fan cutout trimmed and lined with 1mm plywood strip. Strip adds to fan efficiency. Small hole is for muffler stack.



The center boom former No. 11 is positioned by pinning onto a balsa strip. Once in place, screws into the blind nuts will hold it during gluing. Care required to position pushrod hole correctly.



Screw through the boom into former No. 11 holds it during gluing. Screws will later hold the horizontal stabilizer.



Scale exhaust stack openings and vent openings complete the fuselage construction — now ready for painting.

aware that it is impossible to fly a good looking packaging job, but we have found that, generally, when a manufacturer takes pride in his product, it does reflect in the package. Herr Kavan can justifiably be proud of his Jet Ranger kit, from package to finished ship.

We would like to take you along as we build our Bell Jet Ranger. There are several plywood formers which must be mounted into the fuselage. These have not been die-crunched, but rather are simply painted on the sheets. This does mean that they must be cut out. A Dremel jig saw makes an easy job of this, and produces a better part than would be produced by stamping. Although all of the parts are not immediately needed, we cut them all at one time, putting aside those which were not being used.

Each piece was checked for fit, and sanded smooth. The front bulkhead, formers, and floor were fitted and assembled, leaving the floor (#8) unglued for the moment. Likewise, the engine/transmission housing was fitted and glued together. One top piece on the housing must be removable to allow the muffler to clear when installing or removing the power train. This piece is held by sheet metal screws, and should have a couple of small pine blocks (not included) mounted to the housing to receive the screws.

The top former (#9) is used to mark the outline of the cut out in the fuselage top. This is then carefully trimmed. The outer frame (#9A) is then epoxied to the inside of the fuselage, around the opening. Stabilit Express, a quick setting German epoxy product, is used for all of the assembly work involving attachment to the fuselage. This has been included in the kit.

The cabin windows must be cut out of the fiberglass fuselage. These are molded in, so location is no problem. A Dremel Moto-Tool, hand grinder (with a cut-off wheel or small burr) will be the easiest way to trim out the windows. A narrow border (1.5-2mm) must be left around the inside of each opening to provide an edge to cement the windows to later on.

The cabin top is fitted to the fuselage. When satisfied with the fit, it is securely taped into place. The mounting holes are laid out and drilled through both the top and the fuselage (3mm). The top is then removed and

to page 88

PLASTICS: SHOW AND TELL

BY RAY HANISCO

PART SEVEN

Polycarbonate - - - -
Referred to as P.C.,
it goes under various names,
including Lexan.
It can be cold formed
flattened 180 degrees
upon itself without
fracturing, and even run
over by a locomotive
without serious damage.

This month, let's talk about that very strong plastic called Polycarbonate. In the plastics industry, it is referred to as P.C. It goes under various names in the trade, and the one you will probably recognize is 'Lexan.' Polycarbonate has a peculiar trait – it is able to be cold formed. I have bent it 180°, and really flattened it on itself, without it fracturing. On occasion, I have seen it drawn into cups, hammered with a four pound hammer, and even run over by a locomotive. In all cases, it withstood the beating extremely well.

Remember our old gal 6/6 Nylon? She had a Tensile Strength about 1/3 greater than Polycarbonate. For those who do not remember, Tensile Strength is the ability to resist pulling apart. This does not look good at first glance, but when it comes to Impact Strength, Polycarbonate has about 16 times the advantage. It takes about the same amount of pressure to flex both of these materials, so now you can believe it does have rigidity.

I saw a write-up in one of the technical journals, extolling the wonders of Polycarbonate. In the article, it mentioned a company who manufactures propellers for boats. This company gives a "Lifetime Warranty" against breakage. I do think that if a company has such faith in a material, and will stake its reputation on it, it has to be good.

How would you like a warranty on an airplane like that? Let's work on it, and maybe we can talk a company into it. Man, they may be able to take the abuse I dish out.

The only parts in the model field that I have seen that were made of Polycarbonate is the new Sullivan Race Car Chassis. They seem to be "indestructible." Let me tell you a story about how Harry Preiss of Sullivan Products tested the chassis. One day, after Harry had carefully mounted all of the paraphernalia required to make up a race car, he took it out on the test strip behind the shop. With the engine finely tuned, and all systems checked out, he let it start to accelerate. As the car, minus body, approached the far end of the test strip, a quick left turn had it returning to him like a "yo-yo." Back and forth, back and forth, until he had it grooving like an Indy driver. Full of confidence, he brought the wheels back for a refuel job, so that he could see just what it had. Dripping with fuel from the quick pit stop, the car sped out of the pit in record time. Again, grooving like crazy, he wheeled the car around a turn, and ran over a rock that, to the car, probably looked like a boulder. The car took it as if it were just a slight bump in the track. Feeling like a pro, he decided to try the rock bit again. It worked as easily as before. "Have to try it on the other side of the car," he thought. As before - - - Success. On the next go around, he cut too quickly, and had to give it a little right. This action placed the car in line with the rock, and also in line with a fallen tree at the edge of the track. BLUMP!, over the rock it went and, being at full throttle, under the fallen tree it went, as well!

Many foot-pounds of energy were spent as the car wriggled through its barrier. Harry stood in complete shock as he watched the servos snapping off as if they were being shot from a gun, the receiver scooting along the ground like a hockey puck, and the flangeless engine wedging itself into the tree like an axe.

"Good job," he said to himself as he walked, with no confidence at all, toward the strewn parts. Upon picking up the servos, he found the mounting lugs were snapped off. The next servo had popped from its grommets without any apparent damage. The engine, having its flanges amputated, had panted its last breath. Now, deep into the brush to find the chassis.

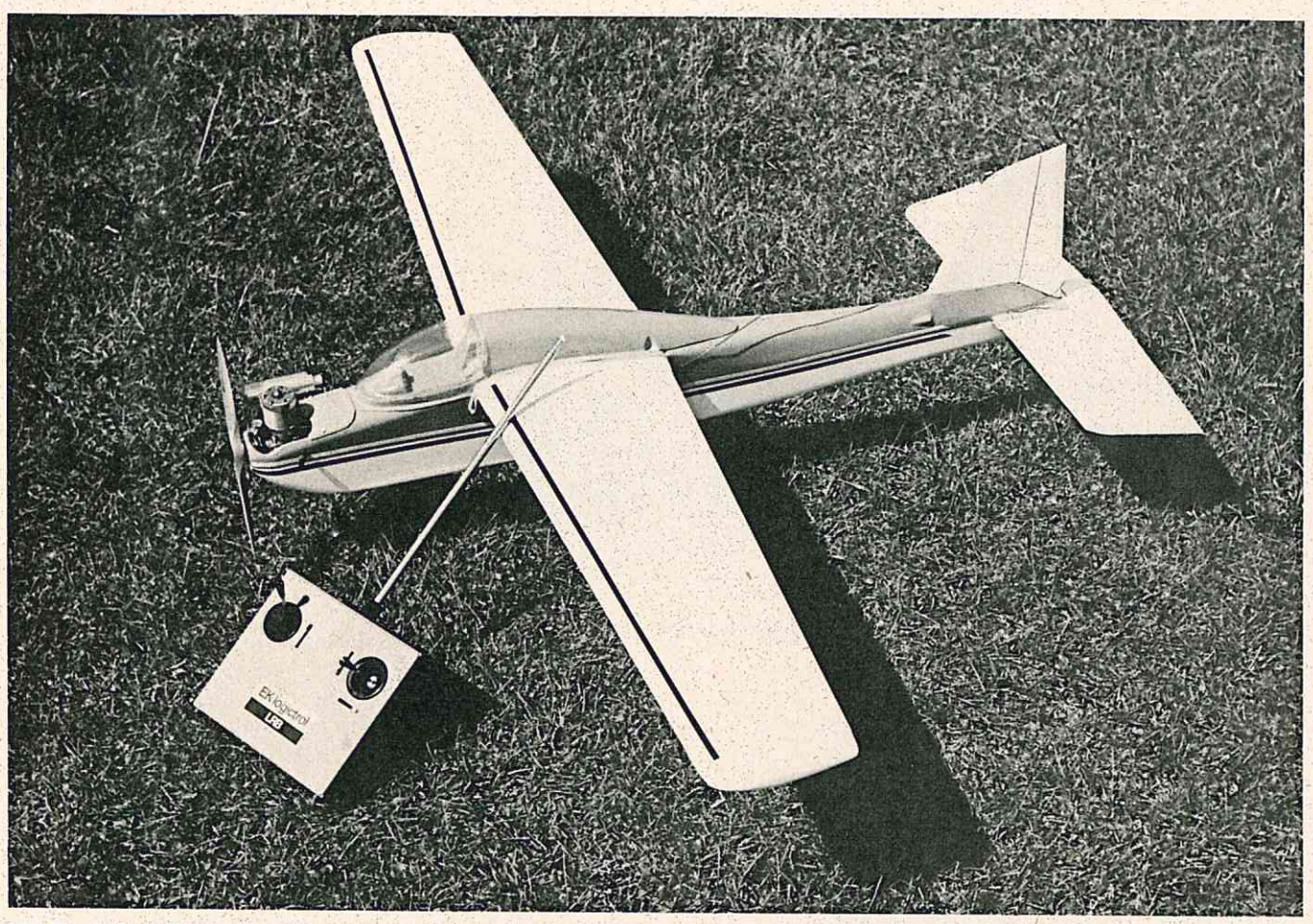
"There it is," he said. With anxious eyes scanning the chassis, a smile appeared when he saw the rugged Polycarbonate chassis looking like new, except for a little dirt on its face. Relieved, Harry had proven to himself that this chassis could really take the punishment.

Time to get back to the P.C.

If you are fortunate enough to have some, or can get some, of this material, cut a sliver from the edge. Use your "X-Acto" knife, since it works better than a clam shell. You will find the plastic will cut fairly well, and not have any tendency to chip.

Grip one end of the plastic in the pliers that you use for plastics testing and ignite the other end of the plastic. You will notice that, in order to keep it burning, you will have to keep it in the flame. Carefully examine the plastic while it is in the flame. It will give the appearance of growing into a cellular structure and it will decompose. Fumes? Almost non-existent. In fact, if I were to tell you it smelled like something, I would be telling a bare-faced lie. I cannot identify any odor from the burned material.

to page 88



The Ready Bird 23, less than thirty minutes after opening the box!

TEST REPORT

Product Test: Bill O'Brien *Photography: Don Dewey*

An Industry First, the completely Ready-To-Fly

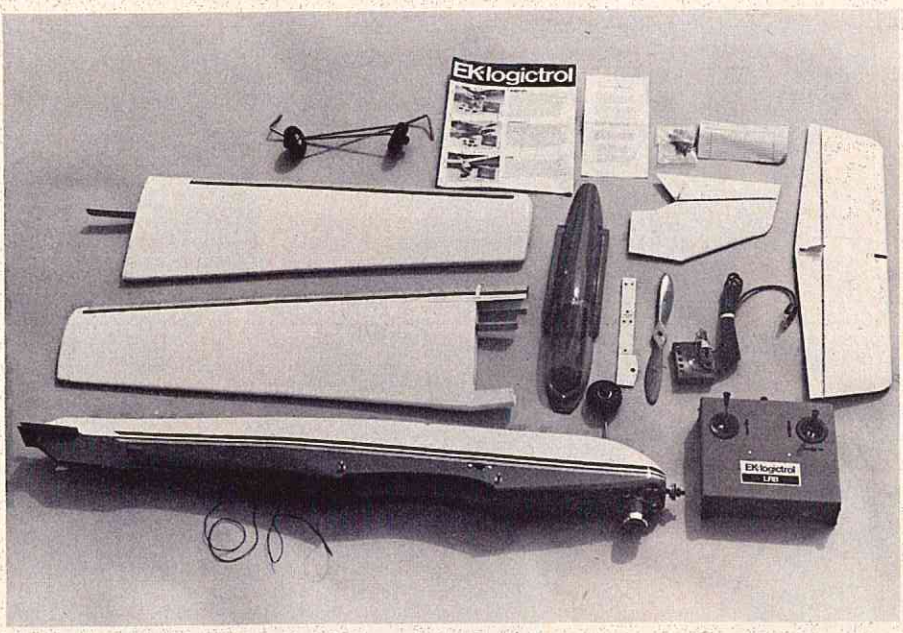
READY BIRD 23

The RC industry has taken a giant step forward.

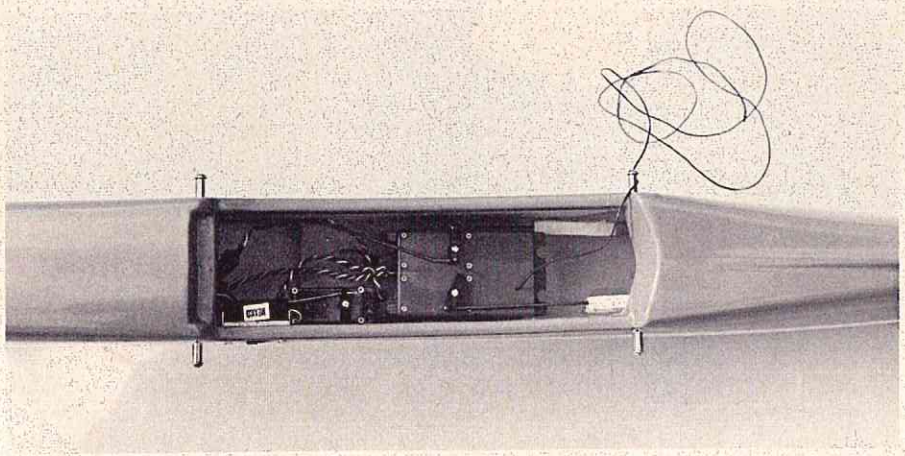
Due to the cooperation of several manufacturers and one of the nation's largest mail order houses, Hobby Lobby International, Route 3, Franklin Pike Circle, Brentwood, Tennessee 37027, there is now a true ready-to-fly aircraft available to the novice and sport flyer.

First shown at this year's Toledo Conference, the Ready Bird 23 is a ready-to-fly aircraft with EK-logictrol three channel proportional system installed, all pushrods in place and connected, and a Fox .25 RC engine installed and ready-to-run. The fuel tank is installed with fuel lines connected to the engine, the RC system switch is in place and the wheels and wheel collars are installed on the landing gear struts. Even a Top Flite 9/4 prop is included with the package. Due to shipping restrictions, it is necessary for the purchaser to join the two wing halves together, and install the finished vertical fin and horizontal stabilizer. Even then, all surfaces are hinged and control horns are in place ready for attachment to the clevises. The total length of time from the moment you receive the Ready Bird 23 until you are ready to fly (excluding charging time) is 23 minutes! And, if this isn't enough by itself, the total price from Hobby Lobby International is $199.95!

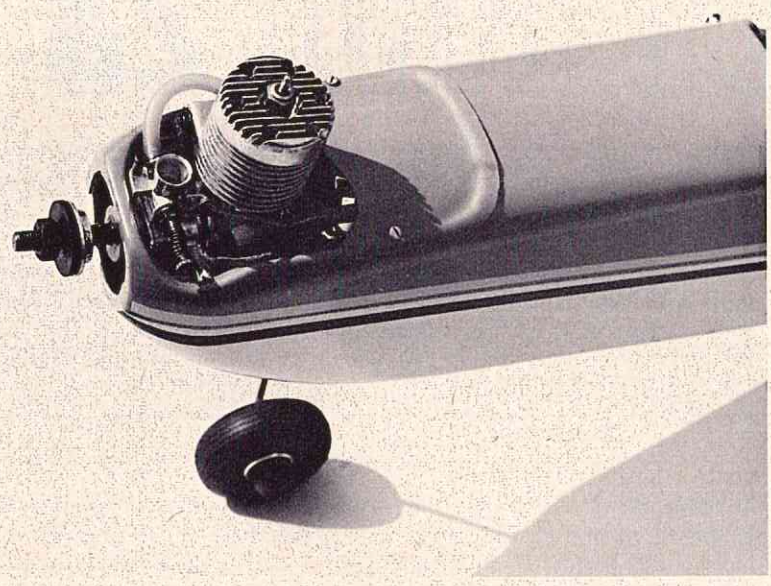
It took very little mathematics to determine that the individual component cost, when totaled up, far exceeded that of the package price, not to mention the fact that all of the installation work on the RC system, pushrods, and engine were completed. But, in addition to that, those individual components from the plastic ready-to-fly aircraft, the radio system, and the engine are well known American products that have been thoroughly tested and proven over months and years of field usage.



The Ready Bird 23 as it comes out of the box. Engine, fuel tank, fuel lines, radio, pushrods, steerable nose gear all in place and hooked-up.



EK logictrol three channel radio is pre-installed with all pushrods in place.



The easy-starting, reliable Fox .25 is supplied installed in the Ready Bird.

The Ready Bird 23 is a plastic aircraft with internal plywood reinforcing and a foam wing with hard skin plastic covering. The tail surfaces consist of foam sheet covered with hard plastic skin with the hinges integrally molded in place. When we received our prototype package at RCM, we joined the wing halves together with Hobbypoxy Formula 4 spread liberally on the foam wing dihedral joint and on the two plywood dihedral braces. The dihedral joint met perfectly and the wing was placed on end to allow to dry. When the glue had dried, MEK (Methol Ethyl Ketone) was wicked under the plastic leading and trailing edge dihedral braces with a small paint brush. This material bonds the plastic braces to the hard plastic wing sheet. The wing was then set in place on the fuselage and the plastic canopy and fairing were cemented to the wing center section using this same procedure. The clear plastic canopy can be cemented in place or can be simply secured with Scotch Transparent Tape.

The completed horizontal stabilizer is simply slipped into the slot in the rear of the fuselage and the distance from each tip measured to the surface on which you are working. If the stabilizer is not level, cut a small plywood shim (1/32" or 1/16") and insert it under the stabilizer between the stab and the stabilizer fairing. Once the stabilizer is properly aligned in relation to the wing, we simply drilled four 1/16" holes through the plastic stabilizer fairing and the stabilizer itself, and inserted small sheet metal screws on each side to hold it in place. Finally, a small amount of MEK can be wicked between the stabilizer and the stabilizer fairings on each side of the fuselage. Next, the vertical fin and rudder are installed in the fuselage slot by placing a small amount of Hobbypoxy Formula 4 on the base of the fin and inserting the fin straight down until it contacts the bottom of the fuselage. Pull the fuselage sides together against the fin with two fingers and wick in some MEK to permanently bond the vertical tail surfaces to the fuselage. Connect the elevator and rudder control horn and the flying surfaces are complete.

Bolting the main landing gear in place is simply a matter of taking the two rectangular plywood discs with the pre-drilled holes, placing the landing gear in position on the bottom of the fuselage, and then installing the

to page 86

BASIC SAILPLANE DESIGN

BY PRESTON ESTEP JR.

PART VI: DESIGN DETAILS

This section will deal with some aspects of glider design which are usually given short shrift. Wing planforms, dihedral break location, tail configuration, fairings, etc., are not usually considered as important as, for example, airfoil selection – but they are. Let's start with planform.

The effective AR of a wing will be highest (and induced drag the lowest) when lift distribution on the wing is elliptical. This very well-known aerodynamic fact does not necessarily mean, however, that the wing should be elliptical. In fact, models with fairly high AR should **not** have elliptical tips, because the tip chord becomes small and the Re drops to a point at which the airfoil doesn't work right (see Figure 1).

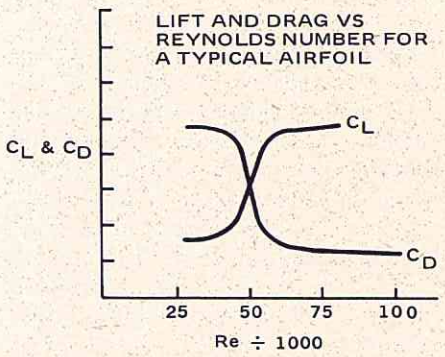


FIGURE 1

This "critical Re effect" sets a lower limit of 5" or so on tip chords. Fortunately, there are several ways to get a nice elliptical loading using blunt tips by correct combinations of taper and washout.

For example, consider a straight taper wing (Figure 2).

FIGURE 2

The taper ratio and a little washout produce nearly elliptical loading in the following way (Figure 3).

Taper Ratio $\frac{T}{R}$	Washout Req'd
.5	0
.6	1½°
.7	3°

FIGURE 3

Or how about the full-scale type of wing with a straight inboard section and tapered tip (Figure 4).

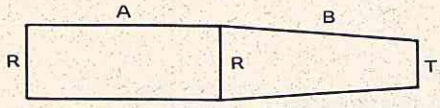


FIGURE 4

For most ratios of A to B and for taper ratios of $\frac{T}{R}$ = .5 or so, no washout is required to produce a good approximation of elliptical loading. In both the above cases, the departure from optimum will be less than that obtained from a fully elliptical wing which has more than a few inches at the tips operating at very low Re.

Dihedral breaks are a seemingly inconsequential matter, but if you like polyhedral you should harken to this fact: The breaks should be farther inboard than you probably think, in order to generate the most vertical lift vector for a given effective dihedral. For a typical wing, the ratios should be as shown.

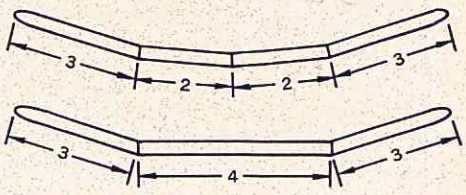


FIGURE 5

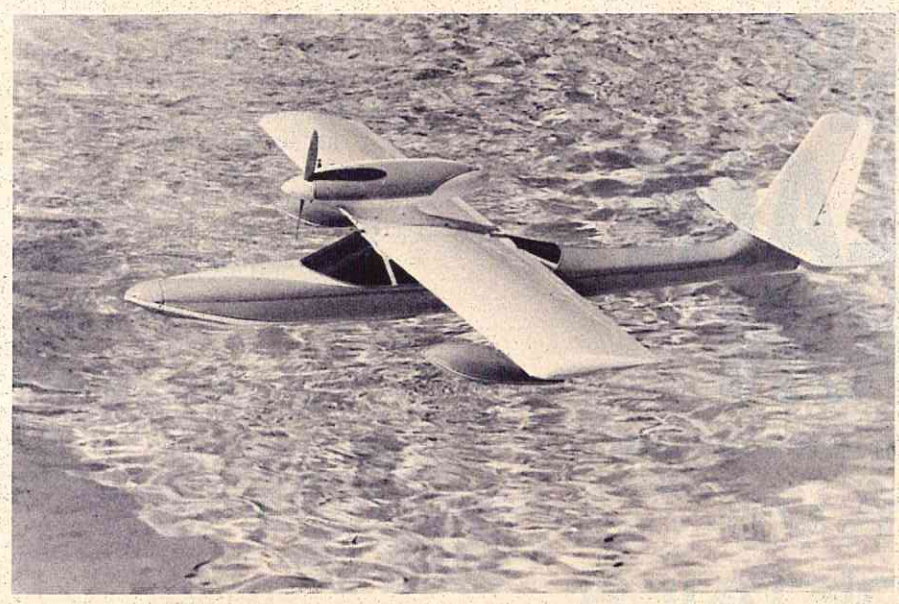
The advantage over V dihedral is small.

Tail design has not been badly neglected, but the general acceptance of T-tails as optimum is erroneous, because a good V-tail design produces a notably reduced tail drag. It's lighter, too. And really it's easier to build a sliding servo arrangement than it is to build a T-tail, if you think about it objectively. The general parameters for a V-tail are as follows: A total area of 22-25% of the wing (holy cow!), a dihedral angle of 30° under each panel, lots of rudder movement and restricted elevator movement. In line with our airfoil discussion, remember to keep tail surfaces thin. This reduces drag, but makes controls somewhat more sensitive. Full scale tests indicate that V-tail drag is about 3/5 that of a T-tail, but the interference effect between thick boundary layers to which I have often referred surely increases that advantage somewhat at low speeds. Both have the advantage of reducing the effect of wing downwash and turbulence on the stab. If you have ever wondered why HLG's have anhedral in the stab, or why the Kurwi 68 has dihedral in the stab, that's why.

Wing sweep is employed in the Cumulus and in El Ultimo. What is the effect of sweep? Well, it makes it easier to get the aerodynamic center of the wing back toward the C.G., for one thing. Also, 5° of sweep produces 1° of dihedral effect.

Another major effect is to reduce C_L max somewhat, and also reduce C_{DO} somewhat. For 28° sweep, as found in El Ultimo, C_L max is reduced by about 10° and C_{DO} by about 20°, at

to page 84



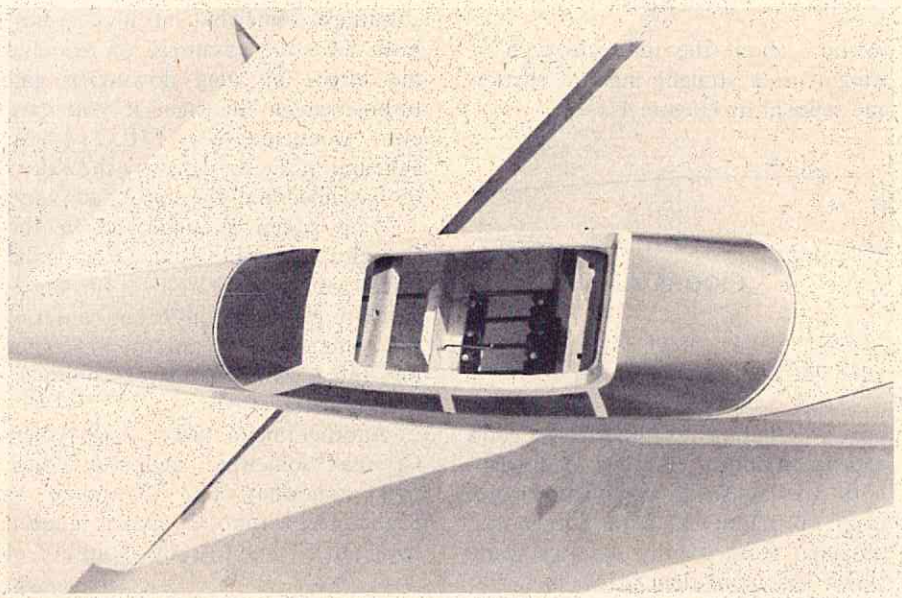
RCM's completed Wavemaster at rest after a successful test flight.

Product Test: Earl Harting TEST REPORT *Photography: Dick Sonheim*

A good way to start flying off the water and avoid the crowds at the flying field. RCM tests the

WAVEMASTER

Be sure to use a servo mounting tray. Also, nose wing hold-down bolts.



One area of this flying sport that most of us overlook is the fun of flying off water. The only limitations on your flying site is the size of the lake or river that you are fortunate enough to live near.

With the number of float kits on the market, it is relatively easy to convert your land plane into a float plane. On the other hand there have been very few seaplane kits available. Several years ago Du-Bro Products made a big hit at a number of the trade shows with the Seabird 600 seaplane. Although it has not been advertised lately, a few Seabird kits are still available.

Over the years Ken Willard has done a lot of experimenting with seaplanes and float planes. As a result of this he designed the Wavemaster seaplane. The Wavemaster design was very successful and Paul Sherlock of the then Sherlock Aircraft Models, who was producing those beautiful Lear jets and 727 plastic radio controlled kits, offered to kit the Wavemaster. Just prior to getting the Wavemaster kit on the market, Paul Sherlock sold his business to Wayne King of King's R/C Distributors, 178 School Street, Daly City, California 94014.

The Wavemaster is an all plastic kit with foam wings. The most difficult part of the assembly is joining the top and bottom shells forming the fuselage. It is not quite as easy as it would appear and the kit would be greatly improved if the fuselage could be pre-assembled at the factory in a jig.

We found the best way to join the two fuselage halves was to start from the wing saddle area and work forward and aft from that point. This was done after the nosegear bulkhead was attached. Melt up some plastic from the wing cutout area to form a putty and then apply it to the whole seam around the fuselage to make it waterproof. It can then be sanded out with very fine sandpaper. The nose cone should be fitted after the top and bottom halves are joined. The tail joiner should be backed up with a strip of balsa to allow pockets to be made for the rudder hinges to be mounted. We do not recommend MonoKote hinges on the rudder as shown in the instructions.

Assuming that the builder follows the instructions, in order of sequence, the next step would be to add the tail group. You cannot line the tail group up without having the wing mounted to the hull. Assemble the wing and

to page 74

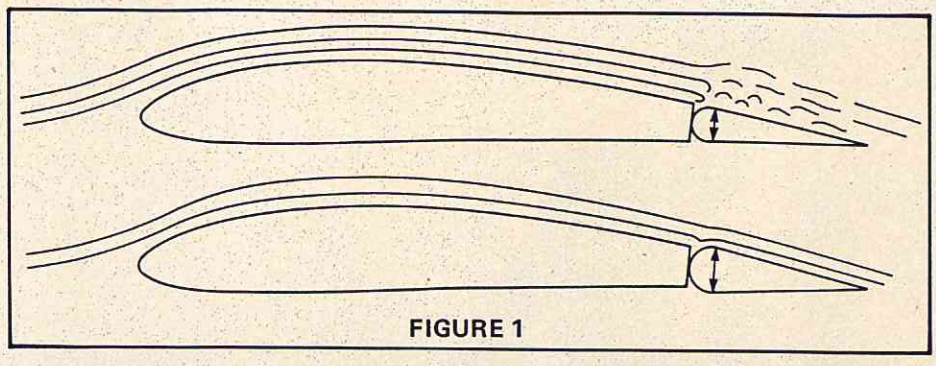


FIGURE 1

On almost any airplane---you can reduce wing, rudder, and elevator drag by more than 20 percent! In addition you can eliminate flutter forever, increasing control effectiveness.

DRAG and FLUTTER

BY WILL D. MITCHELL

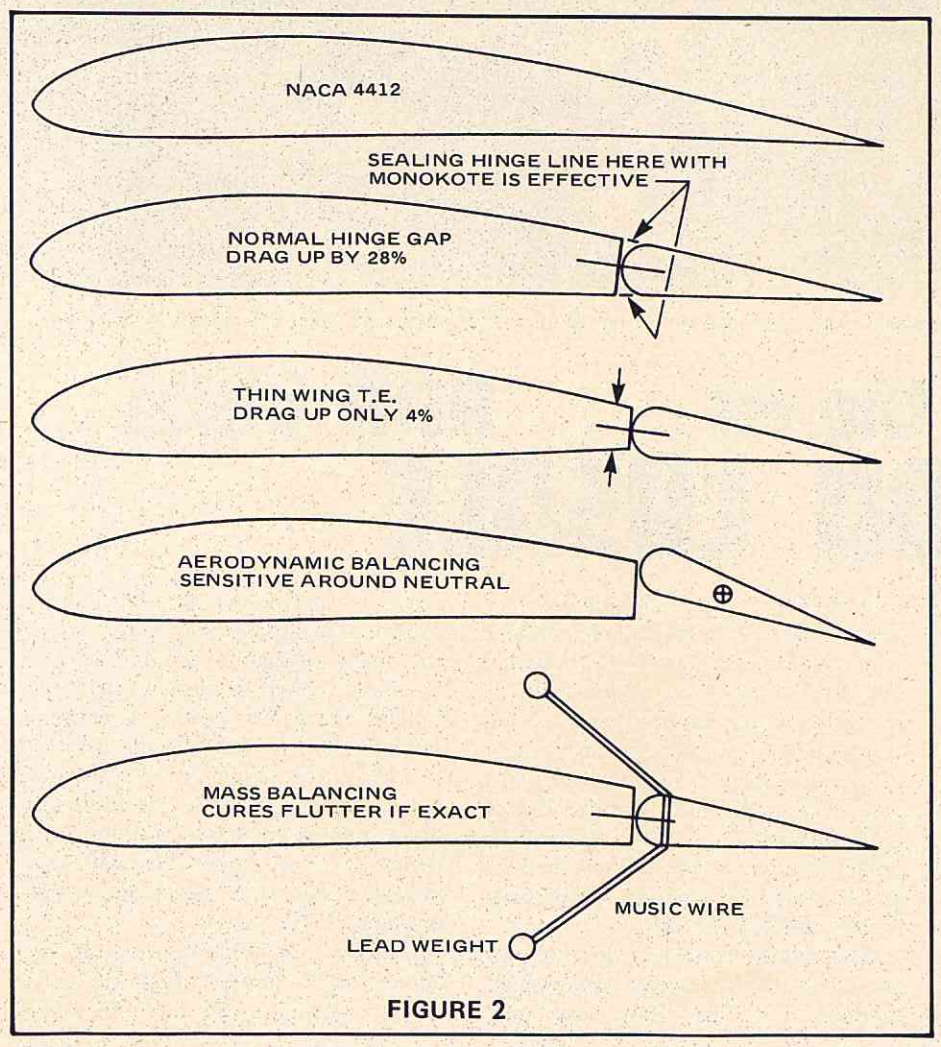


FIGURE 2

When Col. Eby discovered I hadn't brought my radio gear to Okinawa on the last trip, he practically forced a Lanier, Super Tiger, and a radio on me, as a loan! I gratefully accepted, on the condition that he allow me to fix or buy it if I broke it, knowing his generosity, and my skill! The plane was well built, and as he taught me years ago, the ailerons had mass balance weights installed, to eliminate destructive flutter. The clevises were steel, the servos secure; yet it happened!

High, inverted, and flying away, all of a sudden there were no ailerons! Panic with a borrowed plane! And Laniers, like most pattern ships, have almost no roll rate with rudder action. A sort of inverted half loop solved the immediate problem, and I discovered that full throttle turned the plane left, while idle turned it right at high airspeed. Hollering "Dead Stick" to clear Yomitan's mile long runway, I flailed around in some semblance of a traffic pattern, and kept it out of the weeds.

An immediate inspection showed – you guessed it – the steel clevises had pulled out of the servo arm. But how? I replaced them and pulled as hard as possible – but I couldn't pull them loose, no matter what. Well, men, that's how destructively powerful flutter can be!

Tom, Herb, and Milt all offered suggestions, and a bit of tape and plastic fuel line solved the problem for the day. But you can bet, there were no more high-speed dives with that plane that day! And I had a new project for my wind tunnel when I came home.

Aerodynamics say that it's the gap at the hinge line that causes all of our problems. Air cannot cross the gap smoothly, so we have excessive turbulence, and high drag over the ailerons. Any looseness in the hinges or linkage lets the turbulence set up a powerful oscillation – that rips things loose, and even strips servo gears.

For solutions, I've used or seen mass balancing, hinge line sealing, viscous dampening, and aerodynamic balancing. But, I remembered something else: The BD-4, an experimental light airplane, has extra-thick ailerons – in proportion to the trailing edge of the wing. Why?

I cut up a section of a broken NACA 4412 glider wing, and installed ailerons. The aileron area was 25% of the total, and airspeed in the tunnel

to page 68

BY DICK TICHENOR

Lou Casale proudly poses with a pair of his polished jewels. Lou is one of very few to successfully design and build R/C aircraft of aluminum.

Castles in the air..... RCM Visits LOU CASALE

Is there a model builder anywhere who doesn't appreciate a perfect example of absolutely immaculate workmanship? And, isn't it a heart-warming feeling to take your carefully crafted model out to the field and hear the admiration and compliments from the other fliers?

This is all old hat to Louis Casale - - - wherever he goes he has enjoyed that experience for many years. Lou's particular field is all-aluminum R/C aircraft - - - and even our best photo efforts can't really do justice to these polished gems.

Lou has a rare combination of talents. He has been a model builder and flyer since the early 1930's which has given him a vast knowledge of model aerodynamics and flying techniques. In addition, he has been an aerospace engineer since the late '30's which has provided a sound basis for strength/weight disciplines so vital to model aircraft design. On top of that, as a craftsman, he is a perfect-ionist – it has to be right.

The models shown in these photographs are .60 powered and weigh between 7-7½ lbs. They have wing spans of approximately 66" and fly every bit as good as they look. Among the many intriguing details that Lou has incorporated in these scratch-built models are items such as a working nose wheel disc brake on the front of the low wing design. Lou hasn't decided what he wants to do with this innovation as yet so we can't print the details at this time. We will say, however, that it is clever and works extremely well.

There is not much that we can say about Lou's aircraft that can't be better said in the accompanying

photographs. We would like to point out that the metal structure has presented no problems to the radio performance – in Lou's case an S & O Proportional system. So, as you look over the photographs, we'll use this space to share Lou's interesting background with you.

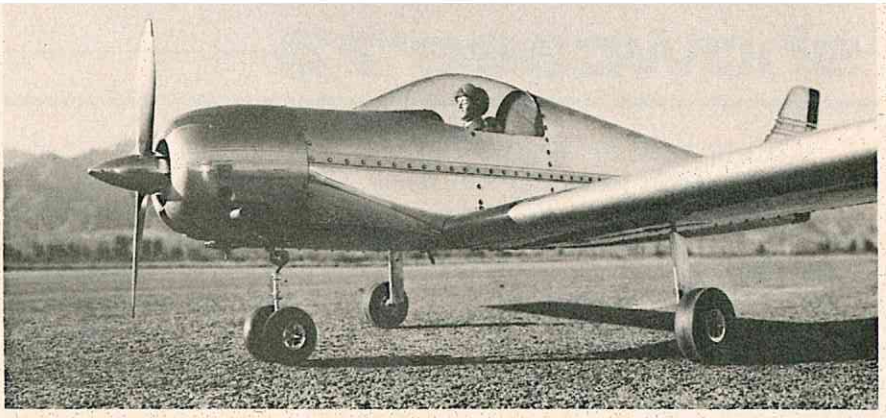
To the best of our knowledge, Lou is the only person to win the Scale event at the Nationals three consecutive times. He was living in Syracuse, New York, when he built a Waco Taperwing that beat his own idol, Lou Proctor, to take first place at the 1934 Nationals. The Waco Aircraft Company was so impressed that they sent him additional information which Lou subsequently used to update the model for a repeat win in 1935. Waco repeated their assistance and, with further updating and a new paint job, the Taperwing once again won over its Scale competition at the 1936 Nats. The Waco was so outstanding that the Smithsonian Institute requested it for permanent display in their aircraft museum. Lou had previously promised use of the Waco to the Exchange Club of Syracuse who sponsored their model club for a promotional exhibit. Sadly, it was damaged beyond repair in shipping and didn't quite achieve its niche in the halls of fame.

Lou migrated to Calif. in 1938 and flew his first metal fuselage free flight model in 1939. That flying field will ring a bell with the old timers since it was at Rosecrans and Western Avenue in Southwestern Los Angeles. Among the people using the field at that time were Irwin Ohlsson, Albert Weathers, John Brodbeck, Sr., Duke Fox and Barney Snyder. As a matter of interest, it was at this very field only two years later that RCM's editor soloed his first free flight aircraft with the assistance of one Jim Walker.

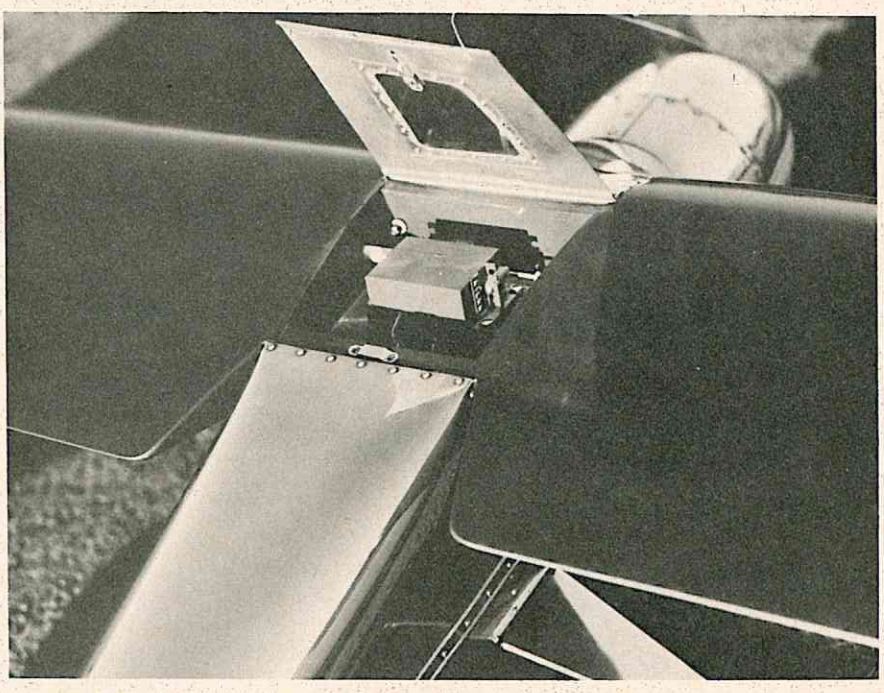
Douglas Aircraft sent Lou to Chicago in 1942 as an engineer on their C-54 program at what is now O'Hare Airport. The first Casalaire kit was something less than a tremendous financial success in the post-war years so Lou went to work for Northrop Aircraft in 1948. A sleek mid-wing all-aluminum control line design was developed in 1949 that was competitive in speed circles but was never put into production.

Watching the R/C activity at Los Alamitos in 1958 rekindled the spark and started a whole new generation of aluminum aircraft from Lou Casale's pipeline. Dick Riggs test flew the first

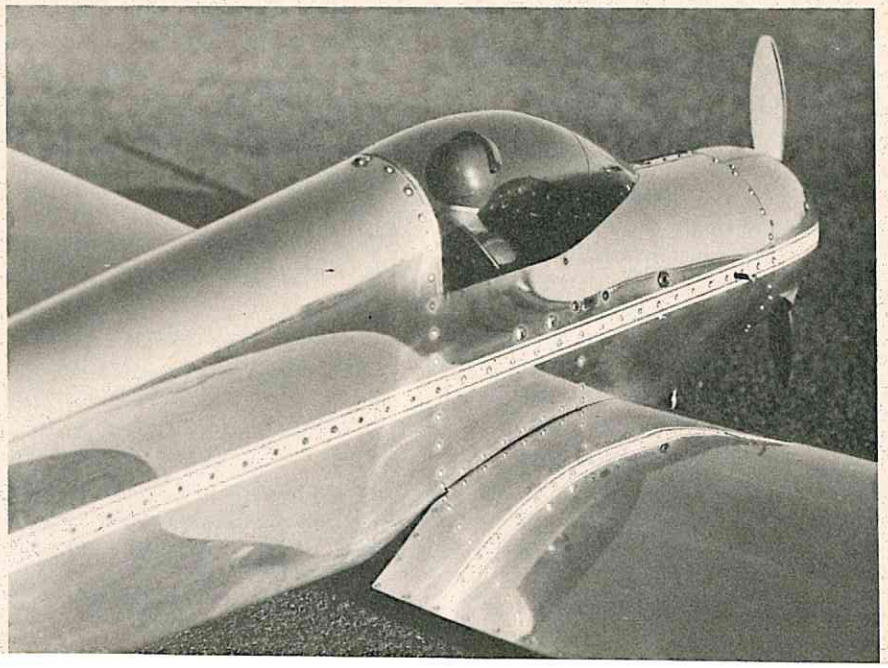
to page 68



How's this for realism? Lou's ingenious working disc brake is installed between the twin nose wheels. All, the work of a master craftsman.



ABOVE: Top access door allows easy service to aileron servo. Wing is secured by a screw through the neutral axis of the wing spars. BELOW: The clean lines complement the immaculate craftsmanship. And, Lou presently has several more "in the pipeline" under construction.



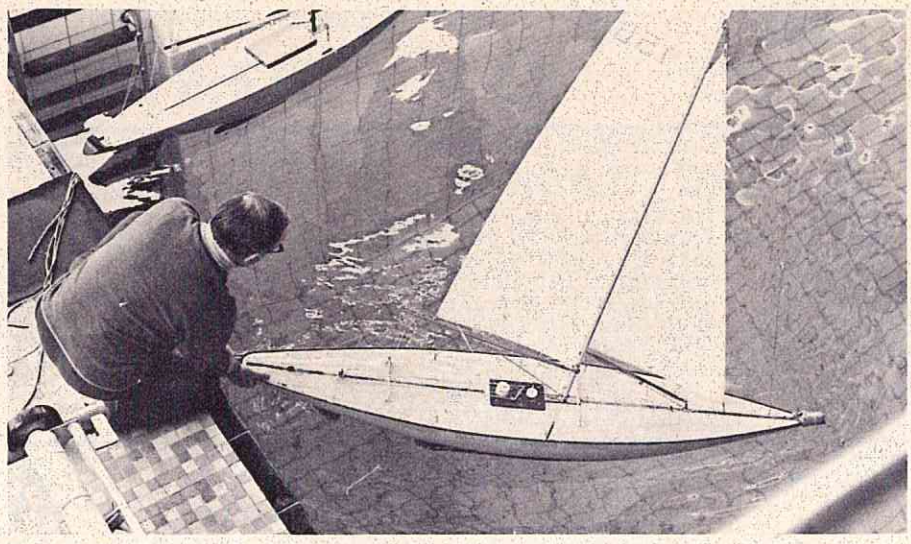
AMYA

RADIO CONTROL

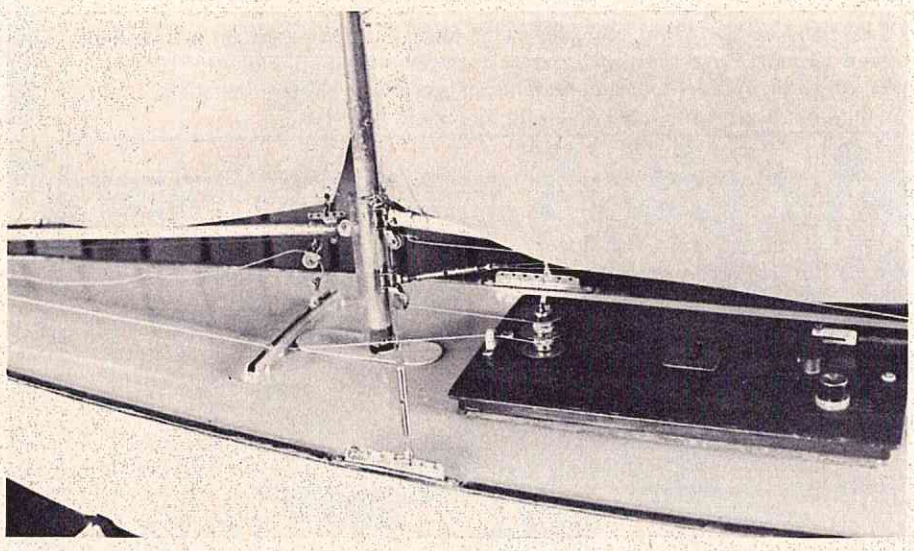
YACHTING

BY ROD CARR

Roger Stollery, well-known model yacht designer, mans the Model Yachting Association's booth at the London Dinghy Exhibition. A very professional set-up which drew much interest from the crowds.



Norm Hatfield, MYA Vice-Chairman, launches R/C "A" Class yacht at Crystal Palace diving pool public demonstration. Note sheets, winch and rudder pushrods all on deck originating in R/C box/hatch aft of mast, a typical English R/C installation.



Detail of R/C "A" vessel. English use drum winches to the exclusion of almost everything else, but look at all those clever blocks and fittings!

While in many sporting efforts United States enthusiasts are gamely working to catch up to the level of accomplishment of long established European traditions, in the sport of R/C model yacht racing the U.S. is leading the pack. Under the able guidance of the American Model Yachting Association, competition R/C sailing is more widespread, better administered, and growing faster than any comparitive effort in any other country on the globe. Not content to rest on its laurels, the AMYA has started to lay the foundation for eventual recognition of the R/C side of model yachting by the International Model Yacht Racing Union. (The best figures currently available indicate that AMYA has more vessels registered than this worldwide international body – maybe the tail will wag the dog before we're through!!!) AMYA has also initiated close ties with foreign yachtsmen as they have appeared such as the Japanese effort under the direction of Mr. Ritsuri Honda. Believing the sport to be best directed by those who actually sail it, AMYA has established a tradition of utilizing its traveling members as ambassadors. A good example is my fellow columnist, Bart Bartlett, who made a trip to England last year. It was in Bart's august footsteps I trod this March.

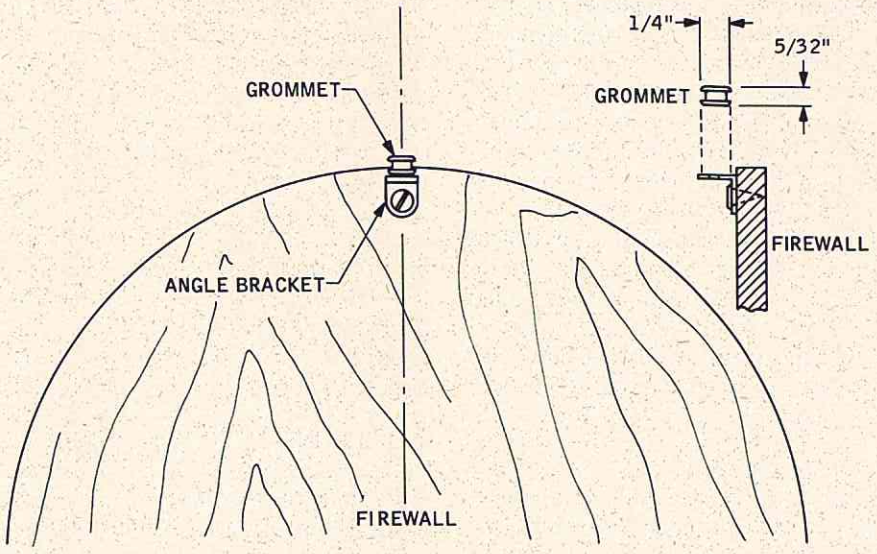
Renewed contact with the members and officers of the English Model Yachting Association (MYA) was deemed appropriate on a number of grounds:

1. Rumors of a 10-Rater and 50/800 Class International R/C Regatta to be held in England in 1974 had begun to circulate. It seemed that preparations and planning for U.S.

to page 75

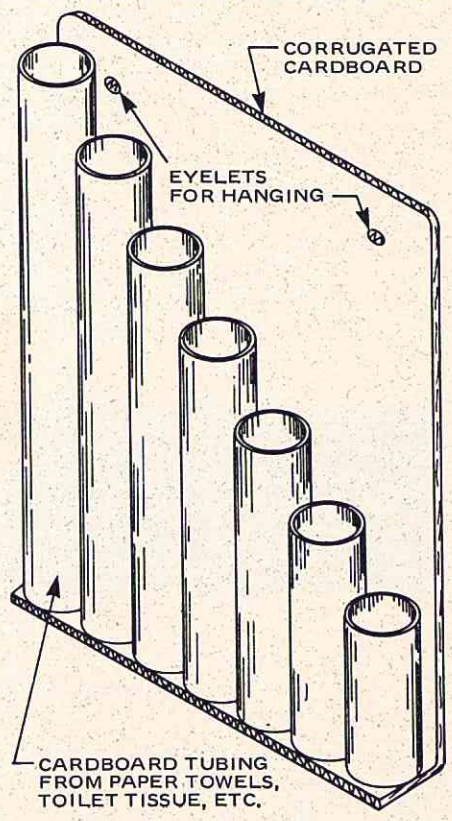
FOR WHAT IT'S WORTH

If you're tired of cracked plastic cowlings, try mounting your angle cowl mounting brackets 1/16" lower than the inside diameter of the cowling itself. Now, use a small rubber grommet between the cowling and the bracket. Screw down until the cowling is at the desired location and you will eliminate stress cracks. This idea was submitted by Walter Perrin, Jr., of Granada Hills, California.

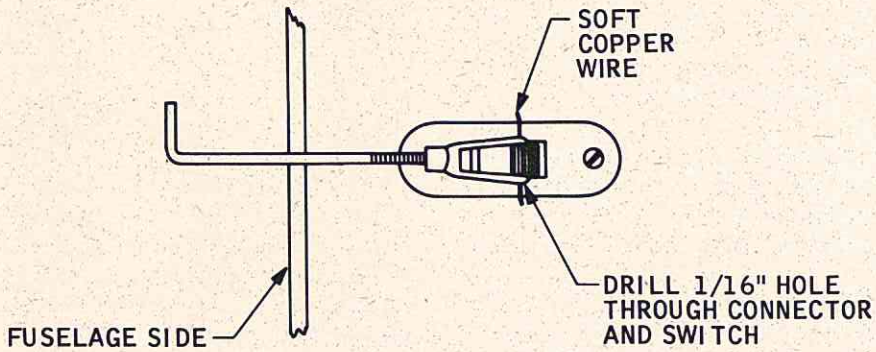


Thomas M. Wood of Bainbridge, New York, came up with this idea for keeping miscellaneous construction materials organized and at arm's reach. It is ideal for storing pushrods, music wire, dowels, balsa strips, tubing, threaded rods, etc., of various lengths. The unit can be built from materials normally thrown away using white glue to assemble and enamel paint to finish.

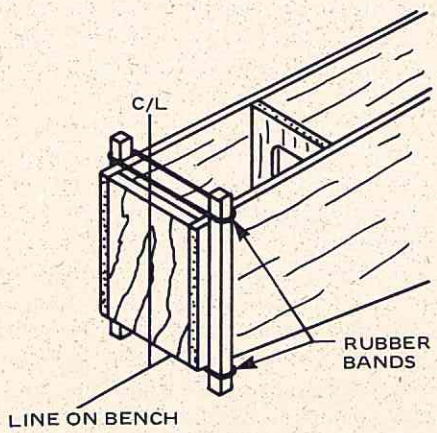
USE WHITE GLUE:
1. GLUE TUBES TO CARDBOARD
2. RUN GLUE BETWEEN ALL THE TUBES

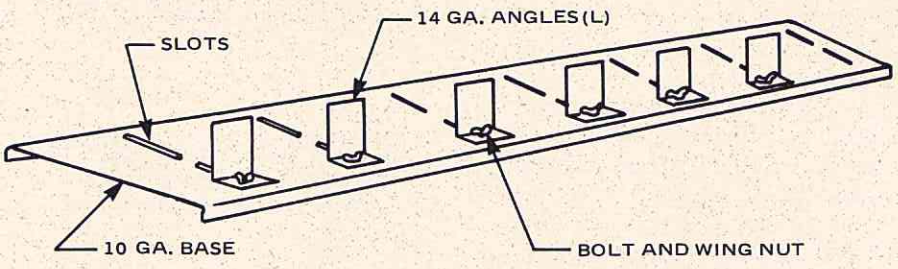


A nylon snap-link connector and pushrod can be easily modified to operate a slide type airborne switch. Simply remove the pin and drill a hole through the connector and switch, spread the connector arms to fit around the switch, and insert a new wire pin. The threaded pushrod can then be quickly connected, or removed, as required. This idea was submitted by Bruce Busfield, of Louisville, Kentucky.



During construction of slab-sided fuselages, one problem that always arises is how to clamp the sides to the formers so you can get a good bond, as well as good alignment. You can spend a lot on a fuselage jig, but this method is economical and simple. Simply rip some white pine into ¾" strips of various lengths from about 4"-10". Place a pair on each of the bulkhead stations and rubber band the top and





FOR WHAT IT'S WORTH

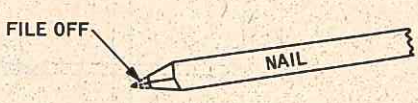
bottom of the strips together. Use different size bands to vary the pressure. A slightly more involved unit consists of a simple fuselage jig made of 10 gauge and 14 gauge steel, although wood could be substituted quite easily. A nice straight line down the middle of each former that lines up with a nice straight line on the bench or jig is absolutely essential. Be sure to use carriage bolts with the wing nuts so that they don't rotate when you try to tighten the wing nut. This idea was reprinted from the Saginaw Valley R/C Club of Freeland, Michigan.

From the "Prop Wash" in Chattanooga, Tennessee, comes a suggestion that if you happen to be trying to get Gold 'N Rod to hold a Goldberg threaded rod tight enough so that it will not pull out, forget it unless you heat the Gold 'N Rod ever so slightly with a soldering iron to seal the Goldberg threaded rod in place.

Speaking of Gold 'N Rods, try a hot glue gun for securing them to fuselage sides. This idea from the Tennessee Valley Monthly Newsletter.

Wheel wells have become a very definite factor in building with the advent of the retractable landing gear. It seems to take so much time and fooling around simply to get the well installed, sheeted, etc. In fact, just cutting the hole in the foam has been a problem. With foam, everyone thinks of heat to do the cutting. For the wheel well it has never worked satisfactorily. Here is an idea from the Diablo Valley Radio Controllers, Inc., of Concord, California. Try an empty 8 oz. Hobbypoxy can. The bottom of the can was cut off with a hack saw, and this cut does not have to be straight. Now, use your hand to hold the can, rotating it while pressing down and, presto, a beautiful **round** hole ready for the sheeting to be applied to the edge. It is wise to sheet all of the opening **before** skinning the bottom of the wing. Now, with the bottom covered, cut out all of the openings. After you have done this, cover the top of the wing. Now, you will notice a little pressure on the wheel cutout and the skin will depress quite easily. Previously, I used to fiddle around and skin the inside of the wheel well to get the strength over the opening. This time I merely turned the wing over and mixed a fair amount of epoxy, poured it into the opening until there was a little less than 1/16" deep. Let it set and, presto, a strong skin over the wheel opening – it really takes very little glue and the fit is perfect. Now, for those of you who hate to waste the epoxy and want to use the inexpensive glass resin - - - DON'T! I'm not sure which, either the foam doesn't like the resin or vise versa, but you will have one of the biggest empty spaces you will ever see!

Jeff Klink, of Sacramento, California, recently lost the hex wrench that fit the 1/8" wheel collar he was using. However, he was able to fabricate a satisfactory substitute by filing the point from the tip of a large nail and using the squared end that was left.



For those who are installing retractable gear in foam wing cores, here is a sure-fire way of cutting wheel wells as suggested by Gus Kaser of Plymouth, Michigan. First, remove one end of a small can of evaporated milk. Then mount the can on a block of wood. Heat the can with a torch and press the can into the wing ala cookie cutter method. The result is a true and perfectly round hole for your retract gear.

Ernest Hancock of Baltimore, Maryland, suggests this idea for tying that aerial to the vertical fin or stabilizer on your airplane. Using this method there is no need to loop the antenna wire back on itself, a procedure which is definitely not recommended. The wire may be adjusted for any tension without slipping.

If you're having trouble with your sanding resin not going on smooth and thin, try this method from the SCRAM "Bulletin." First, sand the areas with 180 grit paper and dust off. Now, cut a 1" x 1½" x 4" piece of foam rubber and mix your resin to cure in about 10 minutes. Spread it on with one end of the foam. This acts like a mop and you can spread it evenly and smoothly without any excess resin build up. When you are done just throw the foam away. Remember do only one side at a time as resin is self-leveling and will tend to run if the position is changed before it has had time to set up.

LeRoy Schlinkert of Hamburg, Wisconsin submitted an idea for making exact duplicates of plywood parts such as half ribs to reinforce wing dowels, etc. LeRoy covers a piece of ply with Scotch Double Stick Tape then puts the second piece onto this after which the shape can be cut and sanded two at a time for identical pieces. LeRoy also suggests that an excellent measuring cup for exact mixing for epoxy glue or paint is to use the small cup that comes with NyQuil cold remedy. These small mixing cups are graduated on the side and can be cleaned and re-used.

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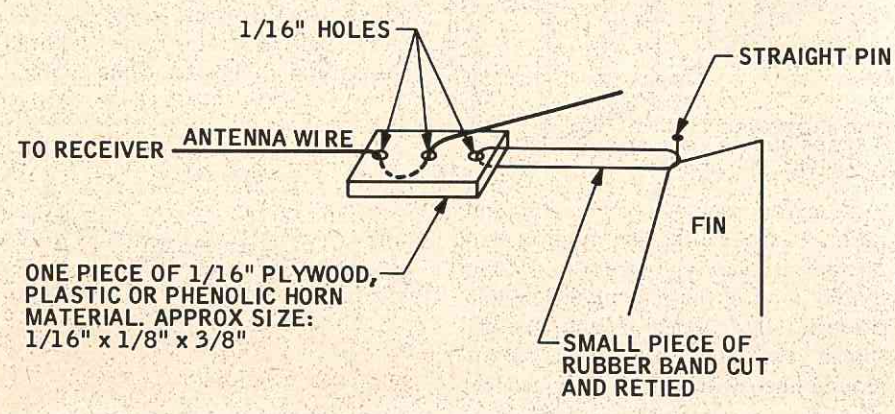
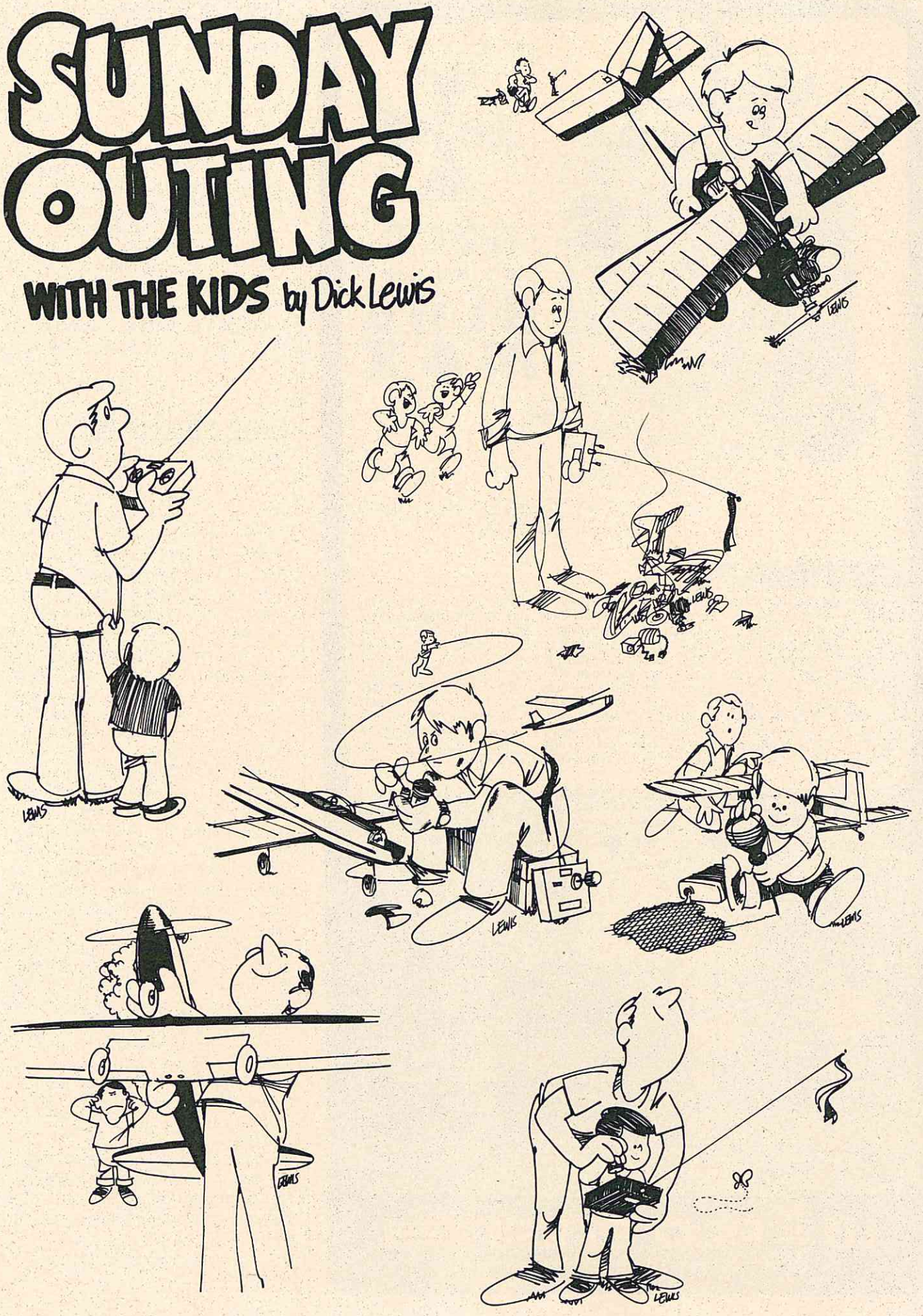


SUNDAY OUTING

WITH THE KIDS by Dick Lewis



RCM VISITS LOU CASALE

from page 57

aluminum R/C ship for Lou the following year and the latest versions are presented on these pages.

For a second year Lou is president of the Pomona Valley R/C Club as well as being their number one flight instructor and inspirational spark plug. RCM congratulates Lou Casale for his contributions towards advancing the state of the art of R/C modeling. □

DRAG AND FLUTTER

from page 55

could vary from zero to 64 mph. An infinite aspect ratio was simulated by sealing the wing tips to the tunnel sides. Elevator horns and Kwik Links were attached from the aileron to the wing, so flutter could be allowed, or stopped.

With a normal hinge line, I was surprised to find a 28% increase in drag, over that of the basic wing. Flutter would begin at 12 mph when the Kwik Links were removed; the hinges were quite free.

Then, I cut away the last third of the wing, just forward of the aileron, and replaced it with sheet styrene. Using appropriate balsa blocks and Scotch Tape, I could then make the trailing edge of the wing thicker or thinner than the leading edge of the aileron. The results of these tests were highly gratifying.

Things were optimum with the T.E. of the wing 12% to 15% thinner than the thickest part of the aileron. The 28% increase in drag dropped to a 4% increase, and I could not make the aileron flutter at 64 mph! That is an 85% improvement in hinge gap drag, and who knows what improvement in flutter. With the wing thinner or thicker than this, drag increased markedly. (See Figure 1.)

Smoke streamline tests showed that the aileron could be deflected about 20% further before aileron stall set it. That gives a substantial increase in roll rate.

I had to try the other solutions in the tunnel:

Mass balancing greatly reduced the power of the oscillations, and delayed them until 41 mph. More perfect balancing might have eliminated them altogether.

Sealing the hinge line with Super MonoKote eliminated all trace of hinge line drag and flutter, until the surface was deflected. Then, with 10 degrees of deflection, the MonoKote started to flutter, and drag shot up 19% – as compared with 6% on the wing with the 15% thinner trailing edge.

I once used viscous dampening to cure a bad case of rudder flutter. I squirted silicone rubber into the whole hinge line, and let it cure. Then I cut out enough that the rudder moved sluggishly, and no more flutter. I didn't test this in the tunnel.

Aerodynamic balancing is a must with flying stabs, but it is much less desirable in control surfaces. The surface must be hinged to rotate about the 30% chord line (actually, anywhere from 1/4 to 1/3 chord). Flutter disappears, but the 28% drag increase is still there. When the surface deflects a few degrees, drag actually drops, and lift increases markedly. But, with a few more degrees of deflection, drag shoots up, and lift nearly stabilizes. This means very sensitive controls around neutral – just the opposite of what the modeler wants. Flying stabs do not have this bad characteristic, for there is no hinge line.

The moral of all this: No matter what sort of plane you're flying, make all your control surfaces about 12% to 15% thicker than the trailing edges of their respective wings or stabs. It's the cheapest, easiest, and most effective way to decrease drag and flutter, and increase control surface efficiency.

Glider nuts, now you can add flaps or ailerons without penalty. And it works on pylon ships, as well!

TEST DATA

Thinning the wing T.E., relative to the thickest part of the aileron.

NACA 4412 airfoil.

Reynolds Number 72,000.

Aileron max chord – 1 centimeter.

Drag Coefficient of NACA 4412 airfoil at test angle of attack – .0085.

Wing T.E. in cm.	Coefficient of Drag
1.10	.021
1.05	.016
1.000	.012
0.95	.011
0.090	.010
0.88*	.0090
0.85*	.0089
0.80	0.10
0.75	0.17

*optimum area

SCALE IN HAND

BY DAVE PLATT

This column is being written in mid-March. Recently our appearance in these pages has been somewhat spasmodic, due to that well-known ailment "pressure of business." Also, those readers who have written us about this time received delayed responses – up to a month in a few cases – for which we apologize.

Now some light at the end of the tunnel is visible, mail is back to normal, and we shall be continuing the column on a more regular basis. So, for those who may have wondered, you have your explanation.

★ ★ ★ ★

Readers of this column will recall that, over the past several months, we have been running a series on finishing methods for Scale and Stand-Off Scale models. Up to this time, we have our model covered and filled, surface detailed and, in all ways, ready to paint. We are going to proceed with painting techniques; in order to simplify the description we'll choose one specific subject but the methods will vary little from one model to another. We decided on a *Focke-Wulf FW190* because, of all scale types, the military ones give modelers more trouble; and the German types, which used highly complex camouflage schemes, will give a greater range of information. In other words, if we can paint a *190*, we have learned enough to paint anything.

First, it is necessary to decide on a paint brand and type which we will use. As described in an earlier column, polyurethanes and epoxies seem to work best. Lately we have experimented with K & B Superpoxy (using the satin hardener for a matt-surfaced ship) and found it excellent, possibly superior, even, to polyurethane. Unless you have some reason to use something else, K & B would be our recommendation.

Let's assume that our *190* is color-schemed as follows:

Entire undersurface – light blue (65).

Wing and stab uppers – "Splinter" pattern of olive green and dark green (02 and 71).

Fuselage sides and fin – Mottled in dark green over olive (71 over 02).

Fuselage upper "spine" – Black-green (70).

Normal Luftwaffe markings throughout.

TOOLS

In addition to paint, certain tools should be gathered together at this time: (a) a small spray gun; (b) an airbrush as used for painting plastic models; (c) thinner for the paint, also plenty of cheap thinner for washing the equipment; (d) two or three very small pointed brushes; (e) #320, 400, and 600 "Carborundum" brand silicone carbide wet and dry paper; (f) a yard or two of "Fas-Cal" (this is a clear sticky-backed mylar film which we will use for applying the markings); (g) a bowl of water, a dishcloth, old newspapers, masking tape, and a lot of small jars, etc. Also, a **clean** cardboard box big enough to hold the wing, another for the fuselage. Ready to proceed? Fine – let's go.

First, with a damp cloth, wipe off the wing. Examine closely for imper-

to page 72

SCALE IN HAND

from page 70

fections and correct, if necessary. Now, mix up about 4 ozs. of light silver-gray and spray the entire wing. This coat has a dual purpose: It will show up any surface imperfections, and will be used later on in the "weathering" process. Put the wing inside the dust-free box and, while waiting for the paint to cure, do the same thing with the fuselage assembly and any other parts separated at this time, such as cowling, control surfaces, etc.

When dry, sand the wing lightly with 320 paper. Although "wet-and-dry" paper is so called, we only use it wet. Keep plenty of water on the model at all times. If some areas begin to show through bare balsa, do not be concerned – the purpose of the sanding is to get a **level** surface, whatever it takes. Give any bare patches a second light coat and set aside while working similarly on the fuselage.

When all parts are level and uniformly gray, we should have a really fine base surface which it will only take one light coat of color to finish completely.

Next, we take our light blue and spray all undersides. Bring the blue up the fuselage sides to about half-way, since we will be wanting a gradual merge of color in this area.

Now, we need to be really careful, because the color division at the wing L.E. is not masked, yet we want no overspray of top color on the bottom of the wing. By holding the gun at a suitable angle to ensure this, give the entire wing top a coat of olive green (02 – somewhat poorly described as "gray" by the R.L.M.) – technicalities aside, the lighter of the two "splinter" colors. The color division at the leading edge should be as "hard" a line as you can get with the airbrush, but should **not** be masked. As always, when the paint is on, place the part back in the box to cure.

Now, we come to the tricky part. The fuselage is now sprayed with 02, using the airbrush. The green should gradually merge into the undersurface blue, the change occurring about three-fourths of the way down the sides. Some practice at this would be wise, using a piece of paper. Only when you can do it easily and repeatedly is it time to do it on the model.

By now, we have our two base colors on the whole ship. Switching to the dark green (70), we set out to put the splinter pattern on the wing top. The edge of the panels is similar to the L.E. division described earlier, that is, as hard as can be obtained with the airbrush, but not masked. Look at the scheme you're copying closely. Note that the splinters are composed of angular shapes, usually two on each panel, and that the lines are **nearly**, but not **actually**, straight. Again, the only way this can be done is freehand, and it takes skill – skill acquired by practice. So, back to our paper for some trial runs.

Here are two tricks that we use which will help you: (1) start in the middle of the dark panel and work outwards from there toward the actual division placement you want and (2) when refining the outer limits of each dark panel, point the brush at an angle in toward the center of the panel. This will prevent overspray which will make the edge too "soft."

Having laid out the edges of all splinter panels, fill in the centers solidly.

to page 82

WAVEMASTER

from page 54

bolt it on to the fuselage, then attach the tail assembly using the wing as a guide for alignment.

The only major change, if you want to call it that, made in the assembly of the wing were the tips. Earl Harting, who has been doing a lot of flying off the water, felt that the plastic wing tips would be difficult to seal tightly to the end of the wings. If the hollow plastic tips were not properly sealed you could wind up with a water tank on the wing tip! Our Wavemaster has Harting-built solid balsa wing tips.

The engine mounts in the pylon engine pod were not long enough for a new OS .60. The engine mounts should be made about 3/4" longer. We also recommend that the front of the engine pod be made a little larger to fit one of the standard size spinners.

After the wing core was covered it was about 3/16" too long in the chord to fit down in the saddle. The trailing edge had to be notched out and trimmed to fit the saddle. The foam core blanks fit fine but, when covered, they must be altered as above. This is not mentioned in the detailed instructions or on the plans.

We do not recommend mounting the servos with double sided tape. Install a regular servo tray in the hull as shown in the photographs. You really have to use your imagination when you install the aileron and throttle servos and linkage in the wing. We suggest that the manufacturer work out some proven method and detail it on the plans. The 2" nylon screws for the wing mounting were not long enough. We could see no way that the mounting beam could be installed much higher. The problem was solved by using 2½" steel screws.

Now for the big question – how does it fly? Well, the aircraft flies very well. With very little effort the Wavemaster will fly a knife-edge beautifully. Touch and Go's (wet-and-went?) were a snap once you learned to ignore the noise the hull makes when it comes in contact with the water. It sounds like a rubber ball being thrown into a bathtub!

How does it handle on the water? Here is where we had a few problems. The aircraft appears to ride rather low on the water and, as a consequence, small waves break over the bow and the water is picked up by the prop. The prop tips are very easily eroded by the water affecting the balance of the prop. When power is applied the water spray into the prop disc was aggravated until the hull climbed up on the step. Once on the step, acceleration was rapid and the water spray was minimal. Earl Harting felt that spray rails affixed to the hull may reduce the amount of the water coming up into the prop.

Slow motion movies were taken to try to get a better idea how the plane was acting in the water. It appeared in the film that, until the hull was up on the step in the water, the wing tip floats were plowing in the water. When the airplane is standing in calm water both tip floats are also in the water. We're not sure yet until we do some more experimenting that maybe the tip floats should be shorter so that only one float would be in the water at a time. As for the spray rails, Earl is building another Wavemaster and we understand that he will be adding spray rails. We will try to remember to keep you posted on how they work out.

If you want to try another area of

this flying sport that is overlooked by many modelers, try flying off water- - - - it's a ball. The Wavemaster is an excellent flying airplane and we can recommend it as a good way to start flying off the water and avoid the crowds at the flying field. We are sure that, with a few minor adjustments and maybe a little more practice, we will overcome some of the water handling problems. □

R/C YACHTING

from page 64

involvement required that a face-to-face discussion help lay the groundwork.

2. Since England holds heavy sway on the workings of IMYRU we felt that a little politicing might help establish AMYA rationale for entry into IMYRU.
3. A first hand sampling of English attitudes on one-design racing was required to assist in planning international aspects of such competition.
4. And there was a natural personal desire to meet and learn from the English skippers.

With unmitigated luck my schedule allowed me to meet all objectives in a single afternoon at a single location. Luckily the MYA was involved in the London Dinghy Exhibition on Saturday, the 24th of March. The exhibition was held at the Crystal Palace National Sports Center in a large complex that featured two good-sized swimming pools. A large fan had been rigged at one side of the diving pool and soon a wide selection of R/C yachts from 32" to the big "A's" were plying the water. Commentary was by a 'household word' in model yachting circles the world over, Mr. Roger Stollery. As Roger and I chatted during the course of the afternoon, we both agreed that anything that sailed was fun – be it R/C, vane, or sport, but that cooperation among all three phases was necessary to provide coherency in the development of the sport. Score 3/4 point for Roger, as he is strictly a vane sailer and best known for his advanced design work - - - it shows his true colors to watch him work so hard at an R/C demonstration. While he demonstrated the typical English shock at one-design racing, he was quick to point out that if such a program brought an infusion of new skippers into model yachting, then it should be promoted on that basis alone.

As a quick aside, I might mention that Roger's latest "A"-Class design, Clockwork Orange, is so radical a departure from traditional "A"-Class thinking, and it has done so well in competition, that a move is afoot to ban the beast by a proposed rule change. Can it be that the sacred freedom of the International A-Class Rule is about to evolve into a set of rather liberal one-design class specifications??

As a result of my discussions we might report capsule conclusions:

1. The 1974 event looks like it will be held. The format appears to be rather loose, as there are no well established R/C competitions for 10-Rater or 50/800 class boats in England. However, new boats are hitting the water, and MYA Chairman Jennings and Vice Chairman Hatfield thought that they would be able to field a reasonable number of boats in '74. They indicated a strong interest in finding out how we run our regattas and

to page 80

ENGINE CLINIC

from page 10

arm you will note in the photograph. Although this is a desirable feature I, personally, feel that the wire arm is somewhat heavier than need be and, due to its length and mass, could result in vibration transfer to the carburetor. This, in turn, could result in the carburetor set screws being loosened, wear of the carburetor butterfly to which the arm threads into, etc. However, this is no problem due to the fact that the arm is removable. On the carburetor I used for testing I removed the arm and substituted an ordinary Allen head cap screw. Manual operation can then be performed, if desired, by the use of an Allen wrench.

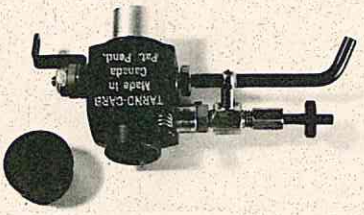
The Tarno-Carb is an extremely well made unit and quite attractive in appearance. The main carburetor body is machined from bar stock aluminum and anodized blue. This, in conjunction with the machined brass needle valve assembly and black oxidized needle, servo arm and manual throttle arm, is an attractive unit.

Performance-wise the Tarno-Carb is the equal of any presently on the market. Idle mixture is quite broad and very easy to adjust. In fact, on initial installation of the carburetor on our Veco .61, I set the idle mixture screw at two turns as per the instructions that accompany the carburetor. The engine idled perfectly right off with no further adjusting necessary. I then tried the mixture setting a quarter of a turn richer and a quarter of a turn leaner from the original setting. No improvement was noted other than a slight richening and leaning of the mixture so the two turn setting was correct. With this setting the engine would idle indefinitely holding the nose of the airplane both straight up and straight down. The only other carburetors that can successfully pass this test are the Perry and the Fox.

The particular airplane we used for a test bed was an old Quick-Fli Mk I. In fact this was THE original Kwik-Fli fuselage and tail assembly built by Phil himself and used to place fourth at the Dallas Nationals some years back. The wing has since been replaced with one with less area. Phil gave me the airplane some years back and I was between ships and it has been used as a

to page 79

from page 76



test bed and back-up ship ever since. In fact, it was passed on down to my son a couple of years ago and recently put back into activity when a lamp post newly installed at the end of our runway at the Supelveda Basin got in the way of his Kaos.

Those familiar with the original Kwik-Fli will remember that the fuel tank position was rather low – lower than desirable, in fact. To compensate Phil mounted the engine on a 45 degree angle to lower the needle valve and carburetor slightly. Even so the top of the fuel tank was below the level of the needle valve. Ideally the center line of your fuel tank should be about 3/8" below the needle valve. Due to the spray bar on the Tarno-Carb being mounted in the top of the carburetor body the effective distance from the spray bar to the center line of the tank was even greater. However, the carburetor still performed perfectly. There was no more tendency to lean out during maneuvers, lean out at the end of the tank, etc., than would be expected with any other carburetor. The carburetor was tried both with and without muffler pressure. We normally use muffler pressure all the time but did want to see if the combination of low tank/high needle valve position would still work satisfactorily. It did. However, for those of you who have not yet given muffler pressure a try, I recommend that you do so. Your needle setting from beginning to end of the tank run will be more consistent. If you should get off a hair lean at a contest, the engine will not sag off and die half way through the pattern possibly ruining the engine, etc.

Power-wise the Tarno-Carb is equal to the Perry, Kavan, or any other carburetor with the same intake area. Carburetor power is simply a function of the intake diameter. If one carburetor develops more power than another it is caused by the intake area being larger – not through some super magic in the carburetor. Increasing the intake area is a cheap way to gain power but at the expense of fuel draw ability which, in turn, affects the performance of the engine. The Tarno-Carb uses a .312 diameter intake the same as the old Veco carburetor, Kavan, and many others. The Perry carburetor uses a smaller venturi diameter but this is compensated for by only having half a spray bar, so to speak, so that the intake area is still the same. When you figure intake area you must take into consideration the diameter and area of the spray bar. Many don't seem to be aware of this.

The Tarno-Carb is presently available for engines in the .40 to .61 displacement range. The price of the carburetor is $19.95. If your local hobby shop does not have one in stock you can order direct from the manufacturer. The Canadian address is 942 Grou, Montreal 379, Quebec. In the U.S. you can obtain a Tarno-Carb from Strato Model Products, Route 6, Blakely, Pennsylvania. Add an extra dollar for postage and mailing. Dealer discounts are available and inquiries are invited. □

R/C YACHTING

from page 75

looking over our equipment. I pointed out, in return, that the U.S. skippers would certainly have a field day looking over the ingenious rigging and fitting systems that the English provide on their vessels. So, it would seem that it will be a relaxed, mutually beneficial meeting between the two largest sailing countries and one that will be more than worth the price of the charter plane flight that AMYA is exploring.

2. The politicing was successful in that I was able to point out the tremendous rate of growth of AMYA and the possibility that it might form a parallel organization to IMYRU out of sheer necessity unless IMYRU took itself by the scruff of the neck and caught up to the present state of the sport.
3. One-design racing is still not an accepted activity in England. It is possible that, in part, this is due to the lack of "pushy" individuals needed to get something like that off the ground. It might also be partly due to the unfortunate choice of the 42" Star-C as a design to be pushed. This is too small and really needs a boat better able to take heavy air in order to become a truly national one-design. I made tentative inquiries as to the feasibility of spreading one of the U.S. one-designs to England under a licensing arrangement. This is still under discussion. We also contracted for one of the 64" Radio Solent hulls produced by John Dowling in Fareham. It should arrive soon, and is representative of a modern hull in the 26 pound area that would seem to me to be a better choice for an English one-design.
4. Meeting and talking with many MYA members at the Dinghy Exhibition was very informative. The accompanying photographs will indicate some of the people and equipment on display to the public.

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I promised some information on AMYA sanctioned regattas in a past column and here is a list of the ACCR's (Annual Class Championship Regattas). There also exist up to 3

to page 82

R/C YACHTING

from page 80

divisional championships for each class, as well as 1 and 2 day special regattas, and local series. Space limits us to the ACCR's for this month. They draw the top skippers, and provide exciting spectator viewing, as well as a top drawer introduction to R/C yachting as a "head-to-head" competition.

July 21-22, 36/600 Class ACCR, Memphis, Tennessee; Bill MacLaughlin, 3197 Toby Lane, Memphis, Tennessee 38111.

July 28-29, East Coast 12-Meter ACCR, Tampa, Florida; Buddy Black, 3004 Samara Drive, Tampa, Florida 33618.

August 11-12, Santa Barbara ACCR, San Francisco, California; George Montague, 305 McCormick Avenue, Capitola, California 95010.

August 18-19, 500/800 Class ACCR, San Diego, California; Mario Singleton, 3828 36th Street, San Diego, California 92104.

Still to be scheduled are ACCR's for Open Class, West Coast 12-Meter, and Regatta One-Design. That information, as well as anything else pertaining to AMYA, is available from Secretary Chuck Black, 4761 Niagra Avenue, San Diego, California 92107. And, as long as you are writing to him, enclose your $3.65 annual AMYA dues in the envelope.

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Any questions you are harboring will get a smug answer if you'll drop them my way to Rod Carr, 2713 Blaine Drive, Chevy Chase, Maryland 20015. □

SCALE IN HAND

from page 72

The stabilizer top is treated in the same way as the wing. Note that any dark panels meeting the fin or fuselage have an irregular division extending, in parts, slightly onto the fin or fuselage.

All of this practice and work on the wing has been useful preparation for the fuselage camouflage. It is our personal opinion that no other scale model subjects offer so much challenge as German WW II fuselages – the difficulty, interest and final beauty of a job well done are unmatched. The job begins with a careful study of the

to page 84

SCALE IN HAND

from page 82

material we are copying. Mottling ran the whole spread from "soft" to "hard," haphazard to clinically tidy – sometimes all on the same ship. Once again, at the risk of boredom, we must emphasize that practice on a scrap of paper is essential to success. Try creating "soft" (hardly visible) mottling. Next, add paint to turn the mottles "hard." Try wavy-line runs, soft and hard. Once you have mastered the airbrush to the point where you can get what you want **first time** on the paper, proceed with the model. Remember that the first time is the **only** time with the airplane.

Now by holding your photos in one hand and the airbrush in the other, copy the mottles as well as you can, for shape, position, and strength. If you don't get a big kick out of looking at the finished job, you're in the wrong hobby!

Finally, the "spine" of black-green is added to the fuselage, sweeping into the fin L.E. Really, this entire fuselage camouflage used by the Luftwaffe is close to that chosen by Mother Nature for so many creatures, birds, and fish, that one supposes it must have been very effective, if troublesome to apply.

By now, our model is looking pretty darned good; but just a bit drab. What it needs now is the crowning touch – the markings. The **decals**, did we hear someone say? To which we'd say, unless you're building a kit and have accurate decals to use, forget it. Too many fine models are spoiled by the use of wrong-size, inaccurate decals. Making your own markings exactly to what you want isn't at all difficult. Just takes a bit of time and a good method. Join us again next month, and we'll let you in on it.

★ ★ ★ ★

Scale in Hand welcomes comments, viewpoints, or requests for help. Write direct to: Dave Platt, 6940 N.W. 15th St., Plantation, Florida 33313. (NOTE NEW ADDRESS!) □

BASIC SAILPLANE DESIGN

from page 53

least in theory. Thus C_L max, which was probably about 1.1, drops to .99, or to be on the safe side let's say .9. The effect on the L/D ratio is, in theory, beneficial, but the overall net effect is probably a washout. The plane flies about 6% faster and slightly flatter, with about the same sinking speed.

C.G. location is sometimes varied to increase performance. As the C.G. moves aft, the tail contributes more and more lift. When the C.G. is at 25% (aerodynamic center) tail lift is zero. At 100% the tail may be contributing 5% of the total lift. This enables the wing to fly at a slightly lower C_L, thus somewhat extending the speed range

to page 86

BASIC SAILPLANE DESIGN

from page 84

and reducing the minimum sink rate. The amount gained is probably not worth the price paid in reduced stall recovery and general handling characteristics.

Fuselage design and fairings are important in reducing parasitic drag. A circular fuselage cross-section which is as skinny as you can make it is the logical choice. Again, El Ultimo has the answer to this one – no fuselage. If you must have one, try pod and boom. But it must be just right – the wings should go into the sides of the pod, and pod should be well faired to wings and boom. The nose should be fairly sharp. A graceful looking example of a nice fuselage design is the Grand Esprit, which has a span of 12 feet. Big planes also have the advantage of reducing fuselage interference effects by making them a smaller percentage of total drag. In a way, this takes away the challenge, since part of the fun of all this is to have reasonably-sized, easily handled models. □

READY BIRD 23

from page 52

plywood hold-down plates over them using the sheet metal screws provided and installing them in the pre-drilled holes through the plywood plates and the fuselage.

The last step is screwing the prop in place with a prop wrench. And, if you've read this far, you could virtually have completed your Ready Bird 23 by this time.

Your finished aircraft can be trimmed up with any type of trim striping you desire or by the application of trim MonoKote to suit your individual preference. In any case, the Ready Bird 23 is ready to fly as soon as the airborne battery pack has been charged. A standard nine volt dry transmitter battery is used in the transmitter and is the only item not supplied with the system. We recommend one or two runs on your engine with Missile Mist fuel before your first flight. Then, you and the Ready Bird 23 are ready to fly.

With regard to the aircraft itself, it is a field proven design from Lanier Industries with a 50" span, symmetrical airfoil, and a total wing area of 350 square inches. The total airborne weight of the Ready Bird 23 is 3½ lbs., for an all-up wing loading of 22 ounces per square foot. The aircraft flies quite well and is an excellent sport flier or design for the novice who has the aid of a local flyer for the first few initial flights. A complete instruction manual and warranty card for the EK-logictrol three channel digital proportional system is included with the package as is a complete owners manual for the Fox .25 RC engine. Accessories such as wheels and propeller are American made by Du-Bro Products and Top Flite respectively.

We, at R/C Modeler Magazine, were truly pleased to see the introduction of the Ready Bird 23 - - - the first truly ready-to-fly aircraft with a multi channel digital proportional system installed and available on a large scale. We congratulate the manufacturers involved and Hobby Lobby International for their efforts in producing a

to page 88

READY-BIRD 23

from page 86

field tested aircraft, controlled by one of the leaders in digital proportional systems, and powered with an engine produced by one of America's leading engine manufacturers.

And, at a price tag of $199.95, a price that is less than that of many radio systems alone, this ready-to-fly package is awfully hard to beat. Tested, Approved, and Recommended by R/C Modeler Magazine. □

PLASTICS: SHOW AND TELL

from page 50

Time to try our specific gravity test. Got the pan of water? O.K., drop it in the water, and watch it sink. Yep!, the specific gravity is 1.2.

Drop a piece on a hard surface and listen to the sound it makes upon impact. Did it go "Flap?" Not mushy, not metallic, just "Flap." You're right, that's the sound of Polycarbonate.

Now the proof test. Place a piece of Polycarbonate in the jaws of a vise, and clamp it tightly, with part of the piece extending above the jaws. Get out your safety glasses, and a heavy hammer. Commence to beat the heck out of the extended piece. Bend it, mangel it, crunch it. If it takes all you can reasonably give it, you can bet it's Polycarbonate. Incidentally, the safety glasses are in case the hammer or vise chips while you are beating the plastic. I doubt if you will ever see the P.C. do any chipping!

Polycarbonate can be solvent bonded using a liquid called 100% Methylene Chloride. Or, you can use 40% (CIS 1,2) Dichloroethylene and 60% Methylene Chloride. DO NOT use MEK (Methyl Ethyl Ketone), or Acetone. Crazing may occur if you do.

If adhesive bonding is desired, try RTV 102, or Eastman 910. Two part epoxies seem to be O.K., also.

So, now you want to paint it too, eh? Fine, let's use Epoxies or Urethanes.

You will find that Polycarbonate is fairly expensive, if you compare it to Styrenes but, at times, we have to give up one thing, ($), to get performance.

Re-cap time . . . so far, we have covered:

1. Styrene
2. Acrylonitrile Butadiene Styrene (ABS)
3. Acrylic
4. Nylon
5. Polypropylene
6. Polyethylene
7. Polycarbonate

Terrific!!!!! You can even pronounce the words now, and if you have all been good students and did your "lab" work, you can identify them too.

Next "Show and Tell" will give you a little insight into what happens when these plastics are "alloyed" or fillers have been added. □

KAVAN JET RANGER

from page 49

the holes in the fuselage are enlarged to 4mm. Blind nuts are installed and epoxied inside, and the top replaced with screws and washers.

The top bearing must be assembled to its bracket, and the bracket mounted to the top former (#9). The angle bearings for the servo tray and two

ball links are also assembled to this former. Our instructions were a little confusing on the direction of screw placements on these assemblies, but the photos should help.

Once all of the parts have been mounted on the top former, the fuselage is placed upside down, and the top former is carefully tack-glued into place from inside. A little care is required here, since the former must be glued only to the top. After the glue has set, the top is removed, and the former is securely glued to the top.

A nylon bushing is installed into the top former, just under the bearing bracket. This bushing has an angled flange with a protruding guideline. The guideline must be lined up with the printed line on the former for proper position. The main rotor shaft is slid through the bearing and the bushing to hold the bushing centered.

The aluminum gear bushing is held to the main rotor shaft with a split dowel pin. This must be carefully driven through both the bushing and the shaft. The output gear is then bolted to the bushing. The main rotor shaft is installed into the cabin top from the bottom.

The forward bulkhead assembly and floor (#8) are positioned in the fuselage. Four shock mounts are installed into the transmission housing, and the transmission base plate is installed on these. The transmission housing is now placed into the fuselage bottom. The cabin top is mounted by its four screws. The transmission housing is now adjusted fore and aft until the main rotor shaft drops easily into its bearing, and the output gear is parallel to the transmission plate. The transmission housing is tack-glued in this position. After the glue has set, the cabin top can be moved, and floor (#8) can be removed. The front framework is now glued into place, finally adding the floor, pulling it back until it meets the transmission housing. Now all joints are securely glued.

The vertical side formers are now added, along with the one across the top of the windshield. The boom former (#11) is also added now. Two large blind nuts are glued into the boom former and allowed to set. The former is then pinned to the end of a balsa strip (about 3/8" square). There are two center marks on the boom indicating the screw locations for the horizontal stabilizers. These should be drilled out with a 3mm (.116) drill. Former 11 is slid into place on the end of the balsa strip, being sure to place the hole for the tail rotor pushrod on the left side of the fuselage. When in place, two screws are installed through the boom into the blind nuts. These hold the former while the balsa strip is removed. The former is now glued into place, using the same balsa strip in order to reach to put the glue into place.

The two horizontal stabilizers are simple built-up structures of balsa sheet with a balsa leading edge and plywood ribs. A tube runs behind the leading edge to guide the mounting screws into place. Care should be taken to ensure that a pair of stabilizers are built – that is, one left and one right.

The vertical fin is fabricated of balsa sheet, shaped as shown. The tail skid is epoxied into place, then reinforced with cloth tape. The center joint is also taped.

The tail cone is shaped from a balsa block. The block supplied with our kit was 5mm smaller than specified, and required laminating a small piece of balsa to one side to make it large enough. Former 14 is epoxied to the front of this block with a strip of aluminum sandwiched in-between for mounting. The tail block is mounted

with two sheet metal screws.

The four holes for mounting the landing gear must be located from the plans. We located the front set of holes from the side view, then laid out the rest from the dimensions given. The skids are mounted to the pre-formed plywood struts with screws and clamps. Four shock mounts are installed to the bottom of the fuselage. The landing gear is then attached to the shock mounts with wing nuts. For the inexperienced helicopter pilot, there is a wider landing gear available – which we highly recommend. The wide gear is constructed exactly like the smaller one.

We should mention that the procedure of bolting the landing gear shock mounts directly into the thin fiberglass fuselage bottom did not seem adequate to survive the punishment that it would surely see (at least in our hands). We have been reassured by Mr. Kavan that it has been his experience that it, in fact, is sufficent. We were further encouraged by the unusual flexibility of the fuselage pieces that were cut out of the windows. We have, therefore, installed the gear **exactly** as indicated. However, we still think it might be wise to add a strip of 1/16" plywood in this area, inside the fuselage. The choice is yours.

With most of the construction work completed, we can begin the mechanical assembly. As with all helicopters, all hardware must be locked in place to prevent loosening and possible disaster. The Kavan Jet Ranger kit includes a tube of Lop for this purpose. Lop is the same thing we've been telling you about – Loctite. For best performance, all hardware should be cleaned with a good grease solvent (lacquer thinner will do) before using.

The engine, transmission assembly in the Jet Ranger is a very simple and straightforward design. The bevel gear right angle drive for the tail rotor is assembled to the transmission base plate first. The engine frames, lower bearing plate and reinforcing plate are now assembled. These should all be bolted on loosely, then gradually tightened and squared up. You will notice that the engine mounting frames each have a lip along one side. The frames may be installed with the lip either facing in or out, depending on the width of your engine's crankcase. The drive shaft for the tail rotor is pushed through the two ball bearings in the right angle drive. The shaft, with the clutch bell housing

pre-installed, is now fitted through the lower bearing of the transmission, upward through the top bearing, then through the spur gear and, finally, into the bevel gear. These two gears must be pinned to the shaft with split dowel pins. This is a somewhat difficult task with only simple tools. It may be easier if you will first start the pins into the gears – driving in far enough that they are securely into the gear and aligned with the pin holes, but not extending into the shaft hole. **Both gears must be in place** before either pin is driven through the shaft. Here a little patience and care are a must. The pins must be driven through without bending the shaft or burring the gears. A drift pin, or a piece of 1/8" music wire and a **small** hammer will do the job.

The engine drive washer is removed and the supplied split cone (3 sizes) is installed, followed by the drive gear and the cooling fan and the original prop nut. The engine assembly is located on the engine frames and is positioned so that the timing belt gears are aligned with each other. The engine mounting holes should be marked and drilled. Cover the bearings to prevent getting metal chips in them. The engine and timing belt can now be installed. The throttle bellcrank and linkage can also be added. A spring wire and clip are provided for external access to the glow plug.

The fan is temporarily removed from the engine and the transmission is mounted into its housing in the fuselage. The center bore in the engine crankshaft is used to mark off a 118mm circle on the fuselage bottom for the cooling fan. The transmission is then removed and the fan blade re-mounted. A strip of thin plywood is mounted around the fan cutout to increase the fan's efficiency.

A Kavan adapter should be secured. The provided muffler is installed on the engine and an appropriate opening is cut in the fuselage bottom. The engine we chose was a Super Tigre G60 Bluehead. This engine has a pair of lugs on either side of the exhaust stack, intended to mount a S.T. muffler. In order to install the Kavan muffler on this particular engine, it was necessary to remove the lugs from the engine.

The tail rotor cutout must be made in the side of the fuselage as shown on the plans. Formers 12 and 12A, which hold the tail rotor transmission, must be positioned carefully. The tail rotor transmission is bolted to former 12

using blind nuts. The tail rotor drive shaft is fitted into the tail rotor transmission and slid forward through former 11 (at the horizontal stabilizers). At the forward end, former 10, with a plastic guide tube installed, is slid onto the drive shaft (watching the pushrod hole location). The drive shaft then fits into the transmission. The tail rotor transmission and former 10 are carefully positioned so that the drive shaft is aligned straight and the tail rotor shaft is square with the fuselage from above and behind. Formers 10, 12, and 12A are then epoxied into place.

After locating the position of external necessities, such as switch, charge-jack, and glow plug connector, these should be cut out. The scale exhaust pipe openings should also be cut, along with any of the scale air inlets that you might care to open. The fuselage is now ready for finishing. Any holes or air bubbles should be filled. The entire ship must be sanded

to page 94

KAVAN JET RANGER

from page 92

with about 360 grit paper to remove the gloss and any trace of mold release. A coat of good primer, such as K & B Superpoxy can now be applied. Refill any small imperfections that appear after priming. The ship may be painted with most any color scheme. Ours is finished in Bell Helicopter's 1973 design, in White, Burgundy, and Metallic Gold. Since, when you purchase your full-scale Jet Ranger, you are given the opportunity to pick your own color scheme – why not do it now?

With a little planning, the forward section of the cabin could be outfitted nearly to scale. Even the transmission, which blocks the rear section, could probably be disguised as a crate or other cargo. You be the judge of just how far you are willing to go, but the medium is there if you want to work with it.

That's about it for this month. Ole Fearless Leader is up on his chair, screaming about deadlines and other unimportant things, so we had better wrap up for now. We'll be back next month with the rotor assemblies and radio installation. In the meantime, we will include a couple of photos of these assemblies for those of you who are building the Jet Ranger.

Before closing we would like to comment on the Kavan Bell Jet Ranger. The kit is unusually well-designed and engineered. With very minor exceptions, the parts have fit as intended. The instructions are very complete, although there are a couple of places where the translation is a little confusing but not seriously so; we understand these are being improved. Overall, the Kavan Bell Jet Ranger is a superb kit, designed for the perfectionist, by a perfectionist. A must for every RC chopper pilot and an intriguing challenge for owners of full-scale Bell Jet Rangers.

The Kavan Jet Ranger helicopter is priced at $450.00 and is distributed in the United States by Model Rectifier Corporation, 2500 Woodbridge Avenue, Edison, New Jersey 08817.

Till next month – Happy Hovering!

keep the plug for the production of yet another mold or follow our construction article and convert it back to a sailboat hull. The mold can be supported by a wooden framework or can be left unsupported, in which case a temporary support will be needed while laying a hull in it.

After the trials and tribulations of making the mold, making a hull becomes childs play. Support the mold horizontally and coat the surface with your favorite parting agent. Let dry. Mix your favorite color Gel-Coat remembering that this will be the finished color of your hull and apply to the inside of the mold, but don't coat the flanges. Once set, form the cloth inside the mold – you will find that this is much easier than the forming on top of the plug. Apply plenty of resin, use a small piece of cloth at the transom making sure it is overlapping the sides slightly. Don't worry about the rough appearance of the hull because the outside will be as smooth as . . . ! Let the first coat set and apply a second one!

While the second coat is setting, trim all excess material using a sharp knife. Use the sharp edge of the mold as your guide, moving the blade in a sawing motion. The total thickness of the single layer cloth and resin should be about 1/16" – 1/32". If you prefer, you can mark the trim line by scoring and then use a razor saw and a file to trim the hull after it has been pulled out. It is advisable to leave some excess material around the bow to be used as tabs for the purpose of lifting the hull out of the mold.

Leave the hull in the mold overnight until the resin is completely set. Then, very carefully, run a knife edge between the hull and the mold along the shear line avoiding scratches to the mold or hull. The hull should be readily removable and with some gentle pushing and shoving will come out. Trim all the edges and start laying the next one!

And what if you don't want a mold?

After sanding the surface smooth, notch the top corners of the frames to accept 3/16" x 3/16" spruce strips. Inlay the strips and glue them to the shear planks. These strips will strengthen the structure, and also provide additional gluing surface for the deck. The hull is now ready to be fiberglassed over. (Many articles have been written about the process of laying fiberglass over bare wood.) Due to the shape of the Soling, this is quite simple and is done in the following manner:

Mount the hull upside down. A simple frame from some 2 x 4's will simplify the matter considerably. Cut a piece of cloth (6 oz.) large enough to cover the complete surface. Don't worry about the transom as it will be covered separately. Lay the cloth on the bare hull, mix a batch of resin and spread evenly all over. The tacky resin will keep the cloth from moving and shifting. Start from the middle and

work towards the sheers, removing wrinkles as you go. The bow is a bit tricky but, by removing most excess cloth around the area and cutting some short slits, no problem should be encountered. Try to brush the resin as smoothly as you can to avoid runs. Most finishing resins are quite suitable (I use Sears). After the first coat is set, trim all excess material around the edge and apply the transom. After the transom has been trimmed, apply a second coat of resin and set aside to dry.

The next step will be to sand the coated surface using wet sandpaper. Start with a coarse grade (80-100 grit) and don't waste your time with worn out paper. The surface will become dull and all dips and depressions will remain glossy. Use a file on heavy runs or ridges. Work down to 180 and then 280 until the surface is smooth! Wet sanding can be deceiving in that the wet hull will feel smooth. Wipe it dry occasionally and check your progress. You will now realize the advantages of a molded hull! Keep sanding!

All the balsa frame can be removed with the exception of the bottom 1/4 strip which is now an integral part of the planking and the bow and transom frames. Clean the inside of the hull and remove all cement ridges. Locate the fin position and lay a layer of cloth on the inside making sure it will overlap the fin slot location by at least an inch. In the 50" boat, this should cover the area between frames 4 and 8. While doing so, you should also apply a small patch (about 2 x 2) to reinforce the area around the rudder tube.

Trace and cut the fin and the two supporting frames. Use marine or aircraft grade ply (Sig, etc.) 3/16" will do for the 36", 1/4" for the 50". File the fin to the cross section shown leaving the top portion flat. Mark and cut the fin slot in the hull by drilling a series of holes and cutting between them with a razor saw, trim with a file. Make sure the slot follows the centerline of the hull. Temporarily install the fin and check the fit between the hull, frames, and fin. When you are satisfied with the result, epoxy the assembly together and make sure the fin is vertical when viewed along the hull.

The need for a stand will now become very apparent. A simple cradle or "field box" will do or you can convert a folding camp stool by removing the canvas top and replacing it with two segments of leather belt, or use your own ideas. The stand is very useful during the next steps of construction and is almost a requirement at the water-side when getting the boat ready for sailing.

Now that you became an expert wood worker and fiberglass layer, it is the time to qualify for the pattern makers union! Trace the outline of the bulb on some wood, using balsa or any other soft wood such as pine. Cut and whittle to shape and sand smooth. Coat with dope until a very smooth surface is achieved and all the grains are sealed.

Glue the pattern to a flat board and build a frame around it. Leave about an inch all around. Coat the inside of the "box" with dope and sand lightly or use wax or another parting agent. If you are the gambling type, don't worry about parting as long as the surface is relatively smooth.

Obtain some molding plaster, hydrocal, hydrostone or whatever is available. Mix per instruction and pour over the pattern. To minimize pin holes which are caused by trapped air, use a brush to apply the wet plaster to the pattern surface and then pour the plaster on top. Shaking and tapping

the box will also help to bring the air bubbles to the surface. The mix will set in less than an hour and then you can remove the pattern. If a parting agent was used, no difficulty should be encountered and the mold and pattern will separate readily. Some persuasion will be required to force the pattern out of the mold and some gentle tapping might prove helpful.

After separating the mold and pattern, bake the mold in the oven for a couple of hours at about 350 degrees to get rid of all the moisture left in the plaster.

Now you have to make another monumental decision! Would you like a cast lead bulb or would you rather use lead shots in molded fiberglass half shells?

Since you are an expert fiberglass layer you might choose the latter which simply means that you use the mold to form two shells the same way you formed the hull. These shells are then mounted flat and lead shot poured into them followed by a generous application of either epoxy or resin. These shells will then be bolted and epoxied to the keel. The advantage of using this system is that you don't have to deal with molten lead.

If you would rather cast your bulb try to obtain the service of a welding torch. Your propane torch just doesn't have the heat capacity you'll need. The process is very straightforward and can be done in either of two ways. The obvious way is to melt the lead (lead shot is fine) in a ladle and then pour it into the dry plaster mold, protecting your eyes while doing so. You will have to over-fill the mold as the lead has a very high surface tension and a meniscus will form. The excess lead can be removed by filing using either a rasp or a course file. Repeat the process for the other half.

If you don't have a ladle you can melt the lead in the mold which, in most cases, will crack from the heat. Wrap a few layers of tape such as filament tape around the mold to help support it, then pour lead shot into the cavity and apply the torch, trying to avoid the mold edges. As the first batch is molten, add more lead shot until the mold is over-filled. You will have to skim the surface occasionally and remove some of the oxidized material which acts as a heat shield! Let it cool completely and proceed as before.

Drill mounting holes in the two bulb halves and check to ensure that they line up properly. Set them aside for awhile while proceeding with the rudder.

If you are building a 36" you can use a piece of .040 thick brass. Cut or shear to the outline of the rudder and clean all burrs with a file or sandpaper. The shaft can be made from a 5/32" O.D. brass tube, slotted and soldered to the rudder. If at all possible, silver solder should be used even though soft solder is acceptable if properly done! The reason for using a 5/32" tube will become obvious when it's time to fix the steering arm which is a standard nosegear fitting. (I use Du-Bro.)

If you are building a 50" boat, the rudder is much bigger and, if made out of thin brass, will be too prone to be damaged or bent out of shape. To use thicker brass means more weight, so what is wrong with using balsa wood? The following method has been used on several boats and the results are a strong, yet light, rudder.

The rudder shaft can be made from 1/4" rod or thick wall tube. Brass or stainless are the two choices. Drill the shaft for the cross piece which is a

to page 106

from page 103

1/8" diameter tube or rod. Cut the rudder halves from soft 3/16" balsa. Cut grooves for the shaft and cross piece in both halves and, using epoxy, glue the assembly together using clamps or weights. After the epoxy has set, shape the rudder to the airfoil (waterfoil?) section shown. Apply a layer of fiberglass cloth to one side, trim and apply the other side, one more coat of resin, sand, and the rudder is done!

(to be continued)

RETRACTS

from page 30

touch or bind on any part of the airframe. **Caution**: Make sure the main gear struts do not hit the main gear pushrods when the main gear goes into the wheel well. If the pushrod take off point is to the rear on one main gear and is to the front on the other, you should have no problem. You have surely noted that the output of the servo rotates 180 degrees, so when preparing your pushrods you must make just enough of a bend at the output shaft of the servo to prevent binding against the servo shaft. Make the main gear pushrods from a twelve inch, 1/16" steel threaded Goldberg nylon clevis. Run the main gear pushrods under the output wheel and make 90 degree bends up through the holes in the output wheel. You should have the servo mounted and the main gears mounted down and locked. The installed main gear pushrods should be well clear of the air frame.

Check out this portion of the installation. Select a direct path for your nose wheel pushrods. I recommend the use of 1/16" music wire and add a brass 2/56 thread to the front end and use of a small nylon clevis here. Now to mount this wire to the output wheel of the servo. Remember there is already two 1/16" wires coming out of the wheel. Don't forget the wheel turns 180 degrees (for those who don't know, that is 1/2 of a revolution).

There are several ways to connect to the wheel, and I am presently using the Florida method. As you recall the two main pushrods come from under the wheel, so let's put the nose wheel pushrod on top of the wheel. Take a piece of 5/16" nylon tubular stock 5/16" long. Drill a 1/16" hole in the center, all the way through. 3/32" from one end of the stock grind a ring around the stock approximately .045" deep. Position the nylon piece over the hole in the servo output wheel so that it will make the nosegear function. With the ring away from the wheel, mount the nylon tube to the output wheel with a small self tapping flat head screw by putting the screw through from the bottom of the servo output wheel. You now have a spacer on the output wheel that will permit the wheel to turn, with all three pushrods connected, and no interference among them. Take the nosegear pushrod, and bend a 90 degree bend approximately 3/32" from end. Make and solder a music wire keeper to this end of the pushrod made of .045" music wire. This keeper will be positioned in the groove in the nylon spacer after you put the end of the pushrod in the hole that is in the top center of the nylon spacer. The keeper will keep the pushrod attached to the

spacer. Solder a threaded connector to the wire at the nosegear while all gears are down and locked. Use a clevis for adjustment. Steering is rather straightforward, and I'll leave this to your liking. Some use a pushrod, some use cable – I use a pushrod. In any event, make sure that the steering control does not add any drag to retracting the gear system.

Now we have the system installed. The gears are in the down and locked position. The servo is in the down mode. All pushrods are connected. You are ready to button up and turn everything on. Hit the retract switch and watch those wheels dissappear. □

R/C FLIGHT TIMER

from page 29

which, in turn, discharges the capacitor rapidly and drives the output to its low state. The circuit triggers on a negative-going input signal when the level reaches 1/3 V_{CC}. Once triggered, the circuit will remain in this state until the set time is elapsed, even if it is triggered again during this interval. The time that the output is in the high state is given by T in seconds = 1.1 times R_A in megohms times C in microfarads. It should be noted that since the charge rate and the threshold level of the comparator are both directly proportional to supply voltage, the timing interval is independent of supply.

CONSTRUCTION NOTES

The partially assembled circuit board is shown in Figure 3. Construction was based on .100" grid hole center-perforated board. The board I used had solder tabs on one side; however, wiring directly to the socket should be no problem, if you cannot locate the printed circuit kind. The 12-position rotary switch was a luxury I used to obtain delay times between 5 and 16 minutes. However, if you desire and only require one time-delay period, simply omit the rotary switch and substitute a suitable resistor and capacitor combination based on the formula $\tau = 1.1\ R_A C$. If you know your engine run and only wish a single time period, say 10 minutes, a combination of 500 microfarad and 1 megohm will give you 9 minutes and 10 seconds. Then, a good trick would be to add a small trimmer resistor of

PARTS LIST

1 each	220 kΩ	1/4 watt 5% resistor
11 each	470 kΩ	1/4 watt 5% resistor
1 each	150 kΩ	1/4 watt 5% resistor
2 each	1 kΩ	1/4 watt 5% resistor
1 each	2.2 MΩ	1/4 watt 5% resistor
1 each	100 μF	12 or 15 WVdc capacitor (tantalum)
1 each	15 μF	12 or 15 WVdc capacitor (tantalum)
2 each	10 μF	12 or 15 WVdc capacitor (tantalum)
1 each	1 μF	12 or 15 WVdc capacitor (tantalum)
1 each	.001 μF	ceramic disc capacitor
1 each		single pole 12-position rotary switch
1 each		SPST slide switch
1 each		GA 100-12 solid-state audio indicator
2 each		SE or NE555V integrated circuits*
1 each		3¼ x 2-1/8 x 1-1/8 "mini" box
1 each		SPST miniature momentary switch (normally open)
1 each		16-pin dual-in-line IC socket
1 each		9-volt battery, Eveready 216 or equiv.
Miscellaneous		circuit boards, knobs, decals, etc.

*The NE indicates the commercial version and is the least expensive.

about 100 k in series to touch up the last few seconds. Although my timer was a little cramped using the 12-position switch, construction should be no problem. Parts placement is not critical and its just a matter of point-to-point wiring to get the right result. Due to the self-resetting feature (necessary if you use both thumbs) two integrated circuits are used and placed in one 16-pin dual-in-line socket. Figure 4 shows a photograph of the completed circuit board and Figure 5 shows the unit ready to go.

TESTING AND OPERATION

Testing of the timer is simplicity itself. The only test equipment required is a watch with a sweep second hand and the patience to wait out the time period for the buzzer. Over a long time period, the delay may vary some seconds, due to the tolerances of the resistor and capacitor combination and, if you insist on absolute accuracy, you can measure them and trim, as necessary. □

PRACTICAL AERODYNAMICS

from page 16

have disastrous effects.s.

Remembering that load factors can be induced by any change in direction, it can be easily seen that a loop imposes the same type of load on an airplane that a turn does. I'm sure some of you have seen the high speed stall phenomena during recovery from a dive or loop. Generally the airplane won't recover because the pilot keeps trying to "pull the nose up" by increasing the angle of attack. However, we know now that if the stall angle of attack has been exceeded the only method of recovery is to reduce the angle of attack and get the airfoil 'unstalled.' Similarly, if an inadvertent stall is encountered in a steep turn, decrease the angle of attack (reduce the load on the wings) and roll the wings to level.

In summary: Load factor is the ratio on an airplane's weight and the load on the airplane. It can be increased or decreased by changing the direction of flight of the airplane. High load factors may cause structural failure or unintentional high speed stalls. Recovery from these stalls is accomplished by decreasing the angle of attack and getting the wings level.

See you next month. Until then don't pull too many G's. □

SUNDAY FLIER

from page 12

no "classing" of aircraft or engine displacement was necessary. In order to make the heats as close as possible, the first event of the day was a "trophy-dash," flown for pure speed, between the pylons. One run was flown downwind for time, the second was flown upwind for time. The combined times determined first, second, third, etc. This event also set-up the races between those aircraft with the most similar times, making for better heats. The starts for each heat were as exciting as anything you've seen in racing! The aircraft were taxied out into the lake with an upwind heading. When they were approximately in line with one another, the starting flag dropped along with a verbal "go" command. Pilots fire-walled their throttles and the aircraft leapt forward, straining for an early lift-off and to be first around the scatter pylon. The combination of roaring engines, flashing aircraft across the water, aircraft trailing streams of water at lift-off and each pilot pulling as hard as he dared to come around the scatter pylon first, made for the kind of excitement that makes spectators come to their feet yelling for their favorite machine to flash past them in the lead.

So you can readily see that seaplane flying is rapidly becoming more popular, and more advanced. If you haven't tried it, you should. Very few lakes are being converted into housing tracts, so there'll always be flying sites.

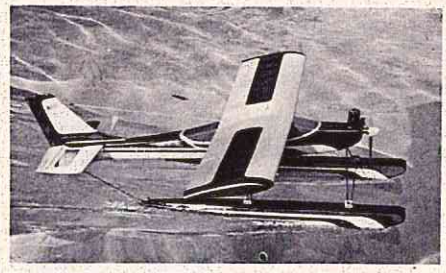
As you get into the sport, you undoubtedly will notice the great variety of designs – particularly in the shape of the bottom of the floats or the hull. The reasons, of course, are as varied as the designers. Let's take a look at some of them – the designs, I mean.

First off, if you happen to have seen some of the designs I've published, you'll notice that I'm partial to the simplest possible bottom configuration. Through the years, I've published such designs as the Drake, the Pelican, Seafoam, the Islander, and the Puddlejumper, all with a flat bottom for the hull or the float. Then there was the Dreamboat, with a "V"

bottom. Why do I like the flat bottom? Two reasons: First, it is unquestionably the easiest to build. Second, insofar as I have been able to observe when it comes to models, the planing characteristics of the flat bottom can't be beat. It's true that the flat bottom makes the impact loads greater than any other design when it comes to landing – something like the difference between a "bellywhopper" dive and a smooth entry – but the facts are that in the model sizes that we fly, the impact loads are not severe, so it doesn't really matter.

In full scale aircraft, the impact loads become a major factor; also, when planing, a flat bottomed design would probably jar the eyeteeth right out of the passengers. So, for both structural reasons and comfort, many types of bottom designs have been developed. Let's look at some of them.

The simple "V" bottom is one of the most popular. Planes well, lessens the impact on landing since the water is struck at an angle. The "V" also serves as a mild keel. Throws quite a bit of spray during transition from displacement to planing.



Tex Newman's 'Headmaster' on floats.

The inverted "V" has some good characteristics. The sharper angle at the edge tends to make the bow wave flatten out, and the proponents of the design also believe that the inwardly displaced water comes together at the middle and is forced backward at a higher rate, creating a sort of Venturi effect and breaking up the flow at the step so the transition from displacement to planing is aided. Structurally, it's harder on the bottom because the trapped water beats the bottom pretty hard – but that's no problem with planes in the size we are flying.

The channel bottom is becoming popular also. Tex Newman built the beautiful Headmaster on floats which is pictured, and incorporated the channel bottom on the floats. Take-offs are smooth, with transition from displacement to planing occurring almost as soon as the model starts to move.

A variation of the above is used on Scott Christensen's Curlew. He has the channel configuration up front, and phases it in to an inverted "V" at the step. Looks nice, and gives the model excellent water handling even in strong winds.

The flat bottom with a piece of triangular stock along the centerline to give a keel effect seems to work well. The relatively sharp (45 degree) break creates a turbulent condition during transition from displacement to planing, which seems to increase the amount of spray which is thrown, but once on the step it disappears.

The curved "V" which I've termed the cruiser bottom, because it is similar to the forward cross section of power cruisers, does impart an angular acceleration to the water at the bow to make the bow wave break out and away so it doesn't tend to fly up into the prop as much. Looks great when you're taxiing out for take-off.

The double curved "V" which I've called the Edo is one that I've never seen on a model. The Edo Corporation

seems to be very partial to this configuration, and since they do a lot of testing in flow tanks, there must be something to it, although I don't know enough about the reasons to tell you. Maybe some of you can enlighten me.

The concave bottom is an old timer. I remember 'way back in the late twenties when the famous Italian aviator, Italo Balbo, flew a Savoia Marchetti twin hulled flying boat across the Atlantic and toured the United States, landing in Lake Michigan just off Grant Park in Chicago. What a thrill that was for a young guy like me who was all charged up about flying. And those Savoia Marchetti's had concave bottoms on their hulls, which had to be triple reinforced to take the beating the water handed out. But they sure were seaworthy.

Another type of bottom which I've never seen on a model – or a full-size float for that matter – is the "cathedral" hull which is appearing on a number of power cruisers. Proponents claim that it just about nullifies the spray, sending it out at a flat angle that hardly comes up off the water. Wonder if it would work with a model?

Naturally, there are virtually an infinite number of variations of these designs – different angles and combinations – and so there's all sorts of chances to experiment if you're so inclined. For my own purposes, the flat bottom does everything I want it to, but I have to admit a fondness for the cruiser hull, such as I designed into the Wavemaster, because it gives a beautiful line to the bow wave, and is a lot prettier to look at – especially if the fabulous Helen Lam is posing with it.

As with the bottom designs, the profiles show many variations. I've shown some typical examples in the sketches. The one thing common to all of them, though, is that the upsweep of the hull line aft of the step has to be sufficient to permit rotation for lift off, otherwise the rear end of the floats dig in and won't let the wing get into a lifting angle of attack. Some designers get the wing into a lifting angle while still on the water by pointing the centerline of the floats slightly down; thus when the model is on the step the wing is at a lifting angle and the plane lifts off without requiring rotation. That method has the drawback of requiring that you be sure and land the model nose high so the forward end of the floats doesn't dig in and dump the model.

Other variations appear in the plan views; some floats taper to a point in the plan view, others have a finite width at the stern with the float top fairing down to the bottom. Simplest design layout is the constant width. This one absolutely requires an upsweep aft of the step, otherwise the wide rear end will drag on rotation and prevent lift off.

I've also shown a couple of variations in the step – the straight transverse break and the "boat-tail" type. Both work. The straight step has more drag in the air, and that's one reason why the boat-tail type is favored by some designers, especially full scale. I used it in the Wavemaster simply because it gives a nice line, and is easy to mold.

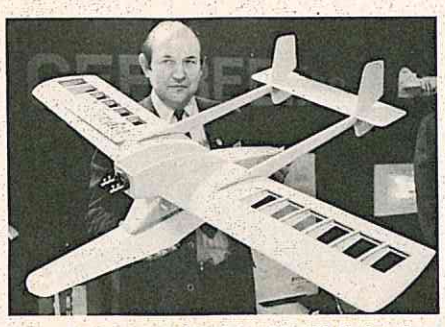
And what are the advantages of the various combinations of floatation – the twin float, the triple float, the single float with tip floats, the single float (or hull) with sponsons? I'm not sure I know, but they've all been used, and they all work. Of course, the triple float – a water borne version of the tail dragger – is virtually out of the

Helen Lam and 'Wavemaster' amphibian flying boat design.

picture except for vintage scale types, like the Antic. For myself, I've always preferred the single float with tip floats. If you set the tip floats at the right height, they are free of the water when the model is planing, and you only have to lift off one planing surface. I've had difficulty at times with twin floats when one float would break loose before the other one did, and I wasn't quite quick enough to correct for the sudden asymmetrical drag. Sure, it can also happen with a single float if a side gust tips the model so a tip float digs in, but the offset drag isn't quite as effective since the center float is considerably larger.

Sponsons work well for take-offs, but their crosswind water stability is low. I remember flying across the Atlantic in one of the old Boeing flying boats which had sponsons, and as we taxied out for take-off in the Azores, I thought we would get swamped when we got crosswind, and the wing tip actually disappeared under water. The pilot had to throttle back rapidly or the situation could have been serious.

So there are some of the things to consider when you decide to try a seaplane or a flying boat. Don't let any of them phase you; go ahead and build the one that intrigues you. There's one thing about flying from and over water. If the plane happens to dive in, the damage is one helluva lot less than if it dives into an asphalt runway! Naturally you should protect the radio to the maximum extent possible to keep it dry in the event of a crash, but even if it gets wet – and the water is fresh – no serious damage results. Just be sure that if salt water gets into the radio, you flush it out within seconds, or a major repair, or replacement, will be required. Water-proofing techniques are getting better all the time, anyway. You can make the radio compartment watertight, then, in addition, wrap the



Don Foster and 'Islander Mk II' flying boat designed around a Gee Bee float as a hull. Ingenious!

receiver and batteries in plastic bags, and mount the servos amidships so that whether the model comes to rest right side up or upside down, the servos are not immersed – unless it's a total demolish job and everything comes apart. I've only had one of those. It was during the attempts I made before successfully crossing the Catalina Channel back in 1957. The big six foot Dreamboat got out of range and came screaming down into the ocean in a full power spiral dive. The two pounds of radio gear kept right on going – through the front end of the hull and to the bottom. But once in twenty years of R/C seaplane flying isn't a bad average, so don't let the prospect scare you. Radios are infinitely more reliable nowadays.

It's the pilots who need to work on reliability now.

•

I've just received a letter from Dave Corven – barely in time to make the deadline for this issue. It won't give other clubs much time to participate in the planning for the Junior Team event at the Soaring Nats at Lockport, Illinois, on July 23, 24, and 25 – but go to it anyway, fellows.

Ken Willard:

About two months ago, our club, The Greater Detroit Soaring and Hiking Society, decided to investigate the possibility of a Junior Team Competition similar to the team event that now exist at the Soaring Nats.

Dan Pruss and the Soar Club in Chicago have concurred that this would have excellent possibilities and could help boost what is already a rather active junior participation in R/C soaring.

In the Southern Michigan area, junior participation in soaring is quite phenomenal as compared to other phases of R/C flying and these kids are beginning to scare the pants off of us old timers.

R/C MODELER MAGAZINE'S

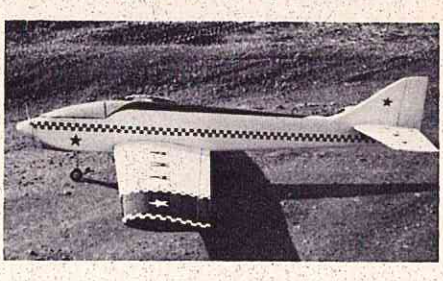
MODEL OF THE MONTH CONTEST

JUNE WINNERS

1ST PLACE

Arthur Biehl
2195 Bienville Drive
Florissant, Missouri 63031

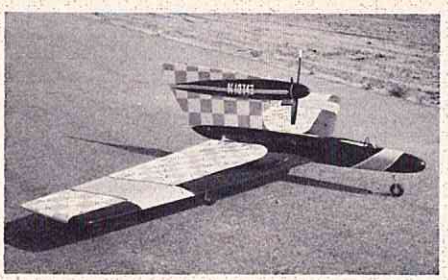
Built from a Sterling U-Control Kit especially modified for Radio Control. Kraft 4 channel radio, O.S. Max .19. Aero Gloss finish with MonoKote trim and K & B Superpoxy. Wing span 36", Weight 2¾ lbs.



2ND PLACE

Earl B. Farley, Jr.
Box 370
Lebanon, New Jersey 08833

Scratch-built Super-Star II from R.C.M. & E plans. Pro-Line radio, H.P. .61 engine. Covered with Silk-Spun Coverite, MonoKote Checkerboard striping. 62" wing span, 7½ lbs.



3RD PLACE

Bert Ayers
24733 Ravenna Avenue
Carson, California 90745

"Shriek" built from Model Dynamics Kit. Kraft Series Seventy-One radio, powered by Torpedo .45. Covered entirely with Super Monokote. Wing span 67", weight 4½ lbs.

Thus, we feel that there is enough juniors around the country to warrant a Junior Team Event at the Soaring Nats.

So, in conjunction with S.O.A.R., the sponsor of the 1973 Soaring Nats, the Greater Detroit Soaring and Hiking Society is proud to announce the contribution of the Soaring Nats Junior Team Perpetual Trophy to be awarded to the Best Junior Team at the 1973 Soaring Nats.

In addition, there will be three individual permanent trophies awarded to the three winning team members. These, also, will be contributed by the Detroit group for 1973.

Further information on this event can be obtained from: Dan Pruss, Box 49D, Plainfield, Illinois 60544.

Thanks for any help you can give.

Sincerely,
Dave Corven, Vice President
Greater Detroit Soaring
and Hiking Society

IT TAKES THREE TO TANGO

from page 6

catalyst – fighting for them a rear-guard defense against the forces of regulation and regimentation which rule the earth and aim to rule Heaven, too.

The increasing sophistication of our technology has left most of us helpless to fix things the way we used to - - - and that tends to frustrate a man.

So an increasing number of us substitute sport-hobbies – where we can again enjoy the satisfaction of breathing life into a dead machine.

All frontiers are first explored – then fenced – then plowed – then paved – then fouled.

These backyard airplane builders are the last remnants of an era when a man did it all . . . or fore-runners of a time when he may have to again. □

FROM THE SHOP

from page 2

process of being distributed to the hobby shops by the time we receive it, we often exchange the kit received from the manufacturer with one we obtain from a local distributor or hobby shop. This is done in order to make sure that the kit we review is similar to the one that you would purchase off the shelf from your local

dealer. Next, we determine what "type" of kit this is – whether it is a highly pre-fabricated and, subsequently, more expensive kit, or a die-cut high speed large production kit in the lower price range. This, then, gives us a basis for comparison to competitive kits in the same category. The next step is the actual construction of the kit following the manufacturers printed instructions, and making notations as we proceed of any discrepancies between the plans, kit parts, and instructions. If we find rough band-sawed fuselage sides, for example, and the manufacturer is new to the kit production field, we jot down a few notes as to how these sides could be more accurately cut in shorter time using a jig and shaper or router. Any omissions in the instructions or plans that we feel would be necessary to the modeler are also noted.

Finally, when the complete framework is finished and sanded, photographs are taken of the skeleton. Next, the model is finished in Solarfilm (for speed and convenience) or in one of the other finishing methods if we are doing a finishing technique article or testing a new finishing product at the same time. Finally, completed photographs of the model are taken and the model is then taken out for test flight by the builder.

Notes are kept on the performance of the model and compared to the flying capabilities of the aircraft as claimed by the kit manufacturer. Finally, all of our notes and recommendations are put together into report form and forwarded to the manufacturer. In many cases some of the errors and discrepancies we have found have gone unnoticed by the manufacturer and he writes back to the effect that he has corrected them and, when corrected, forwards us another kit for inspection. Now, since we present only 12 to 18 kit reviews a year, why might this particular review **not** appear in RCM?

If there are numerous discrepancies and faults in the kit, and the manufacturer does not respond at all to the comments we have made and makes no effort to correct the kit, this review probably will not appear in deference to many fine kits that we do receive and which merit publication as an evaluation. In a few cases, kits have been so bad that it has taken several pages of comments to the manufacturer. And, in a very few cases the manufacturer has refused to make any

corrections to the kit and, as a consequence, we have not only refused to print the review, thus taking up unwarranted space in the publication, but have also refused to allow the advertiser to advertise that product in RCM until such time as it has been corrected. If, on the other hand, the kit is of mediocre quality with a few glaring errors, we bring these to the manufacturers attention and go on to the next kit review. Our idea is to present the best of the reviews that we do during the year which is approximately one out of every four kits we receive. In other words, we are bringing the best to your attention while attempting to help the manufacturer correct the discrepancies we have found on others of lesser quality.

With regards to radio reviews, we do not go into the electronics aspect or theory of operation of the radios at all. As R/C fliers, our approach to a radio review is to simply find out how well it works under continued operation with regards to reliability, range, resolution, and response. If it works, it's worth having. If it doesn't, we don't want to fly it, either.

Our way of reviewing R/C products may not be the best, but it is our aim to provide a service to you, the consumer, by helping the manufacturer to put out a better product. And, since we're simply RC'ers, just like you, and since no one named us Exalted Expert, we simply pass on our findings as one modeler to another. We have lost several major advertisers in the past years due to our type of review, since some individuals in any walk of life cannot accept criticism of any kind. On the other hand, we have received many letters of thanks from manufacturers for pointing out things that they had overlooked in their product which enabled them to correct these items before the product reached your local hobby dealer.

We're pretty fussy about what is advertised in these pages and like to feel that if it's not advertised in RCM it's simply not worth buying.

We hope you feel the same way. If there are additional things that you would like to see covered in our product reports, just write and let us know. We will do our best.

* * * *

According to Robert Nobel, Curator, the Museum of the Philadelphia Civic Center:

The Museum of the Philadelphia Civic Center and the Academy of

Model Aeronautics are co-hosting a large scale exhibition of model planes, boats, and cars in the Spring of 1974 at the Museum facility. Aero-Crafts '74 is open to any and all Academy of Model Aeronautics members, regardless of their preferences in modeling. Prizes will be awarded for various categories covering Radio Control, Free Flight, U-Control, planes, boats, and cars. Sponsors of trophies to date are the Museum, itself, (Most Outstanding Craftsmanship), KLM Royal Dutch Airlines (Best Fokker Aircraft of Any Year), TWA (Best Model of a TWA Aircraft from Tri-Motor to Tri-Star), Naval Aviation Museum (Best Model of a Navy or Marine Plane, Any Year), Sterling Models (Best Sport R/C Plane), Sullivan Products (Best Sport Control-line Plane), Ransome Airlines (Best Model of a Pitts Special as done in the U.S. Aerobatic Team Colors), Philadelphia Maritime Museum (Best Antique Ship to 1900). Entry to the show is possible to any AMA member in the United States and Canadian members of MAC. Entry forms and prize categories are available by writing to: Aero-Crafts '74, The Museum of the Philadelphia Civic Center, 34th Street at Civic Center Boulevard, Philadelphia, Pennsylvania 19104. For those living long distances from the Museum, entries may be submitted by proxy to the Museum through a friend in the area. The Museum's professional staff, aided by Philadelphia area model clubs, will prepare entries for exhibition. There is no entry fee. Models will be insured and well protected while on display in up to 24,000 square feet of exhibition space. There will be close to 100 prize categories and, in addition, the Academy of Model Aeronautics will be awarding achievement certificates down to tenth place in all categories . . . almost a case of something for everyone. All entries will be submitted to the jury for prizes and inclusion in the exhibition. As a Museum there is interest in presenting modeling as an art form, demonstrating that craftsmen are very active in the United States. For the modeler, there will be heavy public exposure for his hobby and sport in front of a new audience. To the best of our knowledge this is the first time a Museum has undertaken such an exhibit. We believe that the degree of participation by modelers in Aero-Crafts '74 will have a direct bearing on Museum support and involvement in modeling throughout the country. □