R/C MODELER

THE LEADING MAGAZINE FOR RADIO CONTROL • APRIL 1968 • 60¢

A few words about me.

I am Electronic Engineer and this is my day job.

From tender age two things attracted my interest and I managed to have them in my life.

The first was electricity and the second the bluesky.

I´ve found the model airplanes hobby in October 1973.

I love the wooden structures from scratch airplanes and boats also.

I started collecting plans, articles, books and anything else that could help the hobby of many years ago and have created a very large personal collection of them.

Since 2004 I became involved with the digitization and restoration of them and started to share the plans from public domain with my fellow modelers.

Now after all this experience I have decided to digitize, to clean and to re publish in digital edition and free of all issues RC Modeler magazine from 1963 to 2005 and others books and magazines.

Certainly this will be a very long, difficult and tedious task but I believe with the help of all of you I will finish it in a short time.

I apologize in advance because my English is poor.
It is not my mother language because I am Greek.
I wish all of you who choose to collect and read this my work good enjoyment and enjoy your buildings.

My name is Elijah Efthimiopoulos. (H.E)
My nickname Hlsat.

My country is Greece, and the my city is Xanthi.

Λίγα λόγια για μένα.

Είμαι Μηχανικός Ηλεκτρονικός και αυτό είναι το αληθινό μου επάγγελμα εργασίας.
Από μικρός δυο πράγματα μου κέντρισαν το ενδιαφέρον και ασχολήθηκα με αυτά.
Πρώτον ο ηλεκτρισμός και δεύτερον το απέραντο γαλάζιο του ουρανού και ο αέρας αυτού.
Το χόμπι του αερομοντελισμού το πρωτογνώρισα τον Οκτώβριο του 1973.
Μου αρέσουν οι ξύλινες κατασκευές αεροπλάνων και σκαφών από το μηδέν.
Ξεκίνησα να συλλέγω σχέδια, άρθρα, βιβλία και ότι άλλο μπορούσε να με βοηθήσει στο χόμπι από τα πολύ παλιά χρόνια.
Έχω δημιουργήσει μια πολύ μεγάλη προσωπική συλλογή από αυτά.
Από το 2004 άρχισα να ασχολούμαι με την ψηφιοποίησης τους, τον καθαρισμό τους αλλά και να τα μοιράζομαι μαζί σας αφού τα δημοσιοποιώ στο διαδίκτυο (όσα από αυτά επιτρέπεται λόγο των πνευματικών δικαιωμάτων τους).
Σήμερα μετά από όλη αυτήν την εμπειρία που έχω αποκτήσει, αποφάσισα να ψηφιοποιήσω, να καθαρίσω και να ξαναδημοσιεύσω σε ψηφιακή έκδοση και ελεύθερα όλα τα τεύχη του περιοδικού RC Modeler από το 1963 μέχρι το 2005 και κάποια άλλα βιβλία και περιοδικά.
Σίγουρα είναι μια πολύ μεγάλη, δύσκολη και επίπονη εργασία αλλά πιστεύω με την βοήθεια όλων σας να την τελειώσω σε ένα καλό αλλά μεγάλο χρονικό διάστημα.
Ζητώ συγγνώμη εκ των προτέρων γιατί τα Αγγλικά μου είναι φτωχά.
Δεν είναι η μητρική μου γλώσσα γιατί είμαι Έλληνας.
Εύχομαι σε όλους εσάς που θα επιλέξετε να τα συλλέξετε και να τα διαβάσετε αυτήν την εργασία μου καλή απόλαυση και καλές κατασκευές.
Το όνομα μου είναι Ηλίας Ευθυμιόπουλος.(Η.Ε)
Το ψευδώνυμο μου Hlsat.
Η χώρα μου η Ελλάδα και η πολη μου η Ξάνθη.

RCM Magazine Editing and Resampling.

Work Done:

1)Advertisements removed.

2) Plans building plane removed and hyperlinked.

3)Articles building plane removed and hyperlinked.

4)Pages reordered.

5)Topics list added.

Now you can read these great issues and find the plans and building articles on multiple sites on the internet.

All Plans can be found here:

Hlsat Blog RCModeler Free Plans and Articles.

http://www.rcgroups.com/forums/showthread.php?t=2354459

AeroFred Gallery Free Plans.

http://aerofred.com/index.php

Hip Pocket Aeronautics Gallery Free Plans.

http://www.hippocketaeronautics.com/hpa_plans/index.php

James Hatton Blog Free Plans and Articles.

http://pulling-gz.blogspot.gr/?view=flipcard

Vintage & Old-Timer RCM Free Plans.

http://www.rcgroups.com/forums/showthread.php?t=2233857

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Thanks Elijah from Greece.

R/C MODELER

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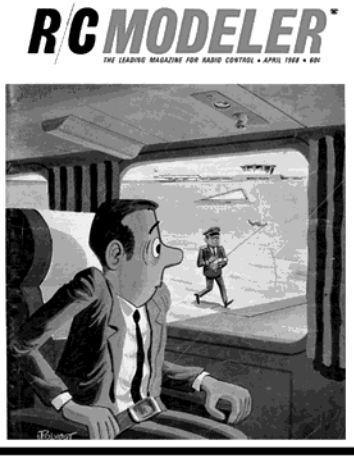
Artist Bill Polvogt captures a rather frightening situation!



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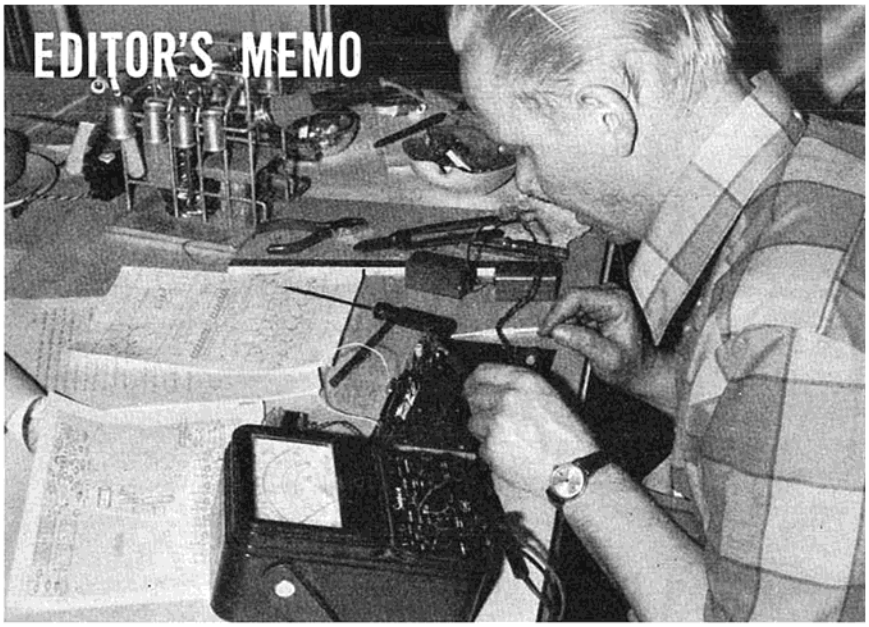
EDITOR'S MEMO



RCM's Editor at work on RCM Classic prototype. Photo by Dick Sonheim.

R/C . . . OUT OF A SUITCASE

By Don Dewey

DURING this past month, so many things seemed to be happening simultaneously, that chaos became firmly entrenched as the order of the day, rather than the exception.

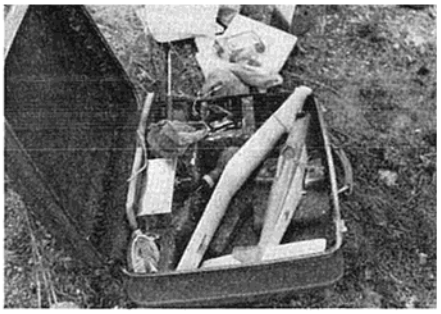
To begin with, R/CM is in the process of moving to its own building — our first, and one which has been affectionately dubbed the "R/CM Mansion!" Unfortunately, the all-girl office staff vetoed my idea of a circular subterranean entertainment center (bar) all done in red and black leather with glass panels round the room that gave an underwater view of two different swimming pools. I don't see why they were so adamant about this — after all, I know of another publisher that has such an arrangement.

Of course, as they pointed out, we don't have our own DC-9, either. Oh, well, there's always the Orbit Room a few miles down the coast. . . .

In addition to our moving chore, there was the 3rd Annual Model Airplane Trade Show — an event that brought manufacturers and their displays from every part of the country. The excitement over the new products — and especially the new miniaturized digital proportional systems — was something to behold! And, with MATS right in our back yard, yours truly missed the whole show. Ed Thompson flew down to finish up the first few articles on the R/CM Classic Proportional System, which begins in this issue. We did get one chance to go flying, though. Herb Abrams, the man from Rand, came by the old offices, accompanied by Hank Hankinson and Milt Miller from Balsa Corporation. After being "treated" to a complete demonstration of the new Coverite (which we had already been using for several weeks), complete with several spray coats of Aero-Gloss, half of which ended up on my paneled office wall, he headed for the Hill. These Easterners just have no appreciation for fine flying sites, immediately dubbing our hillside paradise as "the lump." Herb Abrams, bent on demonstrating for all eternity the merits of pulse proportional, proceeds to unpack a 25" span "Li'l Roughneck" from a small suitcase — the latter also containing all of the other accoutrements necessary for an enjoyable afternoon's flying.

Now, before proceeding further, imagine, if you will, four grown men in suits, white shirts and ties, carrying a couple of thousand dollars worth of photographic equipment up the side of a mountain to a hewed out portion of the landscape, used as a "flying site." Carefully, a tiny airplane is unpacked from a once expensive suitcase, and for the next solid hour, these four grown men attempt to start a diminutive Cox .020 engine which, stubbornly, refuses to cooperate. After this solid hour of "no compromise" determination, during which time Herb Abrams alternately blows through the fuel line and prays a lot, the engine finally roars to life, quits, and then refuses to start once again. Dusk is rapidly approaching (a fact which can be determined by the fact that dusk is a slightly less dense shade of dark than smog), and we discover that Herb's faithful starting battery has given up the faith. Quickly wiring together some spare 500 mah cells, a new starting battery is brought to the firing line, and the Cox responds with renewed vigor and enthusiasm (?). With a twenty minute tank in his aircraft, Herb carefully adjusts the needle valve, and gives detailed instructions to Hank Hankinson on the proper methods of hand launching the aircraft. (ROG's are impossible —

Herb Abrams unpacks his portable hangar on Dewey's Hill.



Close-up of Herb's suitcase, complete with Lil Roughneck and all paraphernalia.

Milt Miller, Abrams, and Hank Hankinson assist with Operation Fueling.

Sometimes you plead . . . sometimes you have to kiss 'em to get them started!

Herb gives detailed launch instructions to Hank while braving heavy propwash.

You can't win them all. The Hill claims another victim!

they exercise horses on the field and the aircraft is too small to overcome the inevitable obstacles). With a sudden burst of energy (more han he had shown since he had been propounding the merits of Coverite while spraying my paneled walls), Hank lurched off across the field. Suddenly, the Li'l Roughneck was airborne!

Now, at this point, we have been admonished upon the threat of death, withdrawal of advertising, and all other manner of devious acts, not to mention the actual outcome of the flight. All we will say is that the Li'l Roughneck is a proven flier, that the Min-X radio equipment, Rand actuator, batteries, and engine worked to harmonious perfection. The pilot however. . . .

We will also state that the length of the flight was exactly eleven hours, seventeen minutes, and forty one seconds less than the world FAI R/C Power Duration record set by W. Bertrand. Four grown men, in suits, white shirts and ties, then packed the remains of an enjoyable afternoon's flying back into the once expensive suitcase, and trudged down the hill, gathering up enough moxie to once again resume their respective careers of telling one and all about the benefits of an exciting, challenging, and relaxing hobby. . . .

●

We hope you'll like this issue. Ed Thompson's R/CM Classic is one of the most complex series of layouts we've ever attempted, but one I'm sure you will enjoy. Also, this issue contains a full proportional ducted fan ship, The Banshee, as well as a first in the model press — the much talked about Yak 18. R/CM also introduces a new event, which we hope you'll try, and which may well, in the coming months, become as popular as its full size counterpart — biplane racing.

●

The entire staff of R/C Modeler Magazine extends its deepest sympathy and condolences to the family and friends of Joe Hardie, Publisher of Flying Models, who died of a massive heart attack just prior to Christmas. Joseph J. Hardie was dedicated to the interests of modeling, and his influence will be sorely missed, although he will be long remembered for his many contributions to model aviation.

PART III: CREATIVE R/C

By Jim Davis

TYPICAL CUTTING DIE

THE KNIFE OR "RULE" IS A RAZOR SHARP METAL BAND SET INTO A PLYWOOD BLOCK. IT IS THEN MOUNTED IN A DIE PRESS WHICH IS SIMILAR TO A PRINTING PRESS.

YOU CAN DESIGN A MODEL FOR KITTING

THERE it sets, your pride and joy! A model you designed yourself. It looks good, flies good, and the boys at the flying field really drooled over it. Then you start imagining what a thrill it would be if a manufacturer produced a kit of your model. Something that you designed; your own theories, your own thoughts being put into mass production, advertised in magazines, and shipped all over the world.

"Boy, what a dream," you say, "but not very likely to happen." Not impossible at all, in fact very possible. New products are the lifeline for any company and model kit manufacturers are constantly searching for new designs.

It must first be determined if there is a market for your design. What advantages does it have over other designs already on the market? If it is a scale model,. how close to scale? If a competition model, what is its contest winning history? It should be a good looking and realistic model. It should look like an airplane, not a box with a wing strapped on. There are exceptions to this rule such as "Das Ugly Stick." This is a design which has the advantage of ultra-simple construction which more than offsets its lack in looks. Most important of all it must be thorougly test flown and completely debugged before presenting it for sale.

The more complete your work, the less time the manufacturer will need to spend preparing the design for production and the more money you will make on the deal. The ideal package to present would be a finished model (good workmanship), engineering drawings, parts drawings, drawings of formed wire parts, an ink tracing of the engineering drawings, and photos. Methods of payment vary with each manufacturer and would be an outright "cash on the barrel head" purchase, royalty, or a combination of both.

Whether the prototype model is part of the purchase or not depends on part of the deal. Many times the manufacturer will want the model for reference during the kit engineering and also to use as a display model for trade shows, etc.

All drawings should be made on a good grade of vellum tracing paper. An engineering drawing is a must and without it you won't get to first base with your potenial purchaser. This drawing tells the whole story with fuselage side and top view, engine mounting detail, wing construction, equipment installation, and parts. If you are not sure as to what an engineering drawing should look like take a look at a plan in your R/C Modeler. You can see it is complete enough in detail that a model can be successfully built with the information on this plan. Your drawing, of course, must be full size.

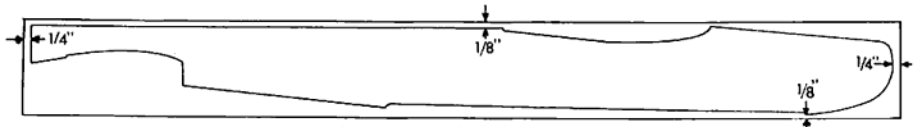
Parts drawings are drawings of all the die cut pieces and should be grouped together with the parts of the same thickness on one sheet. In other words, all 1/16" thick parts on one sheet, 1/8" parts on another sheet, etc. Both the engineering drawing and parts drawings **must be accurate.** If a line is 1/32" off, the part will be off by 1/32" and if it is joined to another part that is 1/32" off you have an error of 1/16". These little errors can multiply like rabbits and lead to all kinds of headaches. Use a drawing pencil with 4-H or harder lead and keep it well pointed. This is especially important on the parts drawings since the dies will be made from these. The lines should be dark yet very thin. A thin line will insure accuracy when the die maker jigsaws the block for the cutting knives.

Drawings for wire parts should be done on individual sheets 8½ x 11 or 9 x 12, only one part on each sheet, so that blueprints can be made and given to the maker of the wire forming fixture. All bends on wire parts should have an inside radius of at least equal to the diameter of the wire. Be sure to specify on each drawing the number of these parts required per kit. Whenever possible bend the wire parts in the same "plane" so that the entire part can be bent in one operation. (A part bent in the same plane would be one that could be layed flat with none of the sections bent up or down. Parts not bent in the same plane require a second bending operation and greatly increases the cost.)

An ink tracing of the fuselage side and top view is of value as art work for the printed plan. Never ink the original engineering drawing because an ink line is fatter than a pencil line and cannot be as accurate.

If you are able to shoot good, sharp, clear photos with good contrast, they are very valuable. Shoot the finished model from all angles and if possible shoot a series of different stages of construction. Prints should be 8 x 10 glossy preferably with a 4 x 5 press camera. If you don't have equipment this fancy, scout up a friend who is a camera nut.

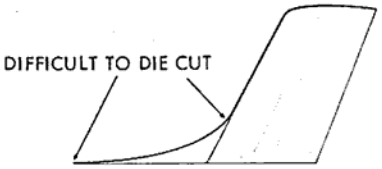
All balsa parts must stay within stock sizes of wood. The most common width is 3 ins. with 4 ins. the second most common. Any wider wood is difficult to obtain from



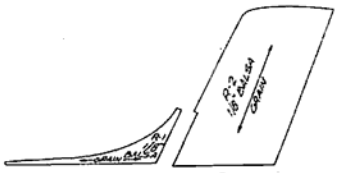
LIMITS FOR DIE CUT PARTS

the mill. Stock lengths are 12, 18, 24, 30, and 36 ins. Second place would be 14, 21, 27, 48, and 54 ins. Don't come up with a leading edge sheet 3¼" by 38"! For widths smaller than 3 inches, allow a saw cut of ⅛ inch. For example, if you require a 1½ inch wide piece the actual dimensions will be 1⅞₁₆".

When it comes to die cut parts we get into all kinds of tricky stuff. All die cut



PROTOTYPE PART


DIE DRAWING

parts have to be kept ⅛ inch away from each edge and ¼ inch away from each end. This means if you have a fuselage side to be die cut from 3" x 36" the largest this part can be is 2¾" x 35½". This rule holds true of any die cut balsa parts.

Plywood is an entirely different animal. Die cutting plywood is the main cause of gray hairs, ulcers, and Excedrin Headaches. Plywood thicker than 1/16" is difficult to cut

AVOID SHARP CORNERS

RADIUS CORNERS

CREATIVE R/C: PART III

and puts a heavy load on the die press. Wherever it is possible to use balsa instead of plywood in the structure by all means use balsa. The die press operator will bless you (or at least speak kindly of you). Plywood stock sheets are 50 x 50 therefore there is no common size of pieces for die cutting. Plywood dies are laid out to get the greatest yield from each stock sheet. Plywood parts can be as long as 10 or 12 inches if necessary but should be kept as short as possible.

Sharp corners should be replaced by a rounded corner wherever possible. This allows the die rule to be bent around a corner in one piece, otherwise the knife must be in two pieces meeting at the corner and will tend to spread apart from balsa chips being wedged in between. This causes an open space on the balsa part making it difficult for the modeler to remove the part from the sheet. This also causes the wood to "hang-up" in the press, and this in turn causes the die press operator to say nasty words. Tapered pieces such as the front end of a dorsal fin causes a problem more severe. In this case widen the area to a blunt end and let the modeler sand it to a taper. Plywood parts **really** create a problem of spreading knives. All tight corners must be rounded or the die press operator will need a chaplain standing by. Die parts which contain slots can cause a problem if the slot is narrow. The minimum width of a slot in a balsa part should be equal to the thickness of the wood and preferably twice the thickness. In plywood the slot should be twice the thickness, or better yet, avoid using slots in plywood altogether.

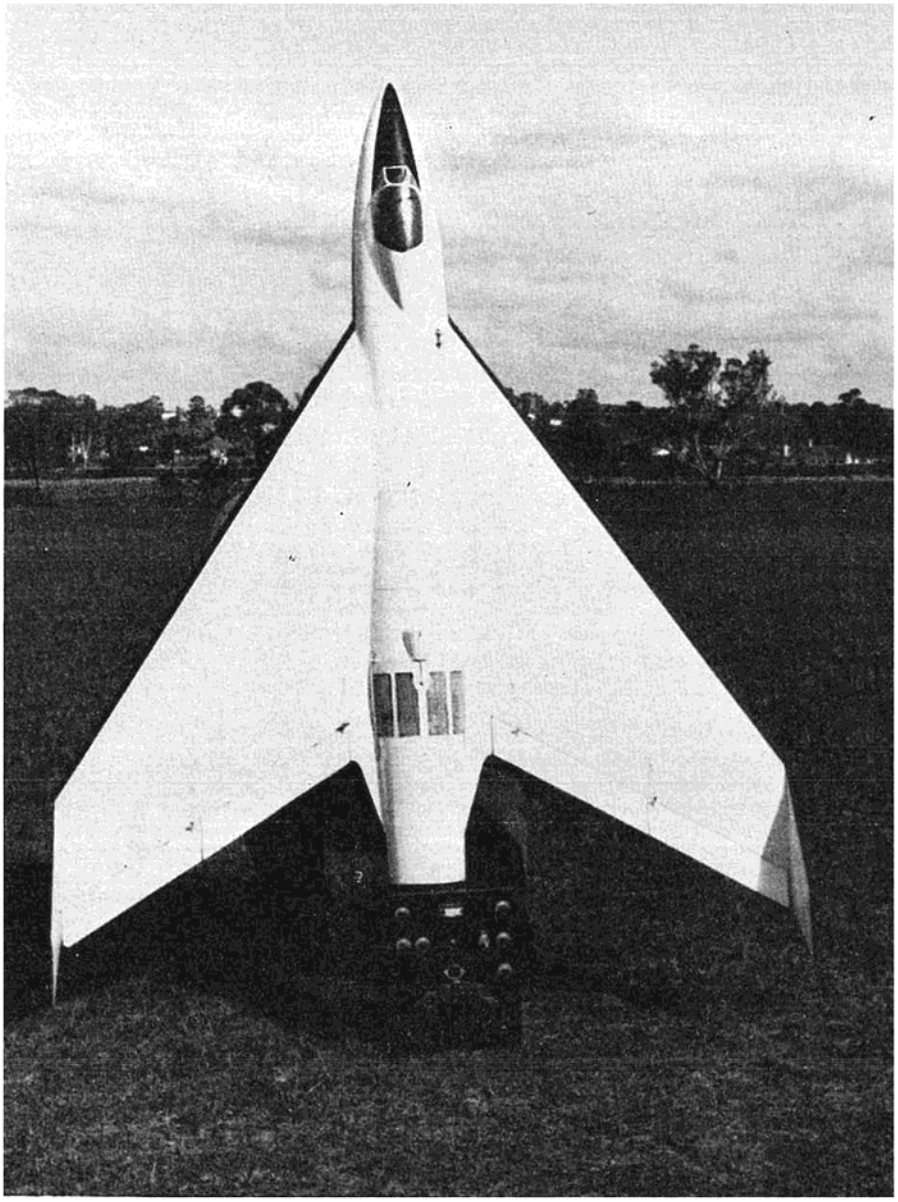
Avoid having one or two die cut parts with thickness different from the rest. For example, if you have a number of parts 1/16" and 3/32" thickness and only one part having ⅛" thickness this part should be converted to 3/32" or two 1/16" pieces sandwiched.

When it comes to blocks the widths should be dimensioned to allow for saw cuts as mentioned before. Wherever a formed sheet will do just as well as a block, use the sheet. This again keeps down the cost. The higher the manufacturing cost the higher the retail price. When balsa blocks increase the price the modeler is paying extra for some balsa which he is going to turn into shavings and sweep out.

If you are fortunate enough to have an artistic talent and can draw illustrations and do plan "paste-ups" your customer may be interested. He wants to get the model on the market in the least amount of time, therefore the more complete you can present it to him the more it is worth.

Do you have a design that you like? Why not share it with the modeling public?

SHARP CORNERS CAUSE DIE CUTTING DIFFICULTIES. MODIFY THE PART ON THE DIE DRAWING AS SHOWN. NOTE THE PART NUMBER, WOOD THICKNESS AND GRAIN DIRECTION MARKED ON EACH PART.



BANSHEE

Thoroughly proven and flight tested, this ducted fan Delta is one of the most exciting models you'll ever fly.

By Captain C. W. Peake

THE "Banshee" is designed to produce something different on the flight line, and has literally stopped the show whenever it has been flown. The basic design was produced as a free flighter using Jetex power, and a later version flew with miniature single channel radio and two Jetex 350 units, but duration was naturally limited.

P. E. Norman had been flying single channel ducted fan models in England for a number of years, but even with a hot engine, his best model weighed only 38 ozs., which would not permit multi installation. However, an American modeler named Wayne Schindler had carried out experiments indicating that Norman's practice of enclosing the fan completely within the duct gave less thrust than a fan just outside the duct inlet. This seems to be due to the fact that a fan can be designed to draw in air at the tips, rather than throwing it off, and this characteristic can be used to force more air through the duct than is possible with a completely enclosed fan. It also allows the use of side intakes, leaving the fuselage free for the installation of radio gear.

A test rig was set up, and a fan and duct unit, built along Schindler's lines, gave 22 ozs. of static thrust. Past experience indicated this should handle a model up to about 3½ lbs. weight.

The first D/F version (christened "Screaming Meemie") weighed in at 57 ozs., and while successful, was underpowered. The model shown is MK II, weighing 51 ozs., and while still requiring catapult launching, is capable of loops, rolls, and Immelmanns except in very hot weather when power output is down.

Might be possible to counteract the power loss with a good dose of nitro, but I haven't tried it yet. It normally flies on a 10% nitro mix.

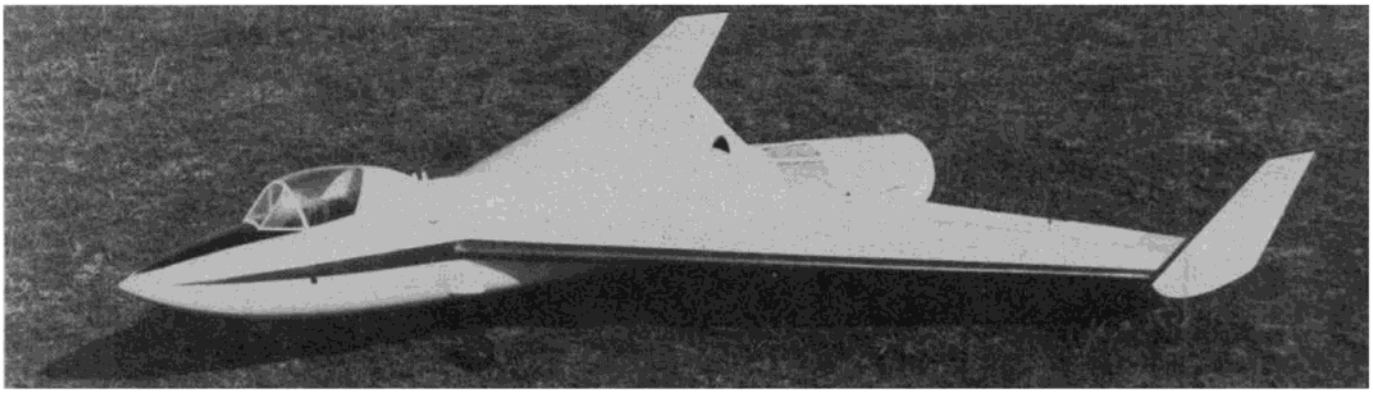
No thrust control is provided, as the Cox 15 Special doesn't take kindly to being throttled down. Some form of air flow could possibly be rigged in the duct, but this is also a project for the future.

Flying-wise, it is a reasonably docile beast when properly trimmed, but should be allowed to fly at its own speed and coaxed through maneuvers rather than forced. Elevators should be treated with caution. Don't attempt to drag it into the air with elevator, as it is likely to sink back on to the ground due to rapid drag rise as the angle of attack increases. This is known in full scale aviation as "the back side of the power curve", and is responsible for some of the changes of technique necessary when converting to swept wing jets. Aileron control also becomes very sloppy at low speed.

This is not a beginner's model, and no attempt has been made to cover all construction steps in detail. However, the sequence given should enable an experienced modeler to reproduce what has proved to be a most spectacular airplane.

Select balsa carefully to keep weight down. Hard ¼" sq. for the spars and spar joining triangles, and soft for the rest. (Not "pulpy" soft.)

Fan and duct assembly provide a good starting point. Steps in fan construction are detailed on the plans. Make sure all nicks, scratches and tool marks are polished out, and the fan carefully balanced. Also shown is the method I use to keep



the fan in place on the Cox 15. If you use another type of engine, make sure to lock the fan securely, as the ordinary method of attaching a propeller may not hold the fan at the high RPM.

Use whatever construction method you can dream up to produce a reasonably even duct of 4⅛" inlet and 3½" exit (inside) diameters. My own method was to use two ⅛" balsa discs of the appropriate diameters joined by a piece of straight ¼" dowel about ⅜" longer than the duct. This was planked in the ordinary way with ⅛" balsa, the ends cut off with a razor saw, and the dowel and discs removed.

If you use this method, it is useful to take two pieces of cardboard about 7" square, cut a 4¾" diameter hole in one and a 3¾" hole in the other, and slip them over the outside. This will hold the duct in shape while you sand the inside. Fill with thinned Hobbypoxy "Stuff" and paint the inside black with Hobbypoxy enamel. The smoother the finish inside the duct, the more thrust you will get. Leave finishing the outside until the cone assembly is installed.

The cone is carved from soft balsa and hollowed. Six flow straighteners are spaced at equal intervals around the cone just inside the duct inlet. From edge is ⅜" from the inlet. Four flow straighteners are fitted with rear edges at the duct exit. All straighteners are cut from 1/16" balsa, are 1¼" wide, and sanded to streamline section. Cut slots in the cone and glue flow straighteners in place. When dry, cut a slot at the base of each of the forward ones, and damp and mold them to an angle of about 30° into the direction of fan rotation. These act as guide vanes for the air leaving the fan. Trim the ends so that the whole assembly may be inserted in the duct. Fill, sand, and paint black, and glue in place. The duct will now be rigid enough for you to work comfortably on sanding the outside.

Airframe.

The heart of the airframe is the ⅛" plywood crutch. If you use a different engine, adjust the engine space and bearers to suit. Place the engine in position on the crutch and outline the mounting lugs. Cut away so that when installed the engine rests on the bearers, not on the crutch.

Your building board should be large enough to accept the entire wing (at least 36" square), and an outline drawing of the top view is required. Place the drawing on the board, cover as usual with waxed paper, and lightly nail the crutch in place with three or four fine nails.

Butt join enough sheets of 1/16" balsa to cover complete wing outline. Grain runs parallel to leading edge. Draw and cut two outlines to exact size for bottom sheeting, and two oversize for top sheeting. Note that top sheet must overlap R1 far enough to meet fuselage planking.

Cut all ribs to shape. R1 is 3/32" thick, R2 through R5 1/16", and R6 is ⅛". No spar cutouts are shown, as the angle of the spar is such that cutouts are in a different place on either side. Place rib in position on edge over plan, mark spar position on each side, draw lines at right angles to lower edge of rib, and cut to spar depth at angle shown by vertical lines. Notch bottom only of tip rib, as rib is not deep enough to take two notches. Top spar is butt joined to tip rib.

Lay bottom sheeting on plan and glue to edge of plywood crutch. Lightly draw spar and rib locations on sheeting. Glue ¼" sq. lower spar in position on sheeting. Glue filler strip along trailing edge, bevel rib edges to match, and glue ribs in position. The filler strip serves to fair the top sheet down on to the plywood crutch, and a piece of 1/16" balsa cut to the shape of the rear prong of the crutch is glued in place after the top sheet to produce a smooth transition from top sheet to crutch.

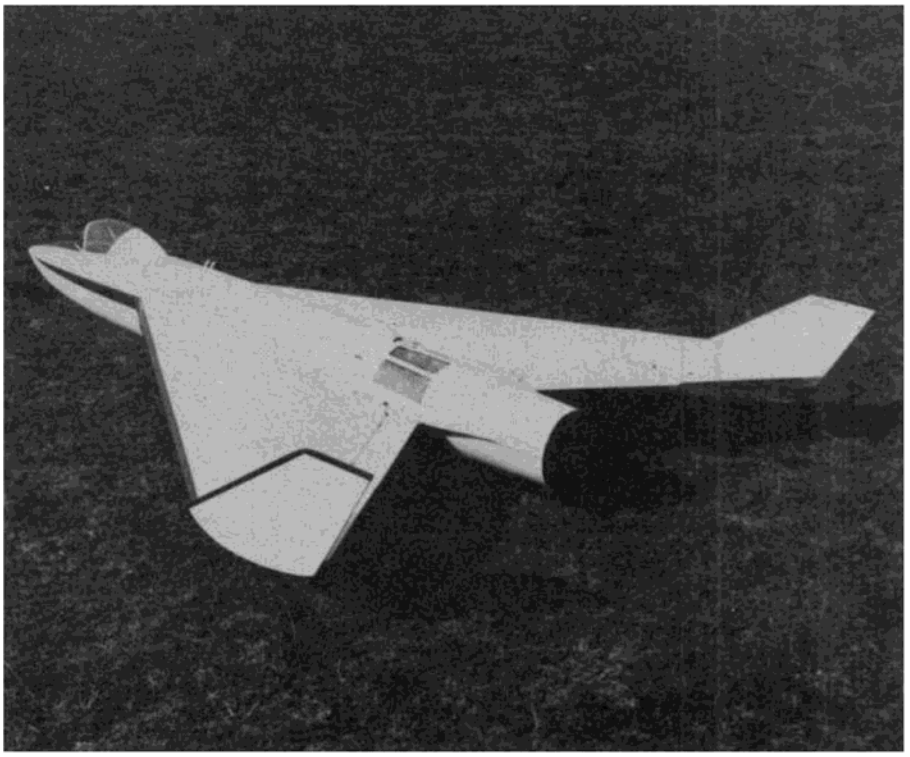
Bevel front ends of ribs to correct angle to butt firmly against leading edge, which is cut from ¼" balsa, and tapers from 9/16" at root end of ⅜" at tip. Glue leading edge and top spar in place, and bevel top of leading edge to receive top sheeting.

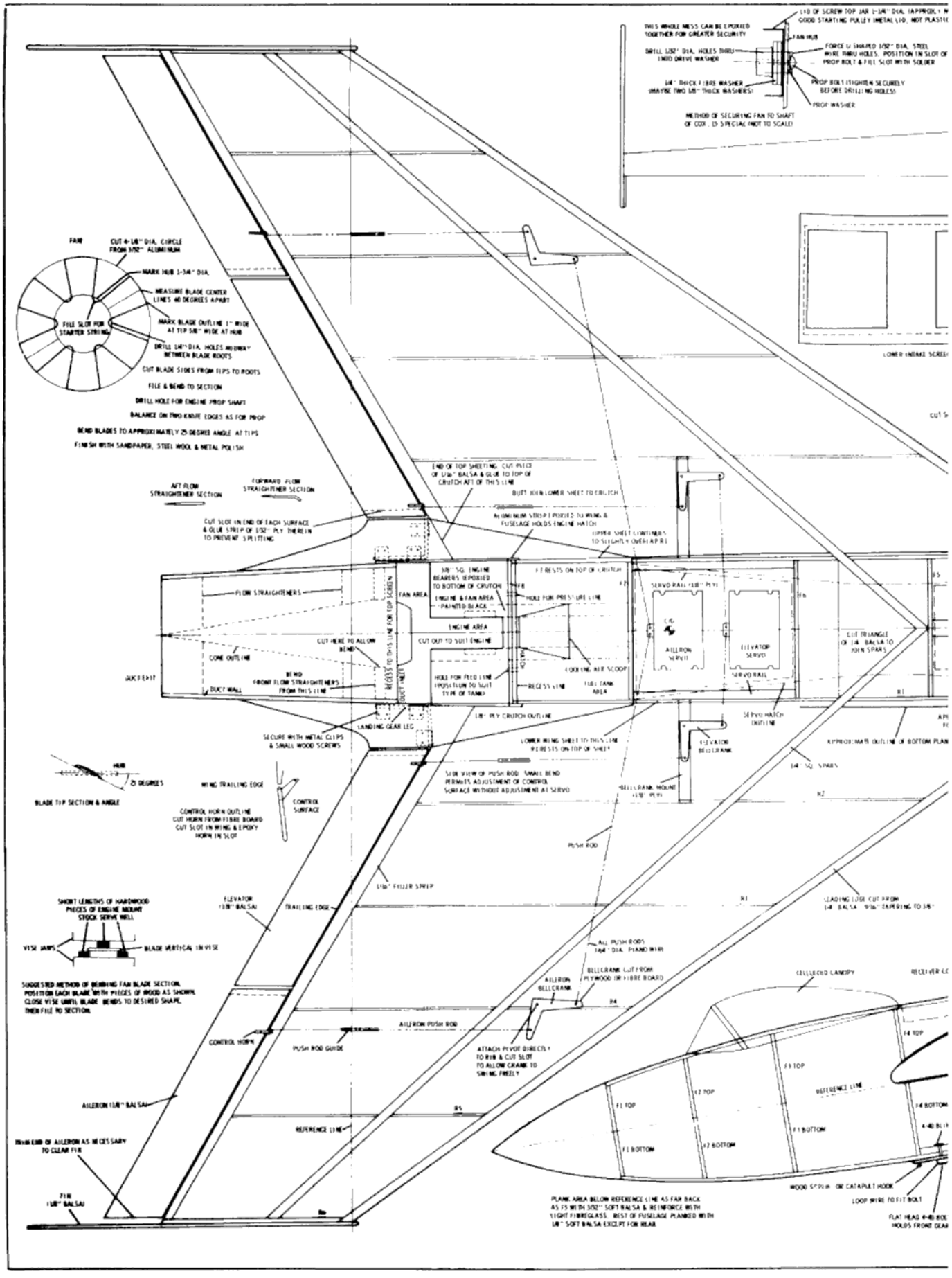
Repeat for other wing. Note that spars and leading edges extend across fuselage and are joined in the center with a triangle of ¼" hard balsa.

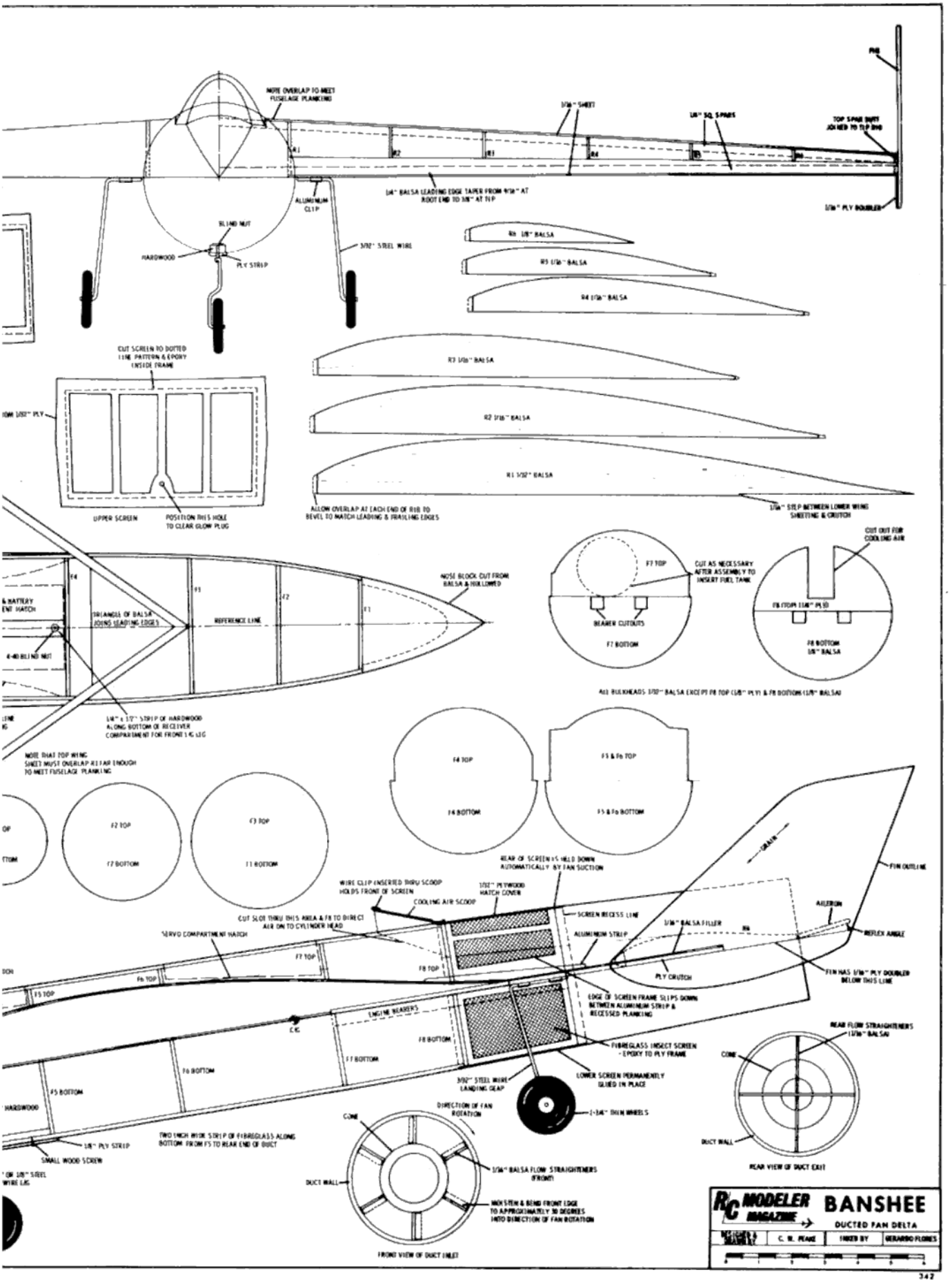
Assembly at this stage should be firmly pinned to board. Install aileron and elevator bell cranks, noting that elevator cranks must be arranged so that both elevators move in the same direction. Install push rods of 3/64" diameter wire. Light wire is adequate since there is little or no "push" function — mostly "pull". Plywood guides should be glued to each rib.

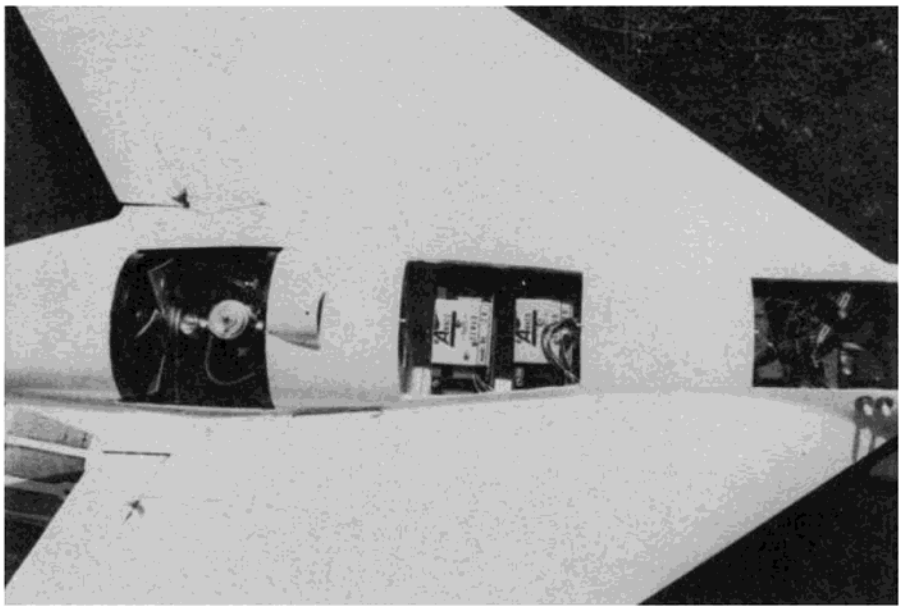
Where push rods extend through trailing edge, cut small grooves in the filler strip, deep enough to allow top sheet to be glued along filler strip over the rods. After fitting top sheet a slot is cut to enable the push rods to be lifted enough to align with control horns. A small piece of nylon or plastic tubing is slipped over the rod and glued into the slot to form a guide, and the slot below the guide filled with a balsa strip.

If you prefer to sheet the top in sections, it is possible to start at the trailing edge




FAN
CUT 4-1/8" DIA. CIRCLE FROM 1/32" ALUMINUM
MARK HUB 1-3/4" DIA.
MEASURE BLADE CENTER LINES 60 DEGREES APART
FILE SLOT FOR STARTER STRING
MARK BLADE OUTLINE 1" WIDE AT TIP 5/8" WIDE AT HUB
DRILL 1/4" DIA. HOLES MIDWAY BETWEEN BLADE ROOTS
CUT BLADE SIDES FROM TIPS TO ROOTS
FILE & BEND TO SECTION
DRILL HOLE FOR ENGINE PROP SHAFT
BALANCE ON TWO KNIFE EDGES AS FOR PROP
BEND BLADES TO APPROXIMATELY 25 DEGREE ANGLE AT TIPS
FINISH WITH SANDPAPER, STEEL WOOL & METAL POLISH
THIS WHOLE MESS CAN BE EPOXIED TOGETHER FOR GREATER SECURITY
FAN HUB
DRILL 1/32" DIA. HOLES THRU INSID DRIVE WASHER
FORCE U SHAPED 1/32" DIA. STEEL WIRE THRU HOLES. POSITION IN SLOT OF PROP BOLT & FILL SLOT WITH SOLDER
1/4" THICK FIBRE WASHER (MAYBE TWO 1/8" THICK WASHERS)
PROP BOLT (TIGHTEN SECURELY BEFORE DRILLING HOLES)
PROP WASHER
METHOD OF SECURING FAN TO SHAFT OF COX. (S SPECIAL (NOT TO SCALE)
AFT FLOW STRAIGHTENER SECTION
FORWARD FLOW STRAIGHTENER SECTION
CUT SLOT IN END OF EACH SURFACE & GLUE STRIP OF 1/32" PLY THEREIN TO PREVENT SPLITTING
END OF TOP SHEETING. CUT PIECE OF 1/16" BALSA & GLUE TO TOP OF CRUTCH AFT OF THIS LINE
BUTT JOIN LOWER SHEET TO CRUTCH
ALUMINUM STRIP EPOXIED TO WING & FUSELAGE HOLDS ENGINE HATCH
UPPER SHEET CONTINUES TO SLIGHTLY OVER AP R1
1/8" SQ. ENGINE BEARERS (EPOXIED TO BOTTOM OF CRUTCH
F1 RESTS ON TOP OF CRUTCH
SERVO RAIL (1/8" PLY)
FLOW STRAIGHTENERS
FAN AREA
ENGINE & FAN AREA PAINTED BLACK
HOLE FOR PRESSURE LINE
ENGINE AREA
CUT OUT TO SUIT ENGINE
CUT HERE TO ALLOW BEND
CONE OUTLINE
BEND FRONT FLOW STRAIGHTENERS FROM THIS LINE
DUCT WALL
HOLE FOR FEED LINE (POSITION TO SUIT TYPE OF TANK)
COOLING AIR SCOOP
TUBE TANK AREA
AILERON SERVO
ELEVATOR SERVO
SERVO RAIL
CUT TRIANGLE OF 1/4" BALSA TO JOIN SPARS
SERVO HATCH OUTLINE
1/8" PLY CRUTCH OUTLINE
LANDING GEAR LEG
SECURE WITH METAL CLIPS & SMALL WOOD SCREWS
LOWER WING SHEET TO THIS LINE (F2 RESTS ON TOP OF SHEET)
ELEVATOR BELLCRANK
1/4" SQ. SPARS
HUB
25 DEGREES
BLADE TIP SECTION & ANGLE
WING TRAILING EDGE
CONTROL SURFACE
CONTROL HORN OUTLINE CUT HORN FROM FIBRE BOARD CUT SLOT IN WING & EPOXY HORN IN SLOT
SIDE VIEW OF PUSH ROD. SMALL BEND PERMITS ADJUSTMENT OF CONTROL SURFACE WITHOUT ADJUSTMENT AT SERVO
BELLCRANK MOUNT (1/8" PLY)
PUSH ROD
1/16" FILLER STRIP
ELEVATOR (1/8" BALSA)
TRAILING EDGE
LEADING EDGE CUT FROM 1/4" BALSA 9/16" TAPERING TO 3/8"
SHORT LENGTHS OF HARDWOOD PIECES OF ENGINE MOUNT STOCK SERVE WELL
VISE JAWS
BLADE VERTICAL IN VISE
SUGGESTED METHOD OF BENDING FAN BLADE SECTION. POSITION EACH BLADE WITH PIECES OF WOOD AS SHOWN. CLOSE VISE UNTIL BLADE BENDS TO DESIRED SHAPE. THEN FILE TO SECTION.
ALL PUSH RODS 1/16" DIA. PIANO WIRE
AILERON BELLCRANK
BELLCRANK CUT FROM PLYWOOD OR FIBRE BOARD
CELLULOID CANOPY
AILERON PUSH ROD
CONTROL HORN
PUSH ROD GUIDE
ATTACH PIVOT DIRECTLY TO RIB & CUT SLOT TO ALLOW CRANK TO SWING FREELY
F4 TOP
F3 TOP
REFERENCE LINE
F2 TOP
F1 TOP
F4 BOTTOM
F3 BOTTOM
F2 BOTTOM
F1 BOTTOM
AILERON (1/8" BALSA)
REFERENCE LINE
TRAILING EDGE OF AILERON AS NECESSARY TO CLEAR FIN
FIN (1/8" BALSA)
WOOD SPRUE OR CATAPULT HOOK
LOOP WIRE TO FIT BOLT
PLANE AREA BELOW REFERENCE LINE AS FAR BACK AS F3 WITH 3/32" SOFT BALSA & REINFORCE WITH LIGHT FIBREGLASS. REST OF FUSELAGE PLANKED WITH 1/8" SOFT BALSA EXCEPT FOR REAR


BANSHEE
DUCTED FAN DELTA
C. W. PEASE
GERARDO FLORES
RC MODELER MAGAZINE
342



is open and accessible servos can be placed in position and rods cut to length without difficulty.

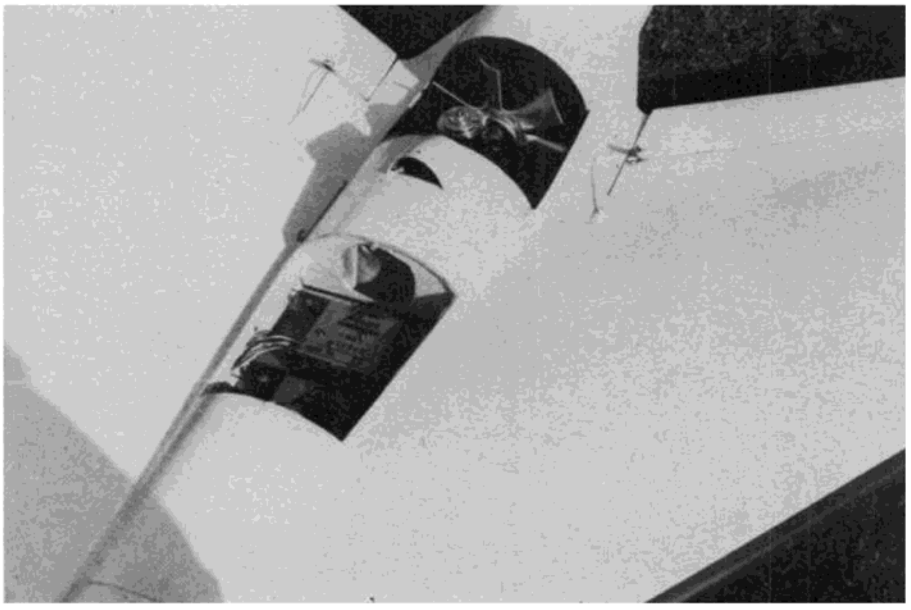
The leading edge should now be pinned down with pins angled in from the front so that top sheet can be placed over them. All inside pins should be removed. Double check for pins inside, as it is most frustrating to get your top sheet nicely fitted and find you're still pinned down *under* that top sheet you have just put on so carefully!

Top sheet can now be affixed with a fairly slow drying glue, plus pins, weights, fingers, thumbs, toes, etc., to bend the sheet to conform to upper rib shape. Start at the trailing edge and work forward. A slow drying glue gives you a bit more time in case you have to rip it all off and start again! This is one of those points at which you swear off models forever.

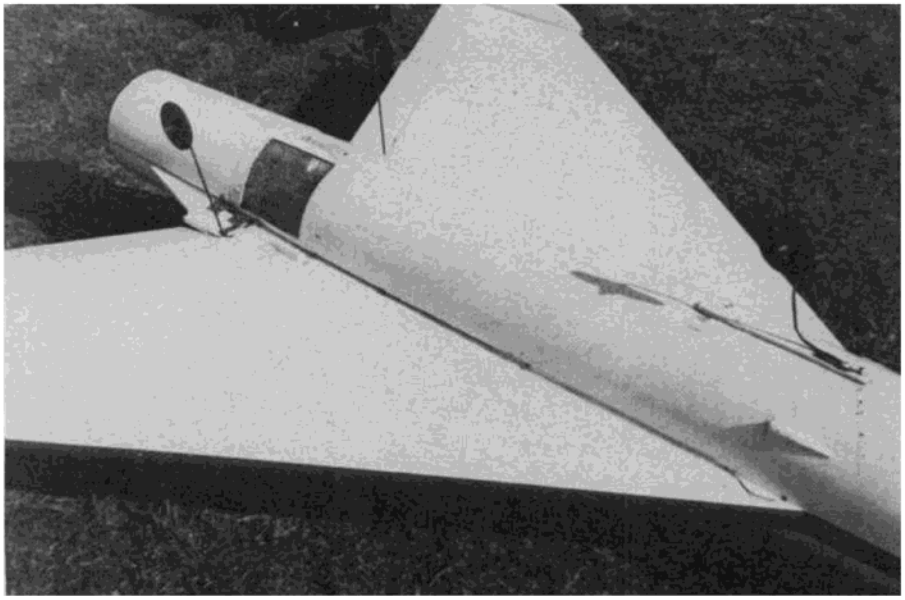
The works. Note switch location. Annco servos now replaced by Mr. Bonner's "real small" control muscles. Pressure line vent to left of engine.

and install the guides as you go, without notching the filler strip. The push rod and bell crank assembly shown was designed for use with reed equipment and Annco servos, but thanks to the ingenuity of Mr. Bonner, the Banshee has now gone proportional with a Digimite 4-RS, and the same linkage works well. The ship was designed before flexible cable and nylon guides were readily available, and the whole installation could be easily changed to lightweight flexible cable and guides.

The important point is that whatever system you use, it must all be securely in place before the top sheet goes on. This includes having the push rods between bell cranks and servos cut to correct length, as once the top sheet is on it is difficult to find the bell crank neutral. While the top



Cooling air scoop, fuel tank installation. Note engine cover clip lying on wing root. If hatch cover tends to sag in middle, 1/16" dowel pegs hold it up. Old lid serves well as starting pulley.



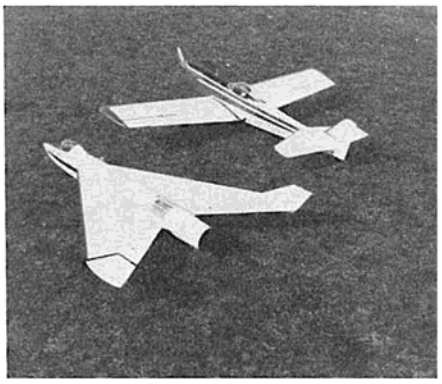
P. S. If you have used my trailing edge grooves, don't glue the push rods in 'em!

After you have stopped cursing model planes in general and ducted fan deltas in particular, cut the bulkheads to shape. F1 through F7 from 3/32" balsa, F8 top from 1/8" ply, and F8 bottom from 1/8" balsa.

Glue two strips of 1/8" balsa 3/8" wide on edge against the leading edge immediately above the points where L. E. and fuselage planking meet. These two strips should project forward so that they can be bent to conform to the forward shape of the fuselage, and they form, in fact, the first of the fuselage planking. The top halves of

(Continued on Page **14***)*

Underworld secrets revealed! Undercarriage, lower intake screen, blocks for take off dolly. Also antenna for reed receiver. Put proportional antenna to top of left fin, away from servos and engine.



BANSHEE

(Continued from Page 13)

F1, F2, and F3 are pinned in place over the plan, and the two strips bent as described and glued to these bulkheads. If your building board is 36" square like mine, this nose section will have to be supported on a separate piece of board.

Glue remaining bulkheads in place between root ribs. Remove nails from crutch, and plank top of fuselage with 1/8" balsa from F1 to F8. This is largely a "cut and try" operation to fair planking smoothly into wing. Cracks can be filled with "Stuff".

The moment of truth has now arrived. When dry, the whole assembly can be unpinned and lifted from the board. (I told you to take *all* the pins and nails out from underneath.)

Glue servo rails in place. If you were smarter than I was when I built mine, the rails could actually be included in the plywood crutch.

Epoxy engine bearers in place underneath crutch. A couple of screws behind F8 will strengthen the joint and hold the bearers in place until the glue dries. Remember that the whole engine and duct area becomes fairly saturated with fuel, and glue and fuel proof accordingly.

Glue bottom halves of bulkheads in place, and plank bottom of fuselage. If you use 3/32" planking forward of F5, and 1/8" aft of F5 except for a 2-inch wide strip along the bottom, a layer of fiberglass can be nicely blended into the thicker planking.

With engine and fan in place (use blind nuts on mounting bolts) insert the completed duct between crutch prongs. Duct inlet should be 3/16" to 1/4" behind rear edges of fan blades. Center duct behind fan, align with reference line, and glue securely in place.

Recess planking and outside of duct inlet 1/32" to accept intake screens. (Upper intake screen is also the cover for engine and fan area.)

Cut screen frames from 1/32" ply and epoxy screens inside. Support in approximate semi-circular shape until glue dries to prevent glue cracking when screen is bent over intake area. Exact frame shape may vary with individual construction techniques and varying material thicknesses, and you may find it easier to make the screens first and then cut the recesses to fit the screens.

Paint and finish inside of lower screen and underside of engine area before gluing lower screen in place. Upper screen is held by the two aluminum strips epoxied to fuselage sides and upper wing surface. The edges of the screen frame slip down inside the strips, and a wire clip inserted through the cooling air scoop holds the screen in place. The screen is readily removable for engine starting. With the Cox 15, a small hole is necessary in the top of the screen to clear the tip of the glow plug.

Engine may now be removed until model is complete.

Cut cooling air slot in top of planking. Line cooling air passage with 1/16" balsa to prevent fuel entering the fuel compartment. Some oil will find its way through the feed line and pressure line holes, but if the cooling air passage is not lined, the fuel compartment quickly becomes oil soaked. Make a small scoop from 1/32" aluminum and epoxy in place. Exact scoop shape is not particularly important as long as some air is directed down on to the cylinder head.

Round off leading edges. Cut fins from 1/8" balsa and add 1/16" ply doublers to lower portions. Control surfaces are also cut from 1/8" balsa, and 1/16" fibre control horns glued into slots. The rather odd control horn shape provides the necessary differential movement. The 1/32" ply strips prevent the surfaces from splitting in the vicinity of the horns.

After wing, fins, and control surfaces are sanded, hinge surfaces to wing trailing edge, and lightly glue fins to wing tips. Light gluing recommended here, as in a hard landing the fin will simply separate from the tip, whereas if heavy gluing is used it takes half your wing tip with it.

Sand, fill, and finish as desired, always with weight in mind. No tissue or silk covering is used on the model shown, which was filled with "Stuff" thinned to brushing consistency, and sprayed with white Hobbypoxy enamel. The fuselage forward of F5 below the line of the wing lower surface is covered with very light fibre glass, and a two inch wide strip of the same material extends along the bottom from F5 right to the rear of the duct. This enables the model to be flown without undercarriage if desired.

Detachable undercarriage details are shown on the plans. A single 4-40 bolt holds the forward leg and six small wood screws with three aluminum clips hold each rear leg. Wheel size is not important, but use thin wheels rather than balloon wheels to reduce drag. The undercarriage shown is surprisingly unobtrusive, and detracts little from the appearance in flight. It is readily removable by loosening the bolt and sliding the forward leg out, and unscrewing the screws on the rear legs. Removal of undercarriage weight and drag results in a corresponding increase in performance. The plywood strip carrying the catapult hook is retained by re-tightening the bolt, and four small streamlined blocks (two of which are clearly visible in the underside photo) serve to prevent fore and aft movement of the dolly used for take off.

Carefully cut hatches from receiver and servo compartments with a razor saw. I find that finishing before cutting hatches results in better fitting hatch covers. Strips of 1/4" x 1/32" balsa glued along the inside edges of the hatch covers form small flanges or lips which can be gently sprung into place under the planking, and the covers will then remain in place without external fasteners.

Hatch covers should be as large as possible. The outlines shown provide sufficient access to the receiver compartment to enable the inside hardwood strip for the undercarriage to be installed without difficulty, and the hole for the fuel tank can be cut in F7 through the servo hatch. The tank can then be installed through the servo hatch without requiring a third hatch above the fuel compartment. A two oz. tank provides duration enough to leave my nerves in tatters.

Use pressure feed for consistent running. I put an old free flight cut-off valve in the pressure line to vent the line quickly in case of a false start. This prevents filling the crankcase with fuel.

Mount servos on 1/32" plywood plates, which are then glued or screwed to servo rails. Receiver and battery pack go in the front compartment, wrapped in foam. Holes must be cut in F5 and F6 to enable plugs and wiring to go through between the two compartments. Plugs will probably finish up inside the intermediate compartment, and I push strips of foam through the holes in F5 and F6 into this area to stop the plugs rattling around. Pictures show reed gear installed (Orbit receiver, 5 pencell size 450 MA/HR Deac batteries, two Annco servos), but as mentioned earlier the Banshee now flies on Bonner 4 RS proportional. The only changes in installation necessary were to modify the servo ends of the push rods for the center output arms of the 4 RS servos, and move the antenna from the underside of the left wing root, as shown in underside photo, to the top of the left fin. Too many funny metallic noises for proportional in the original location.

Final Thrust Adjustment.

Re-install engine and fan, install fuel tank, and connect push rods to control horns. Note the small v-shaped bend in the push rods, which provides a ready external adjustment of the reflex angles. Make sure wheels roll freely, and stand model on a flat smooth surface.

In case you haven't handled a ducted fan before, my starting sequence is as follows:

Fill tank through feed line. The cutoff valve mentioned earlier also vents the tank for filling.

For initial starting, leave this vent open. Connect feed line to engine, and prime through exhaust ports. Don't prime through air intake. Because of the tank position, which is slightly above the engine when the model is standing on the ground, the tendency is usually to get too much fuel in the crankcase. If you have too much trouble with flooding, get someone to hold the rear of the model up a bit, or make a cradle to do this.

Set needle valve to approximate starting position.

Put knotted string in notch in fan hub, turn fan backwards over four or five compressions.

Connect starting battery to plug. If you use alligator clips, it is useful to have a small lug under one of the mounting bolts for one of the clips.

Pull string smartly. (Don't run away — it always makes a noise like that.)

Adjust needle for maximum RPM —

literally maximum noise!

Close vent. RPM will drop off, as tank is now pressurized and mixture therefore richer.

Lean out again for maximum RPM.

For subsequent starts with the Cox 15, the needle valve should be left in the pressurized running position, and the vent closed before starting. If you have a false start, vent the line as quickly as possible to prevent flooding. If it floods, you will have to blow the fuel out of it, and possibly start again with the vent open.

If you can, talk to someone with pressure feed experience. Free flighters and speed men often have more experience of this than radio controllers. It takes a little time and patience to get used to a pressure fed D/F.

Now connect a scale or spring balance to rear of model. Start engine, and check thrust reading. At normal temperatures, you should get 20 to 22 ozs. on straight FAI fuel mix. Adjust blade angles in very small amounts for maximum thrust. **Not** while it's running, stoopid!

Incidentally, the rear end is designed so that if you become too discouraged with the fan set-up (and it is more patience testing than a prop) the whole duct assembly can be cut off straight across between the elevator hinge lines, and a 7" pusher prop installed in place of the fan. Undercarriage would need to be moved forward also. This feature was built into the design deliberately in case fan thrust proved insufficient. The fan has proved so successful, though, that it hasn't been tried.

Trimming and Flying.

Check center of gravity position. A slightly forward CG is permissible, but an aft CG may produce violent instability. Most of the test procedure here is designed to guard against the possibility of getting into the air with the latter condition, which would result in a rapid write-off.

Adjust aileron reflex angle (see plans) to about 8°, elevators to 4°. If the aileron trailing edge is raised ¼", and the elevator ⅛", it will be fairly close to desired angle.

Drive a small peg into the ground, and tie together the ends of a 30-yard length of ¼" flat rubber to form a loop 15 yards long. One end of the loop goes over the peg, and a round wire loop about an inch in diameter is attached to the other end. Again using the scale or spring balance, stretch the rubber to obtain 3 to 3½ lbs. of pull. The wire loop is placed over the catapult screw just in front of the nose wheel.

With all radio on and checked, and an experienced flyer on the transmitter, release the model. It should just lift off, glide a few yards, and land. If it does not, increase pull to 4 lbs. in small increments. If it still won't lift, begin increasing elevator reflex until it does. If it doesn't lift by the time the elevators are up level with the ailerons, the CG is probably too far forward. Aileron and elevator reflex can both be increased up to about 10° to overcome this.

If at any time it shows any tendency to sit back on its tail, hit down elevator. It will do much less damage to thump it in on the nose than to allow it to stall and squash back on the fins. If it shows any tail sitting tendencies, the CG is too far aft, and this must be remedied before it is flown.

Any turning tendencies can be taken out with aileron adjustment, remembering to adjust **both** ailerons, as one aileron alone will also affect longitudinal trim. Do not adjust ailerons to the point where the fully down aileron goes much below the chord line of the wing. If your CG is right and construction is true, they should never approach this point anyway.

Adjust ailerons and elevators to produce a straight fast glide. If you take your time and go through the above procedure carefully, it will ensure that your model is stable in the air and will also help to give you the feel of an unfamiliar type.

When you are satisfied with the glide, use exactly the same technique for a powered launch, with 3¼ to 3½ lbs. of pull. Climb will be fairly shallow, but don't drag it up too much with elevator, as explained before. Takeoff should be simply a continuation of the glide launch.

You may find during the glide tests that the front undercarriage leg bends back rather readily. Mine does, but I just bend it forward again. ⅛" wire may be an improvement, but I haven't got around to trying it yet.

If you aren't shaking at the knees by the time it gets off, you should be! The noise is indescribable (I started to write unbelievable, but couldn't spell it), but when you see this thing howling across a blue sky, you'll forget all the qualms and frustrations.

But hey! We still have to get it down. The Cox usually gives fair warning before it dies — blurp, blurp, blurp! Let it glide at its own speed, don't try to slow it down too much until you get close to the ground. Give yourself plenty of room — it can cover a lot of sky on the glide. Hold it just off the ground and keep that stick coming back until it sinks on to the rear wheels. It's down — what happened to those rosy cheeks?

Do's and Don'ts.

Do use a high speed engine to ensure sufficient thrust. The Cox turns about 25,000 RPM.

Do use pressure feed for consistent running at high RPM.

Do be careful when installing the upper intake screen with engine running. You could finish up with a couple of very short fingers. Also watch that the rear edge of the frame is not drawn down into the fan.

Do your glide tests with all radio operating and someone controlling the model. This is a fairly radical design, and until you are used to it, it is difficult to pick control alignments. An experienced flyer can keep it out of trouble unless it is badly out of trim.

Don't omit the cone and flow straighteners in the duct. This is an important feature of the design.

Don't try to throw it around like a Class III Stunter. Especially on proportional, coax it, don't bully it. A nice long shallow dive and plenty of speed for aerobatics.

Don't neglect to clean oil and dirt out of the duct after each flight. A clean smooth duct gives maximum thrust. Keep intake screens clean, too.

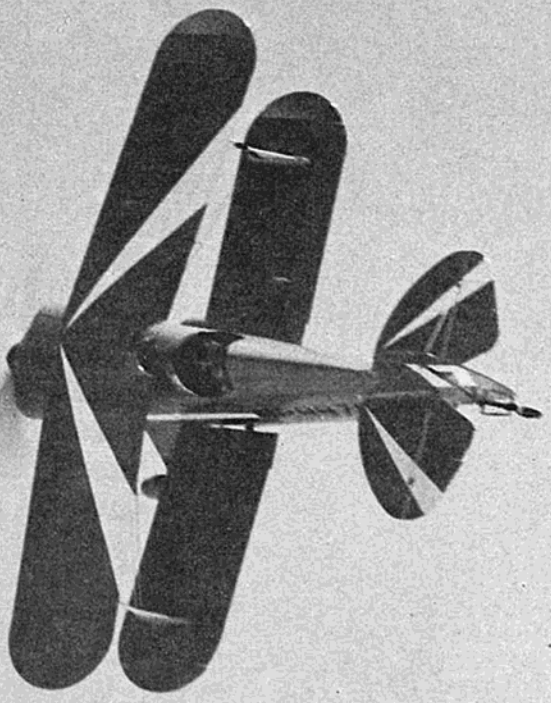
Don't use heavy weight radio. About 10 or 11 ozs. of radio is the maximum. The lighter the model is, the better it will perform. Properly trimmed on the glide tests, it could be flown on single channel if you can dream up a suitable aileron linkage. Don't put rudders in the fins.

Don't write to me (or Don Dewey) and say it won't fly. It has, it does, and it will, if built and handled as described. My apologies for lack of in-flight pictures, but I just haven't got around to getting 'em.

Well, I've done my part. Now you do yours. Build it! Good luck.

Bruce McIntire, Seattle, Washington, bends his Pitts Special around a pylon at 1966 Los Angeles Air Races.

Photo by Jim Larsen.



BIPLANE RACING

Introducing the exciting new RCM miniature biplane racing event.

By Don Dewey

Sport biplanes run up their engines at start line of 1967 Reno Air Races

Photo By Jim Larsen

THE introduction of a miniature pylon race event, patterned after the famous Goodyear events of the 40's and 50's, in the January 1965 issue of R/CM, and the subsequent founding of the National Miniature Pylon Racing Association, served to create an event that has, unquestionably, become the most popular class of competitive flying in R/C history.

With a parallel revival of interest in full scale air racing, it has become apparent that one of the most popular events is the biplane category, where aircraft such as Stardusters, Miniplanes, EAA bipes, Pitts Specials, and others are drawing thousands of new devotees to the air race grandstands. The thrilling sight of veteran pilots such as Alex Rantos, Bruce McIntire, Ralph Ormsbee, Fred Rechenmacher, and Harwood Hellen bending their small biplanes around the pylons at "ground zero" altitudes has injected a whole new stimulus into air racing.

So why not an R/C event, patterned after the races that proved so popular in the past few years at Las Vegas, Reno, and Los Angeles? It might well become one of the most challenging and exciting categories in the annals of R/C competition! For spectator and contestant alike, an all new thrill for an exciting sport — an event that is a natural wherever NMPRA Goodyear racing is held.

The following is R/C Modeler Magazine's proposal for the R/CM Miniature Biplane Racing Event — a set of initial rules and specifications designed to conform to existing NMPRA racing standards. We hope that you will try this new event — that its inherent possibilities be explored during 1968 — so that it may take its place in the future as an accepted and challenging racing category.

R/C MODELER MAGAZINE MINIATURE BIPLANE RACING EVENT

Proposed Rules for 1968

Specifications for .60 Cubic Inch Class Racing Biplanes

OBJECTIVE

The purpose of this event is to cover

the prescribed course at the highest possible rate of speed with a radio controlled model airplane patterned after the full-scale racing airplanes commonly known as miniature biplanes. Race results will be posted in miles per hour.

GENERAL

All NMPRA, AMA, and FCC regulations covering the R/C flier, his plane and equipment, shall be applicable to this event, except as noted herein. There shall be no limitation on the type of equipment fitted to the plane, or the number of controls. The owner of the model shall be allowed two entries, in this event. The owner can only use his alternate model if the first model is not flyable. Only the first model will be processed and subjected to scale pylon judging. Only if the first model is not flyable shall the second model be processed and subjected to scale pylon judging. The owner may have someone else fly his model in competition if he desires to do so. However, if this is done, the model will be entered as a team. Both the owner and the pilot shall have current and valid NMPRA licenses, AMA sporting licenses, and FCC Class C licenses (where applicable). Considerations of safety for spectators, contest personnel, and other contestants are of the utmost importance in this event. Any flying over a controlled spectator area will be cause for immediate disqualification of that flight.

ENGINES

Total piston displacement must not exceed .61 cu. in. Engine must be a stock production engine of domestic or foreign manufacture that has been produced in quantities greater than a hundred units. Any changes other than modifications or changes in the throttle mechanism will not be allowed. If any changes are found the entry is subject to disqualification. No alterations to the carburetor venturi intake will be permitted, except that a Kavan type carburetor may be used in place of the original factory carburetor. The engine will be equipped with an operating throttle that will allow the model to taxi at a rate of speed less than a fast walk.

PROPELLERS

Must be fixed pitch in flight. Adjustable (on the ground) type may be used. Any type of material that is deemed safe may be used. Propellers cannot be smaller than eleven inches in diameter or higher in pitch than eight inches (11/8).

FUEL TANK AND FUEL

Must have a minimum of 6 ounce capacity but need not be filled to capacity. Only commercially available fuels may be used. Pressure type fuel systems may not be used.

FUSELAGE

The fuselage will have a minimum outside width of 4" at the location of the pilot. The ship will have a minimum height of 7" at the location of the pilot and measured from the bottom surface of the lower wing to the top of the cockpit area. The engine will be at least partially cowled with a minimum of one half the bottom of the crankcase hidden.

SPINNER

The model will have a rounded propeller spinner of at least 1¾" diameter.

LANDING GEAR

Non-retractable type. Wheels must be 2¾" in diameter or larger. At least two wheels of the specified size must be used. Auxiliary or third wheel on tricycle type may be of any size but not retractable. A positive means of steering on the ground will be provided. Brakes, or other positive method of halting forward ground speed will be provided.

COCKPIT

A scale like cockpit will be provided, which may be either open or closed. The cockpit area shall be such to allow a scale size pilot to be installed.

WINGS

Minimum of 750 square inches of wing area must be used, including that area displaced by the fuselage, but not including fillets or stall strips. Flaps are permitted but wing area is to be figured with flaps retracted. Two wings are required, with a minimum airfoil thickness of each of 1" measured at the point of maximum camber. The total wing area of one wing shall not be less than forty percent of the total area of both wings combined.

WEIGHT

Weight, less fuel, but including all equipment necessary for flight will be at least 5½ pounds.

RACING NUMBERS

Racing numbers may be obtained from the National Miniature Pylon Racing Association, and shall be the same number as assigned the entrant for use in the Goodyear class racing event if such number has been previously issued. This number shall be located on both sides of the vertical fin and rudder, and shall be no smaller than to occupy an area of at least 30% of the total vertical fin and rudder area.

REGISTRATION NUMBERS

A registration number (s) is required on both sides of the fuselage in the area encompassed by the rear of the cockpit to the leading edge of the stabilizer. The minimum height of the numbers shall be 2 inches. The letter "N" will preceed the registration numbers. The numbers will be comprised of the last two or three digits of the entrants AMA number, and shall be followed by a letter which shall correspond to the first letter of his last name. Example: N773D.

MATERIALS AND WORKMANSHIP

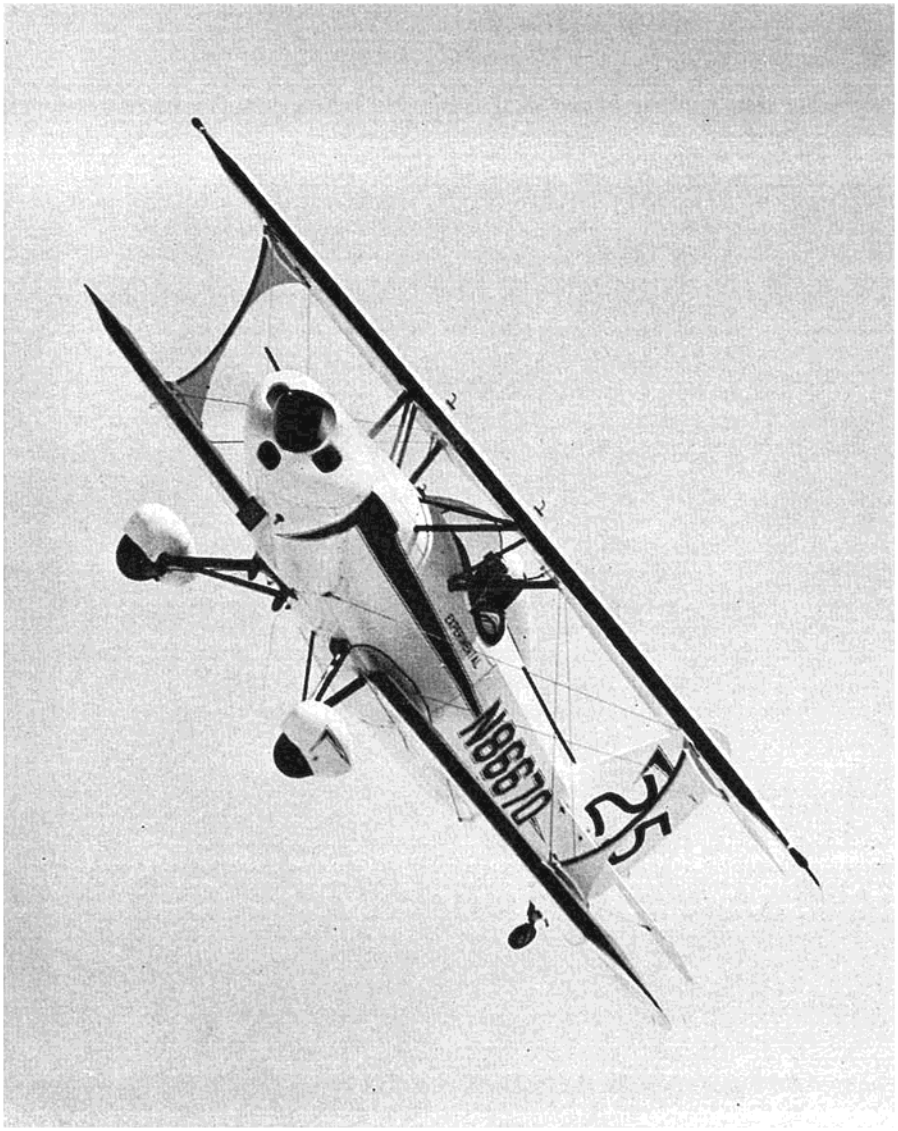
Workmanship must be of satisfactory standards. Contest committees are empowered to refuse permission to fly, or to qualify, any ship which, in their opinion, is not up to reasonable, safe standards in either materials, workmanship, detail design, radio installation, or condition as a result of damage.

INSPECTION

The winners of the first three places in the finals of each series of races can be subject to impounding immediately following the race and will be inspected by the contest committees. Ships with engines found to be altered will be disqualified and appropriate action taken against the owner and/or pilot, or both.

FLIGHT REQUIREMENTS

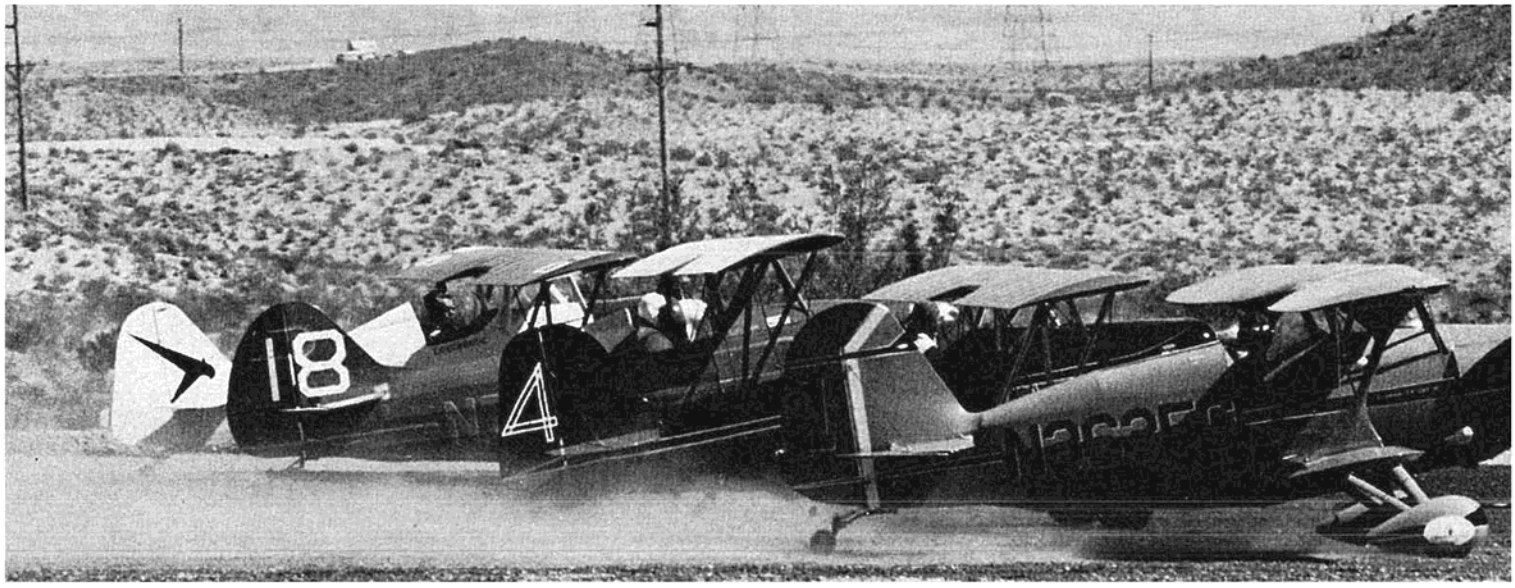
Before attempting to enter a competition, the pilot must have flown the ship before



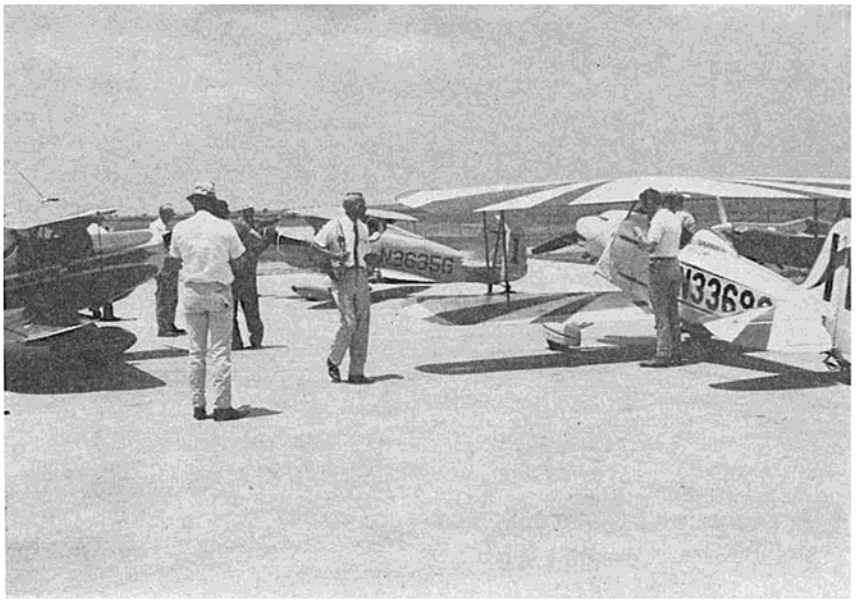
Bruce McIntire, Seattle, Washington, i the cockpit of his sleek red and white Pitt

Harwood Hellen's Starduster approaches the pylon during the Sport Biplane Race at the 1966 Reno Air Races. Photo by Jim Larsen.

A line-up of sport biplanes gets the starting flag from veteran air racer, Steve Wittman, during the 1965 Las Vegas International Air Races. Photo by Jim Larsen.

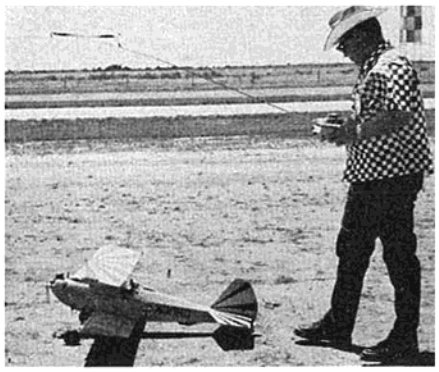


pecial. Photo taken at 1966 Los Angeles Air Races by Jim Larsen.



Beautiful aircraft in every direction . . . and the bipe fanciers dream as they look at the array of racing bipes at the 1967 Texas Air Races. Photo by Chuck Cunningham.

Alex Rantos and his Miniplane dramatically photographed by Jim Larsen during the 1965 Reno Air Races.



two witnesses who are members of the AMA or NMPRA, or both, and demonstrated the following maneuvers before them:

1) Take-off at full throttle without veering more than ten feet from either side of a straight line on the ground directly into the wind.

2) Pull-up from straight and level flight at maximum airspeed and RPM into a full up-elevator loop.

3) Make a dive at a 30 degree angle for at least a length of 500 feet.

4) Make a 180 degree turn at full airspeed and maximum RPM without any appreciable loss of altitude or control.

5) Make three laps of a simulated race course at normal racing altitude, making the turns at full speed, as in a race.

HANDICAP SYSTEM

A handicap system will be used to provide a bonus time in the issuance of points that will correspond to seconds of head start for a staggered racing start. Although this is not scale event, a definite attempt toward realism must have been made before the model is acceptable. Contest committees shall disqualify any entry that doesn't look like a full-scale miniature racing biplane but still meets minimum dimensions. It is the contest committee's responsibility to keep this event free from unrealistic models built only for speed. The judges interpretation of "scale," or "fidelity to scale" does not mean exact duplication of an original full size aircraft, but rather one that simulates or "looks like" one of, or a composite of, full scale racing biplanes.

1. 10 points will be given for appearance. (5 points for workmanship and 5 points for finish). Judging methods that are used for the scale model appearance division will apply.

2. 10 points will be given for realism towards approximating an original miniature biplane racing airplane design. The point system is awarded on a 100%, 50%, 0% basis. The total number of points will be equal to the number of seconds headstart handicap.

a. Fuselage and Landing Gear Group — 5 points.
b. Wing Group — 3 points.
c. Stabilizer Group — 1 point.
d. Rudder and Fin Group — 1 point.

The appearance is not a factor in the realism to scale judging.

4. If the entrant has an unconventional type of design, he must show proof of an actual full scale racing biplane that is similar to the ship under question. The entrant can use a wing configuration from one scale design, a fuselage from another, a tail group from another, and a landing gear configuration from still another design. A combination such as this will pass without any question.

5. Any ship that receives less than 7 points towards realism will be subject to disqualification because of not meeting the intent of the rules.

RACING COURSE SPECIFICATIONS

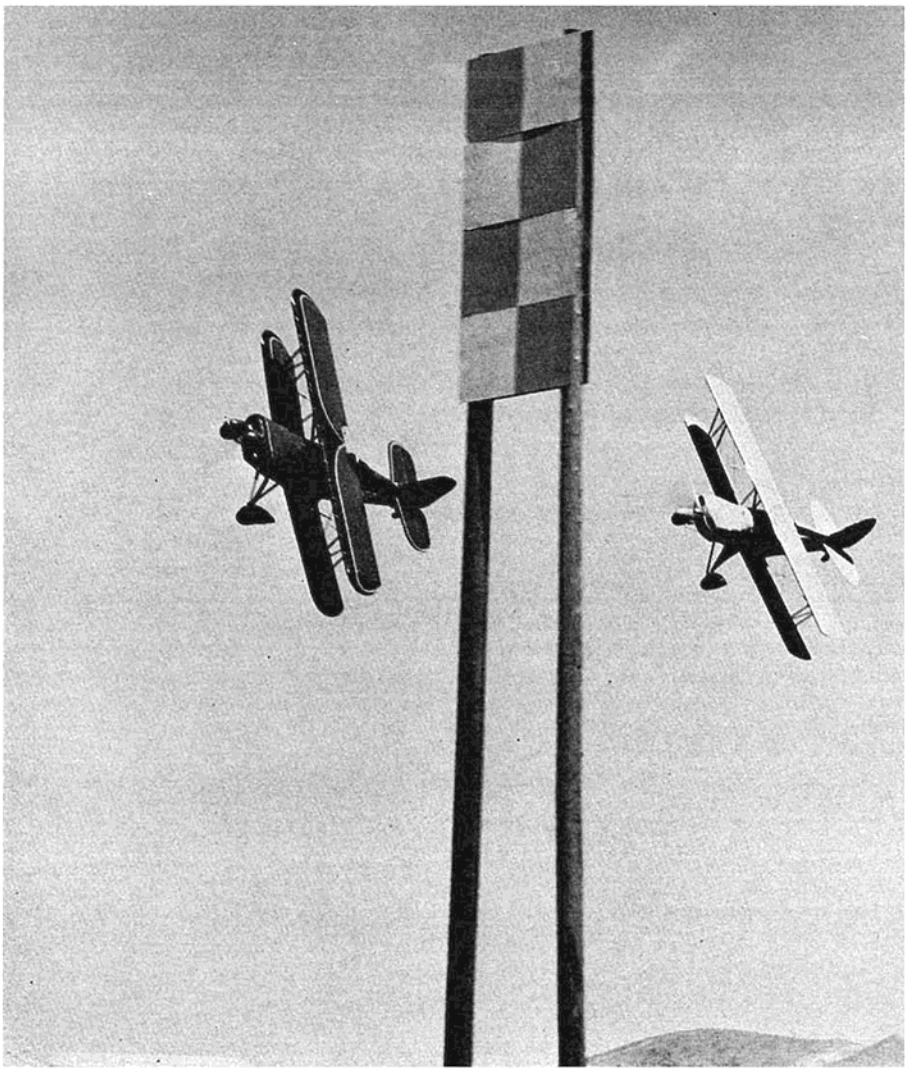
The racing course for this biplane class shall be laid out per 1968 National Miniature Pylon Racing Association specifications for Goodyear racing.

QUALIFICATION HEATS AND RACE SCHEDULES

Shall be per 1968 National Miniature Pylon Racing Association rules and specifications. (See NMPRA Contest Procedure Guide).

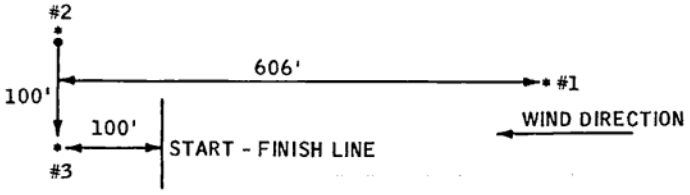
And there you have it — the initial proposal for the R/CM Miniature Biplane Racing Event. Try it — it may well be one of the most exciting events you have ever entered. And don't hesitate to make suggestions for varying the rules in order to increase safety, promote a greater interest in the event, etc. The rules presented here are merely a starting point.

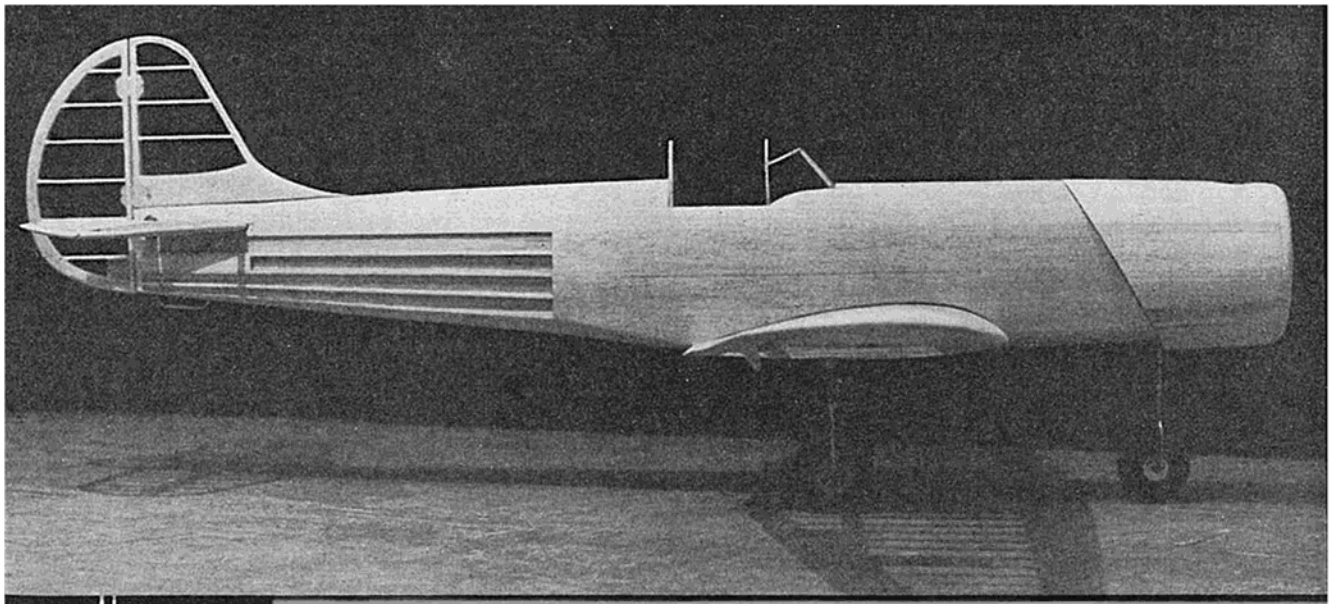
Watch for the R/C Modeler Magazine Trophy later in the year . . . a trophy **you** might win!



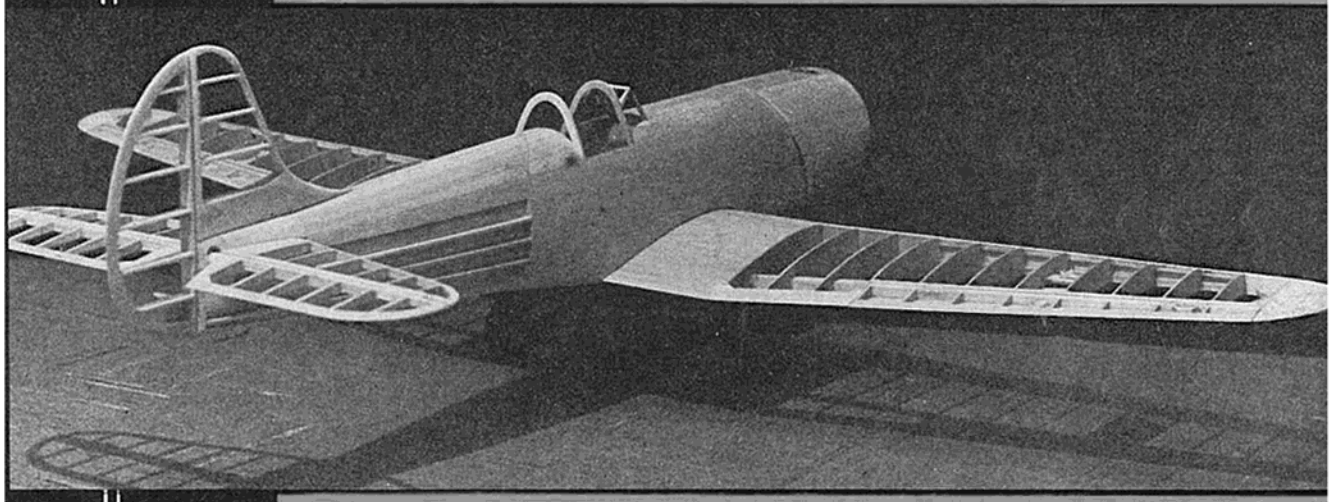
Sport Biplanes round a pylon during the 1965 Reno National Air Races. Ralph Ormsbee flying his Miniplane (#5). The EAA Bipe piloted by Fred Rechenmacher. Upper Lt: Chuck Cunningham and R/C demo at Texas National Air Races.

SET UP THE PYLONS AS PER DRAWING. NOTE WIND DIRECTION IN RESPECT TO PYLONS.

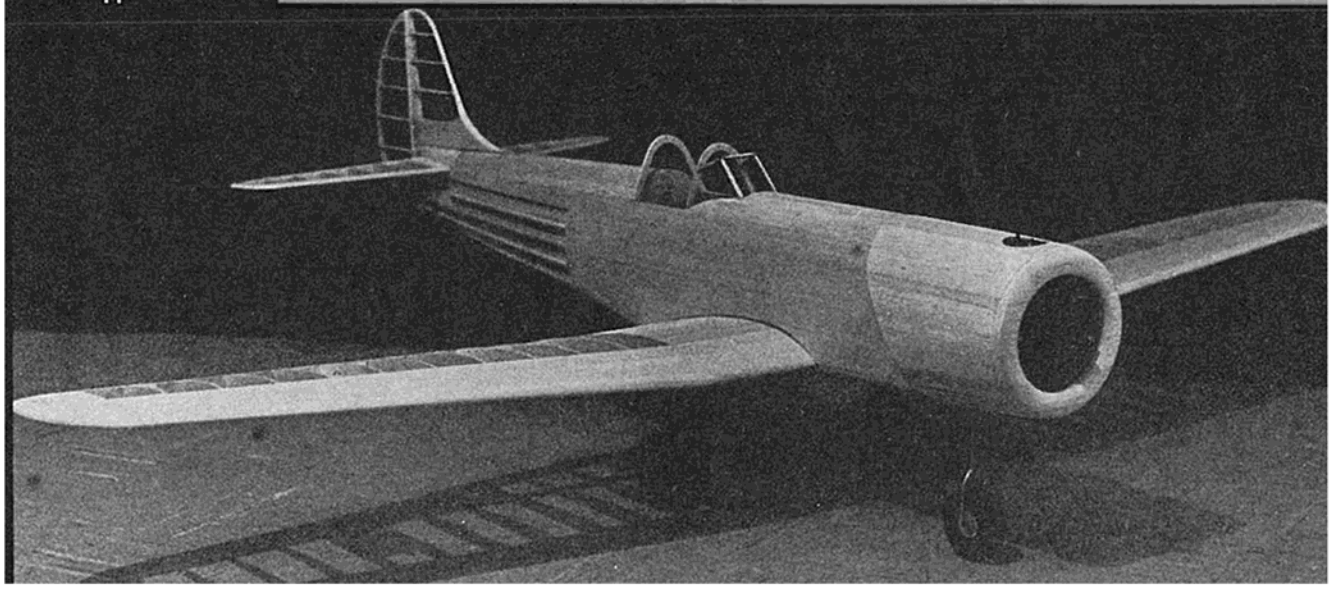


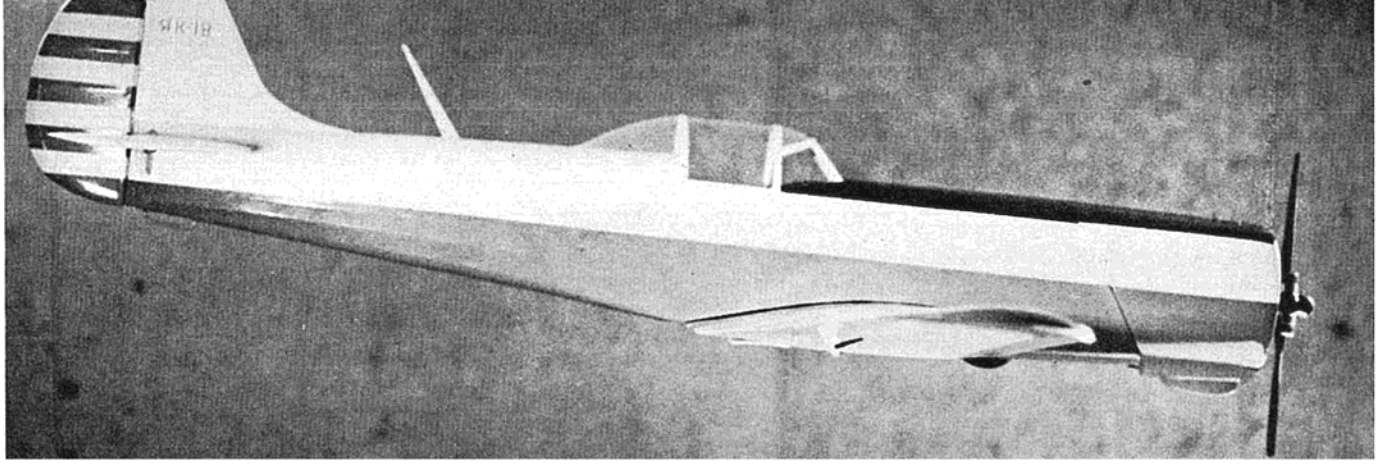


YAK—18



BY COLONEL H.G. BOWERS





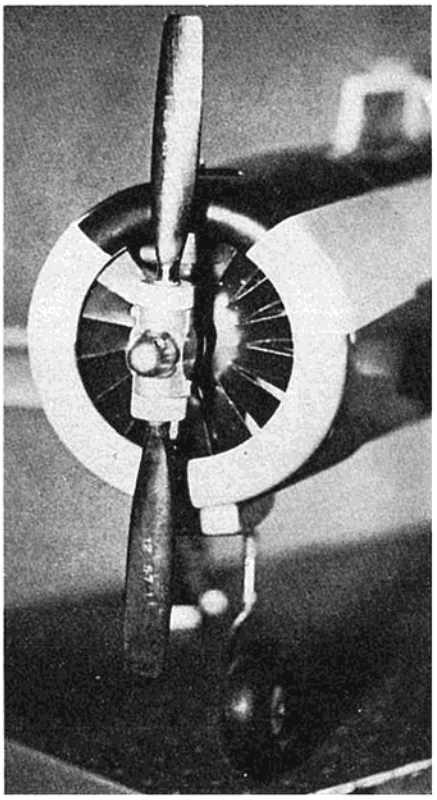
The R/C version of the Russian YAK-18 with gear retracted.

TWO years ago the YAK-18 PM made its debut into international aerobatic competition at Toushino Airfield, outside Moscow, where it captured top honors for the Soviet Union. Competing against the Iron Curtain countries were such noted competitors as Hillard, Krier, Herendeen, and Scholl, who made up the U. S. team.

The YAK-18 is a refined development of the well known trainer, and is equipped with a 294 hp engine, as compared to the 160 hp engine used in the latter. The canopy was modified and dihedral reduced to improve maneuverability. To reduce weight, non-essential electrical components were removed and fuel capacity reduced. These refinements were no doubt responsible for its superb climbing maneuvers, although the aircraft was reportedly somewhat limited in its roll responsiveness.

An initial glimpse of the YAK does not leave one particularly impressed since there is no outstanding or distinctive feature immediately apparent. However, upon closer examination, one develops an admiration for the clean lines and purity of design. It is a very simple airplane and there is no doubt that this very simplicity is, to a large extent, responsible for its efficiency and superb performance.

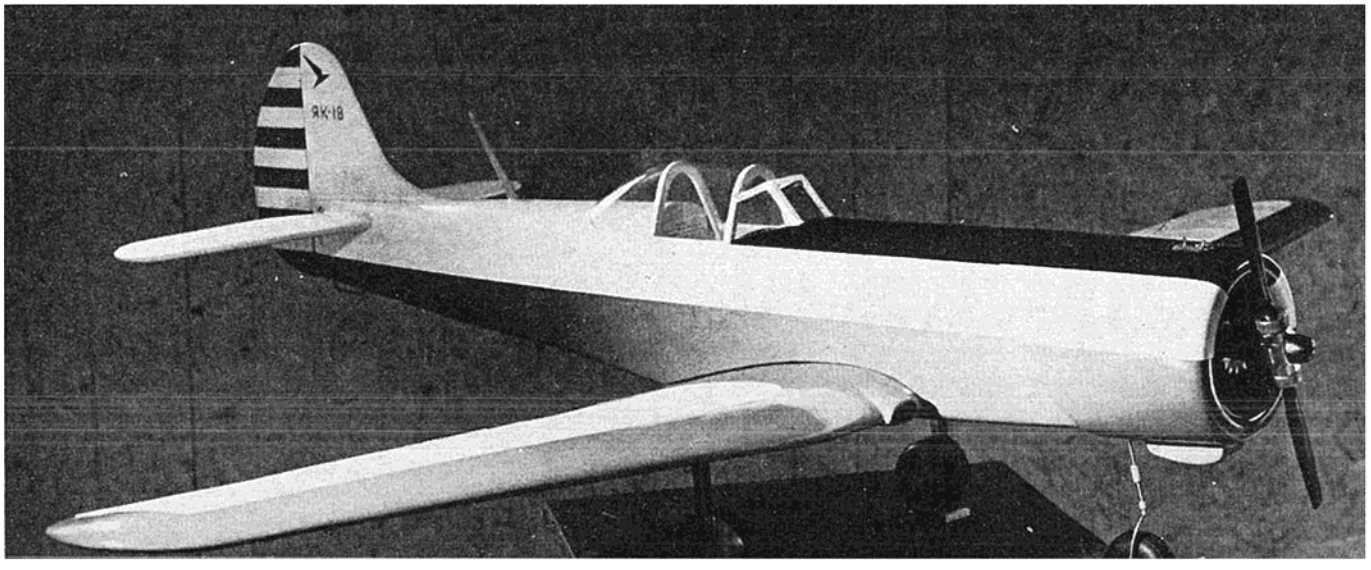
From the modeler's point of view, the YAK offers many advantages which can be fully exploited through the use of the new

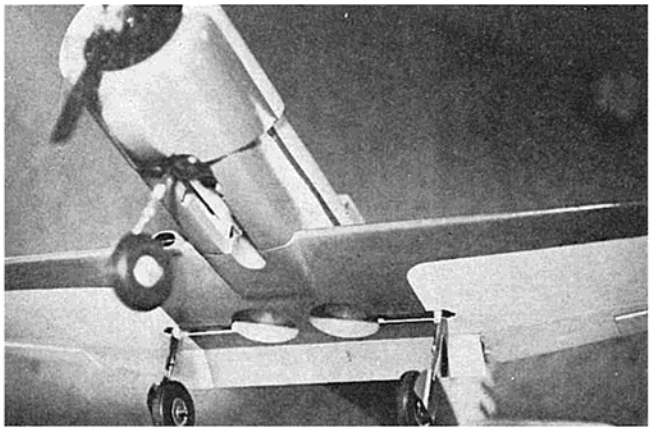


and reliable equipment available to the radio control flyer, such as light weight proportional gear and the remarkable Posi-Tract undercarriage units. The warm glow kindled by photographs of the YAK erupted when I obtained a set of three view drawings by Bjorn Karlstrom. It was readily apparent just how similar the proportions and configuration of this airplane are to the high performance, Class III radio control model. Many comments to this effect were passed between members of the Northern Virginia R.C. Club (the wives insist the R.C. stands for rooster club), and I began to seriously consider building the model. I contacted my chief technical advisor, Comrade Ernisky Greénovich, who is commonly known in the environs of Washington as Commander Ernie Green, USN, and after repeated calculations with slide rule and vodka bottle, we determined that the project was feasible and financable. The latter being determined by the fact that Ernie had a new Kraft radio, a set of Posi-Tract gear, and a Merco .61 hidden away in his workshop. We selected 1⅞ inch to the foot scale since that size airplane would just fit into my engineering department (my daughter calls it "the pit"), and too, 64 inches is a good workable wingspan. This size was perfect for Ernie's equipment. After consultations with our two USAF experts, Col.

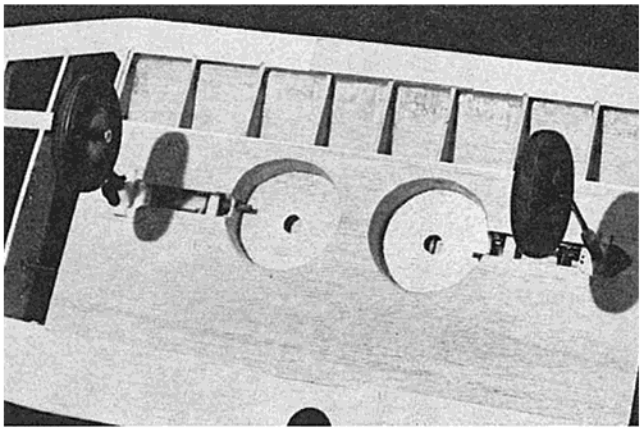
(Continued on Page **27***)*

". . . Upon closer examination one develops an admiration for the clean lines and purity of design."

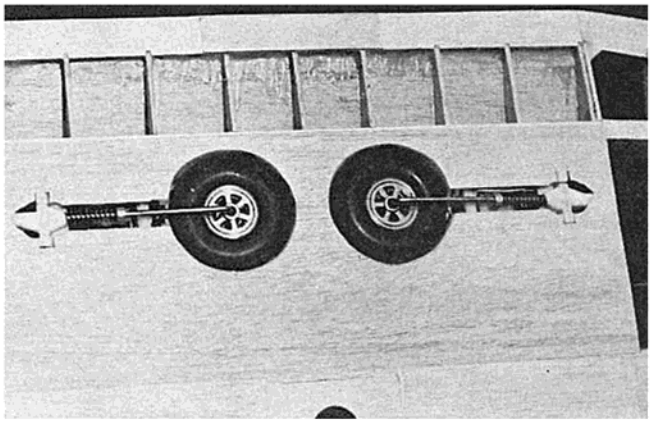




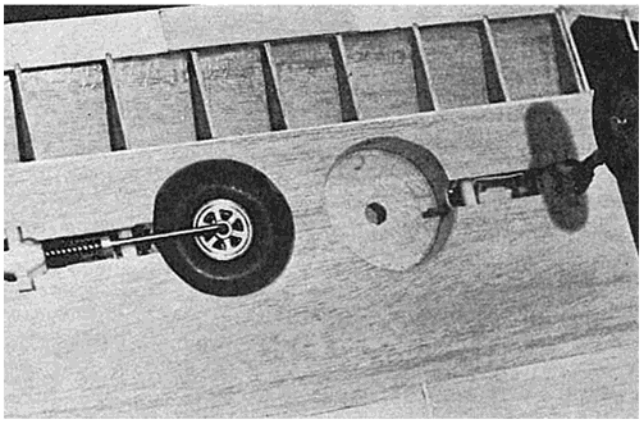
Detail shot of extended gear.



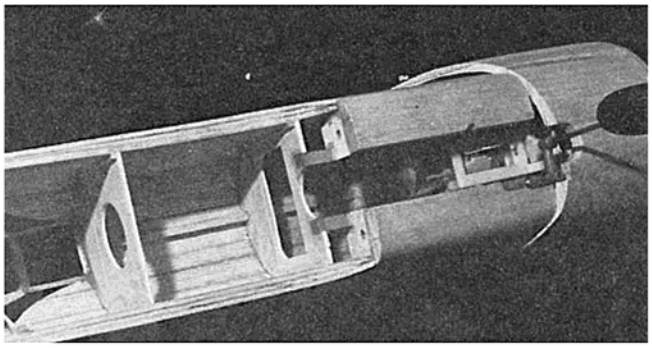
Main Posi-Tract's extended.



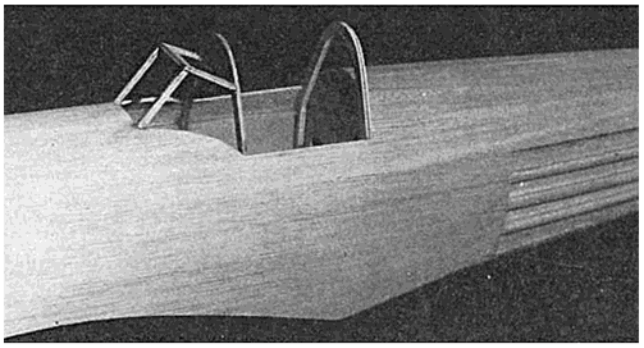
Main gear in retracted position.



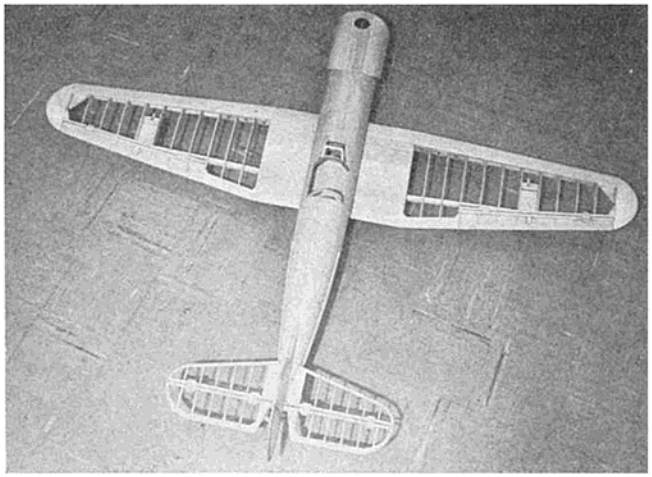
Main Posi-Tract's shown extended and retracted



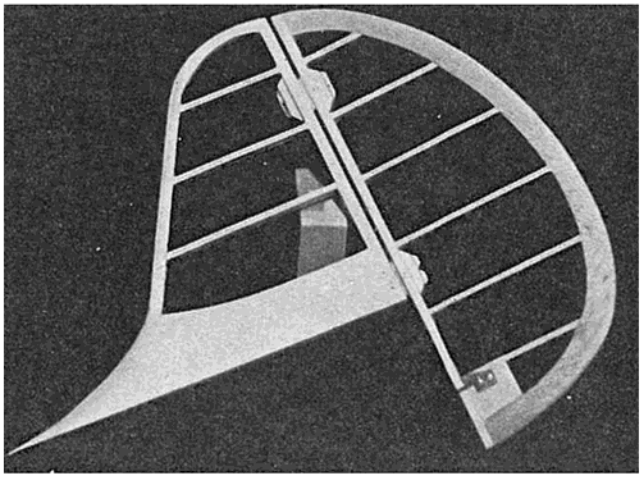
Nose gear and forward interior details.



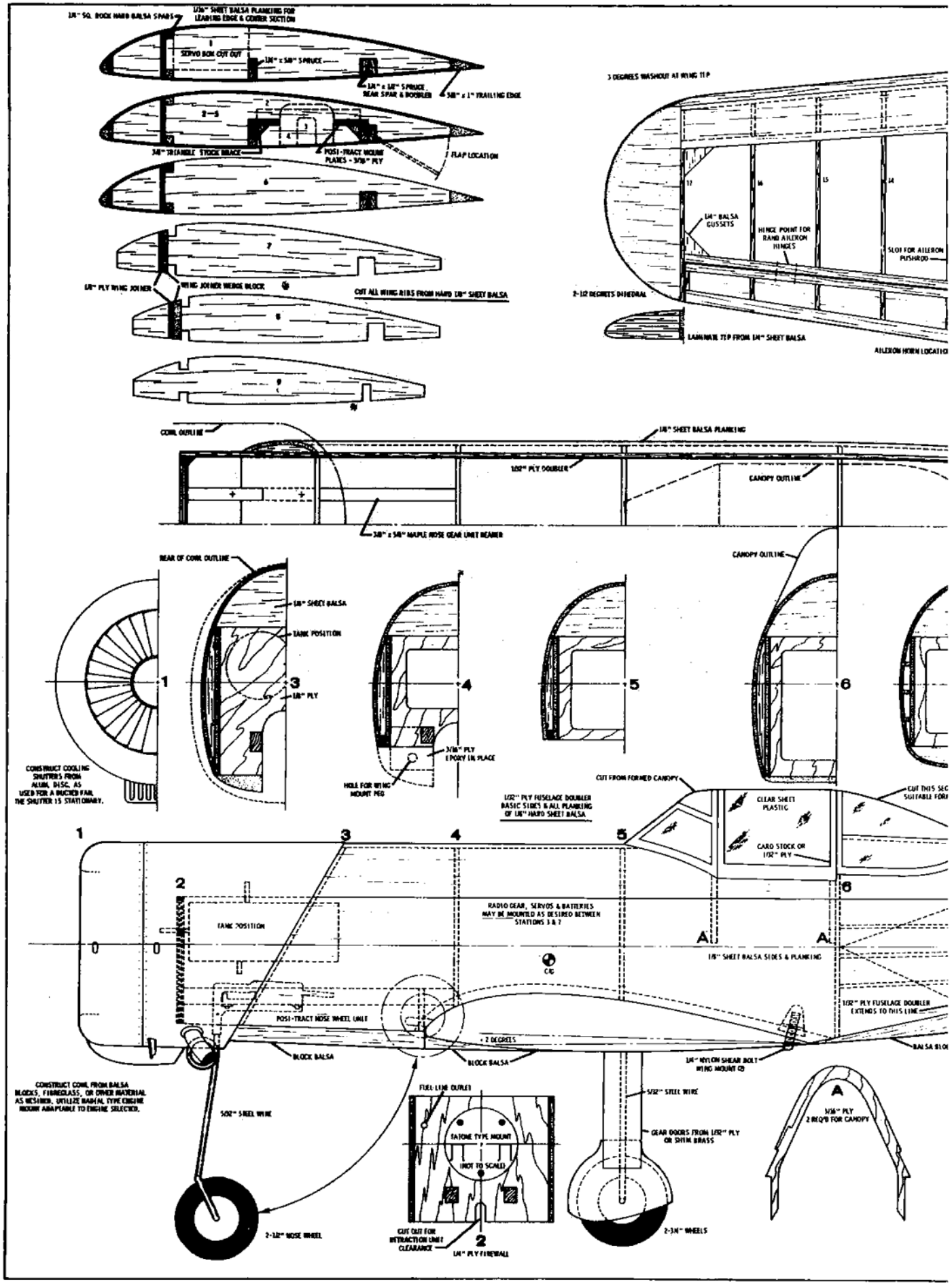
Clean, functional lines at cabin area.

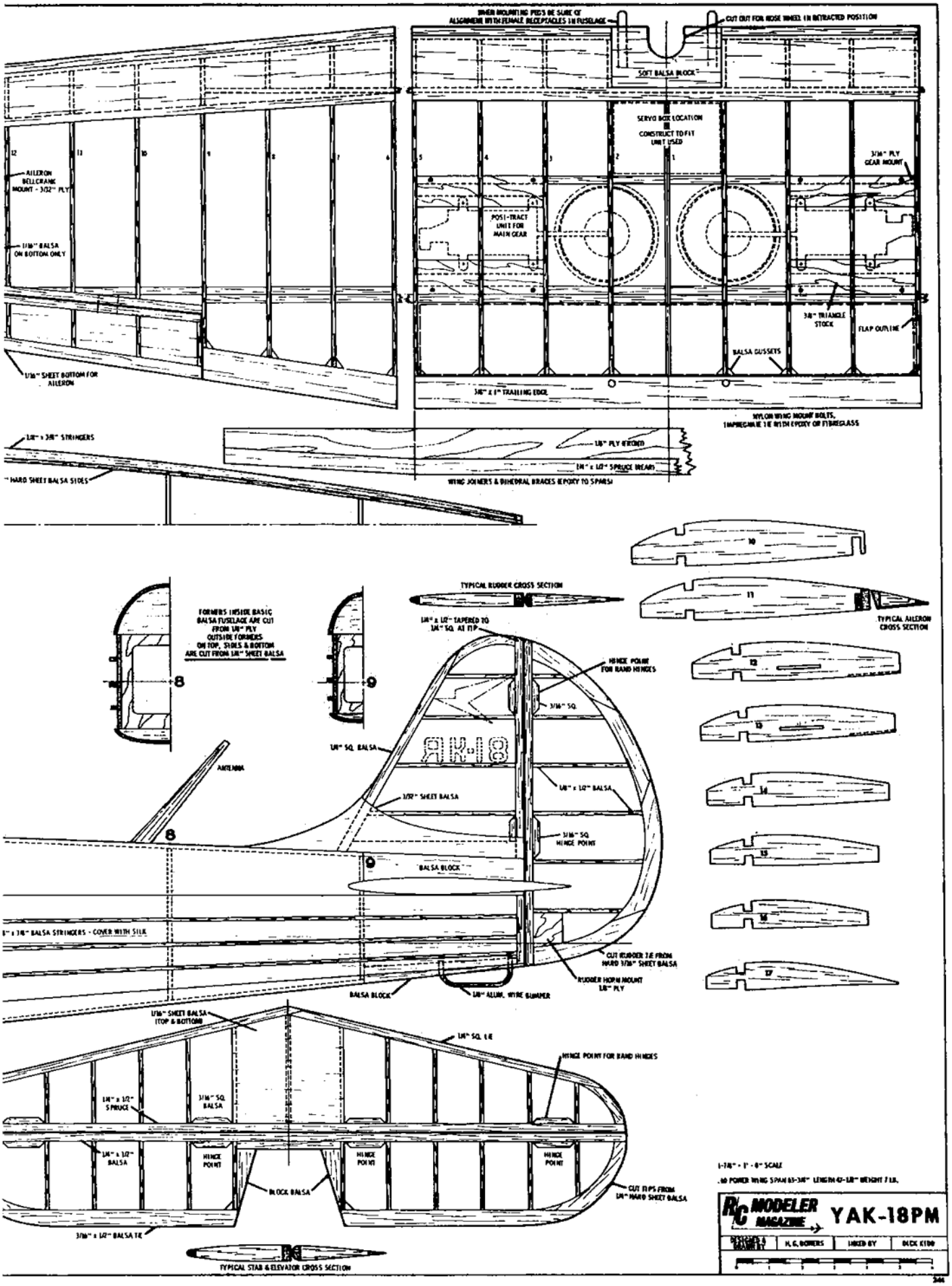


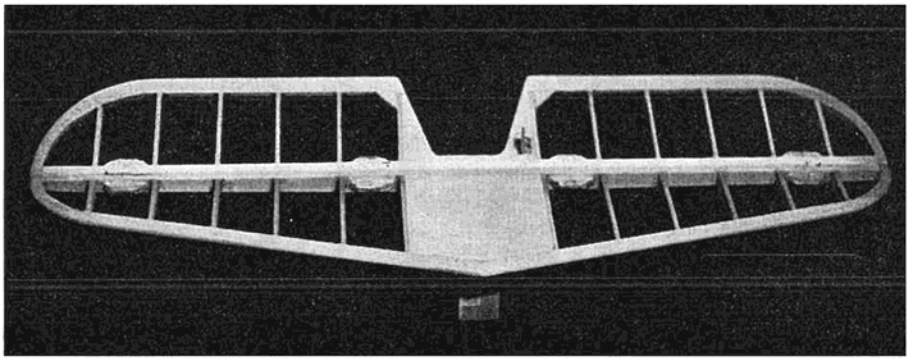
The YAK-18, ready for covering.



Rudder framework with hinges installed.


1/8" SQ. BOCK HARD BALSA SPARS
1/16" SHEET BALSA PLANKING FOR LEADING EDGE & CORNER SECTION
SERVO BOX CUT OUT
1/4" x 5/8" SPRUCE
1/4" x 1/2" SPRUCE REAR SPAR & DOUBLER
5/8" x 1" TRAILING EDGE
5/8" TRIANGLE STOCK BRACE
POSI-TRACT MOUNT PLATES - 3/16" PLY
FLAP LOCATION
1/8" PLY WING JOINER
WING JOINER WEDGE BLOCK
CUT ALL WING RIBS FROM HARD 1/8" SHEET BALSA
3 DEGREES WASHOUT AT WING TIP
1/4" BALSA GUSSETS
HINGE POINT FOR RAND AILERON HINGES
SLOT FOR AILERON PUSHROD
2-1/2 DEGREES DIHEDRAL
LAMINATE TIP FROM 1/4" SHEET BALSA
AILERON HORN LOCATION
CORE OUTLINE
1/8" SHEET BALSA PLANKING
1/32" PLY DOUBLER
CANOPY OUTLINE
5/8" x 5/8" MAPLE NOSE GEAR UNIT BEARER
REAR OF CORE OUTLINE
1/8" SHEET BALSA
TANK POSITION
1/8" PLY
3/16" PLY EPOXY IN PLACE
HOLE FOR WING MOUNT PEG
CONSTRUCT COOLING SHUTTERS FROM ALUM. DISC, AS USED FOR A BUCKED FAN. THE SHUTTER IS STATIONARY.
1/32" PLY FUSELAGE DOUBLER BASIC SIDES & ALL PLANKING OF 1/8" HARD SHEET BALSA
CUT FROM FORMED CANOPY
CLEAR SHEET PLASTIC
CARD STOCK OR 1/32" PLY
RADIO GEAR, SERVOS & BATTERIES MAY BE MOUNTED AS DESIRED BETWEEN STATIONS 3 & 7
TANK POSITION
C.G.
1/8" SHEET BALSA SIDES & PLANKING
1/32" PLY FUSELAGE DOUBLER EXTENDS TO THIS LINE
POSI-TRACT NOSE WHEEL UNIT
2 DEGREES
BLOCK BALSA
BLOCK BALSA
1/4" NYLON SHEAR BOLT WING MOUNT (2)
CONSTRUCT COWL FROM BALSA BLOCKS, FIBREGLASS, OR OTHER MATERIAL AS DESIRED. UTILIZE RADIAL TYPE ENGINE MOUNT AVAILABLE TO ENGINE SELECTED.
5/32" STEEL WIRE
FUEL LINE OUTLET
5/32" STEEL WIRE
FATONE TYPE MOUNT
(NOT TO SCALE)
GEAR DOORS FROM 1/32" PLY OR SHIM BRASS
3/16" PLY 2 REQ'D FOR CANOPY
2-1/2" NOSE WHEEL
CUT OUT FOR RETRACTION UNIT CLEARANCE
1/4" PLY FIREWALL
2-3/4" WHEELS


CUT OUT FOR NOSE WHEEL IN RETRACTED POSITION
SOFT BALSA BLOCK
SERVO BOX LOCATION
CONSTRUCT TO FIT
UNIT USED
3/16" PLY
GEAR MOUNT
AILERON
BELLCRANK
MOUNT - 3/32" PLY
1/16" BALSA
ON BOTTOM ONLY
POSI-TRACT
UNIT FOR
MAIN GEAR
3/8" TRIANGLE
STOCK
FLAP OUTLINE
BALSA GUSSETS
1/16" SHEET BOTTOM FOR
AILERON
3/8" x 1" TRAILING EDGE
NYLON WING MOUNT BOLTS,
IMPREGNATE TIE WITH EPOXY OR FIBREGLASS
1/8" x 3/8" STRINGERS
HARD SHEET BALSA SIDES
1/8" PLY BEHIND
1/4" x 1/2" SPRUCE BEAM
WING JOINERS & DIHEDRAL BRACES (EPOXY TO SPARS)
TYPICAL RUDDER CROSS SECTION
FORMERS INSIDE BASIC
BALSA FUSELAGE ARE CUT
FROM 1/8" PLY
OUTSIDE FORMERS
ON TOP, SIDES & BOTTOM
ARE CUT FROM 1/8" SHEET BALSA
1/4" x 1/2" TAPERED TO
1/4" SQ. AT TIP
HINGE POINT
FOR BAND HINGES
3/16" SQ.
1/8" SQ. BALSA
1/8" x 1/2" BALSA
1/32" SHEET BALSA
3/16" SQ.
HINGE POINT
BALSA BLOCK
CUT RUDDER TIE FROM
HARD 3/16" SHEET BALSA
RUDDER HORN MOUNT
1/8" PLY
1/8" ALUM. WIRE GUIMPER
1/16" SHEET BALSA
(TOP & BOTTOM)
1/4" SQ. LE
HINGE POINT FOR BAND HINGES
1/4" x 1/2"
SPRUCE
3/16" SQ.
BALSA
1/4" x 1/2"
BALSA
HINGE
POINT
HINGE
POINT
HINGE
POINT
BLOCK BALSA
CUT TIPS FROM
1/8" HARD SHEET BALSA
3/16" x 1/2" BALSA TE
TYPICAL STAB & ELEVATOR CROSS SECTION
TYPICAL AILERON
CROSS SECTION
1-7/8" = 1'-0" SCALE
.60 POWER WING SPAN 63-3/8" LENGTH 47-1/8" WEIGHT 7 LB.
RC MODELER MAGAZINE
YAK-18PM
DESIGNED & DRAWN BY
H. G. BORERS
DRAWN BY
INCH KEY



Completed stab and elevator with hinges installed.

YAK-18

(Continued from Page 23)

Gail Jacobson and Major (to be) Pete Rawlings, and final approval by the "Oracle of NVRC," Joe Taylor, we decided to toss out the vodka bottles (for the Juniors, that's Russian Kool-Aid) and get down to business. I developed the plans from Bjorn Karlstrom's three views and from S. Zurad's drawings which appeared in *Aero Modeller* last fall. Construction is very simple and straightforward; however, a few hints will be provided to help the novice scale builder over the rough spots.

My first consideration was to cut the wing outer panels from styrofoam, but when I mentioned this one evening to Comrade Joe Taylorsky, he shouted "Nyet," and began pounding my drawing board with his shoe. He added he would not tolerate such decadent capitalistic methods as are practiced in the West, and took his pitot heater and went home. In order to keep the Cold War cool, I built the wing in the conventional manner, as shown on the plans. The tapered wing with its 3 degree washout at the tip looks forbidding, but really is quite simple when a tapered block is used along the underside of the ribs to achieve the desired washout while the panels are on the work board. Only the center section and leading edges are covered with sheet balsa. Spruce sub-spars are used in the center section as runners for the Posi-Tract undercarriage units. Should a retractable landing gear not be used, a simple scale gear may be mounted on hardwood grooved blocks in the appropriate position. The ailerons are built up on 1/16 inch sheet balsa cut to outline and sanded to shape. I used Rand hinges which have proved to be excellent. The servo box may be installed as required in the center section and push rods, linkage, and bell cranks are conventional. If desired, the speed brake, or flap, may be installed very easily as shown on the plans and actuated with an additional servo. This servo may also be linked with the Posi-Tract landing gear switcher to accomplish both tasks, however, we preferred to use another unit for this function. The wing is mounted to the fuselage with pegs at the leading edge and two 3/16 inch nylon shear bolts at the rear.

The tail members are simple framework, well glued, and sanded to airfoil section. I used 1/4 x 1/2 inch spruce for the stabilizer spar and would recommend that this material also be used for the rear spar on the fin as well. Since the airfoil on the tail members is rather deep, and the framework quite sturdy, no tendency to warp should be experienced. Glue the fin and stabilizer permanently to the fuselage with no incidence or offset.

The YAK fuselage is probably more simple to build than most Class III models and the side planking and stringers over the sheet side provides exceptional strength. The bottom of the fuselage ahead of the wing is made from soft block balsa recessed to receive the nose gear in the retracted position. There is ample room for the retraction unit as well as any and all desired radio equipment and power packs. Since these compartments are generous and long, no problem whatsoever should be encountered in obtaining proper balance of the model. The canopy is built from a simple frame and clear sheet plastic. The portion just above the windshield which contains a compound curve may be cut from a moulded commercial canopy. This may also be used for the rear section if desired. The cowling may be built by several methods such as fiberglass, balsa block, etc. I selected the latter and it proved to be quite simple and satisfactory. For the cooling shutters in the nose, construct from a disc of light aluminum to resemble the impeller used on a ducted fan system. Since this unit does not rotate with the propeller, balance is not critical.

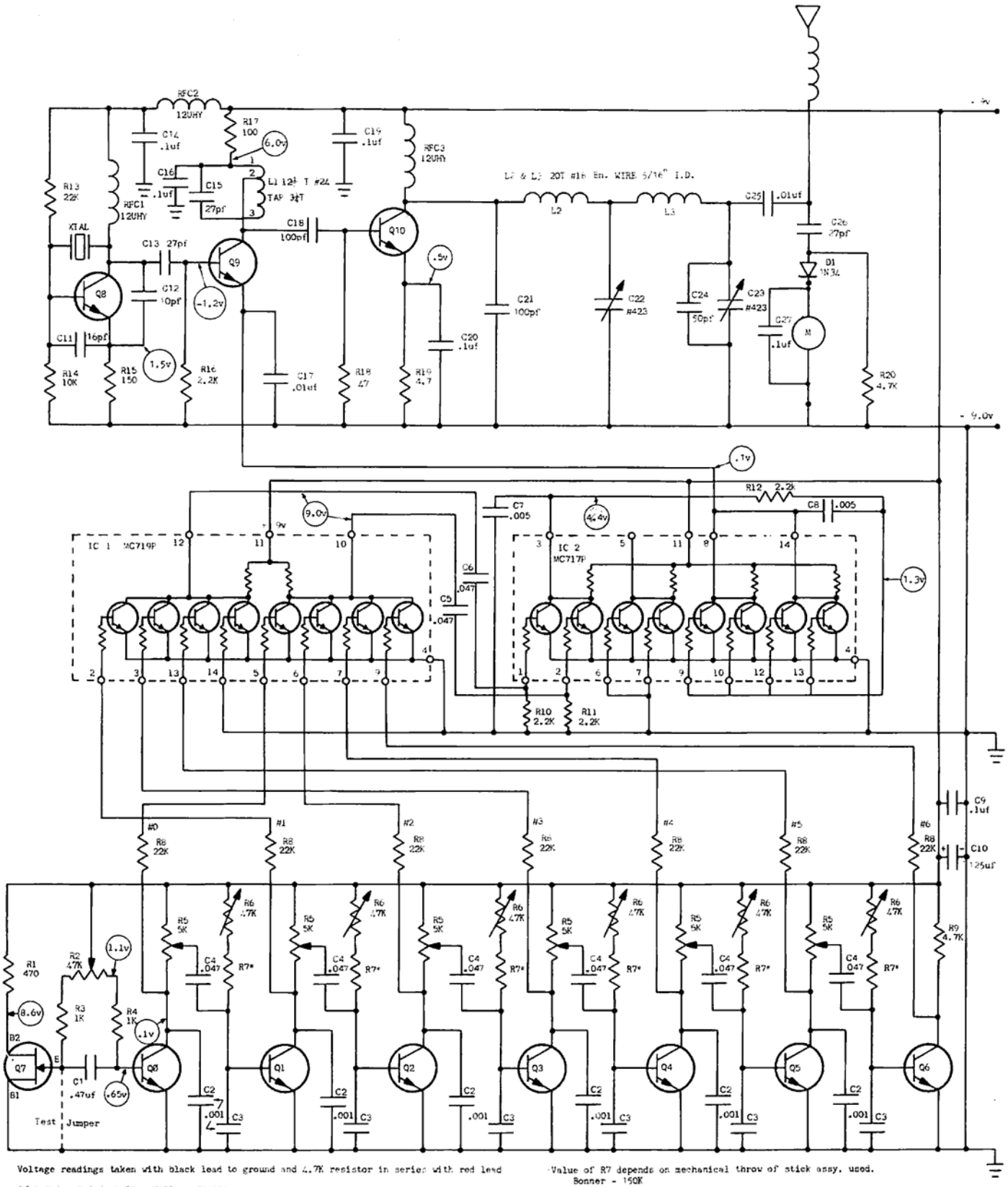
Cover the entire model with silk and use white as a base color with red trim and black details. Our color scheme was copied from the aircraft displayed at the Paris Air Show last summer and shown on page 19 of the November 1967 issue of Sport Flying.

Test flying the model is purely conventional and if proper balance and alignment is obtained, it will be a real dream, and capable of competing not only in scale, but pattern events as well.

Good luck with your YAK and have funsky.

BY ED THOMPSON RCM TECHNICAL EDITOR

PART I



Voltage readings taken with black lead to ground and 4.7K resistor in series with red lead

Q0,1,2,3,4,5,6,8, & Q9 - M400 or 2N412
Q7 - 2N4871
Q10 - SL-151(M 7819) or 2N3553
All resistors ¼ watt 10% Tol.
All caps in mfd unless noted
C1,4,5, & 6 Mylar 5% Tol.; C10 Electrolytic; C22,C23 Variable compression trimmer.
All other caps disc ceramic.

*Value of R7 depends on mechanical throw of stick assy. used.
Bonner - 150K
Micro - 100K
Aux. - 130K (With pot mounted per text)

** Channels shown: For less channels delete higher numbered half shots and use R9 for last half shot collector load. IE. 3 would consist of half shots Q0 through Q5.

THE RCM CLASSIC

NO, it's not the Digiquad. It's more! Better than hoped for? One thing's for sure, here it is and with a name to live up to — The "Classic."

Can **you** built it? You **can** if you can identify the electronic parts used and follow instructions. If you're a little weak on electronics consult your "Local Einstein" — he can judge your ability to get the job done. While you're at it, pin him down for consultation privileges. This system culminates more than a year of concentrated design effort and its principal advisor was 7 years of digital experience. The design is sprinkled with State of the Art advancements and tempered with time-proven concepts.

Briefly, the design evolved as follows: Originally, integrated circuits were worked into all the system components with acceptable results. This was done using the I. C.'s available on the market at the time, compromising where necessary. Some of the compromises were high current drain, high cost, circuit complications, and limited availability. It soon became apparent that the compromises were not worth the time, effort and cost for the home builder. I also found myself playing a waiting game, as new I. C.'s were coming into being every week. I sampled all I could get my hands on in order to solve the problems, and found only a few that could "earn" their way, even partially. I am, in fact, still sampling all I can get my hands on! One thing stood out throughout this period — I was not getting improved performance. I decided at this point to incorporate I. C.'s only where their use was totally justified and not merely as "status symbols." The benefits of their use in the "Classic" transmitter is self-evident and they "pay" their "guts."

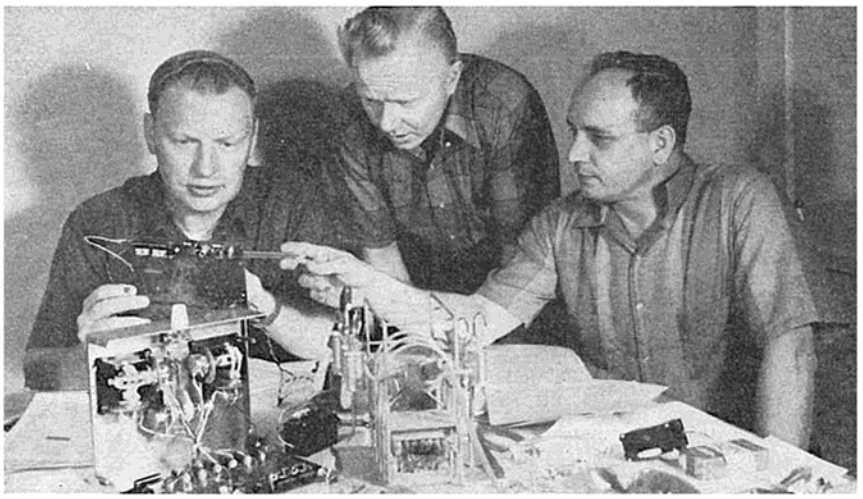
Servo mechanims selection was the next consideration. Fortunately, this was easy as the Orbit servo mechanics have proven themselves to me as the best available to date. I base this on durability of the feedback element, smoothness and just plain "guts."

The testing program for the Classis has been extensive. It has been flown at ambient temperatures from 20 to 100°F. It has been tested at slightly above 0 and at 150°F with acceptable results. Servo "stiffness" is evident at the lower extremes due to lubricant coagulation and minimum lubrication is advised if you fly in sub-freezing temperatures. To date, several hundred flights have been flown on the "Classic" prototype systems and its performance verifies the design effort that went into it. Some note of interest about the Classic are listed below:

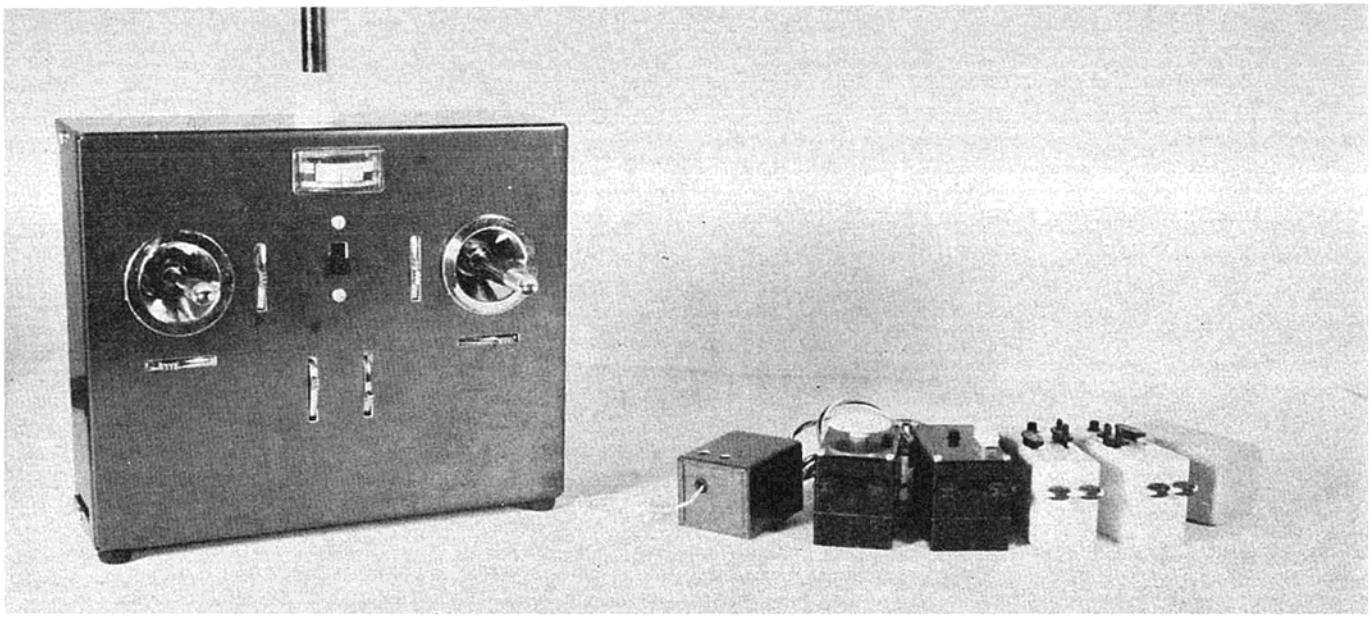
Versatility: The Classic can be built as a 2, 3, 4, 5 or 6 channel system. If less than 6 channels are built initially, more can be added later with a minimum of effort and

Ed Thompson reviewing prototype built by Don Dewey. Dick Sonheim holding PC Board.

Versatility, quality components, resolution, power; all characterize the RCM Classic. One of the finest Digital proportional systems ever designed.



Photos by Don Dewey



The RCM Classic — shown in one of its many choices of transmitter configurations. Two each standard size Orbit and Kraft servo mechanisms displayed with this prototype. See article for variety of servos available. Note size of Classic receiver-decoder at left of servos.

expense. The basic PC board will accommodate 6 channels and instructions are given for less if desired. Either Micro-Avionics or Bonner control sticks may be used. Instructions for the new Kraft or Royal sticks will be incorporated with later articles in the series. In addition to the Orbit servo, amplifiers for the small Bonner and small Kraft are presently being considered. The small Kraft servos are in use with one system now using modified Kraft amplifiers.

Power Output: The Classic is no weak sister in the Rf power department. The double PI Rf tuning network, centerloaded antenna, three-stage circuitry and use of a "premium" Rf power transistor provides more effective radiated power than the average system.

Premium Transistors Used Throughout: The transistor types used in the Classic are of premium quality and especially selected for the circuits that use them. Germanium transistors specifically designed for radio frequency and intermediate frequency use, are used in the receiver. Along with well designed temperature compensation they provide, in my opinion, a better overall receiver than one using run-of-the-mill silicon transistors. The servos use all silicon transistors, including selected drivers for freedom from "Thermal Runaway," and providing increased reliability, power and speed.

Use of Commercially Available Parts Throughout: All parts used in the system are readily available and a complete parts list is given. This includes hardware as well. Commercial sticks are used and no sheet metal/machine work is necessary unless you are a strict scratch builder. Royal Electronics has agreed to provide all parts for the system that may be difficult to obtain elsewhere, including some specially graded transistor substitutes which are listed in the parts list. Royal Electronics has submitted all parts to me for my approval, which I gave them.

Reproducibility: The system is designed to be reproduced by the home builder. The circuits, electronic parts and mechanics were blended with just that thought in mind. Any compromises that were made in the design were on the home builder's side. **This system was designed for you.**

Precise Alignment and Adjustments Possible: Although the Classic can be aligned with a multimeter, provisions have been made for "perfect" alignment. "Perfect" alignment requires an oscilloscope and this is highly recommended. Precision alignment allows servo interchangeability without offset and a peace of mind that the system meets design specs.

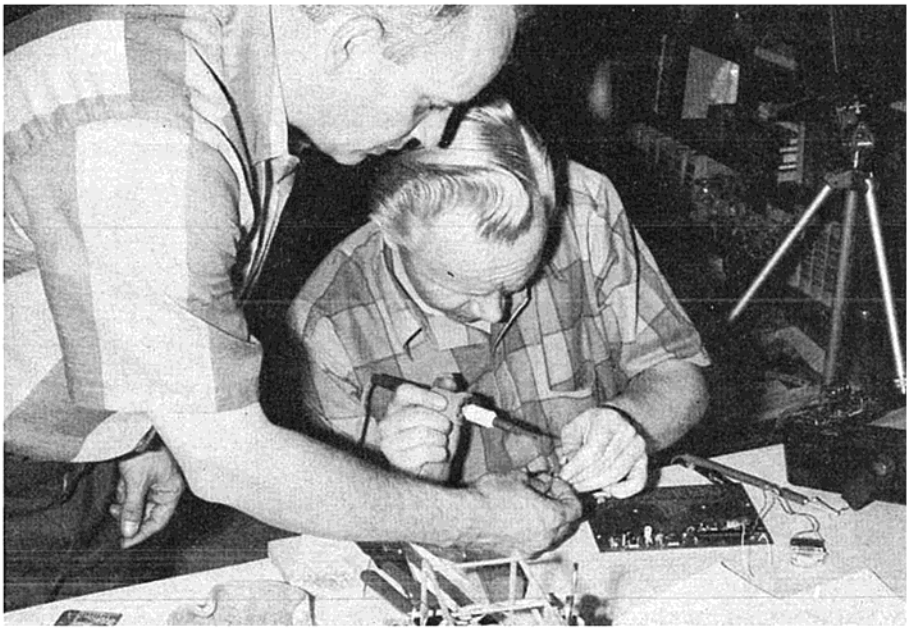
Service: Royal Electronics has agreed to service or align any Classic system built as per the articles.

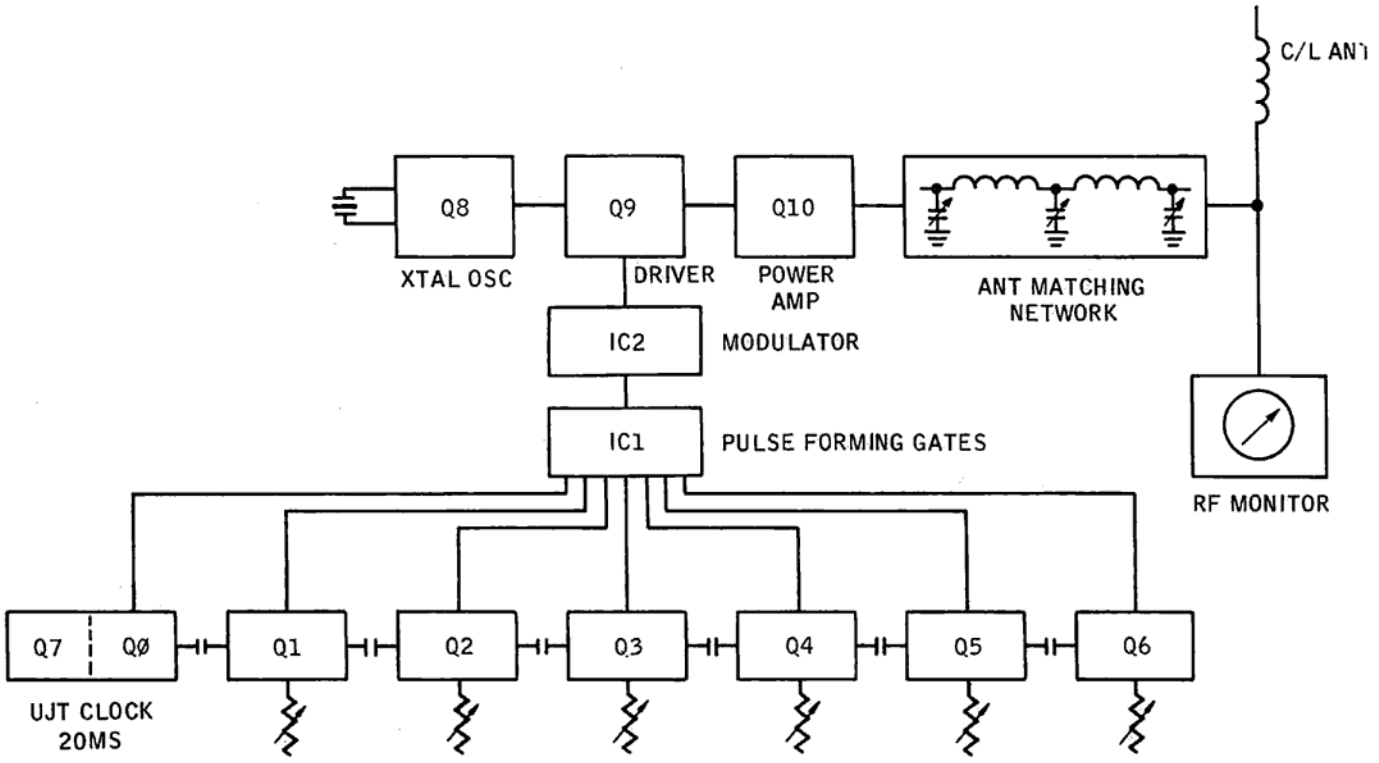
TRANSMITTER

Circuit Description:

To start with, the transmitter employs no magic circuits. Some of the circuitry is unique but easily understood **and** if taken step by step falls into place. A look at the block diagram reveals that the encoder consists of a U. J. T. clock driving variable half-shot stages to form the basic pulse width modulation data. The U. J. T. clock operates at 20 M. S. and uses two transistors, one being the unijunction — Q7 and Q0 on the schematic. In the basic unijunction relaxation oscillator (Fig. 1) a resistor is used to charge a capacitor to the emitter's peak voltage point whereupon the dynamic resistance of the emitter to base-one drops to a low value. This discharges the capacitor and it starts to charge again. The discharge time is considerably less due to a shorter discharge time constant, than the charging time, so a semi-sawtooth signal is developed. The repetition rate of this signal depends on the time constant of the

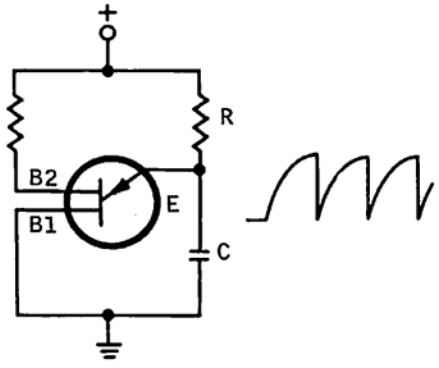
Ed Thompson assists RCM's Editor during construction of prototype transmitter.





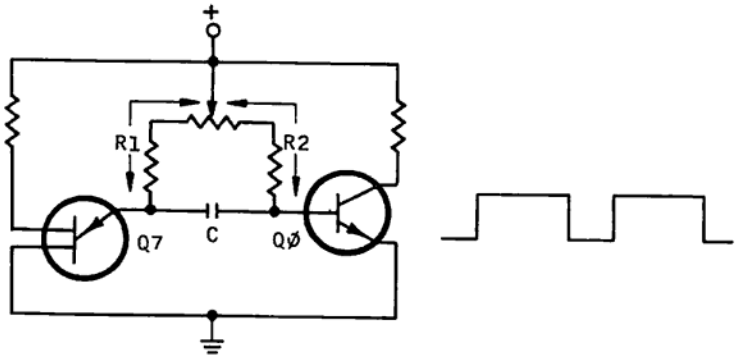
VARIABLE PULSE WIDTH HALF SHOTS 1 - 2MS

CLASSIC XMTR BLOCK DIAGRAM



UJT OSC

FIG. 1

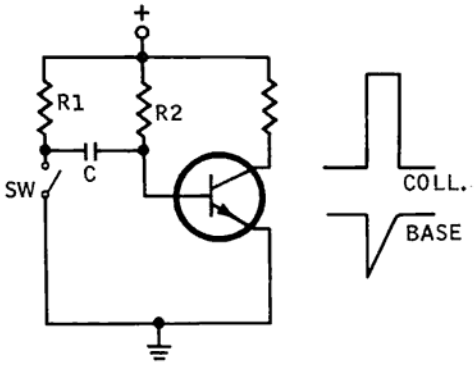


UJT CLOCK

FIG. 2

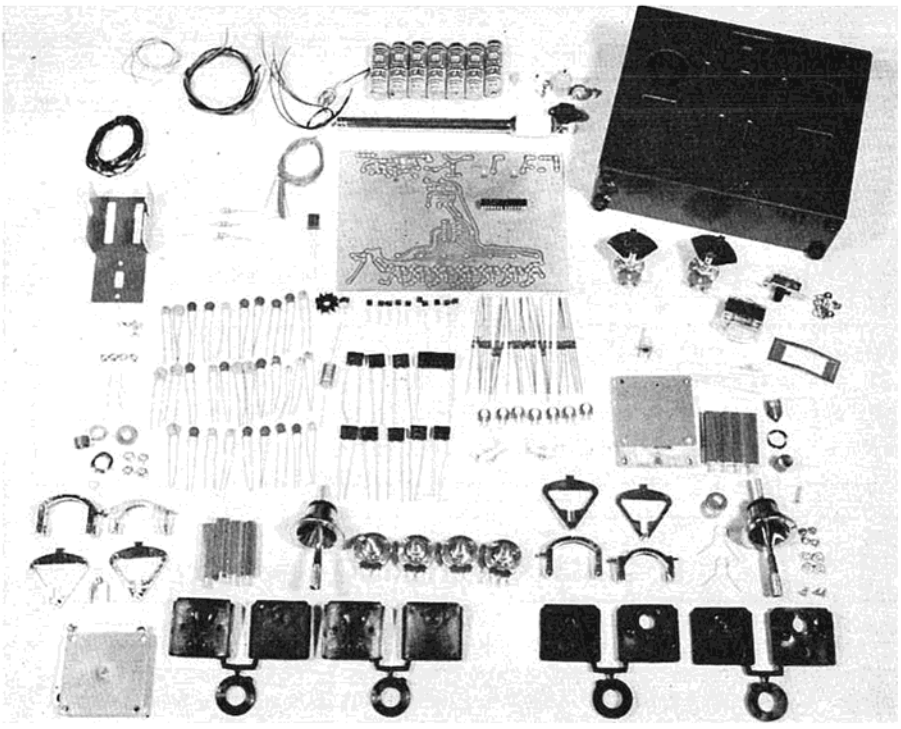
resistor and capacitor. Figure 2 shows the UJT coupled with an NPN to form a free-running multivibrator. The base emitter junction of Q0 is now in the charging path of C and R1 determines the charging time. The discharge path for C now includes R2 which lengthens the discharge time. By varying the ratio of R1/R2 we can vary the on/off time of the circuit. By amplifying the voltage excursions through C, with Q0, the waveform is squared at the collector.

A basic half shot is shown in Fig 3. The transistor is forward biased by R2 and provides a path to ground for C to charge. With the switch open, C is charged through R1 to the supply voltage. When the switch is closed the capacitor supplies a negative pulse to the base of the transistor, reverse biasing the base-emitter junction, and the transistor cuts off. C starts charging through R2 and the negative voltage at the transistor base decays until the transistor is again forward biased and the transistor saturates. The collector of the transistor rises positive during the cut-off period producing a nearly square pulse. The pulse width is determined by the time constant of R2 and C. In figure 4 R1 is a potentiometer and provides a variable voltage discharge pulse. This allows width control of the output pulse. The closer the arm of the pot is to ground when Sw is closed the larger the voltage of the negative pulse produced at the base of the transistor. The larger the negative pulse voltage the longer the time required for R2 to bring the base voltage back to the forward bias voltage. Hence the closer R1's wiper to ground the longer the transistor stays cut off and the wider the output pulse at the collector. Conversely, the closer the wiper to positive voltage the shorter the time the transistor is cut off and the narrower the pulse width at the collector. By adding a control lever/stick to the pot shaft and providing

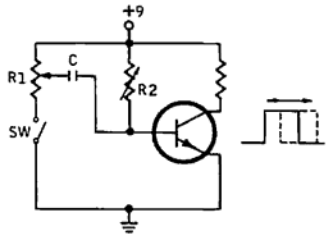


HALF SHOT

FIG. 3



All Classic transmitter parts for Micro stick version shown.

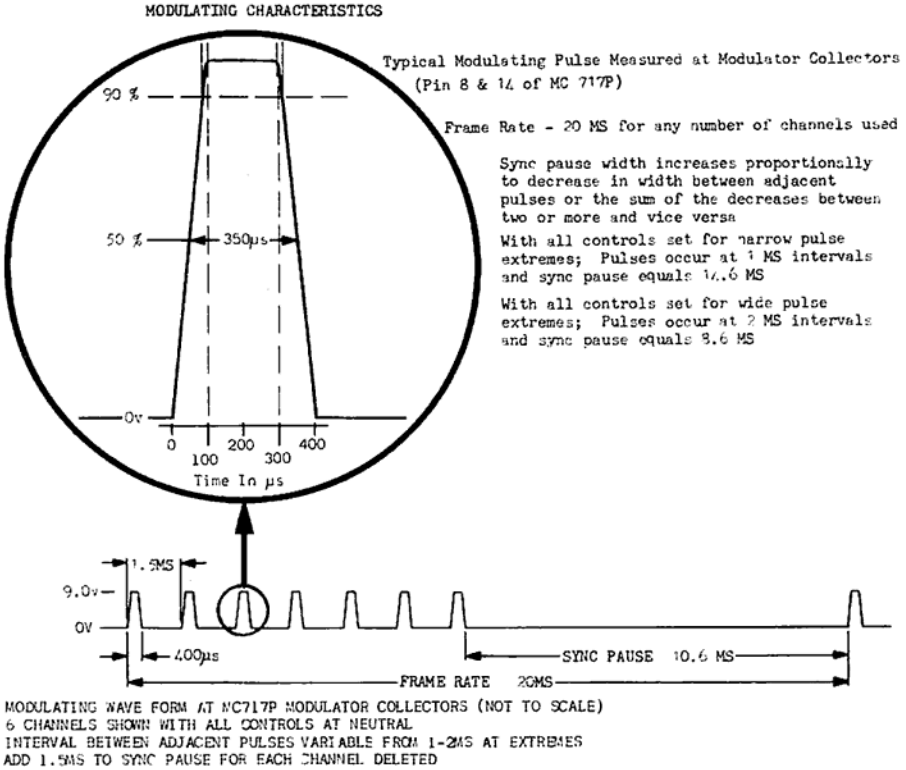


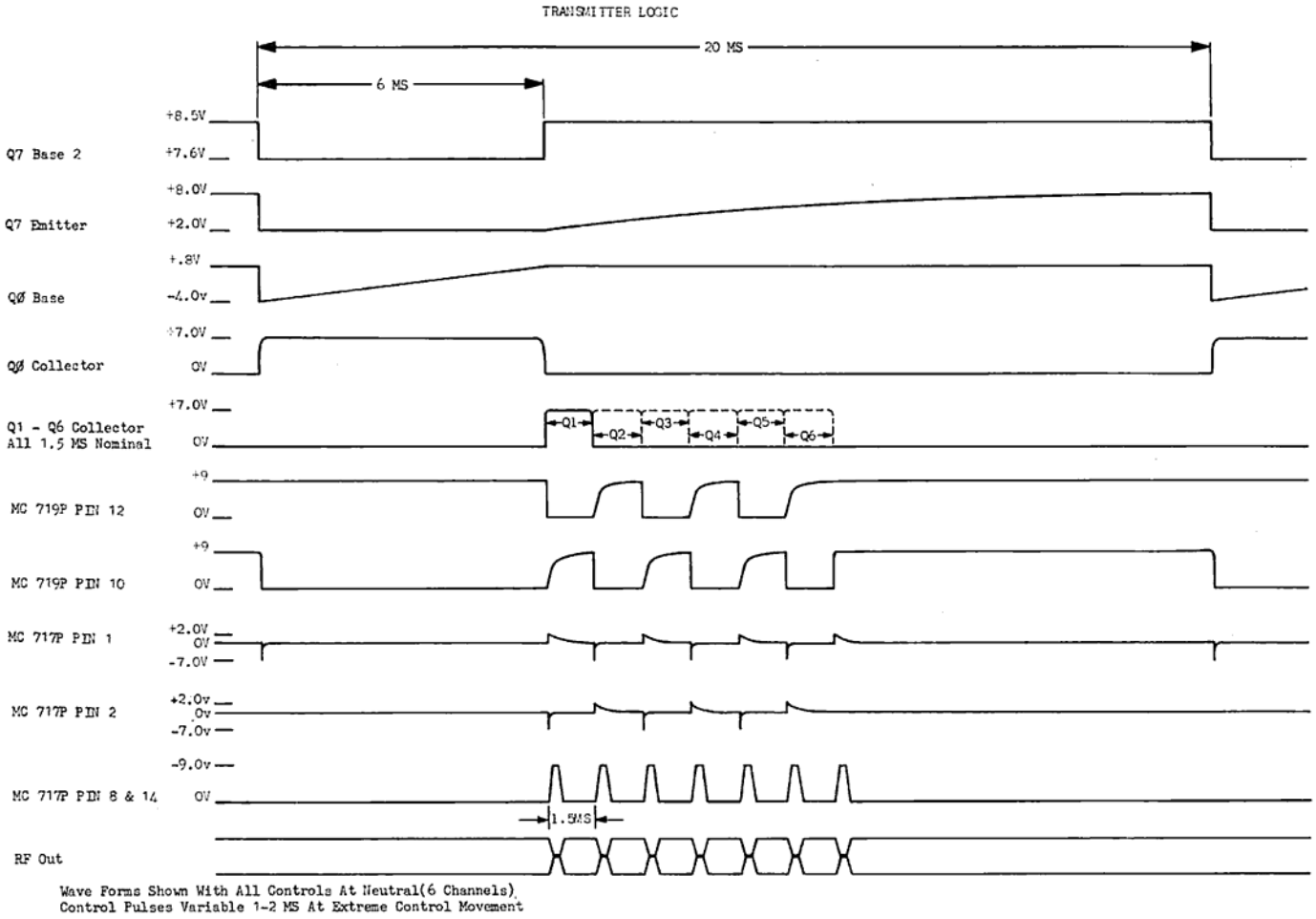
VARIABLE HALF SHOT
FIG. 4

mechanical stops in both directions we can produce a controllable and variable pulse width output. The resistance of R2 determines the pulse width for a given setting of R1 with C being a fixed value. By now it should be evident that many variables have to be "pinned" down before we can put the circuit to practical use. The control stick mechanical throw is a constant because we will use commercial sticks. The value of C is chosen to allow a reasonable value for R2. If C is .047 mfd and R2 is 175K the time constant is approximately 8 MS (T=RC). If we set the control pot wiper to 6.7V with the switch closed, then open the switch to charge C, we will produce a 2.3V negative pulse at the base of the transistor when the switch is again closed (9V-6.7V). This cuts off the transistor and R2 starts charging C again toward the supply voltage. When we reach approximately .6V the transistor will again conduct. With the supply voltage +9V and the peak negative pulse voltage negative 2.3, 11.3V exists across the capacitor. It will take 8 MS to charge the capacitor 63% (One time constant) toward the supply voltage. Since we have negative 2.3 and 63% of 11.3 is approximately 7.12 the voltage after 8 MS would be approximately 4.8V. However the transistor will be in conduction long before we reach this voltage. It will conduct at approximately .6V or when the charge has risen 2.9V. 2.9V is approximately 25% of 11.3V and if the charge were linear the transistor would conduct again 2 MS after the switch was closed. However the charge curve is expotential and the pulse will be somewhat shorter or for our purposes in the "ball park" and can be adjusted to 1.5 MS with minor adjustment during scope alignment.

If we spring load the stick/lever attached to the pot shaft so it is in the center of the stick assembly's mechanical throw we will have a 1 to 2 MS variable pulse with a 1.5 MS pulse at center position. That sounds good so far but it's not exactly true yet. We have to consider the voltage change caused by the mechanical turning of the pot shaft. We can convert the total mechanical stick throw angle into pot shaft rotation angle. The pots we are using have a stated resistance value distributed over a specified number of degrees of total shaft movement. By computing the voltages necessary for 1 and 2 MS, similar to the calculations we just completed, we can select a pot resistance to provide the proper voltage changes (in our case 5K). Since the stick has equal mechanical throw on either side our center-pulse width is automatically 1.5 MS, if we meet the extreme pulse widths.

We're almost ready to stamp the half-shots with our approval but let's consider one more thing — the initial charge time of the capacitor before we discharge in into the transistor base. Once the switch is closed and an output pulse occurs C must be charged again before another pulse can be produced. Opening the switch will allow C to charge through that portion of R1 above the wiper. To insure that C is fully charged before each pulse is initiated the switch must remain open for 5 time constants of the portion of R1 above the wiper and C. The worst case condition would be with the wiper set at center or 2.5K (the wiper is always above the center position). The time constant of 2.5K and .047 ufd is approximately .12 MS. Multiplying by 5 dictates that the switch must be open for a minimum of approximately .6 MS between pulses. This requirement is satisfied in the transmitter as the minimum charge time is 1 MS. The schematic shows replacement of the switch by Q0 through Q6 (Q6





is the last stage and merely acts as an amplifier). A pulse output is taken from each collector via R8 and applied to IC1. C2 and C3 are used to bypass any RF picked up by the pot leads which could cause spurious triggering of the half-shots. The transmitter logic waveforms show how the encoder is commutated. The UJT initiates each pulse train when Q0 conducts. This causes Q1 to cut off for a period determined by the setting of R5 going to Q0's collector. When Q1 conducts again it causes Q2 to cut off for a period determined by the setting of R5 going to Q1's collector, etc., etc., until Q6 has produced its pulse. This cuts-off the modulator amplifiers which are normally conducting due to forward bias via R12 from the normally positive output of pin #3. This turns off the RF driver stage with a modulation pulse. C7, C8 and R12 primarily determine the modulation pulse characteristics. Going back to Q0 conducting to start the pulse train . . . when Q0 conducts Q1 turns off — this sets up the first 4-input gate to cause a modulation pulse, when it turns on again 1-2 MS later, similar to the modulation pulse initiated by Q0. The even-numbered encoder pulses are applied to the second 4-input gate and the odd encoder pulses are applied to the first 4-input gate. If wired, otherwise the pulses from adjacent half-shots would inhibit the rise and fall of gate-output potential which is necessary for proper operation. After initiation of the pulse train by Q0 the dual 4-input gates cause alternate modulation pulses until the encoder completes the pulse train. This action is repeated every 20 MS by the UJT clock.

Q8 and associated circuitry make up the crystal oscillator circuit which drives Q9. Q9 is turned off by the modulator amplifier portion of IC2 at a rate determined by the encoder for "intelligence" transfer to the receiving equipment. L1 is tapped to provide impedance matching to the power amplifier. Q10 is the RF power amplifier and is impedance matched to the antenna by a double Pi tuning network. The double Pi network consists of C21, C22, C23, C24, L2 and L3. This network, the centerloaded antenna and selection of a premium transistor for Q10, is mainly responsible for the excellent power efficiency and low harmonic content of the transmitter. The RF section will deliver more effective radiated power from the 7 nickel cadmium cells used than most commercial systems with 8 and 10 cells, and do it with better efficiency. The RF monitor consists of a meter and rectifying circuit to convert the RF present at the base of the antenna into a visual indication of relative power output. NEXT MONTH — PART II: CONSTRUCTING THE TRANSMITTER.

Although premature, I am including instructions for assembling the Bonner stick this month. Jack Albrecht and Ed Means of Colorado Springs teamed up on text and photos.

ASSEMBLY INSTRUCTIONS FOR BONNER STICK

Refer to Photographs

1) Complete Bonner kit of parts for throttle/rudder stick assembly.

2) Insert control stick into main housing from the rear, place stick retainer plate over ball assembly and fasten in place with the four #4¼" PK screws. Tighten for snug fit, however insure that stick moves free in the socket.

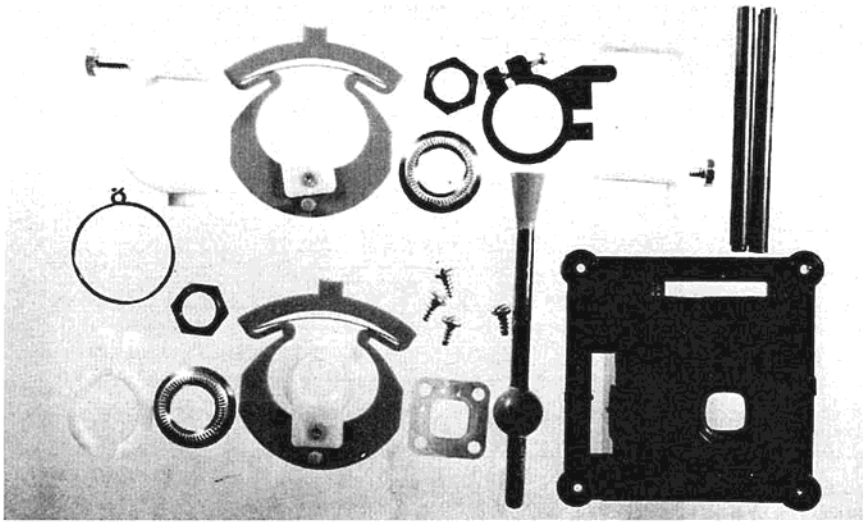
3) Install pot in Trim Lever Ass'y. The nylon pin on the Trim Lever Ass'y. must be on same side as the pot shaft. Install pot bearing on pot shaft with the flange towards the pot shaft. Install pot nut so that it will fit inside of pot bearing and engage first three threads. Do not tighten. The centering spring and retainers are shown laying beside the assembly ready for the next installation.

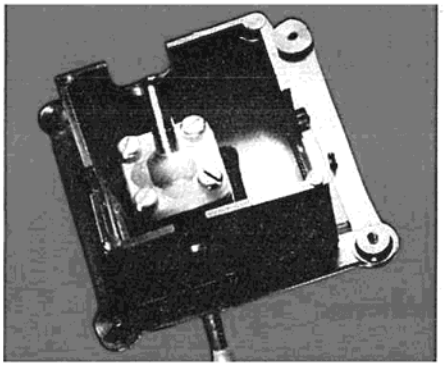
4) Place the centering spring with spring retainers around the pot bearing and engage the red nylon pin on the trim lever as shown between the spring retainers.

5) Install the inside gimbal (smallest) over the pot shaft, engaging the gimbal pin between the spring retainers. *Do not* tighten the pot shaft set screw at this time.

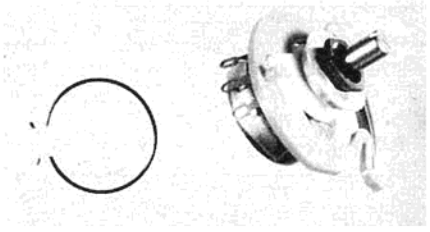
6) Insert the inside gimbal/trim lever assembly into the main housing. When properly assembled, the main housing slips in between the red trim lever and the white nylon spring retainers. Press the gimbal/pot/trim lever assembly in place insuring that the bronze spring is between the small black nylon pin at the front of the housing and the main housing. Tighten the pot nut with the spanner wrench at this time. Press down on the assembly while tightening pot nut to insure trim lever ratchet action.

7) Place the second pot through the remaining trim lever assembly as accomplished previously. Install pot bearing into

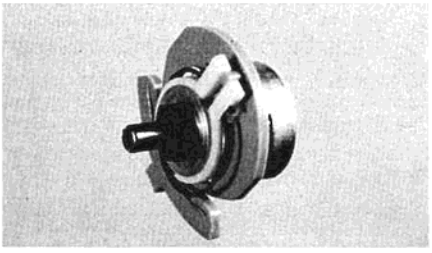


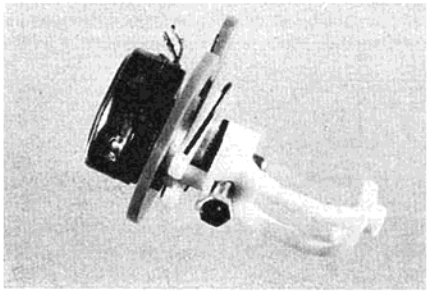


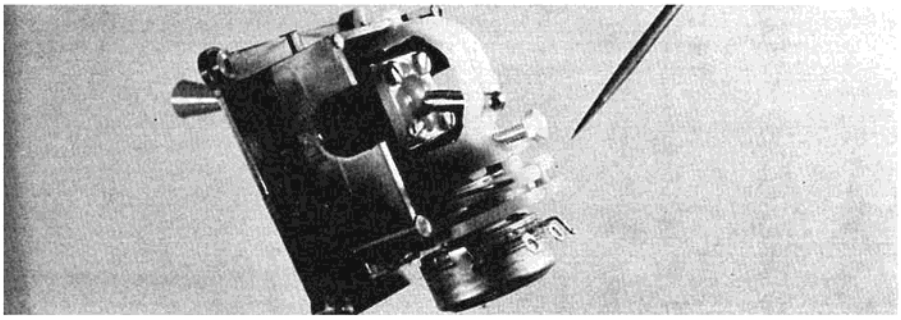
Left: Complete Bonner kit for throttle/rudder stick assembly. Above: Stick assembled in main housing with stick retainer in place.



Left: Pot installed in trim lever assembly with pot bearing and pot nut in place. Centering spring and retainer along side. Right: Centering spring retainer and spring installed on pot/trim lever assembly.





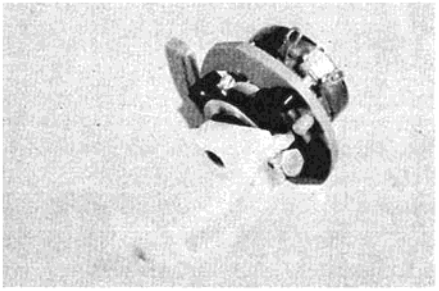


Above, left: Inside gimbal (smallest) installed on pot shaft with trim lever assembly. Above, right: Inside gimbal and trim lever/pot assembly installed in main housing. Pointer indicates engagement of gimbal with trim lever assembly pin.

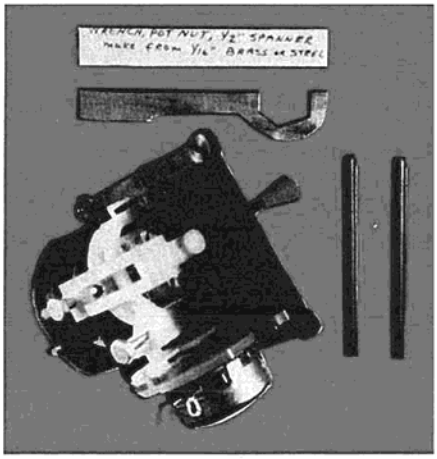
throttle control brake assembly as shown, and place over pot shaft. Install pot nut as accomplished previously. Install outside gimbal (largest) over the pot shaft, engaging the pin in the slot of the throttle control brake as shown. Do not tighten brake set screw on pot shaft set screw at this time.

8) Insert the outside (largest) gimbal/trim lever/pot assembly into the main housing. The main housing slips in between the red trim lever and the throttle control brake assembly. Press the assembly into place engaging the stick into the gimbal. Insure that the bronze spring in the trim lever is between the small black pin and the housing case as accomplished previously. Press the trim lever/gimbal/pot assembly firmly down and hold in place while tightening the pot nut with the spanner wrench. Tighten the set screw in the throttle control brake assembly for desired drag on throttle stick action. The pot alignment will be accomplished in the transmitter assembly and final checkout, therefore the pot shaft set screws will not be tightened at this time.

PARTS LIST FOR BONNER STICK ASSEMBLY



Above: Throttle control brake assembly installed on pot/trim lever assembly with outside gimbal (largest) in place. Right: Completed Bonner stick. Note Spanner wrench for pot nut.



Main Housing	1 each
Control Stick	1 each
Stick Retainer Plate	1 each
#4¼" PK Screws	4 each
Trim Lever Ass'y. W/Bronze Spring	2 each
Pot Bearings	2 each
Pot Nut	2 each
*Centering Spring Retainers	2 each
*Centering Spring	1 each
Inside Gimbal (Smallest)	1 each
**Throttle Control Brake Assembly	1 each
Outside Gimbal (Largest)	1 each
Mounting Posts	2 each

*One set of two retainers and springs used for rudder/throttle stick assembly.

**Only one used with throttle stick assembly. A centering spring with retainers is used in lieu of the brake assembly on the aileron/elevator control stick version.

NATIONAL MINIATURE PYLON RACING ASSOCIATION

N.M.P.R.A.

613 DONNER • LAS VEGAS, NEVADA 89107

By Joe Bridi **Photos by Dick Tichenor**

The Universal City Studios invitational Formula I race, a combined Goodyear contest and public relations effort on the part of the West Coast's top racing pilots, was one of the best represented that has been seen since the 1967 Nationals. The two day event, held December 16-17, was well organized, with several thousand spectators in paid attendance. The crashes were numerous, due primarily to the somewhat restricted flying site, and although this definitely added to the spectator interest, it was not planned that way by either the organizing committee or Cliff Weirick, the Contest Director.

It was cold by Southern California standards — approximately 45 degrees in the morning, and rising to a maximum of 60 later in the day. The wind direction changed several times, adding another hazard to the ever present obstacles — trees, cement parking wheel bumpers, curbs, cliffs, downhill landings, to name just a few! As an example, on one occasion, I landed and the model rolled out of sight — downhill! The flying field had a rise in its center, and you would have to run to the center to see the model roll!

During the first day of flying, we lost at least 40% of the models. The second day's casualty list added another 40%. At the end of two days of continuous Goodyear races there were six or seven flyable models left, and even those needed some form of repair from hitting curbs, etc. In addition, there were two mid-air crashes — Nelson and Oddino and Martin and Francis. Chuck Hayes hit a pylon on one of his turns.

One of the experimental facets of the meet was the use of 11/5 props to see if the speeds could be reduced without imparing the racing or handling abilities of the Goodyear aircraft. The following quotes concerning this experiment are from some of the pilots entered in the Universal Studios event:

Larry Leonard: "It helped slow them down a little."

Phil Kraft: "Much safer — use stock engines and carburetor."

Cliff Weirick: "A step in the right direction."

Joe Martin: "It'll work this way."

Chuck Hayes: "I don't think there's anything wrong with them."

Jimmy Witt: "Okay — make everything equal for everyone, limit carburetor diameter."

George Killeen: "Slowed down speed but harder to fly."

Joe Foster: "Terrible. Limit carburetor hole diameter instead."

Bob Francis: "Use small props."

Jerry Nelson: "The big props don't hurt your finger as much when starting!"

Upton-Grabon: "Better to use small props, (larger ones) changes flight too much."

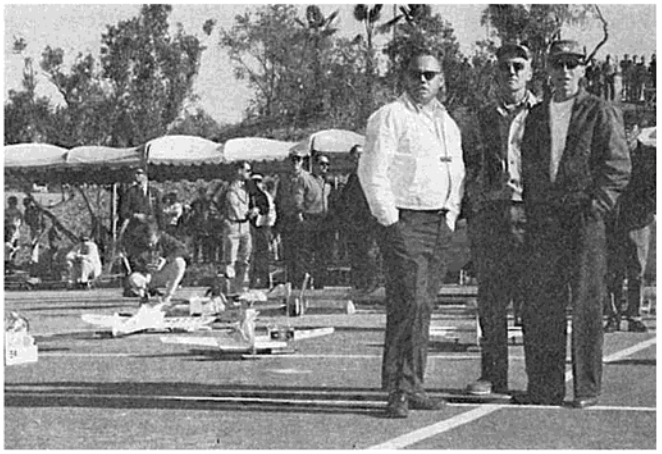
Jim Oddino: "Leave the rules alone."

There you have it — in a few words — what the leading fliers think. My own comments are that the majority seemed to prefer the carburetor hole diameter restriction. The larger props seemed to work almost as well — the engines were easier to start at the flight line. The slower planes were faster and the faster ones a little slower.

These were some of the times that were clocked using larger props: Foster, 2:07; Williams, 2:11; Bridi, 2:13; Kraft, 2:35; Killeen, 2:37; Francis, 2:40; Phillips, 2:48; Witt, 2:52; Oddino, 2:57; Nelson, 2:57; Capon, 2:58.

The final outcome of the "Destruction Derby": First — Joe Foster, 32 points; Second — Joe Bridi, 29 points; Third — George Killeen, 27 points; Fourth — Granger Williams, 26 points; Fifth — Jerry Nelson, 23 points.

I'm going to leave you now and repair that hole on the bottom of my wing!



Woody Blanchard, former A.M.A. Grand National Champion, with newest design. Details in text.

C-VUES

Introducing a new monthly feature by

Ben Herman & Jack Capehart

THIS being the opening column of "C-Vues," we were hoping to discuss the new AMA class C pattern event. However, this column is being written in the early part of December, 1967, and as yet we have not received enough information on the new rules to warrant such a discussion. Nevertheless, the powers that be at R/CM (would you believe, Don Dewey) faithfully promise to forward same if they receive any advance information.

Therefore, in view of the above, this presents an excellent opportunity to discuss some of the letters we have received pertaining to our previous series on aerodynamics. The first one that we would like to comment on is from Tan Francisco (no, it is not San, but Tan), from Tondo, Manilla in the Phillipine Islands and Tan, we're sorry for being so late. Tan points out, in agreement with statements made earlier in our previous series, that the drag induced torque on a high winger tends to make the plane climb, while that on a low winger should make it dive. As Tan points out, the upward torque on high wingers is normally balanced by downthrust in the engine and he concludes that low-wingers, therefore, should have upthrust. He then points out that most current low-wingers are "zeroed" out, or even have some downthrust. He also points out that Maynard Hill's Tortoise, which set the world's R/C speed record, was a high winger and was also zeroed out. These seemingly contradictory facts have bothered Tan and he would like to get our ideas on this.

Well Tan, we agree that these facts might be somewhat confusing and we'll try to clear the air for you. The drag induced torque. This up trim is in addition to the location of the center of drag with respect to the CG are indeed present and must be compensated for. Up or down thrust is just one way to do this, but by no means the only way. The most common way in low-wingers today is to simply add some up elevator trim, which gives a nose up torque to balance the nose down drag induced torque. This up trim is an addition to the normal up trim required to produce the necessary lift in a zeroed out symmetrical wing. This may seem, to some people, to be a rather reprehensible way to go about it (Ed Kasmirski recommends adjusting the wing incidence rather than adding elevator trim), but a little thought will indicate that this zeroed out setup, using elevator trim as required should produce the most nearly uniform results for upright or inverted flight. This same force arrangement could also be used on high-wingers; that is, we could use zero-engine thrust and throw in a little down trim. We feel that downthrust is normally employed in high wingers rather than this latter arrangement (notable exceptions are the current Class I contest bombs which employ up-thrust) simply because this is the way high wingers had to be balanced in the old rudder only days before elevator control was available, but today of course, with multi-channel control, this is no longer necessary.

Another way to produce the compensating torque is by shifting the location of the CG. If you will recall in our aerodynamics discussion we showed that the CG is normally placed ahead of the center of pressure for stability reasons. This setup produces a diving torque. By shifting the CG forward or backward we may vary this torque. Thus, in the case of high wingers, the drag induced torque may be balanced by shifting the CG farther forward than normal, while in the low winger, we might even get away with placing the CG slightly **behind** the center of pressure, the looping torque thus induced being balanced by the drag on the low wing. In both cases however, we must be careful in exceeding the normal 25-33⅓% CG placement for control or stability reasons, as previously discussed. Thus Tan, there are other ways to balance the drag induced torques besides engine thrust.

Finally Tan, with regards to Maynard Hill's Tortoise, although it is a high winger that is zeroed out, you will note that Maynard has used a lifting airfoil stabilizer, and apparently a rather high lifting section at that. Although our drawings of this design (from Flying Models) doesn't list the sections (Maynard, do you also use your shoe soles?) it would appear from the drawings that the tail section is a higher lift section than the wing section. Thus, this is another, although less common, means of balancing the drag induced torque on a high winger. By the way, this drag torque, at 140.28 mph, must be quite strong since the drag increases roughly as the square of the speed. We don't know, but suspect this consideration is what led Maynard to utilize such a stab section. We might point out that lifting stabs should not be utilized without careful consideration of the aerodynamics involved. A good example, of not carefully considering the aerodynamics was Sterling's Mambo Special. This design utilizes a lifting stab section, and if built according to the original plans, would not get off the ground and if hand launched, it was a disaster on its way to happening. As it picked up speed, the lifting stab slowly took over, with the 100 percent predictable results, which in many cases undoubtedly lost another newcomer to the hobby. Although this defect has since been corrected, we wonder why the kit was produced for over a year before this was pointed out to Sterling.

There are lots of other less obvious ways in which the trim of an airplane can be effected. Our favorite punching bag, the Kwik-Fli II, is a good example here. We stumbled upon this one strictly by accident. If you will note, the plans call for positive incidence in the wing. One of us (initials BH) operates under the theory that 0-0 is always the best set-up, which in this case resulted in what must have been the world's worst Kwik-Fli II. This plane was modified to a zeroed out set-up, and on its first take-off run gave every indication of being

(Continued on Page 37)

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a real ground lover. After breaking ground, easing off on the stick resulted in as near a disaster as possible, without disaster actually occurring. Even full up trim proved inadequate on this first flight. The eventual trimmed out condition proved to require about 10 or 15 degrees of up elevator.

This plane was checked carefully prior to its initial flight, and had the proper balance point as well as a carefully checked zero-zero setup, subsequently rechecked with the second author supervising (he couldn't believe it). While zero-zero setups with symmetrical wing sections always require some up-trim, this one was unbelievable. It was obvious that taking out the positive incidence in the wing was the culprit, but why? After a careful study of anything we could think of (which for us isn't very much), we have concluded, at least until someone shows us something better, that the problem lies in the side elevation of the fuselage. Take a close look at the side view of one at the next opportunity. Oddly enough, it's almost a perfect Clark y airfoil, inverted that is. This negative lifting fuselage is what we feel to be the cause of the required positive incidence in the wing, or the excessive up elevator in the absence of wing incidence. It is possible that this "airfoiled" fuselage also creates additional drag causing this design to be slower than most comparably sized models. This, however, does not seem to detract from its aerobatic performance, as the records show, particularly in the case of its designer. Perhaps it is because Phil flies a more compact pattern as compared to, say Ted White.

Another complicating factor is weight variations among different models of the same design, particularly when the design calls for positive incidence in the wing. We can give another example of this from personal experience. One of our favorite designs has always been Ted White's E1 Gringo, which, in the hands of an accomplished flier like Ted, makes a combination that is hard to beat. Ted's planes normally come out in the 8 to 9 lb. class and the design calls for positive incidence in the wing. This set up obviously works well for Ted's planes, but Capehart built one which came out about 6 pounds (he took so long to build it we think that the balsa wood completely dehydrated). This one proved to require considerable down-trim (about 5°) to fly straight and level. Obviously, the lighter air frame required less lift to maintain level flight, and Ted's positive incidence was simply too much for this lighter model. This incidence has subsequently been taken out so that level flight is maintained with the elevator in neutral. The point of all this is that it is impossible to give one force set up that can work over such a broad range of variables as are likely to be encountered when hundreds, or even thousands of modelers build the same design. What worked well for the original designer may require considerable modification for each individual builder.

While still on the general subject of trim

SHOP & FIELD

DON DEWEY
Editor

●

KATHLEEN ACTON
Assistant Editor

FUNDAMENTALS OF R/C ● PRODUCT REPORTS ● HINTS AND KINKS

DUE to the time involved in moving to the new R/CM building, we were unable to prepare our regular Shop & Field column in time for this month's issue. In lieu of this, we'd like to present some ideas from a few of our readers which we think you'll find helpful on future projects.

●

Joe Ziomek submitted the artwork and details on what we feel is one of the finest hinges yet developed. Along with the artwork were two sample control surfaces, hinged per his instructions. We were invited to pull the hinges apart — if we could. We couldn't! The balsa broke, but the hinges held!

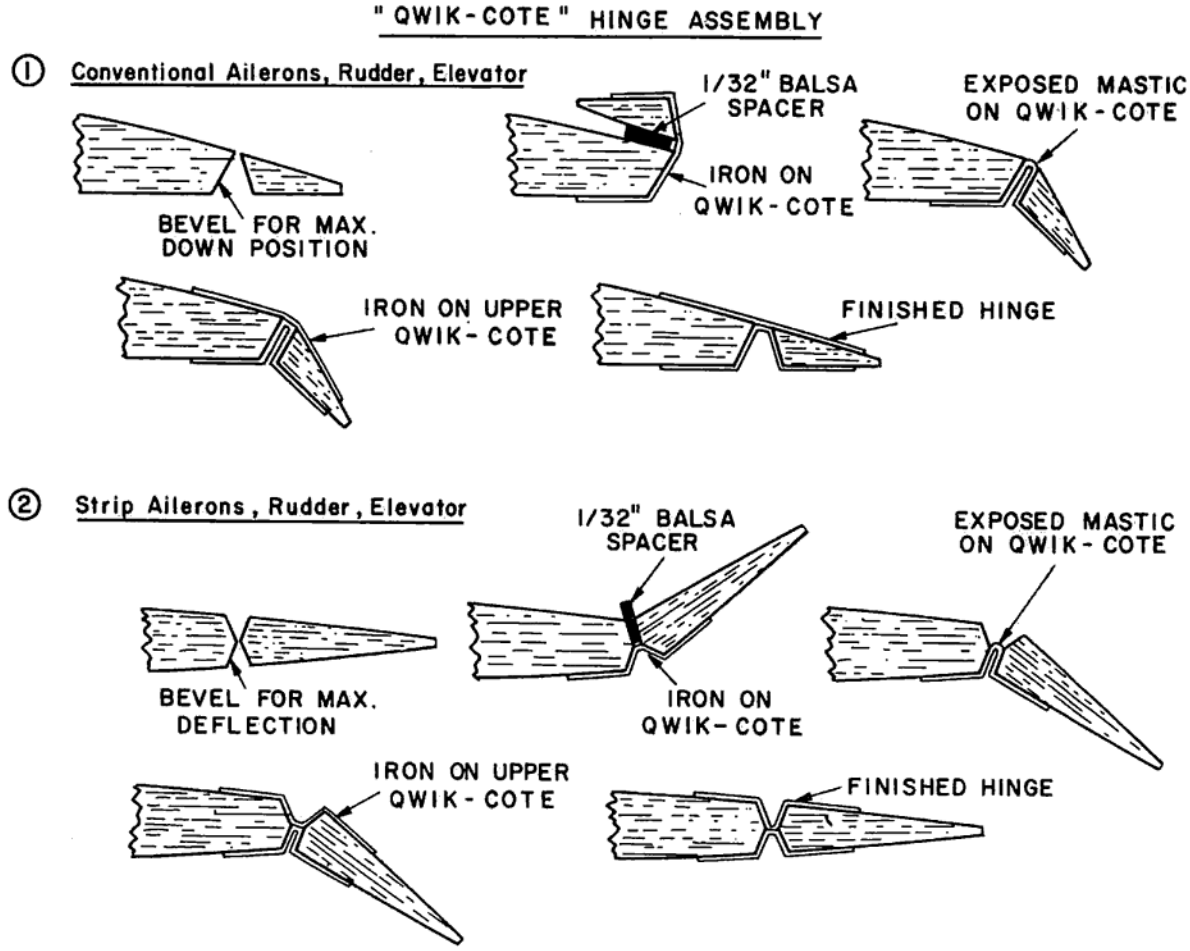
Either Qwik-Cote or Super MonoKote can be used for this process. The regular MonoKote is not recommended for this purpose since the latter has a sticky external adhesive and is, consequently, thicker and more difficult to handle in this application.

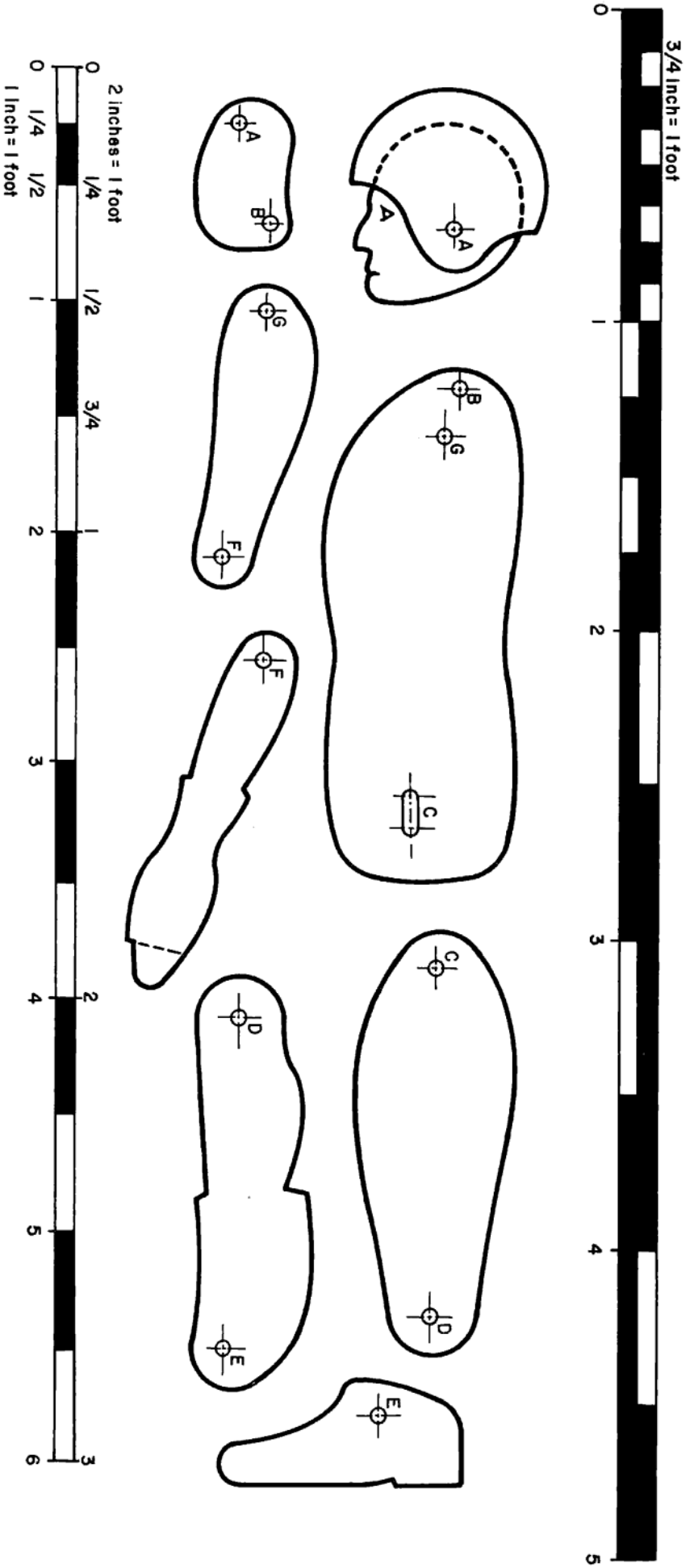
These hinges are self-aligning, inexpensive, quick, and provide for low leakage across the control surface. They are suitable for pulse proportional as well as the larger ships since they are very flexible and offer no binding of any kind. Two seasons of flying with these hinges have proved their superiority. Try them!

●

The cockpit area of Gus Morfis' last scale design gave him a lot of trouble. No matter how hard he tried, he couldn't seem to get the panel and the pilot's seat to "look right." Once, however, he realized that his basic proportions were "off." the problem quickly reduced in magnitude. It was simply a case of "if the real plane had a real man sitting so that he could look out of the canopy without hitting his head, where would the control stick, rudder pedals, control panel, throttle quadrant, and pilot's seat **have** to be?"

Gus's model was being designed to 1½" to the foot scale so what he needed was a scale pilot to this scale. The Air Force has a standard dummy which they use to check out equipment arrangement, and which engineers can use to lay out cockpit components in the most efficient manner. The drawing provided by Gus simplifies the standard Air Force dummy a bit, but not where it counts. The parts are shown full size for 1½" = 1" scale, but he has included conversion scales for ¾" =1',





1″ = 1′, and 2″ = 1′ scales. The patterns should be used to transfer the dummy to thin plastic, cardboard, or plywood, fixing the joints so they will pivot. This allows the dummy to be "bent" around to fit the cockpit area as required. Designers of scale models will find this dummy quite useful when they are laying out their cockpit area. Goodyear designers will find the dummy equally helpful in order to lay out their fuselages with an idea toward maintaining scale-like appearance.

●

From the Port Arthur R/C Club (Oily Birds) Squawk Sheet, comes an idea for a "scale" pilot. First, you locate some neighborhood urchin, or perhaps one of your own, who has a Mattel Thingmaker set. Bribe him with a few well placed "love pats." Next, find a Creeple Peeple set to use in the Thingmaker. Then you find the mold that matches the face of your favorite Contest Director, and using a color to match his humor, mold his head. There are several sizes of heads and many colors to pick from, and you can even make polka dotted or striped heads to match the model. They are designed to mount on a pencil, but a dowel, cemented in to the fuselage, should do as well.

Be sure to tell your Jolly CD that it is his head in the model. This will guarantee a 0 on the best 10 point maneuver you ever do. It's the little, finer points like this that will turn you into a consistent loser. . . .

●

John Dobner suggests the use of the fiberglass battens used on Star class sailboats as light, tough, and inexpensive wing spars. A breakaway wing, using 2″ wide Rand fiberglass matte reinforcing strip to secure the four wing sections, (two each side) to the battens can be employed. A direct Nyrod aileron connection with the servo in the fuselage can be utilized for this "sandwich."

●

Here's several hints from the Garden Grove R/C Club, Inc. "Hangar Talk:" The loosening of Enya .60 cylinder head screws can be stopped by running a 6-32 tap into the present holes and using a socket head screw.

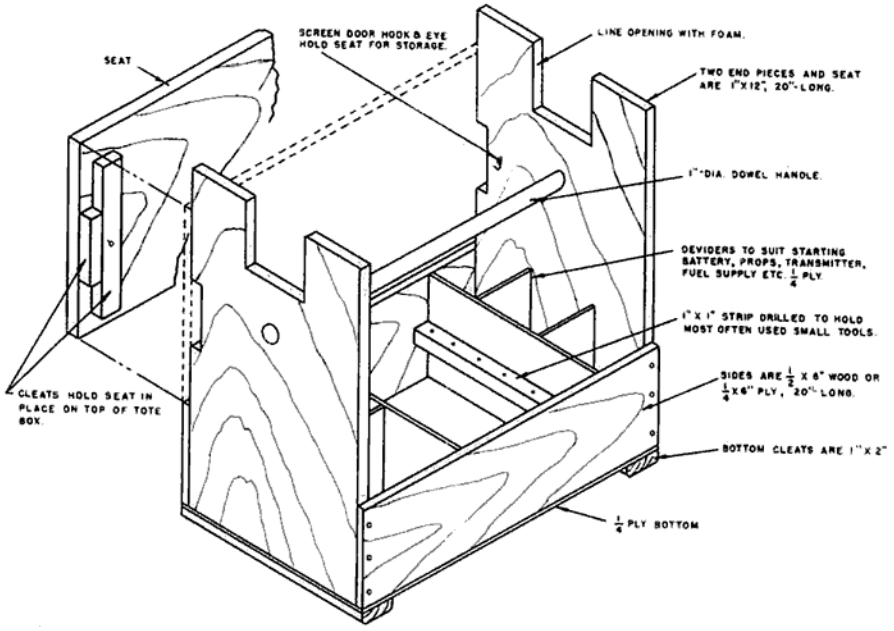
3/16″ piano wire can be bent like cheese (?) if you clamp it in a vise and use an old .22 rifle barrel as a bending tool.

Toenail (not fingernail) clippers nip off plastic or nylon hinge dowels completely flush.

Canopies can be secured neatly by positioning the canopy with a piece of masking tape over the top, and then brushing several thin coats of clear Ambroid thinned with acetone around the bottom edge.

●

Harold Vanellas sent in the sketch of the combination field box and pilot seat. Harold mentioned that at their particular flying field it is necessary to park their cars almost a block from the take off strip. Thus, it is helpful if they can carry all of their required gear in one trip. And, since a flyer is not in the air all the time, he needs a place to sit between flights. At many contests, fliers loll around in folding chairs and chaise lounges, but these are not practical in the pit area. Without chairs, the most available place is the ground — which, in many instances, is cold and damp. Harold commented on the fact that he is at



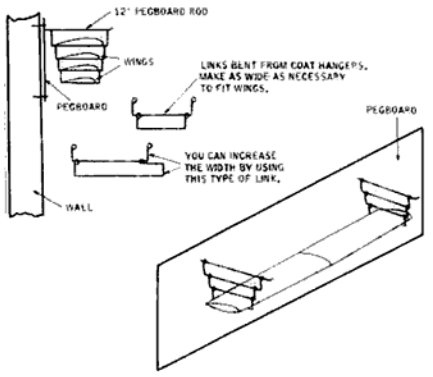
the age where you "don't stand when you can sit, and don't sit when you can lie down," thus the evolution of the field box with built-in seat. The drawing is self explanatory, the seat board stowed on the side of the box when not in use, and place on top of the end plates for a convenient place to sit between flights.

●

Clark Ross submitted the sketch of a device he has used for operating elevons on deltas as well as ruddervators on "V" tailed gliders. The sketch is self-explanatory, and falls into the category of "how come I didn't think of that?"

●

Stan Andrews, of the Centreville Cadets R/C Club, suggests the simple and inexpensive method of storing a number of model wings in an out-of-the-way place. Bent coathangers provide the basic material for constructing the wing rack. These are straightened out, and depending on the size of your wings, pieces from 16" to 24" are cut off. A loop is made on each end of these pieces (be sure to make matching pairs since there are two "chains" to be made of these links), and then a 90 degree bend is made approximately three inches in from each end. By making the lengths progressively smaller, or larger, depending on whether you want your larger wings



on the top or bottom, a chain of the links can be fashioned. To attach these units to the wall, use pegboard and two 12" pegboard rods at the top on which to hang the links. Stan places his links about three feet apart, the wings sliding into these links, which act like shelves. These links can also be hung from the ceiling by using eye hooks.

●

Do you have problems straightening out Nyrod? Bob Barnes suggests putting music wire through the outer portion and brass tubing over the inner part. Put both in a stove at 200 degrees for thirty minutes. You'll find, upon cooling, that the Nyrod is almost perfectly straight.

●

From the Whirlwinds "Breeze" comes a method for taking warps out of foam wings. According to Andy Lukaszewski, it is very easy to build in a warp — his particular foam wing having a warp starting about one third of the distance out from the center and progressing to the wing tip in a direction that would give a left turn. Andy was on the verge of destroying the "useless" thing when out of sheer desperation he decided to ignore the claims that foam wings were impossible to straighten out. Taking a wild guess he reasoned that heating the wing would increase flexibility. Naturally, the kitchen oven was the most likely place for this scientific endeavor, so he heated it to 250 degrees, then inserted the warped end of the wing. The wing was heated until the surface was almost too hot to hold. Don't overheat or your paint job might blister! The wing was then removed and while holding the center section, the tip was twisted opposite to the warp and

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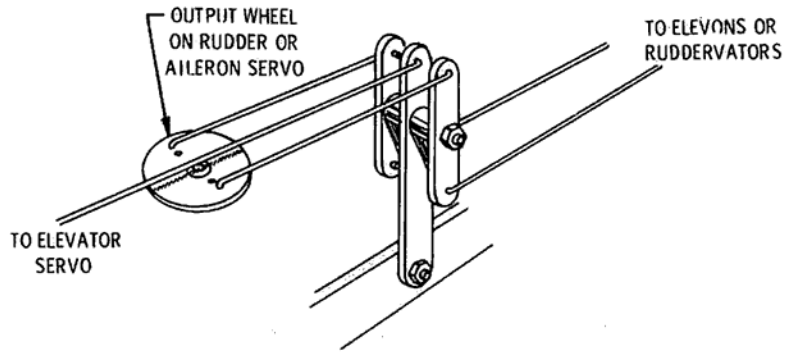
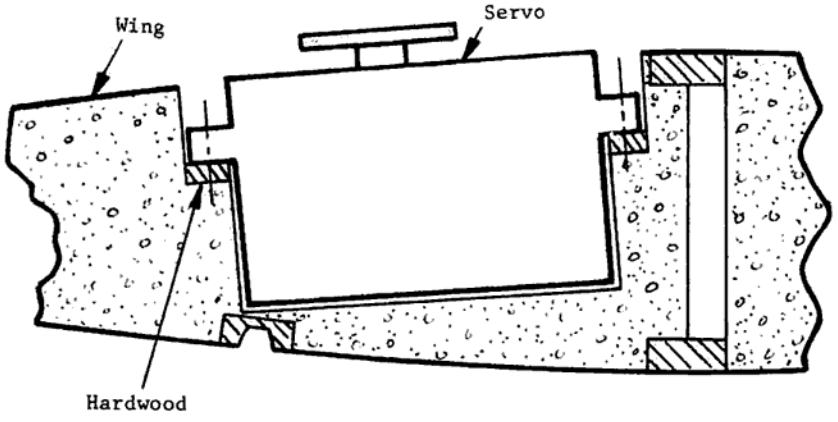
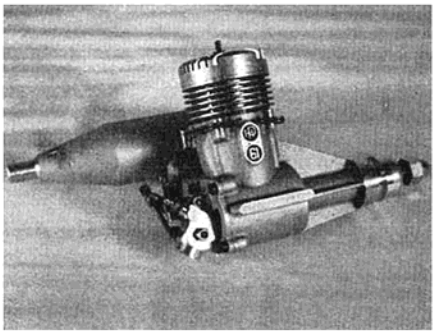


Ever wonder how to keep a landing gear fairing from turning and twisting? The Isthmian Buzzer-D (Isthmian R/C Club) suggests tin can stock soldered to the gear leg, inserted and glued into the slotted balsa or hardwood gear fairings, then the entire unit silk covered and painted.

●





THE H. P. 61

DURING the course of the past year, R/CM has received numerous comments from Europe concerning the development of an engine which was rumored to surpass, in pure power, any large bore engine on the market today. Reports from our European correspondents indicated that the racing version of the prototype was developing as much as 2¼ H. P., and in boat racing, was lapping the fastest racing engines. The R/C version, with throttle, was, reportedly, one of the most powerful stunt engines ever produced.

The engine we are referring to is the HP 61, produced by the Austrian firm, Hirtenberger Patronen — Zundhutchen — und Metallwarenfabrik Aktiengesellshaft. Prototypes of the engine were forwarded to the recently appointed U. S. ditributors, Performance Aero Products, Inc., 4524 So. 34 St., Arlington, Va. 22206. A production sample was submitted to R/CM for test evaluation.

General Layout of the HP 61 G-RC

The engine has been designed for a specific power output of 200 B. H. P. per litre. This corresponds to a peak power rating of 2.0 B. H. P. For several reasons, e.g. fuel consumption, component life, throttleability and power requirement of average-weight models, the engine has been derated to 1.5 B. H. P. for R/C use. This had a beneficial effect on power output in the lower R. P. M. range and allows the use of larger propellers.

According to the power diagram, a 14" x 6" propeller is turned at 9.500 R. P. M., corresponding power output being 1.0 B. H. P.

Technical Background

Cylinder Head: This differs from most other makes by holding compression without any leaks. This is achieved by the long cylindrical part reaching deeply into the bore of the cylinder. The inner contour is trumpet-shaped and features a squish band.

Porting & Piston: The modified Schnuerle-type porting is "aimed." The incoming mixture is not directed by a combustion-efficiency decreasing baffle. Instead there are five specially designed transfer ports which direct the mixture in the required direction. This means highest possible volumetric efficiency as well as lowest gas flow friction losses. Silencer and porting are the product of common development. The flat-crown piston has two stepped rings.

Induction Timing Device: (Pat. No. 1290/66) The influx of the mixture into the crankcase is controlled by a bell-valve. The gas passage is short, straight and pointed right into the cylinder. The bell-valve is self-lubricating. Its friction losses are substantially less than those of a disc induction valve.

Carburetor: (Pat. applied for) The carburetor, friction mounted in the rear crankcase cover, renders possible exact turning of full speed and idle. This is achieved with one needle and two fixable screws. The gas flow in the venturi is not obstructed by a spraybar. The design of the carburetor pays special attention to good suction ability at all speeds (suction height at 2.500 R. P. M.: 20 ins.). The carburetor has only one fuel connection point.

Silencer: This is attached to the engine by two simple quick-release piano-wire clips. It substantially decreases fuel consumption, power output being only relatively little affected (12.000 R. P. M. on a Tornado Nylon 12 x 6 in.). Engine and silencer are mated to each other and the engine's efficiency is not adversly influenced.

Speed Version: Modification from R/C by merely changing carburetor. The speed carburetor is not throttleable, but can be optimally tuned in the air by R/C. In case of use for speed work the engine is operated with pressure tank, crankcase pressure being supplied via a pressure tap which can be fitted instead of one of the upper crankcase cover bolts.

TECHNICAL DATA FOR HP 61 G-RC

Bore: mm	24.5
Stroke: mm	21.0
Swept volume: ccm	9.89
Bore: Stroke	1.167
Bore weight: grams	455
Ball journal bearings	
front	⅜" x ⅞"
rear	12 x 28 mm
Compression ratio	1:9.5
Venturi diameter: mm	7.0 or 8.0
Max. power) with fuel #2	
B. H. P.	1.49 (15,000 R. P. M.)
Max. torque) on suction	
oz. in.	120.0 (8,600 R. P. M.)

Tested, Approved and Recommended by RCM

G-PAD

ONE of the most interesting and certainly one of the most needed, products to be introduced to the R/C industry, might have gone completely unnoticed if physical appearance were a criteria for evaluation. If handed a piece of G-Pad, without any further explanation, you would, upon a cursory examination, probably disclaim it as a rather innocuous appearing material that was incapable of serving any worthwhile function. Physically, it appears to be a severely stiff piece of plastic or rubber foam with some sort of backing material, and is a rather sickly shade of beige in color.

Technically, G-Pad is referred to as a closed cell, flexible, expanded, modified polyvinyl chloride material. Designed for use in the space industry, the material is intended to do three things exceptionally well: (1) To absorb shock (2) To insulate against heat and cold (3) To float.

Item number one — shock absorbtion — is its primary function insofar as our usage of G-Pad is concerned. Initial tests of the material for this purpose were literally phenomenal! A one inch thickness of G-Pad was laid on a concrete platform and **raw eggs** dropped on it from a height of **115 feet!** The eggs remained **intact,** without breaking or even cracking! If you're mathematically inclined, weigh a normal egg, then calculate the speed it would attain when dropped from this height, and estimate the force of the internal mass of the egg against the thin shell upon impact! Now, mentally, substitute your R/C receiver for that egg. . . .

As supplied to us, and as it will be available in our industry, G-Pad is provided in one-half inch thick pads, approximately 8" x 12" in size. Since seeing is believing, we couldn't resist trying the "egg test." And, since climbing the civic flagpole for this purpose might appear slightly ludicrous, we treated the local residents to the more dignified sight of a grown man laying on his roof and dropping one egg after another on to a small piece of material that lay on the concrete walkway some ten or twelve feet below. Being of a somewhat dubious nature, and naturally lazy, we surrounded the material with newspapers. At it turned out, it was totally unnecessary, as **not one egg broke, or even cracked!** (By the way, . . . if you're crazy enough to try this test yourself, drop the egg with the large end down. If you don't, the internal mass concentrated in the large end of the egg will, upon impact, force inself into the smaller end and, in some cases, cause its own breakage.) We conducted this same test with the normal foam rubber customarily used in our R/C installations and **every single egg broke instantly upon impact.** After climbing down from the roof, we tried dropping eggs on the conventional foam from shoulder height, and again, every one broke. The next test, recommended by Ray Pisar of R/C Engineering, was to double up your fist and strike the piece of G-Pad (still laying on the concrete) with all possible force. We did just that, and the material did not allow any physical contact with the surface upon which it rested, nor was there any sensation of impact on the hand. Repeating this process with the conventional foam almost resulted in a broken hand — much to the amusement of the local citizenry who had gathered to watch the strange proceedings!

After this somewhat less than scientific test process (and its accompanying embarrassments) we were convinced almost beyond doubt of the merit of the application of this material for radio control usage. Further examination disclosed that G-Pad is an excellent insulator against both heat and cold, and being unicellular, it can be punctured or torn, and will continue to float in water. As a sidenote, it is self-extinguishing in case of fire and is unaffected by alcohol, castor oil, or gasoline. It does, however, disintegrate upon contact with methy ethyl ketone, which precluded its use with ordinary model airplane cements.

G-Pad weighs approximately six pounds per cubic foot, which puts it in the same

class as lightweight balsa. Following the instructions from R/C Engineering for its use in airborne installations, we cemented the G-Pad to the inside of the fuselage and to itself, using Core-Grip Contact Cement, thereby forming a "padded cell" for the radio equipment as well as actually increasing the structural strength of the fuselage to some degree. Using this procedure — "a box glued to itself and to the fuselage sides" — the possibility of the receiver being thrown out of the airplane in the event of a crash is minimized. Thus, literally complete protection is afforded the radio equipment by having it packed in material that is not only specifically designed for this type of protection, but actually has no equal. Following the method outlined above, the radio equipment is prevented from being ejected in the event of a crash. As Ray Pisar casually pointed out, "there are few things more disheartening than pranging an airplane **and** watching your receiver skitter down the runway unprotected!" If you still have doubts, are cautious, or just can't shake old habits, follow the above procedures and then wrap your receiver in a ⅛" thick piece of soft plastic foam such as art foam. This will take care of your doubts about uncoupling at higher frequencies such as high speed engine vibrations. We do not, however, feel that this is necessary with solid state receivers. Obviously, reed and relay type units should be mounted loosely.

G-Pad, as distributed by R/C Engineering, and as provided to us for test purposes, has been thoroughly tested, and is approved and recommended by R/CM as equalling and surpassing the manufacturers claims and specifications. As a shock absorbing protective material for use in airborne R/C installations, we have found it to be without equal when used in accordance with prescribed installation procedures. One interesting sidenote is that R/C Engineering is primarily engaged in the business of repairing all types of digital R/C equipment — operating on the premise that a qualified individual repair service can offer faster service at less cost than the manufacturer. The introduction of G-Pad by this firm is the first item in a line that will consist primarily of crash and repair prevention items!

Availability: R/C Engineering, 4901 East Holly, Phoenix, Arizona 85008. Price for an 8" x 12" (approximate) x ½" section of material is $1.35. Available direct and through dealers.

SHOP & FIELD

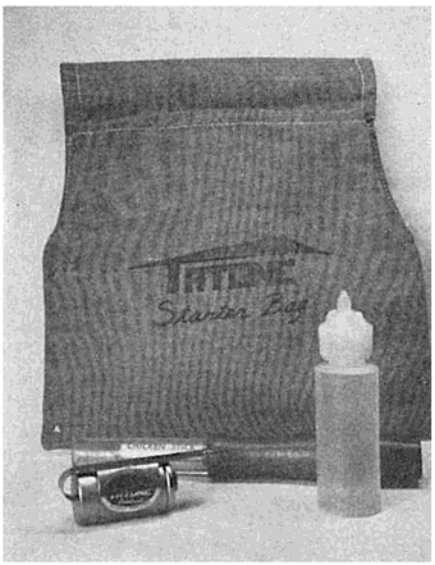
PRODUCT NEWS

Tech Aircraft and Electronics, 2225 E. 17S., Salt Lake City, Utah 84108, announced three new airplanes, each of which are completely finished in high impact plastic and ready to fly. Reportedly rugged and lightweight, they come in white which can be painted or trimmed with any of the widely available contact plastics. Price for their Skyshark, Midget Mustang, and Voodoo 100 trainer is $39.95 each. Individual components are available as replacements for each aircraft and prices and specifications are included on Tech Aircraft's price sheet.

GHProducts, R/C Boat Racing Division, P. O. Box 17448, San Diego, Calif. 92117, is offering a 'ready to race' or ready-to-run SK boat for the R/C boating enthusiast. This package consists of Stinger Manufacturing Company's 'Screamer' SK racing boat, available in a choice of six beautiful irridescent, metalflake decks, and complete with Controlaire one channel analog proportional, installed and operationally checked. A hot Cox .049 TD engine, two ounce fuel tank, two propellers, and installed cavitation plates are included in the price of $144.49.

Ace R/C Inc., 203 West 19th Street, Higginsville, Mo. 64037, has released their 1968 catalog, priced at one dollar. This new 'catalog' is more than just a compilation of products distributed by Ace — it is also full of information that will be valuable to a great majority of R/C'ers. This is a book that is definitely recommended for your shop. And the one dollar price is completely refundable on your first order direct to Ace. Don't miss the new 1968 catalog.

Airtrol of Adrian, Inc., 845 Treat St., Adrian, Michigan 49221, offers the REM-II proportional rudder and elevator system with simultaneous positionable motor control. This is a pulse proportional system that features three simultaneous controls, two of which (rudder and elevator or ailerons and elevator) are proportional, and one (throttle) which is positionable. The servos do not pulse or flop — only a very slight quiver, and have more power than many pulse servos. The decoder is rugged, subminiaturized, transistor circuitry, utilizing rate, width, and tone for control functions. The system is completely wired. Servos have a 236 to 1 gear ratio and are spring centered. The transmitter has approximately 150 MW output power with 85% modulation and tone frequency of from 300 cps to 600 cps. Complete system with all batteries, $189.50.



Tatone Products, 1275 Geneva Avenue, San Francisco, Calif. 94112, in introducing their new 'Starter Bag', billed it as the handiest thing that you ever put your belt into other than your pants! Made of attractive perma-pressed Denim fabric, it is especially designed to carry a Tatone Chicken Stick, Pocket Booster, and Little Squirt primer bottle, plus your favorite wiping rag. With this item, when your engine conks out way down on the runway, you won't have to holler for your boosters and fuel bulb. The Starting Bag may also be used for carrying small parts, tools, or a camera if desired. A must on your list for only $1.25.

World Engines Inc., 8960 Rossash Avenue, Cincinnati, Ohio 45236, has just printed their 1968 catalog. This new compilation of items produced and/or distributed by World Engines is highly recommended for inclusion in your shop library due, not only to the listing of R/C items, but also for the valuable reference data included in this 1968 volume. Send for yours today.

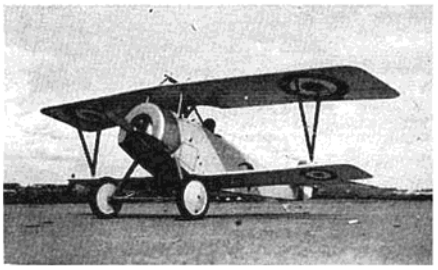
Kraft Systems, Inc., 2466 Seaman Avenue, South El Monte, Calif. 91733, displayed their 1968 Gold Medal Series proportional systems at the 3rd Annual Model Airplane Trade Show. In 1965, Kraft equipment won more major contests than any other make. In 1966, almost every major contest was won with Kraft equipment, including the top three places at the U. S. National Championships. In 1967, Kraft equipment topped their past performance with victory at the World Championships and a repeat win at the U. S. National Championships, plus 8 out of the top ten places at the Nat's. It is little wonder that the new KP-4 and KP-6 systems attracted so much attention at the recent MATS trade show. See your nearest Kraft dealer for information on the new subminiature systems, or write direct to Kraft Systems Inc.

The R/CM Classic, Ed Thompson's new digital proportional system, being presented as a series of construction articles in R/C Modeler Magazine, is destined to become a classic standard in the digital proportional field. Concurrent with this series of articles the complete kits of parts, both electronic and mechanical, are being made available by Royal Electronics, 6190 East Evans, Denver, Colorado 80222. See your Royal Products dealer, or write direct for prices. R/CM Classic transmitter kit is produced by Royal Electronics and it is approved and recommended.

Bonner Specialties, Inc., 9522 W. Jefferson Blvd., Culver City, Calif. 90230, announces their Digimite 6RS — a six channel version of the time tested and proven 4RS — the first of the miniature digital systems. Total airborne weight with four servos is 14.4 ounces. Each servo measures 2.4" long by 1.5" high by 0.8" wide. The battery pack is 2.37" long by 2.12" wide, by 0.62" high. The 6RS receiver measures 2.25" long by 1.28" wide, by 0.8" high. Price for the 6RS with four servos is $425.00 on the 27 mHz band. For 52 and 72 mHz systems, add $15.00 to the price.

Dave-Ons Models, Box 17089, Tucson, Arizona 85710, have expanded the E-Z Servo Mount line to four models which fit the Kraft-Hayes, PCS, Heathkit, Controlaire, the new small Orbit and the standard Orbit servos as supplied with all Micro-Avionics, Logictrol, W. S. Deans, and Command Master servos. The price is $1.00 each on all models, which price includes mounting hardware.

JERRY KLEINBURG



Well done Nieuport by M. Devoize, seen at Club des Cigognes "Circus." Radio Pilote propo, 60" spread, ST 60 and 20x4 prop, 9" cowl. WW-1 vintage on increase in Europe too. (Plessier pic)

NATS NOTES

AS expected, the new A and B pattern competition creations of the R/C contest Board will not be included events when the Nats unfold at Olathe, Kansas this year. AMA's announcement, distributed to all chartered clubs in December, verified the prediction voiced here last month and actually came as no real surprise to contest-minded fliers (although some CB members may now feel they were 'over-sold' on ABC pattern). This means R/C flying at the 1968 Nationals will be limited to Goodyear 450, Scale, and C Pattern — with the pattern event being divided into expert and novice groups. Unfortunately, it could turn into a dull affair.

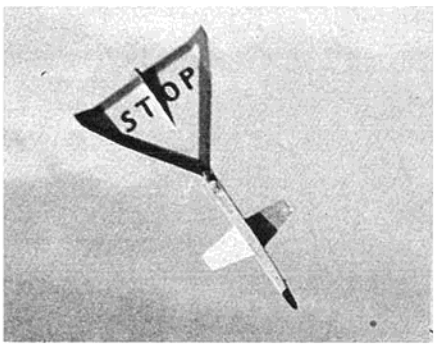
Dull, that is, except possibly for scale where, after the shabby treatment in L. A. last year, a concerted effort is expected that may stimulate and allow a turnout more in keeping with scale's popularity and true potential. With the residual organizing experience and interest from the Mid-America contest held in the Kansas City area — along with the influence of McCullough, Hester, Lindsey, Atkinson, etc. — there's a good chance Scale could carry the day for R/C and make Olathe a worthwhile trip after all. Scale interest is strong and has willing workers in that area which may mean scale builders could be afforded the flying opportunity their R/C creations deserve. Some prime time, as the TV people put it, would be a welcome change. . . .

Goodyear will roll on unabated at the 1968 affair but it will become obvious to many more that from a flying time standpoint Goodyear races are less productive than other events. Unless Ilathe organizers are blessed with a second flying site to stage Goodyear's preliminary heats as was the case in L. A. last year, they'll be hard-pressed to minimize delays between races that consume so much precious time and detracts from this otherwise exciting event. Average speed of the 450's will likely continue to climb while safety considerations will be a major worry for AMA and local Nats officials. The 600 class which is being promoted as a 'safer' racing event may not be seen despite reversal of a previous stand by the R/C Contest Board which, after several votes, finally gave 600 provisional status. The original in-again out-again in-again fumble within the CB's backfield for the cause of the 600's was the quietus that largely lost the 1968 season for the tamer pylon class. Meanwhile, initial evaluations in applying a manditory 'slow-down' rule to control the 450 class showed a lack of success toward finding a solution of the excess speed. Bigger props, evidently aren't the answer and NMPRA isn't ready as yet to cut engine displacement. But according to earlier AMA pronouncements NMPRA must recommend a solution prior to the Nats where it will be seen if there has been success in resolving the requirement. In any case, **additional liability insurance should be required for all Goodyear or racing activity everywhere,** regardless, and AMA ought not delay on this any longer. This is the only way to equitably distribute additional costs.

Class C, nee Class III, fliers will be hard pressed by the decision to not hold the A and B events at the Nats. Touted as beginner events, these classes will suffer since possible entries will be forced into C Novice where, according to the ground rules, a flier cannot legitimately leave for a lower class after once entering or declaring in a higher pattern event. It's either that or not fly — and many will not. This situation, together with the normal amount of reluctance to change, coupled with the confusion resulting from the new rules and maneuvers themselves, will tend to limit patterns entries at Olathe. Those who do attend the big bash and experience long delays while Goodyear is being run will likely conclude that C Pattern is even being side-tracked now. If AMA's hints regarding further cuts in the number of days the Navy will allow flying become reality (the December release indicates **Wednesday** as the first flying day) Olathe may replace Chicago — with its 4 flight 1966 Nats — as a new low point in pattern history. All this, we feel was not the intent of most the members of the Contest Board when they voted for ABC, but now they're stuck with the situation. . . .

It's noted in passing, the dollar value variously expressed as being what it 'costs' to stage a Nats is making the rounds. This is fine, and although estimates of the value of Navy assistance and volunteer civilian help vary, it's agreed the total may nevertheless be viewed as considerable. In our mind however is seen the expenses of the contestants in preparing for and in attending the Nats. It too, is a substantial amount that exceeds the Nats 'cost' by at least four or five times! While appropriate and wholehearted appreciation is due the Navy as Nats host, if we're to put a dollar sign on what happens then let's not forget Mr. Joe Contestant who also fills an important role and pays steeply for the privilege. Consid-

(Continued on Page **44** *)*



French "Flying Signpost" seen at "Storks Circus" is 2/3 size RCM Praying Mantis. A show stopper at fun fest by Club des Cigognes. (Plessier pic)

Limbo, the hard way. Larry Fairman actually flew off with limbo pole buried in the wing. Ship landed OK, damage repaired, won event of Hi-Plains RC Club.

Jim Mowrey, Hi-Plains ADVISOR editor, was bomb drop champ. Kansas club of 19 members has comprehensive flying program.

Probably the continustion of article Top Out with absence of any intermediate page

numerous other tasks. Since then MRC has introduced a new ball bearing version, so we'll belatedly proceed to make good on the original promise with the new product.

Users of .45 size engines don't comprise the percentage that existed in the heyday of K & B and VECO 45's and now that the VECO engine line is a K&B enterprise and .60 size engines are most popular, it's understandable that production of VECO 45's may bow to the big brother. Conveniently filling this .45 cubic inch displacement gap, the new Enya 45 will nicely suit those who require this size engine. Fact is, this particular 45 offering may easily stimulate added use when others find it as good as I did. The highly regarded Enya 60 may bring attention to the 45 but it won't be long before this engine will make its own reputation for R/C service.

Weighing only 10.1 ounces, the new 45 is a simplified but husky version of the previous model. Using the VECO as our power yardstick, it readily matches and even exceeds the power of the heavier American counterpart. This evaluation is based upon air trials using our 6½ pound test bed airplane which noticeably took on new life using a standard 11 x 6 wood prop. While we'll leave the technical niceties and detailed parts breakdown to professional engine commentators (see Pete Chinn in MAN, Feb. '68) it's still no sweat to appreciate the fine workmanship of this good looking power plant. Break-in was just a couple of 8 oz. tanks of Fox Superfuel done more from habit than obvious need for the bench time. Although the Veco mounting in the plane was a bit wide, the Enya fitted into the same mounting plate anyway with new holes taking care of the narrower fore and aft flange bolt hole dimension in the Japanese mill. Since changing the throttle connection of the Enya to accept the existing left hand VECO arrangement wasn't readily done, and to avoid changing servo locations, an S-shaped nylon lined brass tubing cross-over was installed easily using a braided wire cable for the push-pull action. Regular ⅛" I. D. tubing was used and the two bends for the S were made with ease by hand to ¾" radius. Actually, such bends **are** easy if a little trade secret is followed: First heat the tubing till it's red and then **quickly quench in water.** This **softens** brass — as well as other non-ferrous metals — and allows hand working. One other tip — hand working will quickly harden the brass again, so if you notice the tubing stiffening don't hesitate to repeat the annealing process. Just remember, annealing or softening non-ferrous metals — copper, brass, aluminum, etc. — is done just opposite to iron-steel metals where quenching does the hardening.

Back to the installation, the cross-over tubing nested neatly behind the engine and to finish the job, the nylon liner was pushed through next. It went through a little stiffly due to the bends but by avoiding any crimps or creasing of the nylon tubing, the chore was done and an anti-noise arrangement was assured. The braided cable (it comes with the nylon tubing) slipped through easily and after drilling a new hole in the differential bellcrank I equip my ships with, compensation for the small difference in the Enya's carburetor control arm travel was obtained. The cable ends were then bent 90°, a small piece of shrink tubing was applied to each, and with the ends slipped into their respective holes, the installation was completed. No links or other gadgets were necessary. First flights were spent adjusting the idle to obtain just the right kind of landing glide desired using low motor trim as the transmitter reference for the maneuver. This was easy since the Enya adjusts readily and idles well with no fussy fuel problems. Fact is, mixture was on the lean side in idle until the bleed adjustment was closed 1½ turns. Incidently, at high or low RPM vibration was no problem and this is an important item if long term trouble-free service is wanted from radio, batteries, and servos.

The only flaw we found on our stock engine (bought from a local hobby dealer): the link wire that opens and closes the exhaust restrictor was too long and didn't allow the restrictor to rotate a full 90° as I think it should. Maybe the 80° position was OK but minimum exhaust restriction at full throttle is our preference. A new link was bent from .046 music wire in which the working length was shortened .050 inches, or about a fat 3/64ths. Starting the Enya was quick with flooding tendencies a lot less than usual. No seizing indications have ever been noted and the 2 ring piston pops with authority and good compression even on hot re-starts which are also made in a flip or two. All in all, the Enya 45 is a fine working engine that should give several years of service. It's not a glow plug eater and fuel consumption is lower than we've been used to. Although my experience is limited to this single example, if 45 production uniformity matches that of the widely regarded Enya 60, it's expected the 45 will set a new performance and dependability standard. With smaller, lighter airborne equipment coming on the scene, medium sized ships are a trend and the Enya 45 will fit in with the change. And the big, big saving in fuel will appeal to those looking for an economy bonus. . . .

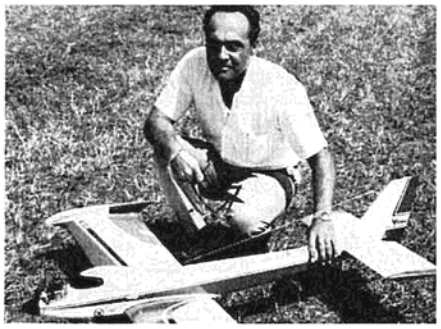
After having an opportunity to check out Tester's Skyhawk ready-to-fly, I'd like to join what must be a big group in recommending it for R/C newcomers and those with limited time. The **really** ready condition of this airplane makes it just about a must for those who don't want to spend a lot getting into R/C or who want to try out the hobby in a simple way first. The Skyhawk provides a minimum expense and time start and is a practical way to get an R/C novitiate into the air and to maintain his interest. Although flying is easy, it's still a good idea to help a newcomer in checking, and the Skyhawk will get student and teacher out to the flying field a lot easier and sooner. After increasing flying time, branching out into a building project and the use of more complex equipment would come more naturally. It's noted that Skyhawk use is spreading and that the gadget guys are extending its use and proving the ship is a good R/C building block. For an example, see Don Nickerson's fine conversion article beautifully detailed in the Dec. '67 issue of Carrier Wave, the McDonnel R/C Club's monthly newsletter. In the past I've hesitated advising beginners regarding first investments, there were too many options. But the choices have narrowed a lot now that the Skyhawk is available and is a well done product.

Stu Richmond and another variation of Acrobat theme. DeBolt kit is regular chameleon, is widely convertible. Stu, also a photo bug is regular contributor.

4th in Novice went to Andy Lukaszewski, popular midwest RCer, in 3-state West Suburban meet.

INTERNATIONAL ROUNDUP

France. More on the "Storks Circus" of the Club des Cigognes which was promised last month. The Circus is the last contest of the French R/C season and fliers go all out to have a good time. They fly just about everything in the book, and maybe a few that aren't. This spirit has made the show a popular outing which drew 5000 viewers to see the fun this year. Example: Balloon busting had 10 ships in the finals simultaneously chasing and breaking 500 balloons released at one time! (One balloon went 800 miles — but the R/C ship chasing it didn't. . .) Goodyear hasn't expanded on the Continent but the Circus put on a race that was termed spectacular with F. Plessier flying a new dark blue Midget Mustang on Orbit Analog using a ST 40. Scale was also well represented with interest growing among European fliers also in WW-I vintage planes. The slow realistic



RC esthetics, the Vespa by Dario Brisegheila, is modeling poetry. Dario, an outstanding craftsman, placed 2nd in Novice in Chicago West Suburban Club meet.

performance of the 5 foot Nieuport by M. Devoize was especially noteworthy. Its Super Tiger 60 turned a 20 x 4 prop while control was maintained with a Radio Pilote, the popular French made digital propo produced by Pierre Marrot, who was 2nd at the Internats in 1967. As pointed out last month, the "Flying Sign Posts", evolved from ⅔ size R/CM Praying Mantis, stopped the show.

South Africa. Chips Wannenburg regularly forwards the "FLYSHEET" of the Cape Radio or SAARF which contains Dennis de Wet's column on single channel and shows bang-bang and flap-flap is popular in that neighborhood. Here's Dennis' comment in the latest issue: "We get enjoyment out of the sheer challenge and unpredictability which 'single' presents to us. I've seen many a jaded aeromodeller, but never once has it been a single-channeller. Without making comparisons, I have recently spoken to a number of multi flyers, who are either so stale that they no longer desire to fly, or who have pranged their models and are grounded for a month or more. The single-channeller, with his fleet of up to half a dozen varied models, just does not know these unhappy circumstances and he merrily goes on flying. . ."

We suspect comments such as Dennis' are often taken as a good natured form of verbal competition or as 'missionary' zeal by many who may not have as yet tried the 'simpler' form of R/Cing. Actually, such commentary is aimed at pointing up that R/C is a multi-rigned circus and that single-channelling, with its different pace, equipment, and objectives, may be as absorbing and stimulating as the other more complex forms, as well as complementing them. The comparison however is like viewing baseball and cricket which somehow don't equate but are never-the-less pursued by their respective players and fans.

South Wales. From Tony Ryall via the SWRC society, we hear that Doug Spreng, the pixie of R/C, who recently migrated to the U. K., is continuing his winning ways there without pause. The Cotswold All-Propo Rally saw Doug liven things and top the field in the stunt as well as the limbo stanza. When he's not flying Doug is helping to spawn another radio creation which we heard has been labelled the Sprengbrooke! Who knows, with Doug this could just be the pucker gen. Tony also reports a contingent of SWRCers made the trip to Moreton Vallance in Gloucester, site of the Rally, where he found the combination of inverted flying and loose battery hatches lead to "X number of airplane pieces." Tony Rees (SWRC news editor), Lynn Walters, Spud Ruck, and Bob Tom were other SW entries and all helped Tony Rees fly his "stunt" ship sporting 4 engines — a glider powered with 2 P. A. W.'s and 2 Wen-Mac's. And it did loop with all four going to earn the stunt title! Pete Waters, their acrobatic mainstay, recently relocated in the U. S. and we hope to see him this year somewhere along the contest trail. Maybe Pete's reverse lend-lease for Doug Spreng. . . .

Mexico. Art Brock reports that the Monterrey contest was another outstanding example of Mexican hospitality and good flying. Hosted by the Asociacion Regiomontana De Aeromoelmismo and sponsored by Carta Blanca Beer, there was no entry fee, plenty to eat and drink, high quality airplanes and flying, all around conviviality, and a memorable victory dinner — all of which is par for Mexican meets. Luis Castaneda of Puebla, flying his Eyna 60 powered "Brujo" (Sorcerer) original, was 1st in the FAI stunt event. He was followed by teammate Jose Rivera and a Taurus hauled by another Enya 60, while Javier Quinanilla of Monterrey, with a VECO 61 powered Thunderball was 3rd. A larger U. S. participation had been hoped for but the late date and short notice given the meet probably combined to keep north-of-the-border entries low. Art says he won't miss next year's contest although he clobbered his Sweek and had to resurrect a Citation powered (as he laughingly calls it) by a Fox 40 which couldn't quite hack the course in such a big bird at Monterrey's altitude.

THE NATIONAL SCENE

DC. Tom Rankin's neat DCRC newsletter for December carries the latest information on many technical innovations of R/C equipment and possible future applications. The newsletter also details the club's flying program which is among the most progressive in the country. This is

Juniors attracted attention at West Suburban RC Club Annual. Mike Mueller collects loot from CD Hugo Mosquero.

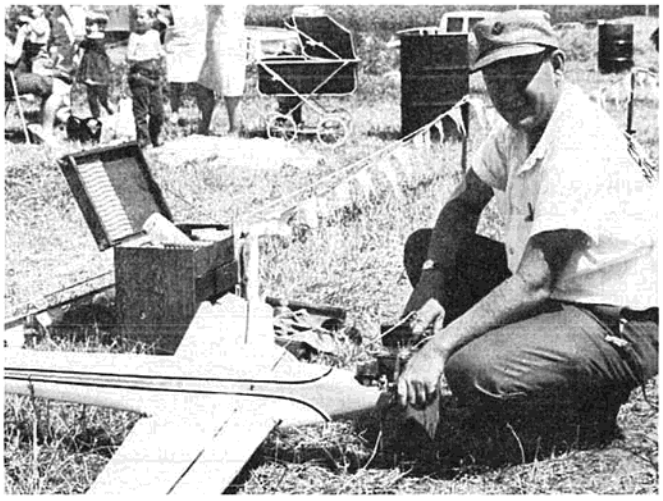
seen in their annual 4th of July affair which will be known in 1968 as the "Mirth of July Meet". It'll be the 14th such get-together the club has sponsored and this one will feature the new international racing event, the FAI 1.7 Meter Radioplane Race, along with three other events which include a gliding event for **any** R/C model, a soaring glider event, and finally, a WW-I vintage contest ala 1967's Rhinebeck meet.

The FAI 1.7 Meter event is similar to C/L team race in concept and was spelled out in a recent AMA release. Wingspan **must** be 1.7 meters (66.9 inches), hence the name. Fuel is also limited with the experimental rules — they all are at this point — calling for 1.69 oz. or 50cc. This feature rules out outright speed as a dominant consideration and will lead to new style planes although current multis will possibly be suitable with little change in initial contests. Two pylons 250 meters (820.2 feet) apart mark the course which takes 20 laps to complete and includes a mandatory 1 minute pit stop requirement. Engines to FAI — AMA limits are allowed and 15% minimum airfoil thickness is called for in the tentavie rules that call for a 19.4 sq. in. fuselage cross section. Fixed gear is another stipulation along with an engine displacement/wing area formula (929 sq. inches for a .60, as an example) that is intended to allow all aircraft to race together and avoid the need for separate size categories. No weight, wing loading, configuration, engine type, or fuel restrictions are imposed. A 2 meter paper streamer is required for aerial identification by lap counters and flag men.

Interesting feature is the trademark 1.7 meter wingspread, regardless of engine size. This is a brand new field in R/C and it'll take some practical experience to find design criteria and operating optimums. It'll take both areas to do the trick and weather — wind, pressure, and humidity — will be a factor in race outcome. Operating rules are a little complicated with regard to take-offs and landings, and on initial look, the course appears awkward by requiring take-offs across the flight paths of ships circling the course. With pit stops going on this'll get sticky. But that's why the tryout of the experimental rules to gain field experience to indicate the bugs that need smoothing out. The DC club deserves commendation for their pioneering work as well as for the other novel events they'll be staging at their Mirth of July Meet set for 5-6 July at the Frederick, Md. Municipal Airport.

California. Club-within-a-club. . . The Valley Flyers have a scale R/C group to foster added scale activity in one of the largest clubs in the U. S. Sparked by Woody Woodward and Frank Capan, ten other VF members (Cliff Benjamin, Don Butman, Dick Adams, Reed Packard — the photo man — Ken and Loretta Hall, Jim Oddino, Hal Daly, Earl Harting, Don Baker) meet every 2 weeks to exchange information and help promote building and flying. The group has already staged its first scale rally and has plans for other activities. The specialized group idea is a good one and something that's bound to grow in the larger clubs.

The west also provides a couple items for our romance dept. — Much happiness



Class II winner, Chas. Williams was one of 48 contestants in Chicago meet at Carrol Stream, Ill.

Don Wehrheim, Chicagoland RC Assoc. Prez. took 2nd in Expert at well attended Chicago area meet. Shared in $1500 prize list. Lost to Hal Parenti, leading midwest contest winner.

and many contests to Pat and Larry Leonard of the Valley Flyers. Larry, a leading flier and R/C's most eligible bachelor, finally marched down the aisle when Pat agreed to love, honor, and be the club secretary. . . . At another side of the marriage-go-round are Marg and Andy Foster who count a silver anniversary this year among their blessings along with having a host of friends in the BIRDS Club. Happy flying, kids. . . .

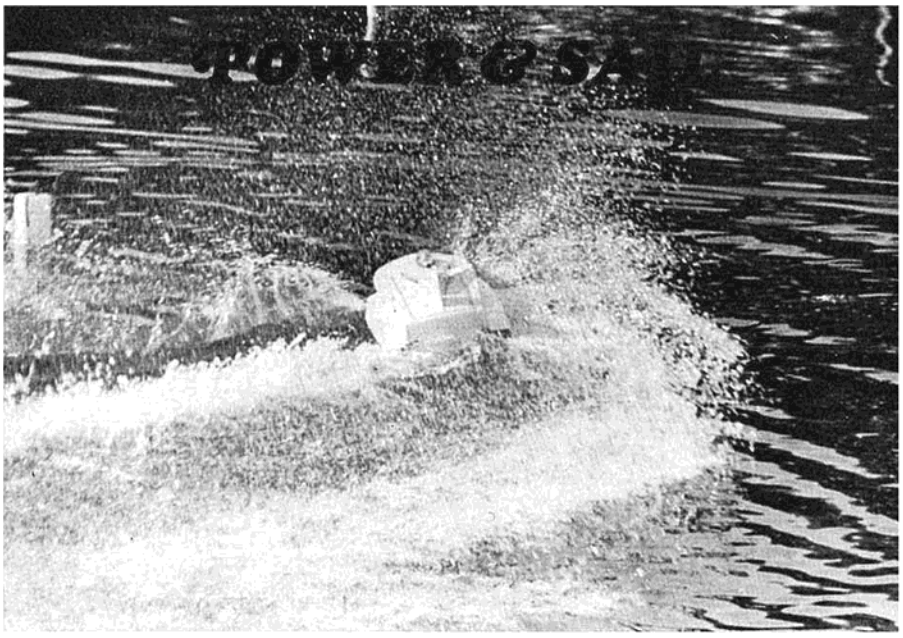
Ohio. In the December CORKS newsletter Ray Stahl comments in a different vein on the current range of R/C actuators: "Unlike R/CM, we will not run down any system. They will all work — once you know their limitations. Further, I would like to emphasize that there are many modes of failure (ways to foul up a system — any system). The success or failure usually depends on recognizing strengths and weaknesses. Then paying attention to design details so that weaknesses are overcome. Attention to detail without understanding the problem won't work, and neither will a fundamentally good system if one of its constraints are violated."

True enough, Ray. I always tell this to beginners as they're picking up the pieces. And since advising is a vicarious thing, it's often ignored — good with the bad. . . In trying to advise beginners with minimum skill or technical understanding, along with a strong hesitancy about investing in several systems to sample them, it's necessary to try a practical — rather than a definitive — approach and suggest equipment which will most readily give satisfaction to the broadest number of potential R/Cers. Naturally, no recommendation is 100% universal because as in any technical realm, R/Cing is also a matter of compromise and personal preference. The latter element is usually based upon the suggester's flying habits but sometimes it reflects a conscious decision based upon knowledge of the ins and outs of a range of equipment. For instance, I like SN escapements over the compound variety. This isn't because the compound isn't good, but after trying both I decided to trade the even pattern of operation of the compound for the alternating action of the SN because the simplicity of the SN assured greater dependability for the large amount of contest flying I did. Equipment choice isn't so much a matter of absolutes as it is a need to satisfy a set of requirements of a particular need. Be this as it may, in trying to help the newcomer start ya gotta keep it simple and to the point. In the long run words and advice can't substitute for just plain experience . . . his!

New York. Another specialized club move was made by the Western N. Y. R/C Pulsers who have organized a GG-only club, which may be a first for Don Perricone, Chet Ingraham, Tex. Coye, and the other members. With experienced hands such as Harold Nesbett, Ernie Schawbe, John Feld, and Ray Roll to help newcomers (who may not know that the initials GG mean, Good Gosh, it flies with all the surfaces flopping!), membership continues to grow and reflect the long term popularity of GG since the new actuators hit the market about 3 years ago. This group could spark formation of a Steering Group working under the AMA R/C Contest Board to standardize and promote GG competition and encourage other "single channel" equipment buffs everywhere.

Kansas. Jim Mowrey, editor of the HPRC ADVISOR, writes us about the Hi-Plains R/C Club comprised of radio pilots from several Kansas counties around Kinsley. It's an active 19 member organization that holds 2 club contests a month to help members bone up on the AMA pattern. Each time, a specific AMA maneuver is chosen and each flier is judged by all the other contestants. In this way judging **and** flying is practiced and by concentrating on only one maneuver a lot is gained. The final contest is a sort of final exam that covers all maneuvers of the previous contests. It also includes a few fun events to keep a variety. Besides merchandise prizes, the top point accumulator gets his AMA membership paid for! In 1967 Larry Fairman took this honor. The club is also active in putting on air shows with Air Appreciation Day at Russel, Harold Krier Day at Ashland, and the Modern Living Show at Dodge City being on their list of shows. For the Dodge City demonstration a special flying field was laid out for the club in the heart of the city! Dodge also provides the club a free club room at the city airport. (Which proves Marshall Dillon raised 'em right! Right, Kitty? . . . Have 'nother beer. . .)

Illinois. Michigan, Wisconsin, and Illinois R/Cers took advantage of the $1500 prize list and the meet sponsored by the West Suburban R/C Club, to enjoy perfect weather and flying at Carrol Stream near Chicago. Bob Kirkgasser sends info that a field of 48 fliers flew a modified AMA pattern in Class II and III with Hal Parenti taking top Expert honors followed by Don Wehrheim, Marv Doucy, Jim Grier, and R. C. Speerly. Norm Page won Novice honors which were shared with Dario (Vespa) Briseghella, George Pitelka, Andy Lukaszewski, and Casey Ziemba. Class II (out of 3 entries) went to Chuck Williams, Stan La Fountain, and R. C. Jordan. A spin contest, limited to the 5 top scorers in each category, went to Bob Benchley whose 23 turns with an Lanier was one turn more and 6 inches deeper than anyone else!! His prize? A Lanier Thunderball, of course. . .



Believe it or not, it's a 2500 watt electric by Bordier of France!

#59, Baitler, U.S.S.R., with his record holding boat.

THE biggest event for European R/C boatmen is the bi-annual European Championships, sponsored by the Naviga, the association equivalent of the American IMPBA. At the present time Austria, Belgium, Bulgaria, East and West Germany, Great Britain, France, Italy, Poland, Sweden, Switzerland, USSR, and Czechoslovakia are active members. In 1961 the Championships were held in East Germany; in 1963, in West Germany; in 1965, Poland was the host, while the 1967 European Championships were held in France. Regardless of where they are held, the same course must be sailed.

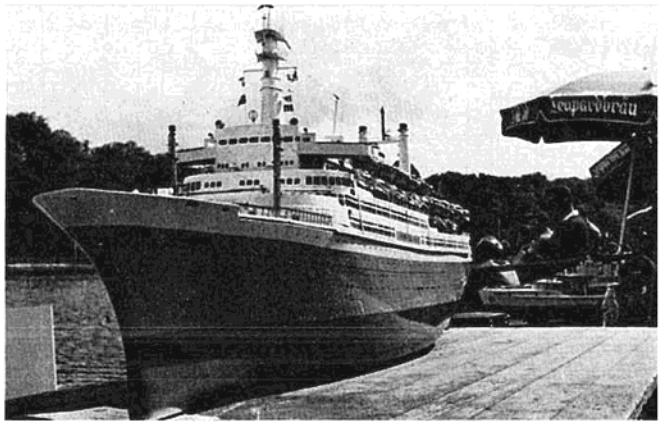
As mentioned, the recent 1967 Championships were held in France, in the town of Amiens, approximately 80 miles North of Paris. The Naviga Championship course is a triangle which must be traversed twice in opposite directions. Due to the tight turns required, the total speed is less than the U. S. ¼ mile oval or straightaway times. However, the following straight course speeds have been achieved in Europe: .60 boats, 40-45 MPH; .29 boats, 35 MPH; .15 boats, 25-30 MPH. The latter class, for a maximum .15 displacement, was quite interesting since there were twenty-two entrants with excellent times recorded. One interesting feature of the class was that a great number of the participants used a direct drive, while the balance used a transmission. During the course of the Championships, it became quite evident that the fastest boats all used a transmission — in most cases a 1:1.5 ratio. This has proved most effective for transmitting the power of European engines to the screw. The most widely used engines in the .15 class are the Hertenberger 15 with a .5 HP rating using FAI fuel. This is further increased to .7 HP at 30,000 RPM by using a high nitro content fuel. The first four places in this smaller boat class were taken by a Hertenberger in first and fourth place, a single Macchi in the second slot, and a Super Tigre in third. Following the actual competition, a record try was undertaken in which a West German participant broke the existing record, set only a few minutes before by an Austrian contender, both using the Hertenberger HP 15. The majority of the .15 size boats use an X-40 or X-50 plastic prop at the end of the transmission. These boats are all approximately 65-70 centimeters long and 20-25 cm wide.

Rossi powered Pirana of Italy's Merlotti.

The .29 class boats is almost dominated by the Super Tigre RV engine. Of the twenty five contenders in the class, all

Part of the group at the R/C sailing pond — European Championships.

A magnificent 8 foot liner, built for precision steering by Munch, West Germany.



used direct drive with the exception of one entrant. All used the popular Piranha hull with dimensions of 70 cm LOA and 25 cm width. Plastic 140 screws were used. The final results showed that only .5 second separated the first three positions!

In the larger class boats, the rules permit up to a 1.80 cu. in. displacement, although none of the entrants used anything larger than a .60 since it would require a boat too large to navigate the tight triangular course. In this class there were twenty-six participants with Rossi and Super Tigre .60's predominant. The time difference for the first ten positions, all of which used the popular Piranha design, was only four seconds! As was expected, the two Hertenberger HP .60's entered challenged the popular Rossi's, with the final tally showing a Rossi in first position with a time of 20.1 seconds; second position a Rossi with 21.2 seconds; third, a HP at 21.6 seconds; and fourth an HP at 22.3 seconds. Following the actual competition, Karl Kuhnel from Austria set a new European record by breaking the "sound barrier" of 20 seconds with an official time of 19.8 seconds, using a stock Hertenberger HP .61.

Insofar as the radio equipment was concerned, it was noticed that just about half of the 250 contestants used a Graupner Grundig installation with only ten digital proportional installations entered.

The electric R/C racing event is divided into two classes — the 30 watt class and the 42 volt maximum class. The former is a class for dedicated specialists, since these boats are approximately 40-50 cm long and weigh less than 400 grams. Attaining a speed of 10-12 MPH, the secret to the success of these little boats lie in the silver chloric magnesium cells, or "salt water" cells. At the start of each race the cells are filled with salt water, each cell then giving one volt for about five minutes at one amp, or as in the case of most boats, two minutes at three amps at .8 volts per cell. Filled with water, and operational, these cells weigh 3.5 grams each. In most cases a Microperm Super motor is used. Ten cells will produce approximately 25 watts, therefore you have a running time in the Naviga triangle of 50-60 seconds.

In the larger, or Unlimited Electric, class you find the real electric power plants. Six to twelve volt motors are used with a 2AH lead battery used as a power source. The 6V motors are powered by a 24V battery, at 50-60 amps, while the 12 volt powerplants use 24-32 volts. With a six volt engine and a twenty volt battery and a light Piranha, a participant from Austria reached second place with a final time of 32.2 seconds. The French participants used boats with a length of approximately 1.5 meters and a 42 volt silver zinc battery. 2 or 3 militer electric engines were used with an X70 screw. The total output of these boats was 2000-2500 watts with a time of 29.2 seconds. The larger boats were not maneuverable enough for the course, but reached straightaway speeds of 30 MPH!

All in all, the European Boat Championships for 1966-67 were well run and well attended. We hope that the next bi-annual event will attract some of the U. S. boaters for a mutual interchange of ideas and information.

●

The Bainbridge Jr. is the U. S. Navy's most recent addition to their miniature nuclear fleet. Although this model was shown locally to the public in early 1966, no press releases have previously been made pending the completion of testing and sea trials. This experimenting was completed in September of this year and the model is now considered operational. The model is powered by two electric motors with reversing capability and an independent energy source provided by 12 volt truck batteries. The receiver is powered by a 28 volt aircraft battery. These independent energy sources provide an endurance of approximately two hours from

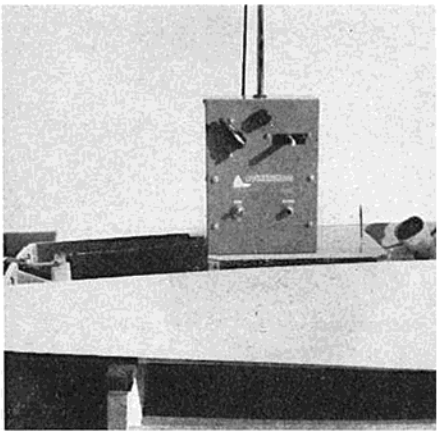
a single battery charge. The transmitter is currently being powered from a 220 volt source converted to 28 volts. Testing has been successful utilizing the internal 28 volt source of the Enterprise Jr. According to Commander J. R. Korbein, U. S. N., surplus lists are currently being screened in anticipation of locating a gasoline powered generator in order that a more mobile unit can be produced.

At the current time, speeds achieved with the present power system have been estimated at approximately 4 knots with an effective range of the transmitter beyond the line of sight. The assignment of a military frequency precludes interference with other activities and enables concurrent operation. According to Cdr. Korbein, the Navy is looking forward to providing a practical problem for some of the Seattle Model Yacht Club tugboat operators!

●

Willoughby Enterprises, 225 West First Street, Tustin, California 92680, report they have purchased the assets of the J. T. Goode Co., of Costa Mesa, and will continue production of the Aquatronics R/C boat system. The partnership of J. T. Goode and Stu Babcock was formally dissolved and neither has any connection, financially or otherwise, with the Aquatronics system now being produced by Willoughby Enterprises. Reports from the field indicate some units in use were malfunctioning due to a mis-match in the transistors used, and this discrepancy in the servo circuitry has reportedly been corrected. All new Aquatronics systems will incorporate this change from germanium to silicon transistors and will bear the Willoughby Enterprise label.

Though the Aquatronics R/C boat systems, both for power and sail boats, were furnished with knob control, the transmitter will, upon request, be modified with a self-centering stick replacing the knob, and an additional trim knob added for servo centering. Readers are to ask for the Power-stick or Power-Sail when ordering direct from the factory. The Aquatronics boat equipment is the only one of its type that offers crystals changeable "on the pond." A complete set of crystals costs $40. With this crystal spare set, the frequencies can be changed at will to conform to the racing or sporting requirements. Willoughby Enterprises notes that a number of requests have been received for the 72 MHZ crystals. Boaters are reminded that it is illegal for them to operate an R/C boat on the new 72-75 MHZ bands.



SHOP & FIELD

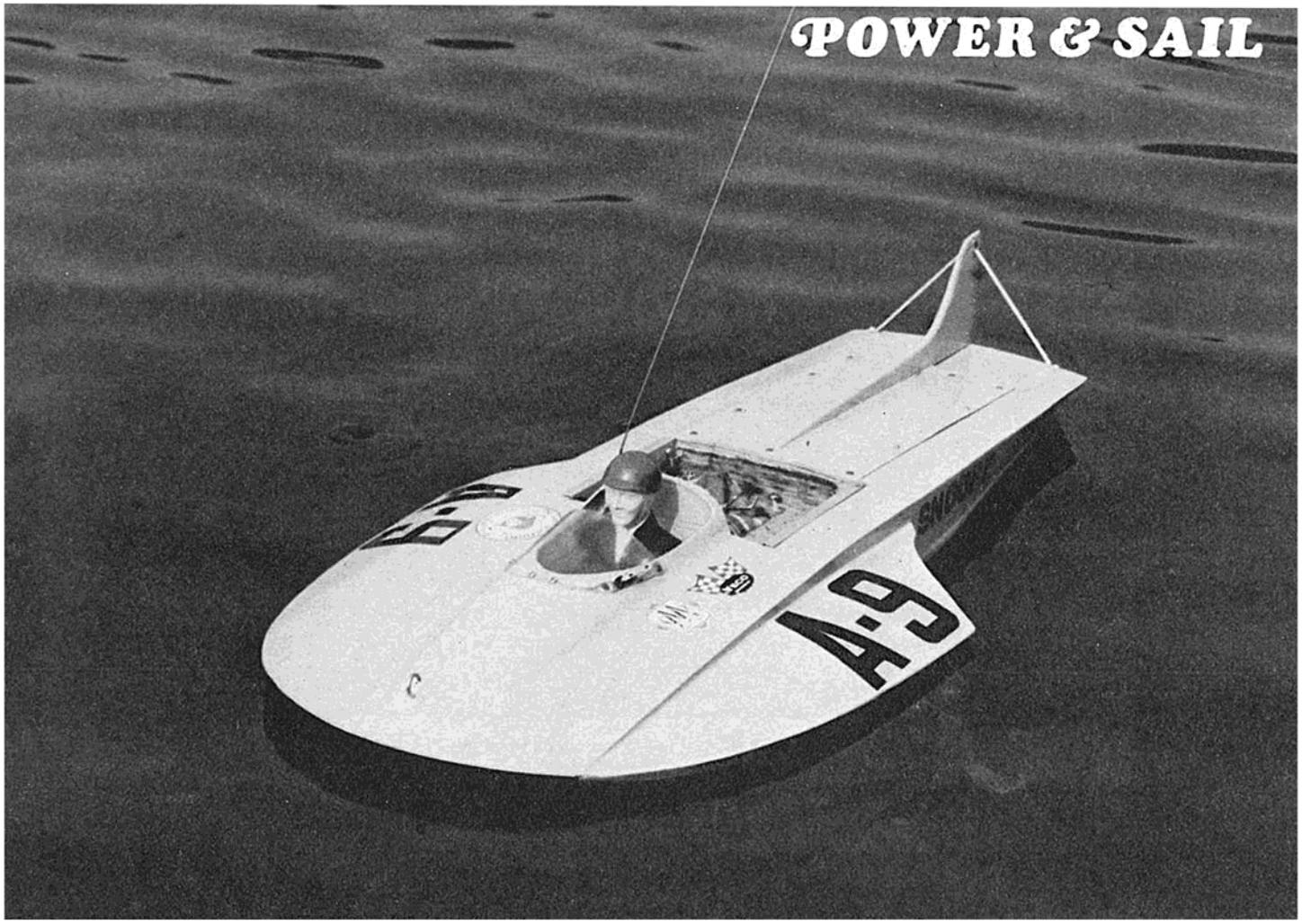
(Continued from Page 40)

held for a couple of minutes until the wing cooled.

Apparently, heating the panel softens the adhesive (he used 3M spray trim adhesive) enough to allow some repositioning of the foam core inside the balsa sheeting. Upon cooling, the foam apparently takes a new set.

●

From the Lanier Ready To Fly News comes a method of mounting wheel type servos in Lanier foam wings. Logictrol, Orbit, and the new Kraft servos can be easily mounted in these wings as shown in the sketch. This method will assure plenty of clearance between wing and fuselage servos.



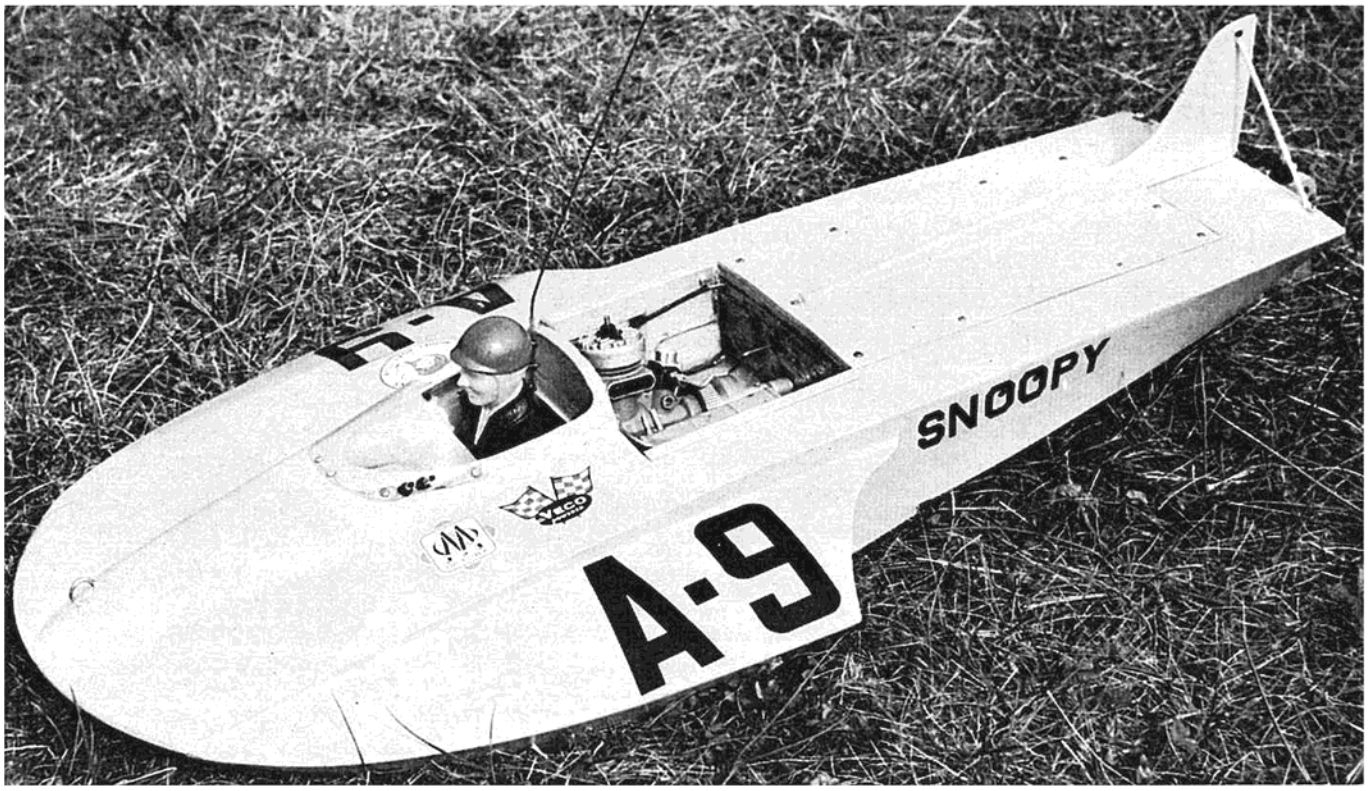
SNOOPY

Like to collect trophies? Dick Hanson's .19 powered, quarter-mile record breaking hydro will really bring home the hardware!

EVER since the first time I saw an unlimited hydroplane go skimming across the Detroit River, some five years ago, I have felt that this is the way my racing boats should run. It took about three years before I caught on how to make them three point. The only deviation I made from the full size hydro was to run the water surface line through the upper half of the propeller. This was from the results that I tried with different depth settings of the propeller, coming to the eventual conclusion that the first half inch of water does not have enough tension to cause a biting force on the prop. This problem only occurs in the smaller diameter props, since one half of the blade is only one half to three quarters long. An additional modification included widening the hull for better stability.

One of the pictures shows the trophies that this hydroplane has won over the past two years of racing. On September 2, 1967, at the Marquette R-C Boat Club meet, it broke the I. M. P. B. A. quarter mile oval record. Snoopy is a real steady runner, and can take winds into the high twenties without flying. Last year it had a tendency to take-off, but I broke up the smooth contour of the top deck by putting in steps. (Picture of this hydro appeared in the February, 1967, R/CM) This year I also changed the engine, although reluctantly, from a horizontal to a slightly tilted position. The horizontal engine lowered the center of gravity, and made the hydro hug the turns, but it was very difficult to service. In competition, when given only three minutes to start your engine, it was a little disheartening to find out that you have a burnt-out plug! I just about had to take the engine out, so I settled on pust tilting the engine about ten degrees from the perpendicular. In this position, the exhaust fumes are shot upward and away from the interior of the hull.

A hydroplane that is operating at near peak performance is not exactly the most reliable or steady thing in the world, whether it is a model or the real thing. They have a tendency to curve right when they start to plane. This is due to the torque which pushes the right sponson down in the water and this, in turn, acts like a brake. A counter force acts upon the torque when a slight left rudder is given, then the right sponson comes up and the hydro accelerates very quickly. You can only get this special acceleration with a proportional because it's mostly a "feel and visual" effect. You move the rudder stick slowly to the left until the hydro is moving at maximum speed, then continue with that slight pressure to the left, but the boat will be running true down the course. With reeds or relay systems, you will have to put a slight left trim in the rudder to make the craft run a straight line. This condition applies only if you are surface "proping" and mov-



ing at record speeds. I like to use a self-neutralizing throttle servo, because you have a quick response in case it starts to fly or to be used in the turns when conditions become rough. It has to be held in high, and then when released, it will return to a speed which has been set to run fast, but safely.

One of the things I tried this year, with success, was to pack the servos with styrofoam, instead of bolting them to the hull. It was the first year that I went through the whole season without sending servos in for repair!

Before starting the construction text, there are a few things about prop riding hydroplanes that must be understood. First, the finished model must be as light as possible. This is why I use balsa wood with 1/32" plywood along the sides on the sponson. In multi-boat races, I have survived some pretty good hits without being knocked out of the race. Balsa, covered with silk, is extremely strong, so spare the hard heavy wood! An aluminum ring embedded in the nose will make an indestructible bow. A couple of years ago, I hit a boat dead on the course and my bow impaled itself through the sides of a fiberglass boat, without any damage to me. Secondly, all surfaces that come in contact with the water must have sharp corners. Try lightly touching the back curved side of a spoon to water coming out of a faucet, you will see it being sucked in toward the center of the stream of water. This will happen to a hydroplane if there are any rounded corners or curved surfaces. As the hull picks up speed, it will be sucked down and never will fully come up to plane.

And so, on to the construction.

CONSTRUCTION

Cement and pin ribs 6 through 9 to the main rails, parts 10. Lay assembly on a flat surface, and make sure rib 10 is perpendicular to parts 10, then place a weight across parts 10 and over the ribbed area. Cement the two halves of part 12 together. When assembly has dried, glue remaining ribs 2 through 5 to the main rails. Glue parts 13, 14, 15 and 21 into place. Glue bottom plate 12 into place. If you plan on putting an aluminum ring in the bow, do so now, if you can make it in one piece circling from rib 2 to the other side of rib 2. Glue parts 20 into place. The dotted lines on the parts indicate rib 5 position. Glue parts 19 into place. Glue parts 17 into place. See detail A and sand as shown in order to glue parts 16 into place. See detail B and sand as shown. Glue parts 18 into place. (Cover parts 18 later with 1/32" plywood.) Coat inside of hull with HobbyPoxy paint.

Glue on 3/32" plywood transom and mount the rudder post. Glue a piece of 3/32" plywood to hold strut between ribs 8 and 9. The engine and drive assembly can be put in. Mount the strut true center and cut a slot in the bottom of part 12 and a hole in rib 6 to receive the stuffing box and

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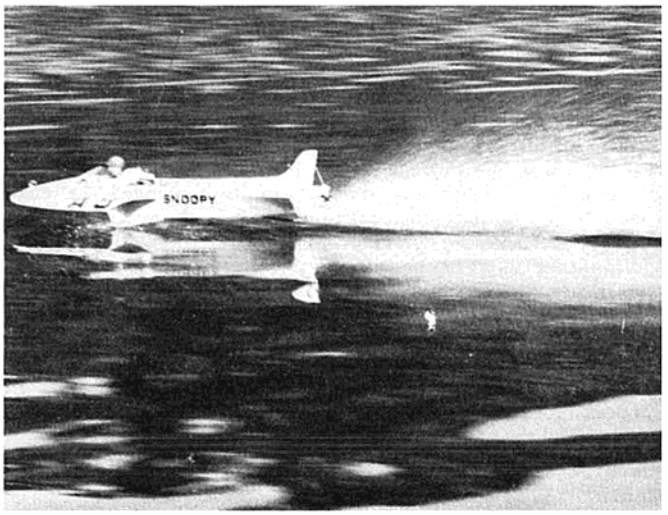
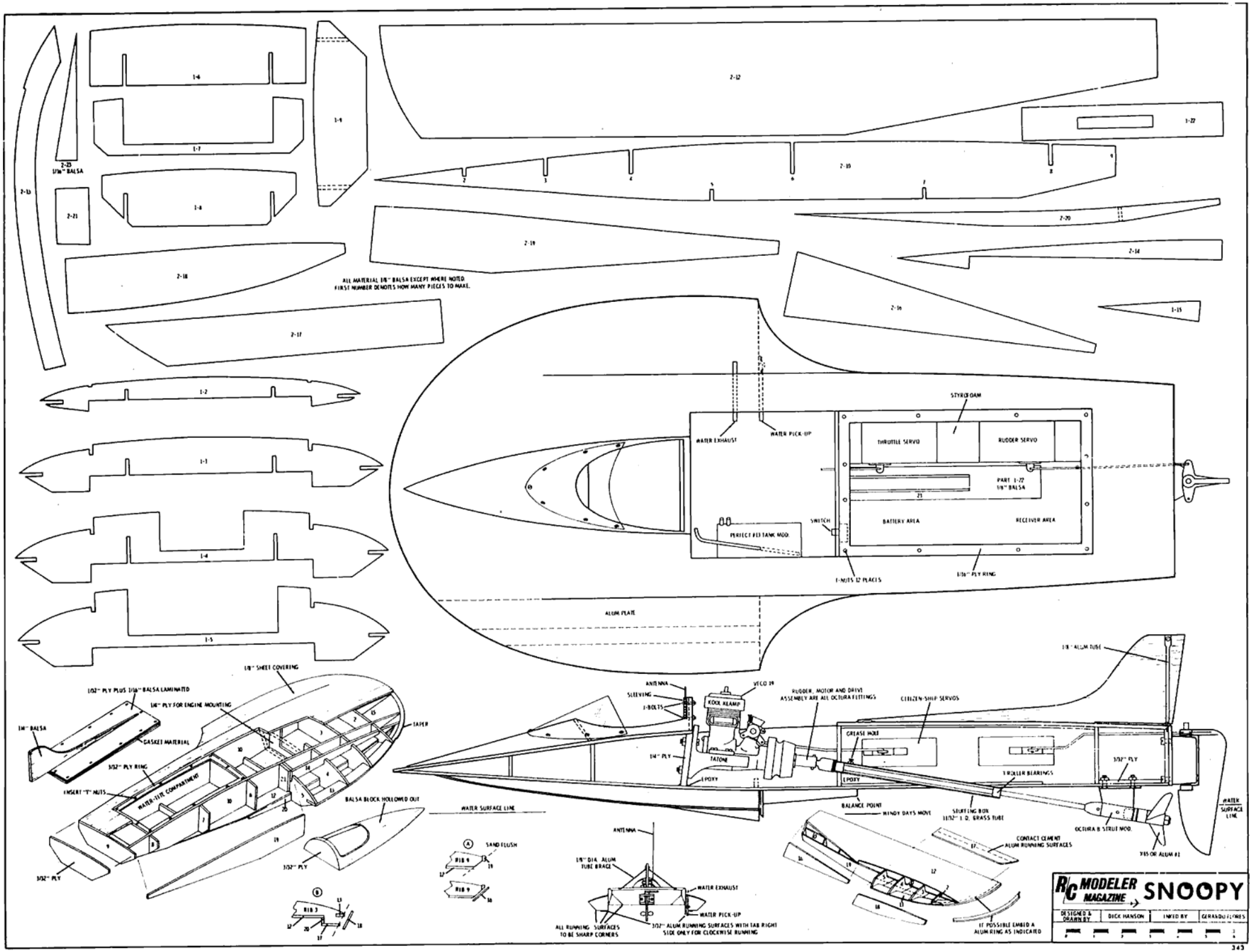



ALL MATERIAL 1/8" BALSA EXCEPT WHERE NOTED
FIRST NUMBER DENOTES HOW MANY PIECES TO MAKE.
2-25 1/16" BALSA
WATER EXHAUST
WATER PICK-UP
THROTTLE SERVO
RUDDER SERVO
STYROFOAM
PART 1-22 1/8" BALSA
BATTERY AREA
RECEIVER AREA
SWITCH
PERFECT FUEL TANK MOD.
T-NUTS 12 PLACES
1/16" PLY RING
ALUM PLATE
1/8" SHEET COVERING
1/32" PLY PLUS 1/16" BALSA LAMINATED
1/8" PLY FOR ENGINE MOUNTING
1/8" BALSA
GASKET MATERIAL
1/32" PLY RING
INSERT "T" NUTS
WATER-TITE COMPARTMENT
TAPER
BALSA BLOCK HOLLOWED OUT
1/32" PLY
WATER SURFACE LINE
SAND FLUSH
RIB 9
RIB 3
ANTENNA
SLEEVING
T-BOLTS
KOOL KEAMP
VECO 19
RUDDER, MOTOR AND DRIVE ASSEMBLY ARE ALL OCTURA FITTINGS
CITIZEN-SHIP SERVOS
GREASE HOLE
1/4" PLY
TATONE
EPOXY
TROLLER BEARINGS
1/32" PLY
BALANCE POINT
WINDY DAYS MOVE
STUFFING BOX 11/32" I.D. BRASS TUBE
OCTURA B STRUT MOD.
3/8" ALUM TUBE
WATER SURFACE LINE
3/16 OR ALUM #2
CONTACT CEMENT ALUM RUNNING SURFACES
1/8" DIA. ALUM TUBE BRACE
WATER EXHAUST
WATER PICK-UP
ALL RUNNING SURFACES TO BE SHARP CORNERS
1/32" ALUM RUNNING SURFACES WITH TAB RIGHT SIDE ONLY FOR CLOCKWISE RUNNING
IF POSSIBLE EMBED A ALUM RING AS INDICATED
RC MODELER MAGAZINE
SNOOPY
DESIGNED & DRAWN BY
DICK HANSON
INFO BY
GERARDO FLORES

SUNDAY FLIER

KEN WILLARD

It's always interesting to see how people react to written words — and R/C model enthusiasts probably have as wide a variance in that respect as you will find in any group of people sharing a common interest.

A short time ago, R/CM announced an editorial policy of "truth in reporting." Not that information previously printed wasn't truthful — it was, at least in the opinion of the magazine's staff. But, as Don Dewey pointed out, there is a certain amount of "lack of faith" with the readers if you follow the old axiom that "if you can't say something nice, don't say anything at all." The error of omission, in many cases, is just as serious as the error of commission.

If a product is advertised, and not reviewed in the various reviewing columns written by the magazine's staff, you could, in the past, logically assume one of two things — either the product had not been tested, or it had been tested and found unsatisfactory — perhaps not wholly, but enough so that it was not considered worth writing about.

This left the reader to make up his mind solely on the merits of the ad, and perhaps that's just as well. "Caveat emptor" — let the buyer beware!

But — if a unit, or product, is tested by R/CM, and found wanting, then there is a responsibility involved — two, in fact. One is to the manufacturer. He should be informed that, in the opinion of the reviewer, the product needs changing — either redesigned or modified, before it can be recommended for the R/C modelers' market. This may be hard to swallow, but in the long run it really is better for the manufacturer. It's a helluva' lot easier to apologize for a delay in distribution than it is to overcome a bad reputation. The word gets around, anyway, if a product is unsatisfactory.

The other responsibility, and perhaps the prime one, is to the magazine's readers. Today's R/C product advertising is so confusing to the average modeler, and particularly to the beginners, that they actively seek advice by reading everything that is published, and then writing to the magazine for further information. Of the thousands of letters received by R/CM, 90-95% ask for advice, and possibly 60-70% ask specifically about commercial items.

We try to answer all letters which request a reply. Don, Chuck, Bernie, Jerry, Ed, Kathleen, Bill, and I spend many hours each month writing personal replies in addition to our column material. If we haven't tried the product that the reader is inquiring about, we say so. If we have, then we state our honest opinion.

So, by printing it in the magazine, we're only extending our letters and, in effect, answering questions.

Like I said, though, reactions certainly vary. The majority of the manufacturers have endorsed the plan — and certainly most of the readers. But I received a newsletter from a club recently in which the writer of one of the contributions stated, "I'm going to review this item and tell you its features, and not run it down like R/CM." Boy how wrong can you interpret our policy! In the first place, we had not reviewed the item at all, and in the second place, there is no intent, ever, to "run an item down." If an item does not do what it claims, or if there are operational, structural, or service shortcomings, and a statement to that effect is made, is that "running the item down?" I don't think so. Further, if we ever goof — and since we're human we will — we'll give the manufacturer "equal time" as the TV people say. You may recall that I've already done that on occasion in the past.

Guess I'd better get off my soapbox now — I just wanted to try and keep the record straight.

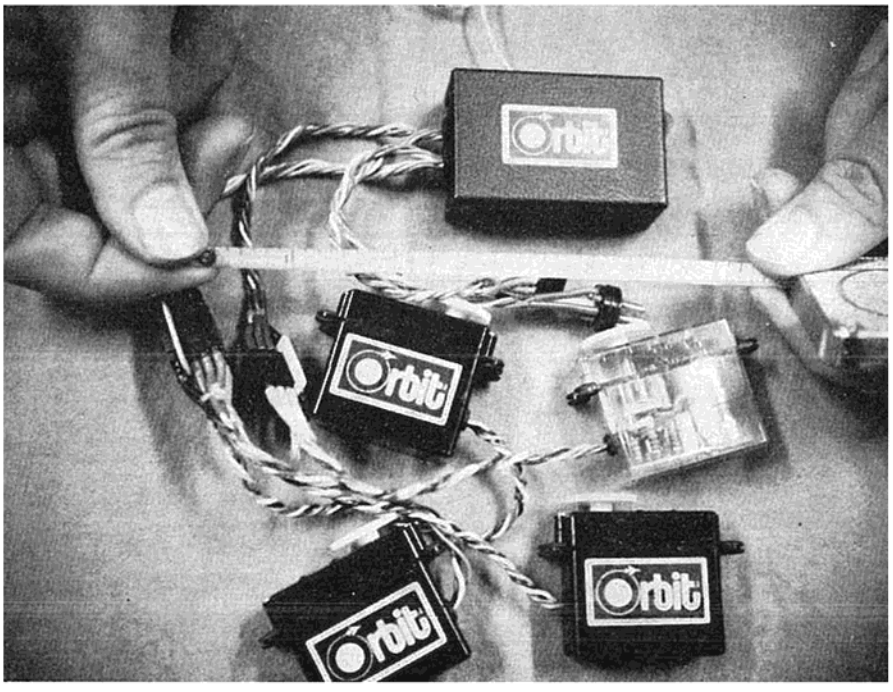
●

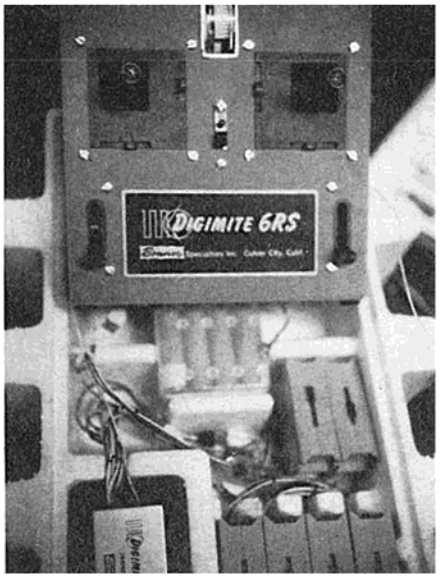
Over the weekend I attended the Third Annual Model Airplane Trade Show, staged by the Garden Grove R/C Club. As you might expect it was bigger and better than ever. Over fifty manufacturers had displays, and there would have been more except that the exhibition hall couldn't accommodate them.

As usual, there were so many items that it would take a catalog to cover them all, so I'm only going to select those which were of the greatest interest to me. Naturally, they are related primarily, from my standpoint, to application in small airplanes — but not necessarily.

First, of course, there were the pulse proportional systems — Rand, Airtrol, Hallco — and even Logictrol had a system, using the Rand actuator. But these systems (with the exception of Logictrol) and the related radio units — Min-X, Citizen-Ship, Bonitron, etc., have been pretty well covered even before the M. A. T. S. show, so I'm only mentioning them at this time, since some of the newer things haven't appeared until now.

Most imminent, and therefore first to be discussed, is the new, small, Kraft proportional scheduled to be available just about





the time this column appears. You want light weight? Here it is. Servos 1¾ oz. each, receiver 2 oz., and 500 ma. battery pack 4 oz. — which can be cut to 2½ if you use 225 ma. cells. Even though the servos are small and light, they still have enough thrust to control a .61 powered brute!

But I'm interested in .020 to .15 powered jobs, and there's where the Kraft lightweight system will find widespread acceptance.

The little Kraft servos, at 1¾ oz., are smaller and lighter than his recently announced 2½ oz. servos — yet they have the same power! They just don't have all the flexibility which the slightly larger servos provide with 2 linear and one rotary takeoff points.

You can get an idea of the size from the photo showing the receiver, battery pack and servos alongside the cigarette pack.

Orbit Electronics displayed their new unit which was recently announced. In addition, and this intrigued me, they showed an ultra small servo and receiver setup which they put together just to show what could be done in the present state of the art — if you wanted to and were willing to pay for it.

Note the size of the servo — 1⅜" x 1¼" x ⅝". And the receiver — 2" x 1¼" x 1". Battery supply would be 180 ma. All up weight of a four servo installation — 8½ oz.! But, the cost at the moment, so I was told, would be high. However, this won't always be true, as the components become available in greater quantity, so you can see what's in store later in 1968.

Bonner Specialties, who led the way with small proportional, haven't been idle. They displayed their new Digimite 6RS (for real small) which will be a great boon to the scale enthusiasts who want retracting gear, flaps, or other auxiliary controls. The receiver will be the same size, and for all practical purposes the same weight as the 4RS. The two auxiliary control levers are conveniently located below the two primary stick boxes on the transmitter, as shown in the photo. The 6RS system will sell for about seventy five dollars more than the 4RS.

PCS, which has joined forces with Kraft, showed their new system which is identical to the Kraft, except it will not be available with the smaller size servos at the $299 price.

An old timer in the field of radio, but a relative newcomer to the proportional market, turned up in the person of Bill Cannon, of Cannon Electronics. He has taken over the old C&S line and will service the equipment, and in addition is marketing a new line. Cannon Electronics is going all out for a price breakthrough by marketing a three servo system — rudder, elevator and motor control — all on digital proportional, for $225. The servos will be the same size as Kraft and PCS, and suitable for .049 to .15 powered ships as well as the .45 to .61 monsters.

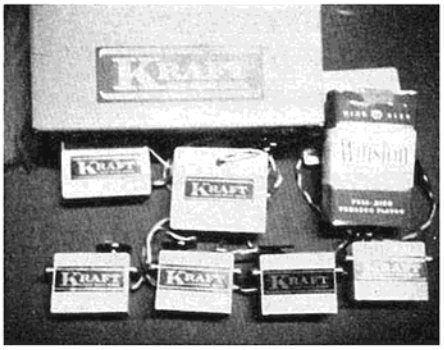
At $225, the Cannon digital proportional will be competitive pricewise with some of the sophisticated pulse proportional rigs, such as the Rand Dual Pak with Min-X transmitter and receiver.

All in all, it looks like 1968 is going to be highly competitive for the R/C manufacturers! Another entry in the small digital proportional, naturally enough, will be Micro Avionics. Although they didn't have a new small system on display at MATS, it will have been shown at Toledo before you read this, so it's no secret.

Love that competition!

●

Along with the new small radios there was a highly interesting display by L. M. Cox Manufacturing. Dale Kirn has developed a new motor control unit for the Golden Bee .049, and which can be used on the other Cox .049's (although the low end on the TD .049 has to be fairly fast to keep it from loading up) and which doesn't reduce the peak power at all. Some of you may recall that I had power problems



with the Shearwater when I used the Medallion .049, yet when the TD .049 was installed it was almost too much. Well, the new motor control unit will take care of that situation. Dale will be describing how you can make one yourself, in a forthcoming issue of R/CM, and then, later this year, the unit will be commercially available.

●

Competition in the covering and finishing field continues to be rough.

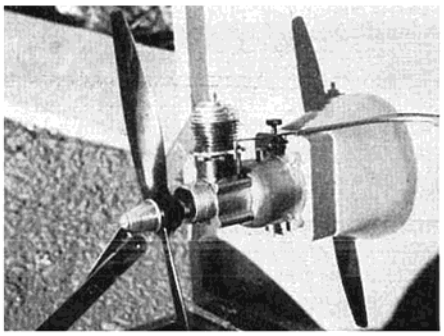
SPL Shrinktite has been reviewed by R/CM already, and was a popular attraction at MATS.

The new Coverite material is a very interesting development. It is similar to Shrinktite in some respects, such as the tightening process using heat. However, Coverite is applied to surfaces by heating the adhesive which is impregnated in the material, while Shrinktite uses a separate adhesive.

Coverite is strong, and if you wanted to, you could use it on a slope soarer without additional finishing material such as dope or HobbyPoxy, since it is sufficiently sealed by the adhesive. But it wouldn't be very pretty, so additional finishing is preferable.

Top Flite officially announced Super MonoKote with the dry, heat activated adhesive. It will come in rolls 26" wide from which you can buy as long a sheet as you need, from one foot up. It's a great improvement over the regular MonoKote, but the latter is still excellent for trim purposes. The big advantage that Super MonoKote has is that no dope, lacquer, or other finishing material has to go on top of the mylar finish — and that saves time. I still like ot use an assist from HobbyPoxy in some of the tricky areas like the engine well, particularly since it is compatible with the Super MonoKote.

Some people undoubtedly will have trouble with Super MonoKote. Others will have trouble with Shrinktite and Coverite. So what else is new? A lot of people, including me, had trouble with silk, nylon, and silkspan until they learned some of the tricks of applying it. Wouldn't it be a dull world if we all liked the same thing? One thing you can say — these new materials certainly give you a bigger, and better, choice of covering techniques.



●

Not too many really new kits were displayed at MATS. In the larger engine classes, Flite Glass Laminates displayed their P-51 Mustang and "Flite Box," previously mentioned in R/CM.

K&K Products showed the Ballerina and Rivets fibreglass Goodyear racers, which should be popular with the racing fans, considering how well they placed in the Nationals — 3rd place for the Ballerina, and 1st place for Rivets.

For the single channel servo, galloping ghost, and proportional enthusiasts as well, Top Flite displayed the Headmaster, which should be on the dealers' shelves by the time you read this. The plans appeared in R/CM, but the kit has the added features of T. A. C. (true alignment construction) and a lot of hardware goodies, plus a new, combined, printed and die cut fuselage side for even faster construction. It looks good to me — of course, I may be a bit prejudiced!

●

You'll be reading elsewhere about some of the other activities at the MATS, but I'll close this bit by telling you that a group of us were invited to inspect the Orbit Electronics plant while the trade show "activities" were in progress, so we did.

At 3 A. M., Sunday morning!

CUNNINGHAM ON R/C

DID you ever buy or sell an R/C aircraft? Not the ready to fly kind, but the type that you buy from a buddy, or another modeler?

One of the original nuts in this R/C sport, Helmer Johnson, sold one of his ships on an approval basis to a fellow modeler. The contract of sale is a classic among "things legal." Note that the contract states a fifteen flight limit prior to turnback. The fifteenth flight was a success, money finally changed hands, and, yep, you guessed it, on the sixteenth flight the "Panhandler" bit the dust!

OFFICIAL TYPE CONTRACT

Hear Ye — Hear Ye; whereas, etc., and all that legal type jazz:

Be it known to all present — including seasoned fliers, student pilots, showoffs, cooners, hobby dealers, attorneys-at-law, that one S. M. "Sonny" Page and one Helmer Johnson are entering into one business-type agreement;

WHEREAS — SUCH AS, etc., Sonny Page has agreed to purchase a famous airplane known far and wide as the "Panhandler" from Helmer Johnson under these conditions:

1. *After 15 flites of said plane — if he wishes.*
2. *Immediately following a crack-up (if it occurs) during the above mentioned 15 flites.*

The purchase price is a paltry $45 with wheels — $40 without wheels. NOTE: If, after 15 flites, one S. M. Page chickens out on purchase agreement, his radio gear is to be taken out of said "Panhandler" and said plane returned to its rightful owner, Helmer Johnson.

It is further understood that there will be no crying by either party and especially prior to flite #16 when (and if) one Sonny Page tender $45 ($40 without wheels) to one Helmer Johnson.

Dated at Forth Worth, Texas, this 27th day of July, 1967.

Witness: Joe Witness Seller: Helmer Johnson

Witness: Edd Alexander Buyer: S. M. Page
Extra Witness: Wendell Roberts
Other Witness Keith Coover

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A lot or interest has been created by Phil Kraft's Kwik Fli III, which is scheduled to be kitted by Top Flite Models. A number of readers have written in asking just what is the difference between the II and the III. The wing is the same, as is the horizontal stab. The elevator has been enlarged, about doubled in size and split rather than a single piece. The thrust line has been lowered one inch, the nose length has been increased 1" as well as the distance between the trailing edge of the wing and the leading edge of the horizontal stab has been increased 1". The vertical stab has been moved to the rear of the fuselage so that the rudder hinge line is at the end of the fuselage. The rudder area has been increased, about fifty or sixty percent, due mainly to dropping the rudder down below the elevator. These are the changes in a nut shell, and if you want to modify your own II, or build a new fuselage, there's the info.

While on the subject of the Kwik Fli II let's discuss wing leading and what it does to your aircraft. The Kwik Fli that Kraft flies weighs in at six pounds. On his own plans for the III he states not to let the weight get above six and one half pounds, with the desired at six pounds. At this weight you have a wing loading of 22 oz. per square foot. This is based upon the net wing area, or that portion not covered by the fuselage. I prefer to base all calculations of wing loading on the total wing area, which in this case is 660 sq. inches, giving a loading of 20.9 oz. per sq. foot. What happens then to a Kwik Fli, or something of similar size, with a weight of seven to seven and one half pounds? The overall performance of the aircraft suffers considerably. At seven pounds the wing loading (on the total area) is 24.4 oz. per sq. foot, while at seven and one half pounds of weight the loading is 26.1, which is a bunch!

If you are designing your own ship, and you have a pretty good idea just how heavy you build, you can take this into account when coming up with the overall wing area. For example, if your construction and finishing methods usually give you an overall similar to Phil's light ship at 20.9 ounces per square foot increase the wing area enough to give this result. To find the wing loading use the formula

$$K \frac{\text{weight (in pounds)}}{\text{wing area (in square inches)}}.$$

K is a constant of 23. Putting figures for a II in this, the formula reads $23 \times \frac{6}{660} = 20.9$ ounces per square foot. Of course if you want to do it the long way around, convert the weight to ounces and the wing area to square feet and divide the weight to ounces and the wing area to square feet and divide the weight by the wing area.

To get back to your enlarged wing area, if you want a loading of 20.9 oz/sq ft. with an assumed weight of seven pounds, substitute these figures in the formula and you get $20.9 = 23 \times \frac{7}{X}$, and X = 780 sq. inches. I think you'll find that if you are having trouble with ships a little too heavy for the wing area, shoot for an ultimate in both weight and area and see what kind of luck you will have.

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A great number of letters received by both myself and at the RCM office ask us to recommend radio gear to the writer. These letters want the "real low down" on this gear or that. Perhaps if we knew the "real low down" we could give it to you. With our new "no holds barred" on products we review, we hope to point out both good and bad features of not only new radio equipment, but also new engines and aircraft from the modeler's viewpoint. For me to try and recommend a certain brand of radio gear to writer is almost impossible. There are a number of good sets of proportional equipment available today, and though I have flown a number of different kind, I've only owned one kind and know it well.

It is, of course, a real problem for a man just entering the R/C sport, but I suggest that if you have a question of what gear to buy, visit your local flying field and talk to the fliers there. If they are happy with the gear that they are flying, by all means, try this, too. If they are unhappy, or experiencing difficulties, then this, too, should be discovered.

The reasons for buying one set of equipment over another can often be as simple as a matter of quick service, or the type of sticks used, or the color of the transmitter case. For the best results and information, go to your local field and see what is being flown. If we have reviewed a piece of gear then we shall be happy to try and point out its good and bad points. Those just now coming into this sport are being treated to a great array of stable, high-performance equipment. Those who have been around for awhile can remember when things **weren't** so good!

The problem of repairing damaged radio gear is a very frustrating one both for the owner and for the factory. Quite often the factory receives a box of slightly crunched parts with a note asking for quick repair in order that the owner can get back in the air for the coming weekend. If the repair man is lucky there will be a brief note along with the pieces telling something of what happened. Put yourself in the place of the repair man. He has to restore the thing to working order and then find out what caused the crash in the first place. More often than not the crash was not the fault of the radio equipment. It can usually be attributed to battery pack failure, faulty switch, pilot error, or interference. Try to be as helpful as you can when sending in the goodies for reworking. It is a big help in getting them back to you quickly.

Another problem to the factory is when some erstwhile modeler sends a set in for repair that should have been retired five years earlier. Perhaps the current owner just purchased it a month ago, even though it was made six or seven years before. The current owner can't, or won't, understand when the manufacturer tells him that he should just give it up as a bad job and buy

(Continued on Page 55)

CUNNINGHAM ON R/C

(Continued from Page 54)

some new gear. There are a lot of worthwhile buys around in used radio equipment, but not all of them are gold plated. When someone has purchased an old, non-working set and expects the factory to put it in apple pie order he is very often asking for the moon. Would you buy a 1959 Edsel and expect the factory to put it in tip-top shape for fifteen bucks? Would you purchase a used TV set and expect someone to recondition it and hang a guarantee on it to be good as new? Why then expect as much from an older set of R/C gear that may have had much rougher treatment?

New gear is another matter. The buyer should expect that when he takes it from the box it will work and work well. If it does not he expects the manufacturer to stand behind his product and to put it in working order. Failure to do this is a reflection not only upon the manufacturer but upon the entire hobby industry. If this sport is to take its place with other very popular pasttimes, then everyone should realize both his rights and his limitations.

●

Another question that has been appearing quite a bit lately has to do with a bit of ancient R/C history. Many letters have come in asking just what in blue blazes is "Galloping Ghost" and what is the reason for the name. There is also a great misunderstanding about GG and what it will do. To set the record straight we must push back in time to the murky distance of the late 1950's. Certain energetic and industrious R/C pilots and tinkers, among them John Worth, for some years now the Executive Director of the AMA, developed the idea of getting simultaneous rudder and elevator control from a single channel receiver and a rat's nest of wire on the aft end of the models. This system was called both "Simple Simul" and "Galloping Ghost." The Ghost name, being way out, stuck. These early ships galloped about the sky in great swoops and leaps (some did fly just as well as today's GG systems, though). The gallop was caused by a slow pulse rate causing the elevator to move through its arc slowly and transmitting a "gallop" to the aircraft. The Ghost part of the name came about by the simple idea of someone actually getting four or five controls from one channel; in other words, there must have been a "Ghost" in there somewhere!

Today's Galloping Ghost systems are a far cry from these early rigs, but the principle is the same. We really should call this kind of radio equipment by a more meaningful name, such as "Pulse Proportional," or PP for short. It would be hard at this late date to change everyone's thinking to this, so, it appears as the GG will have to stand.

I think that I, along with most of the other writers who have dealt with GG are guilty of not explaining the limitations of this system and have lead our readers astray, and into believing that this is a less expensive system that will do everything that a more expensive proportional set will do. This is **NOT** true, and a GG rig will not fly the same way as will a full house proportional set, nor will it fly large, high powered aircraft.

The GG system is great in its field. It **WILL** fly smaller ships with rudder, elevator and throttle in a pleasing manner, and can be called upon to stunt a bit, but it is not a system to take the place of a Logictrol or a Kraft proportional. No amount of "wishing" will make this take place. It is a good system for the modeler who wishes to spend a minimum amount of money in this sport, or for the flier who has limited time or flying sites. For the serious competition flier, or scale modeler, or really dedicated Sunday Flier the only system to purchase is a fullhouse Proportional Rig. I hope that now this will lay at rest the many, many modelers who write in asking if they can put a GG rig into an Enya .60 powered Supercraft!

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Q. I notice that Doug Spreng's latest aircraft differs from the Thunderstormer drawings you published. Do you plan to publish these changes?

A. Doug is now living in England and no plans are available for his new ship. Possibly they may become available in the future, but not now.

Q. What do you mean by double covering with silkspan, and how do you do it?

A. Double covering with silkspan is just what the name implies. The structure is double covered, or covered twice. This is only done over open framework wings. First, cover the wing with silkspan applied with the grain of the paper running parallel with the wing span. Shrink this with a light application of water, either sprayed on or with a sponge. Brush or spray on two coats of dope and let dry. Next cover the wing with silkspan grain running parallel with the chord of the wing. Shrink with water and then put on several coats of clear dope. A wing finished in this manner will be as strong as silk and will not require as many coats of dope to fill the pores, and will therefore be lighter.

Q. What should I use for pushrods?

A. This really depends upon the size of the aircraft that you are building. If it is a .60 ship then the pushrods may be made from 3/8" square hard balsa sticks, 5/16" wood dowels (from the hardware store) or fiberglass tube sold in model shops for this use. Of course you can also use the new nylon within nylon tube type pushrods.

Q. What is a good homemade fuel mixture?

A. The simplest "home brew" is one part, or one quart, Baker's AAA castor oil to three parts, or three quarts, of methanol. If you wish to add nitro-methane to the mixture, replace a portion of the methanol (5% to 10%) with this chemical. Some large engines recommend that you use a simple 3 to 1 mixture.

Q. What is the proper way to balance an R/C propeller? Do they need to be balanced at all?

A. Always check the balance of all of your props, either when you buy them, or prior to installing them on your engine. An unbalanced prop can lead to all kinds of troubles. The best way to balance a prop is to lightly scrape off the finish from the underside of the heavy blade. Do this with a knife or a razor blade. Do not clip the tips to achieve balance. If a little light scraping will not bring it into balance then scrape both the top and undersurface of the blade. Do not alter the airfoil shape of the prop, just remove some of the finish.

Savannach VG

Savannach VG

Savannach TM

Savannach TM

Savannach ADV

Savannach ADV

Savannach Bingo

Savannach Bingo