MODEL PLANE BUILDING
FROM 'A' TO 'Z'

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Introduction:

from the pages of Flying Models

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. . . from 'A' to 'Z'

FLYING MODELS has for many years set the pace for informative material which has been of help to both beginner and expert. The highly popular "Data Sheets" can be considered one of these pacesetters and many a beginner found it easier to start in this fulfilling hobby because of them. This material also jogged the memories of experts who had drifted away from many usable techniques.

It's the effort of this handbook to compress the maximum of usable information into one handy reference. To do this, we've taken material which has created the greatest interest in modelers over the years and "compartmented" it into this publication. We feel that this material has been refined down to its most usable form.

It is to no amazement that there is a recurring request for material of this nature. The hobby and sport of model plane building is constantly finding new recruits in search of material to get started. Also, many of the oldtimers are seeking sources to replace material and information which was lost or misplaced. Then, too, there is the group that missed out getting the material as originally published because supplies were exhausted by the time of their request.

We feel that this book will prove to be an excellent guide for clubs and schools with projects in model plane building. It should also serve to indicate how broad the field of modeling spreads, its complexities and solutions, its simplicities and pleasures.

The simple gauging of the man-hours that went into drawing all of the lines, lettering all of the panels and plans — not to mention the man-hours of thought that went into producing the Handy Hints — is too formidible to contemplate. What you find here is a condensation of many years of effort by many excellent model builders, designers and artists.

We hope you enjoy this publication and gain many time-saving knacks to make hobbying more pleasant. And, we suggest that you keep close tabs on this edition. It is a limited printing and will prove to be a scarcity as have the 5 previous Handbooks in this series.

The Editors

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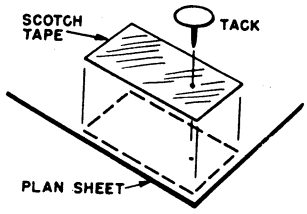
We would like to dedicate this publication to two staunch modelers whose designs and efforts have done so much for model aviation — Paul Del Gatto and S. Calhoun Smith. Both have passed from the modeling scene but they have left their marks for the many that follow. Much of what you find in these pages was created and drawn by them and we feel that MODEL PLANE BUILDING FROM 'A' TO 'Z' is a fitting tribute.

Handy Hints

PLAN SAVER

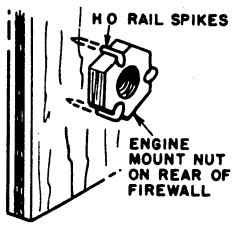
Kit plans are usually folded tightly or rolled as they come from the box. In order to smooth them out flat, to put them down on the building board, try



this trick: Put a small square of Scotch tape at each corner (and several along the edges if the plan is big). The tape reinforces the paper so that it will not tear when thumb tacks are inserted and the paper is stretched smooth. WARREN McCANDLESS, Toledo, O.

NUT HOLDER

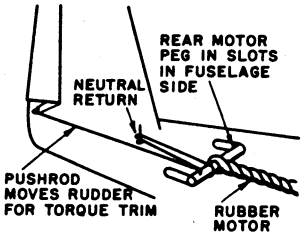
When mounting blind nuts on the rear of a firewall, for radial engine attachment, try holding the nuts in place with HO rail spikes. Several spikes



and liberal coats of cement will anchor the nuts firmly. Works well on smaller engines but 19's and 29's vibrate too much. TOM HUME, Monrovia, Calif.

TORQUE COMPENSATOR

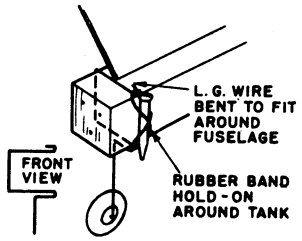
Adequate rudder trim, to counteract torque on a rubber model, usually results in too tight a glide turn when power is spent. To correct this, make this automatic trim control: The rear motor peg is fitted in slots and at-



tached to the rudder horn. As tension on rubber motor becomes less, the spring or rubber-loaded rudder returns to neutral. Experiment to find the proper rudder trim settings for power on and power off conditions. CECIL P. LEWIS, Beaufort, N. C.

EASY GEAR-MOUNT

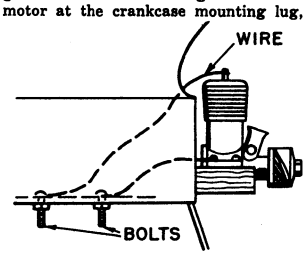
This is one especially suited to ½A models with slim noses. Instead of mounting the landing gear on firewall, bend it to fit around the fuselage and clamp it with rubber bands. Eye-dropper tanks can also be held in place under the bands. Small blocks will hold the gear in position. The gear can be removed for VTO flying or a heav-



ier wheel, on an interchangeable gear, can be used for windy weather flying. HOWARD G. EVANSON, Minneapolis, Minn.

BOOSTER ATTACHMENT

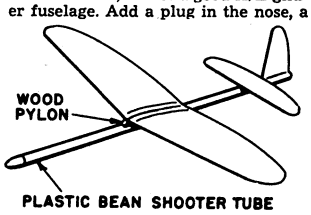
If your booster-leads tangle with the propeller when you are starting that engine, try moving the attachment point back out of the way, as shown here. Mount two bolts at some convenient spot and run wires to the engine. One wire should be ground on the motor at the crankcase mounting lug,



the other connects to the glow-plug top. A slip-on connector could also be used at the glow plug, with wires leading to bolts for the alligator-clip booster connection. A two-prong plug and socket could be fitted into the fuselage side. DANNY RHOADS, Fremont, Ind.

QUICKIE FUSELAGE

A plastic bean shooter tube, obtainable in 5&10's, makes a good H/L glider fuselage. Add a plug in the nose, a



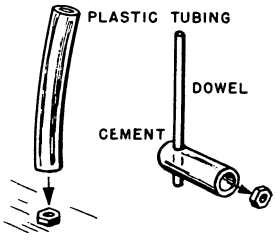
prop and rubber to make simple rubber model. Plastic cement may have to be used for adhesion to the plastic tube. Reinforce wing and tail joints with gauze or paper. HARRY MEEKINS, North East, Md.

Substitute Wrench

Ever tried to get a nut onto an engine bolt down inside a cowling or around a tight corner? This hint may help you next time you come across this problem:

Take a few inches of larger diameter plastic tubing and push the nut into its end. If the nut won't fit, enlarge the hole in the tubing with a knife or apply heat from a match for a moment. Put the nut on a table top and push the tube down onto it.

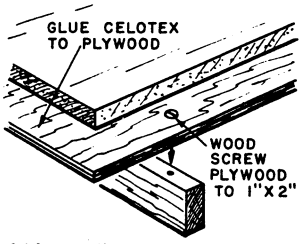
Getting the nut started is usually the hardest part. The tubing will get into



those tight places to enable you to do this. Final tightening will have to be done with a small open end wrench or something similar.—W. A. POLLARD, Cheshire, England.

Building Board

A good workboard for building models can be made from a piece of Celotex or similar wallboard. This is

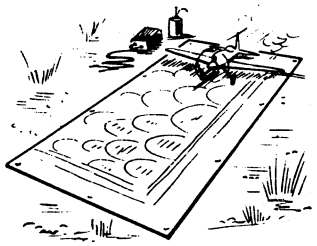


fairly smooth and will take pins much easier than most hardwoods.

To retain a good flat surface and prevent warps, back up the Celotex with a sheet of plywood and a couple of 1" x 2" stiffeners. Glue or nail the Celotex to the plywood. Make the board a convenient size, such as 24" x 36".—C. E. NASH, Carlsbad, N. Mex.

Yo-Yo Runway

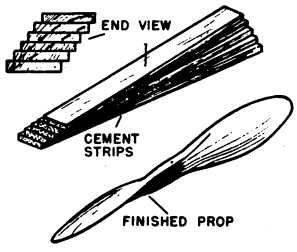
Control-line flying sites are not always as smooth and dust-free as most modelers would like. If this is your trouble, a portable runway can be made from a strip of old linoleum floor cover-



ing. Hold the corners down with spikes. A 3' x 10' linoleum strip should be large enough for most flying. Try this on your local rock-pile or dust bowl!—DON JONES, Tarzan, Texas

Laminated Rubber Props

When a prop block or blank of the lesired size is unobtainable, try this method on your next fan. It is similar

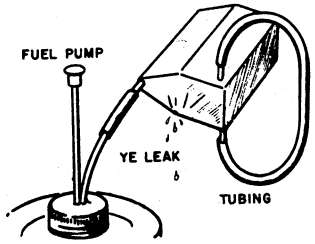


to that used for full-scale light-plane propellers. Cut strips of ⅛" sheet balsa about ½" wide to the desired length. Cement them together as shown, spreading slightly fan-like. Carve and sand to shape. Vary the thickness and width of the strips according to the size of the propeller needed. Cut the strips extra wide so that there will be plenty of wood to work with. Cement lines will aid in proper contouring.—JAMES HARRIS, Chicago, Ill.

Tank Testing

Most modellers go about testing a fuel tank by plugging up the two breather tubes, attaching a football pump to the filler tube, putting the whole works underneath six inches of ice cold water, and then pushing up and down on the football pump and looking for air bubbles. This is the old reliable method, and it always works, but it is not so handy when a leak develops on the flying field. So try this method of finding a leak in a fuel tank:

Take some excess neoprene tubing, about 4" or so, and attach one end to a breather tube on the tank that is to be

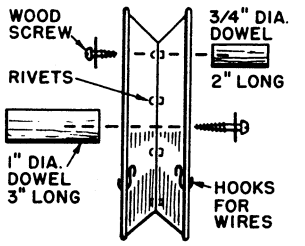


tested, and then attach the other end of the tubing to the remaining breather tube. Now take the neoprene tubing on the end of the fuel pump nozzle and attach this to the filler tube on the tank. Start pumping until the tank is full of fuel—then keep right on pumping.

If there is a leak, you will notice fuel oozing out of the leak, along with a lot of air bubbles. If there is no leak in the tank, there is not enough pressure generated in most fuel pumps to cause any disastrous results.—KENNETH SCOTT, Beloit, Wisc.

Line Reel

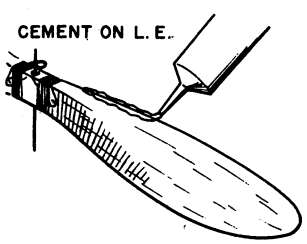
An inexpensive control-line storage reel can be made from two 5" aluminum pie pans. Rivet or bolt them bottom to



bottom, and fit with a handle and crank. Drill holes in the rim to hook on the line ends.—ROBERT MUNDY, Upper Sandusky, Ohio.

Rubber-Model Prop Saver

Balsa rubber-model propellers take a beating along the leading edges. Try this kink to make the props more durable: Coat the leading edges with a

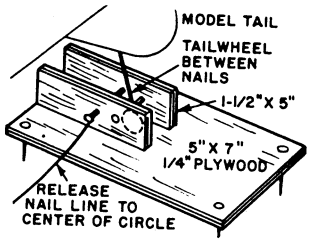


couple of layers of cement. On large props, a strip of silk or paper can also be added. Set in cement.—LEROY WILLIAMS, Perryville, Ark.

HINTS

PLYWOOD STOOGE

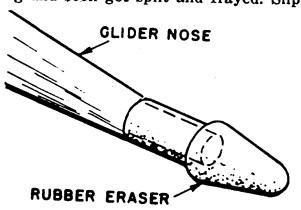
Here is a handy helper that can be made from scrap plywood or thin lumber. The base has two pieces of wood nailed in place vertically with space between them for the tailskid and tailwheel of a model. One nail is fixed, the



other one movable to release skid. Fishline to center of circle pulls the release nail. One release nail may be used if the skid is bent with an eye in end. RAYBURN WILTON, Mt. Brydges, Ont.

NOSE GUARD

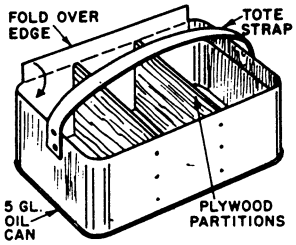
H/L glider noses really take a beating and soon get split and frayed. Slip



a rubber pencil eraser over the nose and let the rubber do the bouncing.

ACCESSORY KIT

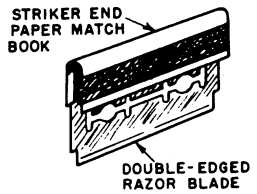
If you need a kit to carry tools, props, fuel and batteries to the flying field, here is an inexpensive idea: Obtain a 5 gallon oil can and cut off the bottom, leaving the sides 6" to 9" high. Cut each



corner down about 1" and then fold edge over inwards so there will be no exposed sharp edges. Rivet or bolt a belt or strap across top for a carrying handle. Put in plywood partitions as required. WESTLEY GLISSON, Titusville, Fla.

FINGER SAVER

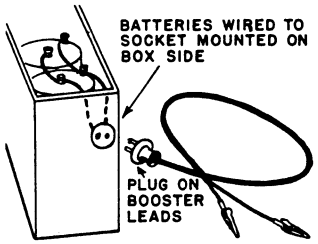
When using double-edged razor blades for cutting balsa, protect your fingers with this handy wrinkle: Tear off the striker end of a paper match book and then slide razor blade between the match cardboards and up against



the staple. This will avoid quite a few nicks in the fingers. CHARLES KELLOGG, JR., West Newton, Mass.

Plug-In Booster Leads

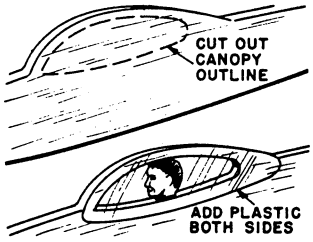
If you use a field box to keep your fuel, props and booster batteries handy to your model, this trick will help you. Mount your booster batteries inside the box and run leads to a socket mounted on the side of the box. Attach



a plug to one end of your booster leads and alligator or Kwik-clip to the other end. Booster leads can then be plugged in to use, and unplugged, rolled up, and put in box when not in use, thus preventing possibility of shorting out. If available use small plug and socket of the type used for R/C models. MURRAY HEARD, Lima, Peru.

Profile Cockpit Canopy

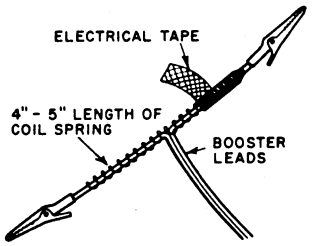
To help dress up your solid plank profile model, make a cockpit canopy as shown. Cut out the center of the solid wood canopy and then cement



clear plastic on each side. Put in a silhouette pilot's head if desired. ARTIE WIESE, Bay Shore, N. Y.

NO-SHORT BOOSTER LEADS

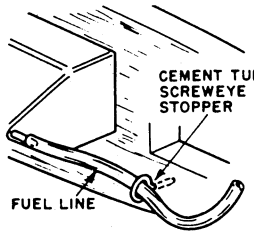
Booster battery leads with alligator clip ends often touch when dropped after starting an engine. To keep the clips from touching, shorting and draining the battery, twist about a 4" or 5"



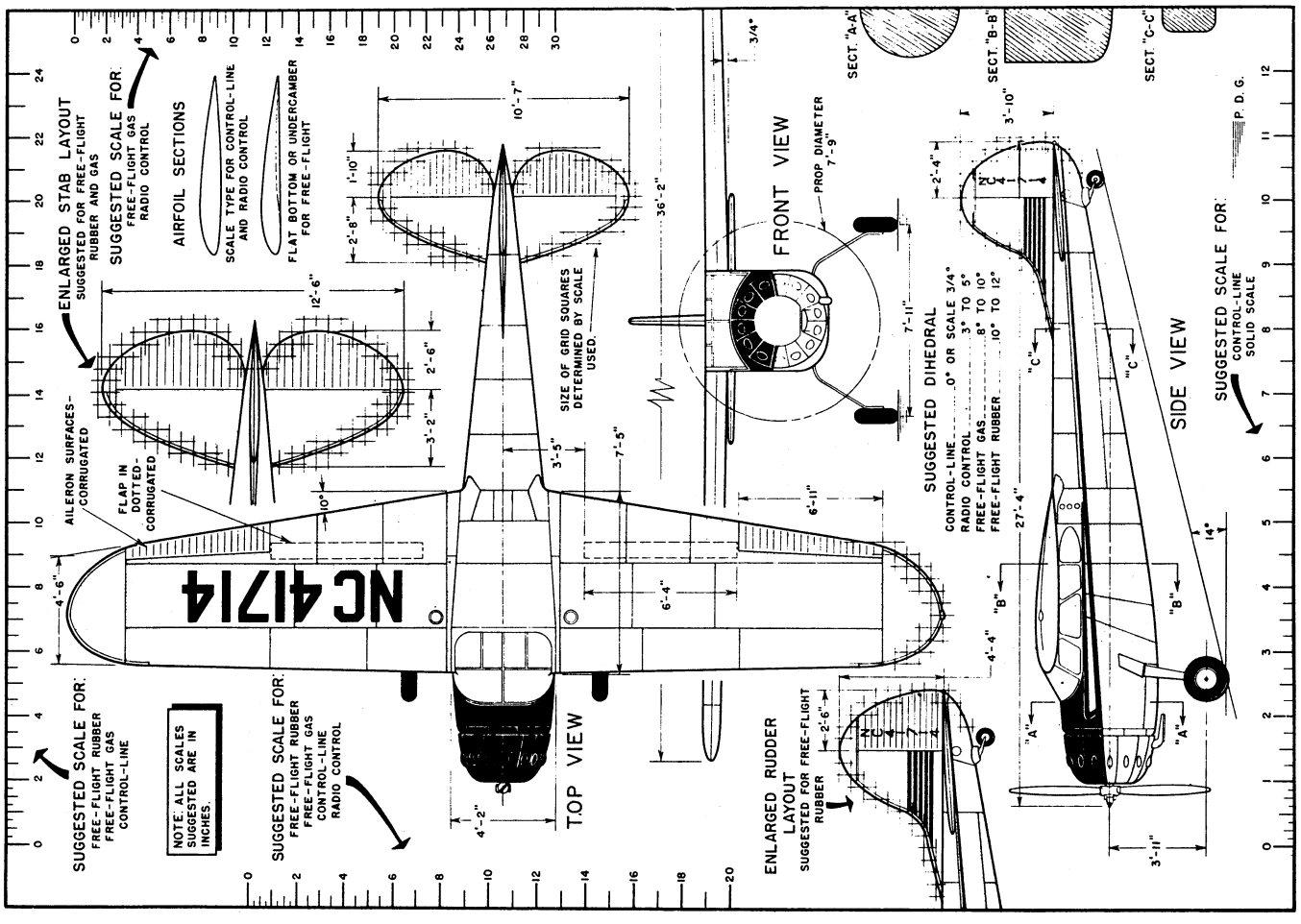
length of ¼" diameter coil spring onto the leads and wrap with electrical tape. Spring will keep clips apart when not in use, but is flexible enough so that clips can be put on the engine easily. BILLY CENTNER, Westport, Conn.

FUEL-LINE GUIDE

Screw-eye stoppers from cement tubes can be used to hold down floppy fuel lines leading from tank to engine on profile models. Drill a small pilot hole in fuselage side at the desired



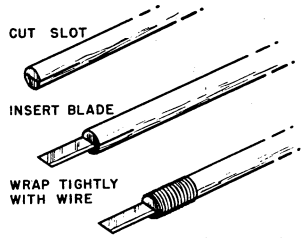
location. Screw eye into place, and thread the fuel line through the eye. It will keep the fuel line away from engine heat. WAYNE BROWN. Drumheller, Alberta, Canada.



HINTS

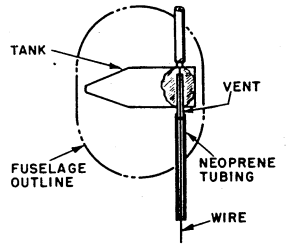
Modeler's Knife

If you don't have a standard commercial knife set, here is a handy substitute: Cut a slot in a length of ¼" or ⅜" diameter dowel to fit a standard knife blade or Injector razor blade. Insert blade in slot and wrap tightly with copper wire to hold blade firmly. Rewrap when blade is replaced.—E. WOODSON, JR., Roxbury, Mass.



Plumber's Helper

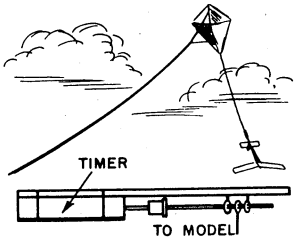
When neoprene tubing on vent pipes pulls away from short vents on models where the tank is well buried in the fuselage structure, simply run a piece of wire into the vent and slide the neoprene tubing over it.—C. BERGSETH, Seattle, Wash.



Hi-Fly Glide Test

Ever wished for some method of glide-testing your models at a higher altitude, to determine necessary adjustments, before trying a powered flight? This kite-launch system really works well. The kite has a small Elmic timer tied on its tail. The model's tailskid is hooked onto the timer, the timer is set for about one minute, and the kite and model are sent aloft. When the timer releases the model, it can make a prolonged glide down, giving the builder plenty of time to watch glide performance.

Tests have shown that an ordinary 3' kite will lift a light 30" ½A model in a 14 m.p.h. wind. But this amount of wind is undesirable for most testing, so you need a larger kite to lift more in less wind. Remember that increasing the size twice increases the area by four. A 55" newspaper-covered kite towed a ½A free-flight model in a 9 m.p.h. wind.



When flying in a strong wind, use a long thin tail. In a light wind, when no tail is needed, tie the timer to the end of a piece of string running at least 10' from the kite, to prevent the model from swinging and upsetting the kite.

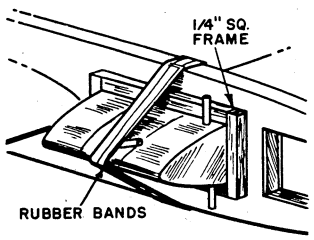
Flying procedure goes like this: Raise kite, tie down end of cord, then place string under arm and walk kite nearly to earth. Attach model, release kite, move downwind, and wait for your model.

Even if you don't use this wrinkle for glide-testing, it's great sport for flying hand-launched gliders or small towliners.—DOMINIC D'ONOFRIO, Detroit, Mich.

Tank Anchor

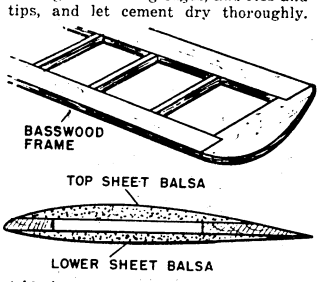
Here's a solderless fuel-tank mounting for your profile trainer, stunt or combat ship:

Place the tank in position on the side of the nose and mark its outline on the side with pencil. Then, cement strips of ¼" square wood around the outline, as shown, to form a shallow slot for the tank side. Slip a few husky rubber bands around the fuel tank and fuselage to hold the tank in place.—PAUL GERHART, Tracy, Calif.



Speed Wings

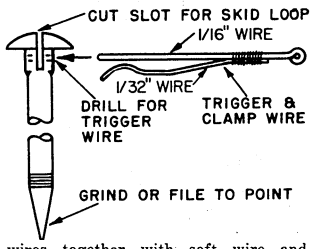
Strong, easily built wings for your speed job can be turned out using the procedure shown. Lay out basswood leading and trailing edges, add ribs and tips, and let cement dry thoroughly. Add sheet balsa top and bottom sheets and carve to airfoil shape. This makes a durable lightweight wing that can be carved to sharp edges where needed.—EVERETT L. BARLOW, Albuquerque, N. Mex.



Simple Stooge

Here's a simple stooge well suited to grass or dirt controline flying sites:

A ¼" diameter carriage bolt, about 6" long, is slotted and drilled at the head in the manner shown. Then, a trigger is made, using 1/16" diameter wire for the top part and 1/32" diameter wire for the clamp part. Bind the two wires together with soft wire and solder. The end of the bolt is ground or filed to a point,

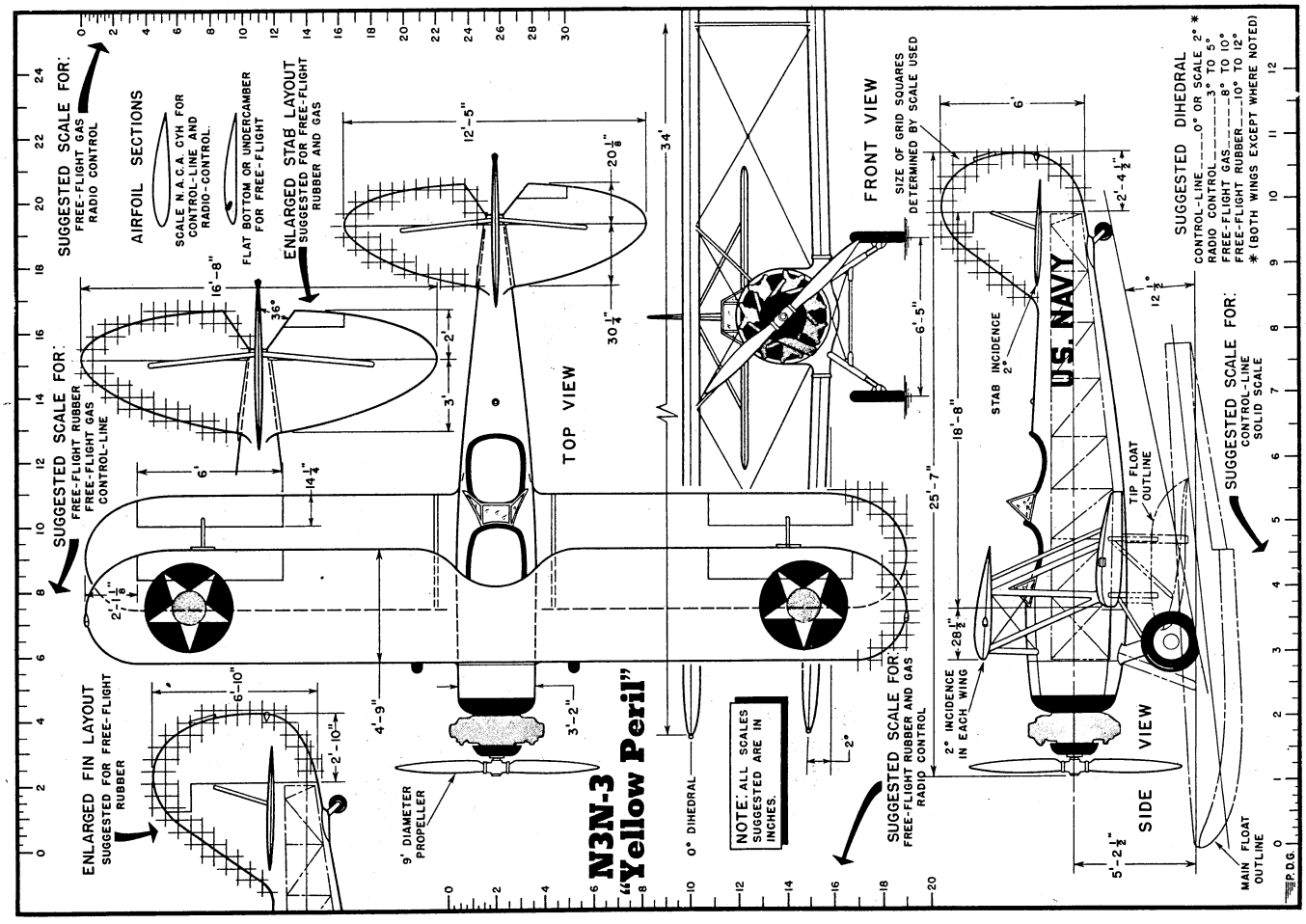


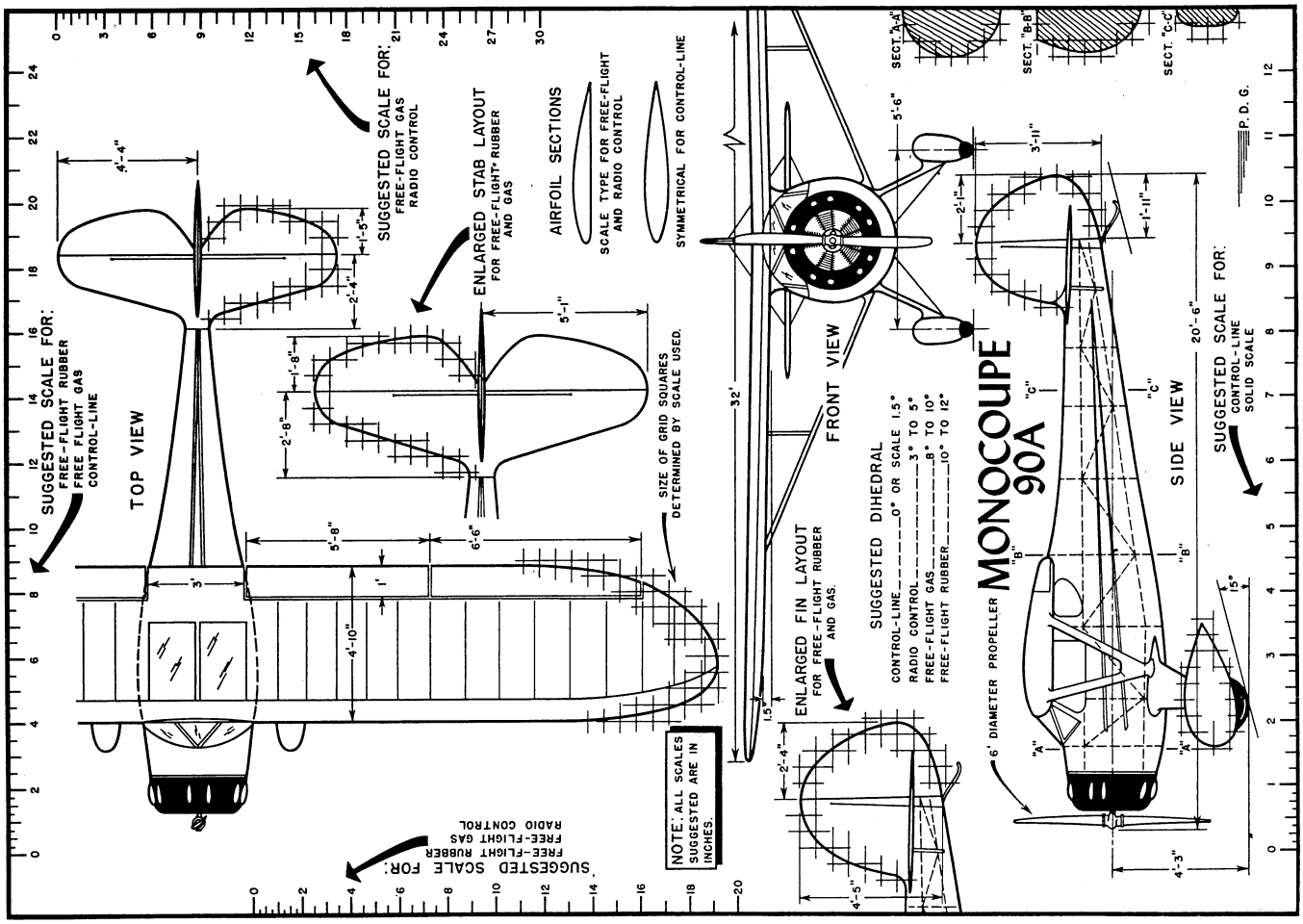
The operation goes like this: The bolt is pushed into the ground. The tailskid loop on your model is placed in the slot and the trigger wire is passed through the bolt head and loop, with the clamp wire bent around one side of the bolt to hold the trigger in place.

A string extending to the center of the flying circle is tied to the loop at the end of the trigger. Then, to fly, the string is yanked, the trigger wire pulls out of the hole in the bolt, the tailskid is released, and the plane takes off.—BILL RINCK, Springfield, Mo.

Cement-Proofing Plans

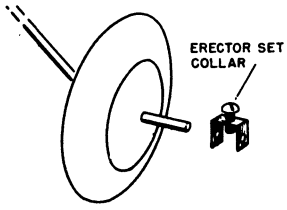
Being caught short without any waxed paper when some important building is in progress need not make things difficult. Lay the plans out on your workboard and get an ordinary candle. Light it and, holding it on its side, allow the wax to melt and drip off onto the plan. Drip only onto the junctions of the structure pieces, where cement is liable to overflow. While still soft, spread the wax puddles out with your finger or wait until it cools and then scrape the top flat with a knife, so that the surface will be smooth to build over.—M. KRIM, Bronx, N. Y.





Wheel Retainers

Robbing the kid brother's Erector set may stir up a family fight, but some of the small hardware comes in handy in

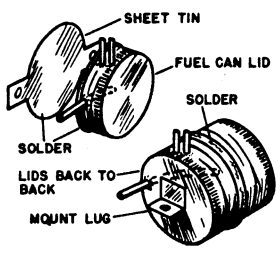


the model workshop. The U-shaped shaft collars with setscrews, for example, can be used for wheel retainers. Simply tighten the setscrew down on the axle end.—DAVID ARTHUR, Jackson, Ohio.

Baby Engine Tanks

Small fuel tanks for Class ½A engines can be made easily from bottle or fuel-can caps.

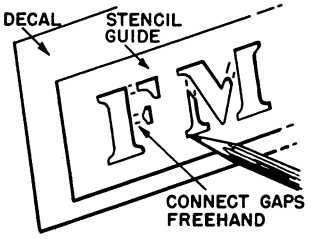
First remove the paper liner, then



cut a sheet of tin slightly larger than the lid size and solder it directly to the bead on the lid. Or, join two lids at the bead with open ends facing each other. Solder the fuel and filler lines into the caps before joining. Solder on lugs as needed.—DON MANSMANN, Pittsburgh, Pa.

Decal Patterns

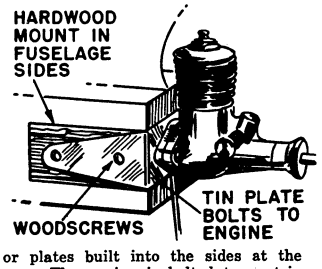
A good stencil guide for the modeller who likes to make his own numeral and letter decals can be found in any five and ten cent store. Lay the guide over a decal sheet and trace the outline



Then, cut out the decal and apply it in the usual manner. On dark colored decal paper it is easier to transfer the outline to the backing paper (but remember to flop the stencil guide!)—ROBERT AVERY, Watervliet, N.Y.

Strap Engine-Mount

Radial mounting of small ½A engines can be a fussy job on some models. Try this system for an easily accessible outside mount: Your model fuselage should have hardwood bearers

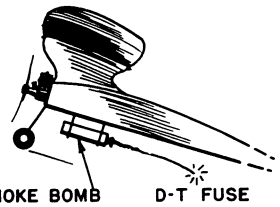


or plates built into the sides at the nose. The engine is bolted to a strip of heavy tin-can stock, thin sheet dural or steel, bent around the nose and sides. Woodscrews hold the strap to the hardwood. Thrust adjustments can be made by enlarging the holes in the strap for the wood screws and sliding the strap to adjust.—JOHN KIDWELL, Dinuba, Calif.

Free-Flight Finder

If you are flying where conditions are hilly, with tall grass, or where the corn is tall, you may be able to use this idea for locating that wandering free-flight model:

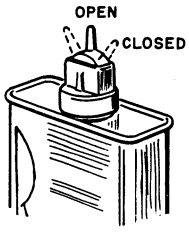
Attach a smoke bomb (type used in control-line) to your model with some dethermalizer fuze attached to the bomb fuze. Use as long a D-T fuze as



needed. Then, when the model gets down and the bomb fires off, the smoke will be visible for a good distance. (Check with your hobby dealer to see whether local laws permit you to use smoke bombs).—JIM JANSEN, Manitowoc, Wisconsin.

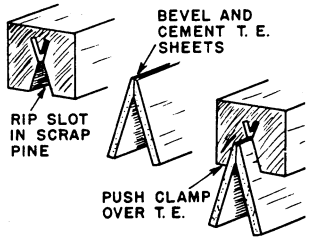
Primer Can

The new Ronson lighter-fuel can with the switch spout makes an inexpensive, pocket-size, fuel and primer can for ½A tanks. The switch spout is open when straight up and closed when moved to either side. Made of fuel-proof plastic, it can be pried off with a screwdriver for refilling the can with fuel.—GEORGE WEHRFRITZ, Jacksonville, Fla.



Trailing Edge Clamp

A sheet trailing edge presents a cementing problem since it is difficult to apply pressure to the joint along its entire length. The clamp shown will solve the problem and insure smooth sheet trailing edge construction. Rip slots in a length of scrap pine with a table saw at the approximate angle of the trailing edge. Taper the rear edges



of trailing edge sheets, cement together, and add the clamp tapping it lightly into place. Cemented trailing edge sheets can be put on the ribs now or let dry. Wax the inside edges of clamp to prevent excess cement sticking to it. VERNON H. VAN DIVER JR., Woolford, Md.

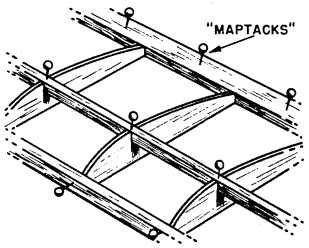
Jetex Fun

A real jet-powered bomb can be made from a Jim Walker 10¢ glider, Interceptor or Hornet. Mount a Jetex 35 or 50 engine under the balance point or on the fuselage top if desirable. Cement tail pieces permanently in place so the jet blast won't dislodge them. Then let 'er rip. DOUGLAS HILL, Denver, Colo.

HINTS

Needles and Pins

This is not a commercial for the maptack manufacturers, but did you know that maptacks can serve the model builder equally as well as chart watch-



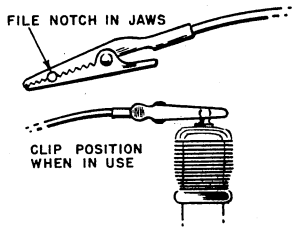
ers? Maptacks have a round head (about 3/16" diameter) and are made of steel, with very sharp points. They come in various sizes and colors and are ideally suited for model work. They can be easily handled, and their heads won't fill your finger full of holes, like ordinary straight pins. Maptacks are available in most book and stationery stores. Try them when building your next model!—BOB BAKER, Fond du Lac, Wisc.

Lead Salvage

Rubber and towline model builders should welcome this suggestion: Instead of cutting up good solder for ballast, try reclaiming the lead in your used cement tubes. When the tube is used up, flatten it with a hammer and roll it tightly. Cut off the clip and spout ends to make a smooth roll. These weights can be trimmed with shears or a knife to the required size.—GLENN GESELL, Worcester, Mass.

Glow-Plug Clips

If your booster clips keep sliding off your glow-plug top and shorting out against the cylinder head, simply file a

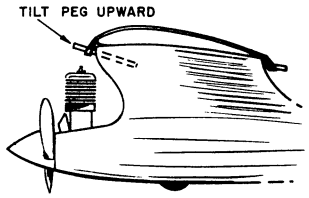


notch in the jaws of the clip, large enough to fit over the glow-plug top, as illustrated.—KROME BOWEN, Gainesville, Florida.

Pop-Off Wing Tie-Down

Usually modellers can think of many ways for holding the wings tightly onto a free-flight model. But what about those wing-low landings and spirals?

The idea shown here will get the wing off the fuselage with a minimum of damage. Simply cock the front tie-down dowel up slightly so that the rub-



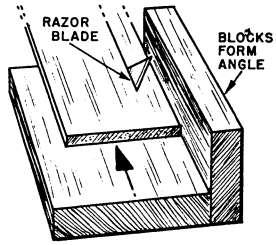
ber will slide forward and off with ease. Tension will hold the rubber in place under normal flying conditions.—GORDON WARD, York, Pa.

Balsa Stripper

An easily constructed stripper can be made as shown. Cement two blocks or thick sheets together to form an angle. Imbed a razor blade in the lower block at the desired distance from the vertical block. Allow only a corner of the razor to extend upward and have it slant into the block.

Use heavy blades, such an Injector, or single-edged blades with the backs off. A couple of nails driven through the side of the block behind the blade will hold it firmly in place.

To use the stripper, simply push sheet stock against the blade, with the



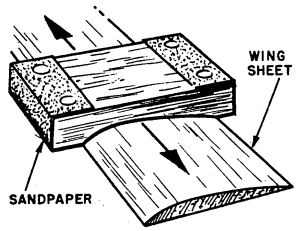
edge snug against the vertical block. Hold the sheet flat on the lower block for a square cut. Mind those fingers, too!—JAMES SCOTT, Quebec, Canada

Substitute Thinner

If your hobby dealer happens to be sold out of thinner, you can substitute lacquer thinner sold at body shops, hardware and paint stores. You won't be able to buy as small a quantity as is sold in hobby stores, but the investment will keep you in thinner for a long time. A word of warning, though, fuel-proof dopes do not mix with lacquer thinners. Butyrate dope thinners, obtainable at airport supply shops, will do the job however.—BOB KOPSKI, Freeland, Pa.

Forming Sheet Wings

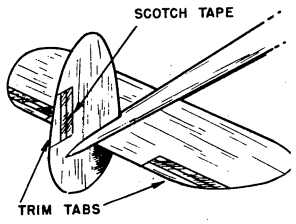
Getting a constant airfoil section on solid model or glider wings has always been a problem, but this sanding block will do a neat job. Carve the block to the desired airfoil shape and then sand



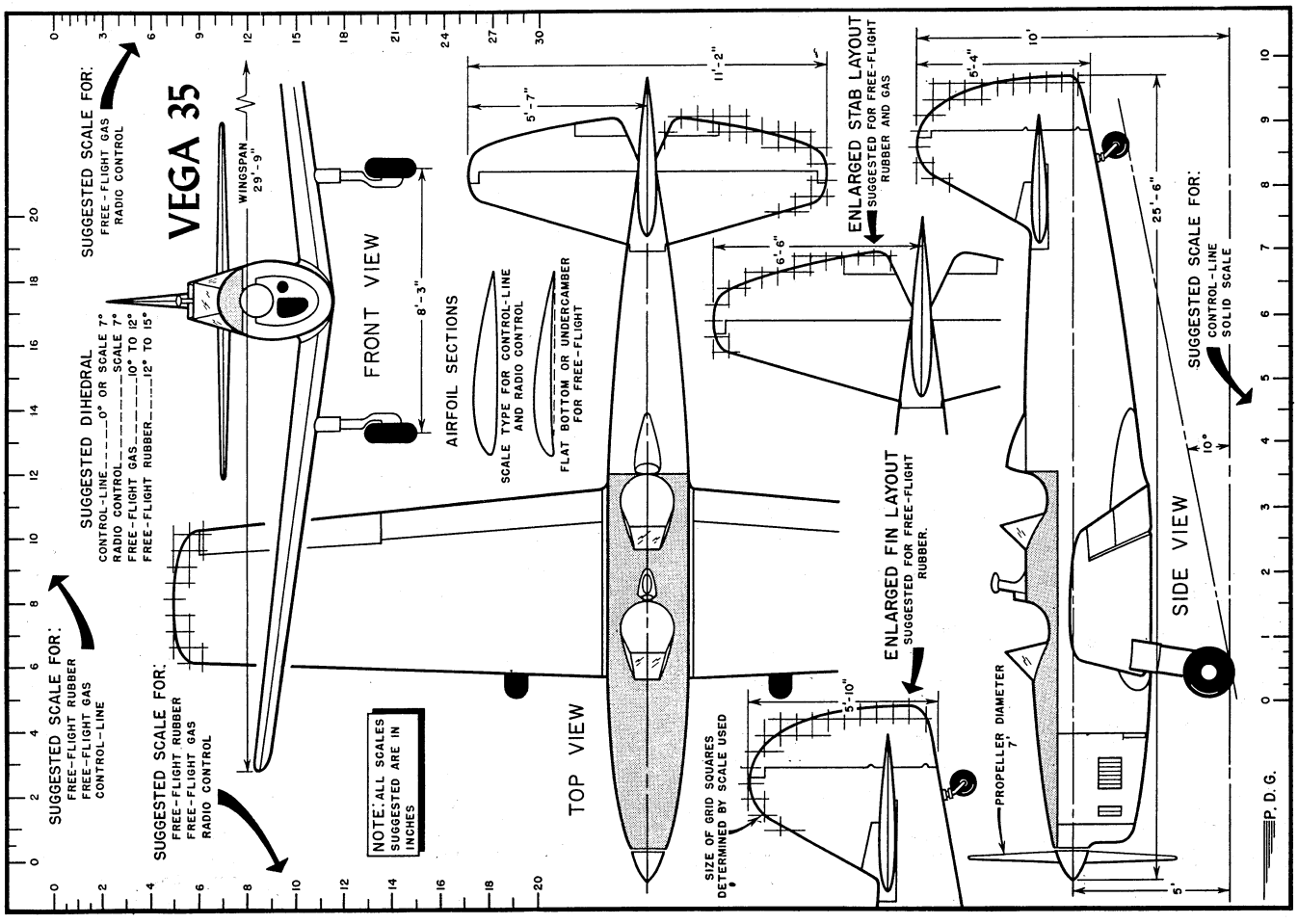
away. A little rough carving on the wing will shorten the labor.—LAWRENCE RODRIGUE, Kamloops, B. C.

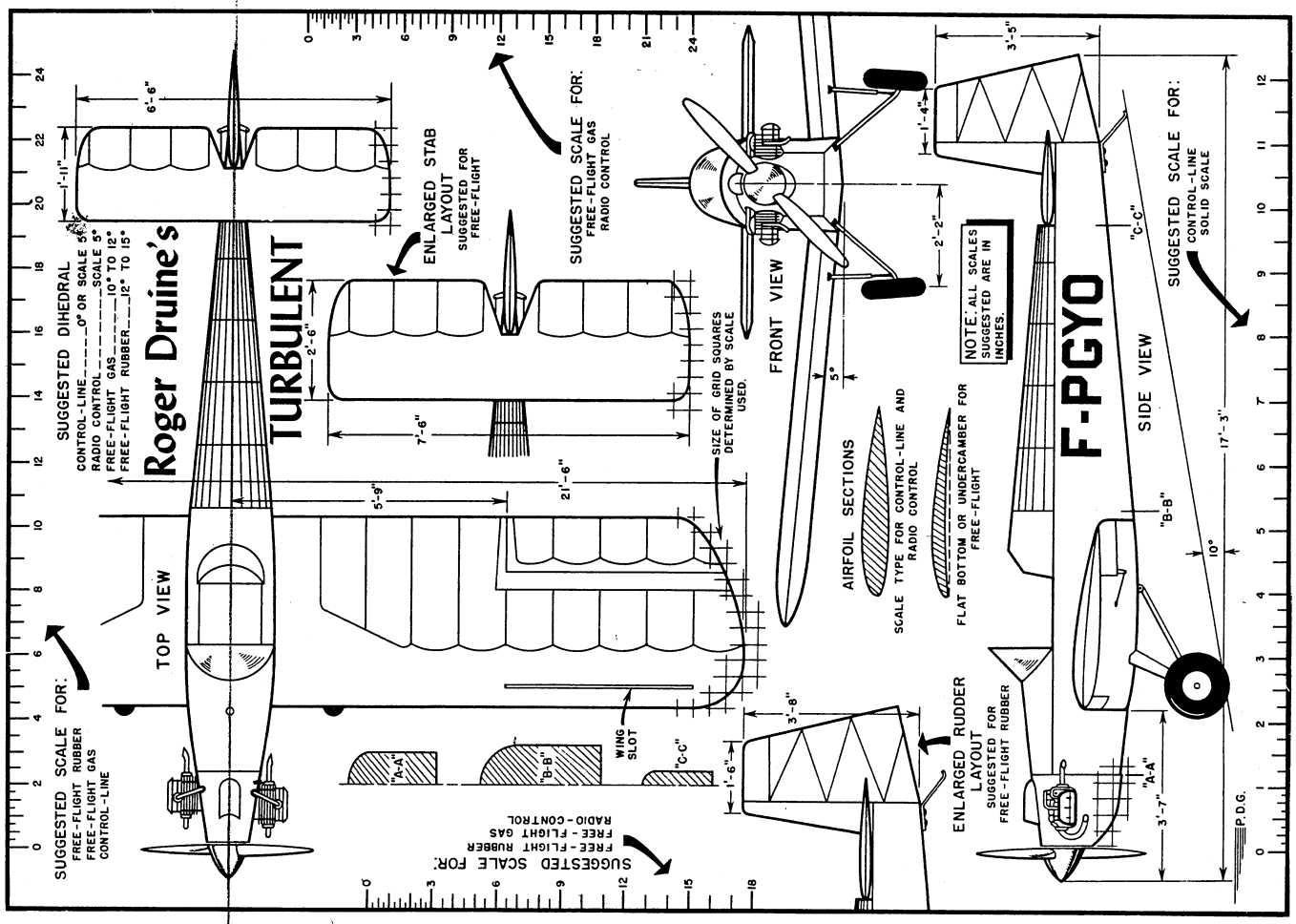
Glider Adjustments

Fine adjustments on hand-launched gliders can be made with these trim tabs. Simply cut out portions of the control surface to form the tabs and hold in place with a length of Scotch tape. Make good clean cuts so that the



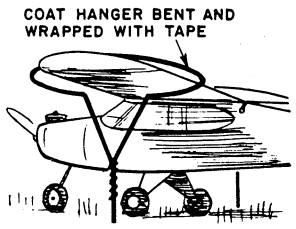
tabs will bind slightly and therefore hold the adjustments.—ROBERT RANDALL, Greenfield, Mass.





Model Tie-Down

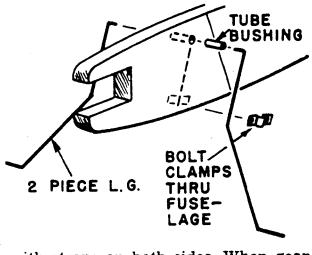
Ever been out on the flying field on a windy day and had your model flipped over and damaged? Well, this is a sure fire preventive. Take two coat hangers and bend as shown. Cover



wire with tape or cloth wrapping. Slip the tie-down over the wingtips and push ends into ground. FREDERICK C. BRANDT, Toledo, O.

Removable Ukie Gear

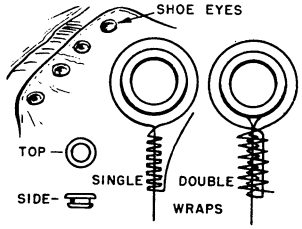
Yo-yo trainers are hard on landing gears, so why not make yours removable for easy replacement. Make the gear in two pieces as shown. Insert a length of brass tubing, inside diameter equal to wire's diameter, in fuselage. Slip the ends of the gear legs in the tubing and clamp it to fuselage side



with straps on both sides. When gear is badly bent or damaged it can then be removed by unbolting clamps. ED SURGALSKI, Beaver Falls, Penna.

Flying-Wire Ends

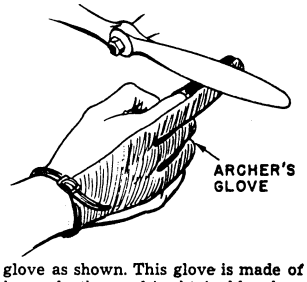
To make a strong loop in the ends of control-line flying wires, add a shoe-eye or similar eyelet. Pass the wire



around the eye twice and double-wrap for a strong loop. Don't rob a new pair of shoes for the eyes or Poppa spank!—JAMES C. LITTLE, Tiskilwa, Illinois.

Finger Protection

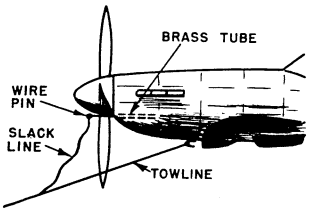
Knuckle busting seems to be a definite part of starting model engines, but you can protect those tender digits by wearing a three-fingered archer's



glove as shown. This glove is made of heavy leather and is obtainable wherever archery equipment is sold. J. PAUL MAY JR., East Aurora, N. Y.

Tow-Line Tricks

The rubber-powered flying-scale model has always been a popular favorite across the pond, and from England comes this trick for getting longer flights from this type of ship: Rig a hook for a towline on the underside of the model. Mount a brass tube in the nose close to the propeller to hold a wire pin, which extends forward across



a propeller blade. Attach a slack line to the pin from the towline so that, when the towline is pulled loose, the pin also will pull loose and release the propeller. This will enable the power to the vertical face for the front crankcase-cover mounting screws and the crankshaft bearing. The horizontal face of the angle is drilled and bolted or screwed directly to the fuselage bottom.

If desired, the mounting lugs can be sawed and filed off the sides of the engine to make the narrowest silhouette possible. Use machine screws slightly longer than standard for mounting the front crankcase cover and the dural mount, to allow for the thickness of the added metal. — ALAN GILKINSON, Rochester, Minn.

Fire! Fire!

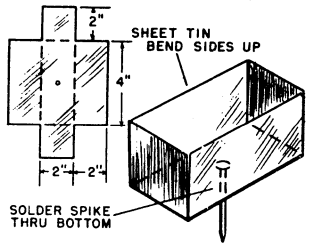
The said sight of a modeler stomping on a burning model is frequently seen on the flying field. Don't let this happen to you—carry your own miniature fire extinguisher in your tool box!

Use the cartridge holder from a CO_2 engine, cutting off the line to leave about ½" for a nozzle. Keep the holder loaded with a CO_2 cartridge at all times. To use, screw down the thumb screw and aim at the fire. If the CO_2 gas itself doesn't do the job, the force of the gas will blow the fire out.—JOHN CZACH, Chicopee Falls, Mass.

Can Holder

When the fuel can keeps tipping over in the grass or on rough ground, try this wrinkle:

Bend a piece of sheet tin into the shape shown and solder a large spike

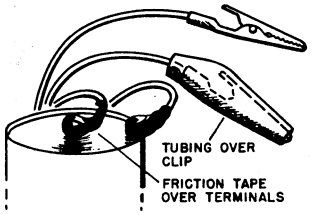


into the bottom. Push the holder spike into the ground and drop the fuel can into it. This will keep the pump spout from collecting dirt.—ROBERT AREHART, Gary, Ind.

No More Shorts

The old problem of preventing booster clips from short-circuiting is solved by this method:

Slip a length of rubber tubing over one alligator clip. Cut the tubing long



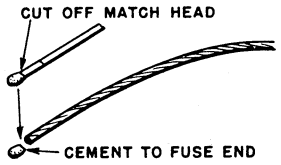
enough to completely cover the clip and make sure you get a snug fit. Use this clip for attachment to the glow plug—it's easy to open the jaws far enough. Cover the battery terminals with friction tape so the clips cannot short out there.—HERB WATSON, Terre Haute, Ind.

HANDY HINTS

Fire Starter

To help light Jetex fuse or dethermalizer fuse, cement a match head to the working end. When ready to use light match head with flame from another match, there will be plenty of heat to ignite fuse.

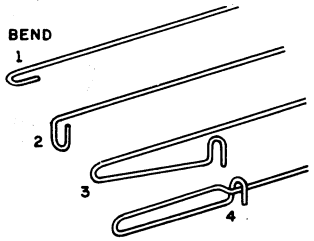
A good method for making dethermalizer fuse is to soak mason string



or similiar absorbent rope in solution of one part saltpetre to three parts of water for about 15 minutes. Let the string dry thoroughly before using it. PALTRINERI ARZEVEDO JR., Silvertown, Penna.

Lead Out Ends

Stiff steel wire leadouts on your Control-liner should have the ends

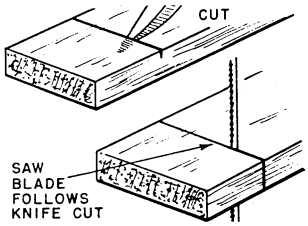


fixed as shown. This is essentially a safety pin type clip and is easily fastened or unfastened to attach or remove flying lines. TERRY HABER, Brooklyn, N. Y.

Clean Jig-Saw Cuts

When cutting ½" or thicker balsa with a powered or hand jig-saw, the saw blade sometimes has a tendency to wander as it goes through different wood density and grain.

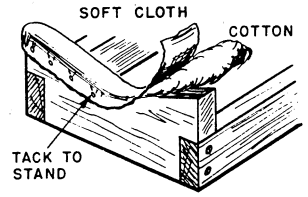
To smooth out the cuts, try this: Cut the wood with a sharp knife before



making a jig-saw cut. The cut need only be about ⅛" deep. This cut then serves as a guide for the saw blade. Make the knife cut with a straight edge where possible and by hand on curved lines.—S. C. SMITH, JR., Red Bank, N. J.

Boat Stand

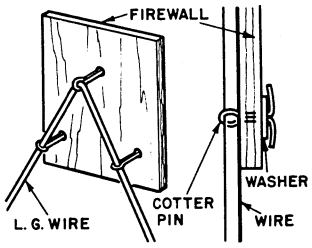
Model boats usually spend more time on their stands than in the water. To prevent marring the bottom finish and denting the wood while transporting the boat in your car, cover the portion



of the stand touching the boat with a good layer of padding. This can be of various materials. Felt weather stripping is good. Sponge rubber is good if covered with cloth (rubber gets gummy as it ages). Or, a strip of cotton covered with soft cloth can be tacked in place.—ROBERT LAHAS, Glendale, N. Y.

Landing Gear Mount

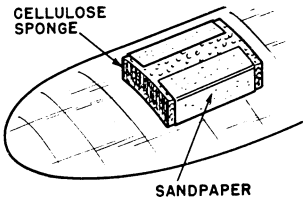
Here's an inexpensive way to fasten landing gear wire to a plywood firewall or bulkhead. Slide cotter pins onto the bent wire and drill the firewall as shown. Push the cotter pins through



holes, put washers over the pins and bend the ends outward. Tap lightly with a hammer to tighten. Cut off excess ends of cotter pins, and cement in place on the model. C. N. ELPHICK, Maitland, N.S.W., Australia.

Soft Sanding Block

To sand curved surfaces smoothly, try wrapping sandpaper around a piece



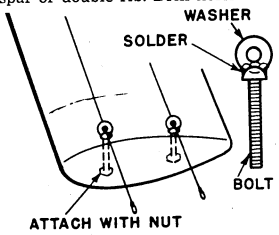
of cellulose sponge. The sponge will bend to conform to the curve of the surface. PHIL COBURN, Detroit, Mich.

C/L Handle Marker

In order to prevent mix ups when picking up the control handle, simply paint the up half of the handle green and the down half red. TOM BALUCH, Fontana, Calif.

Line Guides

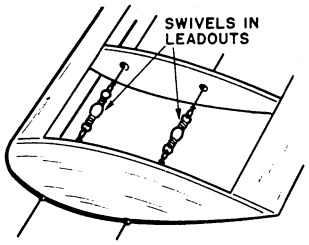
Solder a washer to the head of a bolt to make this simple line guide. Attach it to built-up wings by bolting it to a spar or double rib. Drill holes for the



bolt in a solid wing and fasten the guide with nuts and washers. TOM SHAFTER, Ironton, O.

Hidden Swivels

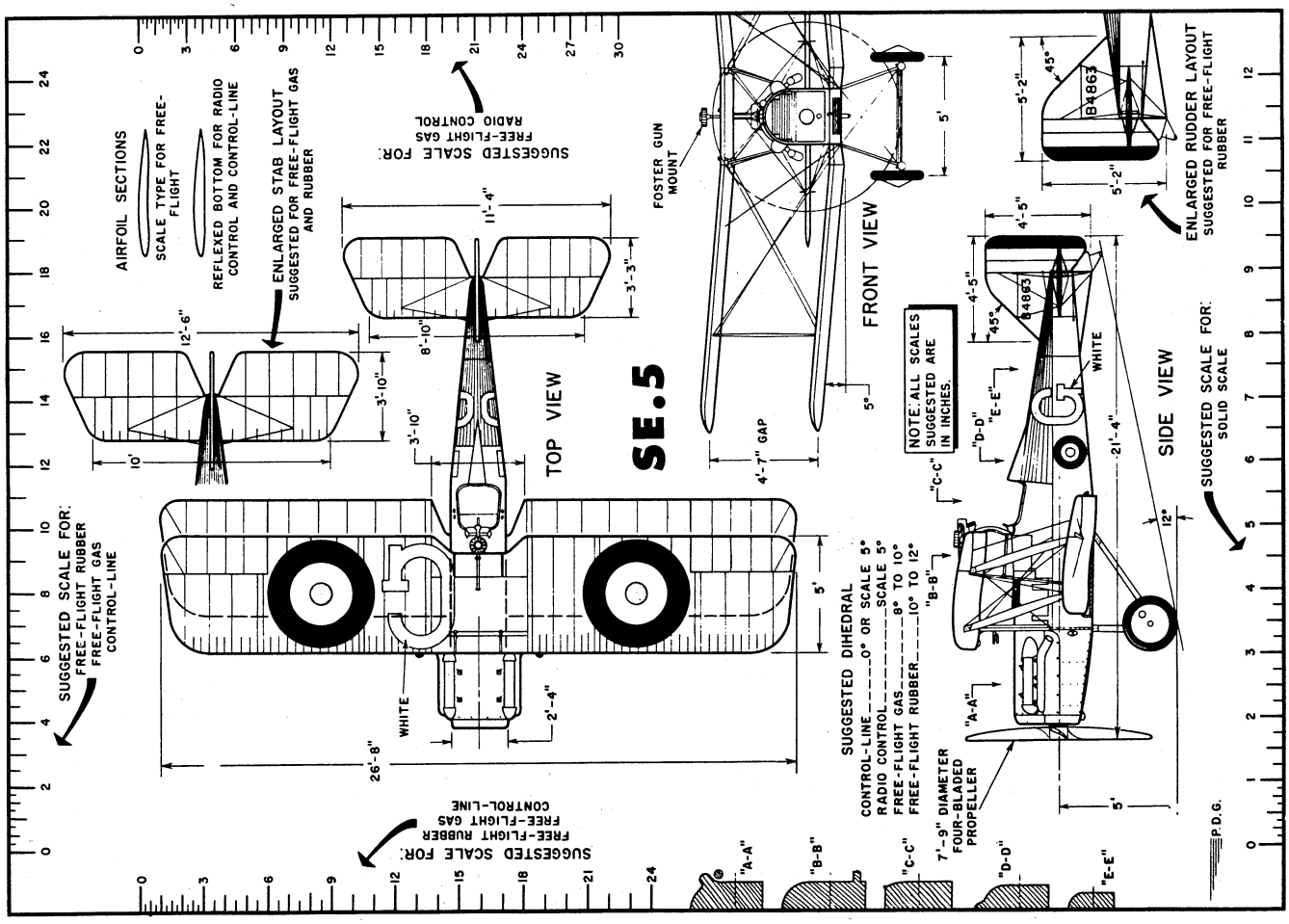
Why not put swivels permanently into a control system inside the wing? Attach the swivels to leadouts between

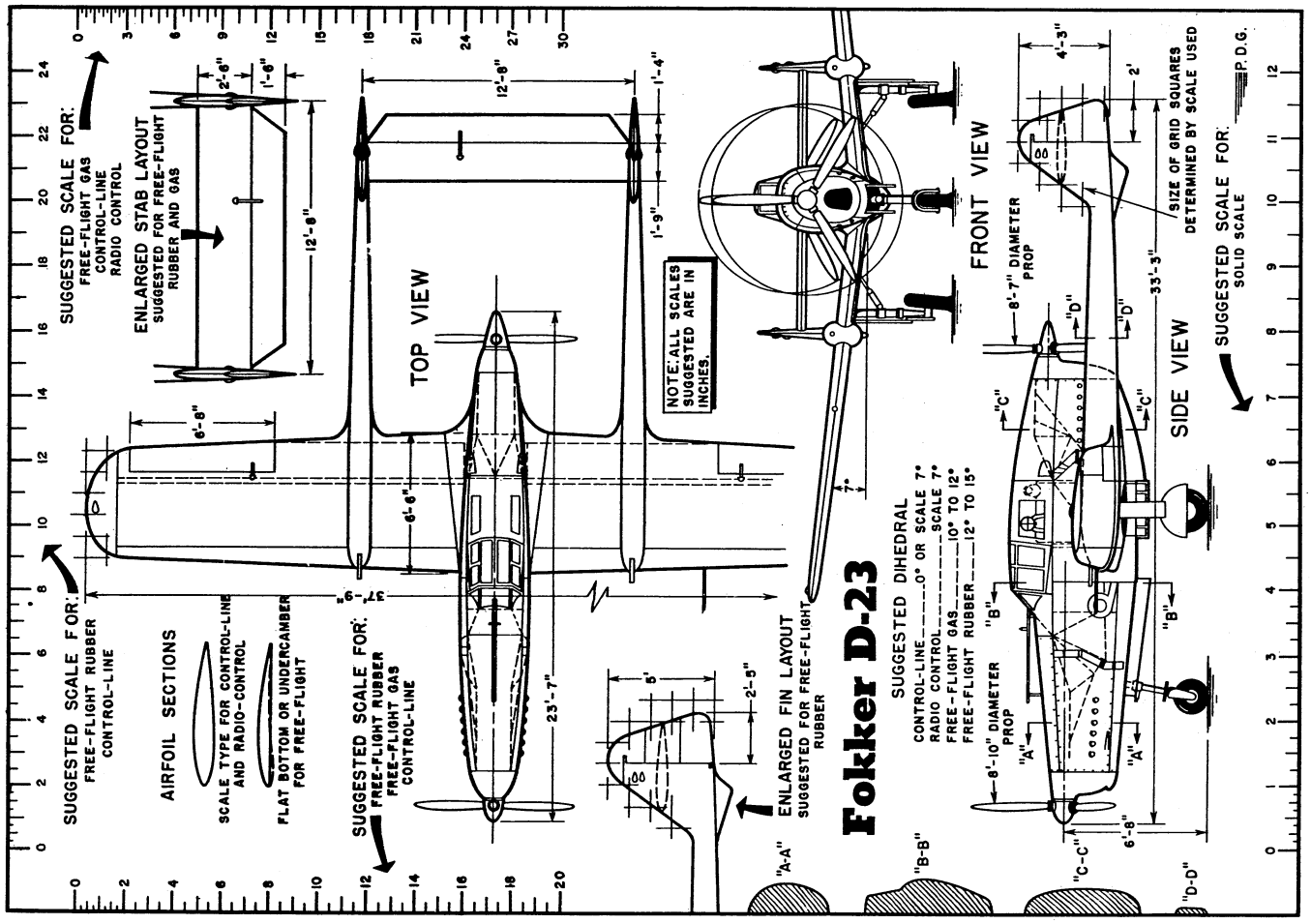


the two outer ribs and add short leadouts extending out of the wing tip .This will save a bit of drag. KEVIN J. LIERSCH, Victoria, Australia.

Tank Cover

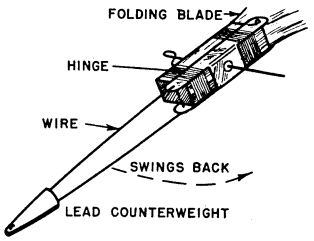
When you install that eyedropper tank on your ½A model, don't throw away the rubber bulb. Use the bulb as a cover to keep dust and dirt out of the tank when the model is not being used. RANDY KLEINERT, Norton, Connecticut.





Folding Prop Tricks

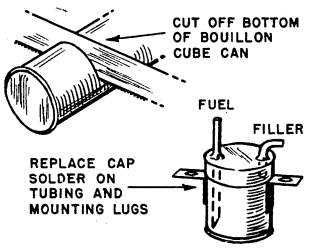
Rubber model fans take note: Why not *hinge* the counterweight on a single blader, to allow for landing bumps? This will prevent shaft bending and nose-block dislocation. The counterweight easily can be removed and another of different weight substituted when experimenting with various prop blades. The counterweight also can be taken off to convert the prop to double-



Many Tanks

The proper size metal tank for the smaller (.02 to .09) glow-plug engines is often hard to find. Try making your own from a cut-down bouillon cube can. Some dental powders come in small size cans and these also are suitable.

Cut down the can to the height desired, put the cap on, and solder fuel line and filler line in place. Be sure the fuel line just clears the bottom of the tank. If the cap fits snugly, no solder will be needed. However, it would be a good idea to solder it on anyway, just in case. Solder lugs on side or top for mounting.—RAY GREENING, Buffalo, New York.



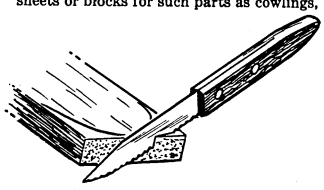
Cement-Proofing Plans

The family electric iron can be used to good advantage on other items besides shirts and skirts. To cement-proof working plans, and also make them transparent for reversing when only one wing is shown, work paraffin into the paper with an electric iron. Set the iron on low heat and rub over a cake of paraffin, then quickly rub iron with the melted paraffin over the plan. Waxed paper can also be laid over the plan and the iron run over this to melt wax onto the plan.

Be sure to lay several layers of newspapers or wrapping paper under the plans, to soak up the excess wax.—PAUL WILLIAMS, Ridgeway, Mo.

Balsa Knife

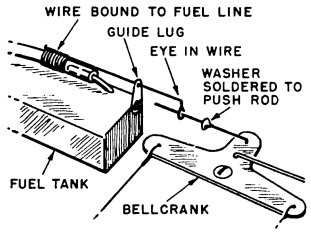
An ordinary kitchen paring knife with a serrated cutting edge makes a good balsa knife. When used with a sawing motion, it cuts through all but the hardest balsa. It is very useful for roughing out thick sheets or blocks for such parts as cowlings,



pants and tail cones.—MARVIN R. CLINCH, Rome, New York.

Engine Shut Off

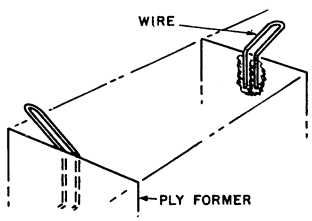
Here's a simple engine shut-off device for team racers. A length of wire is run from bellcrank to tank end of fuel feed line. The wire is bound firmly



to the fuel line. When full down (or up) control is given, the feed line is pushed off the tank connection, letting engine stop when fuel in line is used up. Use fuel line that is sliding fit over tank pipe. Cowl must be opened to reset the fuel line connection.—GAIL CARLO, Ottumwa, Iowa.

Whose Fuel?

To avoid confusion on the crowded flying field, scratch your name on the side of that new can of fuel so that you can claim it when it wanders off. Use a screwdriver point, ice pick or scriber to cut into the paint on the can.—MYRON BRODY, New York City, N. Y.

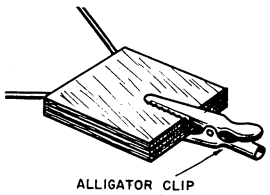


Wing Hold-Down

Wing hold-down dowels or wire pins sometimes bend or break away. Try a new method for making and mounting the wire hold-down. It particularly applies to cabin jobs, but can be used on pylons with variations. Bend hooks as shown and mount so they pass through plywood strip or formers. Cement well. Cock wire up at a slight angle so the rubber will come off easily in hard landings. Tie one end of the rubber through the wire loop so it will not be lost when the wing pops off.—BOB MANGAM, Brooklyn, N. Y.

Handy Clamps

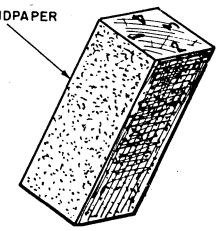
When cementing in hard-to-get-at places on thin layers of balsa or ply-



wood, try using alligator clips for clamps, as shown.—PHIL PILATT, Baltimore, Md.

Sandy Dandy

Make your sandpaper block do extra duty by cementing a different grade of sandpaper to each of the four sides. Number the ends to correspond to the

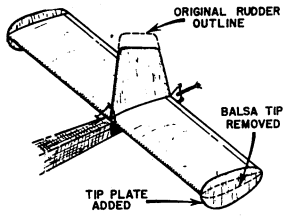


grade of sandpaper on each face.—RICK M. JOACHIM, Plano, Illinois.

HANDY HINTS

Revised Tail Assembly

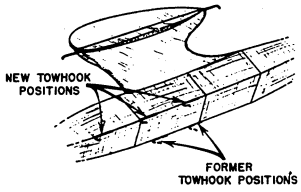
I recently built a Jasco "Streak" and since then have had many flights. However, with the single strut landing gear I used, takeoffs were pretty tricky. To remedy this I cut off the



balsa tips, added 1/16" sheet balsa rudder tip plates, and at the same time decreased the main rudder area about 15%. Performance proved equally as good, and chances of ground looping on take-off were eliminated.—FRANK NEELY, Chicago, Illinois.

Side-Tow Tip

Though Enterprise's "Towline Terror" tows very well under average weather conditions, its small size makes it very difficult to obtain maximum altitude on the towline in gusty weather. To improve the situation, I

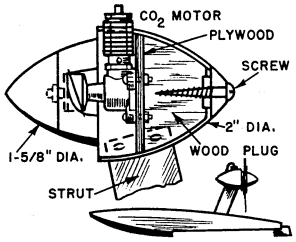


removed the towhooks from the bottom and relocated them on the left side of the fuselage which was also the direction in which I had trimmed the model for the glide. In addition, I also added another hook forward of the original two.—RICHARD CONTE, Washington, D. C.

Motor Egg

If you occasionally stray to building prop-driven boats or cars for your CO_2 motor, here is a neat cowling that will add a trim appearance to your model when using the engine as a pusher.

The motor is mounted in a 2" Froom spinner against a circular plywood mount. The plywood is backed up by a

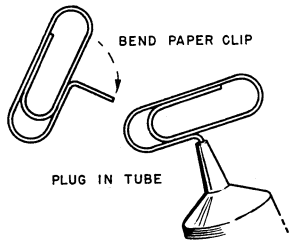


balsa filler block, held into the spinner by a wood screw. Drill the spinner nose for the wood screw. This spinner and engine mount can be bolted to a dural arm or strut-fastened to the model.

Use a 1⅝" diameter plastic spinner on the prop shaft. This is the two-piece type with the rear section held directly onto the shaft by the prop nut. The front portion is threaded onto the rear portion. It may be necessary to cut ¼" off the rear edge of the plastic spinner to clear the motor cylinder. Two smaller spinners of the same size also could be used.—JOHN E. MORRIS, Hamden, Conn.

Sticky Stuff

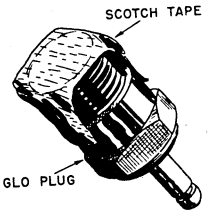
When the cement tube oozes out on the bench between squeezings, don't



plug it with a nail or pin, try bending a paper clip as shown. This key is larger and easier to use than a pin.—JACK SUMMERS, Redlands, Calif.

Storing Glow Plugs

New glow plugs that are stored in the tool box should have their elements protected from dust, dirt and



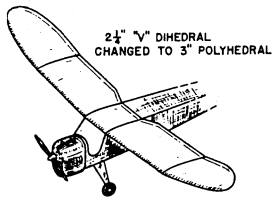
balsa shavings. Simply apply a short length of Scotch tape over the element end and fold over the sides.—TOM SHANNON and BILL STEELE, Stratford, Ont.

Elevator Hinges

Good material for elevator hinges is leather. This is particularly helpful on larger models where strength is needed. Try a strip cut from an old kid or calf glove. Leather can be fastened with cement. We suggest double cementing.—ALLAN EARL, Sharbot Lake, Ontario, Canada.

Contest Conversion

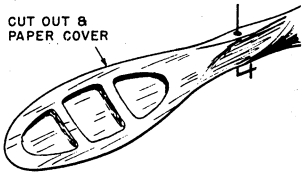
After about sixty flights had been obtained with an Enterprise "Shadow," using an .049 engine, I decided to adapt it for contest flying. To do



this, I increased the dihedral approximately ¾" and changed the wing to a polyhedral-type arrangement. Power was also increased by using an .065 Royal Spitfire.—WALTER PECROS, San Francisco, California

Lightweight Prop

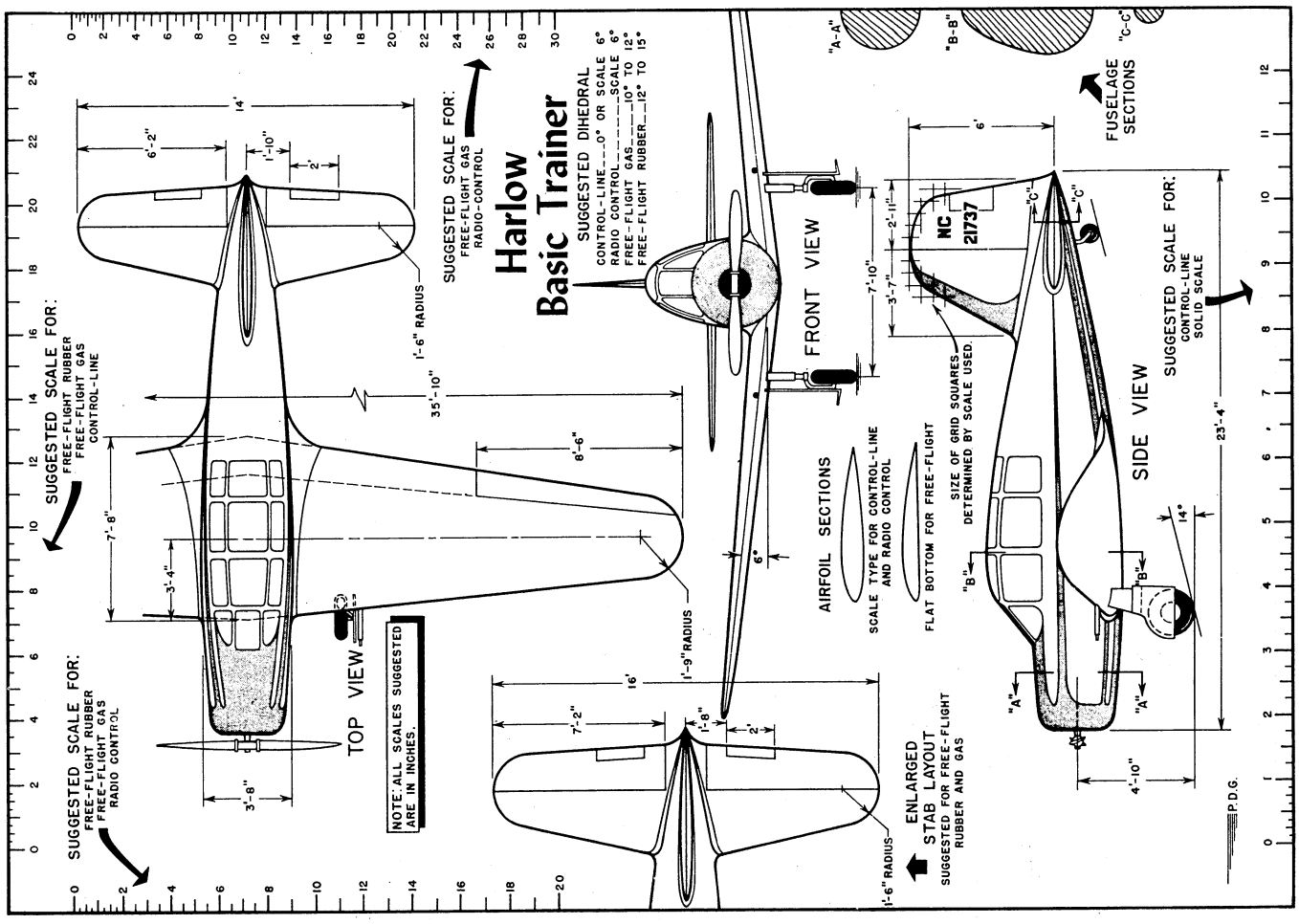
Try cutting lightening holes on both blades of a regular carved balsa prop and covering it with tissue when a

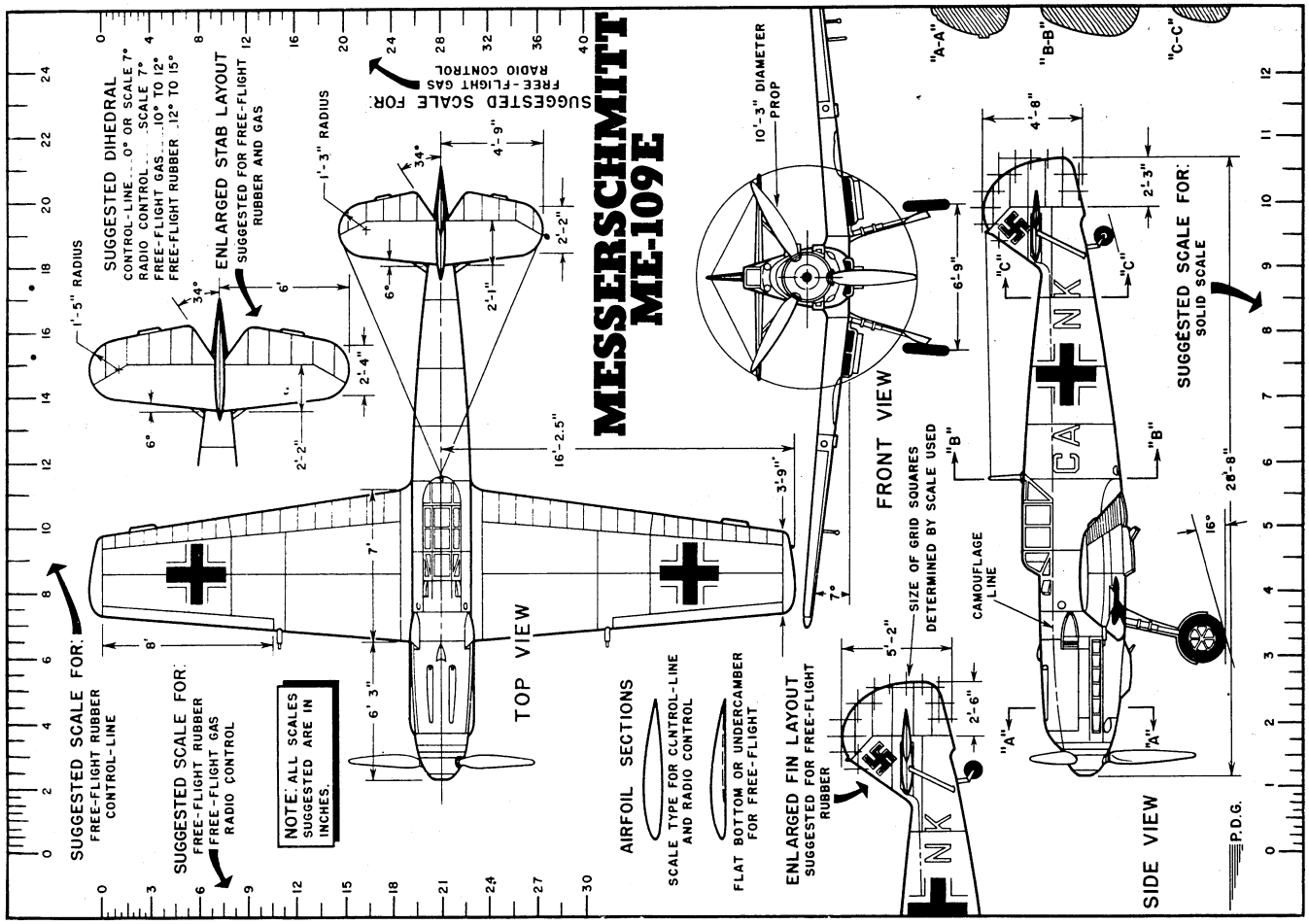


lighter prop is needed for indoor or outdoor rubber jobs.—GENE KASMAR.—Parma, Ohio.

Needle Valve Springs

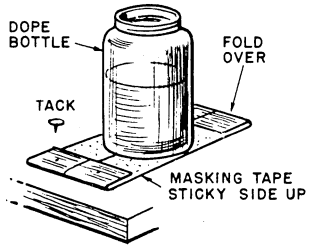
If you lose the spring from the needle valve on engines such as the Wasp, try substituting the spring from an old valve stem taken from a bike or auto tube.—ROGER L. MARVIN, Siloam Springs, Ark.





Bottle Holder

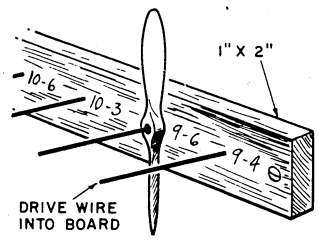
To keep the dope bottle from wandering around or tipping over on your workbench, try this simple gadget:



Take a length of Scotch or masking tape, fold ends over, and thumb-tack or tape it to your bench, sticky side up. Then place your dope bottle on the sticky area to hold it in position.—LINWOOD CATLIN, Pinetta, Va.

Prop Rack

To store spare props out of the way at your workbench, use a pegboard and mount it on a wall or shelf. Drive lengths of wire or dowel in the board for the various size props you use. A



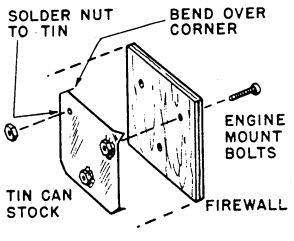
glance at the board will let you know when your supply is low for any particular size.—B. E. GRAHAM, West Palm Beach, Fla.

Storing Dope & Rubber

Here are a couple of useful ideas for keeping model supplies in tip-top shape: If stored upside down when not in use, bottled or canned cement and dope will not evaporate and harden to any degree. Model rubber should be stored in an airtight container in a dark place, as it is affected by both light and air and will lose its elasticity. A fruit-jar painted black, with a little talcum powder inside, is ideal.—ARTHUR GINSBURG, Revere, Mass.

Firewall Nut Plate

Here is a neat, hidden, radial mounting for smaller engines. Before closing up the nose of your model, make a nut plate to fit the rear of the firewall. Drill tin-can stock to match the engine mount holes, and solder nuts over the holes. Bend over the ends to hold it in



position against the firewall. The engine is then bolted to the front of the firewall.—MIKE KERTESZ, Gary, Ind.

Fuel Line & Tank Cleaner

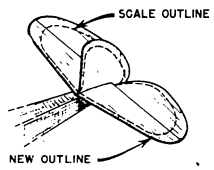
After prolonged storage, glow-engine fuel lines get plugged with caked castor oil. You can huff and puff but they often stay plugged. Prodding with a piece of wood doesn't always clear the sticky mess. The answer? A supply of pipe cleaners in your tool kit.—DOUGLAS CAIN, Talco, Texas.

Design Short-Cut

Make cardboard templates of your engine side and top views and mark the location of the engine lugs and mounting holes. Then, when making drawings of your new designs, all you need do is locate the engine template to check if the engine will fit. Works fine with speed models where tight cowlings are a must.—RICHARD SIMONTON, Jackson, Michigan.

Improved Performance

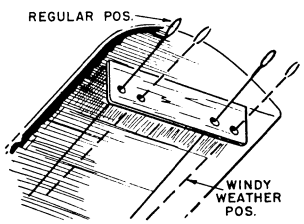
Monogram's "Speedee-Bilt Monocoupe," because of its scale proportions, proved sensitive to adjustments and as a result, I found it difficult to adjust for consistently good flights.



To improve performance, I enlarged the tail surfaces approximately 20% more than the original area, retaining the scale outline.—JOHN RICHTER, Newark, New Jersey.

Control In Wind

To help compensate for the bouncing around your controliner gets in high winds, try this trick. It will help maintain line tension better and prevent loss of control. Make wingtip guide wide enough to allow for another set of guide holes behind the regular ones. Make the holes large enough so that



the lead end loops can pass through easily. If the wind is moderate, place leads in front guide holes. In strong winds, move leads to rear holes. This will swing the nose of model outward more when flying.—SYDNEY WARD, Guelph, Ont., Can.

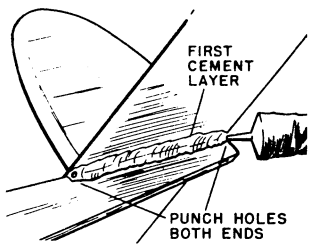
Trimming Stencil

Here's a handy substitute for masking tape, that can be used for putting designs on models. Cut the desired design out of the center of a piece of writing paper or smooth bond note paper. Wet it and place it in position on model. When almost dry dope the open space of the design. Let dope dry a few minutes then peel up paper quickly. Surface tension holds the damp paper in place while doping.—DUANE H. LAVINKA, Lark, N. Dak.

Better Cement Joints

When sheet balsa is joined at right angles for such parts as formers and fuselage sides or tail surfaces, the cement applied to the joint pulls out from the crack when dry. This leaves a web of cement with an air space under it along the crack. For making such joints doubly strong at points of high strain, try this wrinkle:

Punch a hole through both ends of

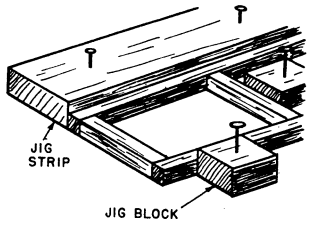


the cement web. Hold cement tube spout against hole, and squeeze cement into the pocket until the cement runs out the hole at the other end.—TED SCHNEIDER, Evansville, Ind.

HANDY HINTS

Better Frameworks

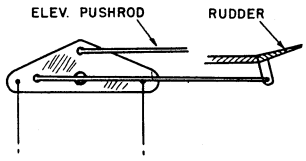
Use thick sheet, together with small blocks, to make a really accurate jig for fuselage sides. Since it is hard to drive pins into building board dead



square, resulting frames may not be accurate. Pins also may cause light strips to crack at sharp bends. The blocks will prevent this.—G. WOOLLS, Bristol, England.

Rudder Control

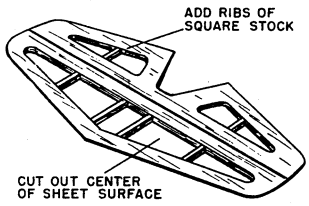
To help stunt ships stay out on the end of the lines, why not get help from the rudder? This system utilizes a second pushrod hooked to the bellcrank, which moves the rudder out-



ward when up or down control is given. Travel is slight at the bellcrank, so the horn or rudder should be fairly large to get enough movement. Neutral setting should have about 10° offset, with about 20° full offset.—ROLAND E. WOOD, Richwood, Ohio.

Lightweight Stabilizer

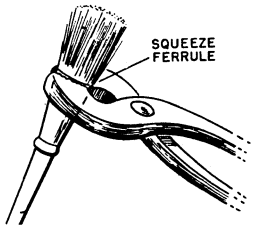
To reduce the weight of sheet balsa tail surfaces on control-liners, try this construction method: Cut out the center of the surface, leaving about ½" to



¾" balsa all around. Add ribs of square stock of the same thickness as the sheet surface. Cover with paper. On bigger models two layers of paper should be used.—RICHARD SARPOLUS, Cranford, N. J.

Tightening Brush Bristles

Dopes and thinners have a way of loosening the hairs in even the most expensive brushes. If your brushes leave hairs on that fine finish, try this trick.



When you buy a new brush, squeeze the metal ferrule just above the hair end. Use pliers or a vise. This will lengthen the brush's life and prevent hairs from dribbling out.—ROBERT SHIUAK, Stockholm, Sask., Canada.

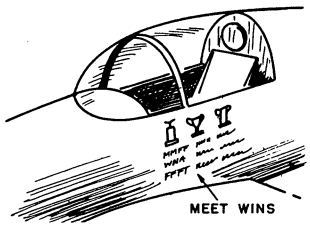
Slow Go

For testing those glow-plug free-flight ships, just put the propellor on backwards, instead of running the engine rich as some modellers do. This slows down the plane enough for testing. Later, when the plane is fully adjusted, just turn the prop over and fly full speed.—DON OWEN, Galveston, Texas

Score Board

If you've won a few contest awards with your favorite model, why not keep a record of it? Make a scoreboard of plywood and paint your listings on it. Trim-Film can also be used. A miniature trophy, with location, contest and how you placed, can be shown.

A similar listing can be put on the model itself, along the cockpit, in the same manner as combat kills are re-



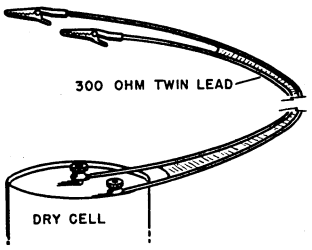
corded on real airplanes. Team racers can have small checkered flags.—DICK NEAL, Thorntown, Ind.

Handy Clamps

Holding scale plastic model parts together while cement or solvent dries can be aided by using spring-type clothespins. These can be used on most thin parts such as wings and tails and small diameter fuselages. Patches of scotch tape or masking tape across seams can be used in same manner where clothespins won't fit. DON HERTZFELDT, La Crosse, Wisc.

Booster Leads

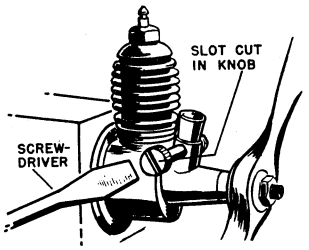
Get a length of the 300 ohm twin-lead wire used for television installation to make your next set of booster



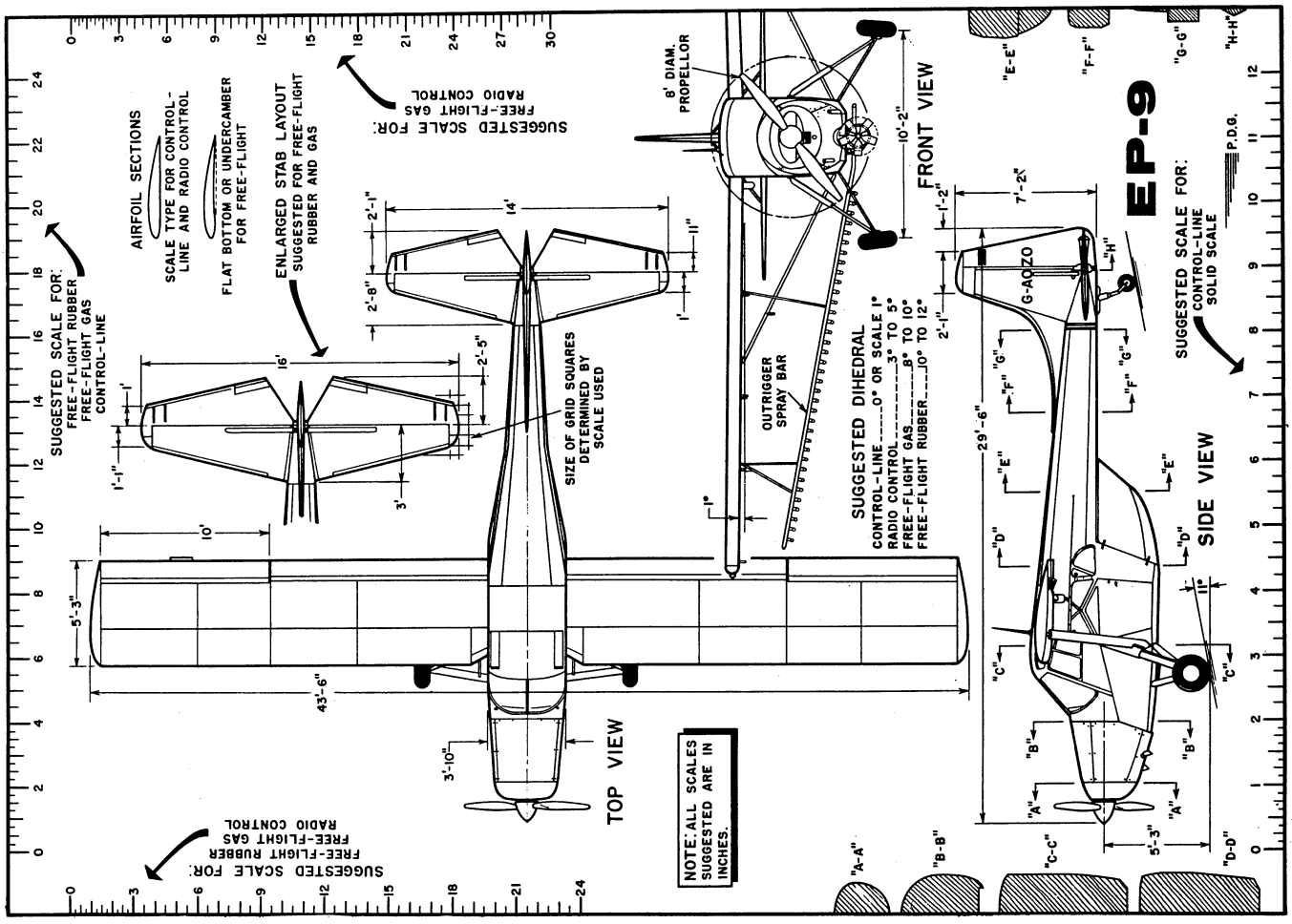
leads. Solder lugs and alligator clips on ends, and separate center insulation at ends as shown.—RAY GREENING, Buffalo, N. Y.

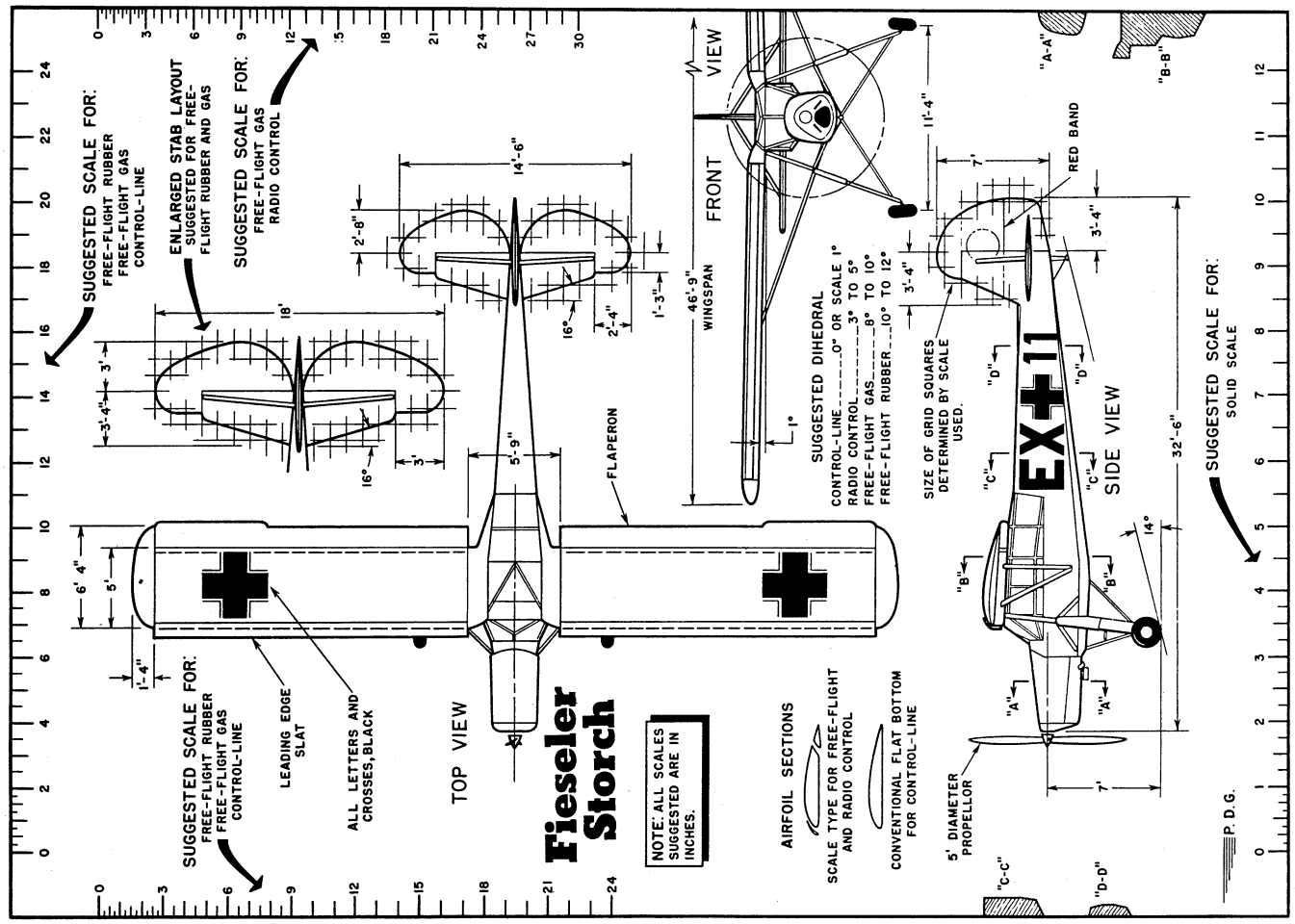
Tuning Tiny Throttles

If you have difficulty turning the needle valve on the smaller engines while they are running, try this trick: Take the needle valve out of the engine and file or cut a notch across the knob, using a thin file or hack saw blade. The



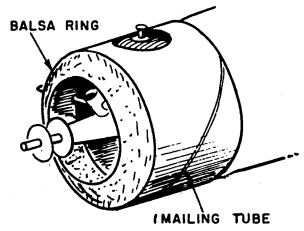
needle valve can then be turned with a screwdriver while the prop is turning. This also is helpful when the engine is cowled in and the needle valve partially covered.—JERRY HARTER, Bothell, Washington.





Circular Cowlings

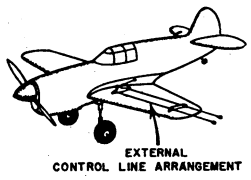
Cowlings for 1/2A or small A engines can be made from mailing tubes. Make the front ring from sheet balsa,



then carve the front and fuel-proof the inside thoroughly. Dope outside to suit. Mount with screws or clips at rear.—ANTHONY DELUNA, Brooklyn, N. Y.

Stunting P-40F

On Monarch's "Curtiss P-40F" the movement of the bellcrank was restricted because of its scale proportions, limiting the extent of its manauverability. To get around this, I



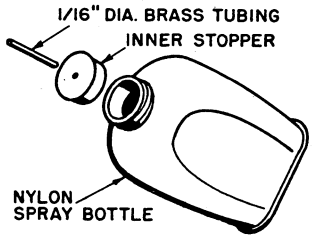
decided to mount the control system on the wing. It does not look as nice now with the external bellcrank, but at least I can loop it and do other maneuvers as well.—RONNIE SPINKS, Crooksville, Ohio.

Small Parts Storage

Clean out your old dope bottles and use them for hardware storage. Label them to indicate the contents. Screw lids to underside of shelf for handy access.—EUGENE GREEN, Muncie, Ind.

Handy Primer Bottle

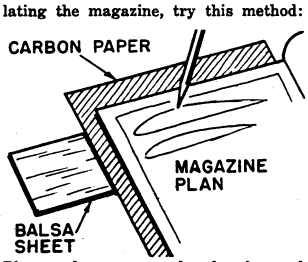
An empty, nylon, squeeze, deodorant bottle makes a good primer bottle or tank filler for small engines. Pry out the inner stopper and force-fit a 1" length of 1/16" diameter brass tubing into the spray hole. This hole may have to be enlarged slightly to take



tubing, but be sure you get a snug fit. To use, fill the bottle with fuel. Handy for team racing also. Vary the size of the tubing to suit tank-filler lines. Store by pulling out the tubing or inner stopper and replacing it with the regular cap.—RONALD DECROCE, Newark, New Jersey.

Plan Transfer

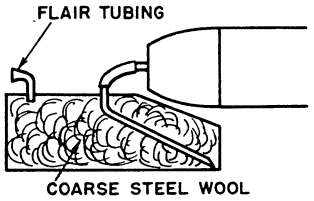
On magazine plans, full-size patterns for various parts are frequently shown, sometimes on both sides of a page. To transfer these outlines without mutilating the magazine, try this method:



Place carbon paper under the plan and balsa under the carbon paper. Then trace over the outline with a pencil and the outline will be transferred to the balsa by the carbon paper.—CARL R. HENDRICKSON, Flatrock, Ind.

Non-Stop Jet Tank

The Dyna-jet engine sometimes stops running during take-off because of poor fuel-flow, resulting from bouncing on rough ground. To cure this trouble, fill the tank with coarse steel wool before final assembly. Be sure the steel wool is free of small particles that could



clog the fuel line and metering jet. Fit the tank with a venturi near its front so that the air flow will pressurize the tank. Flair tubing for the venturi to a funnel-like shape.—G. LEE HALEY, Springford, Ont., Canada.

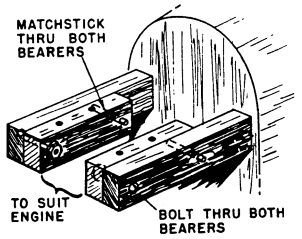
Vibration Reduction

A layer of rubber between the engine backplate and the firewall will often cut down vibration somewhat. Cut a disc of rubber from an old inner tube. —GEORGE GARVEY, Pawtucket, R. I.

Breakaway Engine Mount

Here's an engine mount that proved very popular with free-flighters back before the days of yo-yos. It still works well and could be used on control-liners to reduce engine and prop damage:

The inner engine bearers are spaced to suit your engine, and the outer bearers are built into the model with snug clearance around the inner bearers. The outer bearers can be regular hardwood stock or hardwood plywood. The inner bearers are bolted to the outer bearers at the front and the rear of the

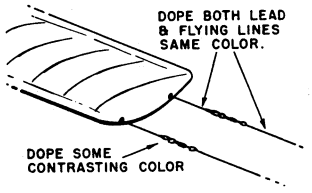


inner bearers is positioned with a match stick or thin dowel.

When the engine hits, the match stick acts as a shear pin, letting the engine and the mount pivot on the front bolts, thus reducing some of the shock.—EDMUND TURNER, Fairbury, Nebr.

Color-Coded Flying Lines

To prevent mixing the "up" and "down" wires when connecting to the leads on your model, try coloring both



the lines and leads with bright dope. For instance, red for "up" and blue for "down."—MARVIN SAWYER, Hanford, Calif.

Brush Cleaner

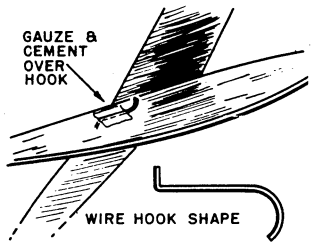
When your dope thinner supply runs low, use nail polish remover to clean dope brushes. The remover has a bit of oil in it, so wipe brushes well after cleaning. To keep peace in the family, don't raid Mom or Sis's supply—buy your own at the drug or variety store.—DAVID ANDRAS, Schenectady, N. Y.

HANDY HINTS

Glider Finger-Rest

The mighty heave used when flying hand-launched gliders is sometimes rough on wing trailing edges. To preserve your glider wings, try installing this wire hook on the fuselage side:

Bend the hook to the shape shown, bury the short straight end into the



fuselage, and double-cement the hook into position so that the curved end sticks out parallel to the wing. Cover the installation with a patch of silk or gauze.

The hook should be located on the fuselage just under the trailing edge, where your forefinger can get a comfortable launching grip. — REGGIE MILLER, Port Austin, Mich.

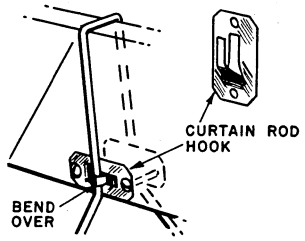
Cowling Strengthener

Use ordinary surgical gauze to strengthen thin-carved cowling or other model parts. Dope or cement gauze strips over the whole inside area. Run the strips across each other and build up several layers if needed.—BERNARD MARDEIVILLE, Troy, N. Y.

Gear Mounting

Landing gears on profile models sometimes work loose because of hard landings and vibration. Try this method to anchor the gear strongly:

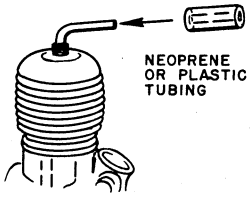
Curtain-rod hooks (obtainable at hardware stores) are bolted or screwed to the fuselage sides. The punched-out center, forming the hook, is bent around the gear wire. You can make a



similar anchor strip by cutting a groove in a flat strip of aluminum or brass.—H. DUAIM, Bayonne, N. J.

Diesel Hot-Pad

The variable compression screw on a small diesel often gets very hot. To avoid burning your fingers, fit a short



length of neoprene or plastic tubing over the part you handle.—H. WESTWOOD, Middlesex, England

R/C Tube Storage

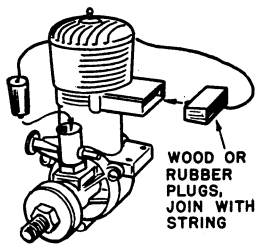
Some brands of cigars are packed individually in an aluminum container. This is a good storage can for small parts, such as radio tubes. The container will take two tubes neatly. Stuff the can ends with cotton so that the tubes won't rattle around inside.—JIM O'BRIEN, JR., Bellerose, L. I., N. Y.

Paper Covering

When wet-covering compound curves on model structures with silkspan, a small amount of detergent added to the water will make the paper extremely pliable, for an easier, smoother job. —J. K. MEYER, Glendale, Calif.

Engine Dust Covers

To eliminate the use of a dirty and often unattractive rag for keeping dust and dirt out of model airplane engines, I use two small inserts, similar to those shown, which fit snugly into the ex-

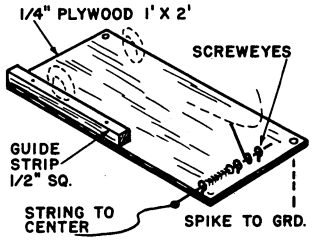


haust stack and venturi (air intake). These can be made in a few minutes from scrap balsa or foam rubber. They do the job, are easy to handle, and do not detract from the appearance of the plane.—J. W. SCHERER, Wyckoff, N.J.

Still Another Stooge

If you fly alone, you'll find this a handy helper. It features an improvement over other stooges in that there is a guide to keep your model in proper launching position while you are getting out to the center of the circle.

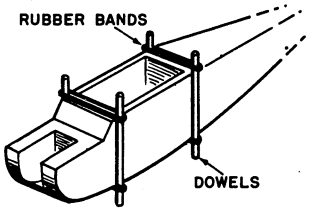
Use a piece of board or plywood for the base. This can be nearly any size,



but should accommodate the landing gear of your model. The stooge release consists of screw-eyes and a wire pin, spring-loaded. A strip of wood along the inside of the base acts as a wheel guide, to get the model off straight. —A. J. WHITE, Leominster, Mass.

Building Clamps

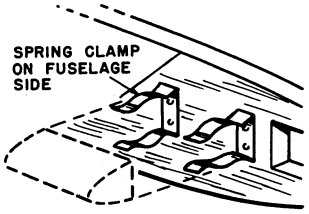
When joining fuselage structures of box-type construction, this method will aid in applying pressure in the right



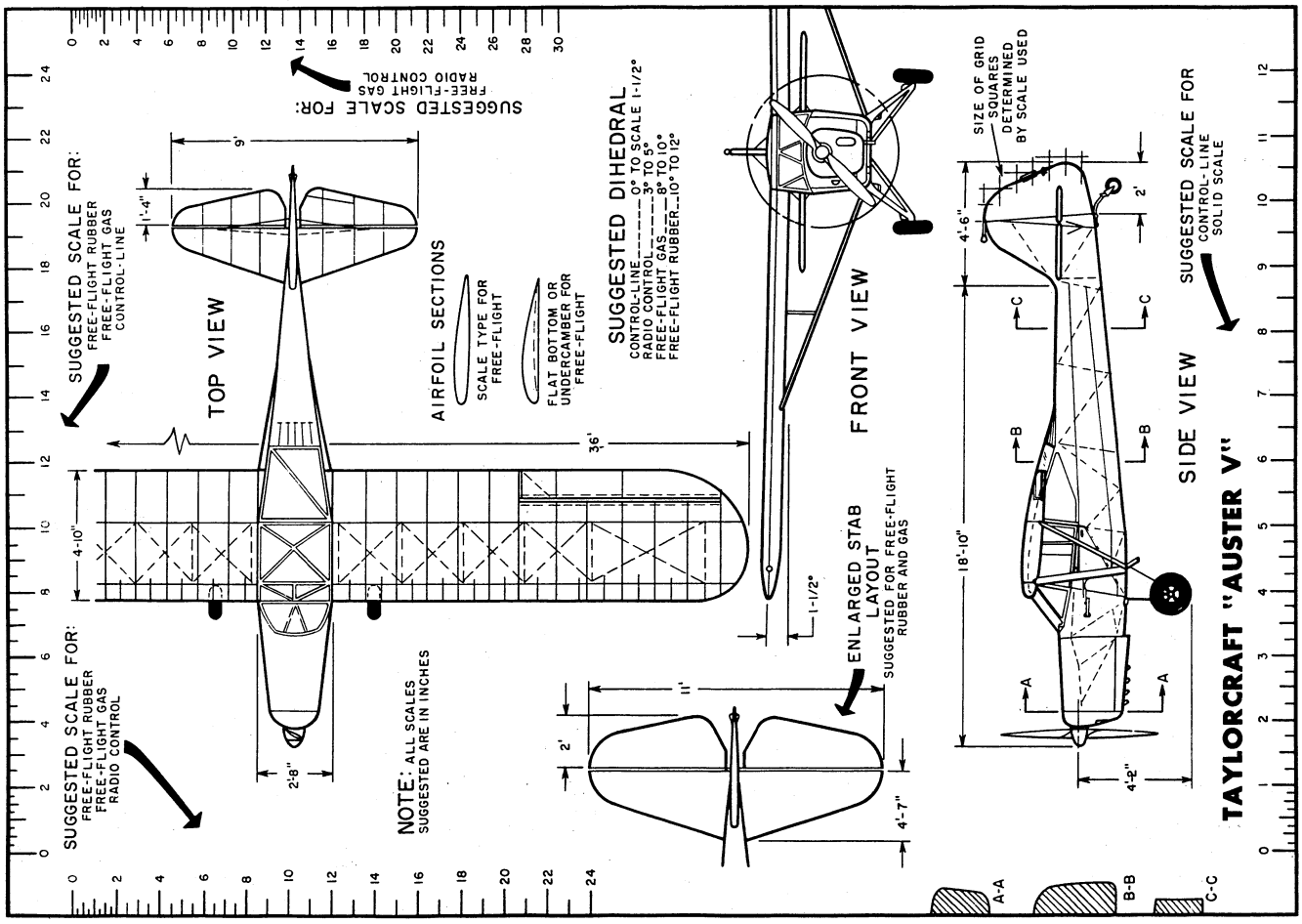
place: Use lengths of dowel or strong square stock up the sides of fuselage, and wrap the ends with rubber bands to apply pressure.—C. D. FIELDS, St. Louis, Mo.

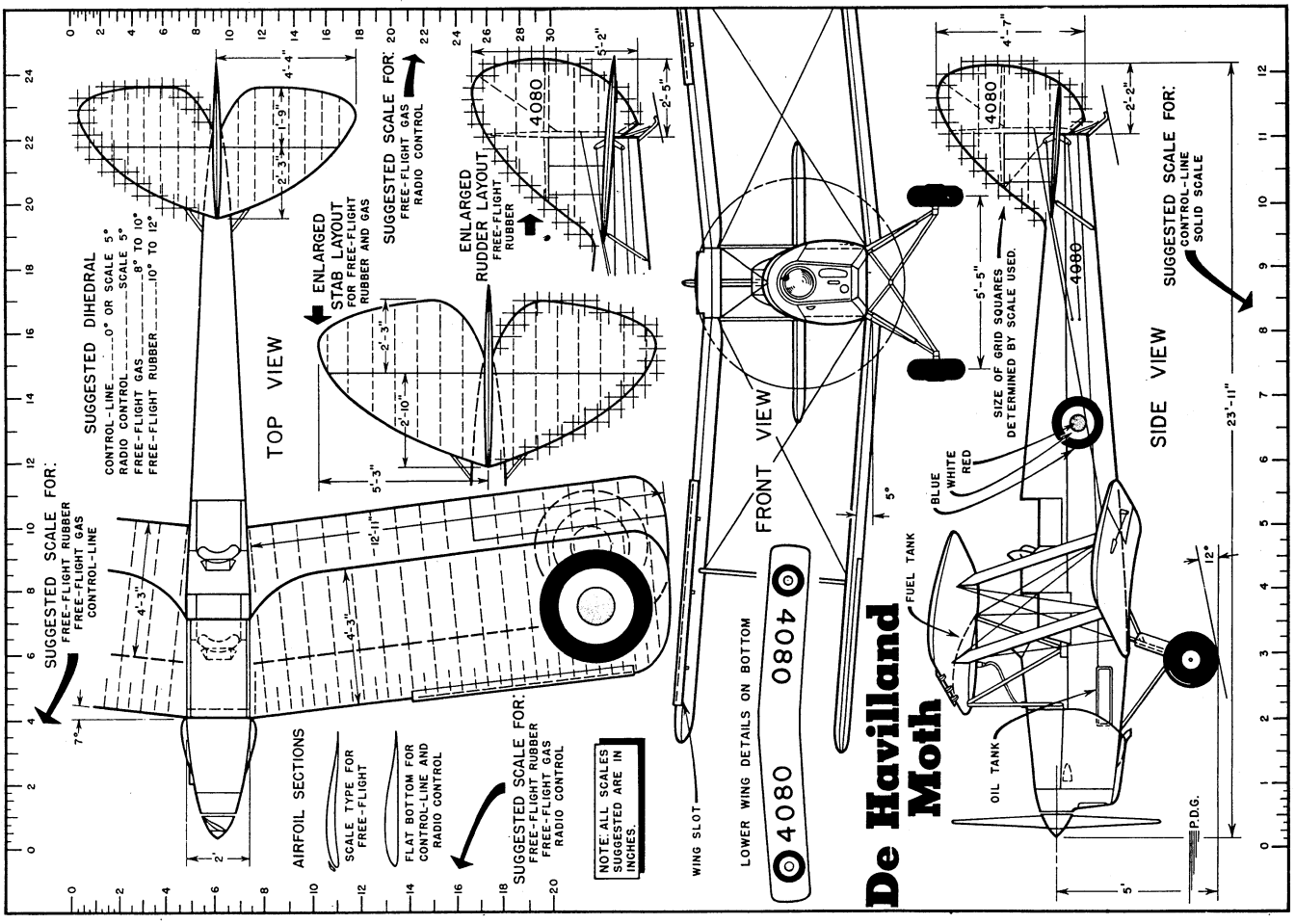
Tank Mount

Having trouble keeping the fuel tank in place on your profile model? Try this wrinkle: Hardware stores can supply spring clamps of the type used for hanging up brooms and tools. Simply screw or bolt two of these clamps to the side of your model. Slip tank in place in the jaw of the clamps. This system is also handy for removing the



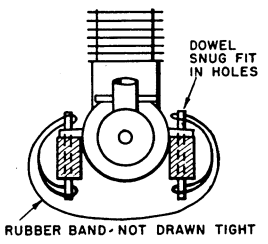
tank when cleaning the model or for changing to a larger size tank.—HILTON RIVERA, Astoria, L. I., N. Y.





Breakaway Engine Mount

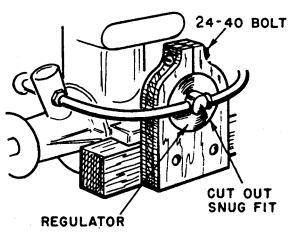
Here is a variation on the beam mount for 1/2A engines. The mount is strong enough to hold the engine rigidly in place, but will come apart if the model hits something solid. Drill holes in the beam mount in the regular manner, under the engine mounting lugs. Then instead of using bolts, insert dowels through the lug and beam. Let the dowels project a bit above and below. Hook a rubber band over the dowels and stretch it tightly under the engine over the dowels on the opposite side. A bad blow will break the dowels or pop the rubber bands off, saving the engine from



serious damage.—PAUL R. BIEN, Cincinnati, Ohio.

Regulator Clamp

This clamp, made of 1/4" plywood and a 4-40 motor mount bolt, when cemented to the motor mount or a slot in the fuselage, will reduce vibration and keep the pressed-in connection on the Walker fuel regulator from working loose and leaking air. The regulator may be readily removed for cleaning or replacing, without removing the mount.—C. H. ROBISON, Ottumwa, Iowa.

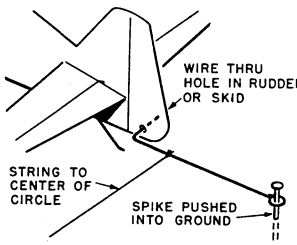


Balsa Filler

The never-ending search for a perfect balsa grain-filler still goes on. Here's another idea: Add powdered Fuller's earth to sanding sealer or clear dope to make cream thick mixture, dope on and sand in regular manner.—BRUCE SHERWIN, Central Valley, N. Y.

Simplified Stooge

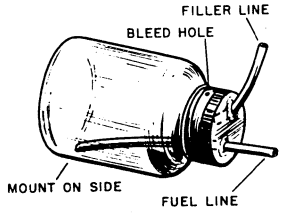
For the control-line fans who want to fly when there is no one around, here is a very simple helper: Bend a wire around a spike so that it pivots.



Punch a small hole in the rudder for the hook end of the wire, then tie a string (about the length of your control lines) around the wire near the hook end. Push the spike in the ground almost to the head, but leave room for free movement of the wire, place the string parallel to your flying lines and hook the wire into the rudder. The plane will stay put until you release it by pulling the string, thus unhooking the wire from the rudder.—FOSS RATTE, Brattleboro, Vt.

Free-Flight Fuel Tank

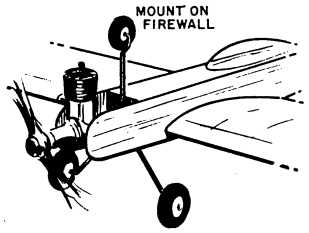
A visible fuel supply is helpful for timing glow plug engine runs when no timer or engine cut-off is used. The use of an eye dropper for the small engines has led to this idea: Use a small dope bottle for a fuel tank with the larger engines. Clean thoroughly and solder the fuel lines into the cap, as shown. Bury tank in fuselage structure with



one side visible, or strap on to outside.—DON MILKENT, Kenosha, Wisc.

Crash Insurance

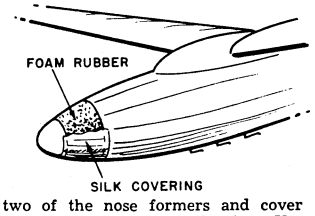
To save glow plugs and prevent engine damage when learning to fly



planes inverted, mount a small diameter wheel on the fuselage top, extending above the engine.—CHARLES HOLPHEN, Opelousas, La.

Shock Absorber Nose

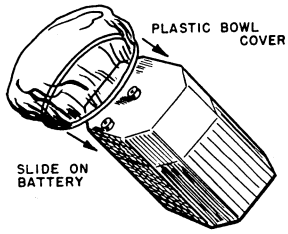
Sailplanes and gliders take a real beating in the nose section. Try adding a shock absorber to your next model. Cement foam rubber between



two of the nose formers and cover with silk or nylon sewn in place. Use Pliobond to fasten rubber to wood.—PETER SAYER, Warwickshire, Eng.

Short Preventer

To prevent your booster battery from shorting while being stored in your tool box, try this wrinkle: Place an ordinary plastic bowl cover over the top of the battery. This will pre-



vent the binding posts from coming in contact with the sides of the box or the various tools in the box. Remove wires first.—LAIRD CROWE, Oklahoma City, Okla.

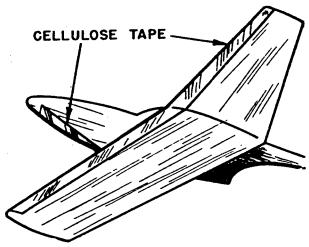
Ignition Fuel Hop-Up

Add a bit of glow to your ignition fuel to start a balky engine or do cold weather flying.—P. BLAIS, Montreal, Canada.

HANDY HINTS

Glider Insurance

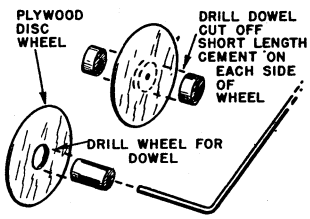
To prevent minor dents and splits in the leading edges of glider wings, fold a strip of ¾" or 1" wide cellulose tape



over the length of the leading edge. The same trick applied to the nose and belly will save the surface at these points.—MICHAEL KRIM, N. Y., N. Y.

Wheel Hubs

Lightweight wheel hubs for rubber-powered or free-flight gas jobs can be made from a short length of hardwood dowel. Drill the axle hole first, then cut dowel to the desired length. The wheel disc can either be drilled for the dowel or the dowel can be cut in short lengths

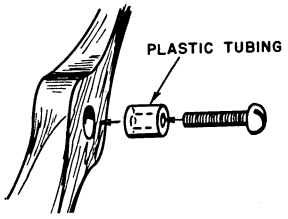


and cemented on each side of the wheel. —JAMES H. HARVEY, Santa Maria, Calif.

Prop-Hole Reducer

Frequently the prop you wish to use on a certain engine has a hole larger than the prop shaft or shaft screw. If you fly ½A or small Class A engines, you probably have come across this problem.

To save the trouble of finding or making a metal reducer for the shaft, slip a short length of fuel-line tubing into the prop hole. Use tubing with an outside diameter which is a snug fit in the prop. If the screw or shaft is too large for the tubing, let the threads

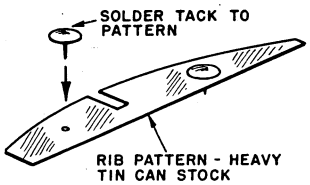


cut the inside of the tubing to size by turning the tubing onto the shaft.

Engine heat will soften tubing, so it will not last long—this is a good emergency trick only.—MELVIN FARRER, Fort Bragg, Calif.

Wing-Rib Pattern

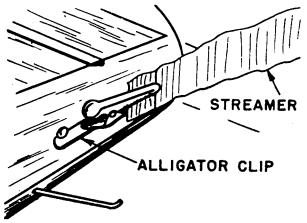
When cutting out a large number of wing ribs of the same size, make a sheet-metal pattern to use as a guide. Punch two holes in the pattern and



solder a thumb tack through each hole. The tack points are pressed into the wood stock to keep the pattern from shifting while you cut around it with a knife or razor.—RONALD KENNEMER, Fontana, Calif.

Combat Ribbon Hook-Up

For a quick, secure attachment for the ribbon on your combat jobs, fasten an alligator clip under the tail of the model. Flatten the rear part of the clip and either drill a hole through it for screw attachment to the plane or bend



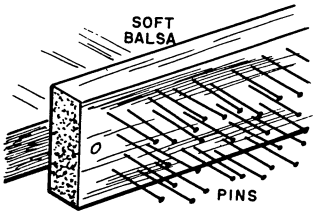
its end and cement this into the tail. —PHIL HARVEY, Seattle, Wash.

Storage Tray

A plastic tray for silver makes a good storage tray for tools, brushes, cement tubes, etc., in your workshop. Such trays can be purchased at hardware or kitchen-furnishing stores.—CLINT SCOBLE, Hamden, Conn.

Pin Cushion

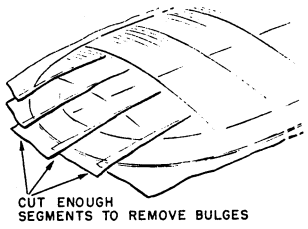
A length of soft balsa sheet tacked up over the workbench makes a handy pin cushion, preventing pin pricks when



reaching into a container full of pins.—LARRY HAMM, Dover, Ohio

Covering Wing Tips

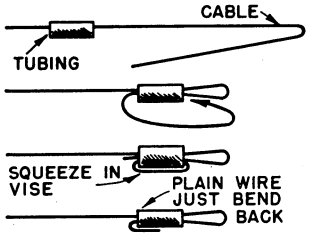
● Covering wing tips usually presents a problem because the paper must cover compound curves. Try cutting segments as shown to produce a neat job. Overlap towards the trailing edge. Dope the



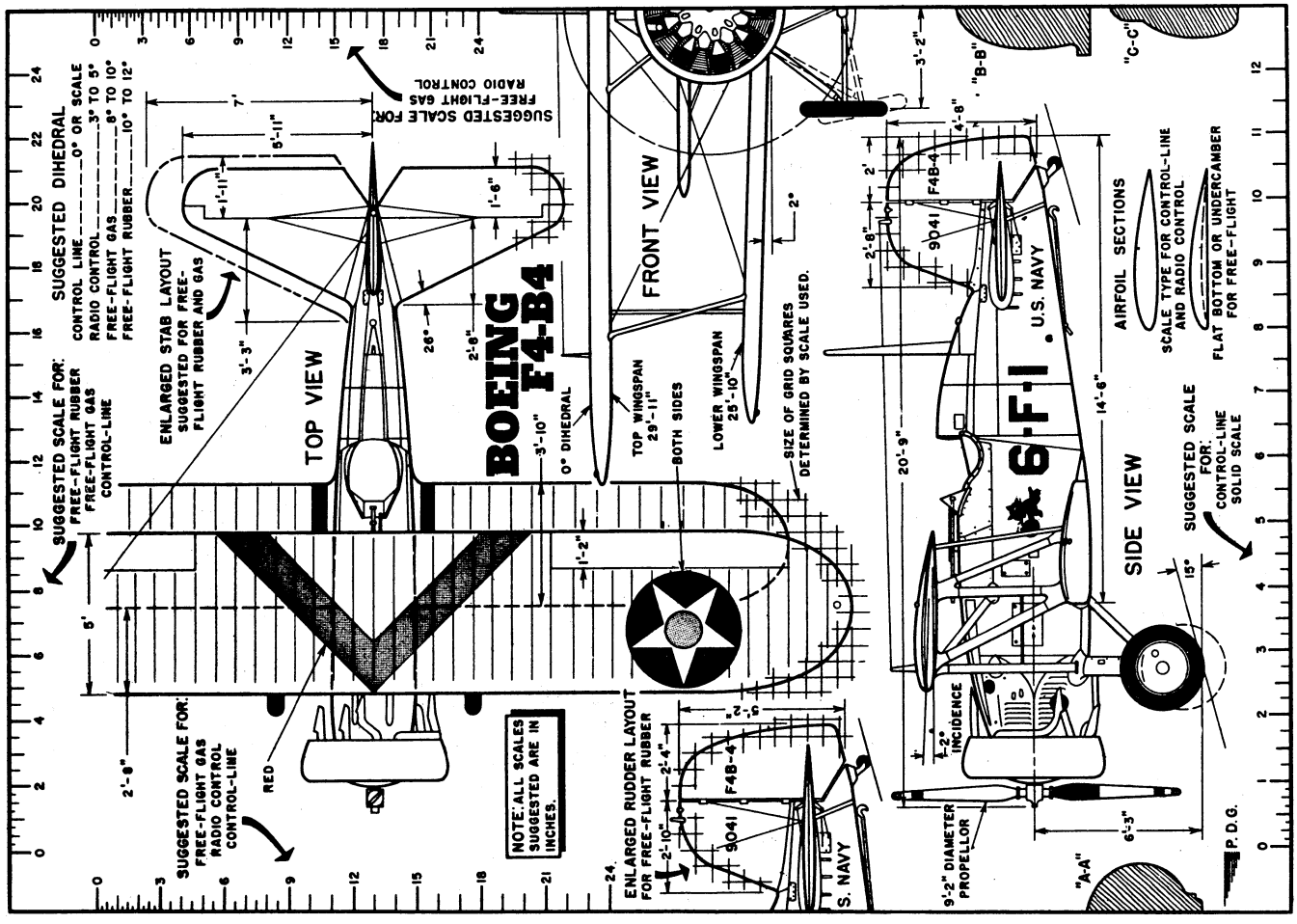
rear segment down first, then work forward. — KENNETH TROXELL, Frederick, Md.

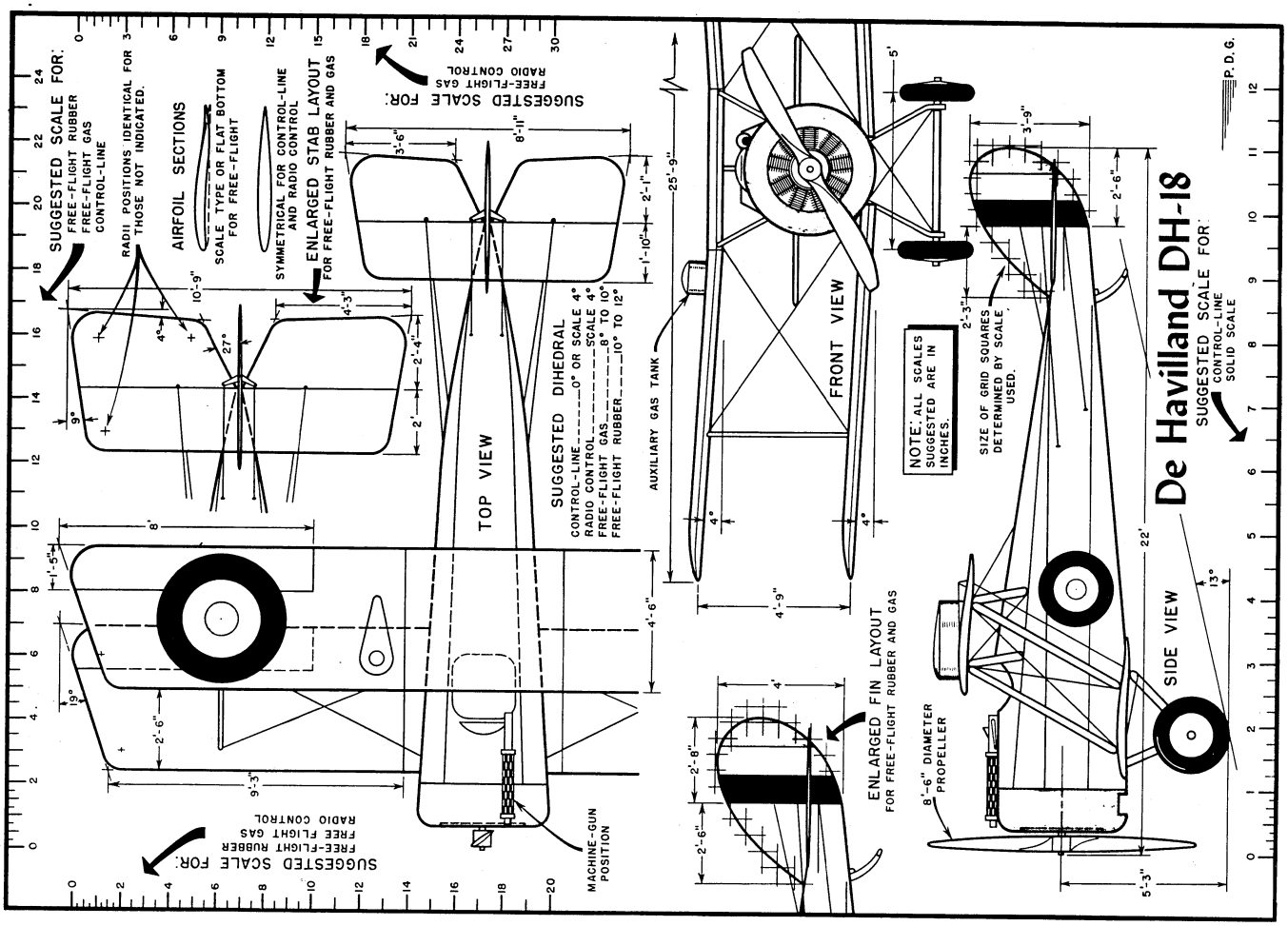
Wire End Loops

When making up control-line lead-out wires on flying lines, borrow the commercial trick of using tubing clamps instead of wire binding. For flexible wire, run the short end through the tubing twice, as shown. Regular steel wire need only be bent back along the tubing. Use soft copper or brass tubing of about 3/32" O.D. for wire up to 1/32" diameter. Clamp the tub-



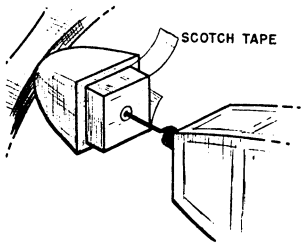
ing in a vise to squeeze it around the wire.—ARTHUR PERGAM, Willow Grove, Pa.





Tightening Nose Blocks

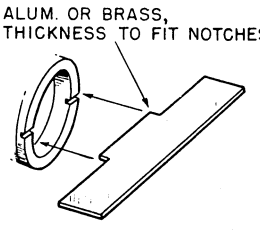
Rubber modelers can use this idea to good advantage: If the nose block becomes loose through wear, damage or



thrust adjustments, wrap Scotch tape around the rear portion. Build up layers as needed for a good snug fit.—JOHN GIOVINE, Bronx, N. Y.

Backplate Spanner

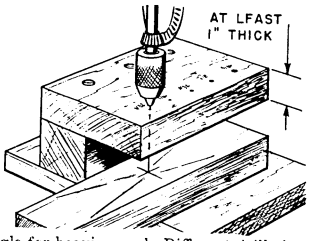
Notched crankcase back covers on such engines as the O.K. Cub frequently need tightening, or must be removed for cleaning the inside of the engine. Don't try jabbing long-nosed pliers into the notches and twisting the cover. Instead, make a wrench or spanner from



a piece of aluminum or brass, as shown. Select a thickness that is a snug fit in the notch width. Then twist the wrench with your fingers or a pair of pliers.—HANNES LAUBE, Brooklyn, N. Y.

Drilling Straight Holes

This handy jig will enable you to drill prop blocks, nose blocks and wheels with perfect squareness, using an ordinary hand drill. The jig can be made of wood for light work or of metal an-



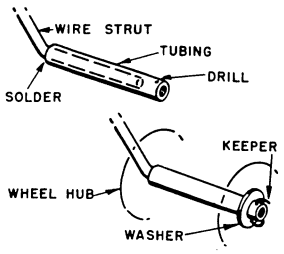
gle for heavier work. Different drill size holes can be put through the same jig and bushings of the proper sizes added. Take the jig to a machine shop to have the guide holes bored with a drill press.—RUDY PRIKOSOVICH, South Bend, Indiana.

Super Finish

When your current favorite solid scale model has been completely doped and all decals and details are finished, paint it with several coats of a good clear hot-fuel proofer. Do the job in dry weather, in a dust-free room, and allow ample drying time. The high gloss finish is worthwhile and durable.—CHARLES GOLDSTROM, Pittsburgh, Pennsylvania.

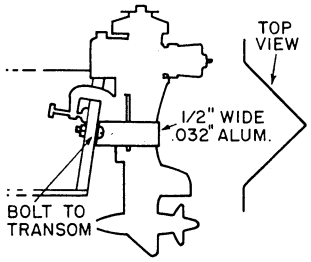
Wheel Retainer

If you wish to use one set of wheels on several models, or wish to have the wheels easily removable so you can change over to skis or floats, here is a neat way of doing the job: Solder a length of copper or brass tubing over the landing gear axle. Let the tubing extend about ¼" or ⅜" beyond the wheel, and drill a hole through the tubing for a small cotter pin or soft wire keeper. When assembling, put a washer between the wheel and retainer.—D. BLACKMORE, Austin, Texas.



Motor Saver

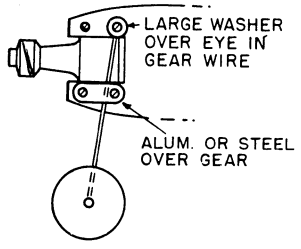
Model outboard boats have been known to turn over or have engines vibrate loose, with the valuable motor ending in the "deep six." Also, motors sometimes move during running, changing the desired direction on the water. Try this wrinkle to solve both problems:



Bend a ½" wide strip of 1/32" aluminum or brass, as shown, and bolt or screw it to the transom. This will keep the motor rigidly in position during operation.—TED SARLER, Florida, New York.

Simple Landing Gear

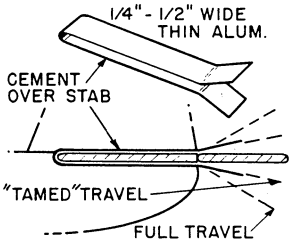
Stunt and Combat fans who fly profile ships can use this method for gear attachment (It can be made for either single-wheel or two-wheel gears): The gear-wire end is bent to form an eye, at this end is fixed to the engine-attach bolt with a large washer. Other attach bolts have a piece of aluminum



or steel over the gear, as shown. The gear is easily replaced when bent or broken.—EDDIE CINCOTTA, Brooklyn, N. Y.

Control Tamer

Control-line beginners have a universal tendency to overcontrol during their first flights, with resultant disaster to their models. Since most models have more than adequate elevator travel up and down, slightly reduced travel will help cut down that tendency to over-

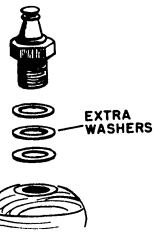


control. Attach metal strips, bent as shown, to the top and bottom of the stabilizer. Bend so that travel is restricted during early flights. As your technique improves, the "Tamers" can be opened up, and removed entirely when proficiency has been reached.—TERRY HUFF, Cedar Springs, Mich.

HANDY HINTS

Long And Short Of It

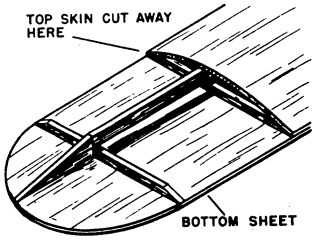
Have you ever been caught without a short type glow plug when flying your ½A ship? If you have a long thread plug from a larger engine available, the trouble can be solved in this manner: Add enough washers (plug gaskets) to shorten the threads. Then,



check for compression leaks by putting a few drops of fuel on the plug and flipping the prop a few times. If bubbles appear at the plug washers, try other washers that are newer and smoother.—STUART CULP, Bethany, Missouri.

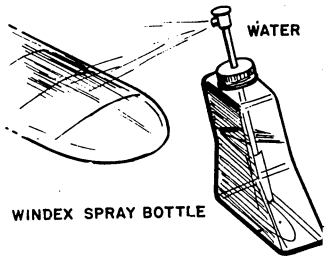
All-Wood Wings

A simple method for building strong, light wings for rubber models or small gas jobs is shown here. Use a sheet the width of the wing. Put light strips, such as ⅛" square, across the wing chordwise. At the high point of the upper camber, lay a spar of about 3/16" square. The size will be determined by the thickness of the airfoil



Little Squirt

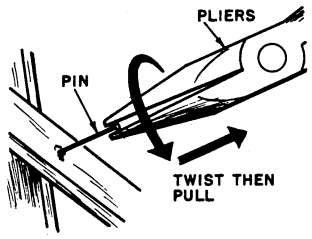
If you wish to water-tighten the tissue on your model, try this: Use an empty window-cleaning spray bottle, filled with water. Clean spray pump thoroughly before using. Spray model



evenly to avoid excess warping.—RICHARD RIEGER, Houston, Texas.

Pulling Pins

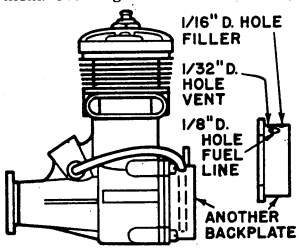
Here's a simple trick that may be overlooked by most modellers. When pulling pins from cemented structures



grasp the pin head with pliers and turn or twist the pin to break it loose from cement that may be surrounding it. Then pull the pin out. TOM MARKLAND, Cincinnati, Ohio.

Free-flight Fuel Tank

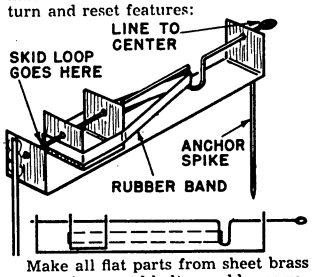
Engines such as the Fox and K&B Allyn with recessed crankcase backplates are well suited to this trick. Obtain an additional backplate and drill for filler, vent, and fuel line as shown. Attach the backplate over the regular backplate with another gasket between them. Use longer screws if necessary.



Fox 29 and 35's run 30 to 40 sec. on fuel contained in this backplate tank. A Fox 19 will run a bit longer. Prevents fly-aways from stuck timers. The space in tank can be reduced to hold less fuel by adding small blocks of hardwood if no timer is used. CHUCK PETERS, Ft. Smith, Ark.

Still Another Stooge

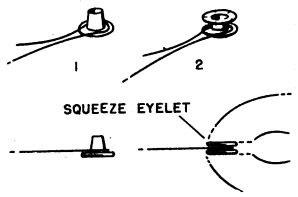
Most stooge designs have a release pin that is pulled completely out of the stationary parts. Here's one that eliminates this feature and has simple return and reset features:



Make all flat parts from sheet brass or aluminum and bolt or solder as required. Use steel wire for anchor pins and release rod. Return actuator can be a spring or rubber band. SP2 JOHN M. ROWLAND, Denver, Colo.

Wire Ends

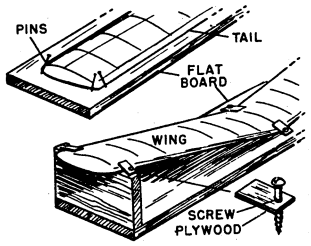
For extra safety when putting the eyelets on control-line wire ends, it is a good idea to squeeze the rims of the eyelet together so that the wire won't



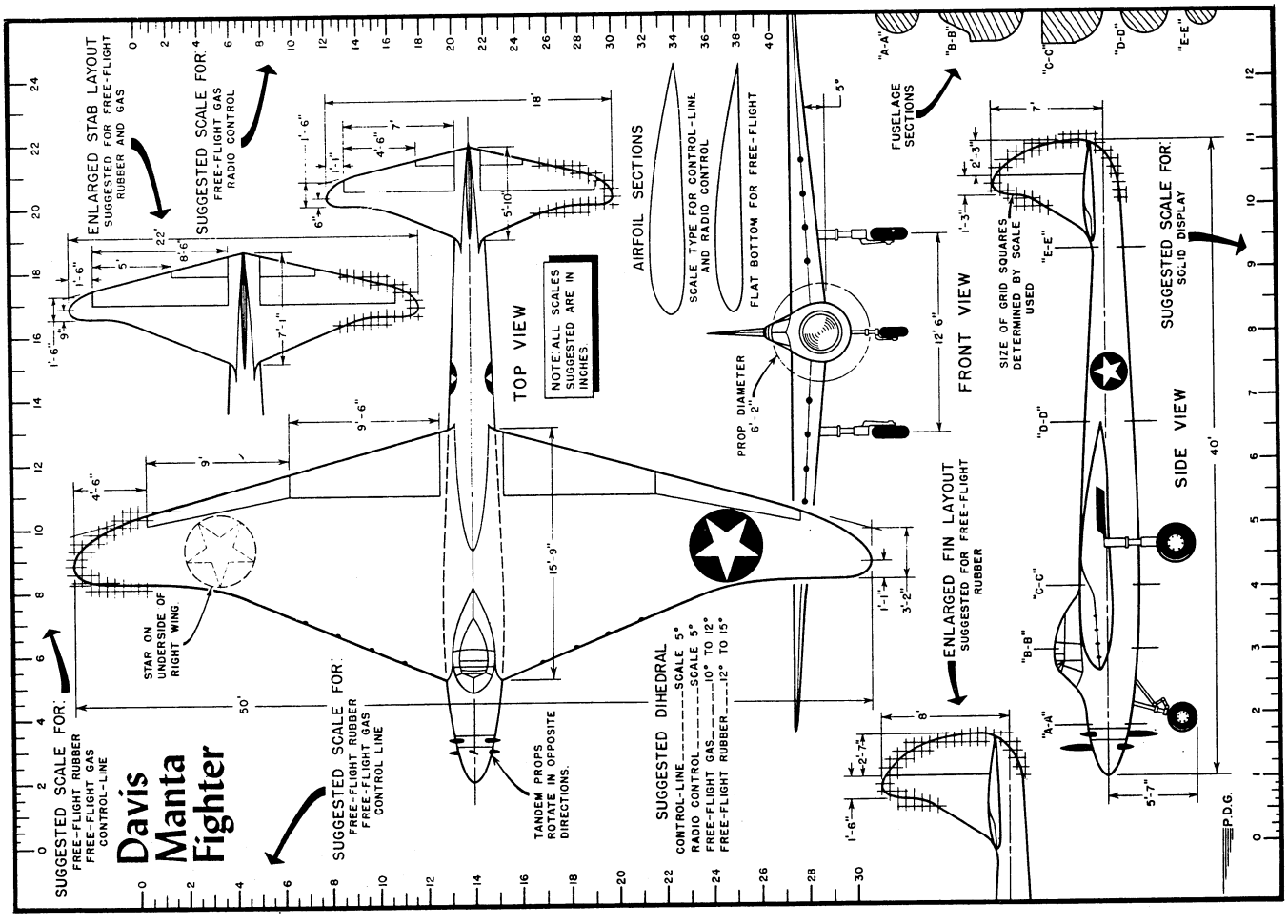
come off. This also helps to keep the eyelet in place while binding the short wire end down.—MARTIN GOSKY, Lakewood, Ohio.

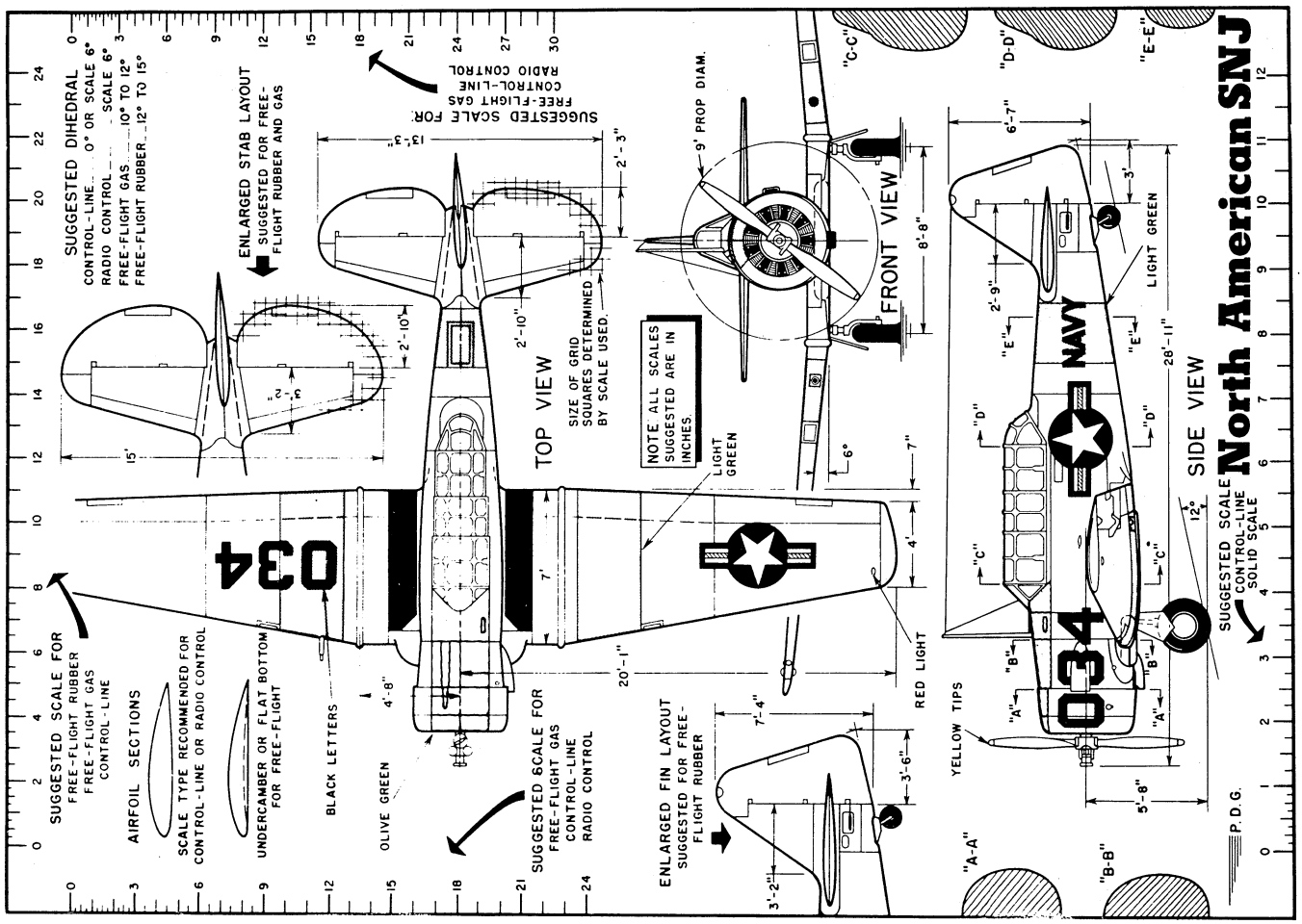
Warp Prevention

To keep tail surfaces and wings from warping while being stored, this method is a good one: Get a good piece of flat board or plywood a little larger than the surface and pin the surface



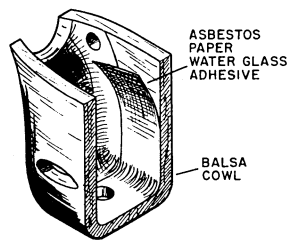
down on the board as shown. Small clamps can also be used. Make them from a short strip of thin plywood and hold down with a small woodscrew.—BOB CRAWFORD, Muncie, Ind.





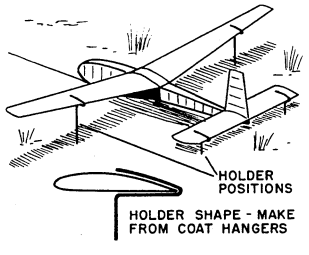
Cool Cowlings

With enclosed engine installations such as those used on team racers, scorching and burning of the inside of the cowling sometimes occurs. Try lining the inside surfaces around the engine with asbestos paper. On small models, use the thinnest grade paper available. On larger models, where weight isn't such a problem, you can use 1/16" sheet asbestos. Use water glass as an adhesive for applying the asbestos paper.—**Ralph Joline,** Jamaica Plain, Mass.



Towliner Stooge

If you want to fly your towline glider without assistance, bend up coat hangers as shown. Push the wires into the ground, in the location indicated. Be sure the glider is aimed into the wind. Lay out your towline and start your launching run in the usual manner.—**Virgilio Ilagan,** Gerona, Tarlas, P. I.

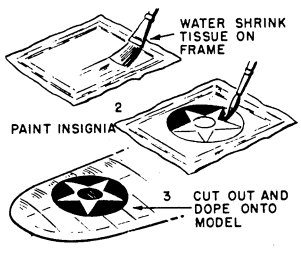


Float Spray

New clear spray plastics which are on the market (such as Quik or Krylon) provide an excellent lightweight "seal" for float bottoms of R.O.W. models. The plastic seals both tissue and clear dope without adding weight and without smearing. Fuel-proof qualities are only fair, however. NORMAN MICHIE, Madison, Wis.

Flying Scale Decoration

● Instead of trying to paint scale details (such as insignia or numerals) on the fuselage and wings after your model is completed, try this:

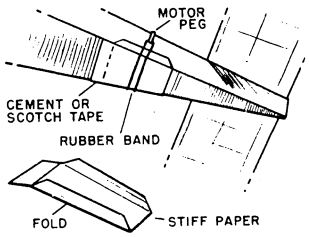


Make a simple balsa strip frame slightly larger than the particular decoration. Cement a sheet of tissue onto the frame. Water-shrink the tissue on the frame. Then flatten the tissue and draw in and paint the decoration. Next, cut out along the outline and dope in place on the model.

Use thinned clear dope and work quickly in order not to make colors run. Numerals can be cut to size out of black tissue and doped directly to model. Use regular tissue for rubber models, and heavy tissue for gas jobs.—MIKE McALLISTER, New York, N. Y.

Hatch Cover

Here is an idea that will help keep dirt, field mice and grasshoppers out of the rear end of your rubber model.



Usually an open hatch is left at the rear motor peg for access to the motor. A stiff paper cover hinged at the front and covering the hole and sides will serve to keep the rear end clean and tidy. See sketch.—RUDY PRIKOSOVICH, South Bend, Ind.

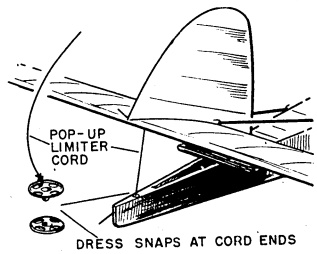
Glow-Plug Booster Clips

If your alligator booster clips get lost, strayed or stolen, try these equally good substitutes: Take an ordinary round heavy-duty soldering lug and cut out a small notch to allow the lug to be slipped over the knob of the glow plug.

With some glow plugs, the regular high-tension ignition wire clip can be used. These clips can be used on both booster leads—sliding the other clip over the crankcase bolt or onto the exhaust-stack edge. Pinch back together with pliers when the clips open up through use.—GERALD HAMLOWE, Bloomington, Ill.

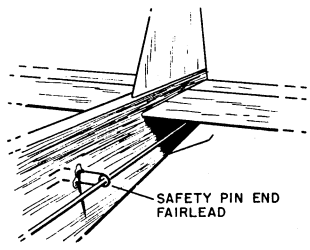
Removable Pop-Up Tail

After fumbling around on the field for many an hour tying limit strings on a pop-up tail, it was found that a very simple and much used device could be applied with success. By the addition of a simple dress snap on either end of the limit string, removal of the tail assembly is made both easier and faster. Be sure to cement half of the dress snap very securely to either the tail assembly or fuselage. This works well with Class A or smaller models, but for larger ones a snap fastener of the type used for control-line ends is needed.—**Fred Otten,** Brooklyn, N. Y.



Pushrod Fairlead

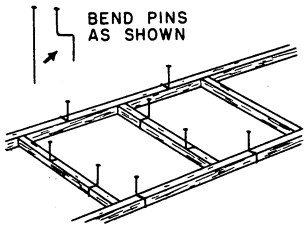
On profile planes, the pushrod has no brace and sometimes bends from the opposite forces formed by the bellcrank and the slipstream over the elevator, resulting in a lack of control. Many braces are in use, but an unusual one that works easily is this: Cut the snap end off a safety pin, thread the pushrod through the loop on the other end, and push the two sharp ends into the fuselage, bend over and cement well. More than one may be needed.—**Stuart Culp,** Bethany, Mo.



HANDY HINTS

Bent Pin Kink

● To prevent splitting or piercing small-size balsa strips when building model parts on the work board, bend pins as shown. Stick pins into board on



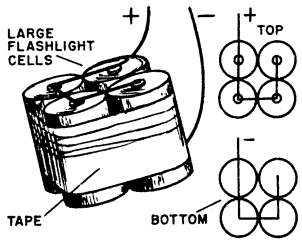
the outside of curved sections to hold in place. The right-angle bend will hold the work tightly against the flat surface.—JOE W. WRIGHT, Gormley, Ont., Canada

Glass Work Top

When working on plastic or other models that don't have to be pinned to plans, put the plans under a sheet of glass and work over it. This will hold plans in place, give you a smooth working surface without danger of marring table or desk, makes plans easier to see, keeps them from being mislaid, and cement and paint can be cleaned off easily with a razor blade. ROBERT EVANS, S. Cannellsville, Pa.

Handy Glow-Plug Boosters

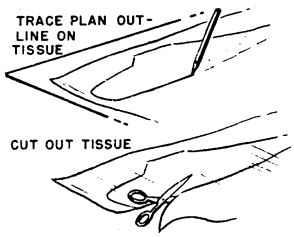
If large dry cells are temporarily unobtainable, try using four large flashlight batteries wired in parallel as a substitute. This pack also makes a light



handy unit to carry for contest work. Bind four cells together with Scotch or friction tape, and solder the wires in parallel, as shown, to obtain 1½ volts. Battery life will not be as long as with large dry cells, so use this only as a substitute booster.—DON BARBAY, Beaumont, Texas.

Paper Work

Covering models with tissue can be made easier if this procedure is followed: Lay the tissue over the plan drawing of the parts to be covered and trace the outline with a pencil. Then cut out the paper slightly larger than the pencil outline and apply it to the model part. This method makes it easier

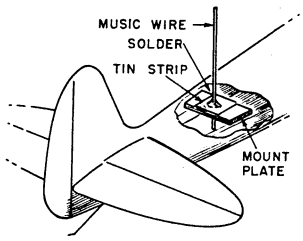


to cut out the right size piece of covering and is also more economical since odd sized scraps can be compared with the drawing before being applied to the model.—DAN LIBS, Ulysses, Kansas.

Rudder Flip-Over Insurance

● To prevent damaging the rudder on your control-liner in those flip-over landings, try this wrinkle:

Make a guard of 1/16" music wire and mount securely in the rear portion of the fuselage. Wire should extend at least one inch above top of rudder.

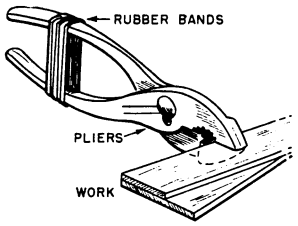


Solder the wire into a 1" square strip of tin and liberally cement to a strip of hardwood or ⅛" plywood. Cement assembly securely into fuselage structure.

This guard looks like a radio antenna mast and will take the shock in the event of a flip-over.—E. J. SAUNDERS, Toronto, Canada.

Clamp Substitute

● When it is necessary to clamp two parts of your model structure together to let cement dry, this trick will help if you don't happen to have "C" clamps in your tool box:



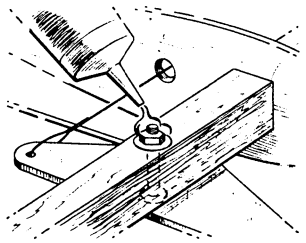
Wrap the handles of your pliers tightly with rubber bands—then pull jaws open and slip the work in. The rubber bands will hold the jaws onto the work until the cement dries.—GRADY LEE WALKER, Ninety Six, S. C.

Securing Nuts

● Your model cement can be used for other things besides sticking balsa wood together.

Where a nut and bolt is used to mount some accessory or hardware part permanently on your model in a place which will be inaccessible when structure is finished, spread a liberal blob of cement over the nut and the nearby wood. This will prevent the nut from working loose from engine vibration.

This works well on control-plate pivot bolts, landing gear "J" or eye bolts, and

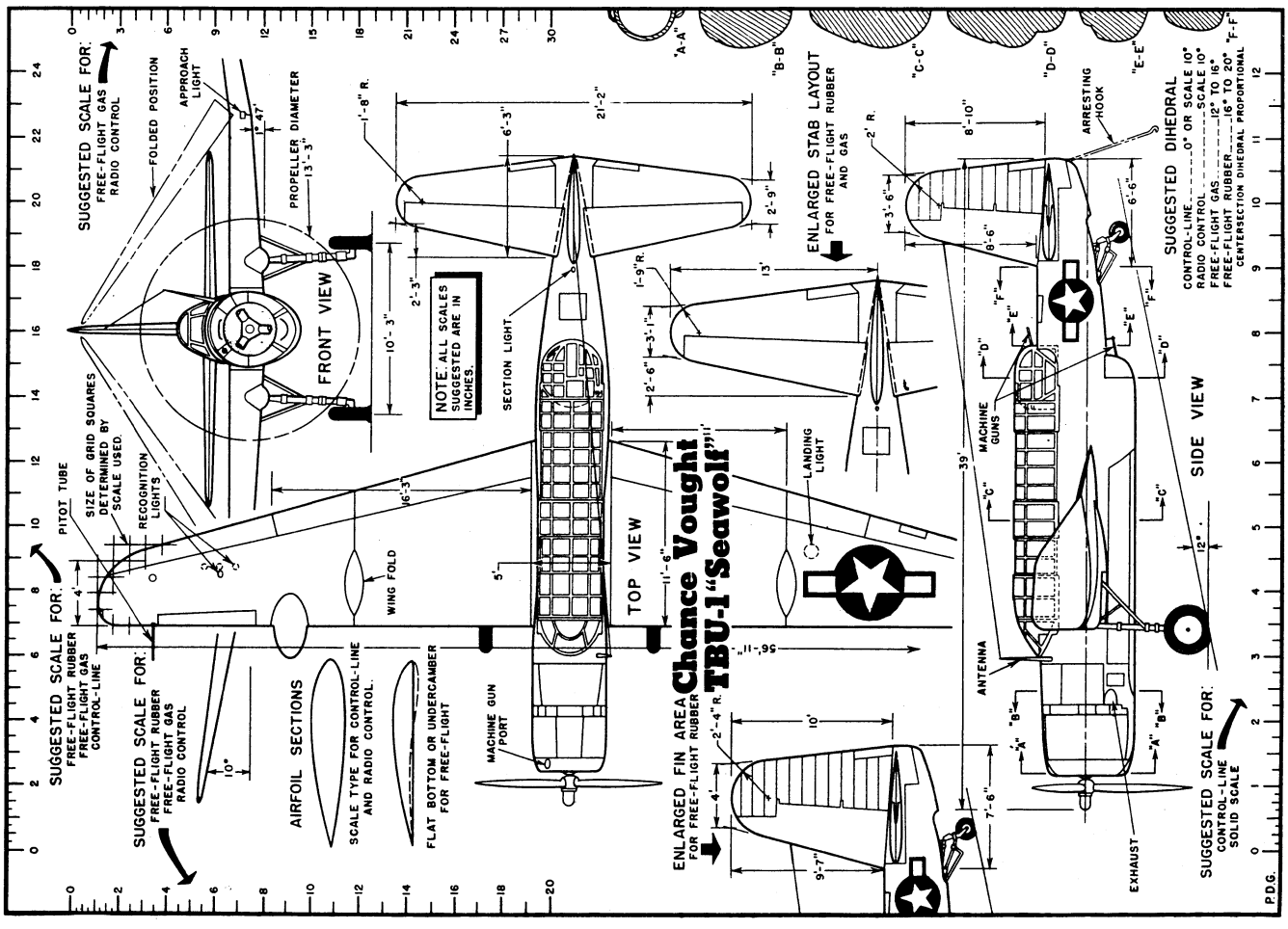


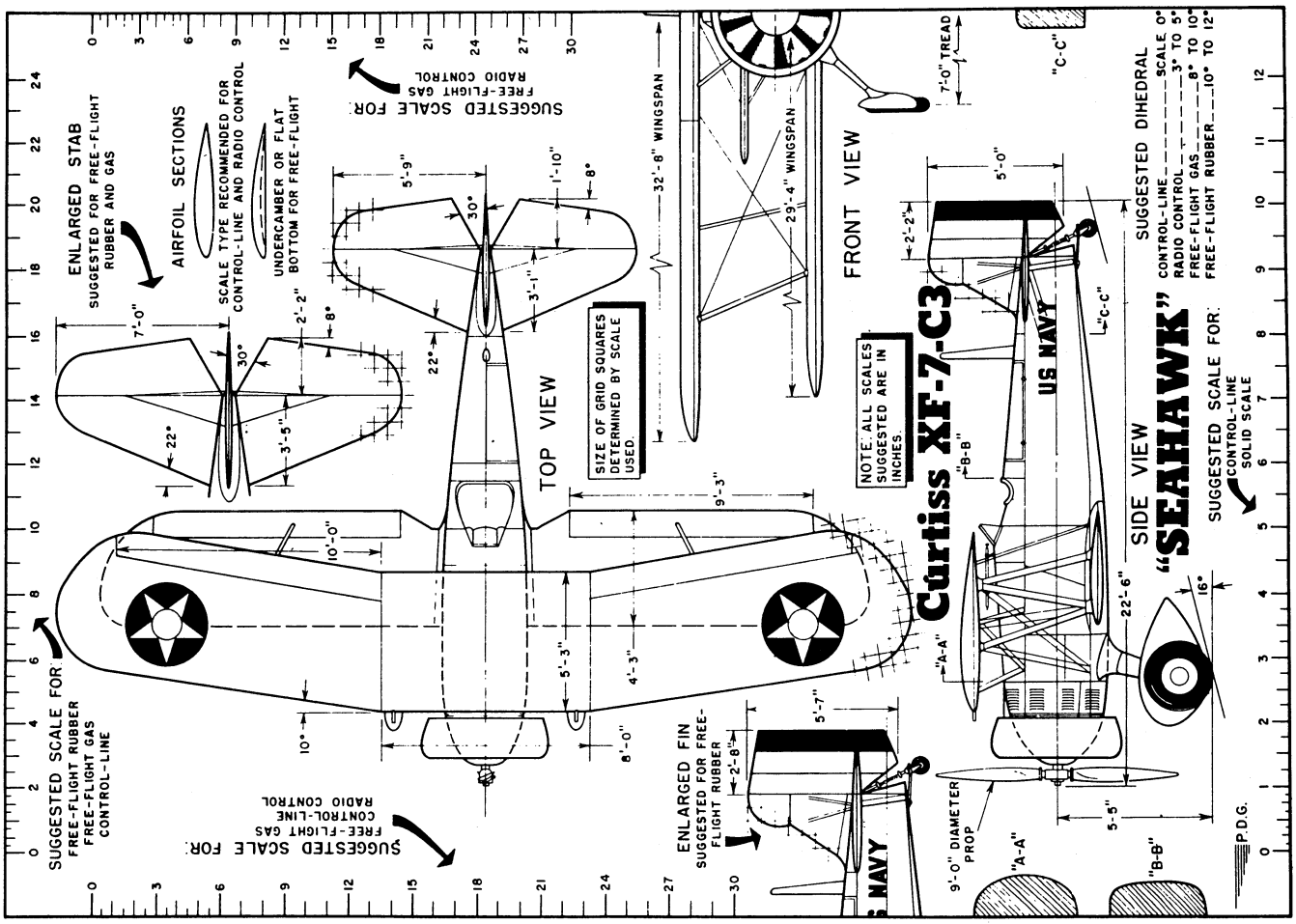
can be used on engine mount nuts if the nuts are surrounded with Plastic Wood packed down well. Cement under and over the Plastic Wood.

Always mount nuts and bolts with flat washers and either lock or star (radio) washers. Then the cement will act as a good "safety".—BILLY WRIGHT, Jackson, Miss.

Tight Mount

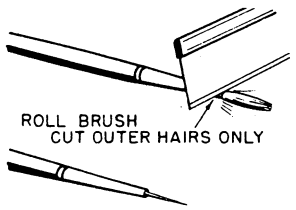
A large automobile-type star washer placed against the firewall behind an Infant or Torp Jr. engine will prevent the engine from slipping in its mount ring.—JIM RUSSELL, Lansing, Mich.





Detail Brush

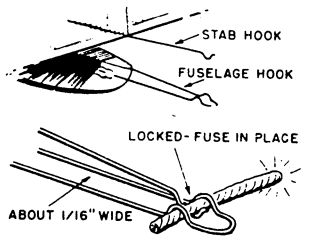
Painting fine details on plastic models can be made easier by this idea. Very fine brushes are quite expensive, but ordinary dope brushes can be work-



ed over a bit to do a better job. Cut away most of the bristles with a razor blade so that only six to a dozen hairs remain.—DAVE CHULICK, Cadillac, Michigan.

Pop-Up Dethermalizer

This pop-up tail dethermalizer system does away with the small rubber



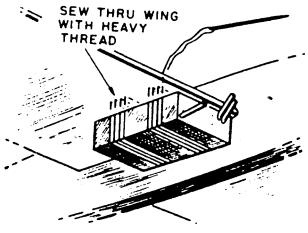
bands used to hold tail hooks together. The wires are bent as shown so that top hook slips down through bottom hook, with the fuse acting as locking pin. When no fuse is to be used a small dowel will serve as a lock.—DENNIS PHILLIPS, Lamesa, Texas.

Tube Bender

In order to prevent flexible fuel line tubing from collapsing when bent sharply, insert small spring from wire collar "stay down" gadget available at most 5 and 10 stores. Push this spring into tubing before attaching to engine and bending.—HERB TALABERE, Walla Walla, Wash.

Tank Mounting

Mounting fuel tanks on the outside of small 1/2A ships can easily be done using this method. If model has sheet balsa wings, put tank in position and using a needle and heavy thread sew around tank and through wing. Go around numerous times until tank is held firmly in place. Tank can also be attached to profile fuselages in same



manner. Coat thread with hot fuel proofer.

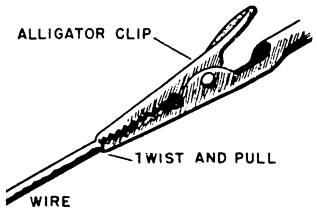
Various stunt tanks can be tried out to determine best performance using a variation of the above method. Use light single strand copper wire passed through fuselage and around tank with ends twisted together.—RONNIE FIKES, Soquel, Calif.

Workboard

An excellent material that can be used for a model workboard is "Nu-Wood," available at most lumber yards. "Nu-Wood" is inexpensive and soft enough to take pins easily. You may wish to put legs on a panel and make a regular table, or simply lay on workbench or table when building. RUSSEL HEIN, Fairbank, Iowa.

Wire Skinner

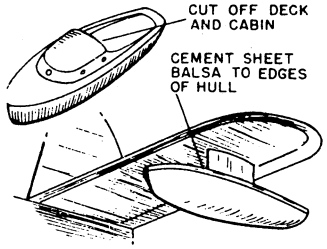
For an easy way to skin or strip battery or ignition wires, try this: Clamp an alligator clip on the wire, squeeze the clip so that it cuts the insulation, and pull the clip off the wire end. This



method works well with wire that has an all-plastic insulation.—DICK ARNOLD, St. Clair Shores, Mich.

Free-Flight Floats

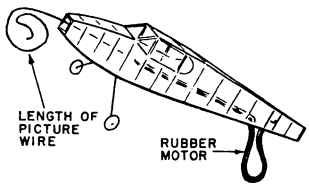
Modelers who favor the tail float design for R.O.W. will welcome this suggestion: Small plastic toy boats can be used for floats under the stab. Cut the deck off and cover with 1/8" or 3/16" sheet balsa, depending on size. Attach



strut mounting to sheet top with model cement. Be sure of a water-tight seam at the deck line.—KEN JOHNSON, Seattle, Wash.

Rubber Motor Installation

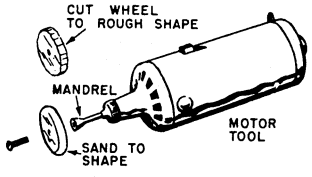
If you have ever tried to fish a rubber motor through a long, narrow fuselage or stick model, you will appreciate this one. Run a length of picture wire through the model from front to rear.



Attach the rubber motor to the rear hook. Attach other end of the rubber motor to the picture wire and pull through to the nose block. Be careful, when inserting the wire, to prevent punctures of the fuselage covering.—CHARLES E. BAMBERG, Lexington, Mass.

Making Round Parts

To make odd-sized wheels and other round parts such as firewalls, a motor tool can be used as a miniature lathe. Simply cut out the part to rough outline

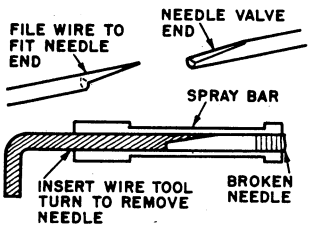


and then mount on a mandrel in the tool. Use sandpaper held against the part with the motor running to bring the part to final shape.—NORMAN CHRISTIANSEN, Pocatello, Idaho.

HANDY HINTS

Needle Valve Extractor

The next time a tapered-shank needle valve breaks in one of your engines try this method of removing the broken piece. File a piece of piano wire to match the taper of the needle



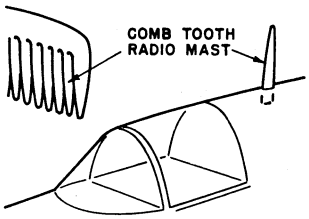
valve end. The wire should have the same diameter as the needle valve. Insert the tool from the nozzle side of the spray bar and turn the broken needle out of the spray bar. LEE HOWER, Tamaqua, Penna.

Tissue Shrinker

To water-shrink tissue covering, use a small soft sponge and rub gently over the tissue to apply water. THERRON TAYLOR, Baker, Okla.

Dummy Radio Mast

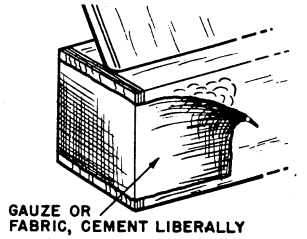
Pocket comb teeth make neat radio masts for scale models. Break a tooth



out of comb and push into fuselage as required with cement on the end. BRIAM LEONARD, Ann Arbor, Mich.

Firewall Fastener

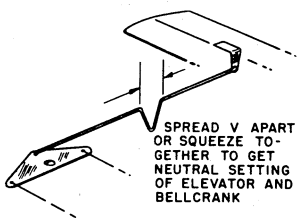
To reinforce a plywood firewall when mounting it to fuselage sides, cover the joints with gauze or aircraft



fabric coated liberally with cement. This will fuel-proof the usually oily area and will greatly strengthen the structure. RONNIE ANZALONE, Kenmore, N. Y.

Adjustable Push Rod

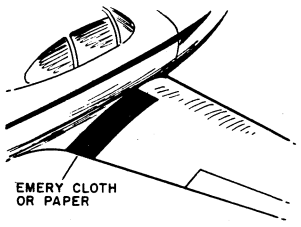
Where the elevator push-rod is mounted externally, try this kink for getting a bellcrank and elevator neutral setting: Bend a "V" in the rod at some convenient location along its



length. Bend the ends to connect to the bellcrank and elevator horn as close as possible. Then, spread the "V" apart or together as needed to get the exact setting.—BOB ELLIS. Trost. Texas.

Wing Walks

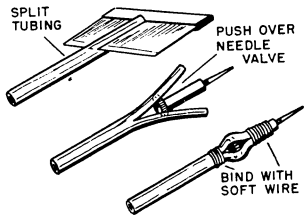
For the scale model fan, here is something to help add realistic detail: The wing walks on full-scale aircraft are usually coated with some sort of grit to aid footholds when climbing on the curved surfaces. This rough surface can be simulated on your model by using



emery cloth or fine sandpaper having black coloring. Cut out the paper to the shape needed and cement down.—PETER DANZO, Union City, N. J.

Needle Valve Extension

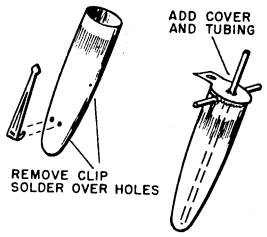
The tiny needle valves on ½A engines are sometimes hard to get at for adjustment when the prop is turning. A simple extension can be made that will help solve this problem. Split the end of a piece of neoprene tubing for



about ⅜" and slip the split end over the needle valve knob. Tightly wrap the split ends with soft wire around the needle valve body as shown. Leave about ¾" of tubing outside the needle valve. This can be bent back out of harm's way while tuning the engine. —EDDIE GRANT, Columbus, Ind.

½A Tank

Here is a fuel tank that can be used with the small engines: Obtain the metal cap from an old or cheap fountain pen or pencil. Pull the clip off, and solder up any clip mounting holes as well as the small breather hole. Drill holes for the fuel-line filler and vents,



Solder tubing in place as needed. Solder a tin disc over the open end. Mount vertically or horizontally as required. CAVIE KETCHUM, Scottsdale, Ariz.

Bottle Cap Seal

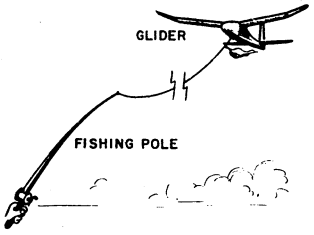
The cardboard seal in dope bottles always sticks and tears after the dope is used a few times, preventing a tight seal. Substitute a 1/16" plywood disc to overcome this.—STUART CULP, Bethany, Mo.

Unsticking Joints

If you cemented that joint in the wrong place, brush some dope thinner very generously on the cement. This will loosen the cement from the wood. Also apply thinner or nail-polish remover around the lids of those hard-to-open dope bottles (Turn bottle upside down). This will loosen the hard dope and make for easier opening.—D. Olson, Mora, Minn.

Flying Fish

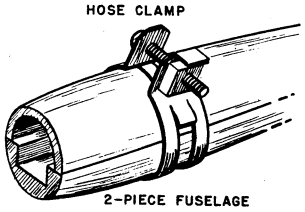
Towline gliders can be launched neatly with the aid of a light fishing pole. This is not allowed in competition, but



is handy for sport flying. The rod can be used to help guide the glider on tow, and the reel makes it easy to wind up the line when flying is over, and to store the line when it's not in use.—RICHARD CONDE, Providence, R. I.

Circular Clamps

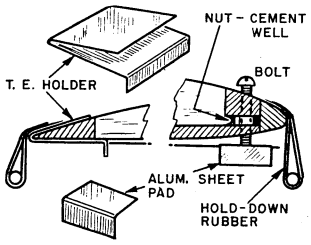
Two-piece solid or speed models with circular cross-sections are often hard



to join while carving or cementing them together. To hold this type of work firmly, simply use an ordinary automobile or aircraft hose clamp. These clamps come in various sizes and the screw adjustment allows any desired tension, as well as considerable variation in diameter.—Pfc. J. LUSKER, Cherry Point, N. C.

Variable Incidence

For test-flying experiments, with various changes of wing and tail incidence, this gadget will insure careful and accurate adjustments. It can be used on

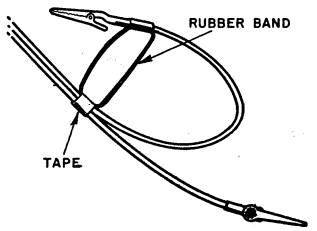


pylon or cabin-type models, and will not interfere with the knock-off rubber attachment.

A lowly nut and bolt form the basis for the idea. Two nuts are mounted firmly in the wing or tail structure, above the outer edge of the fuselage top, and the bolt is threaded through to bear against a flat plate on the pylon or fuselage top. Then, simply screw the bolt in or out to raise or lower the leading edge. The rubber bands hold the surface in place against the adjustment.—BOB LARSON, Erie, Pa.

No Shorts

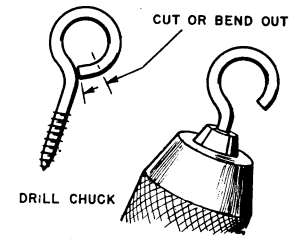
Keeping booster clips apart to prevent shorting out the batteries is always a problem, with either ignition or glow-



plug operation. Usually, when the engine is started and the booster clips are removed, they drop to the ground across each other (It'll happen darn near every time!). To prevent this, try taping or tying a rubber band on one lead as shown. This will keep the clips away from each other when not in use.—JOE MC DUFF Chickasha, Okla.

Rubber Winder Hook

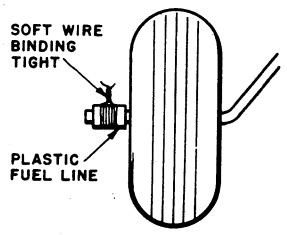
An ordinary screw eye can easily be converted into a good winder hook by



cutting out a small portion of the eye to allow attachment of rubber motor hook or prop shaft. The large diameter and threads of the screw portion will hold tightly in your hand drill chuck. —JACOB TILL, Youngstown, Ohio.

Wheel Retainers

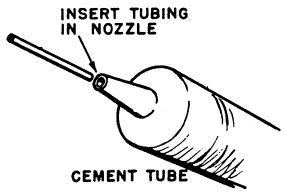
The battle of the wheel collars goes on! If you can't solder retaining washers on the axle, to keep wheels on the model, try this method: Cut a short



length of plastic fuel line and slip it over the axle. Bind it with a few turns of soft wire to anchor it in place. JACK WHITEHOUSE, Dawson, Canada.

Cement Gun

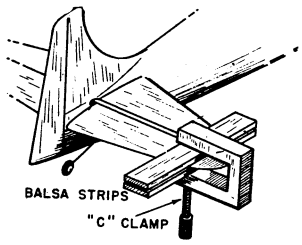
How often have you wanted a longer nozzle on your tube of cement? Here's an answer: Drill out the cement tube nozzle to fit a 1" or 2" length of 1/16 i.d. brass or aluminum tubing. Push the



tubing into cement tube nozzle and squeeze the nozzle with pliers. Plug with a pin or brad when not in use. DEAN BARBER, Wyaconda, Mo.

Aligning Elevators

Here is an easy way to make sure that the elevators of your control-line model are set in neutral when installing the control mechanism:

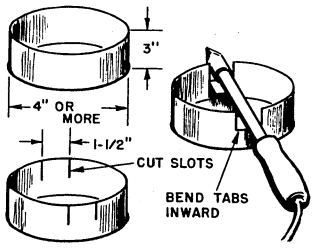


Sandwich the elevators and stabilizer between two pieces of hard balsa and hold firmly together with a "C" clamp as shown.—E. FITZSIMMONS, New York, N. Y.

HANDY HINTS

Soldering-Iron Stand

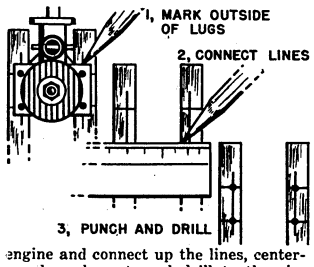
Finding a place on the workbench to lay that hot soldering iron is sometimes troublesome. Why not cut a 3" wide strip from a large tin can and then slot as



shown. Bend tabs over at right angles to the can sides to complete the holder. —GERALD THORSTON, Fort Bragg, Calif.

Spotting Engine-Mount Holes

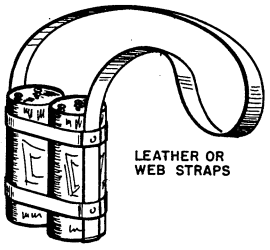
To locate engine mounting-bolt holes accurately on your model's engine bearers, try this simple method: Hold the engine firmly in place and mark wood at front, back and sides of mounting flange, in line with the holes. Remove



engine and connect up the lines, center-punch each spot, and drill to the size of the bolt.—WILSON W. ELLIOTT, Waynesville, N. C.

Battery Carrier

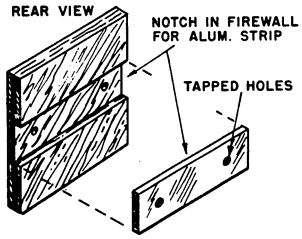
Here is a simple way to carry booster batteries in the field. An old belt, or a leather or cloth webbing strap is run around the batteries lengthwise. Two other straps are run around the batteries and over the lengthwise strap.



This strap assembly can be riveted together into a permanent harness, or tape can be substituted for the two straps around the batteries.—**Unsigned**, 591 Nipissing St., North Bay, Ontario.

Slick Radial Mount

Instead of cementing engine mount nuts to the back of the firewall, or soldering nut plates, try this wrinkle:



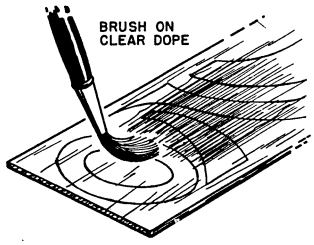
Cut a notch in your firewall large enough to hold a strip of aluminum. Then, drill and tap holes in the aluminum strip for the engine mount bolts. The tapped holes serve as nuts. Finally, cement the aluminum strip into the notch in the firewall and cement the firewall to the nose of the model.—MANFRED FRANKE, Greenfield, Ind.

Storing Engines

To keep dust and dirt out of engines when they are not in use, wrap the engine in household aluminum foil.—TOM WEBB, JR., Fenton, Mich.

Split Preventer

When cutting odd-shaped parts out of soft balsa, the wood may have a tendency to split and tear. The wood can be strengthened by brushing a coat of clear dope on both sides of the wood.



More than one coat may be necessary on some wood. Be sure to do both sides to eliminate warping.—**Charles Bral**, Salt Lake City, Utah.

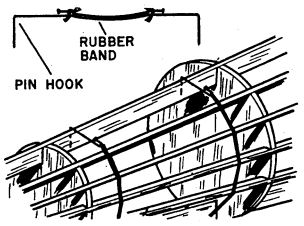
Balsa Filler

To smooth workbench dents and crushed spots on balsa before doping, wet the crushed area. Water will swell the wood to its original surface as it dries. Run a warm iron over the spots to hasten drying, if desired.—BILL HUFFLING, Greensboro, N. C.

Stringer Clamp

Here's another wrinkle for holding down stringers while the cement dries:

Bend two pins as shown and tie a short length of rubber band between the heads.

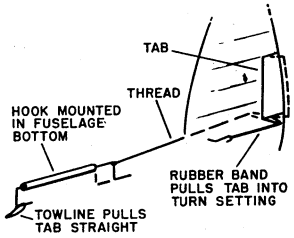


To use, just hook the pins across the stringers, stretching the rubber band so that its tension holds down the stringers being cemented.—LOYLE ERICKSON, Grantburg, Wisc.

Towliner Auto-Rudder

Towline glider launching can be tricky, but here is a gadget which will solve most of the turning problem:

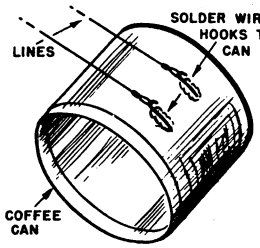
The rudder tab is pivoted and spring-loaded into the turn position. A light line runs to the tow hook, which is built as shown here. When the glider is launched, tension on the tow line



pulls the rudder tab into the straight position, allowing straight climb. When the tow line is released, the tensioner on the tab moves it to the turn position, for a circling guide.—J. P. CURTIS, Middlesex, England.

Line Reel

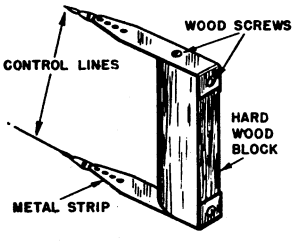
A good reel for your control-line wire can be made from the lowly tin can. Select a can 5" or greater in diameter (coffee cans are good, if you're still drinking that expensive commodity).



Solder two wire hooks on the side of the can as shown. Hook your wire ends over the hooks and wind the wire onto the can. A rubber band hooked through the other wire ends and pulled around the hooks will keep wires from unreeling.—ROBERT SHIVAK, Stockholm, Sask., Canada.

Home-Made Handle

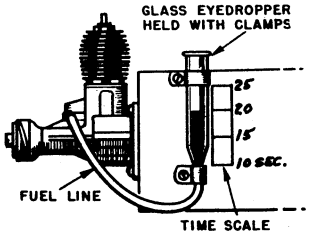
In an emergency, a strong and simple control-line handle can be made of readily available scrap material. Use any ¾" x 2" x 4" hardwood block and shape



as shown. Make the metal strips ¾" x 4" of 1/16" thick or greater aluminum or steel. Set wood screws in cement for a strong joint. Drill additional holes in the metal strip to allow for uneven line lengths.—B. WEDDINGTON, Wellington, Kansas.

Fuel-Tank Timer

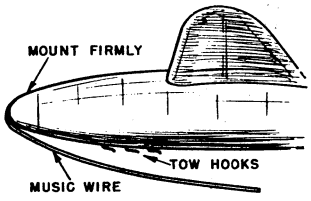
Timing a ½A engine run for free-flight can be tricky. Try this wrinkle for simple and accurate timing: Use an eyedropper for a fuel tank, mounted on the side of the fuselage close to the engine. By trial and error, determine the length of the engine run, and mark eye dropper accordingly. Scratch marks on the glass or paint marks on the fuselage will serve as a scale.



To use, simply run your engine until the fuel level drops to the desired line, then launch your model. Some adjustment of the dropper, either above or below the needle valve, may be necessary to get proper rich-lean running.—R. MAZUR, Little Falls, N. Y.

Towliner Skid

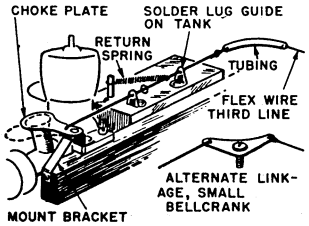
Addition of a music wire skid under the nose of your towline glider will pro-



tect the bottom and tow hooks from landing wear and tear. The wire will also serve as nose ballast when clipped to proper length. Be sure to mount it securely in the nose and leave enough space between the wire and the bottom of your glider to allow for good shock absorption.—C. A. GRELL, Hondo, Texas.

Engine Speed Control

Glow plug engine speed control has been a toughy, but is a very desirable feature for team racing and such events. This system uses a choke plate over the intake stack actuated by a third line. The choke plate is mounted on a bracket beside the intake, a length of wire fastened to the plate runs back



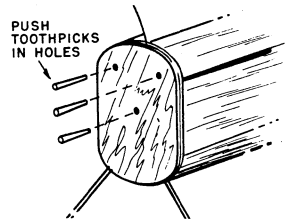
to a piece of tubing acting as a guide for flexible cable running out of the ship to the control handle.

A short coil spring moves wire and choke plate over intake, slowing engine. When cable is pulled, plate uncovers intake, permitting high speed. Coil spring acts as return pressure when cable is released.

A small bellcrank can be used in place of tubing guide and whole action can be reversed if desired. Use flexible cable for third line and make good positive action on trigger on handle. Some engines may need one or more 1/32" holes drilled in choke plate for proper low speed running.—BILL SPROUD, Escondido, Calif.

Renewing Screw Holes

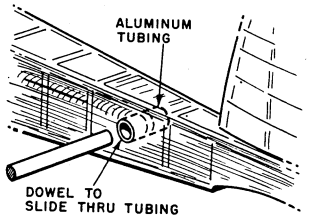
Most 1/2A engines are mounted on a plywood firewall with wood screws. After the engine is taken off and put back a few times, the screw holes become enlarged. Fuel soaking the wood doesn't help either. To correct this,



fill the holes with pieces of toothpicks set in cement, and make new screw holes through the toothpicks.—DAVID LAKE, South Pottstown, Pa.

Rubber Motor Anchor

Large rubber models can utilize this system for rear motor anchoring: Use a piece of 1/4" diameter (or larger) aluminum tubing as the rear anchor. Before winding the motor, insert a piece of dowel through the tubing.

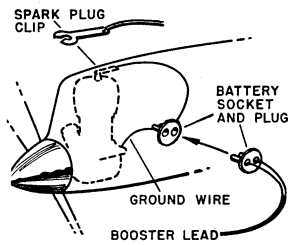


The dowel will serve as a better handle for the anchor man and will prevent the accidental tearing of the paper covering through handling. Remove the dowel after winding the motor.—R. W. DANIELSON JR., San Mateo, Calif.

HANDY HINTS

Glow-Plug Boosters

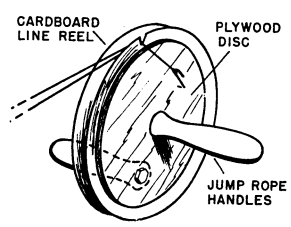
To save time and trouble with alligator clips for glow-plug starting, try wiring the glow plug and engine to a socket mounted permanently on the side of your model.



The glow-plug wire should have a regular spark plug clip, for easy removal. Booster leads from the battery are then soldered to a plug fitting the socket on the model. Use a small radio tube socket and tube plug end, or a portable radio battery plug and socket. This is a good gadget to use on team racers for fast restarting.—BILL WINTER JR., Oyster Bay, N. Y.

Line Storage

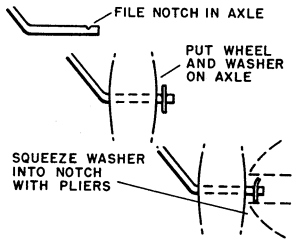
To keep control-line flying wires neat and straight, some kind of a reel is a must. So, save the cardboard reel the wires come on when sold to you. With the addition of two handles, this reel can be used for line storage. Jump-rope handles or cabinet knobs can be used. You can beef up the reel with a disc of plywood or balsa cemented to one or both sides.—GENE FORBES, Fairbanks, Texas.



Wheel Retainers

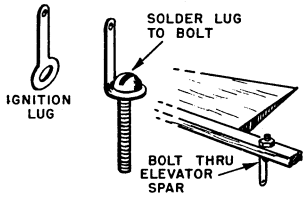
If all the methods for holding wheels on axles were laid end to end, they would reach from here to East Hatrack. Here is still another good idea to add to the pile:

File a notch in the axle end, outside the wheel position. Slip a washer over the axle and squeeze it down into the notch with pliers. Bend if needed to make a tight fit. To remove wheels, just break the washer off with pliers.—BOB KIMM, Vinton, IOWA.



Controliner Elevator Horn

Solder an ignition lug to a bolt head and bend up as shown. Pass bolt through elevator and tighten nut down. Use lugs of good thickness and let the

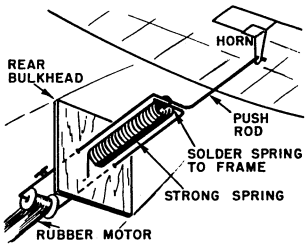


Built-In Variable Trim

Changing trim from power-on to power-off flight is always quite a problem with rubber power. This gadget will compensate for the change in thrust and permit a smooth transition from power to glide.

A strong spring, pushing against the tension of the rubber motor, is used to actuate the elevator (or rudder) trim tab. The size of the spring depends upon the size of the rubber motor and can be determined easily by experiment.

Mount the rubber motor on a bobbin, as indicated. The bobbin, in turn, is mounted on a wire shaft. Bend this shaft into a simulated "U" shape, and pierce the rear bulkhead in the manner



shown. Note, however, that one side of the wire frame must be cut and bent into a catch effect, to facilitate replacement of the rubber motor.

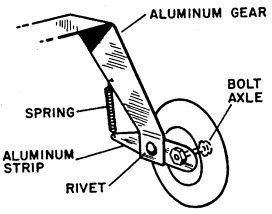
Use a large diameter compression spring, and mount this between the wire frame. Then, bending both sides of the frame towards each other, solder them to the top of the spring. One end of the frame is now cut short, while the other continues on as the pushrod. Attached to an underslung horn as shown, it will give up-elevator; mounted above the stabilizer it will produce down-elevator in the glide.

When the rubber is fully wound, the spring will be compressed and the elevator trim set for best climb under power. As the tension on the rubber diminishes, the spring will move outward, moving the trim gradually to a setting for good glide.—FRED KAUTZ, Minatare, Neb.

Shock-Absorbing Gear

Here's the added something that can change a sheet aluminum landing gear into a real shock absorber:

Instead of mounting the axle directly to the aluminum gear leg, rivet a short strip of aluminum over the axle hole. Mount the axle on the front end of this strip, and place a length of coil spring



at the rear. The spring will take the bounce out of those hard landings.—D. L. WADDELL JR., Clifton Forge, Va.

Clear Plastic

When you need celluloid for windows, windshields or other parts of your model, try using old photo negatives. Soak the negatives in hot water and peel the emulsion off, leaving a clear sheet of celluloid.—EDWARD WEHRLE, Pittsburgh, Pa.

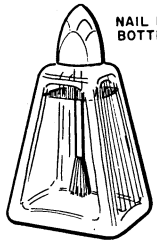
Taping Ignition Connections

Scotch tape makes good light-weight wrapping for splices and connections in ignition circuits. It is much stickier than regular friction tape and it's transparent—you can check connections without removing the wrap.

Try binding the hi-tension lead to the spark coil to insure a tight connection when the coil is mounted in some hidden, hard-to-get-at location in the model structure. Do not use the tape in the vicinity of the fuel or engine.—EDDIE KENNEDY, Short Hills, N. J.

Contest Repair Kink

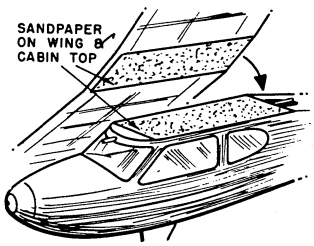
To carry dope and fuel-proofer in your tool box for on-the-spot repair work, use this trick: Obtain some empty finger-nail polish bottles, clean thoroughly with thinner, and fill them with dope, fuel-proofer, or other



needed liquids. The bottles will take up little space, and the small brushes built into the top will serve for applying the liquid. This will eliminate the need for carrying separate brushes and thinner to clean them.—PAUL KOZEL,—Freeland, Pa.

Wing Aligner

Try this method for keeping wings and tails in alignment, instead of the usual dowel or strip key arrangement.



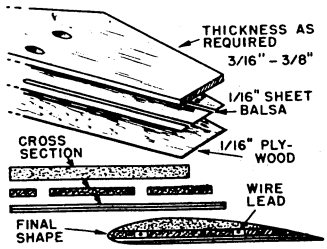
Cement fine grit sandpaper to mating surfaces of the wing and fuselage, grit side out. The friction between the two rough surfaces will prevent the wing from shifting due to engine vibration or flight loads.—DANIEL NOVAK, Chicago, Ill.

Brush Cleaner

One usually runs out of thinner at the wrong time, with brushes still left to clean. To clean brushes adequately, scrub them out in clear dope and wipe as dry as possible. There will be some dope left in the brush, but this can be dissolved before using the brush the next time by soaking it in thinner or dope for a few minutes.—MIKE BRESSON, Alton, Ill.

Speed Wings

Control-line speed model wings must be light and strong. Try this construction method: Lay out plywood wing form and build up laminations of balsa

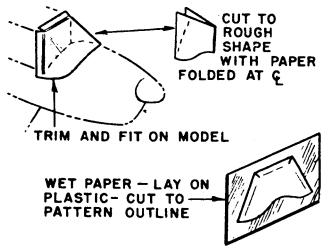


to the thickness desired, allowing for control leads as shown.—C. WELLS, Croydon, Pa.

Accurate Windshields

When making windshields from flat plastic sheet for cabin-type models, free-flight or control-line, follow this procedure for a neat job: From ordinary writing paper, make a pattern of the windshield to the approximate shape. Hold this in place on the model and mark it for any necessary additional trimming—then trim accordingly until a proper fit is obtained.

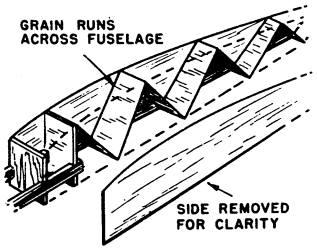
Now, wet the paper and lay it on the sheet plastic. The surface tension will hold the paper in place long enough to



cut out the plastic to the paper outline. Then pull off the paper and cement windshield in place.—D. R. BASTON, Muncie, Ind.

Crush-Proof Box Fuselage

Here is a neat adaptation of the Warren truss bracing used on full-scale aircraft, as applied to free-flight fuselage

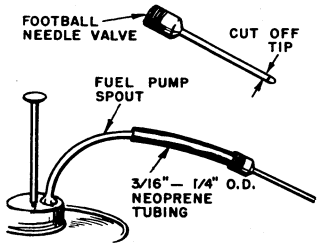


construction. This lends itself best to the smaller size models (½A, A or B), where standard size wood can be used.

The grain of the sheets inside the fuselage should run across the fuselage. Use 1/16" sheet for a class ½A and small class A models, and 3/32" sheet for large class A and B models. Assemble the fuselage from the nose to the tail. Use the "cut and try" system for getting exact taper to the internal sheets. The extra effort will pay off with a very strong fuselage structure. A flat version of this type of construction could also be used for thick control-line wings, sliding the ribs over the box.—BOB PILLIGOR, Kenosha, Wisc.

Baby Engine Tank Filler

Filling the small gas tanks of ½A engines requires eye-dropper techniques. The filler pipe illustrated takes care of the problem neatly, and can also be used



for priming, where single drops of fuel are put into intakes or cylinders.

Obtain a needle valve of the type used for inflating footballs or basketballs having a rubber valve on the bladder. If the needle has a blunt end with holes on the side walls of the tube, cut off at the holes and file off any burrs. A length of 3/16" or ¼" O.D. neoprene tubing is forced into the threaded end of the needle valve. The tubing then is pushed onto the fuel pump spout as shown.—JOE KISH, Zeigler, Ill.

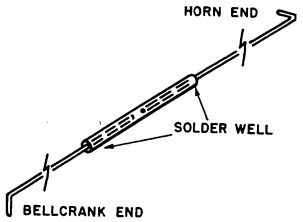
Pickled Engines

Still another household product is handy for storing your pet engine when not in use: Wrap the engine in several layers of "Saran-Wrap." This will seal it completely against dust and moisture. Put a couple of rubber bands around the wrap to hold it in place.—AL PRIVEN, Jericho, N. Y.

Adjusting Pushrod Length

How many times have you bent the ends of a pushrod, only to have the length come out wrong so that "neutral" at the bell crank came out full "down" at the elevators? Well, this simple trick will change all that:

Make the pushrod in *two* pieces. Bend the ends to fit the bellcrank and

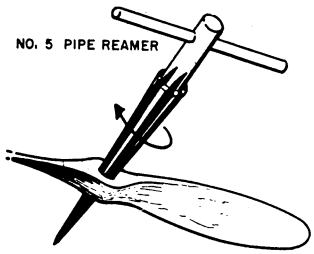


elevator horn, then trim the middle ends so that they almost touch. Make this break between two formers, so that there is room to work in. Then slide a length of brass tubing over the rod ends and solder well. Hold the bellcrank and elevators in neutral position while you center the tubing over the break in the rods.—BOB WADSWORTH, Erlanger, Kentucky

Prop Shaft Holes

Modellers using engines with large crankshafts or prop-spinner adapter nuts (such as the McCoys and Ohlsson "60") generally have a little trouble at one time or other in making the shaft hole on the prop fit easily and accurately. Of course modellers having a drill press can easily solve this problem, but some of us are not so fortunate.

Try using a tapered pipe reamer, preferably with a "T" handle, obtainable from your local hardware store. The No. 5 pipe reamer will give diameters from ⅛" to ½" and is most satisfactory for enlarging shaft holes. If this hand reamer is not available, then a regular pipe reamer can be adapted by having your local machine shop drill

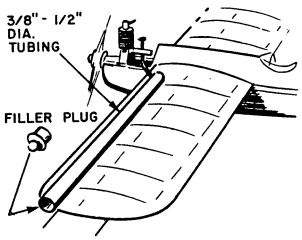


a ⅛" hole through the end which would normally fit into the drill press. Then you can easily press a rod of ⅛" diameter steel into this hole to serve as a handle. The reamer will save a lot of sore hands and tempers.—HOWARD LAMBERT, Lewiston, Maine.

Another Stunt Tank

Thin-walled brass or copper tubing of ⅜" or ½" inside diameter forms this control-line stunt-model tank which is mounted inside the wing leading edges. The outboard end has a simple plug for filling. Centrifugal force keeps fuel flow constant.

Running time for a 2 cc. diesel is about five minutes per foot of ⅜" diameter tubing (2 cc. is equal to .12 cubic



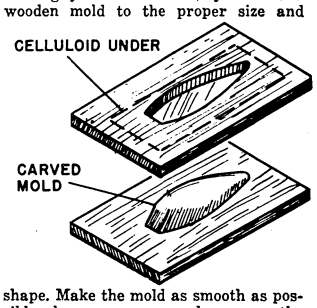
inches). The opposite wing tip should be weighted to balance the model laterally.—ROLAND COTT, St. Helens, England

Clean Cowling

To retain a smooth top on speedliner cowlings, and to eliminate the need for a hole for glow-plug access, simply do this: Solder a short length of wire to the top of the glow plug and let it extend out the rear cowling vent about ½". Attach booster clip here for starting.—BRAD PURINTON, Waggaman, La.

Bubble Canopy

If you can't find a bubble canopy of the right size for that pet model, try making your own this way: Carve a wooden mold to the proper size and

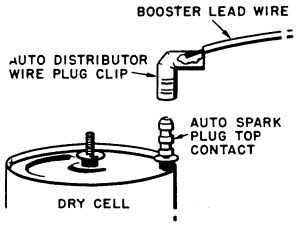


shape. Make the mold as smooth as possible, because any roughness on the mold will be transferred to the molded plastic bubble. Mount the mold on a flat piece of wood.

Then, take another piece of wood and cut out to the mold. The celluloid is fastened to this board with thumbtacks. Apply heat until the plastic becomes soft *(Do Not Use An Open Flame!)*, press down over the mold, and hold until the plastic cools.—DONALD BLOUCH, Cleona, Pennsylvania.

Battery Connectors

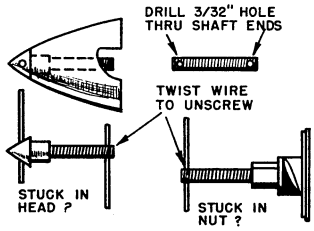
When changing from parallel to series circuit or adding fresh batteries try this wrinkle. Take top contact screws off old auto spark plugs and put them on post of dry cells. (Plug contacts have same thread as No. 6 cells.) The ends of booster leads have auto



spark plug clips from distributor wire soldered to them. The leads can be quickly changed or batteries replaced. Always pull leads off batteries when putting away to avoid shorting at clip ends.—JOHN TATUM, Van Nuys, Calif.

Removing Extension Shafts

Some modelers may have had trouble removing Froom extension shafts from the spinner head or prop shaft nut. Using pliers, of course, does not do the threads any good! Instead, drill holes through the ends of the shaft. Then, when the shaft is screwed down tight, it can be unscrewed by inserting a length of wire through the hole and



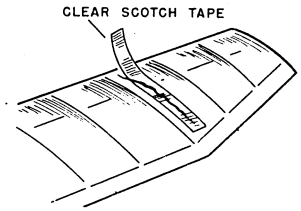
twisting the shaft off in the same manner that the spinner head itself is removed.—HOWARD E. SMITH, Augusta Flying Maniacs, Augusta, Me.

ENGINE CLEANER

When your model bites the dust and the engine becomes packed with dirt, try using "Gunk" to clean it thoroughly. "Gunk" is the trade name of a product used to clean aircraft and automobile engines, generally available at motorcycle or auto supply stores. "Bendix Metal Cleaner" is a similar product that will do the job. Be sure to remove all cleaner before reusing engine. Apply light oil after cleaning.—DICKIE NORTHUM, Fort Smith, Ark.

Patching Paper Covering

Minor tears and splits in paper covering on your model can be quickly patched with clear Scotch Tape. This is particularly



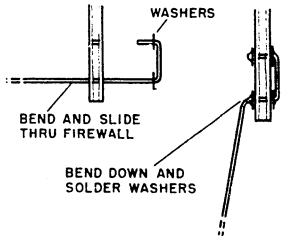
handy when flying at a contest, and saves time and trouble fiddling with dope and paper.—JOSEPH MESSING, Lancaster, New York.

Drill Substitute

For those modelers who do not have access to the small drills used for motor mount holes, here is a simple substitute: Take a nail, the same size or a little smaller than the mounting bolt to be used, heat it red hot, and push it through the firewall where the hole is to be. This method will work on most plywood firewalls and it will make as clean a hole as a drill.—JERRY NORDINE, Litchfield, Minn.

Landing Gear Kinks

A sturdy one-wheel landing gear for rubber and light gas models can be



made as shown. Drill holes in your plywood firewall or former and bend the wire. Then slide the wire through the plywood, make bends in lower portion, and solder washers. —DANNY LUTZ, Los Angeles, Calif.

Bending Balsa

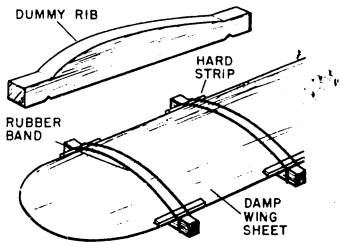
Balsa-covered model structures requiring planking can sometimes be built quicker if sheet balsa is used. Structures such as straight-tapered tail cones can be done in this way. Sharp bends in sheet are best done by soaking the balsa five to ten minutes in hot water, then forming in position. Bind with gauze bandage or rubber bands until wood dries. Remove binding, then cement in place.—DAVID COOK, Harmon, Va.

Sizing It Up

If in doubt about a certain wire diameter, try this gizmo: Use a spark plug gauge of the type having wires of various sizes. Just compare the unknown wire with the gauge wire to find the size. The gauge is also a handy addition to your tool kit if you are running ignition engines. Use it for its original purpose of setting spark-plug-point gaps.—Morris E. Cornelius, Yale, Iowa.

Cambering Sheet Wings

The ½A engines lend themselves ideally to sheet balsa airplanes. Curving sheet wings to a good airfoil shape can be accomplished using the method shown. Cut out and sand the top of scrap ¼" or ⅜" sheet to the desired airfoil shape, notching it slightly on the bottom at the front and the rear. Cut enough of these dummy ribs to space



out at about 3" intervals on one wing panel. Dampen the wing sheet and lay it over the dummy ribs, clamping it with rubber bands. Slip a strip of hard ⅛" x ¼" balsa under the rubber band along the leading and trailing edge to keep the rubber band from cutting into the wing sheet.

As the wood dries, apply a ribbon of cement chordwise next to, but not touching, the dummy ribs on the underside of the wing. The cement shrinkage will help set curve Pick your wing panels from the same or very similar sheets so there will be little difference in grain, weight and stiffness. When dry, the dummy ribs can be removed and used to duplicate this procedure for the other wing panel.—EDWARD HECKER, Indianapolis, Ind.

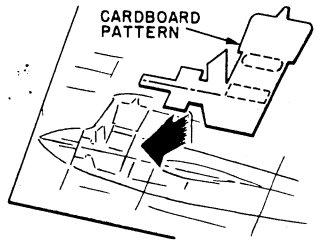
Take-Off Ramp

If your control-line site has rough ground or high grass, get a large cardboard carton, cut through on one corner and open it up to lie flat on the ground. This will form a smooth strip for takeoffs of small airplanes needing only a short runway.—Hubbard Volenick, Baltimore, Md.

Designer's Engine Pattern

● If you do your own model designing or enlarge magazine plans, you will find a full-size pattern of your engine (or engines) very helpful when laying out the engine installation.

Cut the pattern out of a stiff piece of cardboard and give it several coats



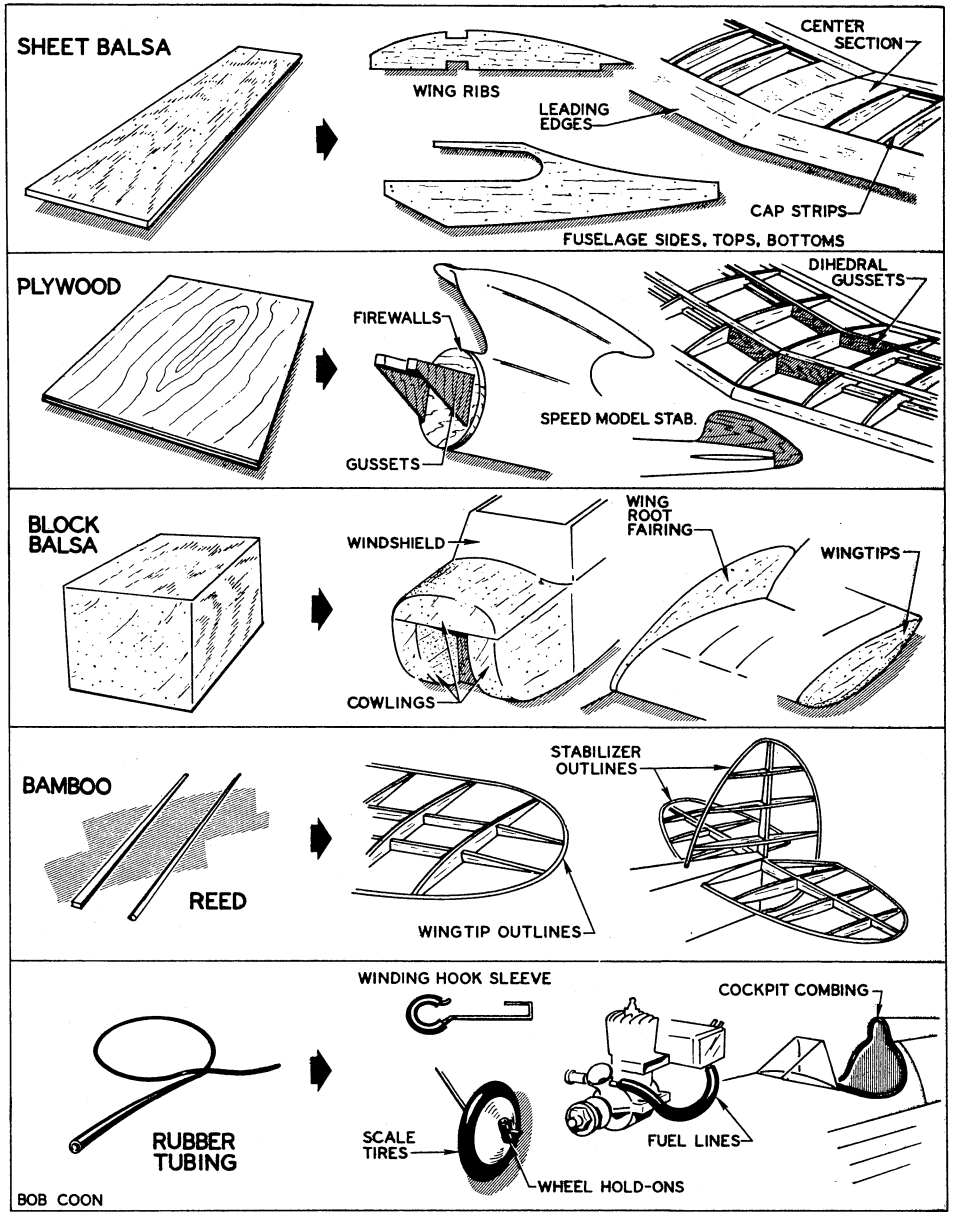
of dope to strengthen the edges. Mark the mounting lug position on the pattern. Front and top-view patterns may also prove helpful.—JOE W. WRIGHT, Gormley, Ont., Canada

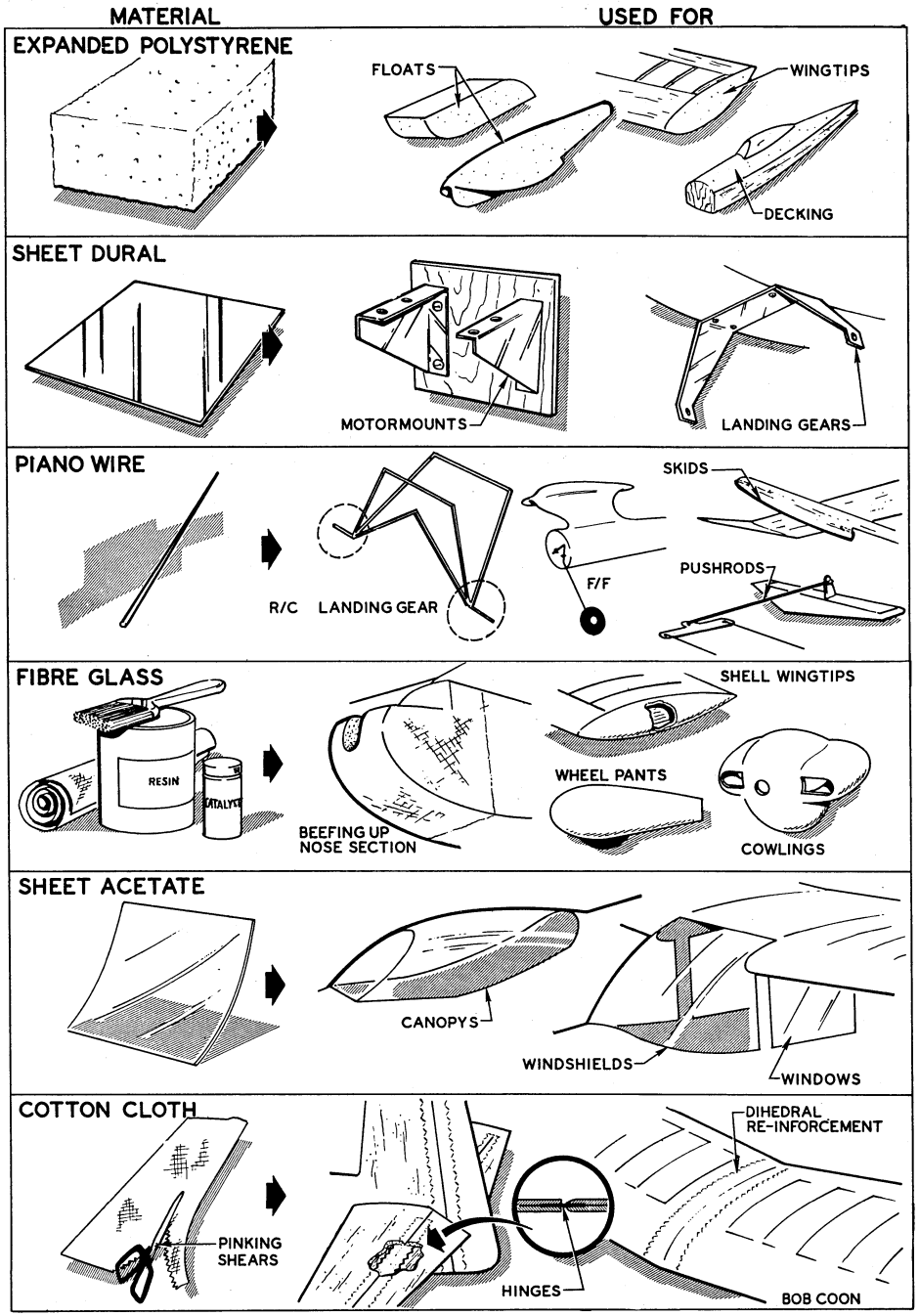
Hot Pilots

The dummy pilot vogue is a good one, but why is the little fellow always installed so that he stares woodenly ahead like a real "dummy"? If space permits, try installing him in a slightly turned position and he appears to glance intelligently over the side of the cockpit —to the delight of surprised onlookers.—DON ANTONELLI, Brooklyn, N. Y.

FM DATA SHEETS

MODEL BUILDING MATERIALS

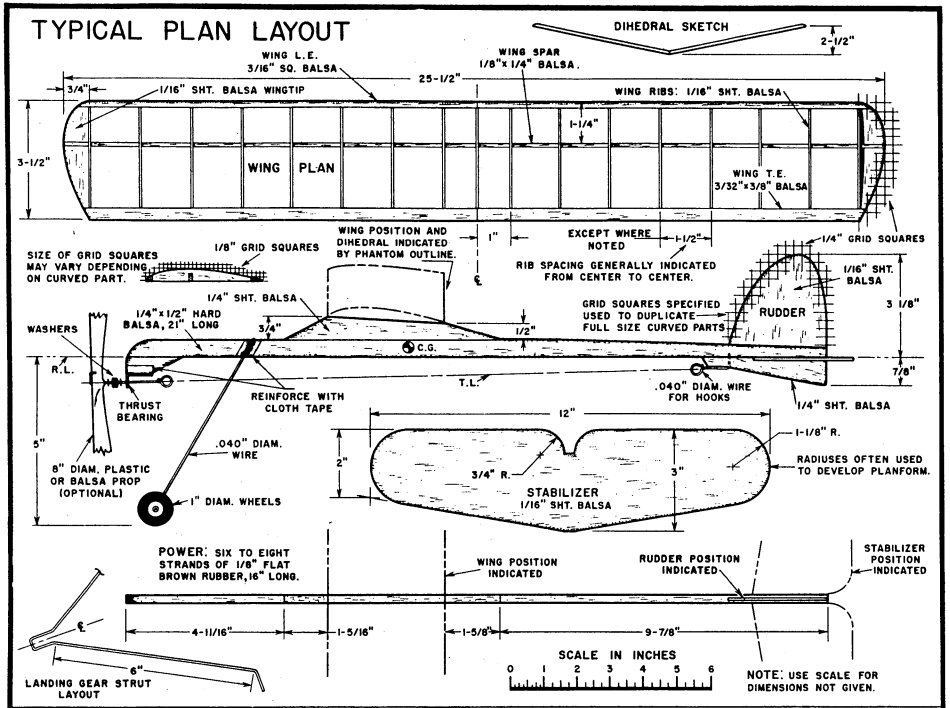




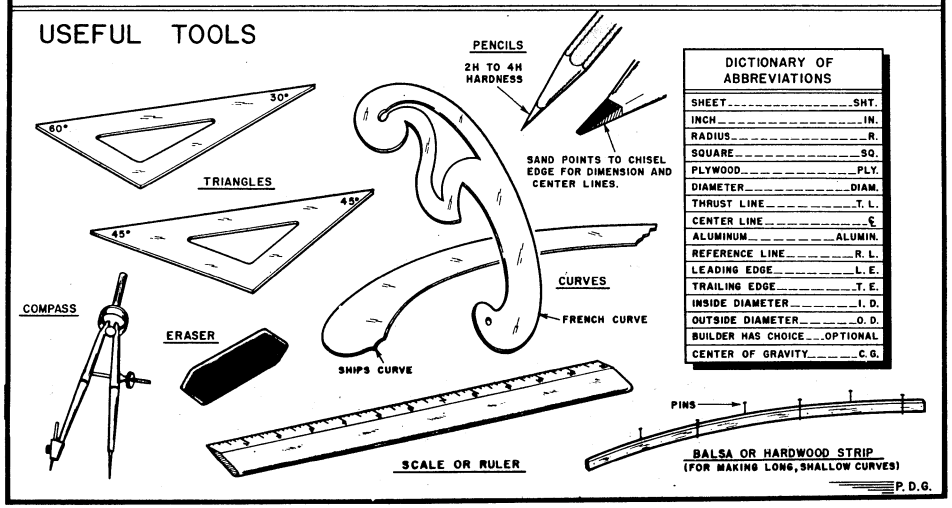
FM DATA SHEETS

SCALING UP PLANS

TYPICAL PLAN LAYOUT



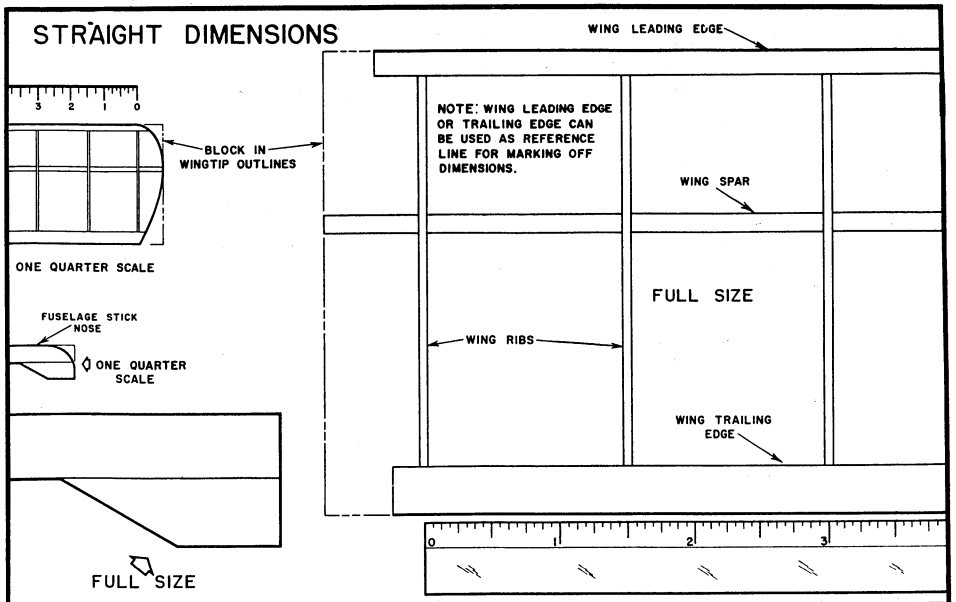
USEFUL TOOLS



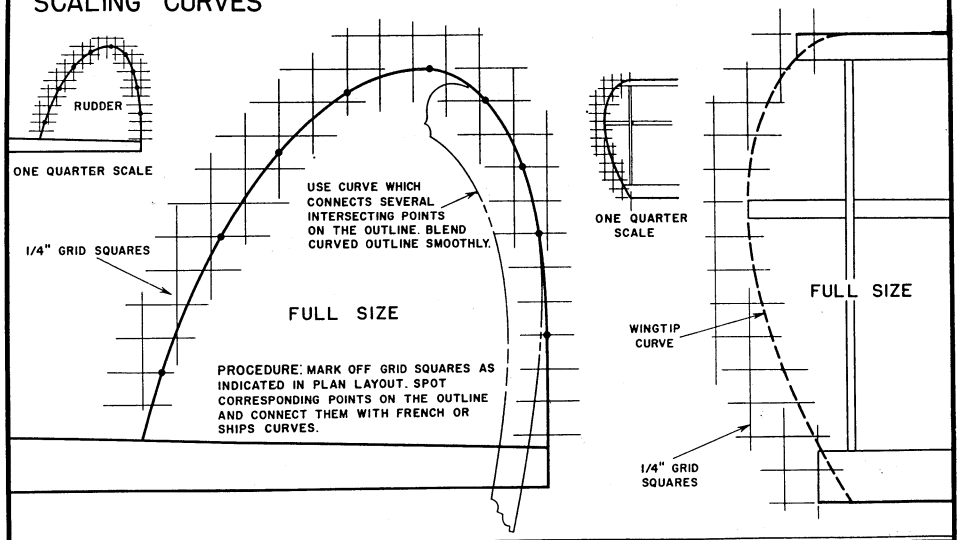
DICTIONARY OF ABBREVIATIONS	
SHEET	SHT.
INCH	IN.
RADIUS	R.
SQUARE	SQ.
PLYWOOD	PLY.
DIAMETER	DIAM.
THRUST LINE	T. L.
CENTER LINE	℄
ALUMINUM	ALUMIN.
REFERENCE LINE	R. L.
LEADING EDGE	L. E.
TRAILING EDGE	T. E.
INSIDE DIAMETER	I. D.
OUTSIDE DIAMETER	O. D.
BUILDER HAS CHOICE	OPTIONAL
CENTER OF GRAVITY	C. G.

P. D. G.

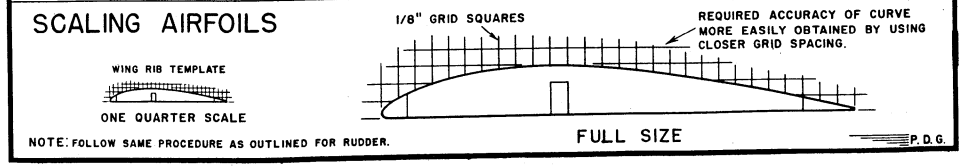
STRAIGHT DIMENSIONS



SCALING CURVES



SCALING AIRFOILS



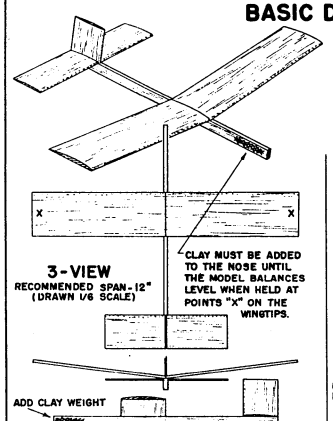
NOTE: FOLLOW SAME PROCEDURE AS OUTLINED FOR RUDDER.

P. D. G.

FM DATA SHEETS

BUILDING, FLYING AND ADJUSTING

BASIC DESIGN:

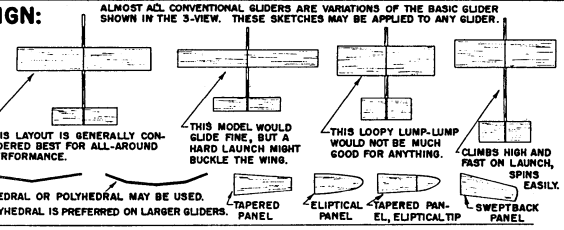


3-VIEW
RECOMMENDED SPAN-12" (DRAWN 1/6 SCALE)

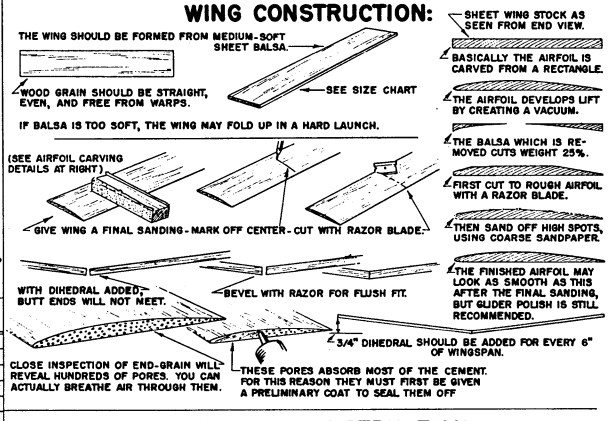
THIS IS THE SIMPLIEST FORM OF GLIDER CAPABLE OF FLIGHT WITH IT, OR ANY GLIDER, YOU CAN LEARN THE RUDIMENTS OF FLIGHT IN A FEW MINUTES.

FOLLOW THESE SKETCHES CAREFULLY FOR STEP-BY-STEP DESIGN, CONSTRUCTION AND ADJUSTMENT PRACTICES.

ALMOST ALL CONVENTIONAL GLIDERS ARE VARIATIONS OF THE BASIC GLIDER SHOWN IN THE 3-VIEW. THESE SKETCHES MAY BE APPLIED TO ANY GLIDER.



WING CONSTRUCTION:

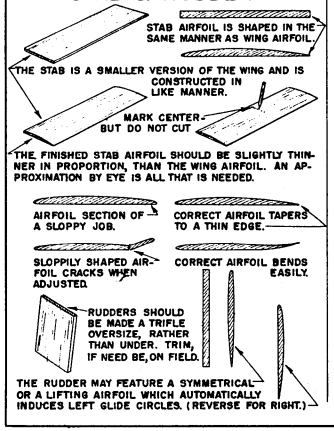


MATERIAL CHART:

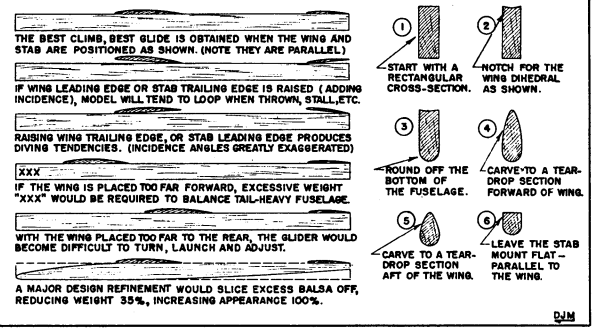
RECOMMENDED WOOD SIZES AND GENERAL DIMENSIONS—

SPAN	CHORD	WING SH.	LENGTH	FUSELAGE	TAIL SH.
12"	2"	1/8"	10"	3/16"X 1/2"	1/16" SOFT
14"	2-1/4"	3/16"	11-3/4"	3/16" X 9/16"	1/16" SOFT
16"	2-1/2"	3/16"	13-1/2"	1/4" X 5/8"	3/32" SOFT
18"	2-3/4"	3/16"	15-1/4	1/4" X 11/16"	1/8" SOFT
20"	3"	1/4"	17"	1/4" X 3/4"	1/8" SOFT

STAB & RUDDER:



FUSELAGE CONSTRUCTION:



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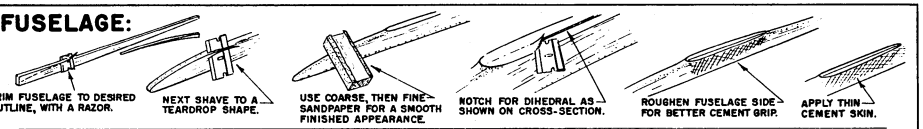
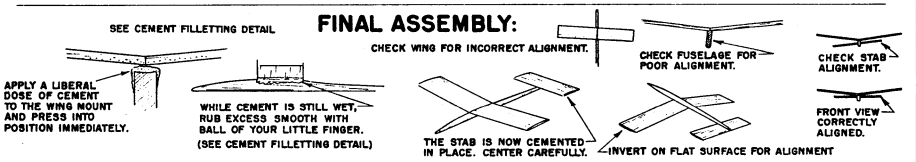
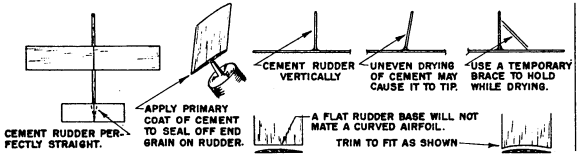
FUSELAGE:

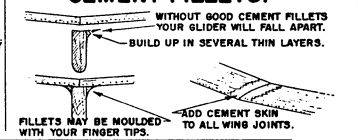


FINAL ASSEMBLY:

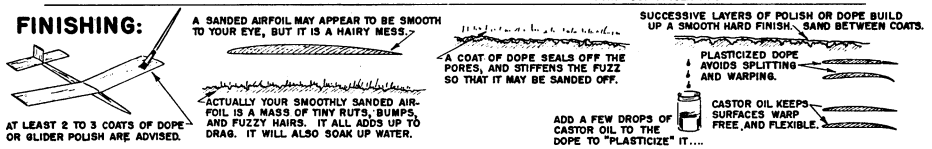




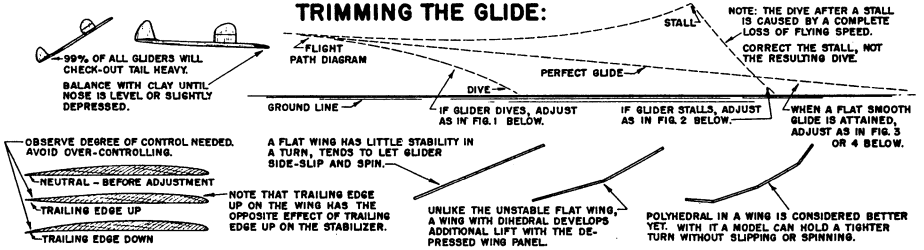
CEMENT FILLETS:



FINISHING:

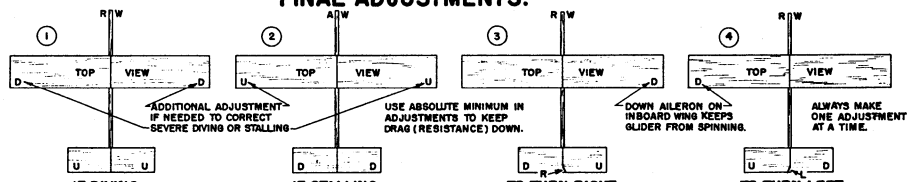


TRIMMING THE GLIDE:



FINAL ADJUSTMENTS:

CODE: L=LEFT, R=RIGHT, D=DOWN, U=UP — AW=ADD A LITTLE WEIGHT, RW=REDUCE WEIGHT SLIGHTLY



IF DIVING: IF GLIDER GLIDES STRAIGHT, BUT TENDS TO DIVE, BEND STAB UP (STEAM WITH BREATH AND BEND) AND REDUCE WEIGHT.

IF STALLING: DO NOT INTERPRET A STALL AS A DIVE. REDUCE INCIDENCE ON STAB FIRST, THEN INCREASE WEIGHT IF NEED BE.

TO TURN RIGHT: TURN TO THE RIGHT INCREASES DIVING TENDENCIES. ANTICIPATE THIS BY REDUCING NOSE WEIGHT, ADDING AILERON.

TO TURN LEFT: LEFT TURN ALSO CAUSES A NOSE-DOWN ATTITUDE. ADJUST FOR A TIGHT CIRCLE, FLAT GLIDE, WITHOUT A STALL OR SPIN.

OPTIONAL LAUNCHING METHODS:

RIGHT HAND LAUNCH:

IF YOU THROW WITH YOUR RIGHT HAND, THE GLIDER MUST BE ADJUSTED TO GLIDE IN LEFT CIRCLES.

BANK GLIDER TO THE RIGHT AND HEAVE AT AN UPWARD ANGLE. AT TOP OF CLIMB THE LEFT CIRCLE SHOULD TAKE EFFECT.

LEFT HAND LAUNCH:

IF YOU LAUNCH LEFT HANDED, THE GLIDER MUST BE BANKED TO THE LEFT AND UP, AND ADJUSTED FOR RIGHT CIRCLES.

WITH CARE IN ADJUSTING AND SKILL IN LAUNCHING, IT IS POSSIBLE TO HIT 100 FT. ALTITUDE WITH A GLIDER.

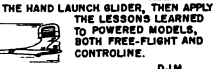
HOOK DETAIL

CATAPULTING WITH 4 TO 8 STRANDS OF 3/16" RUBBER WILL ACHIEVE TRIPLE THE ALTITUDE OF A HAND LAUNCH.

ANCHOR RUBBER POST FIRMLY IN GROUND, AND LAUNCH AS SHOWN.

THIS DESIGN MAY BE MODIFIED AND IMPROVED.

MASTER THE HAND LAUNCH GLIDER, THEN APPLY THE LESSONS LEARNED TO POWERED MODELS, BOTH FREE-FLIGHT AND CONTROLINE.



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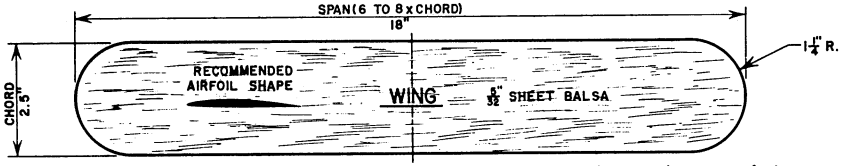
CONCLUSION: THIS IS THE FIRST OF A SERIES OF ILLUSTRATED DATA SHEETS, DESIGNED TO BETTER AQUAINT NEW MODELERS WITH VARIOUS DESIGN, CONSTRUCTION AND OTHER ASPECTS OF THE HOBBY. KEEP THIS INFORMATION HANDY FOR YOUR OWN REFERENCE AS WELL AS YOUNGER BUILDERS IN YOUR NEIGHBORHOOD.

FM DESIGN SHEETS

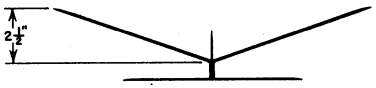
BASIC GLIDER DESIGN

DESIGN LAYOUT FOR BASIC HAND-LAUNCH GLIDER



WING SIZE: Select a span and chord which will give a wing size from 30 to 50 square inches in area. The span should be six to eight times the length of the chord; the approximate thickness of the wing airfoil, 1/16" to each 1" of chord.

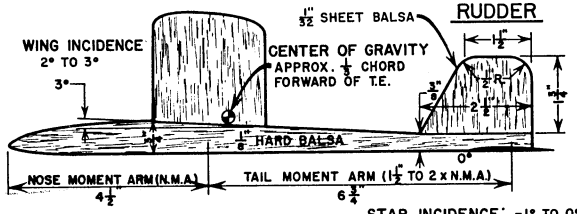
WING AREA: To determine the amount of wing area, multiply the span by the chord; then subtract the area removed in making the semi-circular tips (Area of half-circle is determined by multiplying the radius by the radius and then by 1.57). An airfoil shape similar to the one shown above is recommended, as it will assist in achieving excellent results with maximum stability.



DIHEDRAL
1-1/2" TO 2"/FT.

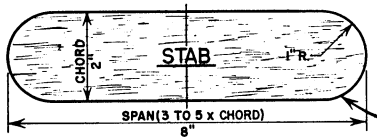
DIHEDRAL: Dihedral is the angular setting of the wing panels with respect to the horizontal plane of the front view of the model. For simplicity of construction, a V-type dihedral is recommended, as shown above.

FUSELAGE LENGTH: The fuselage length—the total length of the model from the nose to the trailing edge of the stab or rudder, whichever is farther from the nose—should be approximately from three-quarters to the same length as the wingspan. The maximum fuselage depth should be no more than one-third the wing chord. The maximum fuselage thickness should not exceed one-quarter of the fuselage depth.



STAB INCIDENCE: -1° TO 0°

MOMENT ARMS: The distance between the centerline of the wing and the centerline of the stab is known as the Tail Moment Arm. This should be one and one-half to twice the length of the Nose Moment Arm (the distance between the centerline of the wing and the nose of the fuselage), with the length of both tail and nose moment arms equaling the fuselage length between the nose of the fuselage and the centerline of the stabilizer.



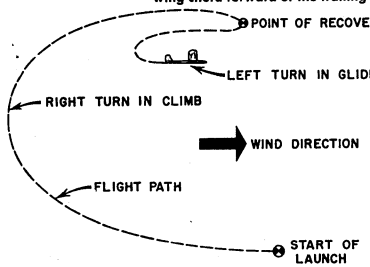
INCIDENCE: Incidence refers to the fixed angle at which the wing or stab is set with reference to the horizontal reference line of the fuselage side view (see drawing). For a basic hand-launch glider, wing incidence should be from 2° to 3°, stab incidence from 0° to 1°. If maximum stability is preferred, use the maximum value for wing incidence and the minimum value for stab incidence.

RUDDER AREA: Select the values which identify the type of rudder used. For a single rudder, the area should be 9% to 11% of the wing area; for a single rudder with tip plates, use 10% to 13%; for double rudders, 12% to 16%.

CENTER OF GRAVITY: The point at which the model airplane is balanced about all its axes is known as the Center of Gravity. When the center of gravity is too far forward, the model will dive, and when too far to the rear, the model will stall. If you follow the proportions set forth for the correct tail and nose moment arms for this glider, the theoretical center of gravity will be located approximately one-third of the wing chord forward of the trailing edge.

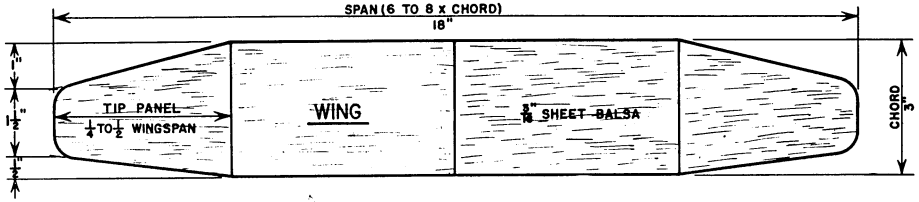
STAB AREA: The size of the stabilizer should range from 35% to 45% of the wing area. Also note that if the tail moment arm selected closely approximates the minimum suggested, then use a large stab area. If the tail moment arm selected is nearer the maximum suggested, then use a small stab area.

ADJUSTING TECHNIQUE: Add ballast in the form of clay to the nose of the fuselage until a glide is obtained with a slight nose-up tendency. For right-hand launch to the right adjust for a left turn: Begin by warping the rudder to the left a little at a time until a wide circle is obtained in the glide. Make final adjustments by warping right inboard wing panel down, or, if recovery is too quick and the model stalls, use right stab panel to delay recovery and tighten turn. In doing so, it may be necessary to remove some clay to compensate for the additional nose-down effect of the stab adjustments.

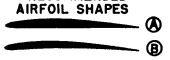


P.D.G.

DESIGN LAYOUT FOR CONTEST HAND-LAUNCH GLIDER



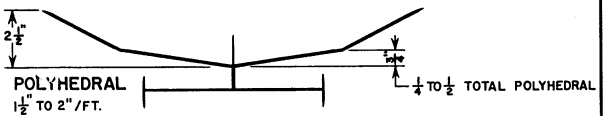
RECOMMENDED AIRFOIL SHAPES



AIRFOIL SHAPE: There are two types of airfoil shapes which can be used. The flat bottom airfoil (A) is recommended as a first design after which an under-cambered section (B) can be employed if desired.

WING SIZE: Select a span and chord which will give a wing area of from 40 to 60 square inches. This size is preferable if your only previous experience has been with a basic hand-launch glider. Use the same chord-to-span ratio limits as on the basic hand-launch glider. A high span-to-chord ratio is preferable on a contest glider. The thickness ratio remains the same as on the basic hand-launch glider.

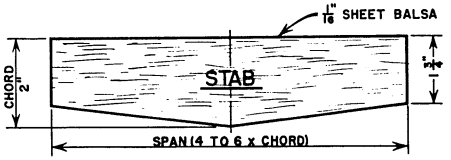
WING AREA: Determine the amount of wing area using the same procedure as on the basic hand-launch glider, subtracting the area cut away at the wing tips. For a tapered wing panel, figure the area of the cut-away triangles by multiplying one-half the length of each triangle by the width.



INCIDENCE: Only a small amount of incidence is recommended with a contest hand-launch glider to assist in maintaining a moderate amount of stability without affecting the altitude obtainable in launching.

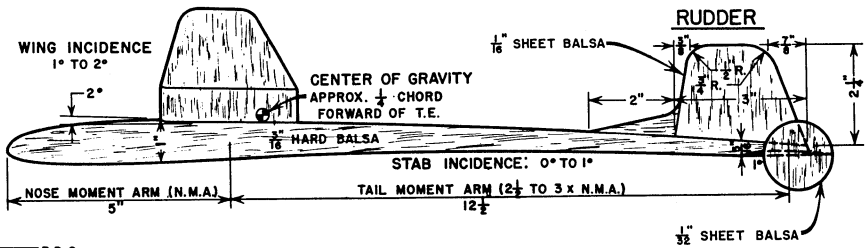
STAB AREA: The stab should be 30% to 40% of the wing area. If previous experience with a contest hand-launch glider is lacking, or launching ability is moderate, use a stab area which closely approximates the maximum suggested, in conjunction with the minimum suggested for the tail moment arm.

POLYHEDRAL: Polyhedral, as shown, is a form of wing panel arrangement preferable to the V-type dihedral, except possibly when the span-to-chord ratio is low. In the design shown, polyhedral is used to best advantage for contest flying.



FUSELAGE LENGTH AND DEPTH: The fuselage length should be one to one and one-quarter the wing span. The maximum fuselage depth should be no more than one-third the wing chord. The maximum fuselage thickness should not exceed one-quarter of the fuselage depth.

RUDDER AREA: Select the set of values which identifies the type of rudder used: For a single rudder use 8% to 10% of the wing area; for single rudder with tip plates, use 9% to 12%; for double rudder, 11% to 15%, after which the procedure is identical to that used for determing stab area. A dorsal rudder design as shown is recommended for optimum directional stability, and can be adapted if a single rudder with or without tip plates is contemplated.



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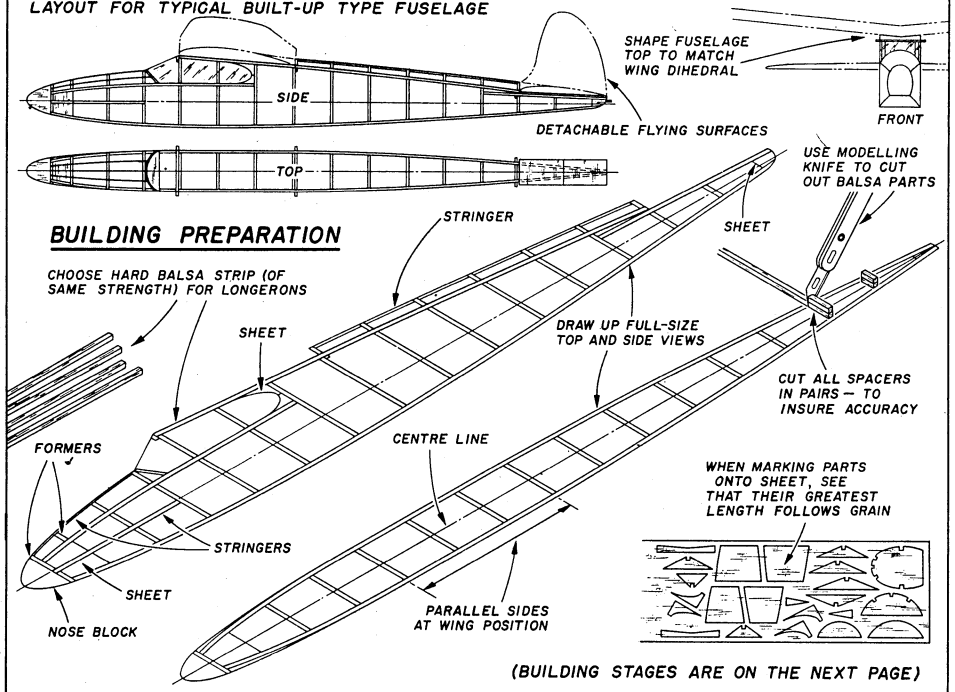
FM CONSTRUCTION SHEETS

BUILT-UP FUSELAGES

LAYOUT FOR TYPICAL BUILT-UP TYPE FUSELAGE

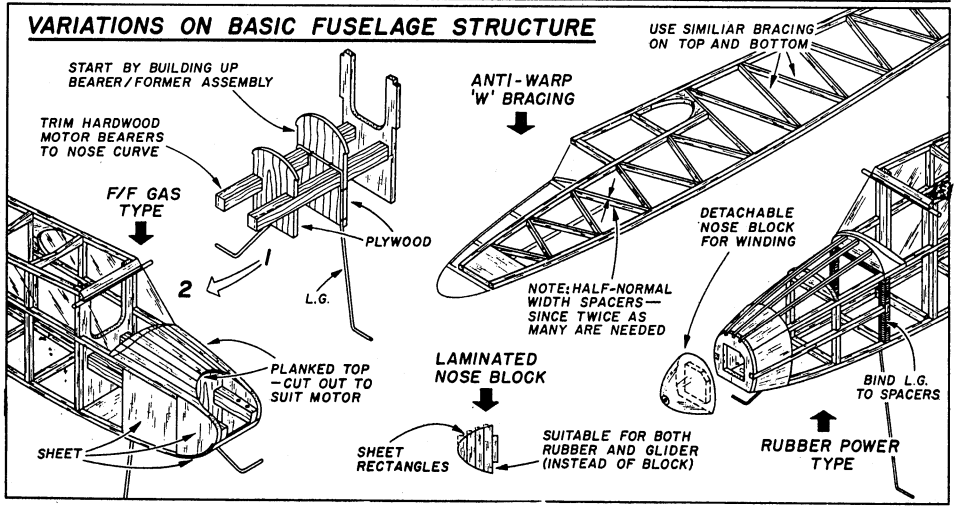


BUILDING PREPARATION

CHOOSE HARD BALSA STRIP (OF SAME STRENGTH) FOR LONGERONS

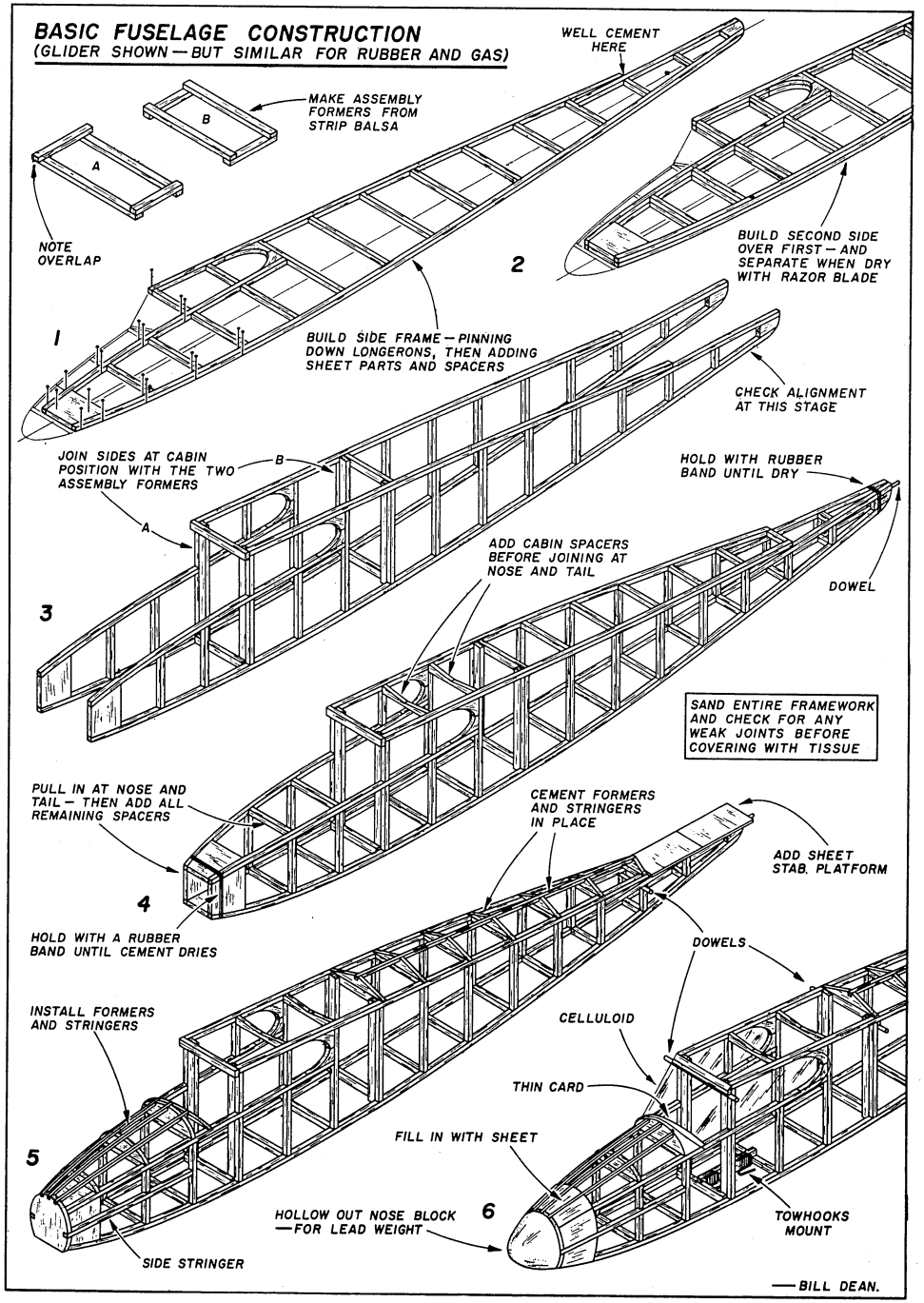
(BUILDING STAGES ARE ON THE NEXT PAGE)

VARIATIONS ON BASIC FUSELAGE STRUCTURE



BASIC FUSELAGE CONSTRUCTION

(GLIDER SHOWN — BUT SIMILAR FOR RUBBER AND GAS)



— BILL DEAN.

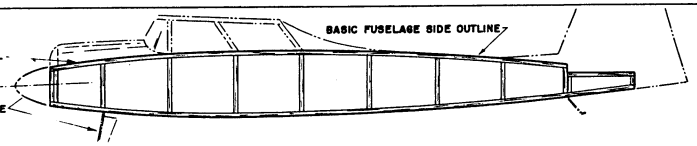
FM DATA SHEETS

FUSELAGE CONSTRUCTION

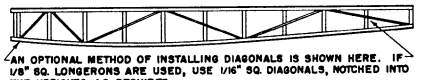
STEP I— STUDY PLAN:

FAMILIARIZE YOURSELF WITH THE FUSELAGE PLAN, AND DETERMINE OUTLINE OF THE BASIC FUSELAGE SIDE TO BE CONSTRUCTED.

NOTE THE CABIN AND SUPERSTRUCTURE DETAILS ON THE SKETCH ARE ADDED LATER, AS ON MOST MODELS.



FUSELAGE SIDES SUCH AS THIS ONE, WITH ONE STRAIGHT AND ONE BENT LONGERON, HAVE A TENDENCY TO PULL OUT OF SHAPE. THIS CAN BE PREVENTED BY THE ADDITION OF DIAGONALS AS INDICATED.



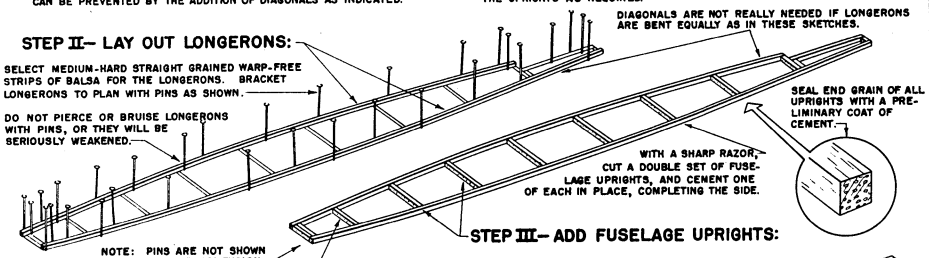
AN OPTIONAL METHOD OF INSTALLING DIAGONALS IS SHOWN HERE. IF 1/8" SQ. LONGERONS ARE USED, USE 1/16" SQ. DIAGONALS, NOTCHED INTO THE UPRIGHTS AS REQUIRED.

STEP II— LAY OUT LONGERONS:

SELECT MEDIUM-HARD STRAIGHT GRAINED WARP-FREE STRIPS OF BALSA FOR THE LONGERONS. BRACKET LONGERONS TO PLAN WITH PINS AS SHOWN.

DO NOT PIERCE OR BRUISE LONGERONS WITH PINS, OR THEY WILL BE SERIOUSLY WEAKENED.

DIAGONALS ARE NOT REALLY NEEDED IF LONGERONS ARE BENT EQUALLY AS IN THESE SKETCHES.



SEAL END GRAIN OF ALL UPRIGHTS WITH A PRELIMINARY COAT OF CEMENT.

WITH A SHARP RAZOR, CUT A DOUBLE SET OF FUSELAGE UPRIGHTS, AND CEMENT ONE OF EACH IN PLACE, COMPLETING THE SIDE.

NOTE: PINS ARE NOT SHOWN TO AVOID CONFUSION.

FUSELAGE UPRIGHTS

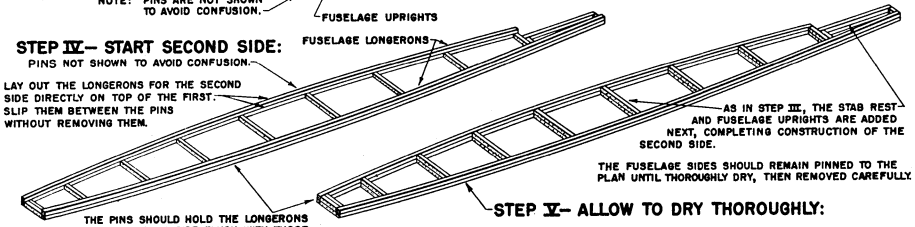
STEP III— ADD FUSELAGE UPRIGHTS:

STEP IV— START SECOND SIDE:

PINS NOT SHOWN TO AVOID CONFUSION.

FUSELAGE LONGERONS

LAY OUT THE LONGERONS FOR THE SECOND SIDE DIRECTLY ON TOP OF THE FIRST. SLIP THEM BETWEEN THE PINS WITHOUT REMOVING THEM.



AS IN STEP III, THE STAB REST AND FUSELAGE UPRIGHTS ARE ADDED NEXT, COMPLETING CONSTRUCTION OF THE SECOND SIDE.

THE FUSELAGE SIDES SHOULD REMAIN PINNED TO THE PLAN UNTIL THOROUGHLY DRY, THEN REMOVED CAREFULLY.

THE PINS SHOULD HOLD THE LONGERONS OF THE SECOND SIDE FLUSH WITH THOSE OF THE FIRST, TO INSURE ALIGNMENT.

STEP V— ALLOW TO DRY THOROUGHLY:

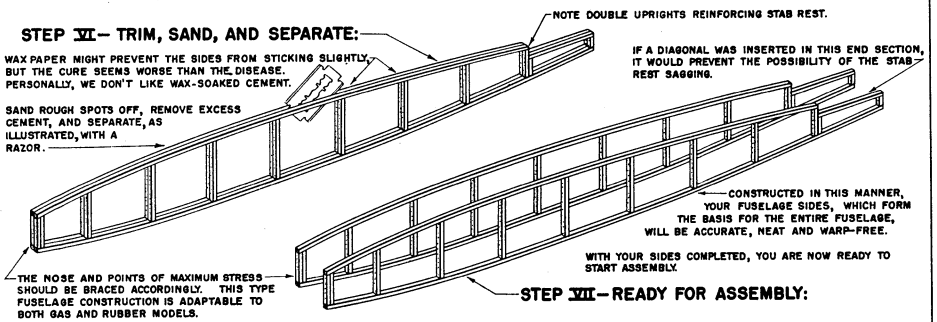
STEP VI— TRIM, SAND, AND SEPARATE:

NOTE DOUBLE UPRIGHTS REINFORCING STAB REST.

WAX PAPER MIGHT PREVENT THE SIDES FROM STICKING SLIGHTLY, BUT THE CURE SEEMS WORSE THAN THE DISEASE. PERSONALLY, WE DON'T LIKE WAX-SOAKED CEMENT.

IF A DIAGONAL WAS INSERTED IN THIS END SECTION, IT WOULD PREVENT THE POSSIBILITY OF THE STAB REST SAGGING.

SAND ROUGH SPOTS OFF, REMOVE EXCESS CEMENT, AND SEPARATE, AS ILLUSTRATED, WITH A RAZOR.



CONSTRUCTED IN THIS MANNER, YOUR FUSELAGE SIDES, WHICH FORM THE BASIS FOR THE ENTIRE FUSELAGE, WILL BE ACCURATE, NEAT AND WARP-FREE.

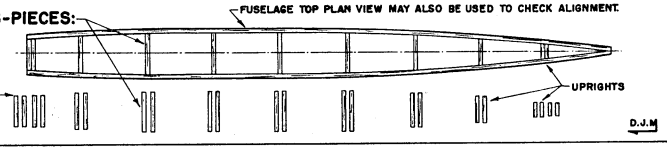
WITH YOUR SIDES COMPLETED, YOU ARE NOW READY TO START ASSEMBLY.

THE NOSE AND POINTS OF MAXIMUM STRESS SHOULD BE BRACED ACCORDINGLY. THIS TYPE FUSELAGE CONSTRUCTION IS ADAPTABLE TO BOTH GAS AND RUBBER MODELS.

STEP VII— READY FOR ASSEMBLY:

STEP VIII— CUT CROSS-PIECES:

NEXT, FOCUS YOUR ATTENTION ON THE TOP PLAN VIEW. CAREFULLY CUT A SET OF CROSS-PIECES IN DUPLICATE AS INDICATED, AND PRECOAT END GRAIN WITH CEMENT AS ON THE FUSELAGE UPRIGHTS.



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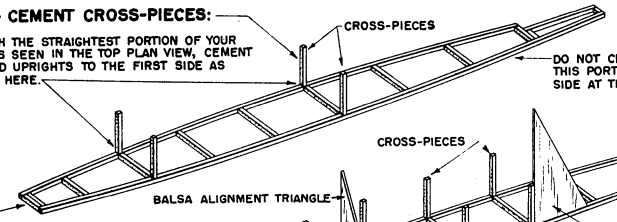
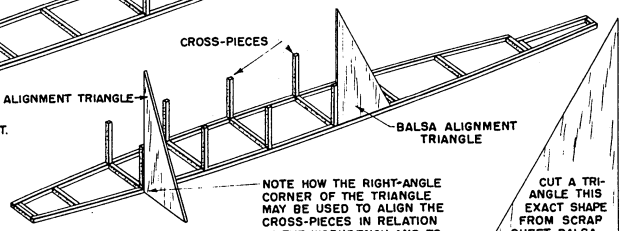
STEP IX— CEMENT CROSS-PIECES:

STARTING WITH THE STRAIGHTEST PORTION OF YOUR FUSELAGE, AS SEEN IN THE TOP PLAN VIEW, CEMENT THE REQUIRED UPRIGHTS TO THE FIRST SIDE AS ILLUSTRATED HERE.



DO NOT ADD CROSS-PIECES TO NOSE AS YET.

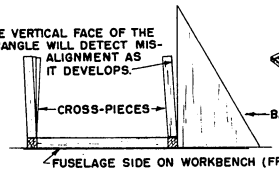


NOTE HOW THE RIGHT-ANGLE CORNER OF THE TRIANGLE MAY BE USED TO ALIGN THE CROSS-PIECES IN RELATION TO THE WORKBENCH AND TO THE LONGERON ITSELF.

CUT A TRIANGLE THIS EXACT SHAPE FROM SCRAP SHEET BALSA.

BASE MUST FIT BETWEEN UPRIGHTS.

THE VERTICAL FACE OF THE TRIANGLE WILL DETECT MISALIGNMENT AS IT DEVELOPS.



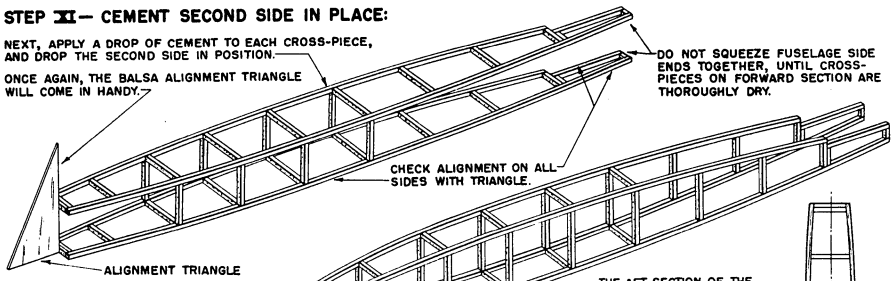
STEP X— ALIGN CROSS-PIECES:

STEP XI— CEMENT SECOND SIDE IN PLACE:

NEXT, APPLY A DROP OF CEMENT TO EACH CROSS-PIECE, AND DROP THE SECOND SIDE IN POSITION.

DO NOT SQUEEZE FUSELAGE SIDE ENDS TOGETHER, UNTIL CROSS-PIECES ON FORWARD SECTION ARE THOROUGHLY DRY.

ONCE AGAIN, THE BALSA ALIGNMENT TRIANGLE WILL COME IN HANDY.

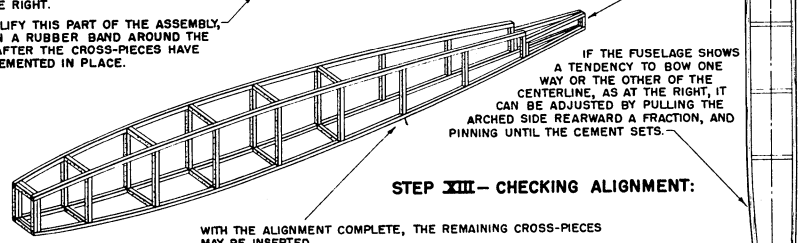


STEP XII— NOSE CROSS-PIECES:

MOST FUSELAGES TAPER IN TOWARD THE NOSE, AS SEEN IN THE TOP VIEW AT THE EXTREME RIGHT.

TO SIMPLIFY THIS PART OF THE ASSEMBLY, STRETCH A RUBBER BAND AROUND THE NOSE, AFTER THE CROSS-PIECES HAVE BEEN CEMENTED IN PLACE.

THE AFT SECTION OF THE FUSELAGE MAY NOW BE PULLED TOGETHER AND CEMENTED AT THE TAIL POST, AT THE EXTREME REAR.



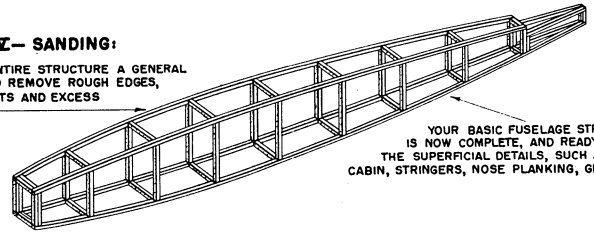
IF THE FUSELAGE SHOWS A TENDENCY TO BOW ONE WAY OR THE OTHER OF THE CENTERLINE, AS AT THE RIGHT, IT CAN BE ADJUSTED BY PULLING THE ARCHED SIDE REARWARD A FRACTION, AND PINNING UNTIL THE CEMENT SETS.

STEP XIII— CHECKING ALIGNMENT:

WITH THE ALIGNMENT COMPLETE, THE REMAINING CROSS-PIECES MAY BE INSERTED.

STEP XIV— SANDING:

GIVE THE ENTIRE STRUCTURE A GENERAL SANDING TO REMOVE ROUGH EDGES, FINGERPRINTS AND EXCESS CEMENT.



YOUR BASIC FUSELAGE STRUCTURE IS NOW COMPLETE, AND READY FOR THE SUPERFICIAL DETAILS, SUCH AS A CABIN, STRINGERS, NOSE PLANKING, GEAR ETC.

CONSTRUCTION PRINCIPLES OUTLINED HERE ARE APPLICABLE TO MOST MODELS USING THIS TYPE FUSELAGE CONSTRUCTION.

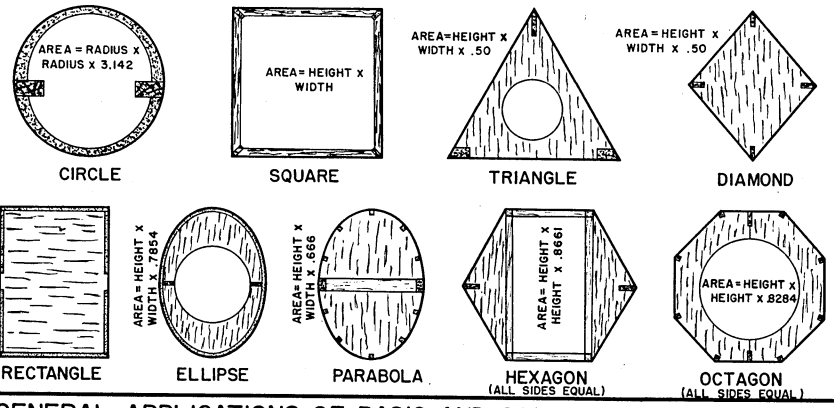
D.J.M

FM DESIGN SHEETS

FUSELAGE PLANFORMS

FUSELAGE AND RUDDER PLANFORMS

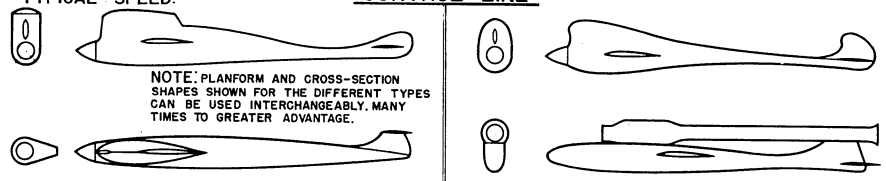
BASIC FUSELAGE CROSS-SECTION SHAPES:



GENERAL APPLICATIONS OF BASIC AND COMPOSITE PLANFORMS

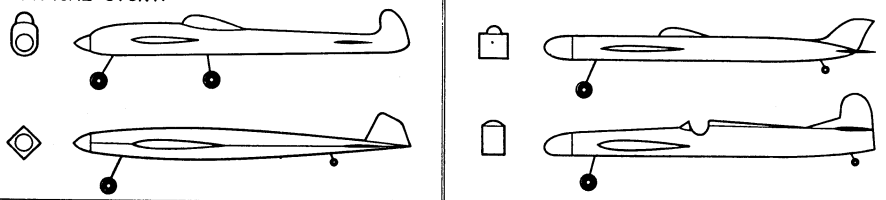
CONTROL-LINE

TYPICAL SPEED:

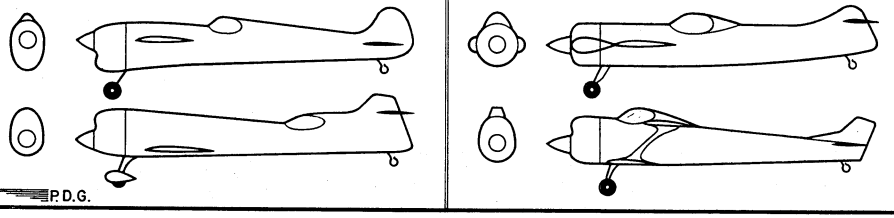


NOTE: PLANFORM AND CROSS-SECTION SHAPES SHOWN FOR THE DIFFERENT TYPES CAN BE USED INTERCHANGEABLY. MANY TIMES TO GREATER ADVANTAGE.

TYPICAL STUNT:



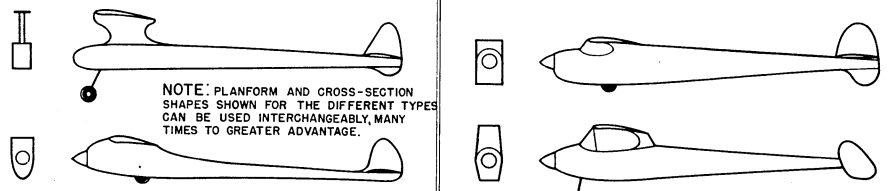
TYPICAL TEAM RACERS:



P.D.G.

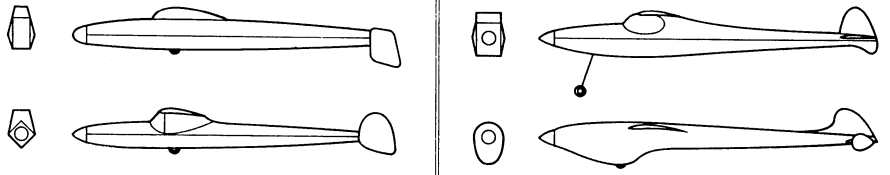
FREE-FLIGHT

TYPICAL GAS:

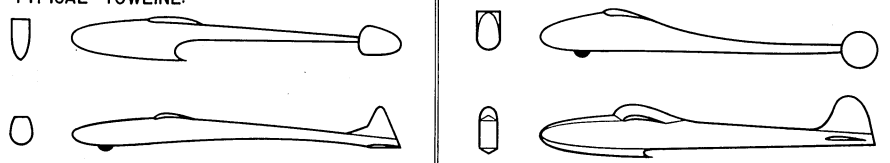


NOTE: PLANFORM AND CROSS-SECTION SHAPES SHOWN FOR THE DIFFERENT TYPES CAN BE USED INTERCHANGEABLY, MANY TIMES TO GREATER ADVANTAGE.

TYPICAL RUBBER:

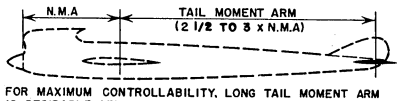


TYPICAL TOWLINE:



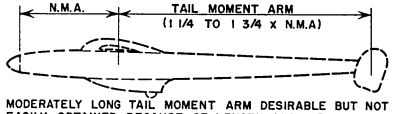
GENERAL APPLICATION OF MOMENT ARMS:

SPEED:



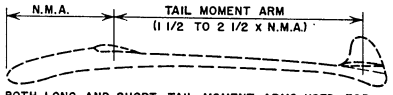
FOR MAXIMUM CONTROLLABILITY, LONG TAIL MOMENT ARM IS DESIRABLE. CENTER OF GRAVITY GENERALLY LOCATED AROUND WING LEADING EDGE DUE TO HIGH CONCENTRATION OF WEIGHT AT THE NOSE. THE USE OF SWEPT FORWARD WING PANELS WILL AID IN OBTAINING A MORE DESIRABLE CENTER OF GRAVITY LOCATION WITH MINIMUM FUSELAGE LENGTH.

RUBBER:



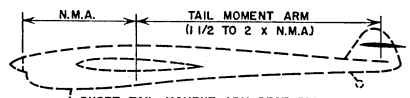
MODERATELY LONG TAIL MOMENT ARM DESIRABLE BUT NOT EASILY OBTAINED BECAUSE OF LENGTH AND WEIGHT OF RUBBER MOTOR. REAR MOTOR BEARING LOCATED WELL FORWARD OF STABILIZING SURFACES ASSISTS IN OBTAINING A MORE DESIRABLE ARRANGEMENT.

TOWLINE:



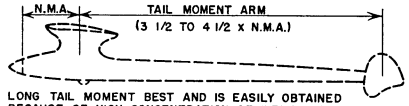
BOTH LONG AND SHORT TAIL MOMENT ARMS USED. FOR EASIER TOWING AND TIGHTER GLIDING CIRCLE, SHORT TAIL MOMENT ARM DESIRABLE. LONG TAIL MOMENT ARM DESIRABLE IN GUSTY WEATHER. BALLAST IS USED TO OBTAIN CORRECT CENTER OF GRAVITY LOCATION.

STUNT:



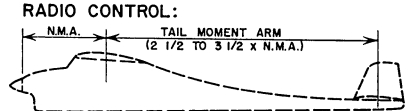
SHORT TAIL MOMENT ARM BEST FOR PROVIDING RAPID CONTROL RESPONSE AND TIGHT BUT SMOOTH MANEUVERS. CENTER OF GRAVITY GENERALLY LOCATED SLIGHTLY FORWARD OF BELLCRANK POSITION.

GAS:



LONG TAIL MOMENT BEST AND IS EASILY OBTAINED BECAUSE OF HIGH CONCENTRATION OF WEIGHT AT NOSE. CENTER OF GRAVITY POSITION WILL VARY DEPENDING ON THE PARTICULAR DESIGN AND THE PROPORTIONS OF THE SURFACES.

RADIO CONTROL:

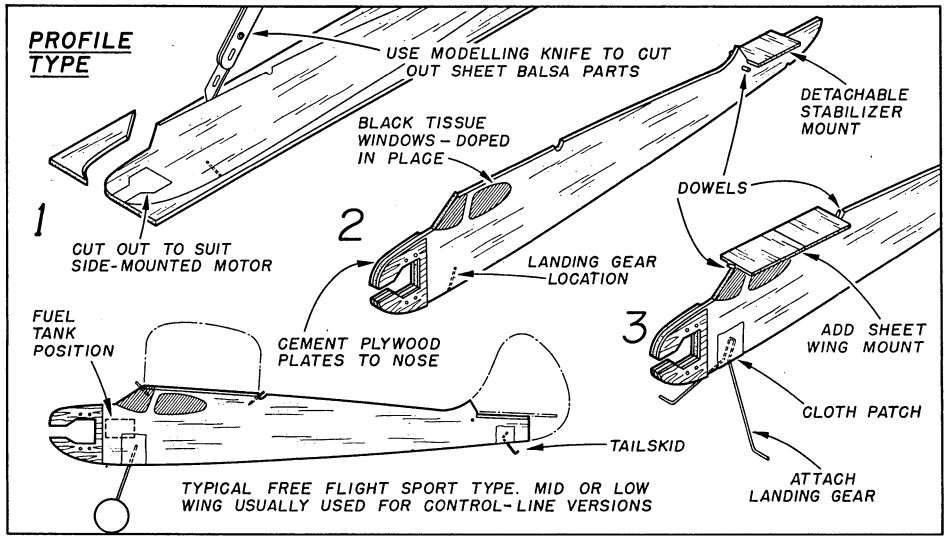


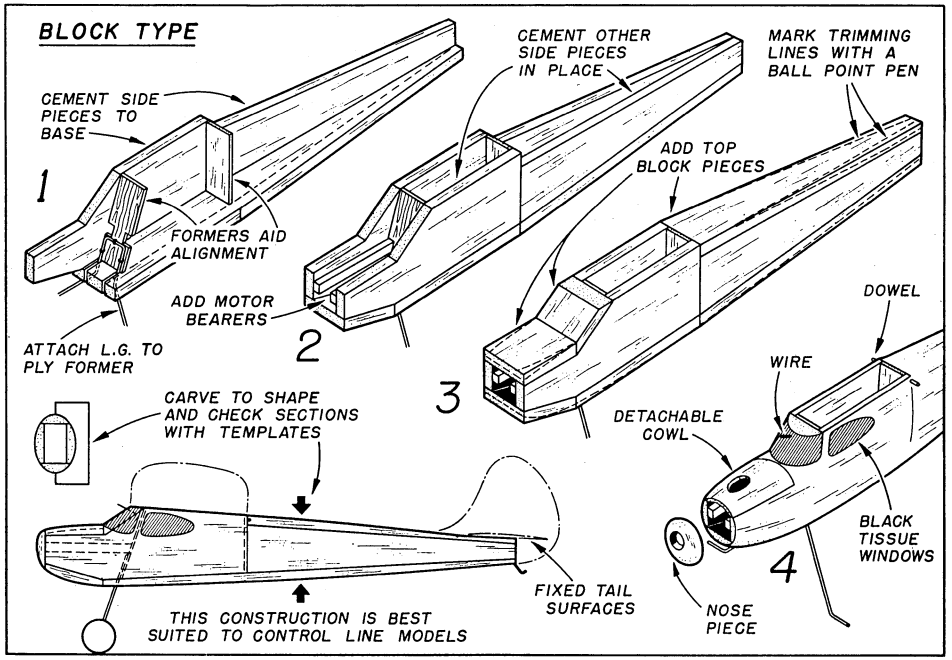
LONG TAIL MOMENT ARM COMMONLY USED, BUT NOT ESSENTIAL. CENTER OF GRAVITY GENERALLY LOCATED 1/4 TO 1/3 FROM THE WING LEADING EDGE - EASY TO OBTAIN BEST POSITION BY SHIFTING LOCATION OF THE RADIO EQUIPMENT.

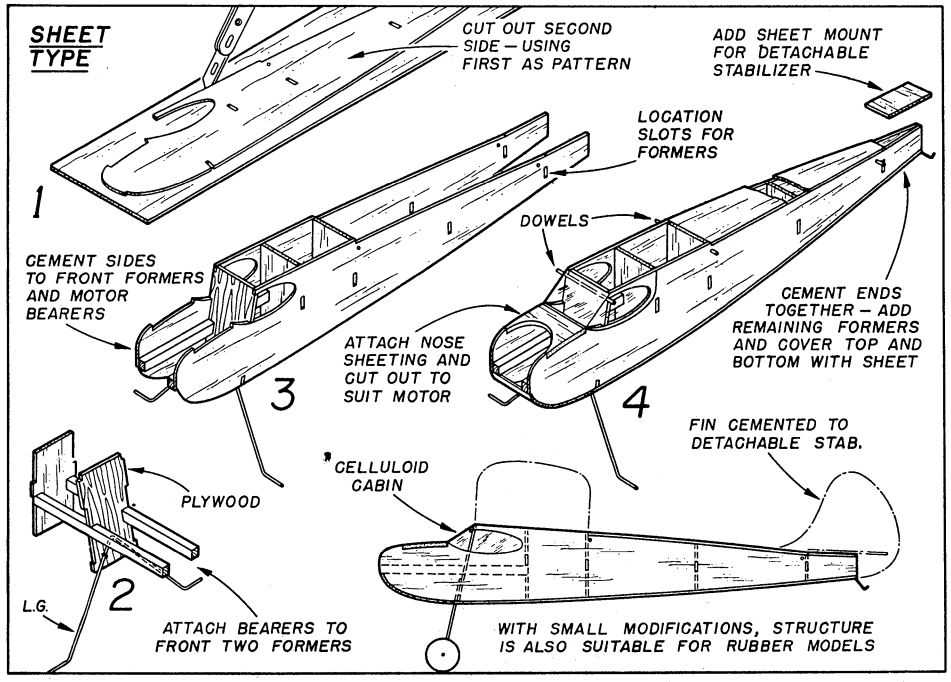
P.D.G.

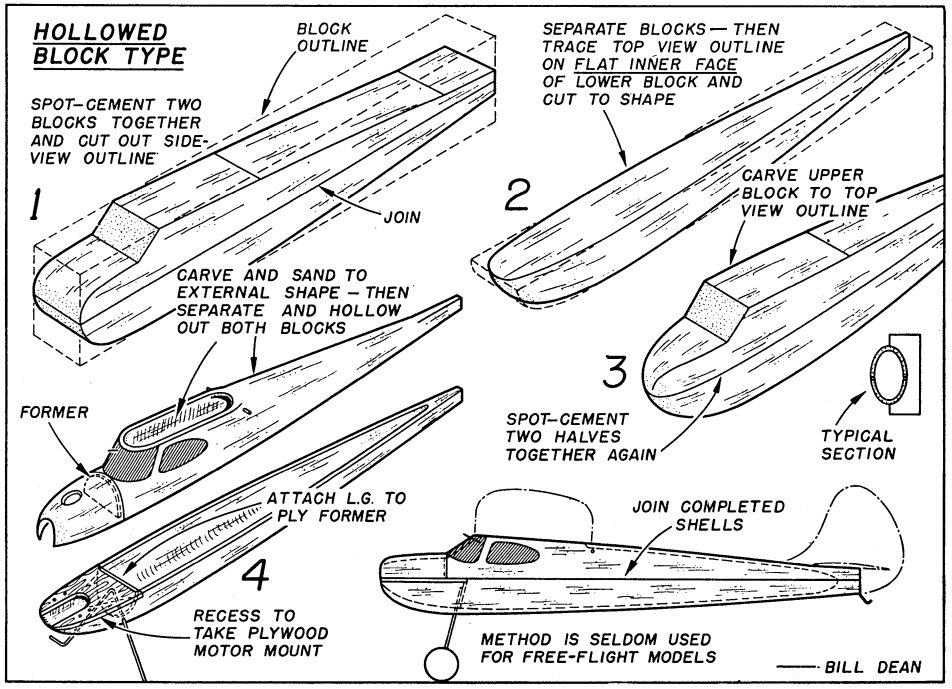
FM CONSTRUCTION SHEETS

BALSA FABRICATED FUSELAGES



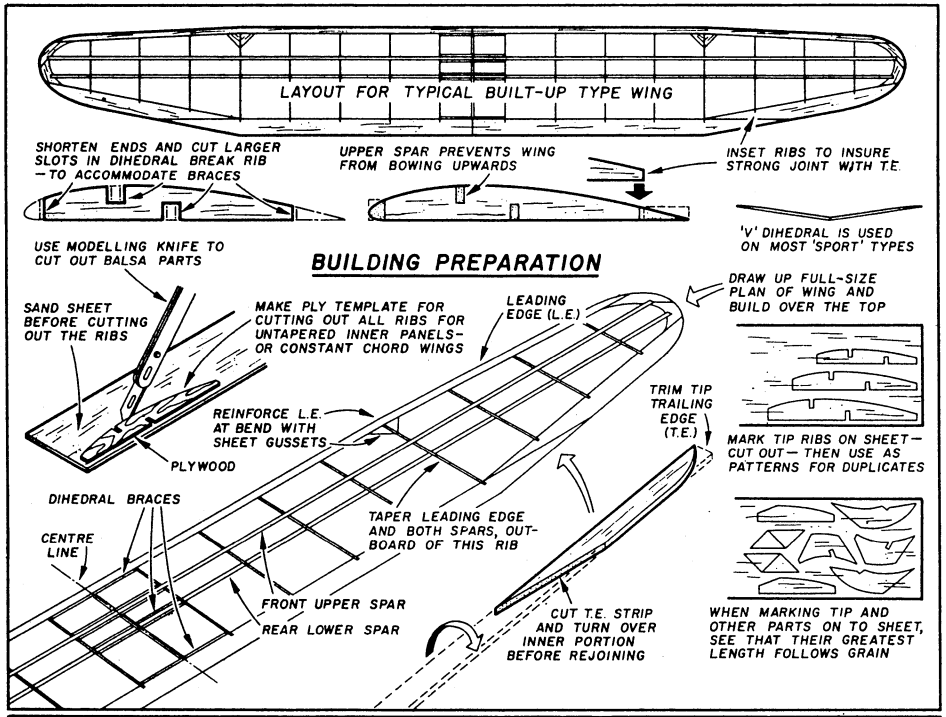


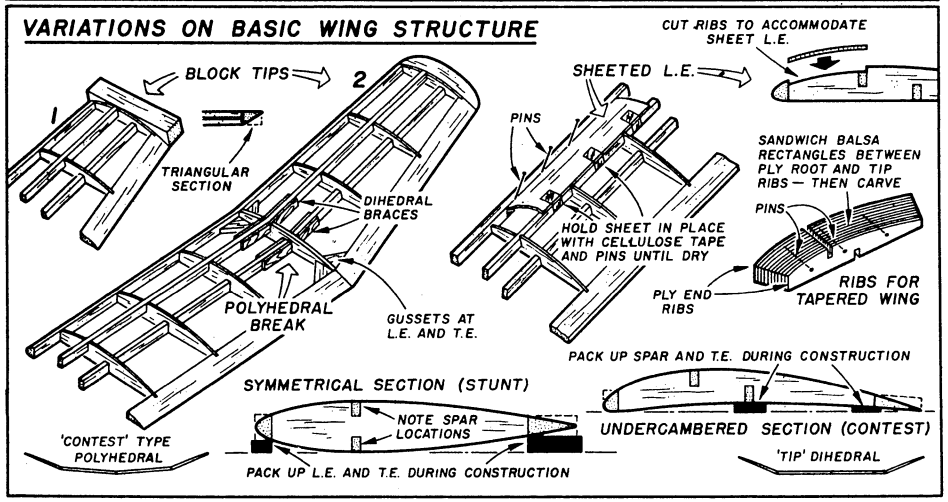


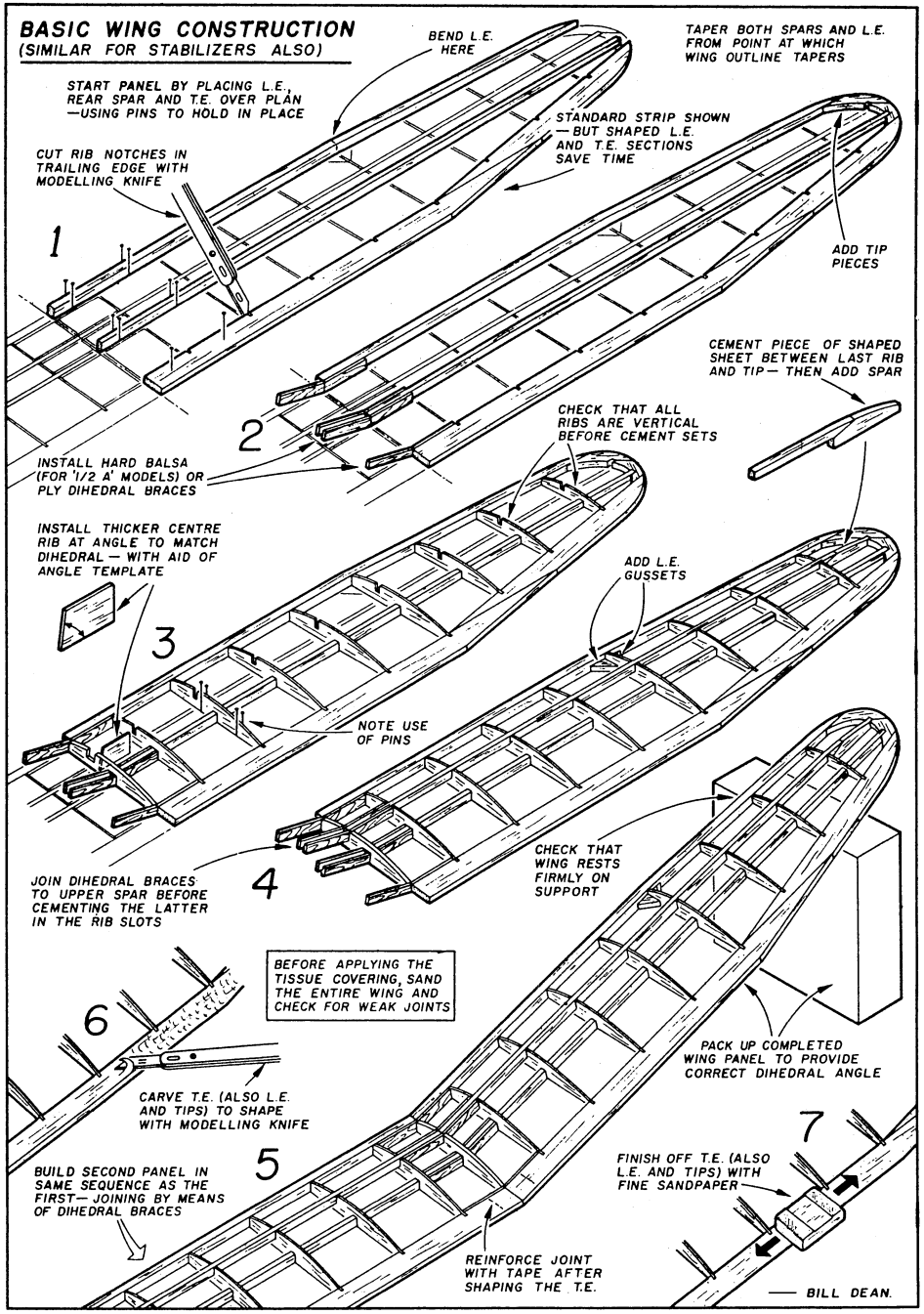


FM CONSTRUCTION SHEETS

BUILT-UP WINGS

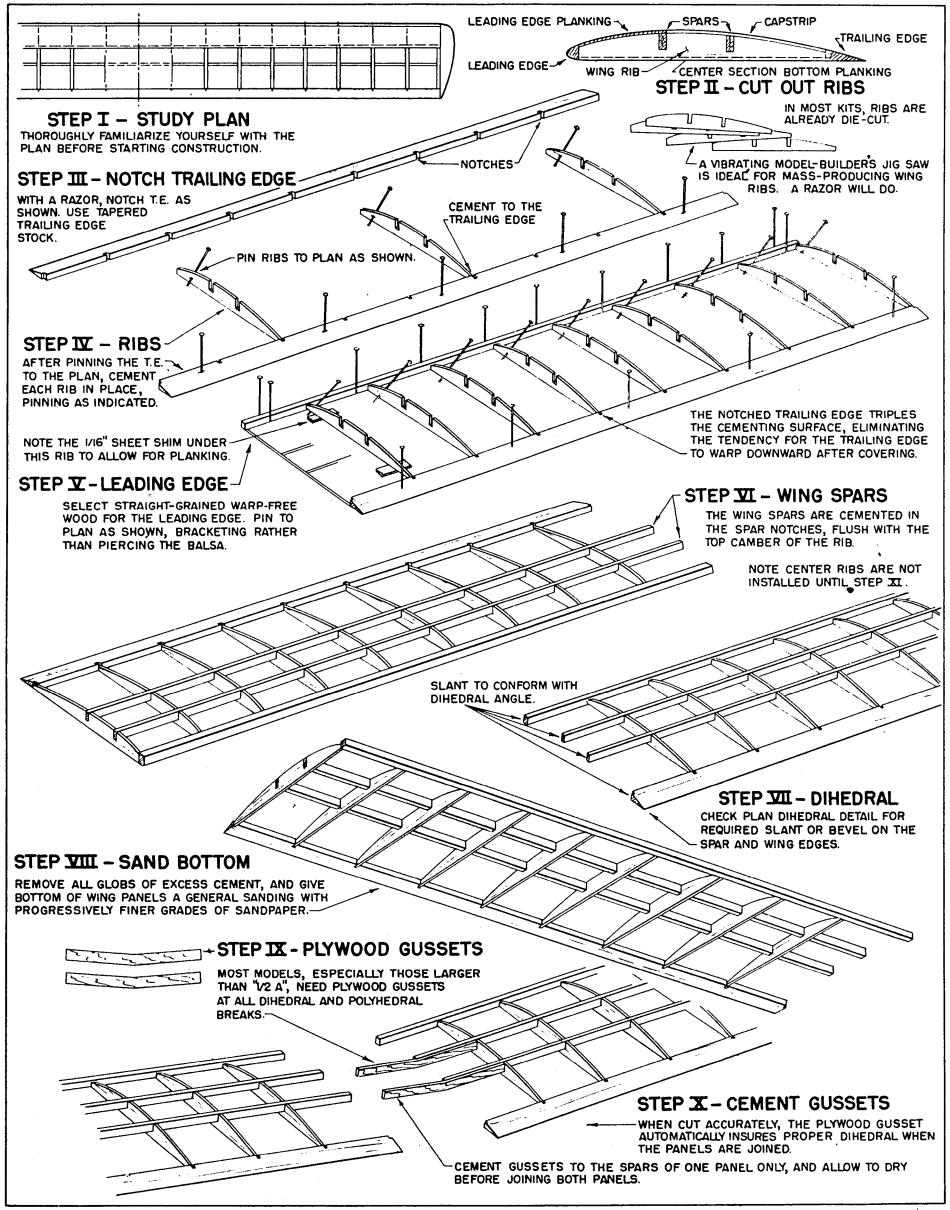


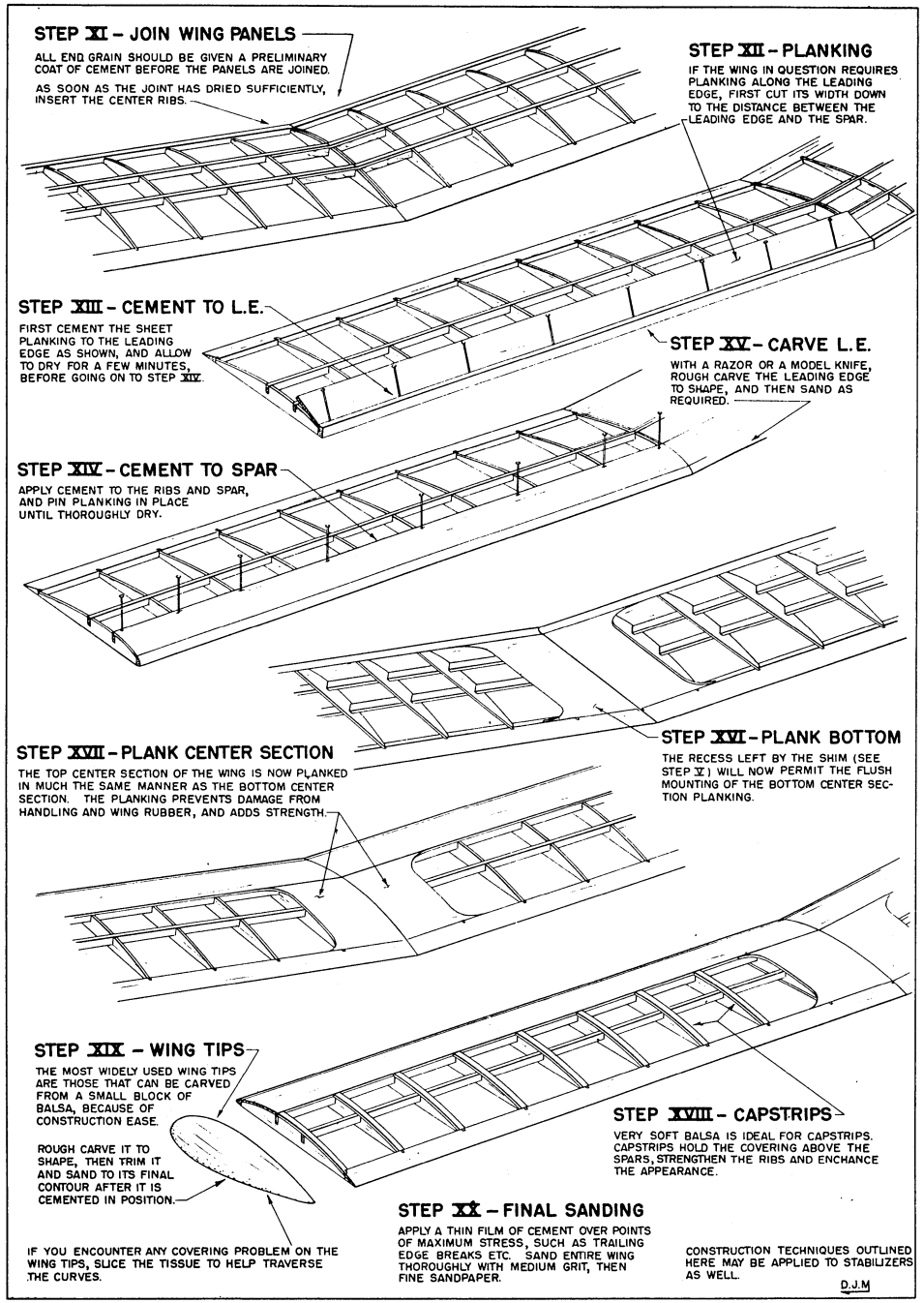




FM DATA SHEETS

WING CONSTRUCTION



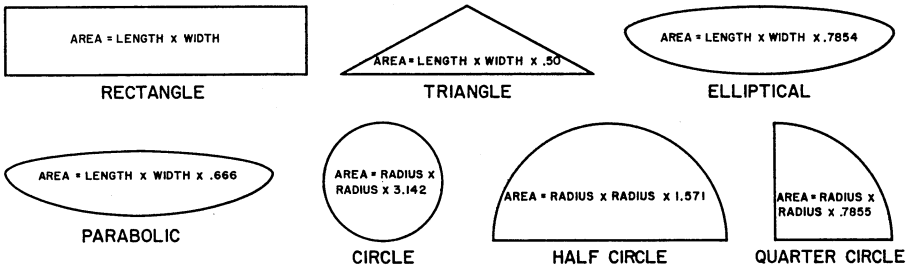


FM DESIGN SHEETS

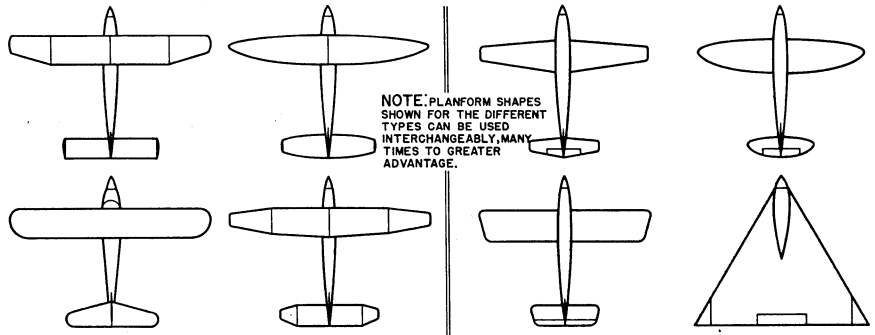
WING AND STAB PLANFORMS

WING & STAB PLANFORMS

BASIC PLANFORM SHAPES



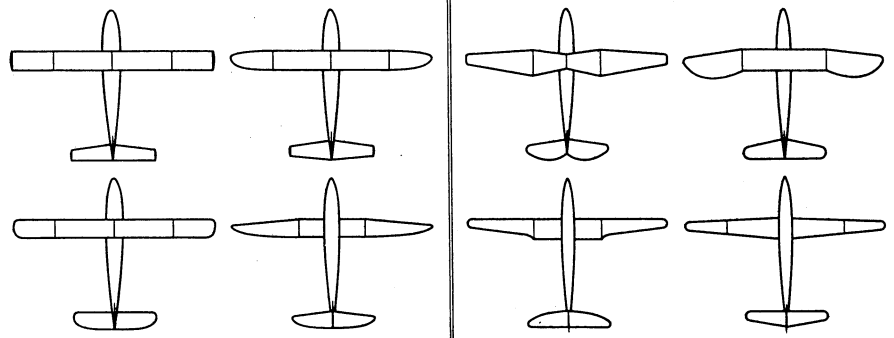
GENERAL APPLICATIONS OF BASIC & COMPOSITE PLANFORMS



NOTE: PLANFORM SHAPES SHOWN FOR THE DIFFERENT TYPES CAN BE USED INTERCHANGEABLY, MANY TIMES TO GREATER ADVANTAGE.

FREE FLIGHT GAS MODELS

CONTROL LINE GAS MODELS



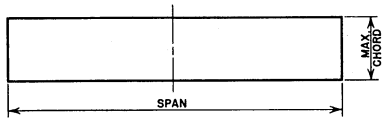
RUBBER POWERED MODELS

GLIDER MODELS

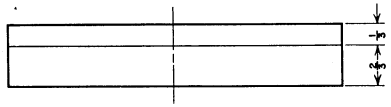
P.D.G.

CONSTRUCTION OF AN ELLIPTICAL PLANFORM

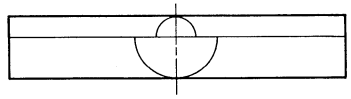
STEP ONE: CONSTRUCT RECTANGLE WHICH WILL ENCLOSE PROPOSED ELLIPTICAL PLANFORM. (MAXIMUM CHORD AND SPAN)



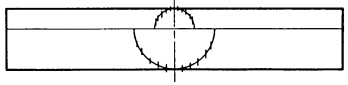
STEP TWO: DIVIDE RECTANGLE INTO TWO SECTIONS - ONE THIRD CHORD FOR LEADING EDGE SECTION AND TWO THIRDS CHORD FOR TRAILING EDGE SECTION. (THIS ARRANGEMENT WILL PRODUCE THE MOST POPULAR FORM OF ELLIPTICAL PLANFORM BEING USED. HOWEVER, THE SECTIONS CAN BE DIVIDED EQUALLY, REVERSED OR ALTERED IN ANY MANNER TO PRODUCE A GREAT MANY OTHER VARIATIONS OF THE ELLIPTICAL PLANFORM.)



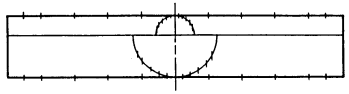
STEP THREE: DRAW TWO HALF CIRCLE ARCS FROM POINT OF INTERSECTION OF CENTERLINE, TANGENT (TOUCHING) TO THE LEADING AND TRAILING EDGES RESPECTIVELY.



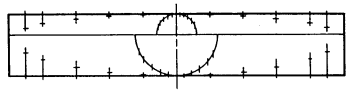
STEP FOUR: DIVIDE HALF CIRCLE ARCS INTO EQUAL UNITS, SUBDIVIDING LAST REMAINING UNIT. FOR SMALL PLANFORMS FOUR TO FIVE UNITS ARE SATISFACTORY, WHILE FOR LARGER PLANFORMS AS MUCH AS EIGHT TO TEN UNITS ARE RECOMMENDED FOR OBTAINING AN ACCURATE ELLIPTICAL PLANFORM.



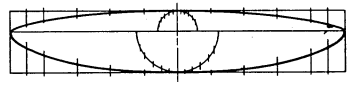
STEP FIVE: DIVIDE THE SPAN OF RECTANGLE INTO THE SAME NUMBER OF UNITS AS THAT OF EACH HALF CIRCLE ARC.



STEP SIX: CONNECT CORRESPONDING UNIT STATIONS BY PROJECTING THEM UNTIL THEY INTERSECT, PRODUCING POINTS ON THE ELLIPTICAL PLANFORM.

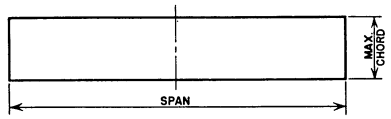


STEP SEVEN: USING FRENCH CURVES CONNECT PLOTTED POINTS TO OBTAIN ELLIPTICAL PLANFORM.

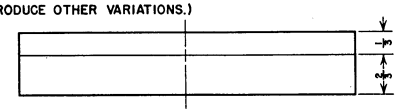


CONSTRUCTION OF A PARABOLIC PLANFORM

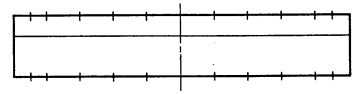
STEP ONE: CONSTRUCT RECTANGLE WHICH WILL ENCLOSE PROPOSED PARABOLIC PLANFORM. (MAXIMUM CHORD AND SPAN)



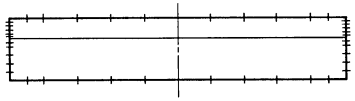
STEP TWO: DIVIDE RECTANGLE INTO TWO SECTIONS - ONE THIRD CHORD FOR LEADING EDGE SECTION AND TWO THIRDS CHORD FOR TRAILING EDGE SECTION. (MOST POPULAR ARRANGEMENT AS IN ELLIPTICAL PLANFORM - CAN ALSO BE ALTERED TO PRODUCE OTHER VARIATIONS.)



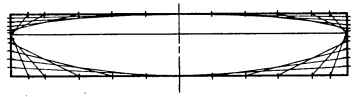
STEP THREE: DIVIDE SPAN OF RECTANGLE INTO EQUAL UNITS, SUBDIVIDING LAST REMAINING UNIT.



STEP FOUR: DIVIDE EACH SECTION OF THE CHORD INTO HALF THE NUMBER OF UNITS ON THE SPAN OF RECTANGLE.



STEP FIVE: CONNECT CORRESPONDING UNIT STATIONS BY PROJECTING DIAGONAL LINES.

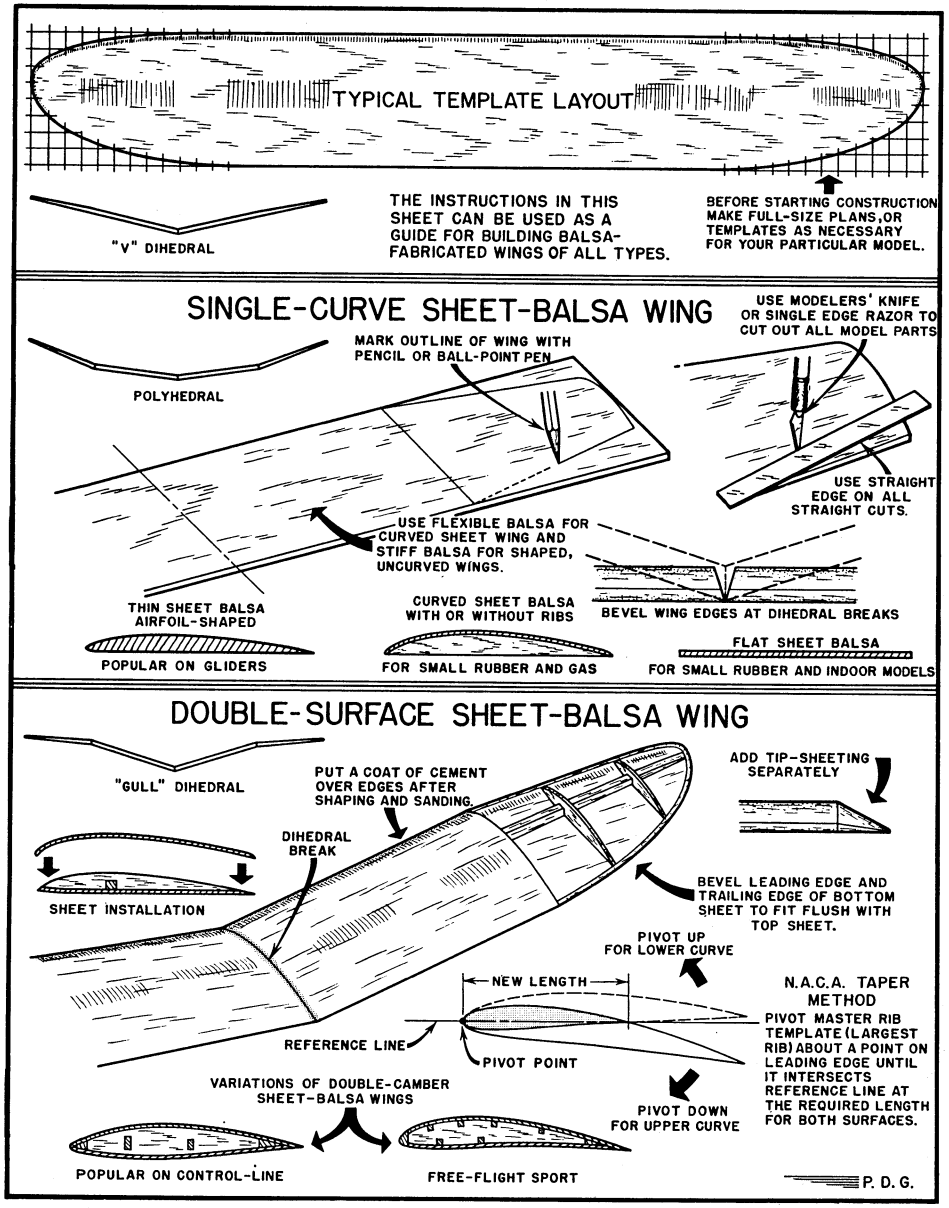


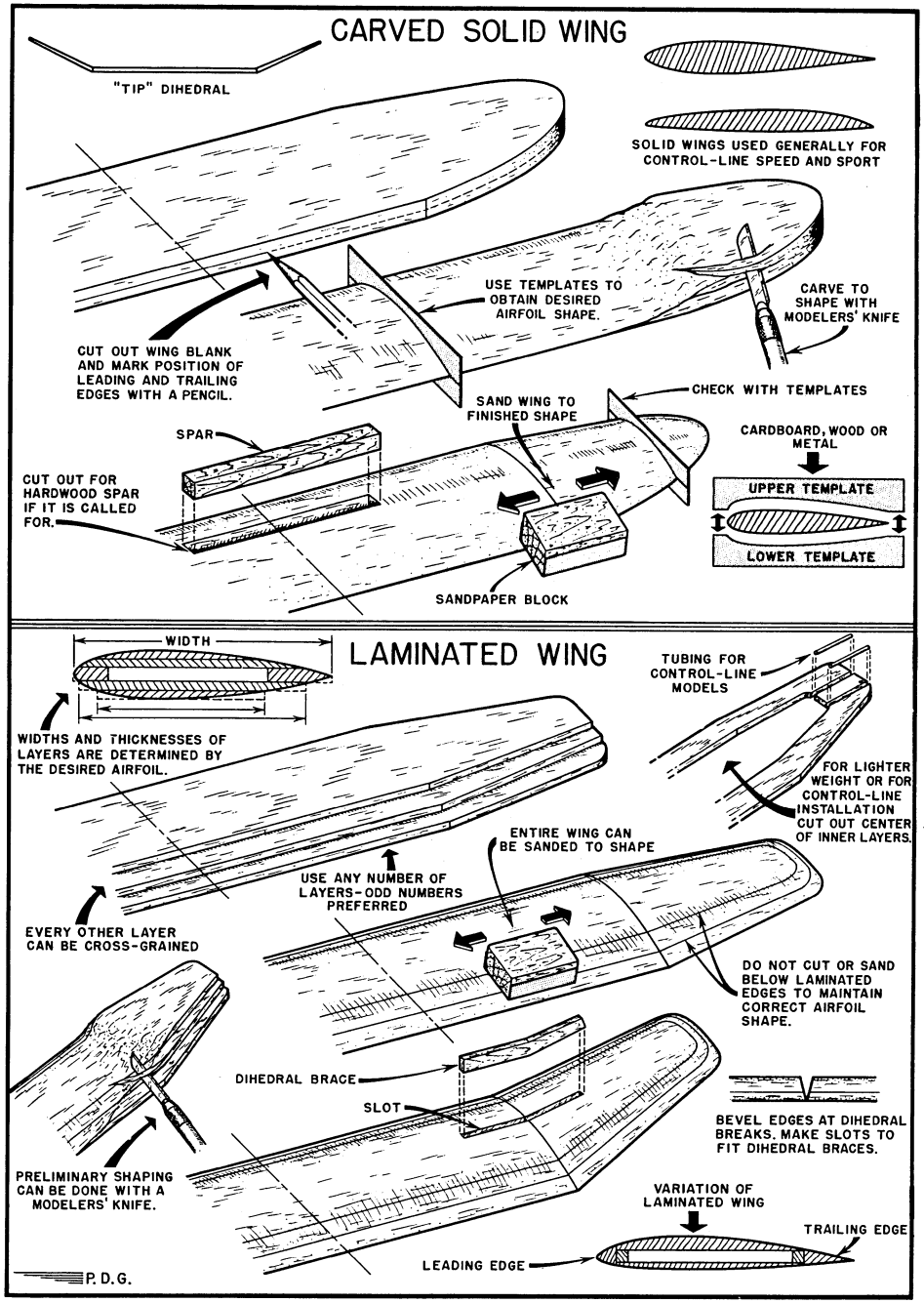
STEP SIX: USING FRENCH CURVES DRAW IN PARABOLIC PLANFORM BY FOLLOWING THE INSIDE PATTERN OBTAINED FROM DRAWING THE DIAGONAL LINES.

P.D.G.

FM CONSTRUCTION SHEETS

BALSA FABRICATED WINGS

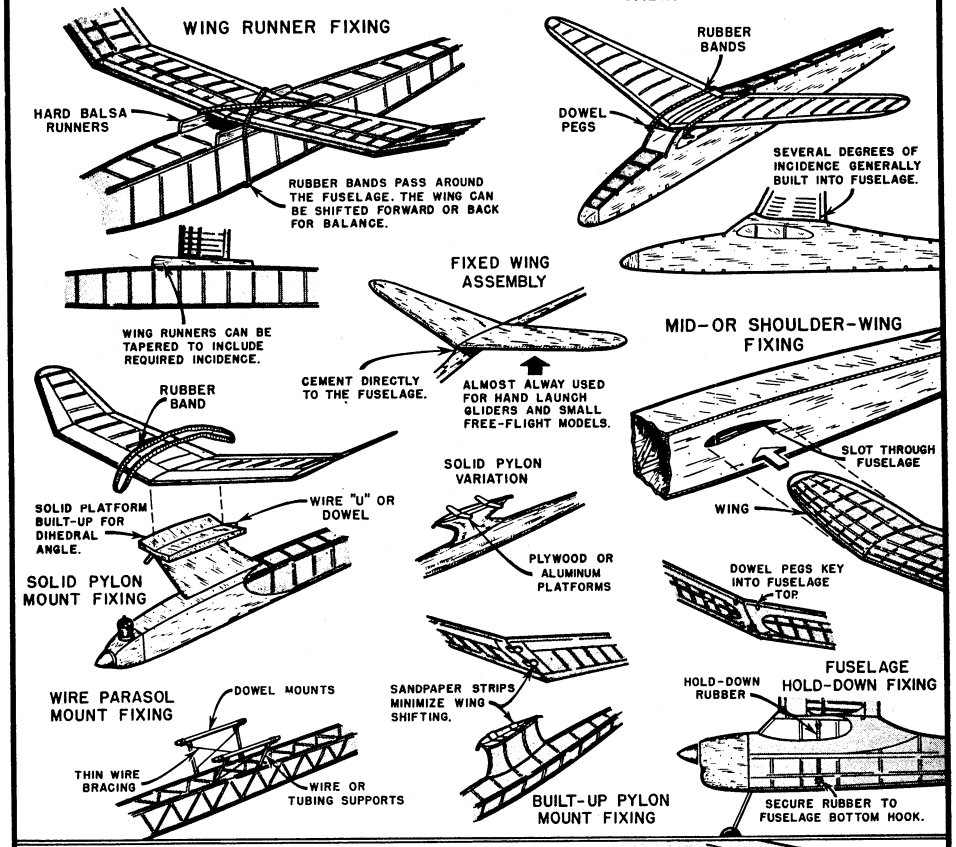




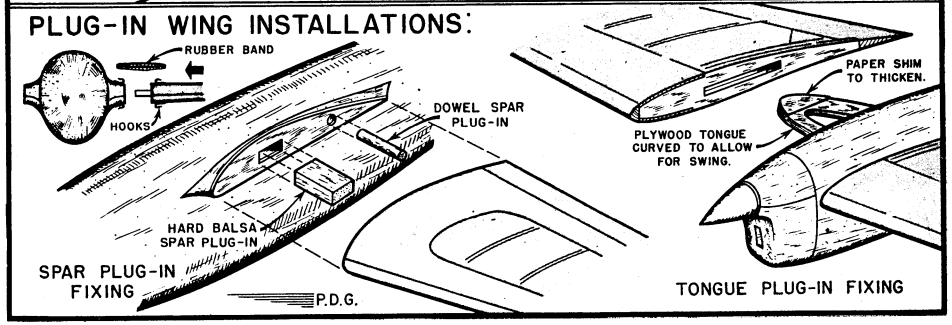
FM DATA SHEETS

WING AND TAIL FIXINGS

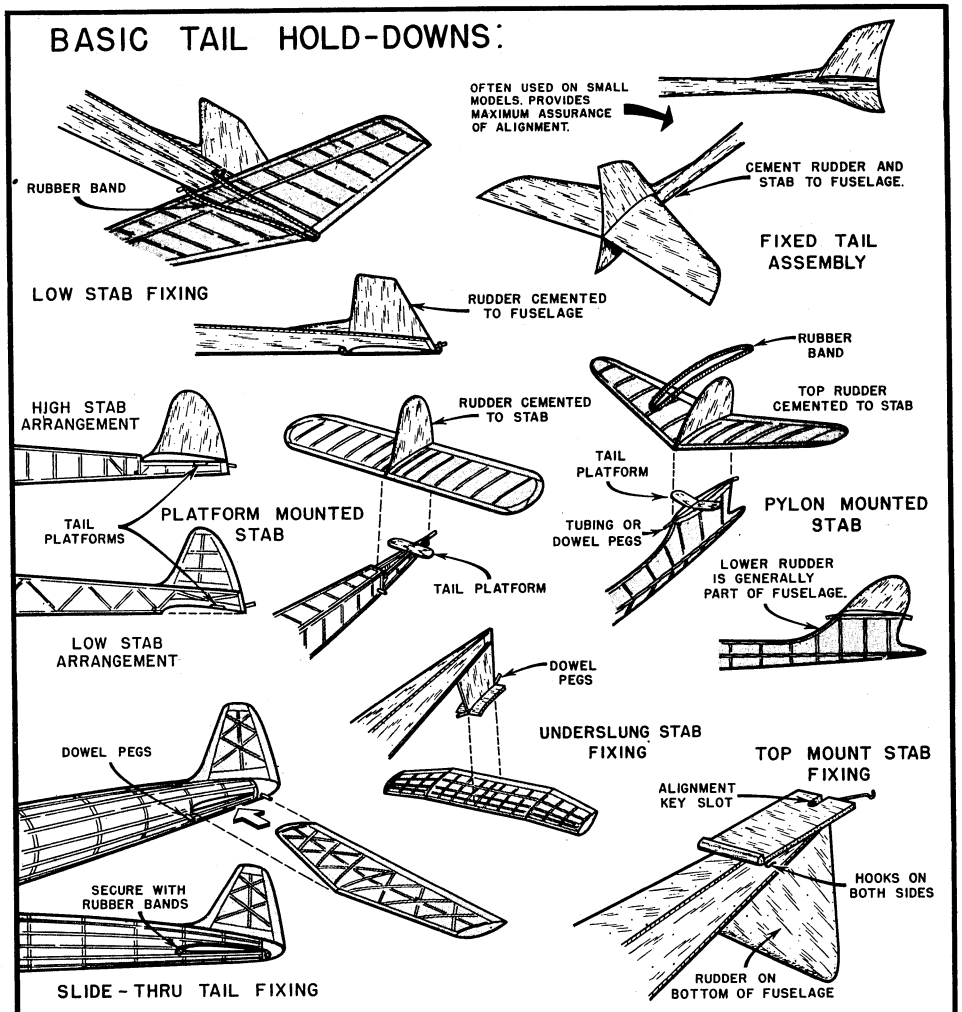
BASIC WING HOLD-DOWNS:



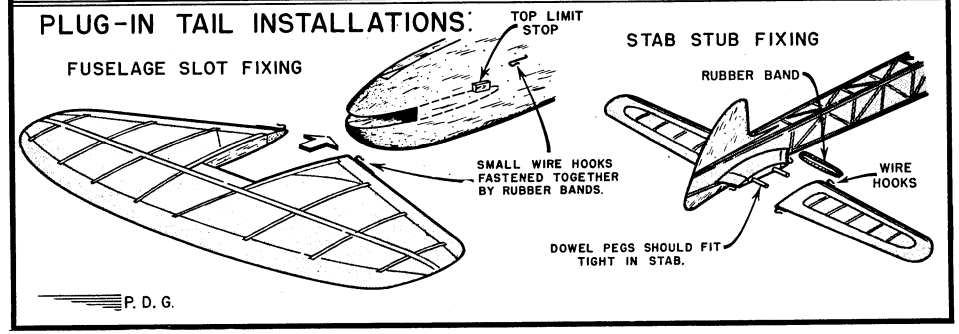
PLUG-IN WING INSTALLATIONS:



BASIC TAIL HOLD-DOWNS:



PLUG-IN TAIL INSTALLATIONS:



FM DATA SHEETS

DETHERMALIZERS AND HOOK-UPS

WEIGHT-SHIFTING DETHERMALIZERS:

SPOOL TYPE

CEMENT THREAD TO WINGTIP OPPOSITE NORMAL GLIDE TURN. (IF RIGHT TURN, ATTACH THREAD TO LEFT WING)

TIMER

WHEN TIMER ROD GOES IN, TIMER FALLS FREE AND STRING UNWINDS.

FALSE BACK ON TIMER

WING-TIP TIMER-SPOOL ARRANGEMENT

TIMER WRAPPED WITH APPROXIMATELY 50 FT. OF THREAD

TIMER HELD IN PLACE WITH SHEET BALSA ON SIDES AND TOP. (SIDES OMITTED FOR CLARITY.)

AS SOON AS TIMER-SPOOL STRIKES GROUND, THE UNBALANCED CONDITION DISAPPEARS AND THE MODEL RESUMES ITS NORMAL TURNING DIRECTION, THUS COUNTERACTING THE SPIN.

DROP-WEIGHT TYPE

RECOMMENDED FOR HAND-LAUNCH GLIDERS

RUBBER BAND

TINFOIL PROTECTION

FUSE

THREAD IS TIED TO REAR PART OF FUSELAGE.

BALLAST (SCREW, NUT OR BOLT IS FASTENED TO THREAD)

RUDDER-DISTURBANCE DETHERMALIZERS:

SPIN-TAB TYPE

LIMIT STOP

RUBBER BAND

WIRE ROD FASTENED TO TIMER DISENGAGES WIRE LOOP ON RUDDER TAB.

WIRE LOOP

TAB "SPIN" DETHERMALIZER DEVELOPED BY DICK KORDA, WHICH CAN BE OPERATED BY FUSE OR TIMER.

SPLIT-RUDDER TYPE

RUBBER BAND

TWISTED RUBBER BAND

FUSE

RUDDER "SPLIT" TYPE DEVELOPED BY PAUL E. DEL GATTO IS FUSE-OPERATED. RECOMMENDED FOR TAILLESS AIRCRAFT.

STABILIZER-DISTURBANCE DETHERMALIZERS:

THREAD LIMIT STOP

POP-UP TYPES (MOST POPULAR)

EXTENSION ARM

TIMER-OPERATED POP-UP TYPE

PIVOT TAIL SURFACES WITH TENSIONED RUBBER BAND FASTENED TO HOOK ON RUDDER AND TO DOWEL OR HOOKS ON FUSELAGE SIDES.

FUSE-OPERATED POP-UP TYPE

RUBBER BAND

FUSE

TINFOIL PROTECTION

POP-AROUND TYPE

TUBING

WIRE

RUBBER BAND, UNDER TENSION, PULLS STAB UP AND AROUND.

TINFOIL PROTECTION

POP-AROUND STAB ARRANGEMENT DEVELOPED BY BOB BURAGAS GIVES SNAP RESPONSE AND EXCELLENT DRAG ACTION. CAN BE FUSE OR TIMER-OPERATED.

SPIN-TAB TYPE

FUSE

RUBBER BAND

BOTTOM VIEW

FOR FIXED STABS ON SMALL RUBBER-POWERED OR GAS MODELS A FUSE-OPERATED TAB CAN BE USED. DEVELOPED BY PAUL E. DEL GATTO.

P.D.G.

FUSELAGE-DISTURBANCE DETHERMALIZERS:

DROGUE TYPE

NOT RECOMMENDED FOR LARGE MODELS

CHESTER LANZO DEVELOPED HINGED CABIN AND FUSELAGE DOOR DETHERMALIZERS, BOTH OF WHICH ARE TIMER-OPERATED.

LOU ANDREWS DEVELOPED THIS TYPE, WHICH PRODUCES THE SAME EFFECT AS A POP-UP TAIL.

SPLIT-FUSELAGE TYPE

WING-DISTURBANCE DETHERMALIZERS:

RUBBER BAND

LIMIT STOP

60°

TIMER-OPERATED WING POP-UP ARRANGEMENT DEVELOPED BY ED SCHLOSSER.

BEST FOR SMALL GAS, RUBBER-POWERED MODELS, OR TOWLINE GLIDERS.

POP-UP TYPE

REALISTIC TIMER-OPERATED, FULL-SPAN WING FLAPS WHICH DROP AT LEAST 80° ARE VERY EFFECTIVE. COPIED FROM FULL-SCALE GLIDERS AND DEVELOPED BY ARMAND VASQUEZ.

RUBBER BAND

TUBING

TIMER

FLAPS

FASTEN TO FUSELAGE SIDES OR ADDED MEMBER

FLAP TYPE

PARACHUTE DETHERMALIZER:

CHUTE SIZE DATA

WING AREA	A	B
100 TO 200 SQ. IN.	16"	8"
200 TO 300 SQ. IN.	18"	9"
300 TO 400 SQ. IN.	20"	10"
400 TO 600 SQ. IN.	24"	12"
600 TO 800 SQ. IN.	28"	14"
800 TO 1000 SQ. IN.	32"	16"

DEVELOPED BY HENRY STRUCK

RUBBER BAND

A

A

STRONG CORD

NYLON

B

B

CHUTE PATTERN

B

B

PARACHUTE IS PACKED IN FUSELAGE. FUSE OR TIMER-OPERATED DOOR OPENS AND PARACHUTE DROPS OUT. CHUTE CORD IS FASTENED AT TAIL. WHEN IT OPENS IT DRAGS BEHIND MODEL.

RUBBER BAND ACROSS FUSELAGE INSURES PROPER EJECTION OF PARACHUTE.

FASTEN TO TAIL

TRIPPING DEVICES:

FUSE TYPE

FUSE

SNUFFER TUBE

A BURNING FUSE IS THE MOST COMMON TRIPPING DEVICE. HAZARD IS MINIMIZED BY HAVING FUSE REST IN SNUFFER TUBE. A CYLINDER OF DRY ICE CAN BE INSERTED IN SNUFFER TUBE INSTEAD OF BURNING FUSE.

PUSHROD SECURED TO TIMER ARM

STRING (PULLS TAIL DOWN)

RUBBER BAND (SUPPLIES TENSION TO HOLD TAIL DOWN)

TIMER-ACTUATED ROD SLIDES THROUGH STAB

HOLD-DOWN HOOK. TENSIONED RUBBER BAND RAISES STAB.

TIMER TYPE

TIMER PLUNGER

PROVIDES TRIPPING LEVERAGE

REMOTE TRIPPING DEVICE DEVELOPED BY JOHN TATONE

P.D.G.

FM CONSTRUCTION SHEETS

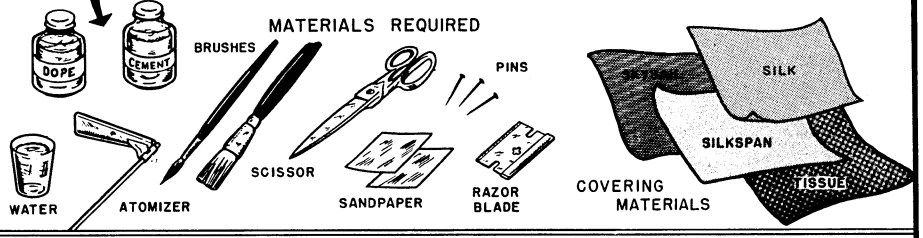
COVERING MODEL AIRPLANES

FLAT SURFACES:

(DRY COVERING)

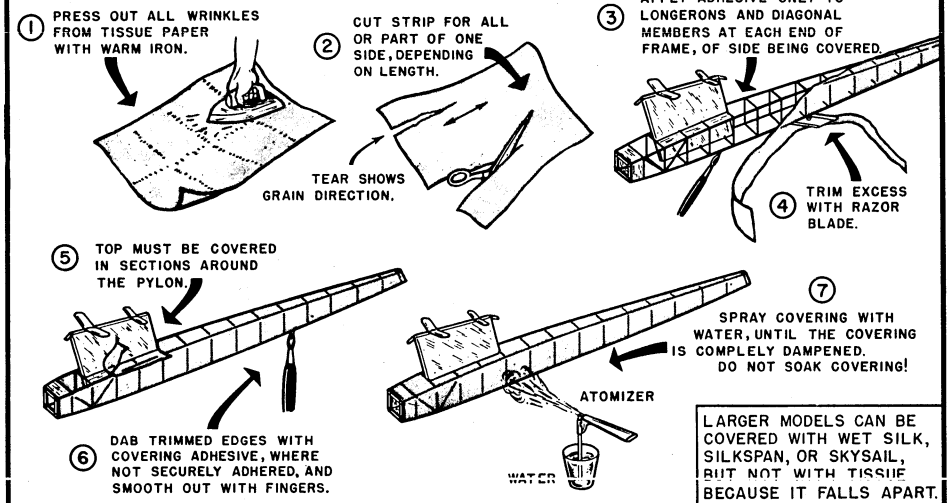
USE A 50-50 MIXTURE AS AN ADHESIVE.

TYPICAL BUILT-UP FUSELAGE



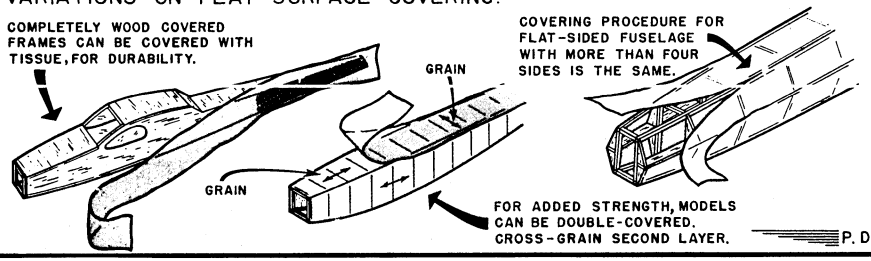
MATERIALS REQUIRED

COVERING WITH TISSUE PAPER:



LARGER MODELS CAN BE COVERED WITH WET SILK, SILKSPAN, OR SKYSAIL, BUT NOT WITH TISSUE BECAUSE IT FALLS APART.

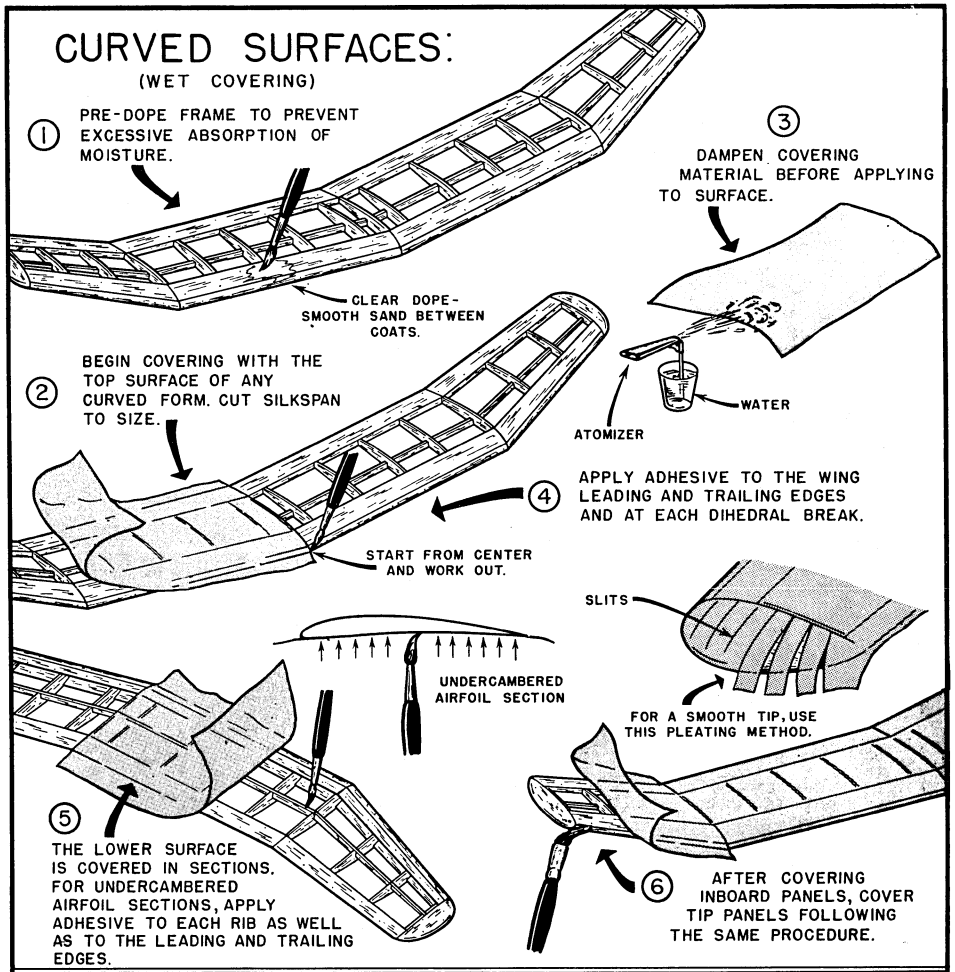
VARIATIONS ON FLAT SURFACE COVERING:



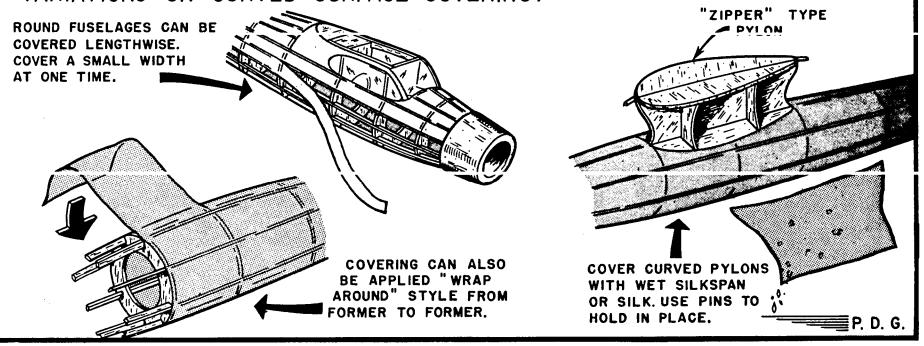
P. D. G.

CURVED SURFACES:

(WET COVERING)



VARIATIONS ON CURVED SURFACE COVERING:



P. D. G.

FM DATA SHEETS

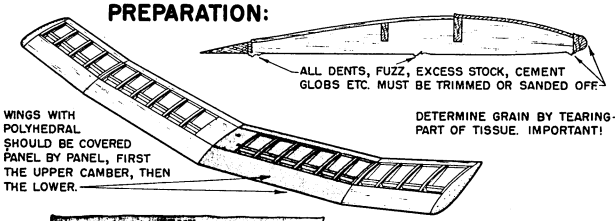
COVERING AND FINISHING

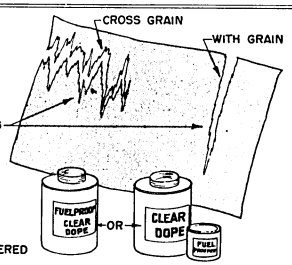
COVERING MATERIALS:

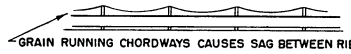
SELECT YOUR COVERING MATERIAL FOR THE JOB WHICH IT MUST DO. FOR THE AVERAGE GAS OR RUBBER MODEL, ANY OF THE STANDARD GRADES OF TISSUE WILL DO NICELY. WHEN ADDED DURABILITY IS DESIRED, USE SILK OR NYLON.

SILKSPAN: WHITE ONLY – APPLY WET OR DRY – CAN BE APPLIED WET OVER COMPOUND CURVES.
SKYSAIL: COLORS ONLY – APPLY WET OR DRY – CAN BE APPLIED WET OVER COMPOUND CURVES.
JAP TISSUE: SCARCE AS HEN'S TEETH. LIGHT – REQUIRES LESS DOPE – MUST BE APPLIED DRY.
CHINA SILK: DIE TO DESIRED COLOR – VERY DURABLE – EXCELLENT FOR ALL COMPOUND CURVES.
NYLON: DIE TO DESIRED COLOR – VERY DURABLE, BUT MUST BE PULLED VERY TIGHT WHEN WET.
MICROFILM: REFLECTS SPECTRUM, TRANSPARENT. FANTASTICALLY LIGHT – INDOOR MODELS ONLY.

PREPARATION:





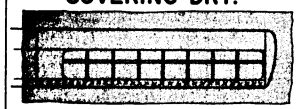


MATERIALS:

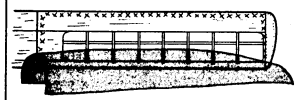
FOR GLOW-PLUG POWERED MODELS, EITHER FUELPROOF CLEAR DOPE OR REGULAR DOPE AND HOT-FUEL PROOFER IS NEEDED, –ALSO, PINS, RAZORS, BRUSHES AND COVERING.

FOR COVERING DRY AND FOR CEMENTING EDGES, THICKEN DOPE WITH A LIBERAL DOSE OF CEMENT. APPLY WITH PAINT BRUSH.

COVERING DRY:

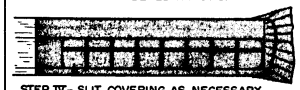


STEP I – CUT A LARGE ENOUGH PIECE OF COVERING MATERIAL FOR CONVENIENCE.



STEP II – APPLY THICKENED DOPE TO T.E., THEN PRESS TISSUE IN PLACE. WHEN DRY ADD DOPE AS INDICATED BY "X" MARKS

STEP III – PULL TAUT AS INDICATED AND IN ORDER OF NUMBERED ARROWS.



STEP IV – SLIT COVERING AS NECESSARY TO NEGOTIATE WING TIP. DOPE EDGES.

STEP V – REVERSE SIDE IS COVERED NEXT. WATER WING PRIOR TO CLEAR DOPING.

DO'S AND DON'TS:

WHEN COVERING A FLAT BOTTOM WING, IT IS NOT ADVISABLE TO DOPE COVERING TO EACH RIB AND SPAR, AS THIS MIGHT CAUSE UNEVEN SHRINKAGE.

IF THE BOTTOM OF YOUR WING IS UNDERCAMBERED, APPLY A COAT OF THINNED-DOWN CEMENT TO EACH RIB AND SPAR TO PREVENT THE COVERING FROM BRIDGING THE CONCAVE SURFACE.

DO NOT USE SILK ON WEAK OR LIGHTWEIGHT STRUCTURES. HEAVILY DOPED SILK HAS BEEN KNOWN TO CRUSH AND WARP FRAMEWORK.

RELY ON COLORED TISSUE OR DYES FOR COLOR ON FREE-FLIGHT MODELS, RATHER THAN EXCESSIVE QUANTITIES OF HEAVY PIGMENTED DOPES.

WHEN USING FUEL PROOF DOPE AND ALLIED PRODUCTS, DO NOT MIX BRANDS. SANDING SEALERS DESIGNED FOR USE WITH THE SAME COMPANY'S CLEAR DOPE, MAY CAUSE TROUBLE WHEN APPLIED UNDER A COMPETITIVE BRAND.

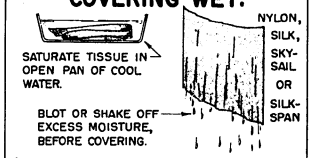
IF YOUR MODEL IS INTENDED FOR USE AS A SEAPLANE, IT IS ADVISABLE TO SPRAY THE ENTIRE FRAMEWORK WITH TWO COATS OF CLEAR DOPE. THIS WILL RETARD ABSORBTION OF MOISTURE. JAP TISSUE IS PREFERRED FOR COVERING, AS IT HAS FAR LESS PORES AND IS THEREFORE EASIER TO WATERPROOF.

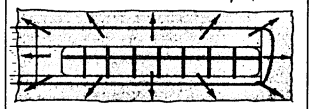
DOUBLE-COVER YOUR MODEL IF YOU SEE FIT. A FEW COATS OF CLEAR DOPE SHOULD BE APPLIED TO THE FIRST LAYER. DOPE SECOND LAYER ON TO AVOID AIR BUBBLES. CROSS-GRAIN TISSUE TO LOCALIZE PUNCTURES.

DO NOT DOPE YOUR MODEL IF POSSIBLE, ON WARM HUMID DAYS. THE DOPE WILL TEND TO TURN MILKY-WHITE. (BLUSHING). RETARDER WILL PREVENT AS WELL AS REMOVE IT. THINNER MAY HELP. TRY TO DOPE IN A COOL DRY ROOM.

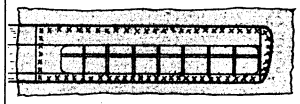
WHEN COVERING WITH WET TISSUE, THE DOPE APPLIED TO HOLD THE TISSUE WILL BLUSH. IF WEATHER IS DRY, IT WILL DISAPPEAR WHEN DOPED.

COVERING WET:

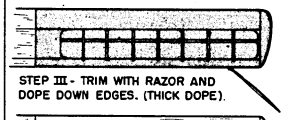




PULL TAUT AND FREE OF WRINKLES AS SHOWN BY ARROWS. KEEP DAMPENING.



STEP II – APPLY THIN DOPE ON TOP OF WET COVERING AS INDICATED BY "X" MARKS.

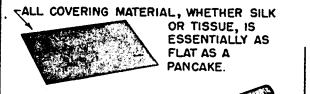


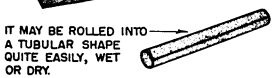
STEP III – TRIM WITH RAZOR AND DOPE DOWN EDGES. (THICK DOPE).

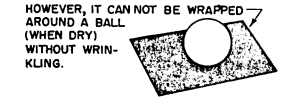
STEP IV – COVER REVERSE SIDE IMMEDIATELY.

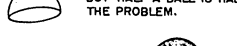
D.J.M

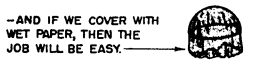
COMPOUND CURVATURES:

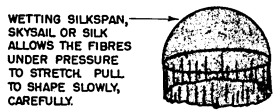


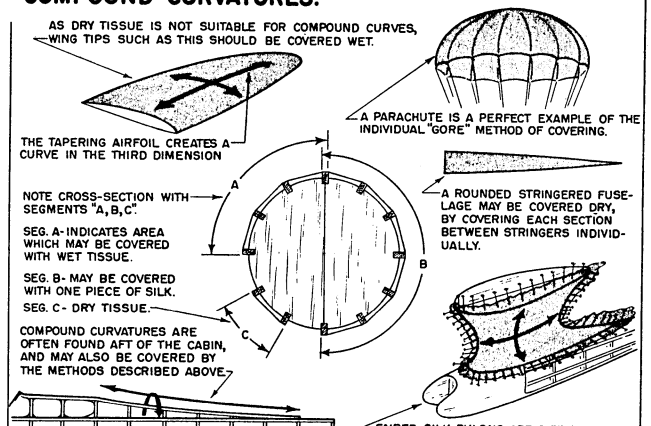




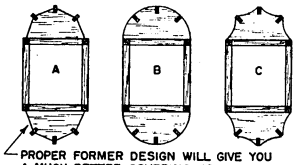


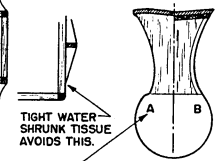


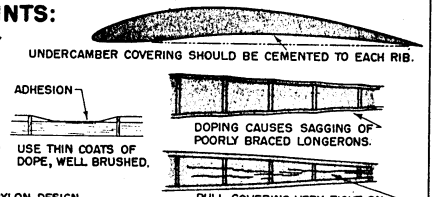




COVERING HINTS:







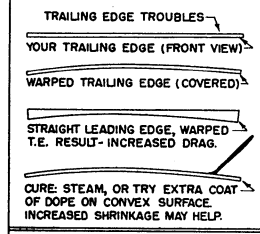
DOPING:

USE A GOOD KNOWN GRADE OF DOPE IS THE BEST ADVICE WE CAN GIVE YOU. THINNER IS TO DOPE WHAT TURPENTINE IS TO PAINT. KEEP YOUR DOPE THIN AND APPLY IN SMOOTH EVEN STROKES. DRY WELL BETWEEN COATS.

USE A GOOD BRUSH, BRISTLES SET IN RUBBER.

FINISHING:

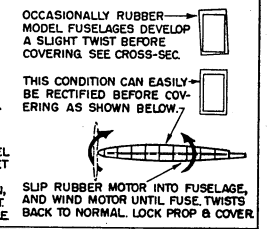
WARP REMOVAL:



STEAM-OUT
EXCELLENT FOR A SMALL MODEL, BUT A TEA KETTLE VS. A SIX FOOT WING IS SELDOM ENOUGH.
TWIST TO DESIRED POSITION, STEAM, HOLD TILL COOL.

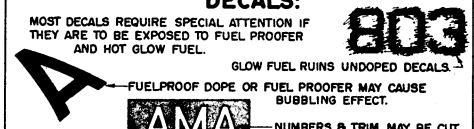
DOPE-OUT
DOPE PANEL, HOLD TILL DRY. DOPE PANEL AGAIN, HOLD TILL DRY, REPEAT WITH EACH COAT. THIS METHOD CONDUCIVE TO SUICIDE. NEVER WORKS WELL ANYWAY. FORGET IT!

SOAK-OUT
THIS METHOD WILL PROVE VERY EFFECTIVE.
SOAK WARPED PANEL IN VERY HOT FAUCET WATER. TWIST IN OPPOSITE DIRECTION, DRY FAST OVER HEAT. HIGHLY INFLAMMABLE

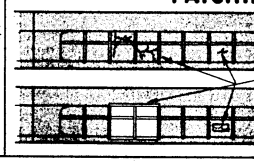


DECALS:

MOST DECALS REQUIRE SPECIAL ATTENTION IF THEY ARE TO BE EXPOSED TO FUEL PROOFER AND HOT GLOW FUEL.



PATCHING:



REMOVE RIPPED COVERING WITH A RAZOR. WHENEVER POSSIBLE REMOVE A BIT OF SURROUNDING TISSUE SO PATCH MAY BE CEMENTED TO WOOD, ELIMINATING DOUBLE-COVERING EFFECT. WATER AND DOPE TO MATCH.

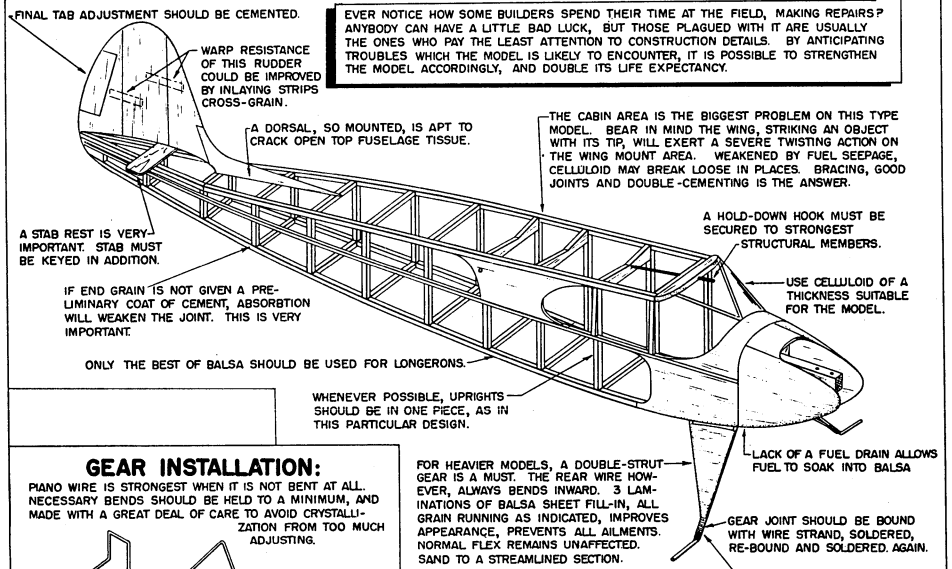
D.J.M

FM DATA SHEETS

ELIMINATION OF STRUCTURAL WEAK SPOTS

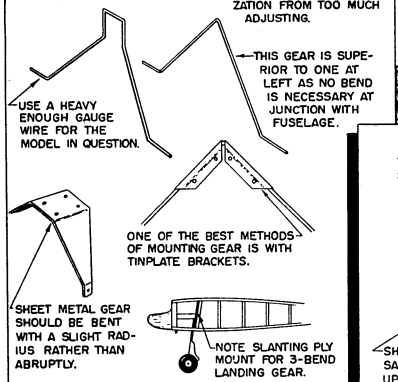
COMMON TROUBLE SPOTS IN CABIN TYPE FUSELAGES:

EVER NOTICE HOW SOME BUILDERS SPEND THEIR TIME AT THE FIELD, MAKING REPAIRS? ANYBODY CAN HAVE A LITTLE BAD LUCK, BUT THOSE PLAGUED WITH IT ARE USUALLY THE ONES WHO PAY THE LEAST ATTENTION TO CONSTRUCTION DETAILS. BY ANTICIPATING TROUBLES WHICH THE MODEL IS LIKELY TO ENCOUNTER, IT IS POSSIBLE TO STRENGTHEN THE MODEL ACCORDINGLY, AND DOUBLE ITS LIFE EXPECTANCY.



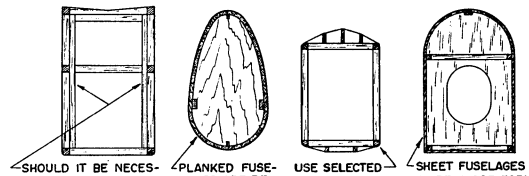
GEAR INSTALLATION:

PIANO WIRE IS STRONGEST WHEN IT IS NOT BENT AT ALL. NECESSARY BENDS SHOULD BE HELD TO A MINIMUM, AND MADE WITH A GREAT DEAL OF CARE TO AVOID CRYSTALLIZATION FROM TOO MUCH ADJUSTING.

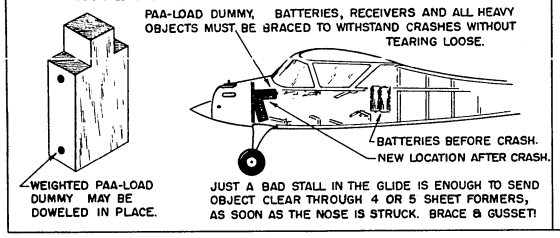


CROSS-SECTIONS:

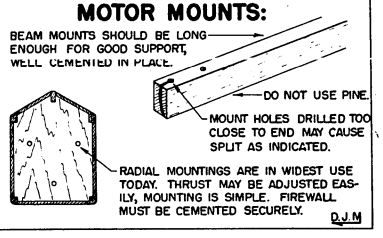
THERE ARE MANY METHODS OF CONSTRUCTING A FUSELAGE, AND EACH IS BESET IN A DIFFERENT MANNER. THE STRUCTURES BELOW WILL GIVE LITTLE TROUBLE.



INTERNAL DAMAGE:



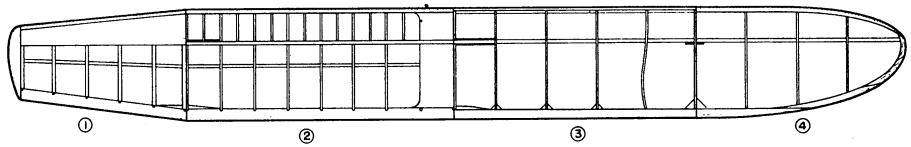
MOTOR MOUNTS:



D.J.M

WING STRUCTURAL PROBLEMS:

THE GENERAL TENDENCY TODAY IS TO CONSTRUCT A WING FROM AS FEW PIECES AS POSSIBLE. EXPERIENCED WAKEFIELD BUILDERS AND SUCH CUT CORNERS TO SAVE WEIGHT, BUT THEY STILL RETAIN THEIR DESIRED AIRFOIL, RIGIDITY AND NECESSARY STRENGTH-WEIGHT RATIO. THE OTHER 98% PREFER A SCANTY STRUCTURE AS IT IS THE PATH OF LEAST RESISTANCE, AND THAT IS WHEN THE TROUBLE STARTS.



IF UPON GLANCING AT PANELS 1 AND 2, YOU FEEL THE STRUCTURE IS TOO MUCH BOTHER, THEN YOU ARE ONE OF THE 98%. PANELS 3 AND 4 ARE THE ONES THAT ARE THE REAL BOTHER, FOR THE WARP RESISTANCE, STRENGTH AND AERODYNAMIC QUALITIES WILL BE POOR. EVEN THO THE INITIAL BUILDING TIME OF PANELS 1 OR 2 MAY BE A FEW MINUTES MORE THEY WILL STAND UP AGAINST THE RIGORS OF ACTIVE FLYING. CONSTRUCTION DEFECTS AND ADVANTAGES OF EACH PANEL ARE ITEMIZED BELOW.

PANEL ①

SHEETED LEADING EDGE MAINTAINS SMOOTH AIRFOIL. CAP STRIPS ON RIBS PREVENT BOWING AS VISIBLE IN PANEL 3. NOTE GUSSET AT TRAILING EDGE. EXCELLENT.

PANEL ②

VERY GOOD SUBSTITUTE FOR CONSTRUCTION IN PANEL 1. EASIER TO REPAIR. TOP SPAR PREVENTS PANEL FROM ARCING UPWARD NOTCHED T.E. EXCELLENT.

PANEL ③

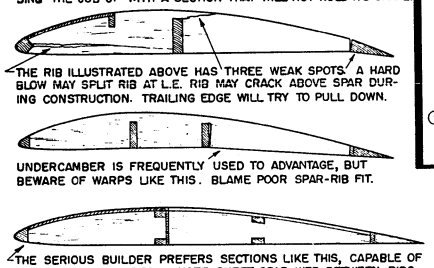
POORLY SUPPORTED THIN RIBS MAY DEVELOP A BOW. DIAMOND-SHAPED L.E. MAY SPLIT RIBS. TISSUE WILL SAG BETWEEN RIBS. BOTTOM SPAR POOR. T.E. GUSSETS ARE GOOD.

PANEL ④

REALLY CRUDE! TIP FAR TOO WEAK, IT'S ALMOST BOUND TO BREAK OR WARP. LAMINATED LEADING EDGE WOULD RELIEVE PRESSURE. SPAR GUSSET WILL PROBABLY FAIL.

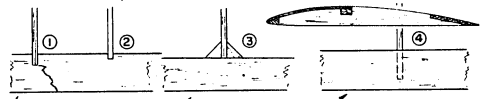
AIRFOIL PROBLEMS:

THERE IS NO PERCENTAGE IN PLOTTING AN AIRFOIL AND THEN MESSING THE JOB UP WITH A SECTION THAT WILL NOT HOLD ITS SHAPE.



TRAILING EDGE:

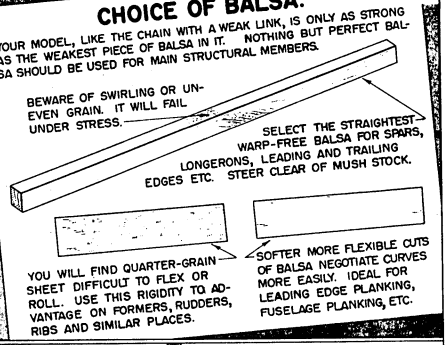
DUE TO THE RELATIVELY SMALL CEMENTING SURFACE OF THE RIB-TRAILING EDGE BUTT-JOINT, IT SHOULD BE STRENGTHENED AS ILLUSTRATED BELOW.



① - GOOD IDEA, BUT TOO DEEP A NOTCH WEAKENS T.E. ② IS EXCELLENT. ③ - TRIANGULAR GUSSETS ARE FINE, BUT MAR THE APPEARANCE. ④ - SHEET TRAILING EDGE ALLOWS A DIFFERENT APPROACH. VERY GOOD.

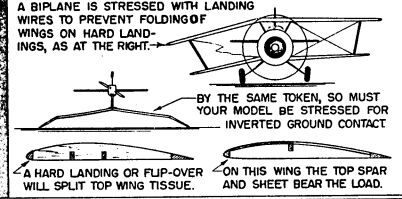
CHOICE OF BALSA:

YOUR MODEL, LIKE THE CHAIN WITH A WEAK LINK, IS ONLY AS STRONG AS THE WEAKEST PIECE OF BALSA IN IT. NOTHING BUT PERFECT BALSA SHOULD BE USED FOR MAIN STRUCTURAL MEMBERS.

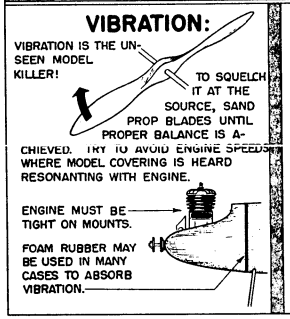


LANDING IMPACT:

A BIPLANE IS STRESSED WITH LANDING WIRES TO PREVENT FOLDING OF WINGS ON HARD LANDINGS, AS AT THE RIGHT.



VIBRATION:



WARPS-ALIGNMENT:

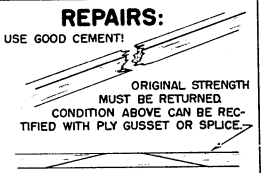
AN EXPERT MAY MISALIGN AND WARP HIS FLYING SURFACES PURPOSELY, BUT IF YOU DON'T UNDERSTAND THE CAUSE AND EFFECTS OF SUCH, YOU HAD BETTER AVOID SLOPPY RESULTS LIKE THE EXAMPLE ABOVE.

WING AND STAB MUST BE SHIMMED INTO ALIGNMENT IN SUCH CASES. STAB REST MUST BE FIRM. LOCK STAB WITH DOWEL PINS TO PREVENT SIDE MOVEMENT.

REMOVE WARPS WITH HOT WATER OR STEAM.

REPAIRS:

USE GOOD CEMENT!



WHEN POSSIBLE, MAJOR REPAIRS ARE BEST MADE AT HOME. DOUBLE COAT ALL END GRAIN WITH SLOW DRYING MODEL CEMENT.

DO THE JOB RIGHT TO AVOID A REPETITION ON THE FIELD.

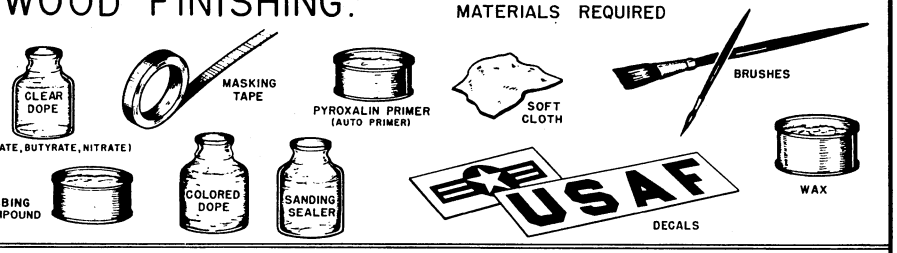
D.J.M

FM CONSTRUCTION SHEETS

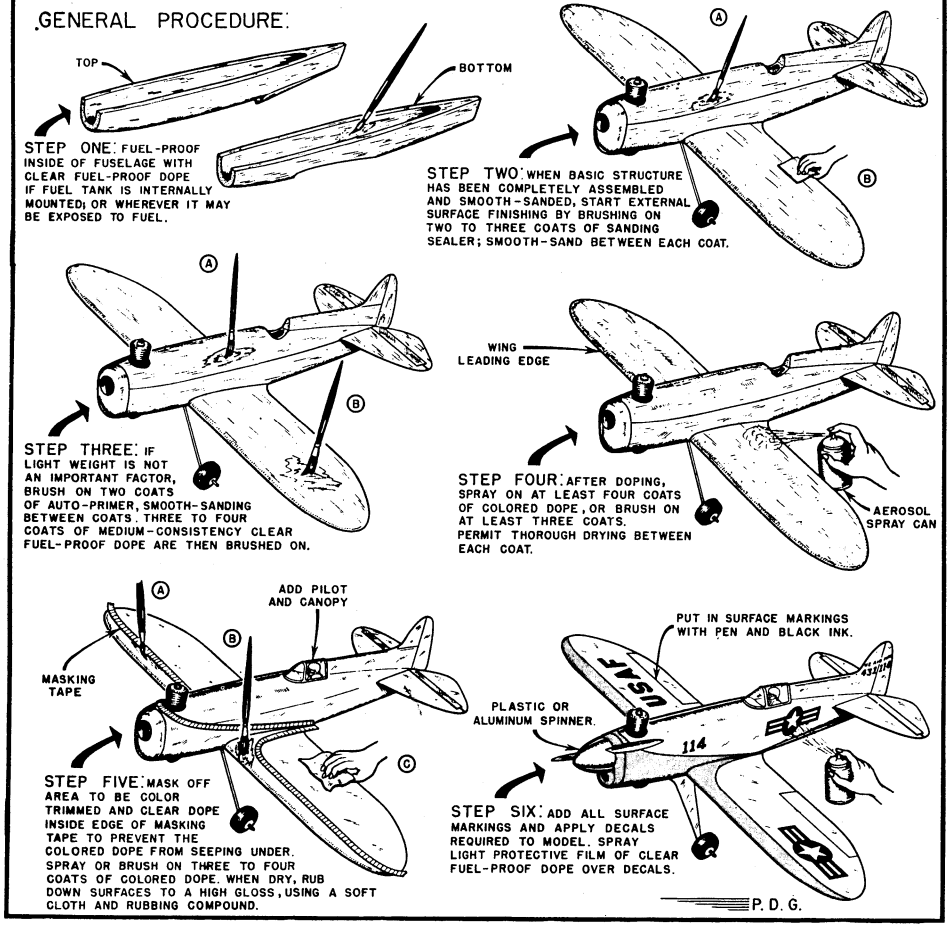
FINISHING MODEL AIRPLANES

WOOD FINISHING:

MATERIALS REQUIRED

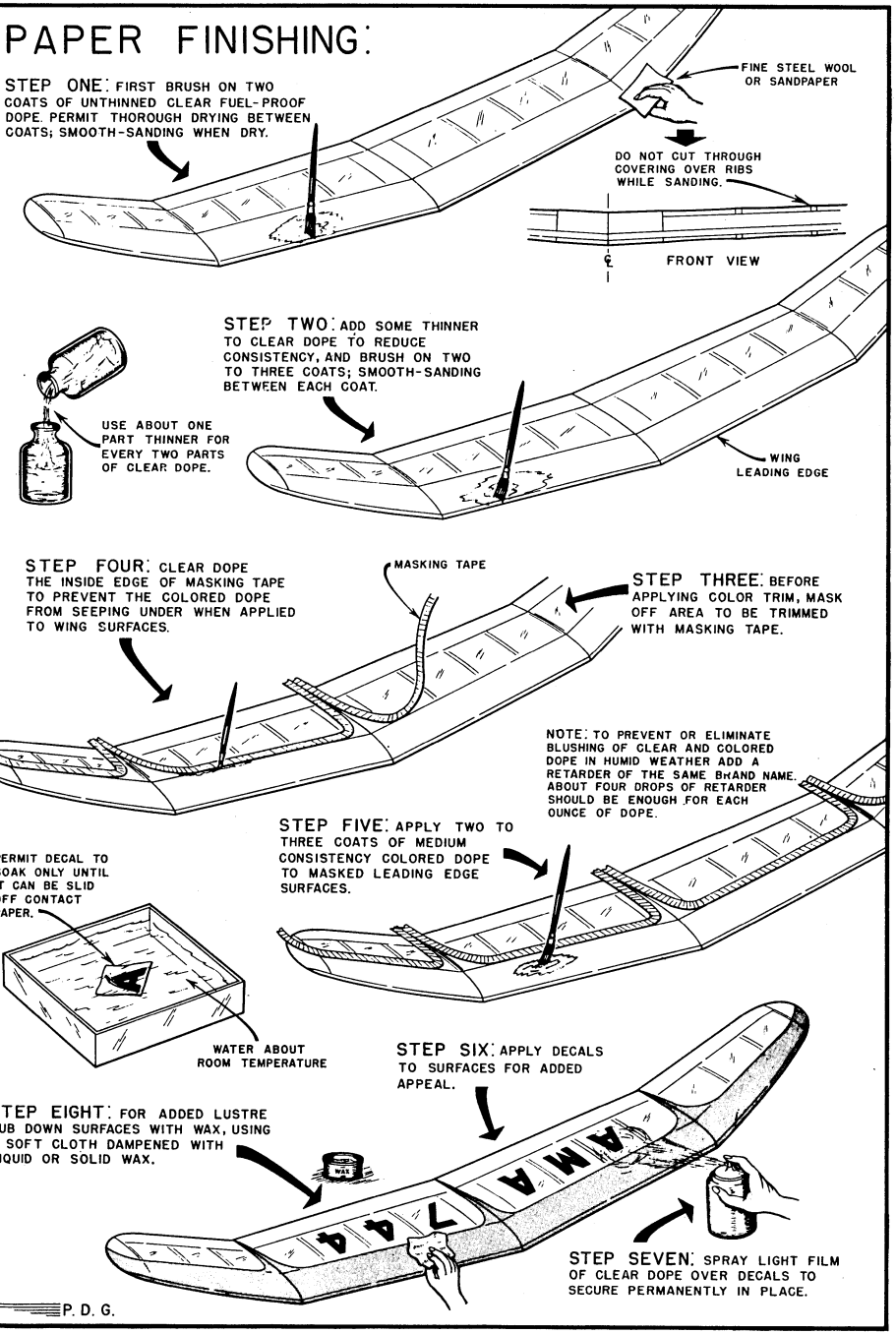


GENERAL PROCEDURE:



P. D. G.

PAPER FINISHING:



P. D. G.

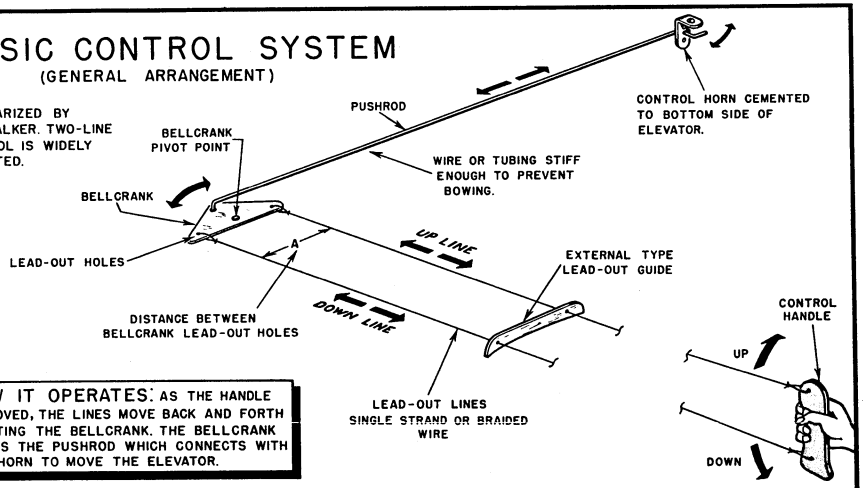
FM DATA SHEETS

TWO-LINE CONTROL SYSTEMS

BASIC CONTROL SYSTEM

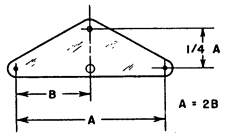
(GENERAL ARRANGEMENT)

POPULARIZED BY JIM WALKER. TWO-LINE CONTROL IS WIDELY ACCEPTED.

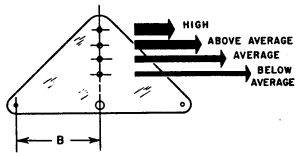


HOW IT OPERATES: AS THE HANDLE IS MOVED, THE LINES MOVE BACK AND FORTH PIVOTING THE BELLCRANK. THE BELLCRANK MOVES THE PUSHROD WHICH CONNECTS WITH THE HORN TO MOVE THE ELEVATOR.

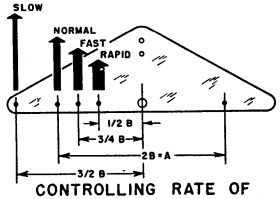
BELLCRANK AND CONTROL HORN DESIGN



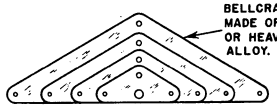
TYPICAL BELLCRANK DESIGN



CONTROLLING DEGREE OF RESPONSE



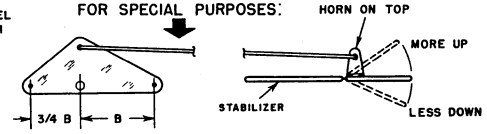
CONTROLLING RATE OF ACCELERATION



BELLCRANKS GENERALLY MADE OF THIN GAUGE STEEL OR HEAVY GAUGE ALUMINUM ALLOY.

THESE BELLCRANKS HAVE THE SAME CONTROL RATIO DISREGARDING HANDLE EFFECT.

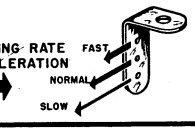
FOR SPECIAL PURPOSES:



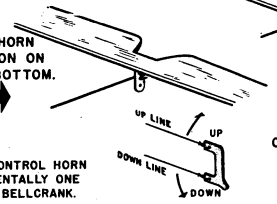
ASYMMETRICAL BELLCRANKS CAN BE USED TO VARY UP AND DOWN RELATIONSHIP

TYPICAL CONTROL HORN DESIGN

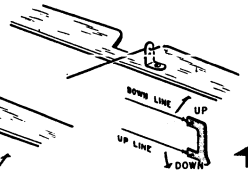
CONTROLLING RATE OF ACCELERATION



CONTROL HORN INSTALLATION ON ELEVATOR BOTTOM.



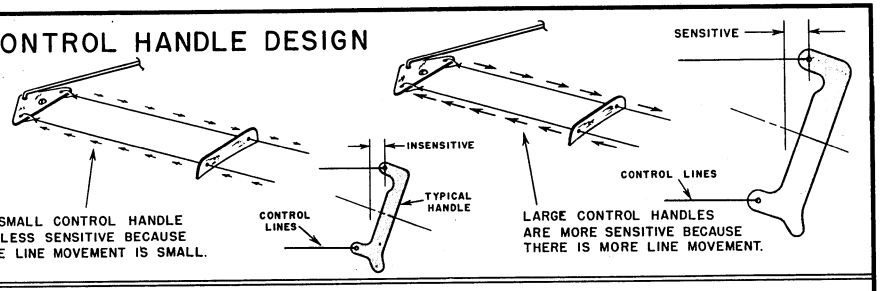
NOTE: A CONTROL HORN IS FUNDAMENTALLY ONE HALF OF A BELLCRANK.



CONTROL HORN INSTALLATION ON TOP OF ELEVATOR

P.D.G.

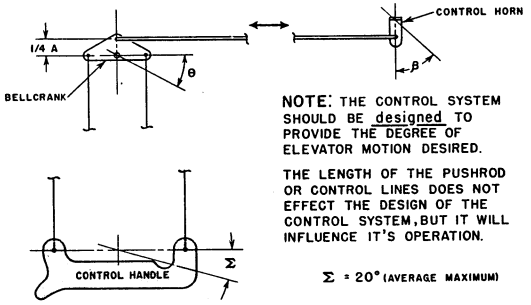
CONTROL HANDLE DESIGN



A SMALL CONTROL HANDLE IS LESS SENSITIVE BECAUSE THE LINE MOVEMENT IS SMALL.

LARGE CONTROL HANDLES ARE MORE SENSITIVE BECAUSE THERE IS MORE LINE MOVEMENT.

BASIC SYSTEM IN OPERATION



NOTE: THE CONTROL SYSTEM SHOULD BE designed TO PROVIDE THE DEGREE OF ELEVATOR MOTION DESIRED.

THE LENGTH OF THE PUSHROD OR CONTROL LINES DOES NOT EFFECT THE DESIGN OF THE CONTROL SYSTEM, BUT IT WILL INFLUENCE IT'S OPERATION.

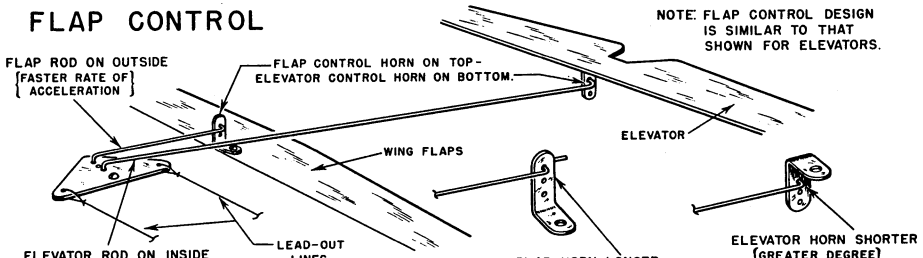
Σ = 20° (AVERAGE MAXIMUM)

EXAMPLES OF DESIGN

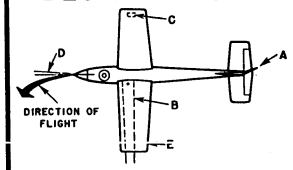
BELL-CRANK	CONTROL HANDLE	CONTROL HORN	Σ	θ	β
3"	5 1/2"	3/4"	20°	37°	33°
3"	5"	5/8"	20°	34°	36°
3"	4-1/2"	1/2"	20°	30°	41°
2"	5"	1/2"	20°	50°	45°
2"	4-1/2"	1/2"	20°	46°	40°
2"	4"	3/8"	20°	40°	46°
1-1/2"	5"	1/2"	20°	70°	50°
1-1/2"	4-1/2"	3/8"	20°	64°	54°
1-1/2"	4"	5/16"	20°	57°	61°

FLAP CONTROL

NOTE: FLAP CONTROL DESIGN IS SIMILAR TO THAT SHOWN FOR ELEVATORS.

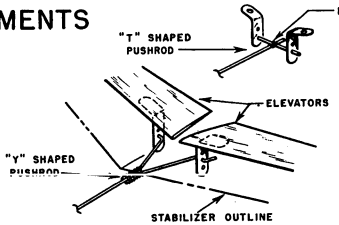


DESIGN REQUIREMENTS

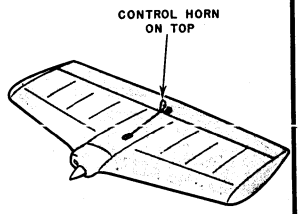


TO MAINTAIN LINE TENSION:

- (A) OFFSET RUDDER OR:
- (B) STAGGER LINES SLIGHTLY REARWARD OR:
- (C) ADD BALLAST TO OPPOSITE WINGTIP OR:
- (D) OFFSET ENGINE OR:
- (E) MAKE INBOARD WING LONGER



FOR "V" TAILS USE "Y" SHAPED OR "T" SHAPED PUSHROD AND TWO CONTROL HORNS.



FLYING WINGS ARE DESIGNED AND HOOKED UP IN THE SAME MANNER AS FLAP AND ELEVATOR CONTROL SYSTEMS.

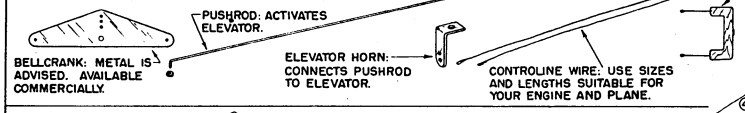
P.D.G.

FM DATA SHEETS

CONTROL-LINE INSTALLATION

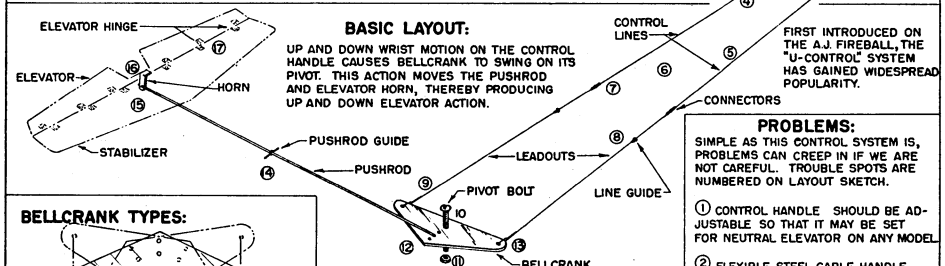
INSTALLATION DETAILS FOR JIM WALKER "U-CONTROL" SYSTEM

COMPONENT PARTS:



BASIC LAYOUT:

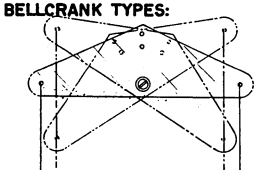
UP AND DOWN WRIST MOTION ON THE CONTROL HANDLE CAUSES BELLCRANK TO SWING ON ITS PIVOT. THIS ACTION MOVES THE PUSHROD AND ELEVATOR HORN, THEREBY PRODUCING UP AND DOWN ELEVATOR ACTION.



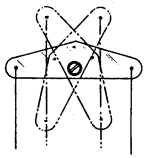
FIRST INTRODUCED ON THE A.J. FIREBALL, THE "U-CONTROL" SYSTEM HAS GAINED WIDESPREAD POPULARITY.

OTHER POPULAR CONTROLINE SYSTEMS INCLUDE THE "MONO-LINE", DESCRIBED IN FEB. 1952 FLYING MODELS, AND THOSE OF VARIOUS KIT MANUFACTURERS, DESCRIBED IN THEIR KIT PLANS.

BELLCRANK TYPES:



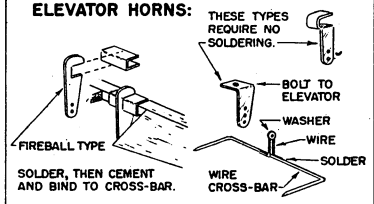
TYPICAL STUNT TYPE BELLCRANK (SHOWN 1/2 SCALE) IN NEUTRAL AND UP AND DOWN ELEVATOR POSITIONS.



NOTE WHAT OCCURS WHEN TOO SMALL A BELLCRANK IS USED. LEADOUT WIRES TRAVEL TOO FAR, NECESSITATE SLOTS IN FUSELAGE. LEVERAGE ALSO IS LOST.

FOR ELECTRICAL TWO SPEED SYSTEMS, USE BAKELITE BELLCRANK.

ELEVATOR HORNS:

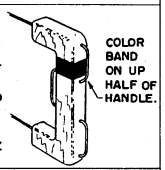


CONTROL HANDLES:

SIMPLEST OF ALL STEEL CABLE INSTALLATIONS IS SHOWN HERE.

READILY ADJUSTABLE, IT MAY BE ADJUSTED TO CORRESPOND TO NEUTRAL ON ANY MODEL.

MANY EXCELLENT HANDLES ARE AVAILABLE COMMERCIALLY.



PUSHRODS:

JOGGLE CONNECTIONS ARE EXCELLENT ON CONVENTIONAL WIRE TYPES.

TUBING (WITH FLATTENED, DRILLED ENDS) SOMETIMES USED.

DUAL PUSHROD

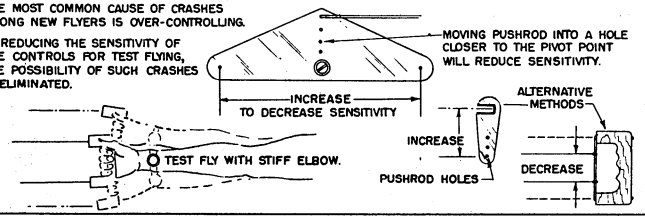
MODIFICATION FOR BUTTERFLY STABS.

SENSITIVITY:

THE MOST COMMON CAUSE OF CRASHES AMONG NEW FLYERS IS OVER-CONTROLLING.

BY REDUCING THE SENSITIVITY OF THE CONTROLS FOR TEST FLYING, THE POSSIBILITY OF SUCH CRASHES IS ELIMINATED.

REDUCING BELLCRANK SWING REDUCES ELEVATOR TRAVEL, BUT NOT THE SENSITIVITY.



PROBLEMS:

SIMPLE AS THIS CONTROL SYSTEM IS, PROBLEMS CAN CREEP IN IF WE ARE NOT CAREFUL. TROUBLE SPOTS ARE NUMBERED ON LAYOUT SKETCH.

① CONTROL HANDLE SHOULD BE ADJUSTABLE SO THAT IT MAY BE SET FOR NEUTRAL ELEVATOR ON ANY MODEL.

② FLEXIBLE STEEL CABLE HANDLE LEADOUTS ARE ADVISED. BRONZE CABLE, CATGUT, FISHLINE, ETC. WILL BREAK UNDER STRESS.

③ WEAK CONNECTORS ARE DANGEROUS. PULL TEST TO AVOID ACCIDENTS.

④ DO NOT USE THINNER WIRE THAN RECOMMENDED FOR YOUR ENGINE.

⑤ LINES MUST BE FREE OF KINKS.

⑥ LINES SHOULD BE CORRECT LENGTH.

⑦ ALL WIRE CONNECTIONS SHOULD BE SLIP-PROOF, SOLDERLESS, WRAPPED.

⑧ LINE GUIDE ON WING MUST NOT HIT CONNECTORS, OR CHAFE ON LINES. NO LINE GUIDE IS NEEDED IF LINES RUN THROUGH WING.

⑨ WIRE CONNECTION AT BELLCRANK MUST NOT SNAG ON FUSELAGE SIDE, OR LIMIT BELLCRANK MOVEMENT.

⑩ IN LARGE OR HIGH POWERED MODELS, A BEARING IS ADVISED AT THE PIVOT. ANCHOR PIVOT BOLT MOUNT TO MOTOR MOUNTS FOR SAFETY.

⑪ SOLDER NUT TO PREVENT LOOSENING.

⑫ IF LESS MOVEMENT OF THE ELEVATORS IS DESIRED, USE PUSHROD TRAINING HOLES (NEARER PIVOT) IN BELLCRANK.

⑬ USE LARGEST BELLCRANK POSSIBLE.

⑭ FRICTION COUPLED WITH AIR PRESSURE TEND TO "BOW" THE PUSHROD. IT CAN WRECK YOUR MODEL. SUPPORT IT IN CENTER WITH A GUIDE.

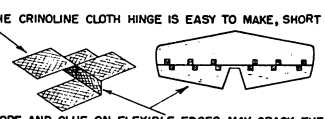
⑮ ELEVATOR HORN (AS SHOULD ALL CONNECTIONS) MUST FORM A SNUG FIT WITH PUSHROD TO PREVENT PLAY.

⑯ CROSS-BAR (CONNECTING ELEVATORS) MUST BE STRONG, WARP RESISTANT. USE HARDWOOD OR PIANO WIRE.

⑰ HINGES MUST BE RUGGED, FUEL-PROOF, WARP-PROOF, UNAFFECTED BY VIBRATION AND FRICTION-FREE.

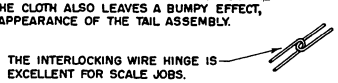
ELEVATOR HINGES:

THE CRINOLINE CLOTH HINGE IS EASY TO MAKE, SHORT LIVED.



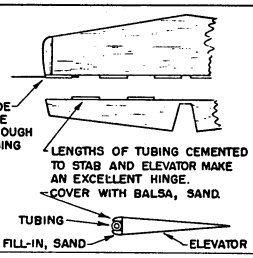
DOPE AND GLUE ON FLEXIBLE EDGES MAY CRACK THE CLOTH. THE CLOTH ALSO LEAVES A BUMPY EFFECT, MARRING APPEARANCE OF THE TAIL ASSEMBLY.

HINGES SUCH AS THESE, AVAILABLE AT YOUR HOBBY SHOP ARE EASY TO INSTALL, TROUBLE FREE.



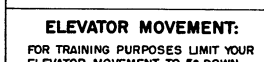
THE INTERLOCKING WIRE HINGE IS EXCELLENT FOR SCALE JOBS.

TUBING AND WIRE HINGE.



ELEVATOR MOVEMENT:

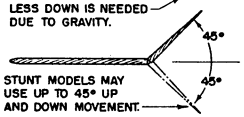
FOR TRAINING PURPOSES LIMIT YOUR ELEVATOR MOVEMENT TO 5° DOWN, 15° UP.



LESS DOWN IS NEEDED DUE TO GRAVITY.

FULL UP AND FULL DOWN

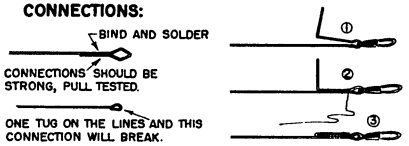
IF ELEVATOR IS STILL IN UP POSITION WHEN DOWN ELEVATOR IS DESIRED, SLIDE STAB TOWARD REAR.



STUNT MODELS MAY USE UP TO 45° UP AND DOWN MOVEMENT.

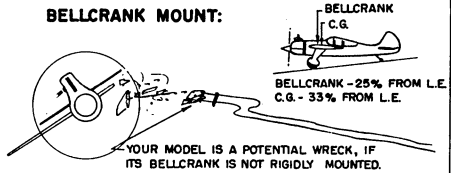
CEMENT STAB IN POSITION ONCE PROPER MOVEMENT IS OBTAINED.

CONNECTIONS:



① BEND CONTROLINE WIRE, SLIP SNAP OR SLIDE CONNECTOR ON.
② BIND AS SHOWN WITH SINGLE STRAND OF ELECTRICAL WIRE.
③ BEND LEG OF WIRE DOWN, CONTINUE BINDING. DO NOT SOLDER.

BELLCRANK MOUNT:

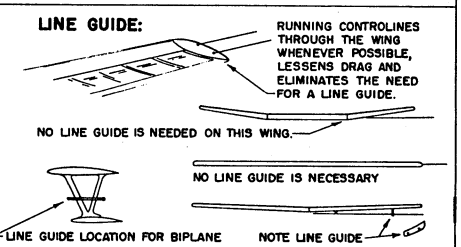


YOUR MODEL IS A POTENTIAL WRECK, IF ITS BELLCRANK IS NOT RIGIDLY MOUNTED.

IF YOUR BELLCRANK IS ATTACHED TO ANYTHING BUT THE MOUNTS, IT MAY SUDDENLY TEAR OUT.

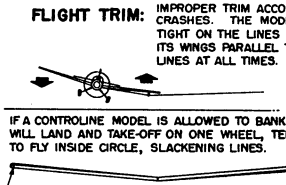
SCREW PLYWOOD BELLCRANK MOUNT TO MOTOR MOUNTS.

LINE GUIDE:



FLIGHT TRIM:

IMPROPER TRIM ACCOUNTS FOR MANY CRASHES. THE MODEL MUST HOLD TIGHT ON THE LINES AND FLY WITH ITS WINGS PARALLEL TO THE CONTROLINES AT ALL TIMES.



IF A CONTROLINE MODEL IS ALLOWED TO BANK, IT WILL LAND AND TAKE-OFF ON ONE WHEEL, TEND TO FLY INSIDE CIRCLE, SLACKENING LINES.

BANKING MAY BE TRIMMED BY WARPING THE TRAILING EDGE OF THE INBOARD PANEL DOWN, (WASH-IN) AND THE TRAILING EDGE OF THE OUTBOARD PANEL UP. (WASH-OUT)

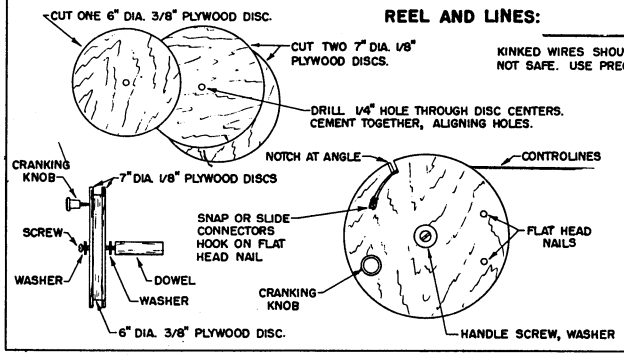
① SLIGHT RIGHT RUDDER
② SWEPTBACK CONTROLINES
③ LEAD WEIGHT IN OUTBOARD TIP
④ RIGHT THRUST WHEN NECESSARY.

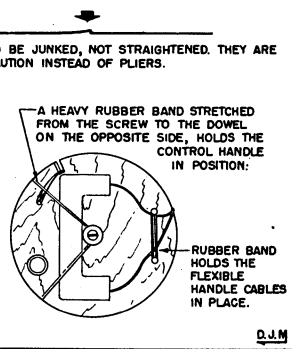
FIXED AILERONS ARE EXCELLENT FOR TRIMMING BANKING TENDENCIES. TACK LIGHTLY WITH CEMENT, UNTIL FINAL ADJUSTMENTS ARE MADE. AILERONS REPLACE WING WARPING METHOD AT LEFT.

ELEVATORS SHOULD BE PROPERLY ALIGNED ON THE CROSS-BAR, TO PREVENT BANKING.

REEL AND LINES:

KINKED WIRES SHOULD BE JUNKED, NOT STRAIGHTENED. THEY ARE NOT SAFE. USE PRECAUTION INSTEAD OF PLIERS.



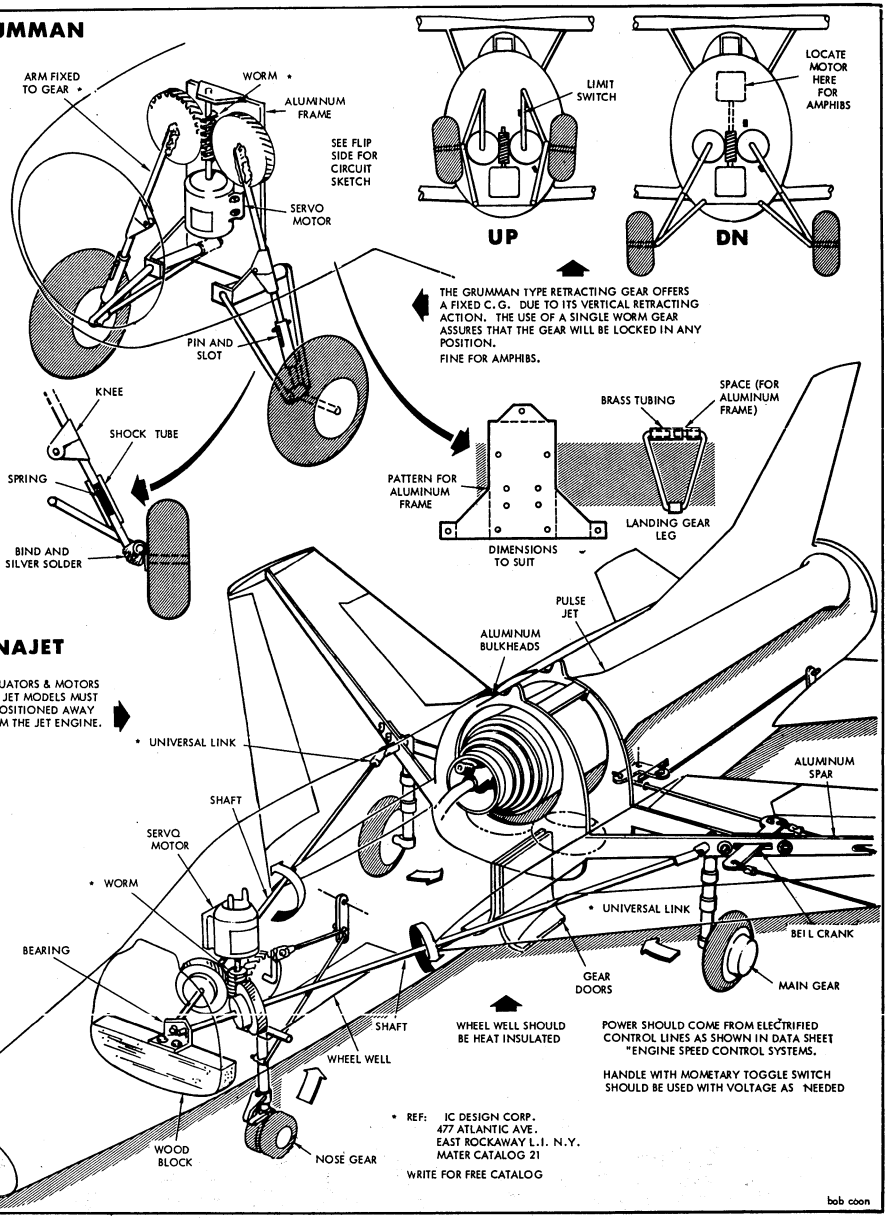


D.J.M

FM DATA SHEETS

RETRACTIBLE LANDING GEAR SYSTEMS

GRUMMAN

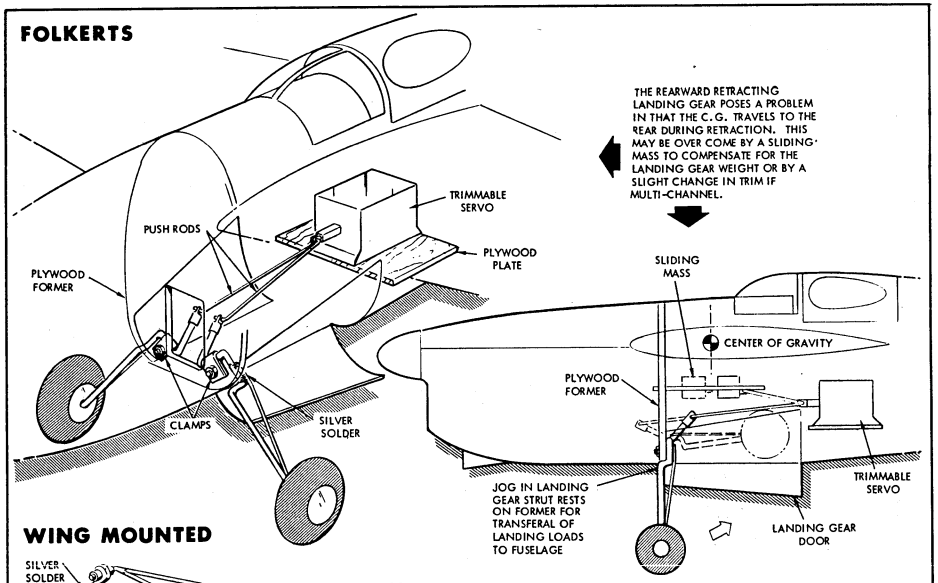


DYNAJET

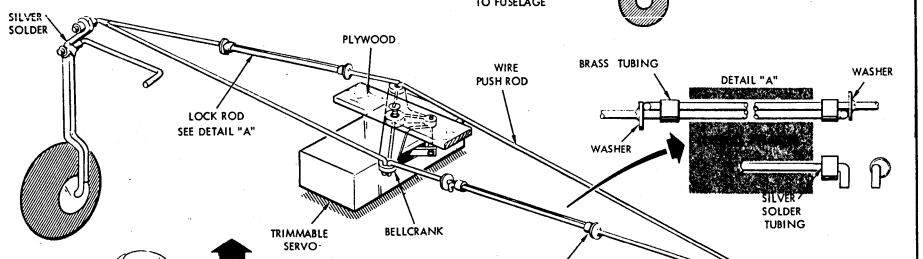
• REF: IC DESIGN CORP.
477 ATLANTIC AVE.
EAST ROCKAWAY L.I. N.Y.
MATER CATALOG 21
WRITE FOR FREE CATALOG

bob coon

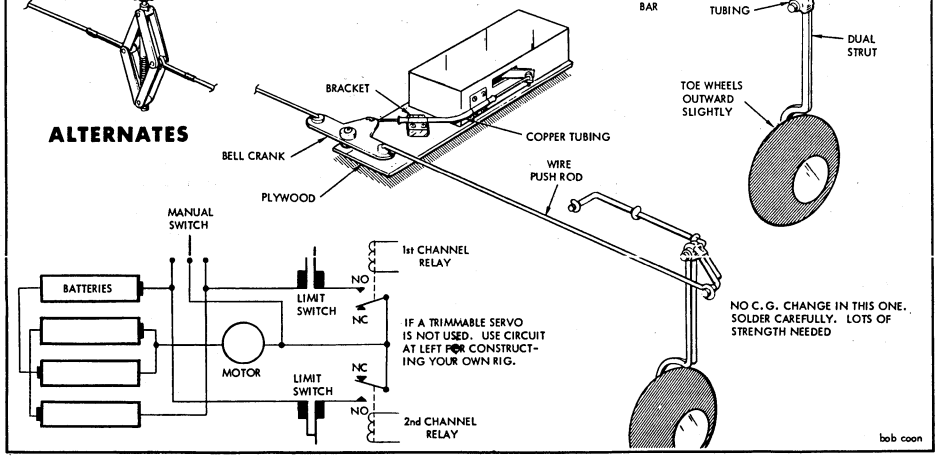
FOLKERTS



WING MOUNTED



ALTERNATES



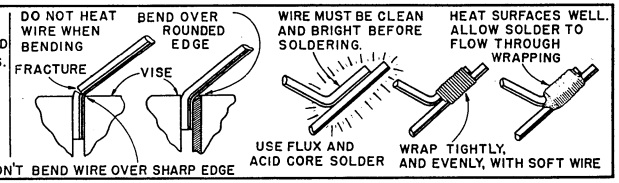
bob coon

FM DATA SHEETS

LANDING GEARS AND SYSTEMS

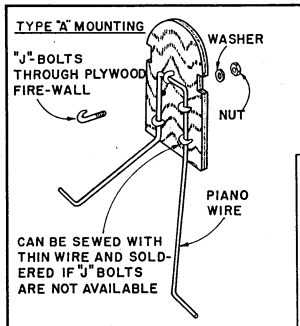
BASIC INFORMATION

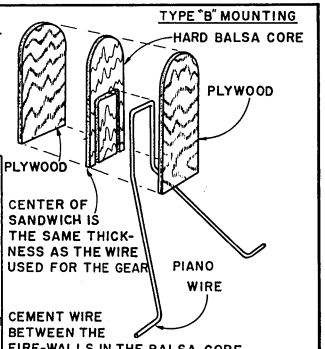
PIANO WIRE IS THE MOST WIDELY USED MATERIAL FOR LANDING-GEAR STRUTS. THIS IS TRUE FOR BOTH FREE-FLIGHT AND CONTROL-LINE MODELS. IT CAN BE OBTAINED AT HOBBY SHOPS IN SIZES UP TO 1/8" IN DIAMETER.



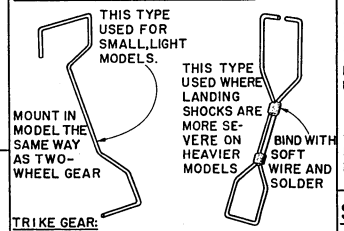
TWO-WHEEL LANDING GEAR

THE STANDARD TWO-WHEEL GEAR IS BY FAR THE MOST POPULAR IN USE TODAY. THIS TYPE GEAR MAY BE USED ON ALMOST ALL KINDS OF MODEL PLANES, USING FIRE-WALL OR FORMER CONSTRUCTION. IT CAN BE MOUNTED EITHER BY METHOD "A" OR "B"



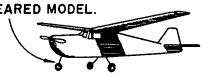


SINGLE-WHEEL GEAR

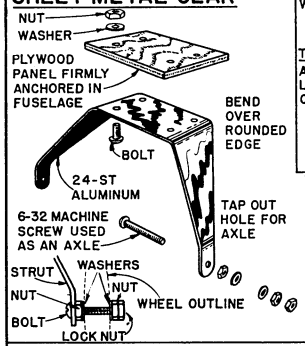


TRIKE GEAR:

A COMBINATION OF THE SINGLE AND DOUBLE LANDING GEARS MAY BE USED TO BUILD A TRICYCLE-GEARED MODEL.

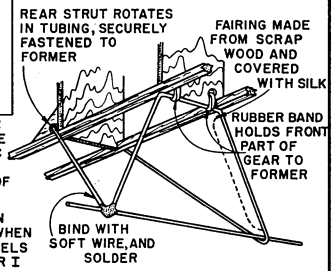


SHEET-METAL GEAR



THE 24-ST SHEET ALUMINUM LANDING GEAR IS USED ON TEAM RACERS, SPORT AND SOME STUNT MODELS. WHILE IT ADDS TO THE LOOKS OF THE MODEL, THIS GEAR DOES NOT STAND UP UNDER HARD CONTINUOUS USAGE.

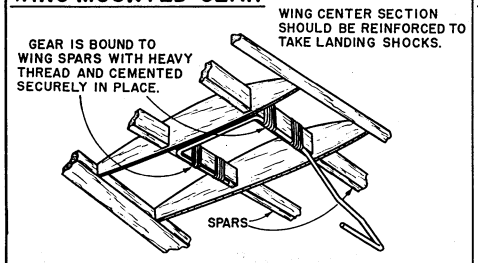
SHOCK-ABSORBING GEAR



THIS TYPE OF GEAR IS USED TO MINIMIZE LANDING SHOCK. R/C MODELS MAY USE A HEAVIER VERSION OF THIS SYSTEM.

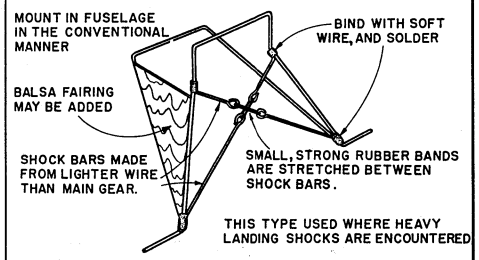
THIS GEAR IS OFTEN RIGIDLY MOUNTED WHEN USED IN SCALE MODELS OF THE WORLD WAR I TYPE.

WING-MOUNTED GEAR



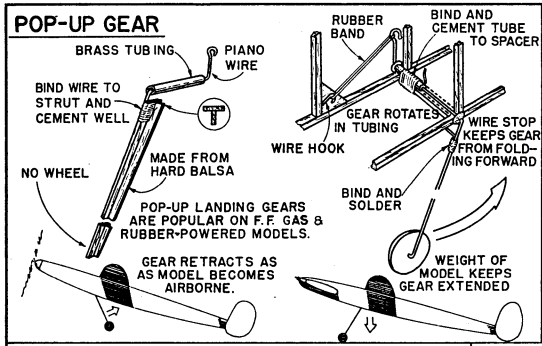
THIS TYPE OF GEAR MAY BE USED ON FLYING SCALE, STUNT AND SPORT MODELS.

SCALE LANDING GEAR

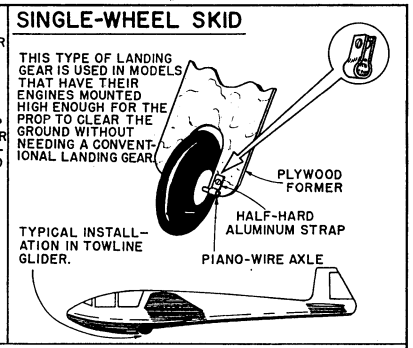


BY-HAROLD STEVENSON

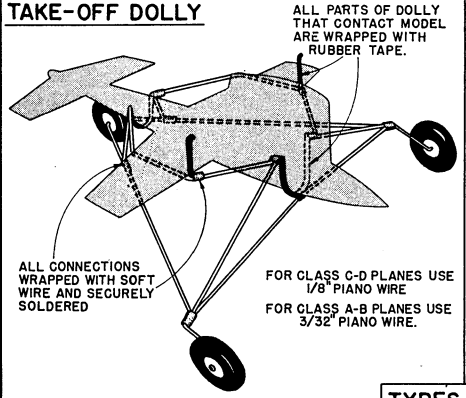
POP-UP GEAR



SINGLE-WHEEL SKID

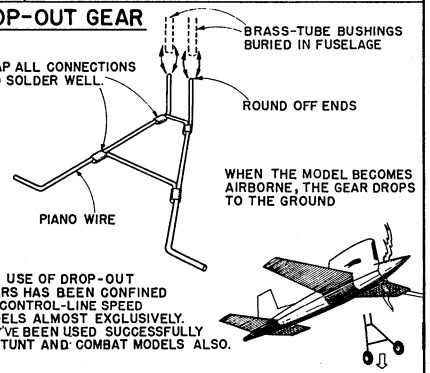


TAKE-OFF DOLLY



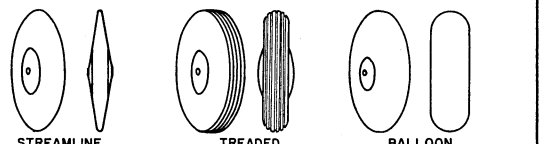
THE TAKE-OFF DOLLY SHOULD HAVE A LOW CENTER OF GRAVITY AND SHOULD SUPPORT THE MODEL EVENLY UNDER THE FUSELAGE AND THE WINGS. IT SHOULD TRACK OR SLIGHTLY TURN OUT FROM THE CIRCLE. CARE SHOULD BE TAKEN IN SOLDERING ALL THE CONNECTIONS, AS THE DOLLY IS SUBJECTED TO SEVERE STRESS IN OPERATION—ESPECIALLY ON ROUGH FIELDS. THE DOLLY SHOULD BE PAINTED WITH A GOOD FUEL-PROOF DOPE OR ENAMEL TO PREVENT RUST AND CORROSION. THE WHEELS SHOULD BE KEPT WELL OILED AT ALL TIMES.

DROP-OUT GEAR

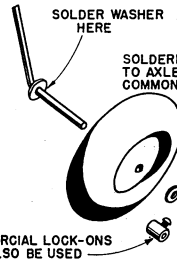


THE USE OF DROP-OUT GEARS HAS BEEN CONFINED TO CONTROL-LINE SPEED MODELS ALMOST EXCLUSIVELY. THEY'VE BEEN USED SUCCESSFULLY IN STUNT AND COMBAT MODELS ALSO.

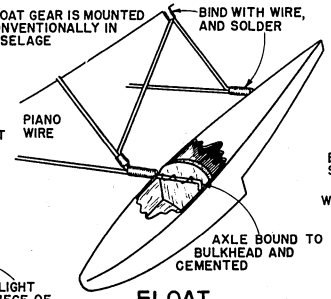
TYPES OF RUBBER-TIRED WHEELS



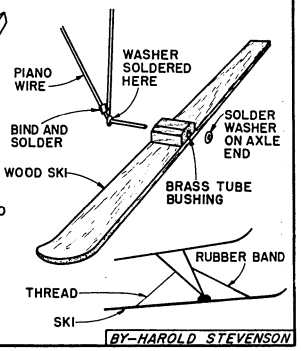
WHEEL ATTACHMENT



FLOAT ATTACHMENT



SKI ATTACHMENT

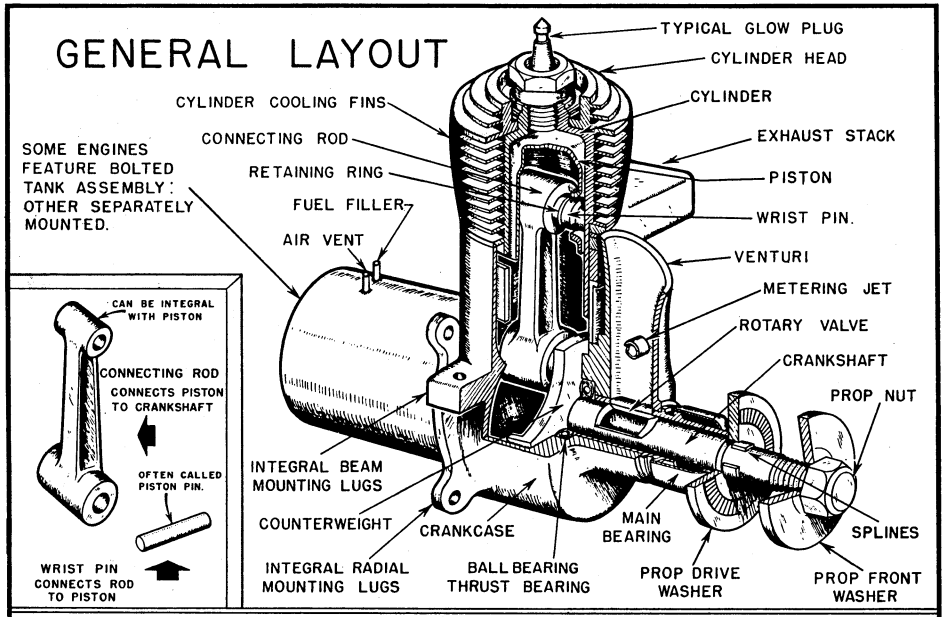


BY-HAROLD STEVENSON

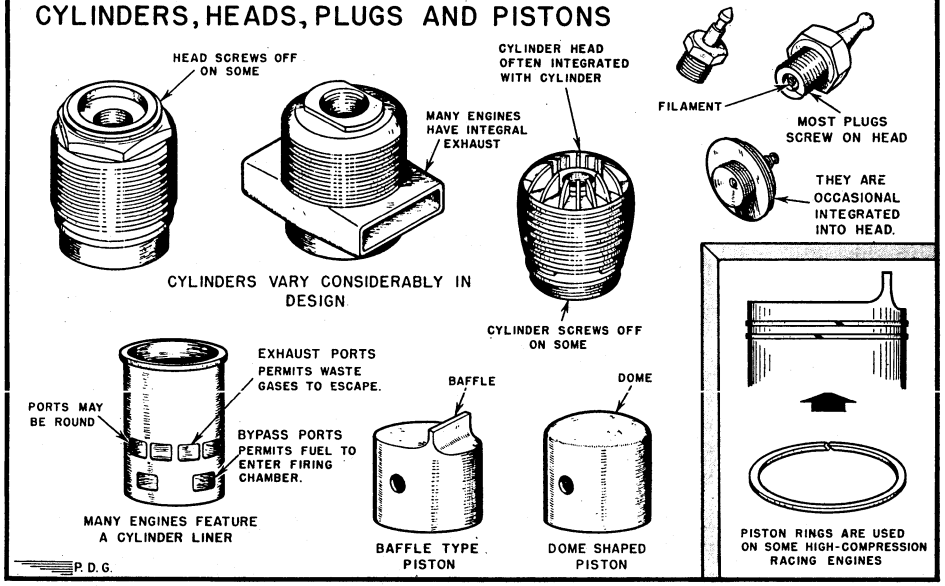
FM DATA SHEETS

ENGINE NOMENCLATURE

GENERAL LAYOUT



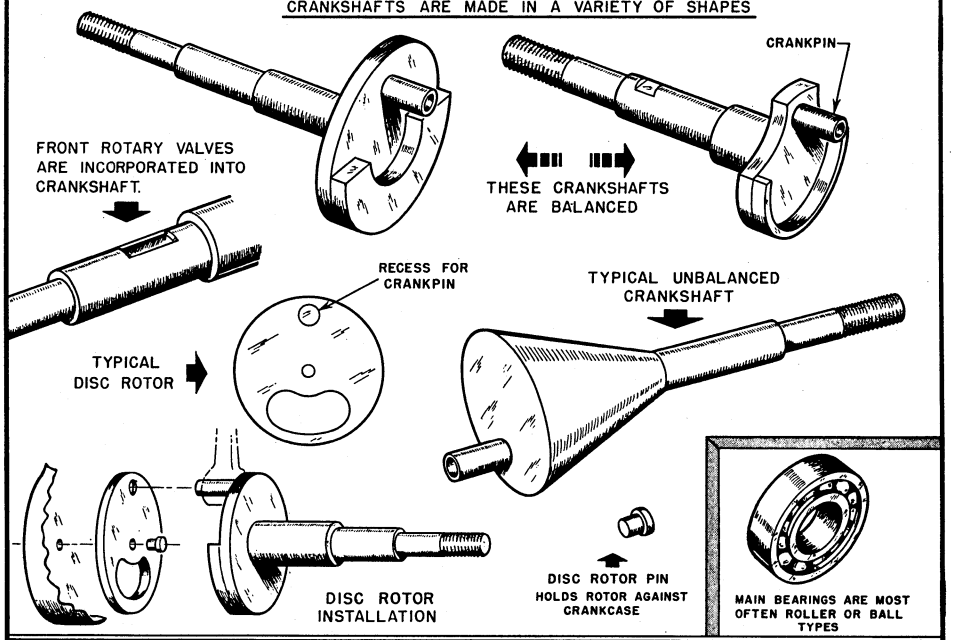
CYLINDERS, HEADS, PLUGS AND PISTONS



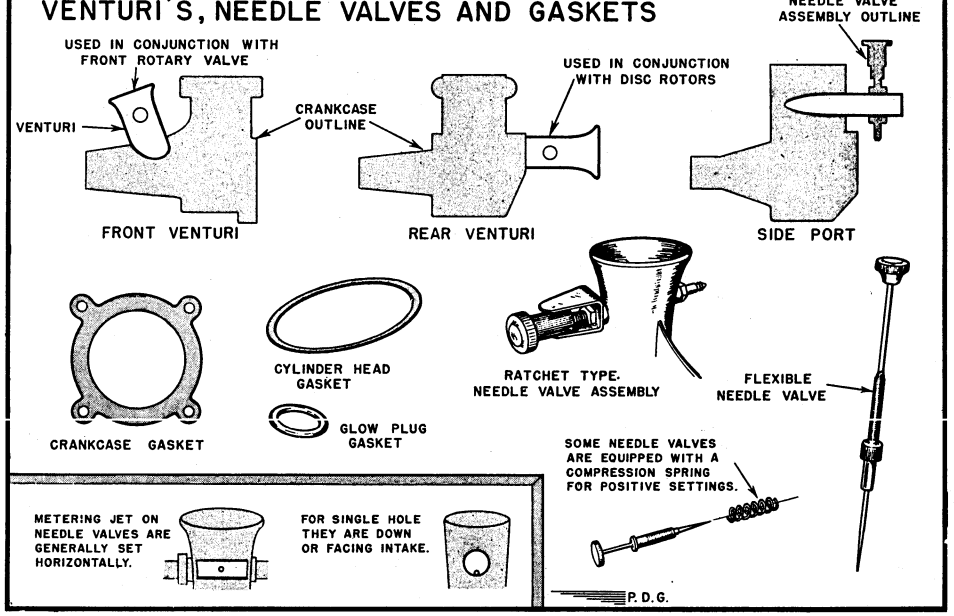
P. D. G.

CRANKSHAFTS AND VALVING

CRANKSHAFTS ARE MADE IN A VARIETY OF SHAPES



VENTURI'S, NEEDLE VALVES AND GASKETS



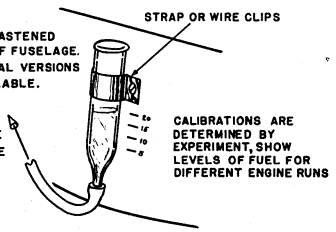
P. D. G.

FM DATA SHEETS

FUEL TANKS AND SYSTEMS

FREE-FLIGHT

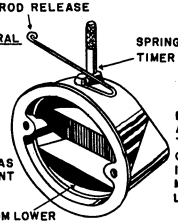
EYEDROPPER TANK



TANK IS FASTENED TO SIDE OF FUSELAGE. COMMERCIAL VERSIONS ARE AVAILABLE.

CALIBRATIONS ARE DETERMINED BY EXPERIMENT, SHOW LEVELS OF FUEL FOR DIFFERENT ENGINE RUNS

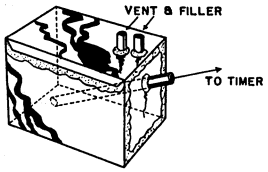
HOLLAND INTERGRAL TIMER TANK



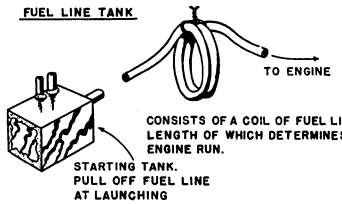
ENGINE IS STARTED AND ADJUSTED USING FULL TANK CAPACITY. RELEASE OF TIMER ROD AT LAUNCHING ALLOWS A PREDETERMINED ENGINE RUN FROM LOWER FUEL CELL.

STANDARD TYPE F-F TANK

AVAILABLE COMMERCIALLY IN MANY SIZES. ALSO HOMEMADE FROM TIN-CAN STOCK



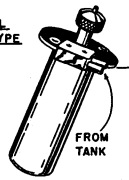
FUEL LINE TANK



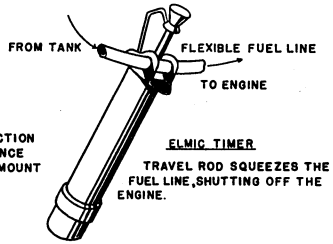
CONSISTS OF A COIL OF FUEL LINE, THE LENGTH OF WHICH DETERMINES THE ENGINE RUN.

TIMERS TO LIMIT ENGINE RUNS

TIMER-FUEL CUT-OFF TYPE



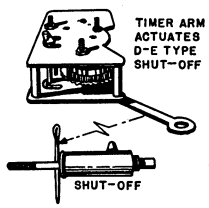
TURNING THE KNOB GIVES A WIDE SELECTION OF ENGINE RUNS, SINCE IT CONTROLS THE AMOUNT OF AIR RELEASED.



ELMIC TIMER

TRAVEL ROD SQUEEZES THE FUEL LINE, SHUTTING OFF THE ENGINE.

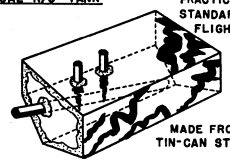
CLOCKWORKS TIMER



TANKS AND ACCESSORIES MAY BE BOUGHT TO FIT YOUR MODEL

RADIO-CONTROL

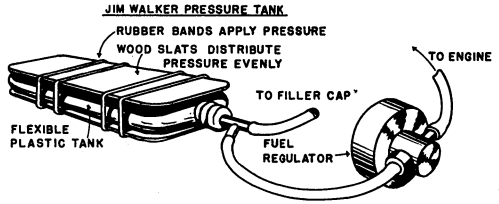
TYPICAL R/C TANK



THIS TANK IS PRACTICALLY A STANDARD FREE FLIGHT DESIGN

VEE BOTTOM IS FOR LAST DROP CONSUMPTION

JIM WALKER PRESSURE TANK



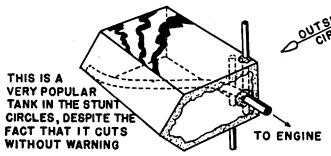
WALKER TANK ALSO USED IN MANY OTHER CLASSES OF MODELS

A VARIATION OF THE "CLANK TANK" IS ALSO USED IN R/C (SEE STUNT TANKS)

BY- HAROLD STEVENSON

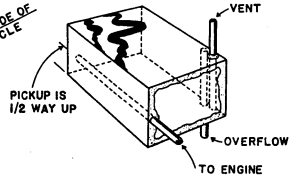
CONTROL-LINE STUNT, SPORT & FLYING SCALE

TYPICAL "WEDGE" TANK

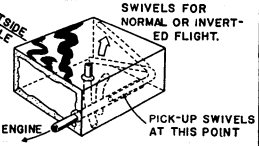


THIS IS A VERY POPULAR TANK IN THE STUNT CIRCLES, DESPITE THE FACT THAT IT CUTS WITHOUT WARNING

SQUARE TYPE ONE OF THE BEST STUNT TANKS IN USE TODAY



"CLANK TANK"



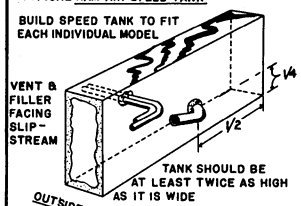
THIS TANK IS ALSO USED FOR AEROBATICS IN RADIO CONTROL F-F MODELS

STUNT TANKS MAY BE PURCHASED IN A VARIETY OF SHAPES & SIZES TO FIT YOUR MODELS

SPEED

TYPICAL RAM-AIR SPEED TANK

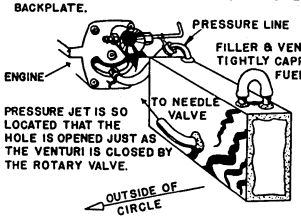
BUILD SPEED TANK TO FIT EACH INDIVIDUAL MODEL



MAKE FROM TIN-CAN STOCK, WELL SOLDERED

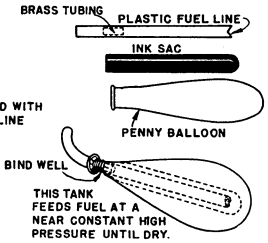
TRUE PRESSURE TANK

AIR PRESSURE IS BLED FROM CRANKCASE THROUGH A #60 HOLE DRILLED IN A 4-40 FLAT HEAD MACHINE SCREW TAPPED IN ENGINE BACKPLATE.



PRESSURE JET IS SO LOCATED THAT THE HOLE IS OPENED JUST AS THE VENTURI IS CLOSED BY THE ROTARY VALVE.

PEN-BLADDER PRESSURE TANK

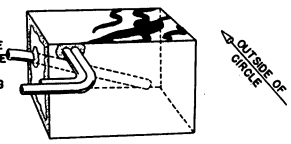


THIS TANK FEEDS FUEL AT A NEAR CONSTANT HIGH PRESSURE UNTIL DRY.

AN ELECTRIC STARTER SHOULD BE USED.

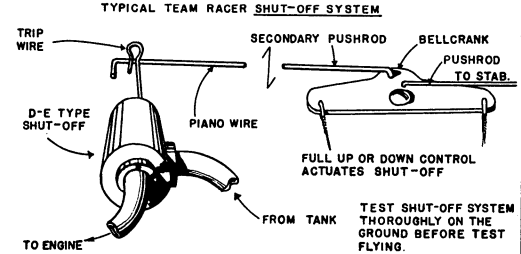
TEAM RACING

LENGTH X WIDTH X DEPTH MUST = NO MORE THAN 1.80 CU. IN.



NO MORE THAN ONE OUNCE OF FUEL IS ALLOWED IN THE ENTIRE FUEL SYSTEM

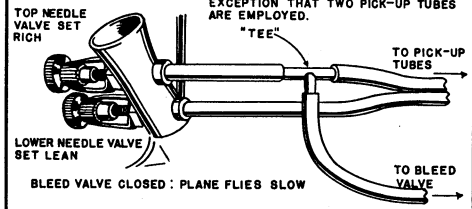
TYPICAL TEAM RACER SHUT-OFF SYSTEM



TEST SHUT-OFF SYSTEM THOROUGHLY ON THE GROUND BEFORE TEST FLYING.

NAVY CARRIER EVENT

TWO-SPEED, TWO NEEDLE-VALVE SET-UP



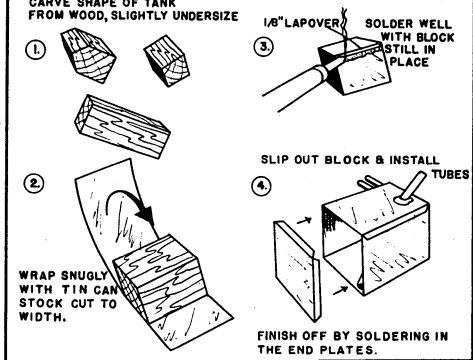
BLEED VALVE CLOSED : PLANE FLIES SLOW

BLEED VALVE OPEN : PLANE FLIES FAST

LOCAL HOBBY DEALERS CARRY PARTS FOR TWO-SPEED HOOK-UPS. THIS SYSTEM IS IDEAL FOR SMALL MODELS WHERE SPACE IS AT A PREMIUM.

TANK CONSTRUCTION

CARVE SHAPE OF TANK FROM WOOD, SLIGHTLY UNDERSIZE



FINISH OFF BY SOLDERING IN THE END PLATES.

BY- HAROLD STEVENSON

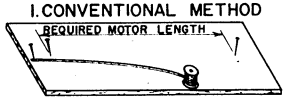
FM DATA SHEETS

POWERING YOUR MODEL

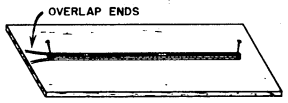
RUBBER MOTORS

METHODS OF PREPARATION

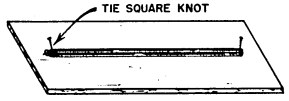
1. CONVENTIONAL METHOD



STEP ONE: MEASURE OUT REQUIRED MOTOR LENGTH AND FASTEN PINS AT EACH END POINT OF REQUIRED LENGTH.

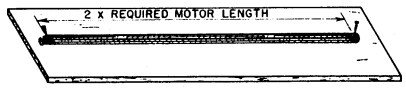


STEP TWO: LAY OUT REQUIRED NUMBER OF STRANDS AROUND THE PIN MARKERS WITH AT LEAST TWO INCHES OVERLAP AT EACH END.

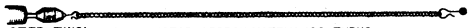


STEP THREE: TAKE BOTH ENDS AND TIE A SQUARE KNOT TO COMPLETE MOTOR.

2. "ROPE" TENSIONER METHOD



STEP ONE: PREPARE MOTOR TWICE THE REQUIRED LENGTH USING THE CONVENTIONAL METHOD.



STEP TWO: PREWIND MOTOR APPROXIMATELY 100 TURNS.

STEP THREE: HOLDING BOTH ENDS LET MOTOR ENTWINE.

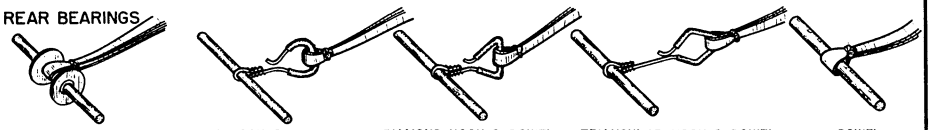
STEP FOUR: BIND ENDS WITH RUBBER TO COMPLETE MOTOR.

TYPICAL MOTOR BEARINGS

FRONT BEARINGS

HOOK & BOBBIN | W-HOOK | ROUND HOOK | TRIANGULAR HOOK | DIAMOND HOOK

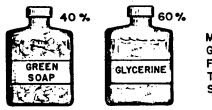
REAR BEARINGS



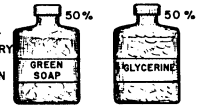
DOWEL & BOBBIN | ROUND HOOK & DOWEL | DIAMOND HOOK & DOWEL | TRIANGULAR HOOK & DOWEL | DOWEL

RUBBER LUBRICANTS

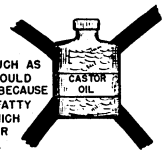
WARM WEATHER: MIX SIX PARTS OF GLYCERINE TO EVERY FOUR PARTS OF TINCTURE OF GREEN SOAP.



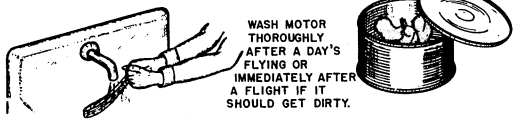
COLD WEATHER: MIX FIVE PARTS OF GLYCERINE TO EVERY FIVE PARTS OF TINCTURE OF GREEN SOAP.



AVOID: LUBRICANTS SUCH AS CASTOR OIL SHOULD NOT BE USED BECAUSE THEY CONTAIN FATTY MOLECULES WHICH HASTEN RUBBER DETERIORATION.

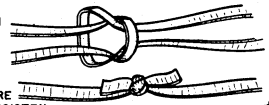


CARE AND STORAGE



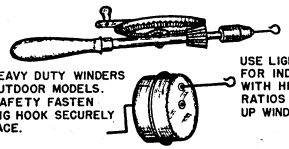
WASH MOTOR THOROUGHLY AFTER A DAY'S FLYING OR IMMEDIATELY AFTER A FLIGHT IF IT SHOULD GET DIRTY.

WRAP RUBBER MOTORS LOOSELY IN SOFT CLOTH AND PLACE IN LARGE JAR OR METAL CONTAINER.



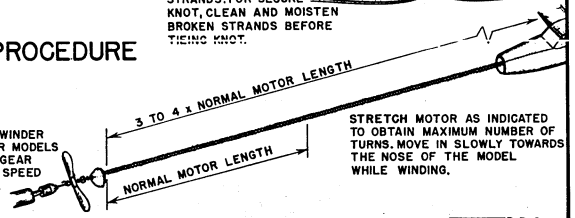
SQUARE KNOT BEST FOR TIEING BROKEN STRANDS. FOR SECURE KNOT, CLEAN AND MOISTEN BROKEN STRANDS BEFORE TIEING KNOT.

WINDING EQUIPMENT AND PROCEDURE



USE HEAVY DUTY WINDERS FOR OUTDOOR MODELS. FOR SAFETY FASTEN WINDING HOOK SECURELY IN PLACE.

USE LIGHT WINDER FOR INDOOR MODELS WITH HIGH GEAR RATIOS TO SPEED UP WINDING.



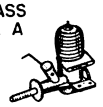
STRETCH MOTOR AS INDICATED TO OBTAIN MAXIMUM NUMBER OF TURNS. MOVE IN SLOWLY TOWARDS THE NOSE OF THE MODEL WHILE WINDING.

P.D.G.

GLOW-PLUG GAS ENGINES

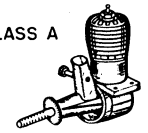
SIZES AVAILABLE

CLASS 1/2 A



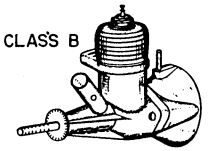
.000 TO .050 CU. IN. DISPLACEMENT

CLASS A



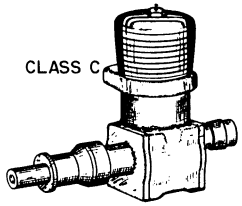
.051 TO .200 CU. IN. DISPLACEMENT

CLASS B



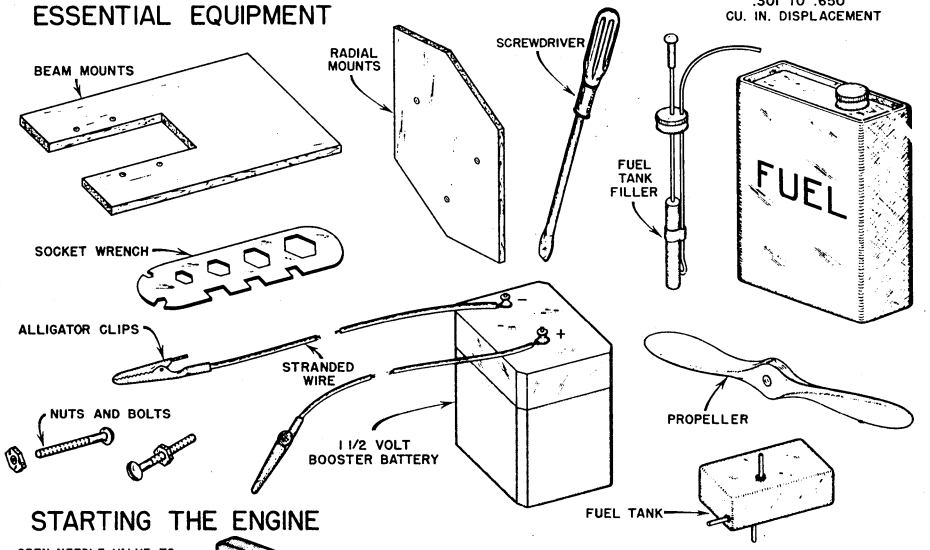
.201 TO .300 CU. IN. DISPLACEMENT

CLASS C



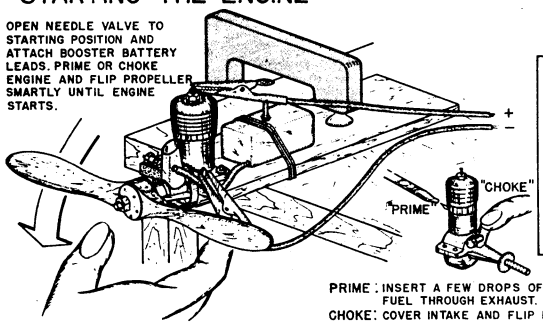
.301 TO .650 CU. IN. DISPLACEMENT

ESSENTIAL EQUIPMENT



STARTING THE ENGINE

OPEN NEEDLE VALVE TO STARTING POSITION AND ATTACH BOOSTER BATTERY LEADS. PRIME OR CHOKE ENGINE AND FLIP PROPELLER SMARTLY UNTIL ENGINE STARTS.



PRIME: INSERT A FEW DROPS OF FUEL THROUGH EXHAUST.

CHOKE: COVER INTAKE AND FLIP PROP.

ENGINE TROUBLE CHECKLIST

A. WEAK BATTERIES: MOMENTARILY CROSS WIRE LEADS AND CHECK FOR SPARK.

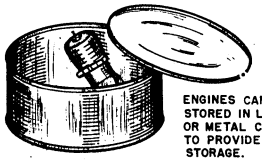
B. DEFECTIVE GLOW PLUG: REMOVE PLUG AND TEST FOR GLOW WITH WIRE LEADS CONNECTED.

C. POOR FUEL MIXTURE: ALWAYS USE FRESH CLEAN MIXTURE RECOMMENDED BY MANUFACTURER.

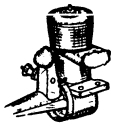
D. IMPROPER NEEDLE VALVE SETTING: FUEL MIXTURE IS EITHER TOO RICH OR TOO LEAN.

E. POOR CONNECTIONS: CHECK FOR BROKEN WIRES OR FRAYED STRANDS.

CARE AND STORAGE



ENGINES CAN BE STORED IN LARGE JARS OR METAL CONTAINERS TO PROVIDE DUSTPROOF STORAGE.



STUFF CLOTHS INTO ENGINE INTAKE AND EXHAUST TO PROTECT FROM GRIT AND DUST.

FOR EXPERIENCED MODEL BUILDERS

TO CLEAN ENGINE: DISASSEMBLE COMPLETELY AND PLACE PARTS IN PURE GAS IN CONTAINER. ALLOW SEVERAL HOURS FOR GAS TO PENETRATE AND LOOSEN SCUM AND DIRT WHICH MAY HAVE ACCUMULATED. WIPE PARTS CLEAN WITH A SOFT CLOTH BEING CAREFUL NOT TO SCORE ENGINE PARTS, PARTICULARLY THE INTERNAL UNITS SUCH AS, PISTON AND INSIDE OF CYLINDER WALL.

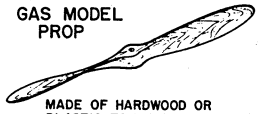
P.D.G.

FM DATA SHEETS

PROPELLER INFORMATION

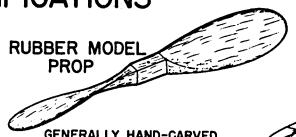
PROPELLER CLASSIFICATIONS

GAS MODEL PROP



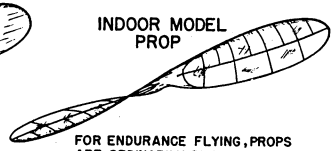
MADE OF HARDWOOD OR PLASTIC TO WITHSTAND THE HIGH REVOLUTIONS OF AN ENGINE. AVAILABLE READY FOR USE.

RUBBER MODEL PROP



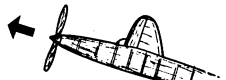
GENERALLY HAND-CARVED FROM BALSA. FOR SPORT FLYING, LIGHTWEIGHT HARDWOOD OR PLASTIC PROPS ARE AVAILABLE IN FINISHED FORM.

INDOOR MODEL PROP

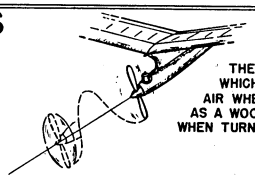


FOR ENDURANCE FLYING, PROPS ARE ORDINARILY BUILT UP FROM STRIP BALSA AND COVERED WITH MICROFILM. LIGHT-WEIGHT ALL BALSA PROPS ARE GENERALLY USED FOR NOVICE OR SPORT FLYING.

PROPELLER FACTS



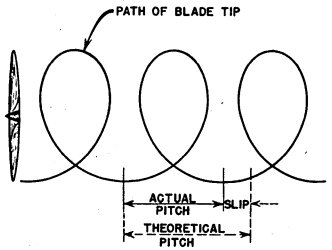
THE PURPOSE OF A PROP IS TO CONVERT THE ENERGY OF THE POWER UNIT INTO FORWARD MOTION. (THRUST)



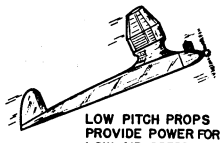
THE PROP IS ACTUALLY AN AIRSCREW WHICH MOVES FORWARD THROUGH THE AIR WHEN ROTATED, IN THE SAME MANNER AS A WOOD SCREW MOVES THROUGH WOOD WHEN TURNED WITH A SCREWDRIVER.

DIAMETER IS THE DISTANCE FROM THE TIP TO TIP OF THE PROP.

THE PROP BLADE IS THE SURFACE WHICH PUSHES OR PULLS THE MODEL THROUGH THE AIR. THIS PROP HAS TWO BLADES.



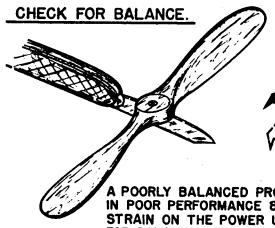
THE DISTANCE A PROP COULD MOVE FORWARD IN ONE REVOLUTION, IF THERE WERE NO RESISTANCE OFFERED BY THE MODEL ("SLIP") IS KNOWN AS THE "THEORETICAL PITCH." THE "ACTUAL PITCH" IS THE TRUE DISTANCE TRAVELED. COMMERCIAL PROPS ARE LISTED ACCORDING TO THEIR THEORETICAL PITCH.



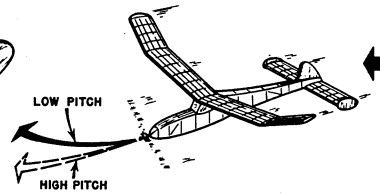
LOW PITCH PROPS PROVIDE POWER FOR LOW AIR SPEEDS.

HIGH PITCH PROPS PROVIDE POWER FOR HIGH AIR SPEEDS.

CHECK FOR BALANCE.

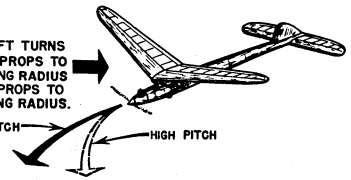


A POORLY BALANCED PROP RESULTS IN POOR PERFORMANCE & PUTS A STRAIN ON THE POWER UNIT. CHECK FOR BALANCE ON A KNIFE EDGE AT CENTER & TRIM HEAVY BLADE, OR ADD FINISH TO LIGHT BLADE, TO OBTAIN PERFECT BALANCE.



FOR NORMAL RIGHT TURNS USE HIGH PITCH TO INCREASE TURNING RADIUS AND LOW PITCH TO DECREASE TURNING RADIUS.

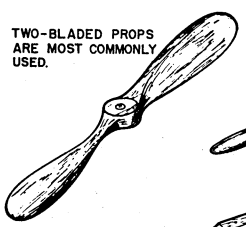
FOR NORMAL LEFT TURNS USE HIGH PITCH PROPS TO DECREASE TURNING RADIUS AND LOW PITCH PROPS TO INCREASE TURNING RADIUS.



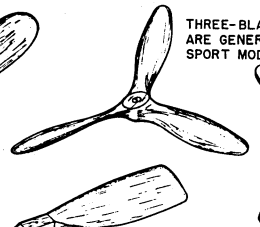
P.D.G.

POPULAR PROPELLER TYPES

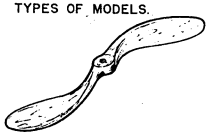
TWO-BLADED PROPS ARE MOST COMMONLY USED.

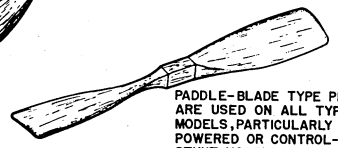


THREE-BLADED & FOUR-BLADED PROPS ARE GENERALLY USED FOR SCALE OR SPORT MODELS.

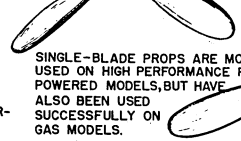


"SCIMITAR"-SHAPED PROPS ARE CONSIDERED VERY EFFICIENT & HAVE BEEN USED ON ALL TYPES OF MODELS.





PADDLE-BLADE TYPE PROPS ARE USED ON ALL TYPES OF MODELS, PARTICULARLY RUBBER-POWERED OR CONTROL-LINE STUNT MODELS.

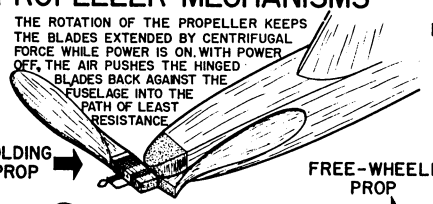


SINGLE-BLADE PROPS ARE MOST OFTEN USED ON HIGH PERFORMANCE RUBBER POWERED MODELS, BUT HAVE ALSO BEEN USED SUCCESSFULLY ON GAS MODELS.

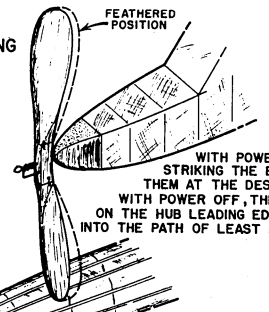
PROPELLER MECHANISMS

THE ROTATION OF THE PROPELLER KEEPS THE BLADES EXTENDED BY CENTRIFUGAL FORCE WHILE POWER IS ON. WITH POWER OFF, THE AIR PUSHES THE HINGED BLADES BACK AGAINST THE FUSELAGE INTO THE PATH OF LEAST RESISTANCE.

FOLDING PROP

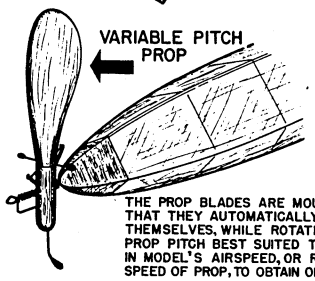


FEATHERING PROP



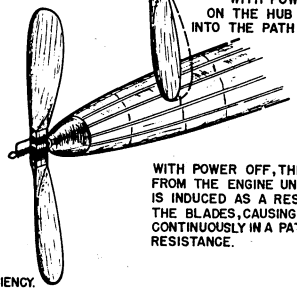
WITH POWER ON, THE AIR STRIKING THE BLADES KEEPS THEM AT THE DESIRED PITCH. WITH POWER OFF, THE BLADES PIVOT ON THE HUB LEADING EDGE SO THEY FACE INTO THE PATH OF LEAST RESISTANCE.

VARIABLE PITCH PROP



THE PROP BLADES ARE MOUNTED SO THAT THEY AUTOMATICALLY ADJUST THEMSELVES, WHILE ROTATING, TO THE PROP PITCH BEST SUITED TO CHANGES IN MODEL'S AIRSPEED, OR ROTATIONAL SPEED OF PROP, TO OBTAIN OPTIMUM EFFICIENCY.

FREE-WHEELING PROP



WITH POWER OFF, THE PROP IS DISENGAGED FROM THE ENGINE UNIT. CONTINUED ROTATION IS INDUCED AS A RESULT OF THE AIR STRIKING THE BLADES, CAUSING THEM TO MOVE CONTINUOUSLY IN A PATH OF LOWERED RESISTANCE.

PROPELLER SELECTION (RECOMMENDED PROP SIZES, IN INCHES, FOR VARIOUS MODELS)

FREE-FLIGHT GAS						CONTROL-LINE					
LOW PITCH		MED. PITCH		HIGH PITCH		LOW PITCH		MED. PITCH		HIGH PITCH	
DIA.	PITCH	DIA.	PITCH	DIA.	PITCH	DIA.	PITCH	DIA.	PITCH	DIA.	PITCH
5	2	5	3	5	4	4	2	4	3	4	4
6	2	6	3	6	4	5	2	5	3	5	5
7	3	7	4	7	5	6	3	6	4	6	6
8	3	8	4	8	5	7	3	7	5	7	7
9	3	9	4	9	6	8	4	8	6	8	8
10	3	10	5	10	6	9	4	9	7	9	9
11	4	11	5	11	7	10	5	10	7	10	10
12	4	12	6	12	8	11	5	11	8	11	11
13	4	13	6	13	9	12	6	12	9	12	12
14	5	14	7	14	10	13	7	13	10	13	13

LIMITED RUBBER						WAKEFIELD					
LOW PITCH		MED. PITCH		HIGH PITCH		LOW PITCH		MED. PITCH		HIGH PITCH	
DIA.	PITCH	DIA.	PITCH	DIA.	PITCH	DIA.	PITCH	DIA.	PITCH	DIA.	PITCH
7	6	7	9	7	13	13	13	13	19	13	26
8	7	8	10	8	14	14	14	14	20	14	28
9	7	9	11	9	15	15	15	15	21	15	30
10	8	10	12	10	17	16	16	16	22	16	32
11	8	11	13	11	19	17	17	17	23	17	34
12	9	12	14	12	21	18	18	18	25	18	36
13	10	13	15	13	23	19	19	19	27	19	38
14	11	14	17	14	25	20	20	20	29	20	40
15	12	15	19	15	27	21	21	21	31	21	42
16	13	16	21	16	29	22	22	22	33	22	44

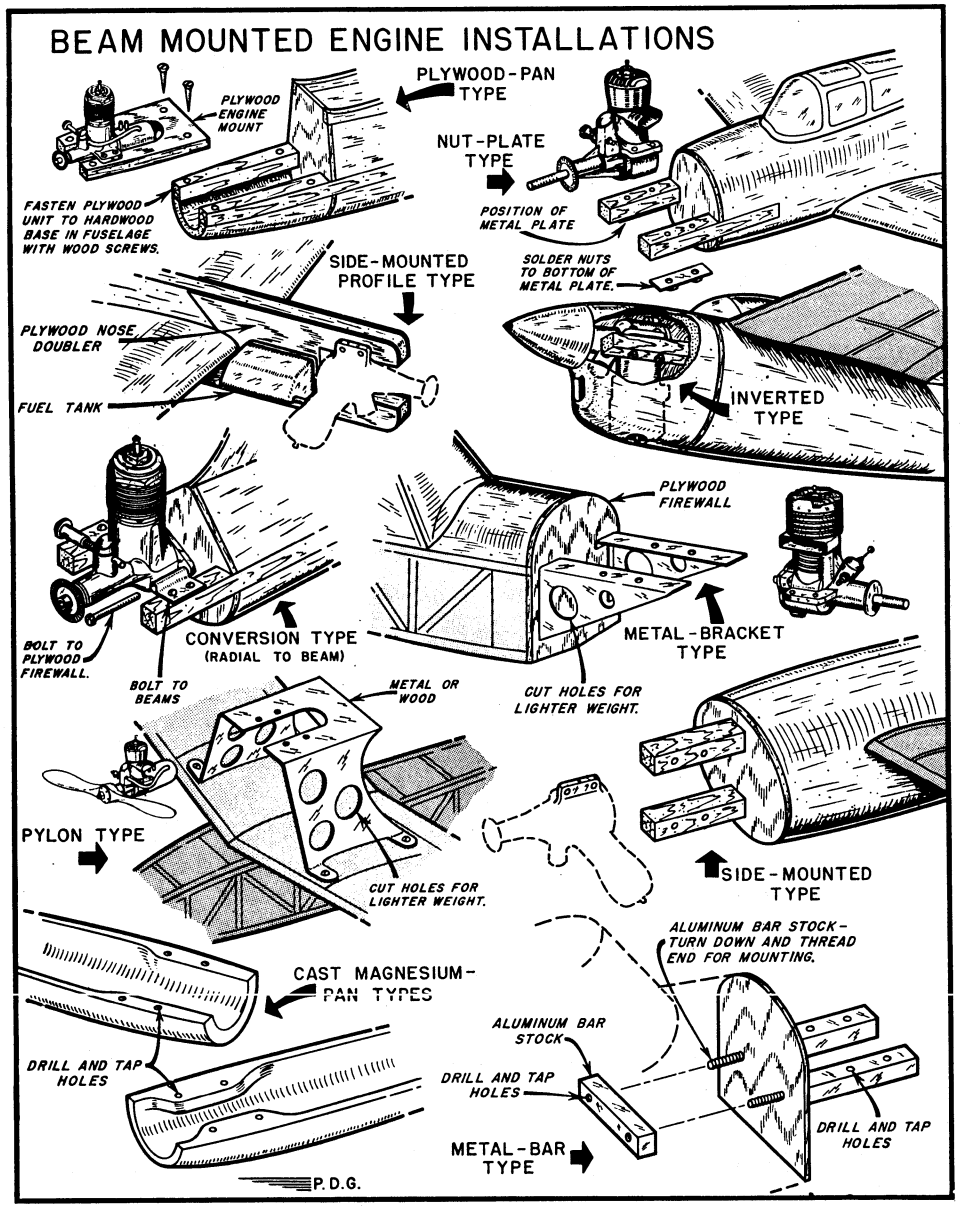
INDOOR STICK						INDOOR CABIN					
LOW PITCH		MED. PITCH		HIGH PITCH		LOW PITCH		MED. PITCH		HIGH PITCH	
DIA.	PITCH	DIA.	PITCH	DIA.	PITCH	DIA.	PITCH	DIA.	PITCH	DIA.	PITCH
11	11	11	16	11	22	9	7	9	12	9	17
12	12	12	18	12	24	10	8	10	13	10	18
13	13	13	19	13	26	11	8	11	14	11	19
14	14	14	21	14	28	12	9	12	15	12	20
15	15	15	22	15	30	13	10	13	16	13	22
16	16	16	24	16	32	14	11	14	18	14	24
17	17	17	25	17	34	15	12	15	19	15	26
18	18	18	27	18	36	16	13	16	20	16	28
19	19	19	28	19	38	17	14	17	22	17	30
20	20	20	30	20	40	18	15	18	23	18	32

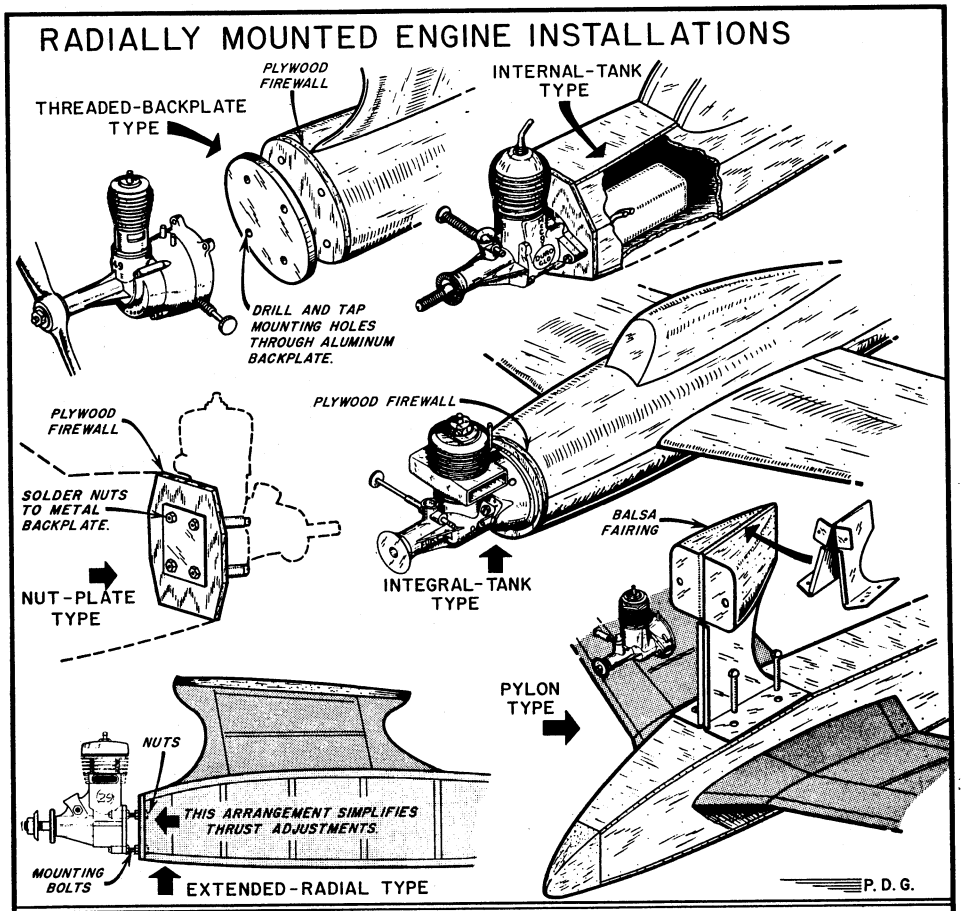
P.D.G.

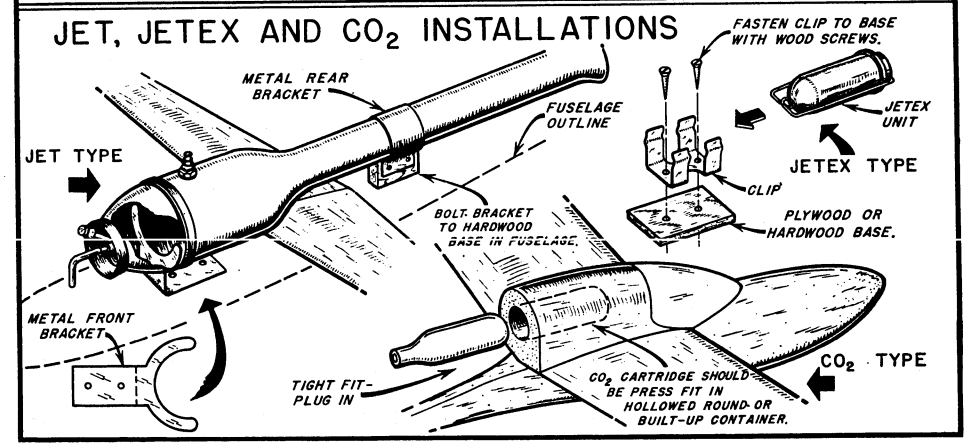
THE PITCH SHOWN IN THESE TABLES IS THE THEORETICAL PITCH!

FM DATA SHEETS

ENGINE MOUNTING







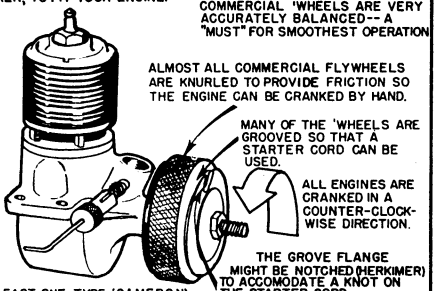
FM MARINE DATA SHEET

INBOARD MARINE INSTALLATIONS

1. FLYWHEELS:

USE THE SIZE RECOMMENDED BY THE FLYWHEEL MANUFACTURER, TO FIT YOUR ENGINE.

THESE ARE WEIGHTS WHICH ARE NECESSARY TO OVERCOME THE STARTING ENERTIA OF THE ENGINE. THEY TEND TO MAINTAIN UNIFORM R.P.M. AND SMOOTH RUNNING. ALL COMMERCIAL 'WHEELS ARE VERY ACCURATELY BALANCED-- A "MUST" FOR SMOOTHEST OPERATION.



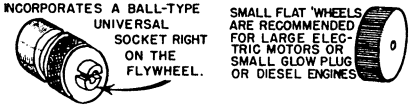
ALMOST ALL COMMERCIAL FLYWHEELS ARE KNURLED TO PROVIDE FRICTION SO THE ENGINE CAN BE CRANKED BY HAND.

MANY OF THE 'WHEELS ARE GROOVED SO THAT A STARTER CORD CAN BE USED.

ALL ENGINES ARE CRANKED IN A COUNTER-CLOCKWISE DIRECTION.

THE GROVE FLANGE MIGHT BE NOTCHED (HERKIMER) TO ACCOMODATE A KNOT ON THE STARTER CORD.

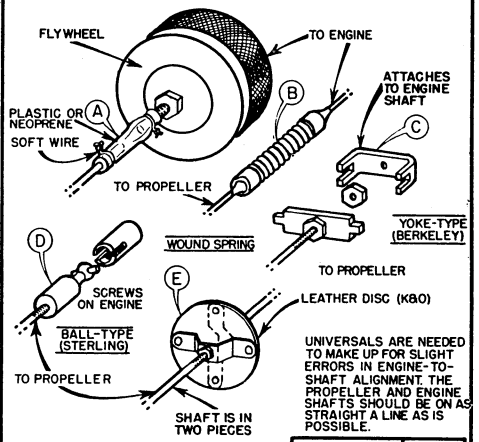
AT LEAST ONE TYPE (CAMERON) INCORPORATES A BALL-TYPE UNIVERSAL SOCKET RIGHT ON THE FLYWHEEL.



SMALL FLAT 'WHEELS ARE RECOMMENDED FOR LARGE ELECTRIC MOTORS OR SMALL GLOW PLUG OR DIESEL ENGINES.

2. UNIVERSALS:

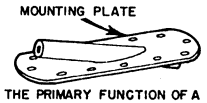
THESE MAY BE PURCHASED, READY TO USE, IN VARIOUS TYPES AND SIZES.



UNIVERSALS ARE NEEDED TO MAKE UP FOR SLIGHT ERRORS IN ENGINE-TO-SHAFT ALIGNMENT. THE PROPELLER AND ENGINE SHAFTS SHOULD BE ON AS STRAIGHT A LINE AS IS POSSIBLE.

ENGINE OR MOTOR	SUGGESTED TYPE
ELECTRIC MOTOR	A,B,C,E
.02 TO .09	A,C,D,E
.09 TO .19	C,D,E
.19 AND OVER	D

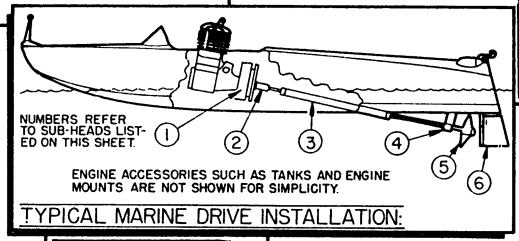
3. STUFFING BOXES:



THE PRIMARY FUNCTION OF A STUFFING BOX IS TO KEEP WATER FROM LEAKING IN WHERE THE PROP SHAFT COMES OUT THE BOTTOM OF THE BOAT.

SOME STUFFING BOXES (CAMERON) REDUCE DRAG THROUGH THE USE OF SMALL BEARINGS. THESE KEEP THE SHAFT FROM TOUCHING THE ENTIRE INNER WALL OF THE STUFFING BOX TUBE.

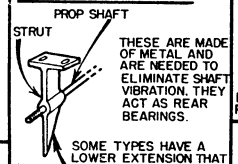
GREASE OR VASALINE PLACED IN THE TUBE MAKES A GOOD WATER SEAL.



ENGINE ACCESSORIES SUCH AS TANKS AND ENGINE MOUNTS ARE NOT SHOWN FOR SIMPLICITY.

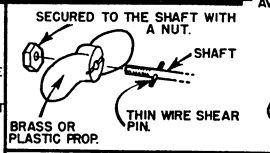
TYPICAL MARINE DRIVE INSTALLATION:

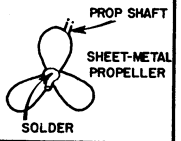
4. REAR STRUTS:



THESE ARE MADE OF METAL AND ARE NEEDED TO ELIMINATE SHAFT VIBRATION. THEY ACT AS REAR BEARINGS.

SOME TYPES HAVE A LOWER EXTENSION THAT ACTS AS A SKID TO PROTECT THE PROP.

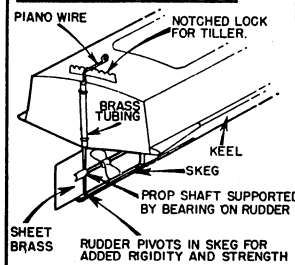




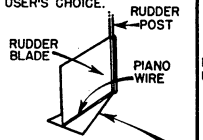
5. PROPELLERS:

THESE ARE AVAILABLE IN MANY TYPES AND SIZES. THE MOST POPULAR ARE 2-BLADED AND ARE STAMPED FROM SHEET METAL. 3-BLADED, CAST BRASS OR PLASTIC PROPS ARE ALSO AVAILABLE.

6. RUDDER SYSTEMS:

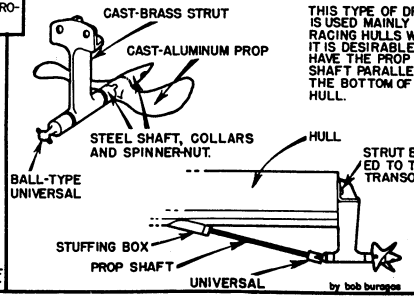


VARIOUS TYPES OF RUDDER BLADES AND POSTS--SOME CHROME PLATED--CAN BE PURCHASED. ACTUAL INSTALLATION IS LEFT TO THE USER'S CHOICE.



TRIANGULAR SHEET METAL FIN TO TRIM PLANING ANGLE

ARTICULATED RACING DRIVE:



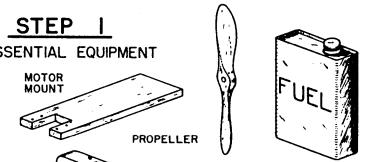
THIS TYPE OF DRIVE IS USED MAINLY ON RACING HULLS WHERE IT IS DESIRABLE TO HAVE THE PROP SHAFT PARALLEL TO THE BOTTOM OF THE HULL.

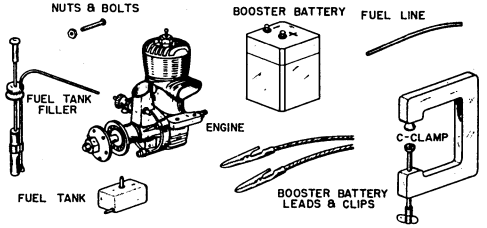
by bob burgess

RUNNING A NEW ENGINE

STEP 1

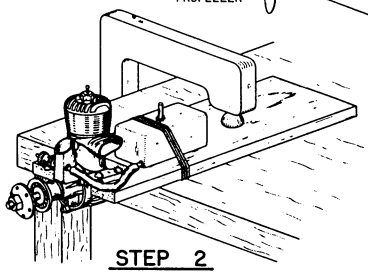
ESSENTIAL EQUIPMENT





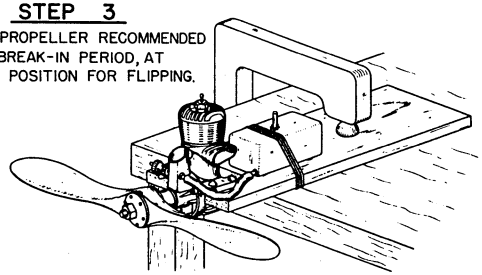
STEP 2

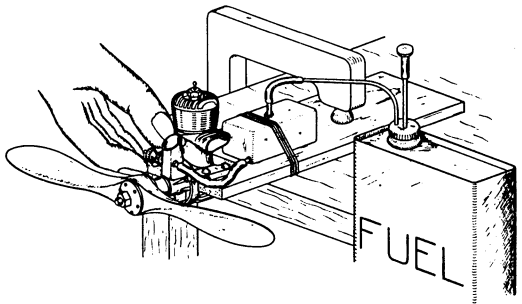
BOLT ENGINE TO MOTOR MOUNT AND SECURE TANK. FASTEN COMPLETED UNIT TO WORKBENCH WITH C-CLAMP.



STEP 3

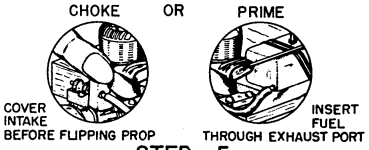
ADD PROPELLER RECOMMENDED FOR BREAK-IN PERIOD, AT BEST POSITION FOR FLIPPING.





STEP 4

FILL FUEL TANK AND OPEN NEEDLE VALVE TO RECOMMENDED POSITION FOR STARTING, ACCORDING TO THE MANUFACTURERS INSTRUCTIONS.

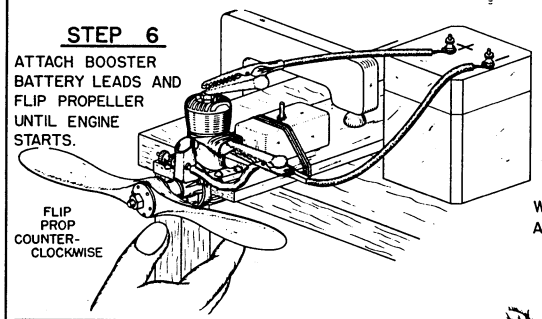


STEP 5

CHOKE OR PRIME ENGINE TO ALLOW EXTRA FUEL INTO THE CYLINDER HEAD FOR STARTING.

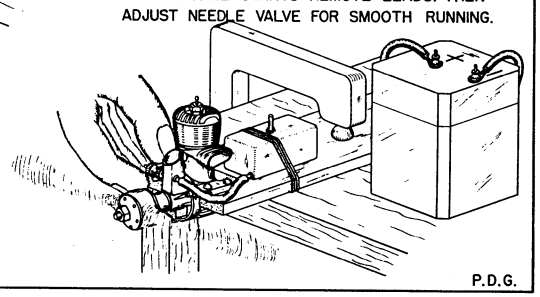
STEP 6

ATTACH BOOSTER BATTERY LEADS AND FLIP PROPELLER UNTIL ENGINE STARTS.



STEP 7

WHEN ENGINE STARTS REMOVE LEADS. THEN ADJUST NEEDLE VALVE FOR SMOOTH RUNNING.



IF ENGINE REFUSES TO RUN CHECK FOR:

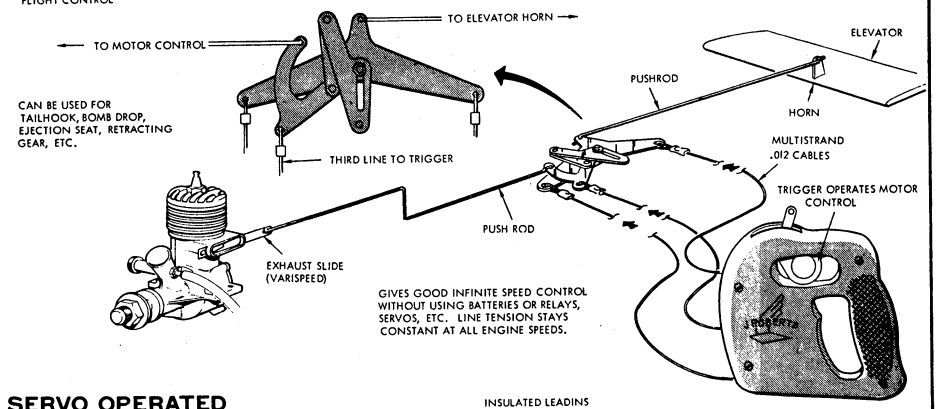
A. WEAK BATTERIES: MOMENTARILY CROSS LINES AND CHECK FOR SPARK.
B. DEFECTIVE GLOW PLUG: REMOVE PLUG AND TEST FOR GLOW WITH LEADS CONNECTED.
C. POOR FUEL MIXTURE: ALWAYS USE FRESH CLEAN MIXTURE RECOMMENDED BY MANUFACTURER.
D. IMPROPER NEEDLE VALVE SETTING: FUEL MIXTURE EITHER TOO RICH OR TOO LEAN.
E. POOR CONNECTIONS: CHECK FOR BROKEN WIRES OR FRAYED STRANDS.

P.D.G.

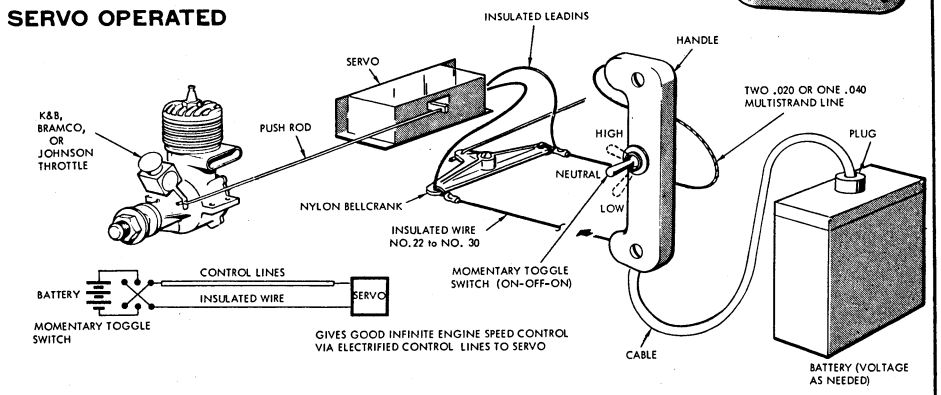
FM DATA SHEETS

ENGINE SPEED CONTROL SYSTEMS:

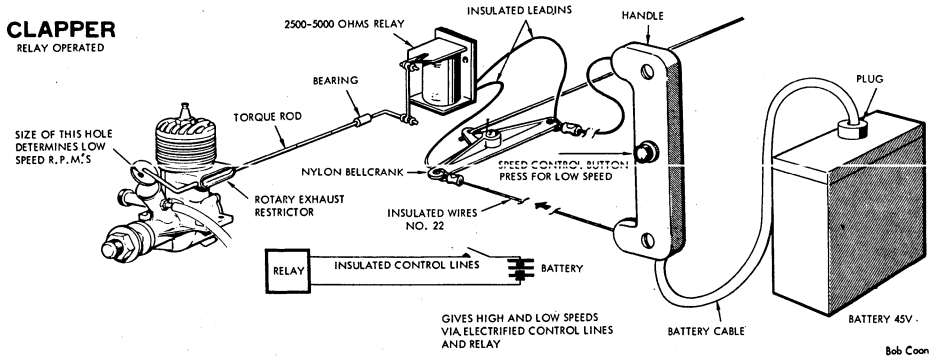
J. ROBERTS
FLIGHT CONTROL



SERVO OPERATED

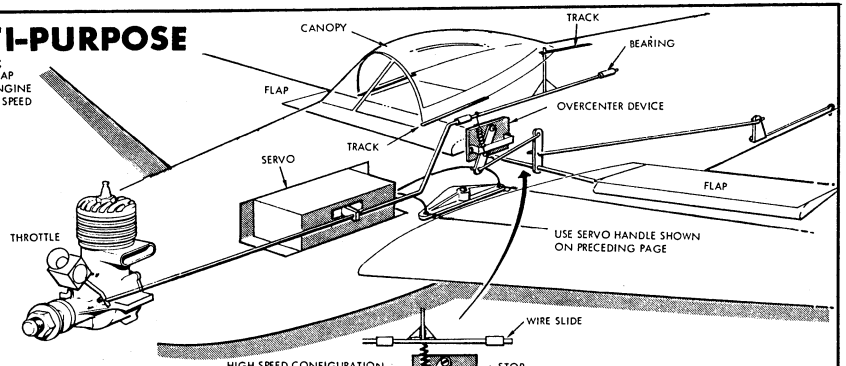


CLAPPER
RELAY OPERATED

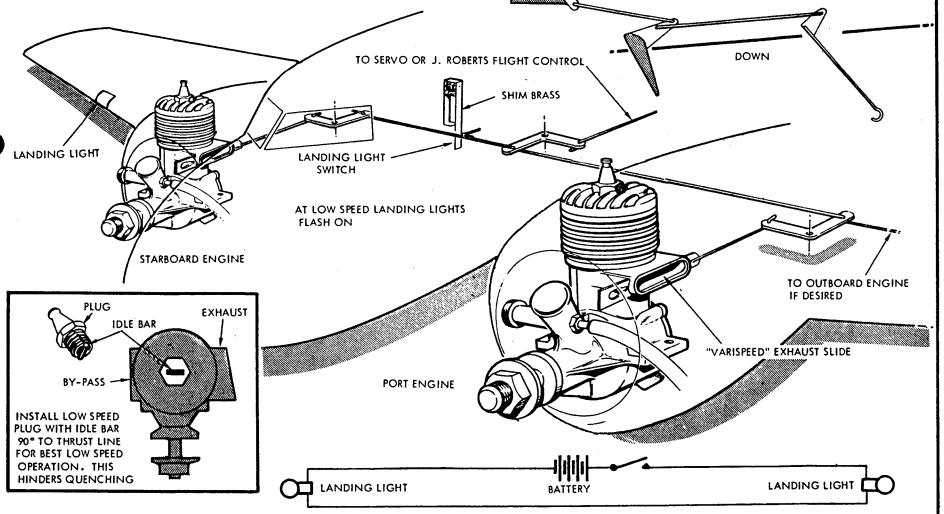


Bob Coon

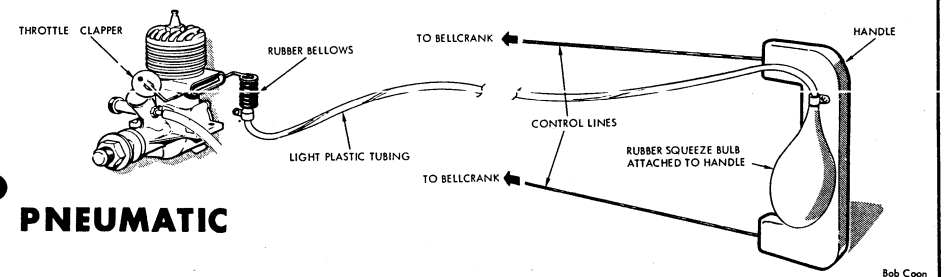
MULTI-PURPOSE
CANOPY OPENS; FLAPS, HOOK SNAP DOWN WHEN ENGINE IS AT FULL LOW SPEED



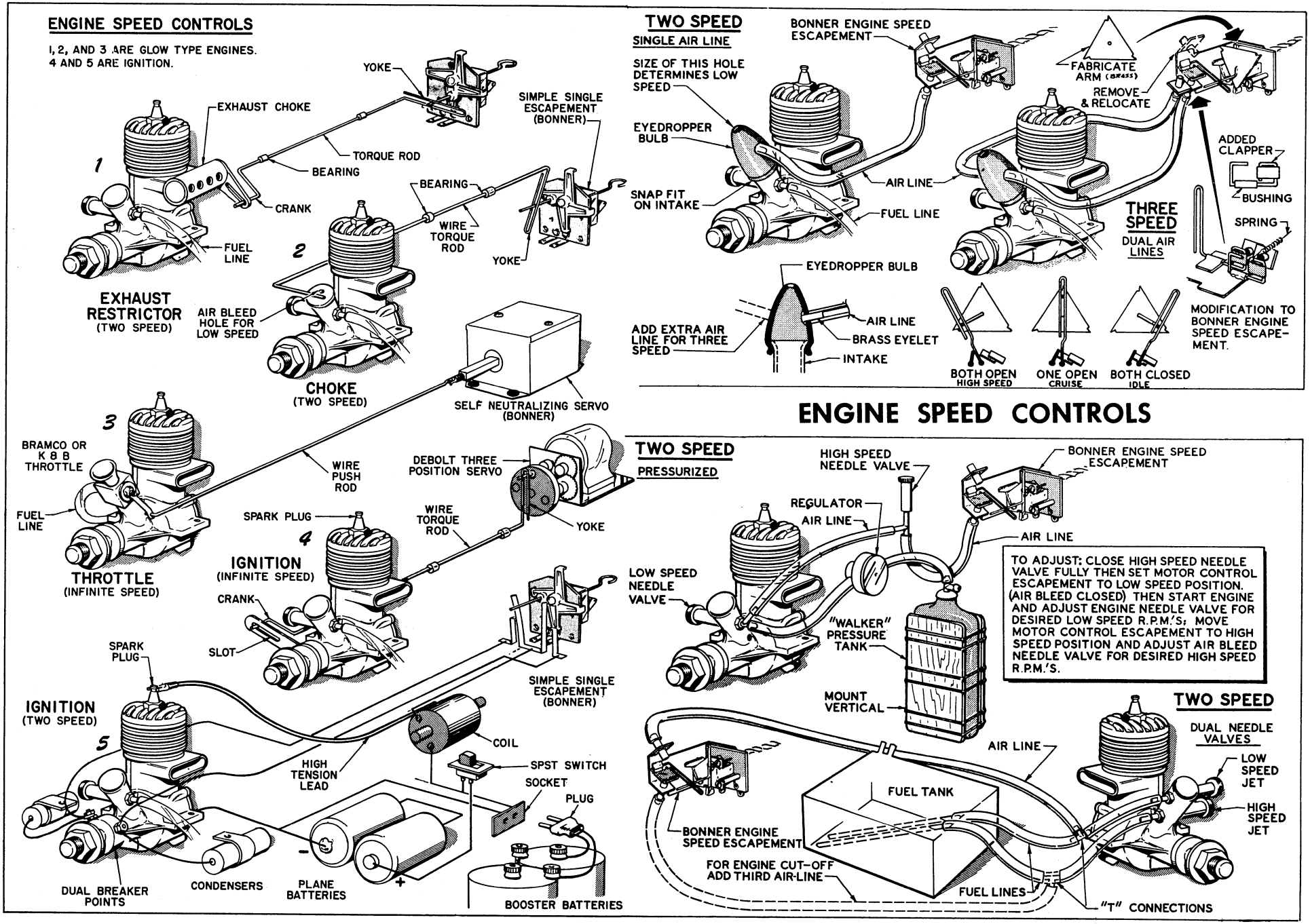
MULTI-ENGINE



PNEUMATIC



Bob Coon

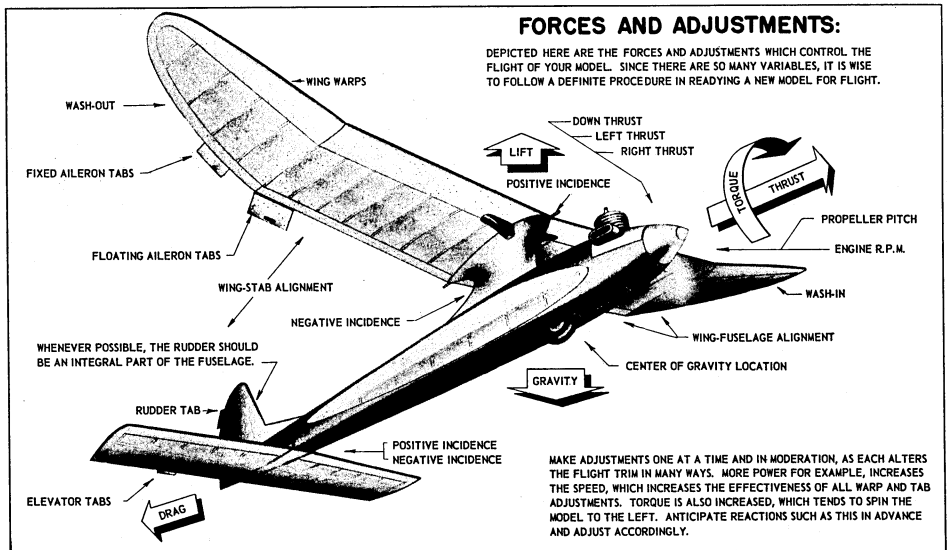

ENGINE SPEED CONTROLS
1, 2, AND 3 ARE GLOW TYPE ENGINES.
4 AND 5 ARE IGNITION.
YOKE
EXHAUST CHOKE
SIMPLE SINGLE ESCAPEMENT (BONNER)
TORQUE ROD
BEARING
CRANK
FUEL LINE
1
EXHAUST RESTRICTOR (TWO SPEED)
BEARING
WIRE TORQUE ROD
YOKE
2
AIR BLEED HOLE FOR LOW SPEED
CHOKE (TWO SPEED)
SELF NEUTRALIZING SERVO (BONNER)
3
BRAMCO OR K 8 B THROTTLE
FUEL LINE
WIRE PUSH ROD
THROTTLE (INFINITE SPEED)
DEBOLT THREE POSITION SERVO
SPARK PLUG
WIRE TORQUE ROD
YOKE
4
IGNITION (INFINITE SPEED)
CRANK
SLOT
SIMPLE SINGLE ESCAPEMENT (BONNER)
SPARK PLUG
IGNITION (TWO SPEED)
5
COIL
SPST SWITCH
SOCKET
PLUG
HIGH TENSION LEAD
DUAL BREAKER POINTS
CONDENSERS
PLANE BATTERIES
BOOSTER BATTERIES
TWO SPEED
SINGLE AIR LINE
BONNER ENGINE SPEED ESCAPEMENT
SIZE OF THIS HOLE DETERMINES LOW SPEED
EYEDROPPER BULB
SNAP FIT ON INTAKE
AIR LINE
FUEL LINE
FABRICATE ARM (BRASS)
REMOVE & RELOCATE
ADDED CLAPPER
BUSHING
SPRING
THREE SPEED
DUAL AIR LINES
EYEDROPPER BULB
ADD EXTRA AIR LINE FOR THREE SPEED
AIR LINE
BRASS EYELET
INTAKE
MODIFICATION TO BONNER ENGINE SPEED ESCAPEMENT.
BOTH OPEN HIGH SPEED
ONE OPEN CRUISE
BOTH CLOSED IDLE
ENGINE SPEED CONTROLS
TWO SPEED
PRESSURIZED
HIGH SPEED NEEDLE VALVE
BONNER ENGINE SPEED ESCAPEMENT
REGULATOR
AIR LINE
AIR LINE
LOW SPEED NEEDLE VALVE
"WALKER" PRESSURE TANK
MOUNT VERTICAL
TO ADJUST: CLOSE HIGH SPEED NEEDLE VALVE FULLY THEN SET MOTOR CONTROL ESCAPEMENT TO LOW SPEED POSITION. (AIR BLEED CLOSED) THEN START ENGINE AND ADJUST ENGINE NEEDLE VALVE FOR DESIRED LOW SPEED R.P.M.'S; MOVE MOTOR CONTROL ESCAPEMENT TO HIGH SPEED POSITION AND ADJUST AIR BLEED NEEDLE VALVE FOR DESIRED HIGH SPEED R.P.M.'S.
TWO SPEED
DUAL NEEDLE VALVES
AIR LINE
LOW SPEED JET
HIGH SPEED JET
FUEL TANK
BONNER ENGINE SPEED ESCAPEMENT
FOR ENGINE CUT-OFF ADD THIRD AIR-LINE
FUEL LINES
"T" CONNECTIONS

FM DATA SHEETS

ADJUSTING YOUR FREE-FLIGHT MODEL

FORCES AND ADJUSTMENTS:

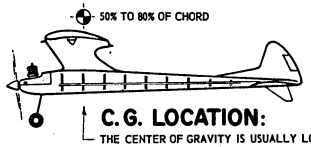
DEPICTED HERE ARE THE FORCES AND ADJUSTMENTS WHICH CONTROL THE FLIGHT OF YOUR MODEL. SINCE THERE ARE SO MANY VARIABLES, IT IS WISE TO FOLLOW A DEFINITE PROCEDURE IN READYING A NEW MODEL FOR FLIGHT.



MAKE ADJUSTMENTS ONE AT A TIME AND IN MODERATION, AS EACH ALTERS THE FLIGHT TRIM IN MANY WAYS. MORE POWER FOR EXAMPLE, INCREASES THE SPEED, WHICH INCREASES THE EFFECTIVENESS OF ALL WARP AND TAB ADJUSTMENTS. TORQUE IS ALSO INCREASED, WHICH TENDS TO SPIN THE MODEL TO THE LEFT. ANTICIPATE REACTIONS SUCH AS THIS IN ADVANCE AND ADJUST ACCORDINGLY.

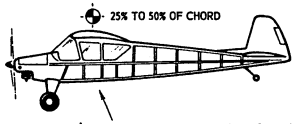
WASH-OUT:

WARPING TRAILING EDGE OF WING TIP UP IS CALLED WASH-OUT. THIS KEEPS TIP FROM STALLING-OUT BEFORE THE MAIN PANELS.



C.G. LOCATION:

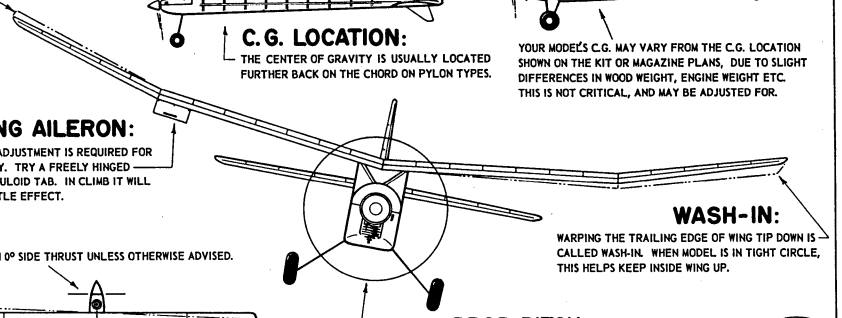
THE CENTER OF GRAVITY IS USUALLY LOCATED FURTHER BACK ON THE CHORD ON PYLON TYPES.



YOUR MODEL'S C.G. MAY VARY FROM THE C.G. LOCATION SHOWN ON THE KIT OR MAGAZINE PLANS, DUE TO SLIGHT DIFFERENCES IN WOOD WEIGHT, ENGINE WEIGHT ETC. THIS IS NOT CRITICAL, AND MAY BE ADJUSTED FOR.

FLOATING AILERON:

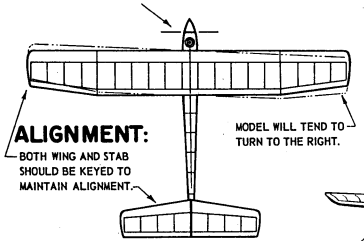
SOMETIMES AN ADJUSTMENT IS REQUIRED FOR GLIDE TRIM ONLY. TRY A FREELY HINGED WEIGHTED CELLULOID TAB. IN CLIMB IT WILL HAVE VERY LITTLE EFFECT.



WASH-IN:

WARPING THE TRAILING EDGE OF WING TIP DOWN IS CALLED WASH-IN. WHEN MODEL IS IN TIGHT CIRCLE, THIS HELPS KEEP INSIDE WING UP.

TEST FLY WITH 0° SIDE THRUST UNLESS OTHERWISE ADVISED.



ALIGNMENT:

BOTH WING AND STAB SHOULD BE KEYED TO MAINTAIN ALIGNMENT.

MODEL WILL TEND TO TURN TO THE RIGHT.

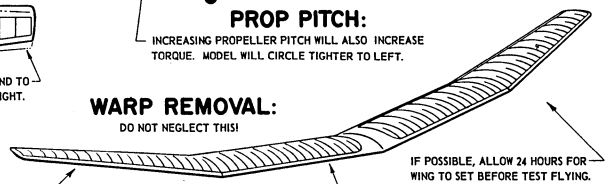
THE WING OR STAB MAY PURPOSELY BE MISALIGNED FOR SPECIAL ADJUSTMENTS. THIS IS NOT FOR BEGINNERS.

PROP PITCH:

INCREASING PROPELLER PITCH WILL ALSO INCREASE TORQUE. MODEL WILL CIRCLE TIGHTER TO LEFT.

WARP REMOVAL:

DO NOT NEGLECT THIS!



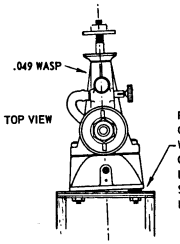
WARPS MAY BE REMOVED WITH STEAM OR HOT FAUCET WATER. TWIST SLIGHTLY IN OPPOSITE DIRECTION. HOLD OVER HEAT SOURCE UNTIL IT IS WELL SET.

IF POSSIBLE, ALLOW 24 HOURS FOR WING TO SET BEFORE TEST FLYING.

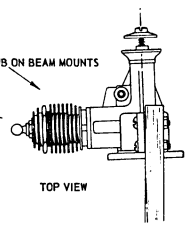
YOUR WING STRUCTURE MUST BE STURDY, OR IT WILL NOT BE ABLE TO HOLD AN ADJUSTMENT.

THRUST ADJUSTMENTS:

THE THRUST OF THE ENGINE IS OF PRIMARY IMPORTANCE IN CONTROLLING THE FLIGHT UNDER POWER. DOWN THRUST IS USED TO CONTROL LOOPING TENDENCIES, WHILE LEFT AND RIGHT SIDE THRUST CONTROL TURN IN CLIMB.



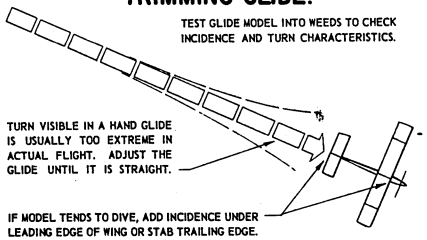
RADIALLY MOUNTED ENGINES MAY BE GIVEN SIDE AND DOWN THRUST WITH WASHERS INSERTED BEHIND CRANK-CASE. IF TOO TIGHT TO LEFT UNDER LOW POWER, ADD RIGHT THRUST IN SMALL DEGREES. IT MAY ALSO PROVE NECESSARY TO ADD MORE DOWNTHRUST.



ADDING LEFT OR RIGHT THRUST TO BEAM MOUNTED ENGINES IS MORE DIFFICULT. AT TIMES IT MAY BE POSSIBLE TO MOUNT YOUR ENGINE ON ITS SIDE AND ADD WASHERS ON MOUNTING BOLTS AS PICTURED HERE. OBLONG HOLES IN MOUNTS WILL ALLOW ADJUSTMENT.

TRIMMING GLIDE:

TEST GLIDE MODEL INTO WEEDS TO CHECK INCIDENCE AND TURN CHARACTERISTICS.



TURN VISIBLE IN A HAND GLIDE IS USUALLY TOO EXTREME IN ACTUAL FLIGHT. ADJUST THE GLIDE UNTIL IT IS STRAIGHT.

IF MODEL TENDS TO DIVE, ADD INCIDENCE UNDER LEADING EDGE OF WING OR STAB TRAILING EDGE.

NEVER INTERPRET THE DIP AFTER A STALL AS A DIVE.

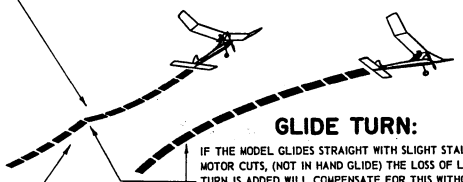
STALLING:

TEST GLIDE INTO THE WIND WITH THE NOSE DEPRESSED. IF A STALL IS DETECTED, ADD A THIN SLIVER OF WOOD UNDER THE TRAILING EDGE OF WING OR STAB LEADING EDGE. (NEG. INCIDENCE)

NEVER TRY TO GLIDE YOUR MODEL UPWARD.

WHEN PROPERLY ADJUSTED, YOUR MODEL WILL BE BUOYANT IN GLIDE, FLOATING GENTLY INTO A LANDING WITHOUT ANY TENDENCY TO STALL.

IF SLIGHT STALL INCREASES WITH EACH DIP, REMOVE A LITTLE INCIDENCE.

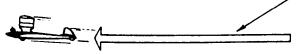


GLIDE TURN:

IF THE MODEL GLIDES STRAIGHT WITH SLIGHT STALL AFTER MOTOR CUTS, (NOT IN HAND GLIDE) THE LOSS OF LIFT WHEN TURN IS ADDED WILL COMPENSATE FOR THIS WITHOUT TRIM.

HITTING RISING AIR CURRENTS MAY CAUSE SLIGHT STALL IN GLIDE.

HAND LAUNCH MODEL INTO WIND IN LEVEL ATTITUDE. RUN WITH MODEL AND LET IT FLY OUT OF YOUR HAND.



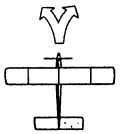
FIRST POWER FLIGHT:

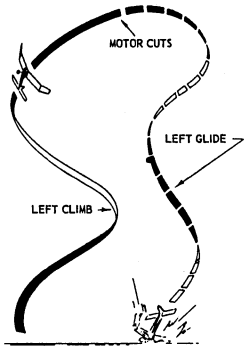
PLACE PROP ON BACKWARDS AND THROTTLE ENGINE DOWN. A CALM DAY AND A 10 SECOND MOTOR RUN IS ADVISED. TEST OVER WEEDS TO PREVENT DAMAGE IF IT SHOULD SPIRAL IN. OBSERVE POWER FLIGHT AND GLIDE FOR FURTHER TRIM.

TURN UNDER POWER:

MOST PYLON JOBS CLIMB TO THE RIGHT WHILE SHOULDER WING AND CABIN AIRPLANES TRY TO CLIMB TO THE LEFT.

ALWAYS REMEMBER THAT INCREASING PROP PITCH OR ENGINE SPEED, WILL TIGHTEN CLIMB TOWARD LEFT. THIS CAN LOOP A PYLON OR SPIN IN A CABIN MODEL.



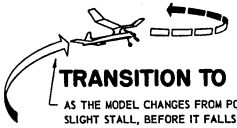


LOOPING:

REMEMBER- LOOPING FOLDS WEAK WINGS.

ADD DOWN THRUST, LEFT OR RIGHT THRUST & LESS INCIDENCE.

ANGLE 10° CROSS-WIND IF IT IS NECESSARY.



TRANSITION TO GLIDE:

AS THE MODEL CHANGES FROM POWER TO GLIDE, THERE IS OFTEN A SLIGHT STALL, BEFORE IT FALLS INTO ITS OPPOSITE GLIDE CIRCLE. SHOULD IT HANG ON THE PROP, THIS STALL MAY BE VERY SEVERE. ADJUST FOR MORE SPIRAL IN CLIMB AND TRY TO GET MODEL TO ROLL OUT. TRIM GLIDE FOR MINIMUM LOSS OF ALTITUDE AFTER THE STALL.

DANGEROUS ADJUSTMENTS:

LEFT CLIMB AND GLIDE, OR RIGHT CLIMB AND GLIDE IS A LITTLE RISKY, SO BE CAREFUL. IF MODEL ACCELERATES TOO MUCH UNDER POWER, AND STARTS TO SPIN IN AS MOTOR CUTS, THE GLIDE TRIM WILL NOT ACT TO PULL MODEL OUT, AS WITH AN OPPOSITE CIRCLE.

D.J.M.

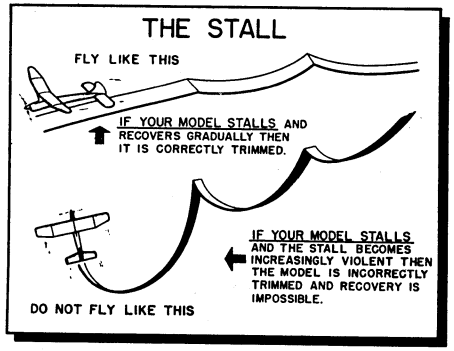
TROUBLE-SHOOTING FOR BETTER FLIGHTS

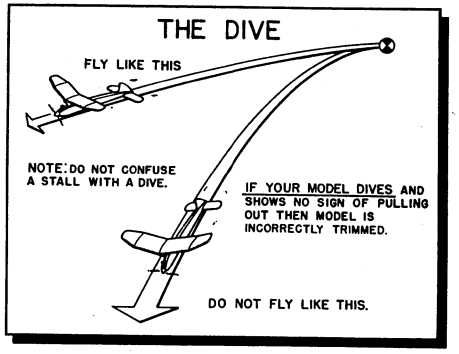
● The drawings on these pages illustrate the basic types of improper flight along with some of the solutions which are commonly used. But, remember, correct flight adjustments are difficult to achieve when you have to combat structural or design defects. So, before you start trimming your model for flight, make preflight checks to see that everything has been done according to the plan and the designer's specifications.

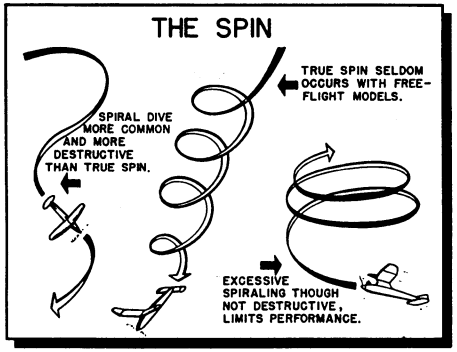
The power plant you use is a very important factor. If it is larger than that which has been recommended, you will have to exert extra caution when adjusting. On the other hand, a smaller power plant gives you more leeway. Top-notch flights will depend on how good the adjustments are for the power that is available for the climb—and the glide trim.

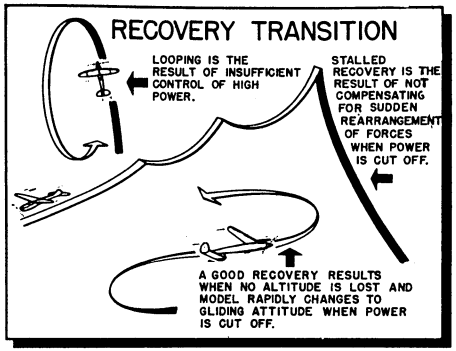
Excessive warps which occur during the construction of the model should be doped or steamed out. Minor warps generally can be disregarded.

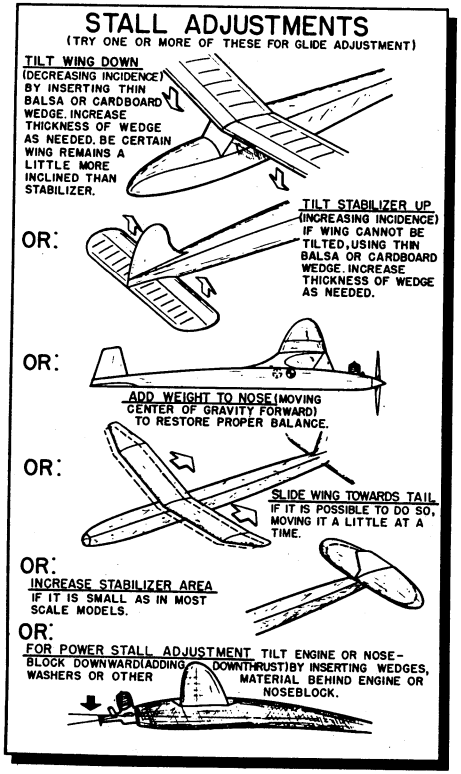
Detachable flight surfaces can be the cause of flight variations unless they are keyed into place. Check to see that each unit is correctly aligned with the other units. If flight performance is still erratic, try the suggestions herewith:

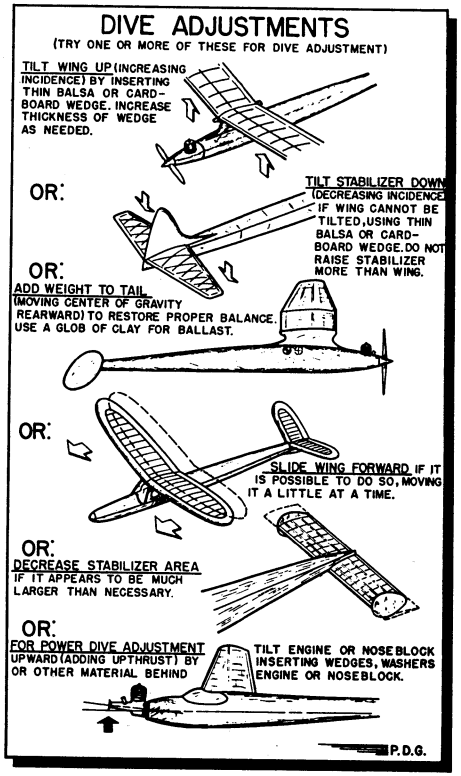


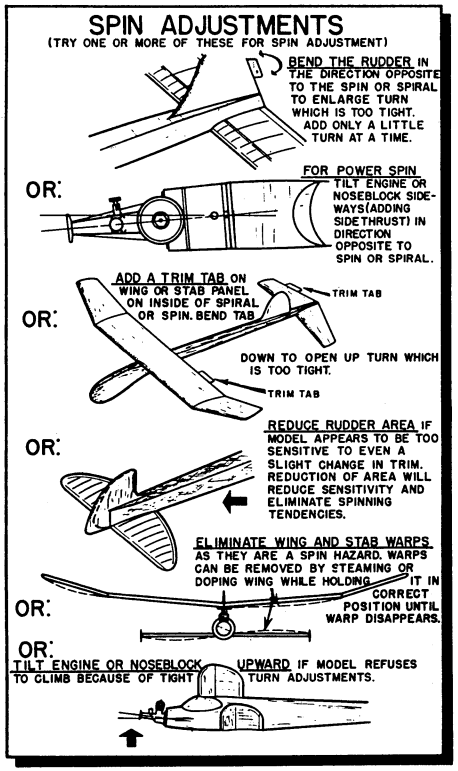


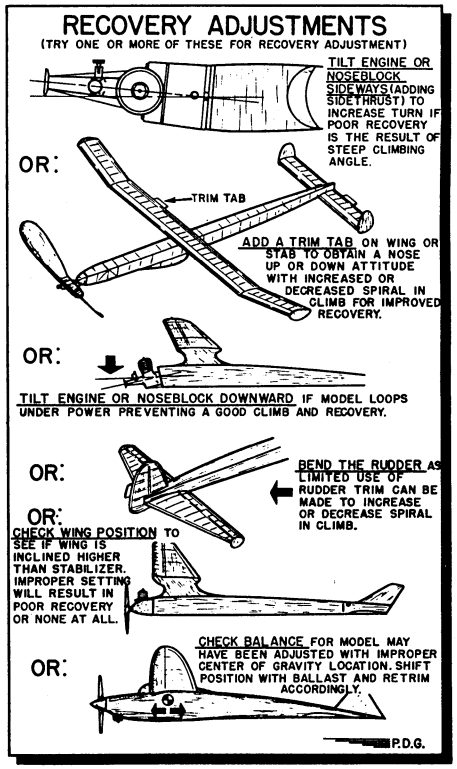








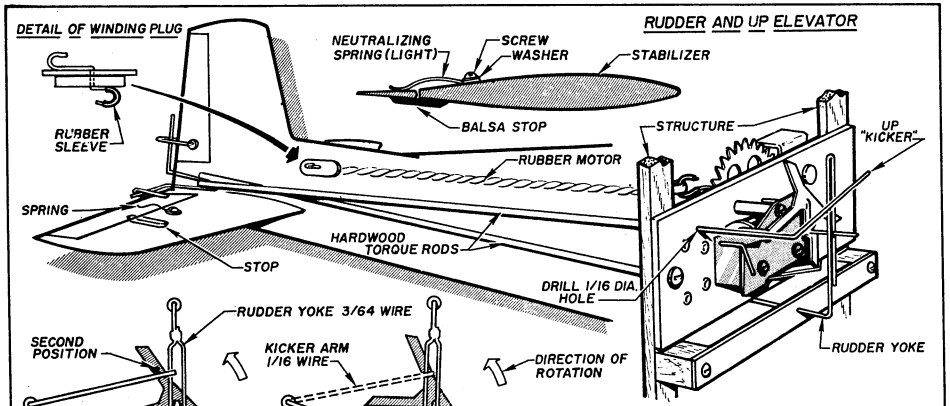




FM DATA SHEETS

R/C CONTROL SYSTEMS

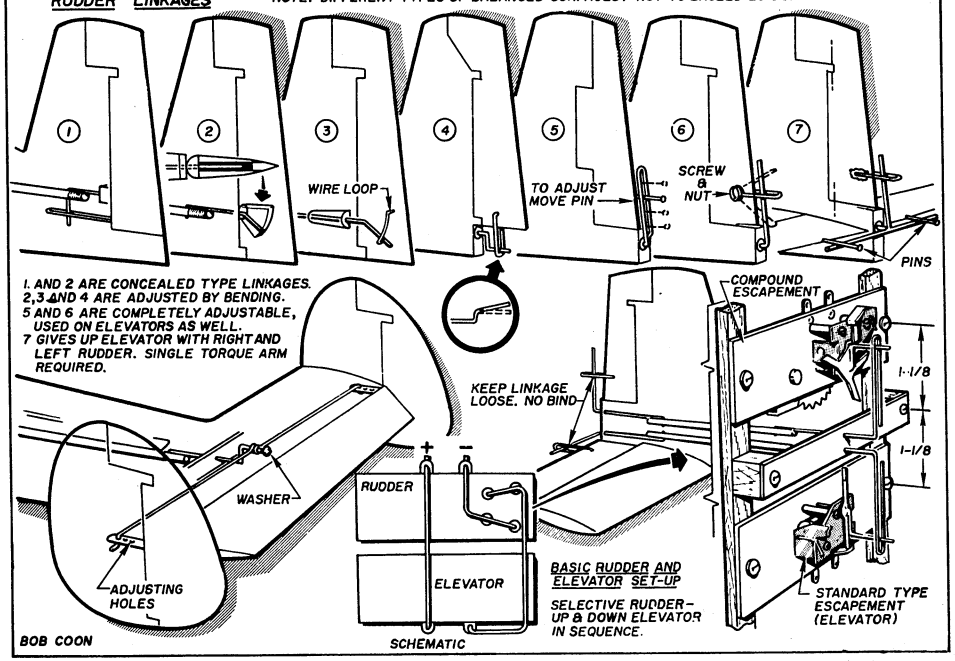
RUDDER AND UP ELEVATOR



OPERATION: ELEVATOR ARM IS CAUGHT BY THE ESCAPEMENT IMMEDIATELY UPON LEAVING THE SECOND POSITION. THIS MOVES THE ELEVATOR UP. WHEN THE SIGNAL IS CUT OFF, THE ESCAPEMENT NEUTRALIZES CAUSING THE ELEVATOR ARM TO SLIP OFF AND NEUTRALIZE THE CONTROL. THE ELEVATOR MOVES TOO FAST TO BE EFFECTIVE WHEN ONLY THE RUDDER IS USED.

RUDDER LINKAGES

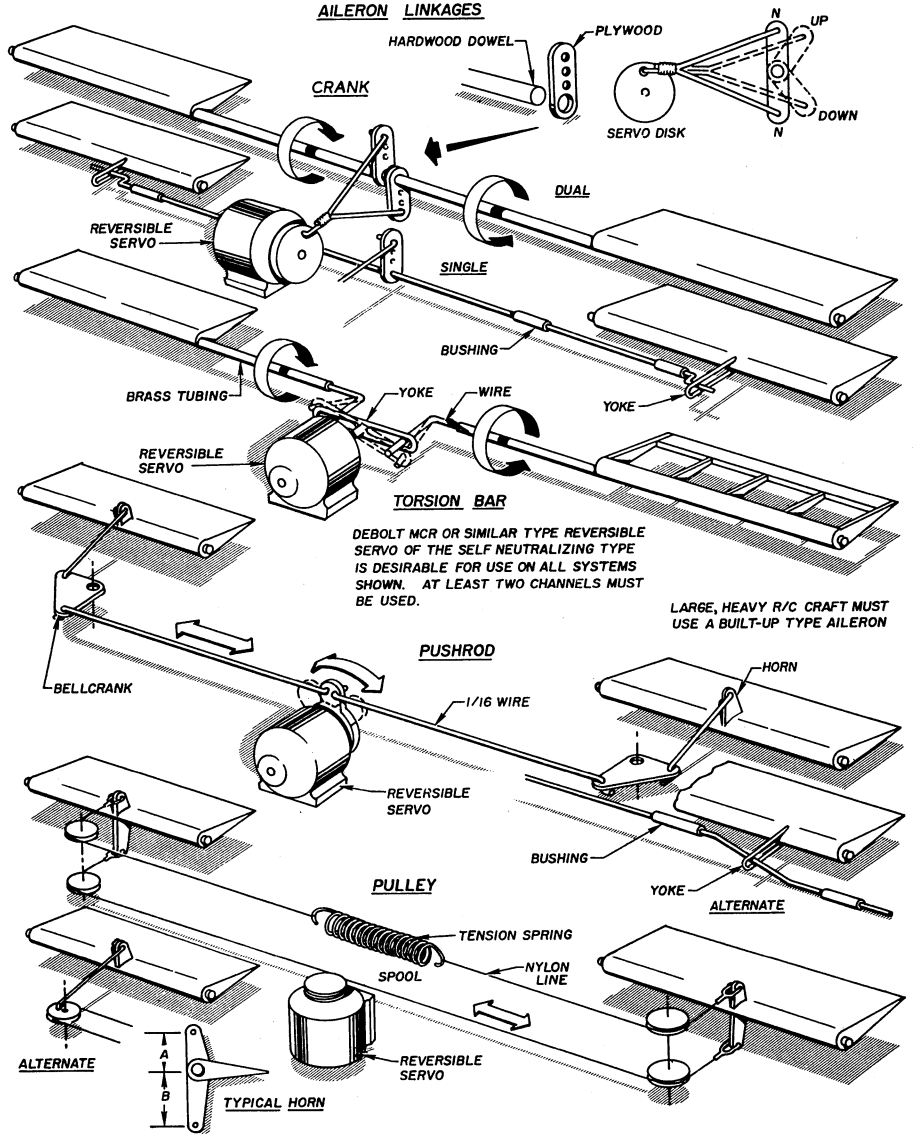
NOTE: DIFFERENT TYPES OF BALANCED SURFACES. NOT TO EXCEED 25% OF TOTAL AREA.



1. AND 2 ARE CONCEALED TYPE LINKAGES.
2, 3 AND 4 ARE ADJUSTED BY BENDING.
5 AND 6 ARE COMPLETELY ADJUSTABLE, USED ON ELEVATORS AS WELL.
7 GIVES UP ELEVATOR WITH RIGHT AND LEFT RUDDER. SINGLE TORQUE ARM REQUIRED.

BOB COON

AILERON LINKAGES



DEBOLT MCR OR SIMILAR TYPE REVERSIBLE SERVO OF THE SELF NEUTRALIZING TYPE IS DESIRABLE FOR USE ON ALL SYSTEMS SHOWN. AT LEAST TWO CHANNELS MUST BE USED.

LARGE, HEAVY R/C CRAFT MUST USE A BUILT-UP TYPE AILERON

AILERONS MUST BE RIGGED DIFFERENTIALLY. "A" IS SHORTER THAN "B" THEREFORE THE AILERON WILL MOVE UP FURTHER THAN IT MOVES DOWN. EQUAL MOVEMENT CAUSES A YAWING ACTION OPPOSITE TC THE DESIRED TURN. THIS IS CAUSED BY THE MORE PRONOUNCED DRAG OF THE DROOPING AILERON.

SEVEN CHANNELS WOULD BE DESIRABLE TO OPERATE A FULL COMPLEMENT OF CONTROLS, RUDDER, ELEVATOR, AILERON AND ENGINE SPEED. HOWEVER, WITH THE EXISTING FIVE CHANNEL EQUIPMENT A COMPLETE CONTROL SYSTEM CAN BE OBTAINED BY COMBINING THE RUDDER AND ENGINE CONTROLS WITH A COMPOUND ESCAPEMENT.

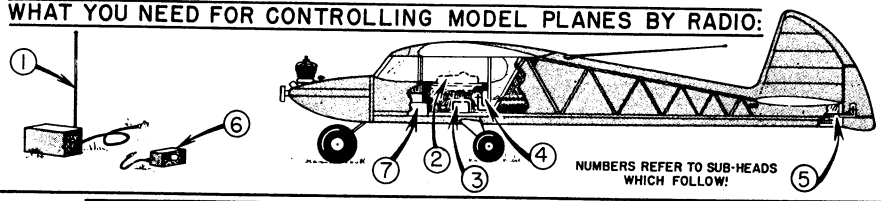
TRY ONE OF THE ABOVE FOR THOSE ADDED POINTS IN "SLOWROLLS", "IMMELMANNS" MAKE TURNS WITHOUT LOOSING ALTITUDE, FLY INVERTED WITHOUT "FALLING OUT" AND MAKE SUPERB "CUBAN EIGHTS."

BOB COON

FM DATA SHEETS

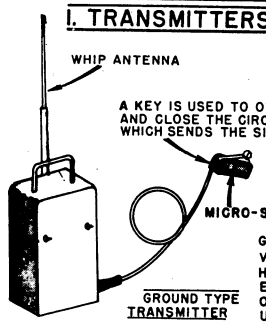
SINGLE-CHANNEL R/C EQUIPMENT

WHAT YOU NEED FOR CONTROLLING MODEL PLANES BY RADIO:

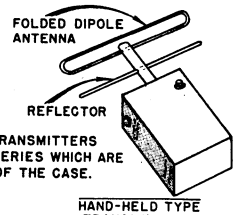


1. TRANSMITTERS:

THESE COME IN SEVERAL TYPES, FOR VARIOUS WAVE LENGTHS, AND AT A WIDE RANGE OF PRICES. UNLESS YOU HAVE A "HAM" LICENSE, YOU ARE RESTRICTED TO THE OPERATION OF RADIO CONTROL EQUIPMENT ON THE 465MC AND 27 1/4MC BANDS.*



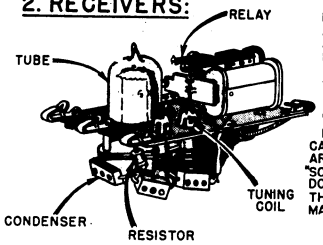
GROUND TYPE TRANSMITTERS ARE MORE VERSATILE SINCE VIBRATOR POWER SUPPLIES, WHICH HOOK UP TO AUTO BATTERIES, CAN BE USED. THIS ELIMINATES CHANGING BATTERIES. POWER UNITS OF THIS TYPE ARE "HOME BUILT". BATTERIES ARE USED IN COMMERCIAL UNITS.



THE HAND-HELD TRANSMITTERS OPERATE ON BATTERIES WHICH ARE MOUNTED INSIDE OF THE CASE.

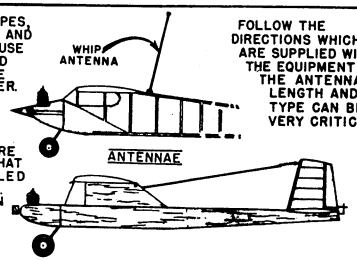
IF BATTERIES OR TUBES MUST BE REPLACED, USE EQUIPMENT WHICH IS IDENTICAL TO THAT USED, OR RECOMMENDED, BY THE MANUFACTURER OR DESIGNER.

2. RECEIVERS:



THESE COME IN SEVERAL TYPES, FOR VARIOUS WAVE LENGTHS, AND AT A WIDE RANGE OF PRICES. USE A RECEIVER THAT IS DESIGNED FOR OPERATION ON THE SAME CHANNEL AS THE TRANSMITTER.

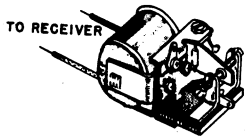
THE BASIC TYPES ARE THE "HARD TUBE" AND "SOFT TUBE" RECEIVERS. VACUUM TUBES ARE CALLED "HARD" WHILE THOSE THAT ARE FILLED WITH GAS ARE CALLED "SOFT". BOTH TYPES WORK WELL. DO NOT USE TUBES OTHER THAN THOSE RECOMMENDED BY THE MANUFACTURER OR DESIGNER!



FOLLOW THE DIRECTIONS WHICH ARE SUPPLIED WITH THE EQUIPMENT AS THE ANTENNA LENGTH AND TYPE CAN BE VERY CRITICAL!

3. RELAYS:

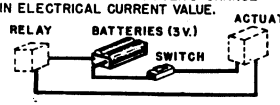
THESE COME IN SEVERAL TYPES AND ARE USUALLY PURCHASED AS SEPERATE UNITS. SOME RECEIVERS HAVE THEM BUILT IN.



WHEN BUYING A RELAY CHOOSE ONE WITH A RESISTANCE VALUE OF ABOUT 8000 OHMS.

THEY ARE ELECTRO-MAGNETIC SWITCHES.

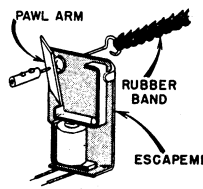
RELAYS ARE USED TO CONTROL THE ACTUATOR CIRCUIT. THEY OPERATE ON THE RECEIVER'S CHANGE IN ELECTRICAL CURRENT VALUE.



THIS IS A SCHEMATIC SHOWING THE "RELAY TO ACTUATOR" CIRCUIT. SOME UNITS NEED UP TO 6 V. SO CHECK THE SPECIFICATIONS.

THE RELAY CONTACTS CAN BE ADJUSTED TO PROVIDE OPTIMUM OPERATION WITH ANY RECEIVER.

4. ACTUATORS:

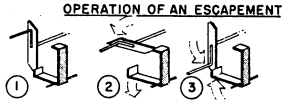


THESE COME IN SEVERAL TYPES AND AT A WIDE RANGE IN PRICE. THOUGH THE SIMPLE ESCAPEMENT IS MOST COMMON, THERE ARE MANY OTHERS IN USE. SOME OF THESE ARE:

(A) COMPOUND ESCAPEMENTS
(B) PULSE MOTORS
(C) SERVO MOTORS
(D) SOLENOIDS

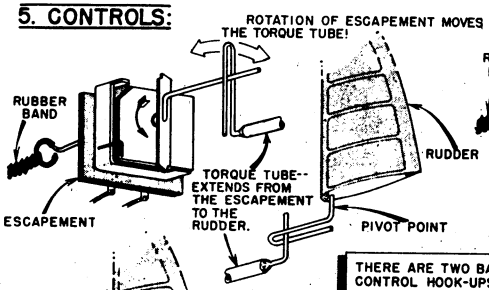
ESCAPEMENTS MOVE THE CONTROLS WITH POWER DERIVED FROM A WOUND RUBBER BAND OR SPRING.

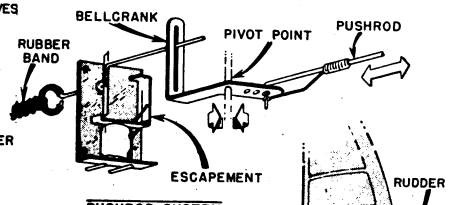
OPERATION OF AN ESCAPEMENT

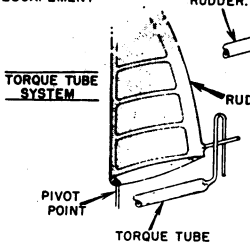


1. NO SIGNAL
2. SIGNAL ON--ARMATURE PULLS TOWARD COIL AND ALLOWS PAWL ARM TO MOVE 90°.
3. NO SIGNAL--TURNS 90°.

5. CONTROLS:



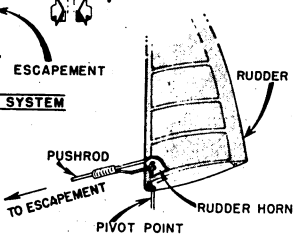




THERE ARE TWO BASIC TYPES OF CONTROL HOOK-UPS WHICH CAN BE COUPLED TO AN ESCAPEMENT:

(A) TORQUE TUBE
(B) PUSHROD

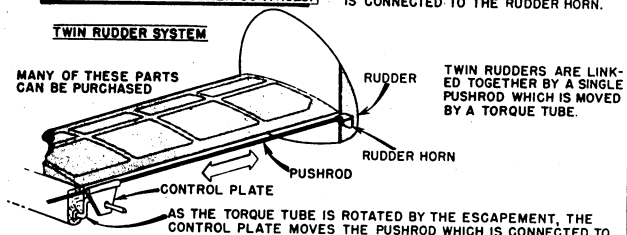
THE DRAWINGS SHOW EXAMPLES OF HOW THESE CAN BE APPLIED TO A RUDDER--THERE ARE MANY PRACTICAL VARIATIONS AND APPLICATIONS TO OTHER CONTROLS.



AS THE ESCAPEMENT ARM ROTATES IT TURNS THE BELLCRANK ON THE PIVOT POINT. THIS MOVES THE PUSHROD WHICH IS CONNECTED TO THE RUDDER HORN.

THE MOVEMENT OF THE TORQUE TUBE FROM RIGHT TO LEFT IS APPLIED TO THE CONTROL SURFACE BY ONE OF THE CONTROL LINKAGES SHOWN ABOVE.

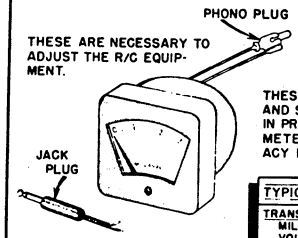
TWIN RUDDER SYSTEM



TWIN RUDDERS ARE LINKED TOGETHER BY A SINGLE PUSHROD WHICH IS MOVED BY A TORQUE TUBE.

AS THE TORQUE TUBE IS ROTATED BY THE ESCAPEMENT, THE CONTROL PLATE MOVES THE PUSHROD WHICH IS CONNECTED TO A RUDDER HORN ON EACH OF THE RUDDERS.

6. METERS:



THESE ARE NECESSARY TO ADJUST THE R/C EQUIPMENT.

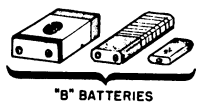
THESE COME IN VARIOUS TYPES AND SIZES AND AT A WIDE RANGE IN PRICE. THE HIGHER PRICED METERS OFFER GREATER ACCURACY BUT ARE NOT A NECESSITY.

TYPICAL METER VALUES:	
TRANSMITTER	
MILLAMPS	0-50
VOLTS	0-6, 0-150
RECEIVER	
MILLAMPS	0-3
VOLTS	0-6, 0-100
ALL OF THE METERS LISTED ARE DIRECT CURRENT (D.C.).	

THE METERS SHOULD HAVE PLUGS ATTACHED TO THEM SO THAT THEY MAY BE READILY INSERTED INTO, OR REMOVED FROM, THE CIRCUITS WHICH MUST BE CHECKED. FOLLOW THE MANUFACTURER'S OPERATING INSTRUCTIONS AT ALL TIMES!

7. BATTERY EQUIPMENT:

THESE COME IN VARIOUS TYPES AND SIZES IT IS NECESSARY TO CHOOSE THE TYPE WHICH IS BEST SUITED TO THE SIZE OF YOUR MODEL.

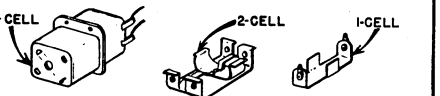


TRANSMITTER:	
N60, 490, VS090	90.0v
K-45, XX45, 467	67.5v
RECEIVER:	
VS016, 477, 457	67.5v
Z30, 455, 738	45.0v

TRANSMITTER:	
720, 2FBP, VS005	1.5v
736, F3, VS067	4.5v
RECEIVER:	
915, Z, VS034	1.5v
7, 935, VS033	1.5v

HEARING AID BATTERIES:	
504E, 411E, U10E	15.0v
505E, 412E, U15E	22.5v
506E, 430E, U20E	30.0v
THESE ARE RECOMMENDED FOR USE WITH 1/2A R/C MODELS.	

THESE CHARTS LIST CODE NUMBERS OF BATTERIES THAT ARE COMMONLY USED WITH R/C EQUIPMENT.



BATTERY BOXES ARE A CONVENIENT WAY TO MOUNT SMALL BATTERIES INTO A MODEL. THESE ARE AVAILABLE IN VARIOUS TYPES AND SIZES.

ACCESSORIES:

SCREWDRIVERS ARE VERY POOR TOOLS FOR TUNING RADIO EQUIPMENT AS THE METAL IN THEM DISTURBS THE CIRCUIT.

PLASTIC TUNING WANDS, SUCH AS TV REPAIRMEN USE, CAN BE OBTAINED AT ALL RADIO SUPPLY HOUSES. WHEN YOU TUNE YOUR EQUIPMENT DO NOT HOLD ON TO ANY PART OF IT AS THIS WILL ALSO DISTURB THE CIRCUIT. DOUBLE CHECK BY STANDING AWAY AND TESTING.

WHEN INSTALLING THE R/C EQUIPMENT IN YOUR MODEL YOU WILL NEED SMALL ACCESSORIES SUCH AS:

HOOK-UP WIRE
NUTS AND BOLTS
PLUG SOCKETS

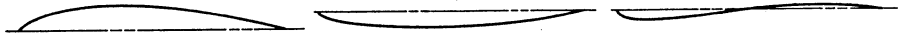
HERE SOME OF THE OTHERS WHICH YOU WILL NEED.

KEEP A FEW SLIDE SWITCHES ON HAND. RECEIVERS USUALLY REQUIRE THE DOUBLE POLE--SINGLE THROW (DPST) TYPE. A SINGLE POLE--SINGLE THROW (SPST) TYPE IS USED IN OTHER PARTS OF MODEL; SUCH AS THE ACTUATOR CIRCUIT.

FM DESIGN SHEETS

AIRFOIL FUNDAMENTALS

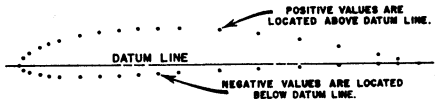
AIRFOIL TERMS-WHAT THEY MEAN:



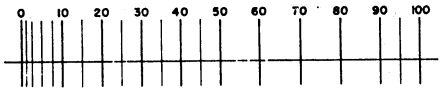
UPPER CAMBER: THE UPPER CURVATURE OF THE AIRFOIL.

LOWER CAMBER: THE LOWER CURVATURE OF THE AIRFOIL.

UNDER CAMBER: THE REVERSE CURVATURE OF THE LOWER CAMBER.



DATUM LINE: A REFERENCE LINE ABOVE AND BELOW WHICH THE POINTS FOR THE AIRFOIL CURVE ARE PLOTTED.

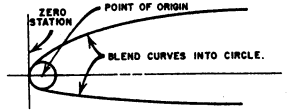


STATIONS: POSITIONS AT WHICH THE POINTS FOR THE AIRFOIL CURVE ARE TO BE PLOTTED. VALUES ARE ACTUALLY PERCENTAGES OF THE AIRFOIL LENGTH MEASURED FROM THE LEADING EDGE OF THE AIRFOIL.

N.A.C.A. 6412

STATION	0	1.25	2.50	5.0	7.50	10	15	20	25	30	40	50	60	70	80	90	95	100
UPPER CAMBER	0.00	2.73	3.80	5.36	6.57	7.58	9.18	10.34	11.14	11.65	11.80	11.16	9.96	8.23	6.03	3.33	1.79	0.12
LOWER CAMBER	0.00	-1.23	-1.64	-1.99	-2.05	-1.99	-1.67	-1.25	-0.78	-0.36	0.20	0.55	0.78	0.85	0.73	0.39	0.16	-0.12

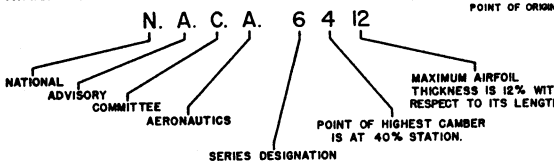
LEADING EDGE RADIUS: 1.58 SLOPE OF RADIUS: 6/20

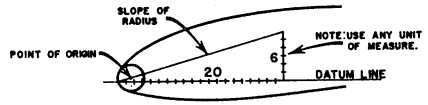


AIRFOIL ORDINATES: EACH AIRFOIL HAS A TABLE OF VALUES WHICH WHEN TRANSFERRED TO THE CORRESPONDING STATIONS ON THE LAYOUT, ABOVE AND BELOW THE DATUM LINE, WILL INDICATE THE POINTS FOR THE AIRFOIL CURVE. THE TOTAL AIRFOIL LENGTH IS CONSIDERED AS 100% WITH THE TABLE OF VALUES DIRECTLY RELATED. EXAMPLE: -1.23 = 1.23% LOCATED BELOW DATUM LINE AT THE SPECIFIED STATION.

LEADING EDGE RADIUS: GENERALLY THE DISTANCE ON THE DATUM LINE FROM THE POINT OF ORIGIN OF THE CIRCLE TO THE ZERO STATION (LEADING EDGE). ONLY EXCEPTION BEING WHEN A SLOPE OF RADIUS IS GIVEN.
NOTE: NOT ALL AIRFOILS HAVE A LEADING EDGE RADIUS.

N.A.C.A. CODE BREAKDOWN

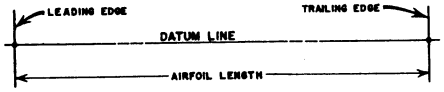




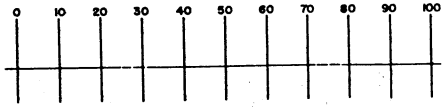
SLOPE OF RADIUS: WHEN A SLOPE IS GIVEN FOR THE LEADING EDGE RADIUS, IT IS TO INDICATE THAT ITS CENTER IS NOT LOCATED ON THE DATUM LINE BUT RATHER ON A DIAGONAL LINE REFERRED TO AS THE SLOPE OF THE RADIUS. A PROPORTION IS GIVEN AS IN THE N.A.C.A. 6412 FOR ITS CONSTRUCTION.

PLOTTING THE AIRFOIL

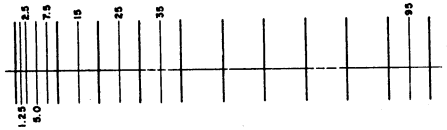
STEP ONE: SELECT AN AIRFOIL LENGTH, TRYING TO USE A SIZE WHICH CAN BE EASILY SUBDIVIDED INTO TEN MAIN STATIONS AND WHERE REQUIRED INTO SUBSTATIONS. EXAMPLE: A $6\frac{1}{4}$" AIRFOIL LENGTH WILL BREAK DOWN INTO TEN MAIN STATIONS $\frac{5}{8}$" APART, ONE PERCENT EQUALLING $\frac{1}{16}$".



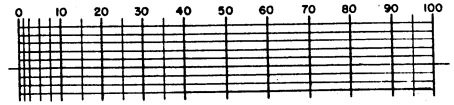
STEP TWO: LOCATE TEN MAIN STATION POINTS.



STEP THREE: LOCATE ALL OTHER STATION POINTS.

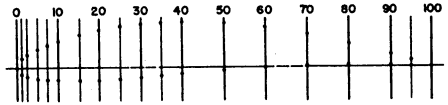


STEP FOUR: DRAW GRID LINES PARALLEL TO, ABOVE AND BELOW DATUM LINE AND SPACED APART 1% - 2% OF THE AIRFOIL LENGTH. NOTE: THIS STEP OPTIONAL, BUT ADVISABLE FOR MODELERS WITHOUT PREVIOUS PLOTTING EXPERIENCE.

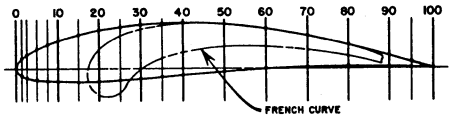


P.D.G.

STEP FIVE: USING TABLE OF ORDINATES LOCATE VALUES FOR UPPER AND LOWER CAMBER AT DESIGNATED STATIONS. NOTE: HORIZONTAL GRID LINES OMITTED FOR CLARITY.



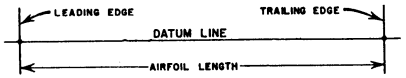
STEP SIX: USING FRENCH CURVES CONNECT THE PLOTTED POINTS TO OBTAIN THE AIRFOIL OUTLINE. SELECT CURVES THAT WILL CONNECT AT LEAST FOUR STATIONS AND BLEND SMOOTHLY WITH PRECEDING CURVE.



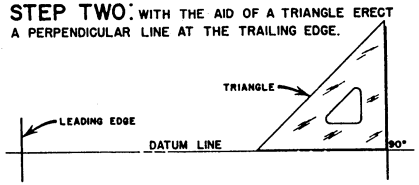
PLOTTING THE AIRFOIL

(SECONDARY METHOD FOR NON-DIVISIBLE LENGTHS)

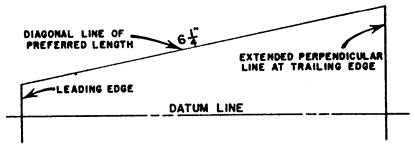
STEP ONE: SELECT DESIRED AIRFOIL LENGTH AND DRAW DATUM LINE.



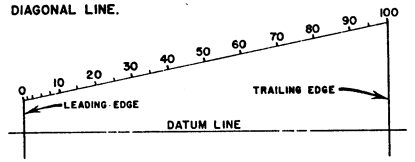
STEP TWO: WITH THE AID OF A TRIANGLE ERECT A PERPENDICULAR LINE AT THE TRAILING EDGE.



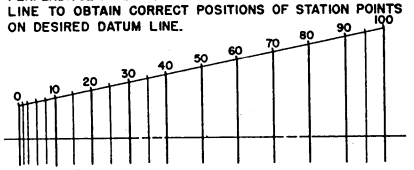
STEP THREE: DRAW LINE FROM POINT ABOVE DATUM LINE AT THE LEADING EDGE TO THE PERPENDICULAR LINE ERECTED AT THE TRAILING EDGE, USING A LENGTH WHICH CAN BE EVENLY SUB-DIVIDED.



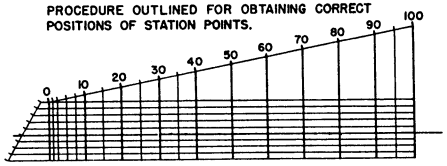
STEP FOUR: PLOT STATION POINTS ON THE DIAGONAL LINE.



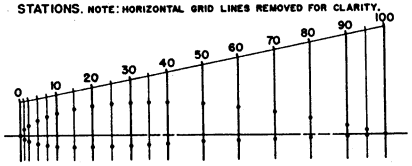
STEP FIVE: WITH THE AID OF A TRIANGLE DROP PERPENDICULAR LINES FROM STATION POINTS ON DIAGONAL LINE TO OBTAIN CORRECT POSITIONS OF STATION POINTS ON DESIRED DATUM LINE.



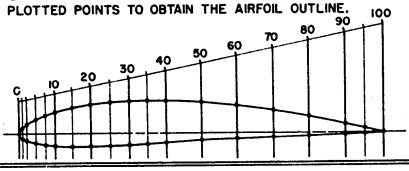
STEP SIX: SPACE GRID LINES 1%-2% APART USING PROCEDURE OUTLINED FOR OBTAINING CORRECT POSITIONS OF STATION POINTS.



STEP SEVEN: USING TABLE OF ORDINATES LOCATE VALUES FOR UPPER AND LOWER CAMBER AT DESIGNATED STATIONS. NOTE: HORIZONTAL GRID LINES REMOVED FOR CLARITY.



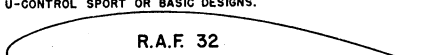
STEP EIGHT: USING FRENCH CURVES CONNECT THE PLOTTED POINTS TO OBTAIN THE AIRFOIL OUTLINE.



SIX POPULAR AIRFOILS

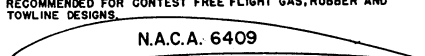
CLARK Y

RECOMMENDED FOR FREE FLIGHT GAS, RUBBER, TOWLINE AND U-CONTROL SPORT OR BASIC DESIGNS.



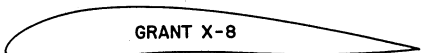
R.A.F. 32

RECOMMENDED FOR CONTEST FREE FLIGHT GAS, RUBBER AND TOWLINE DESIGNS.



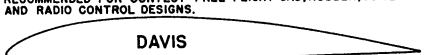
N.A.C.A. 6409

RECOMMENDED FOR CONTEST FREE FLIGHT GAS, RUBBER AND TOWLINE DESIGNS.



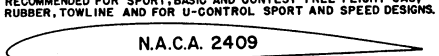
GRANT X-8

RECOMMENDED FOR CONTEST FREE FLIGHT GAS, RUBBER, TOWLINE AND RADIO CONTROL DESIGNS.



DAVIS

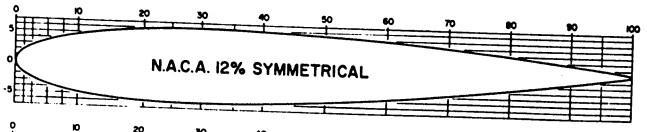
RECOMMENDED FOR SPORT, BASIC AND CONTEST FREE FLIGHT GAS, RUBBER, TOWLINE AND FOR U-CONTROL SPORT AND SPEED DESIGNS.

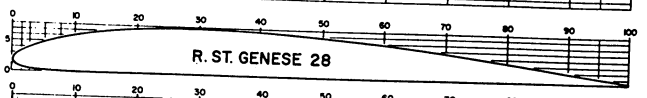


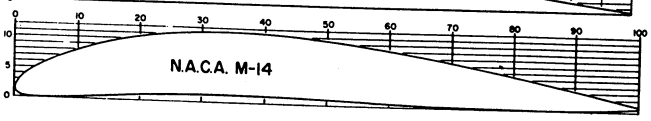
N.A.C.A. 2409

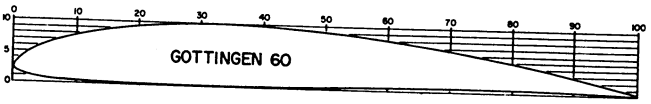
RECOMMENDED FOR U-CONTROL SPORT AND SPEED DESIGNS.

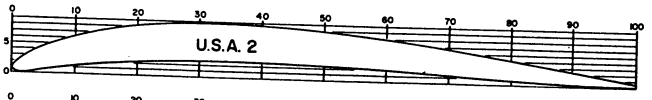
P.D.G.

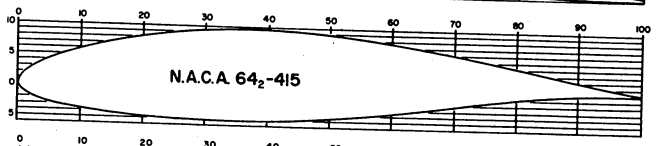

N.A.C.A. 12% SYMMETRICAL

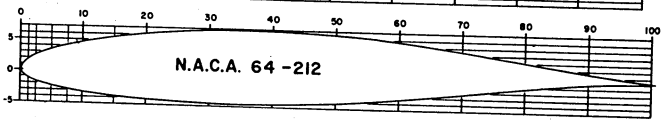

R. ST. GENESE 28

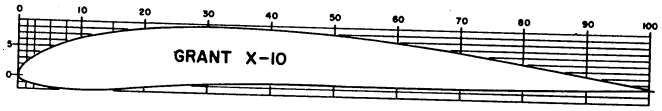

N.A.C.A. M-14

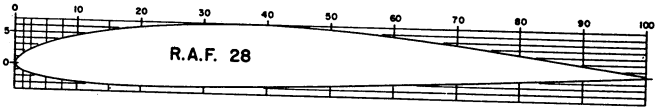

GOTTINGEN 60

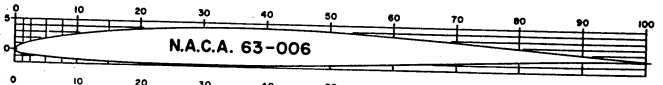

U.S.A. 2

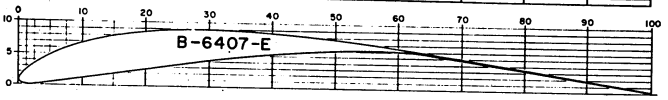

N.A.C.A. 64$_2$-415

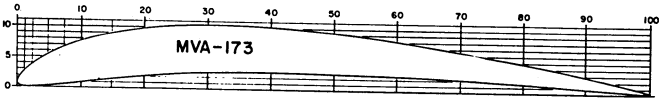

N.A.C.A. 64 -212


GRANT X-10

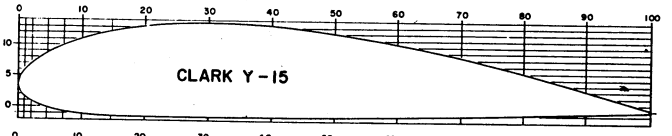

R.A.F. 28

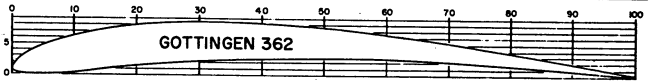

N.A.C.A. 63-006

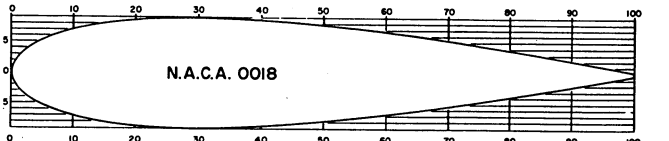

B-6407-E

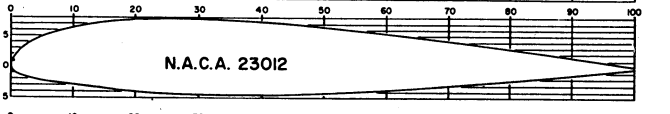

MVA-173

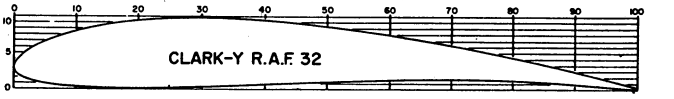

G-610-B

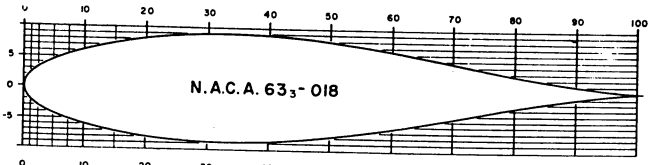

CLARK Y-15

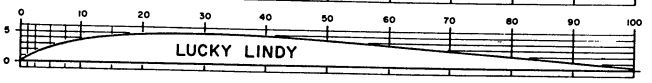

GOTTINGEN 362

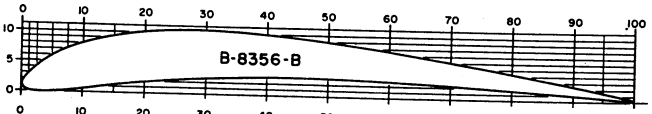

N.A.C.A. 0018


N.A.C.A. 23012


CLARK-Y R.A.F. 32


N.A.C.A. 63$_3$-018


LUCKY LINDY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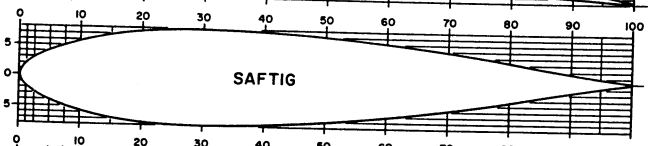
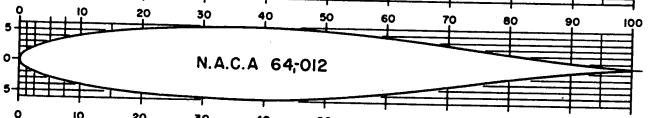
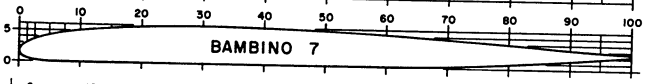
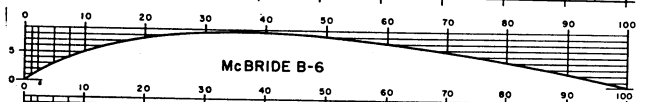
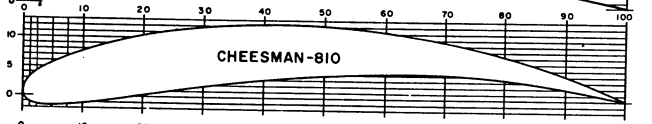
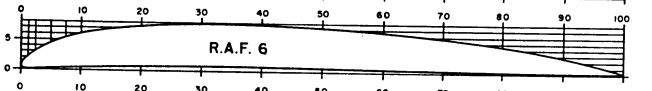

SAFTIG

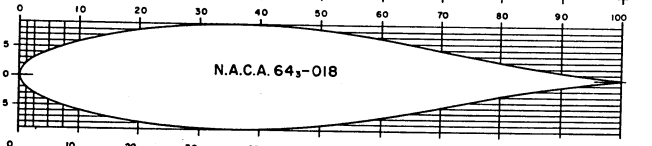

N.A.C.A 64$_1$-012


BAMBINO 7


McBRIDE B-6


CHEESMAN-810


R.A.F. 6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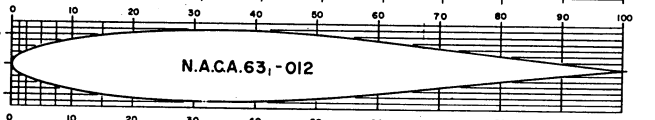
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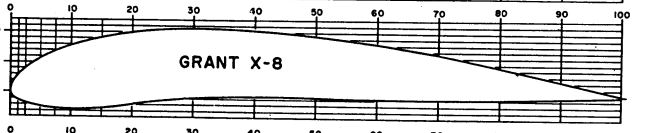
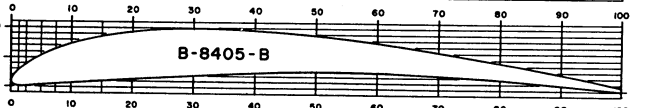

GRANT X-8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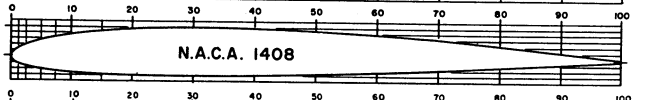
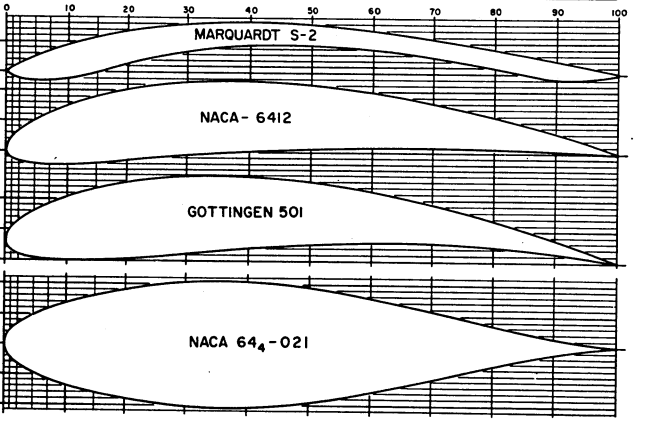
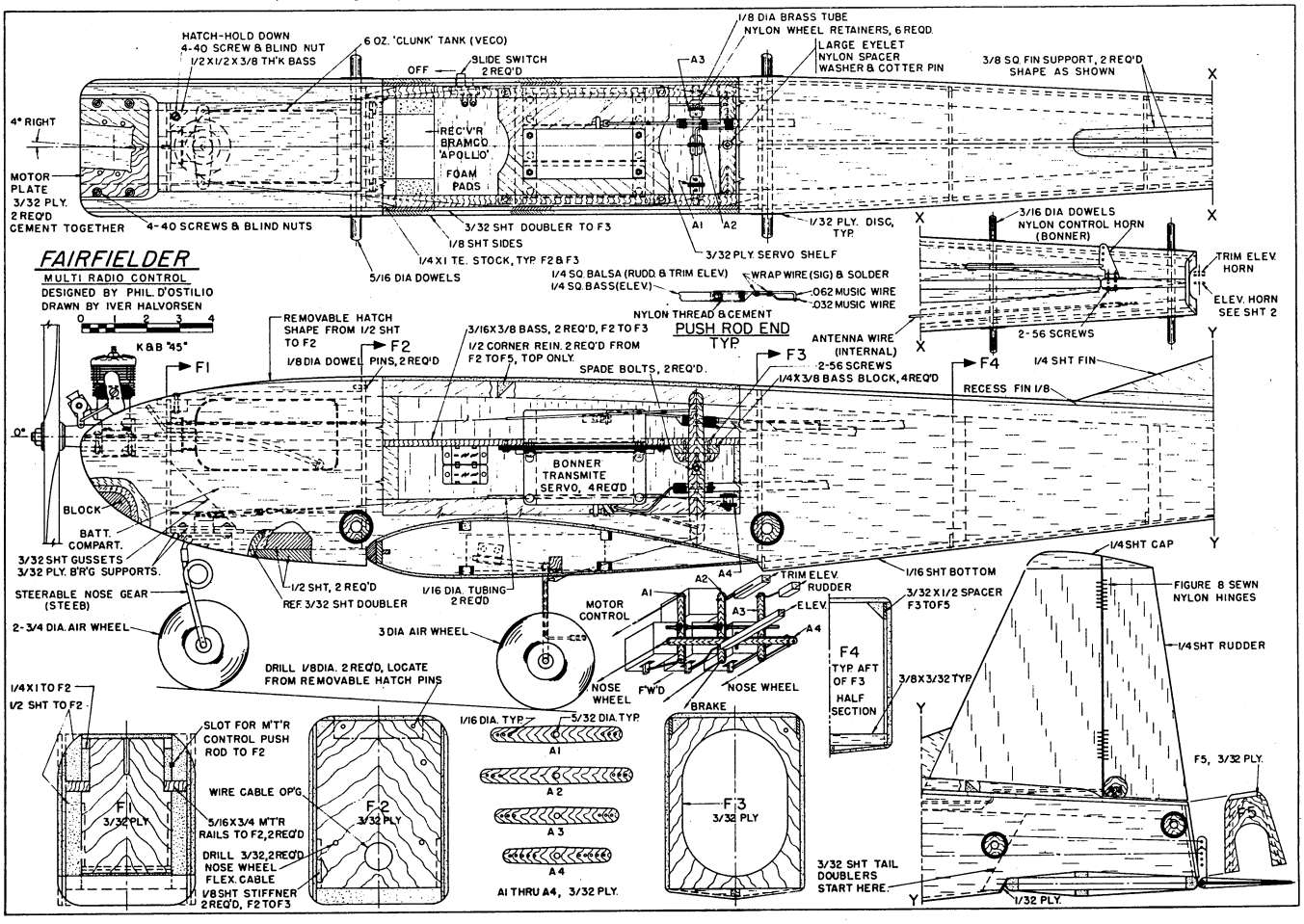
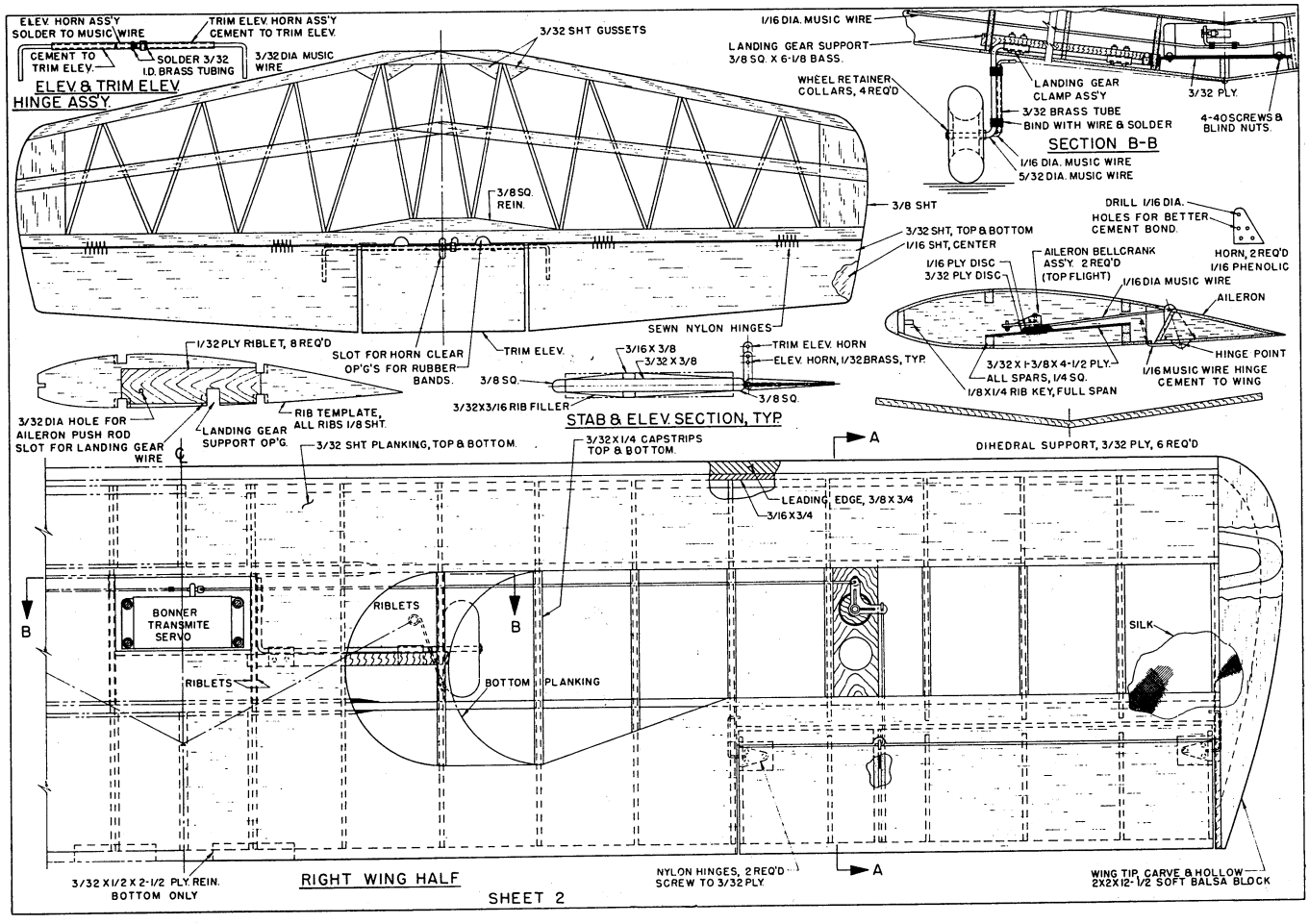

N.A.C.A. 1408

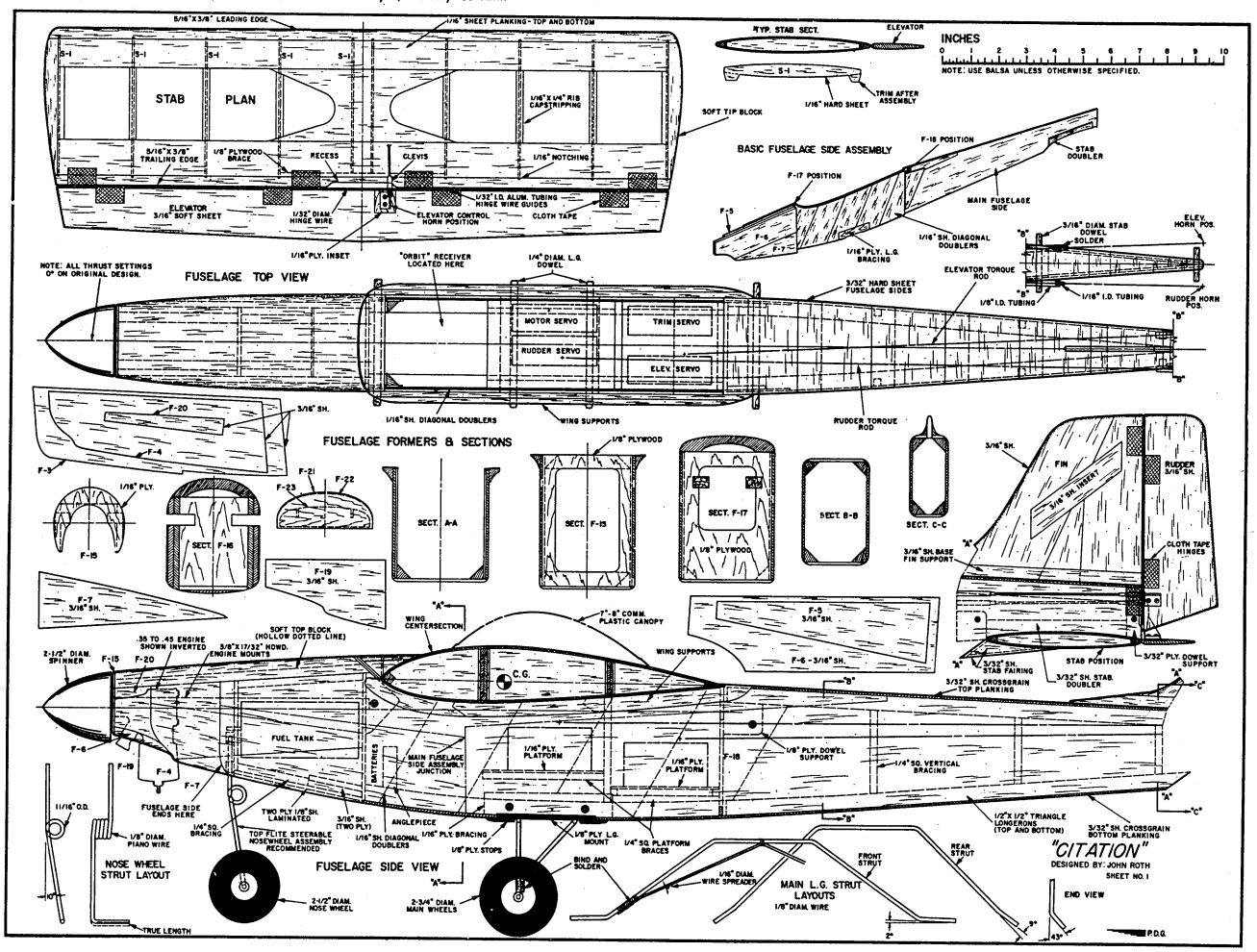

MARQUARDT S-2
NACA- 6412
GOTTINGEN 501
NACA 64$_4$-021

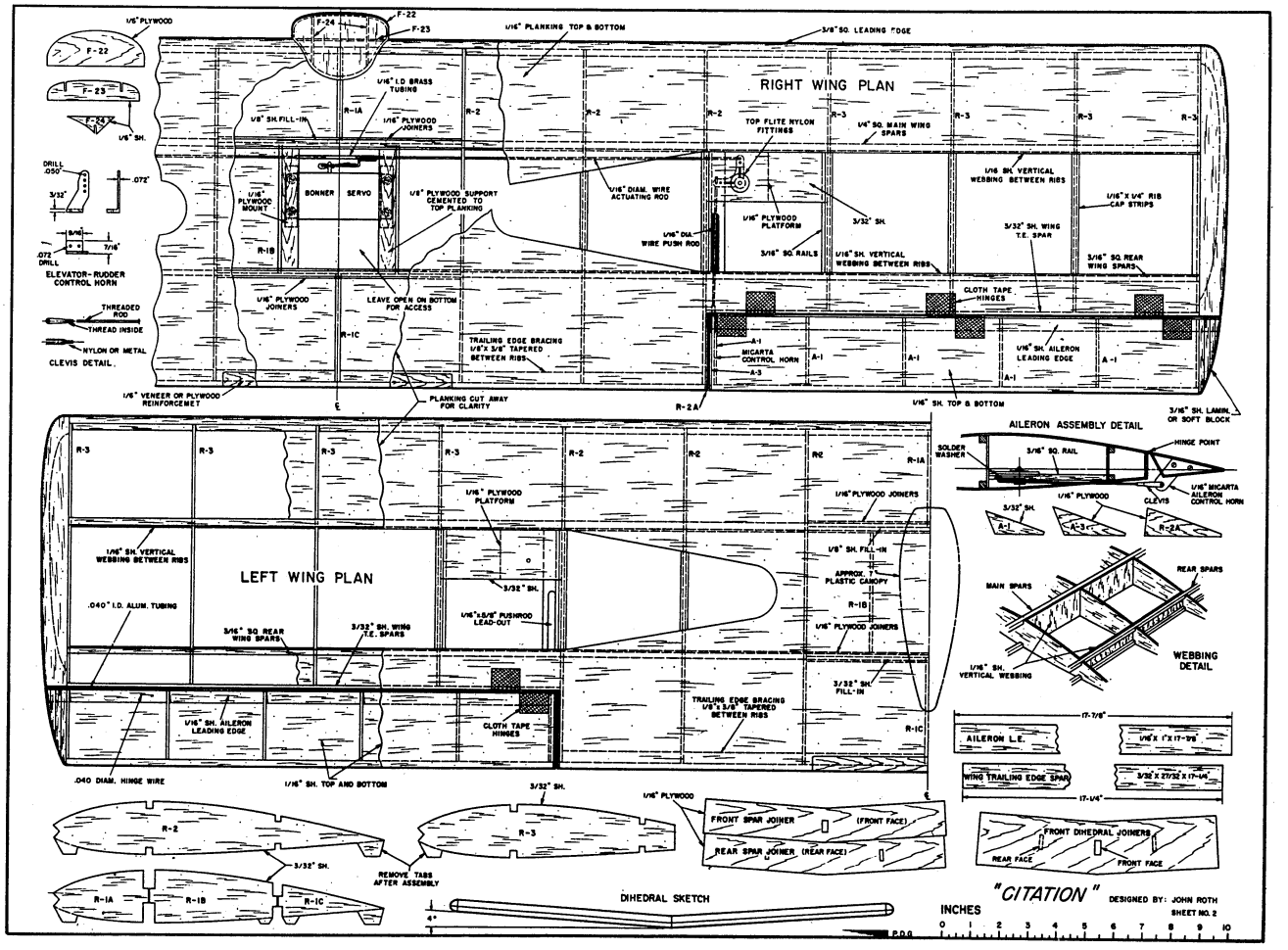
"FAIRFIELDER" Phil D'Ostillio's able R/C Multi design, .45 power, up to 12 channels, 67" span.



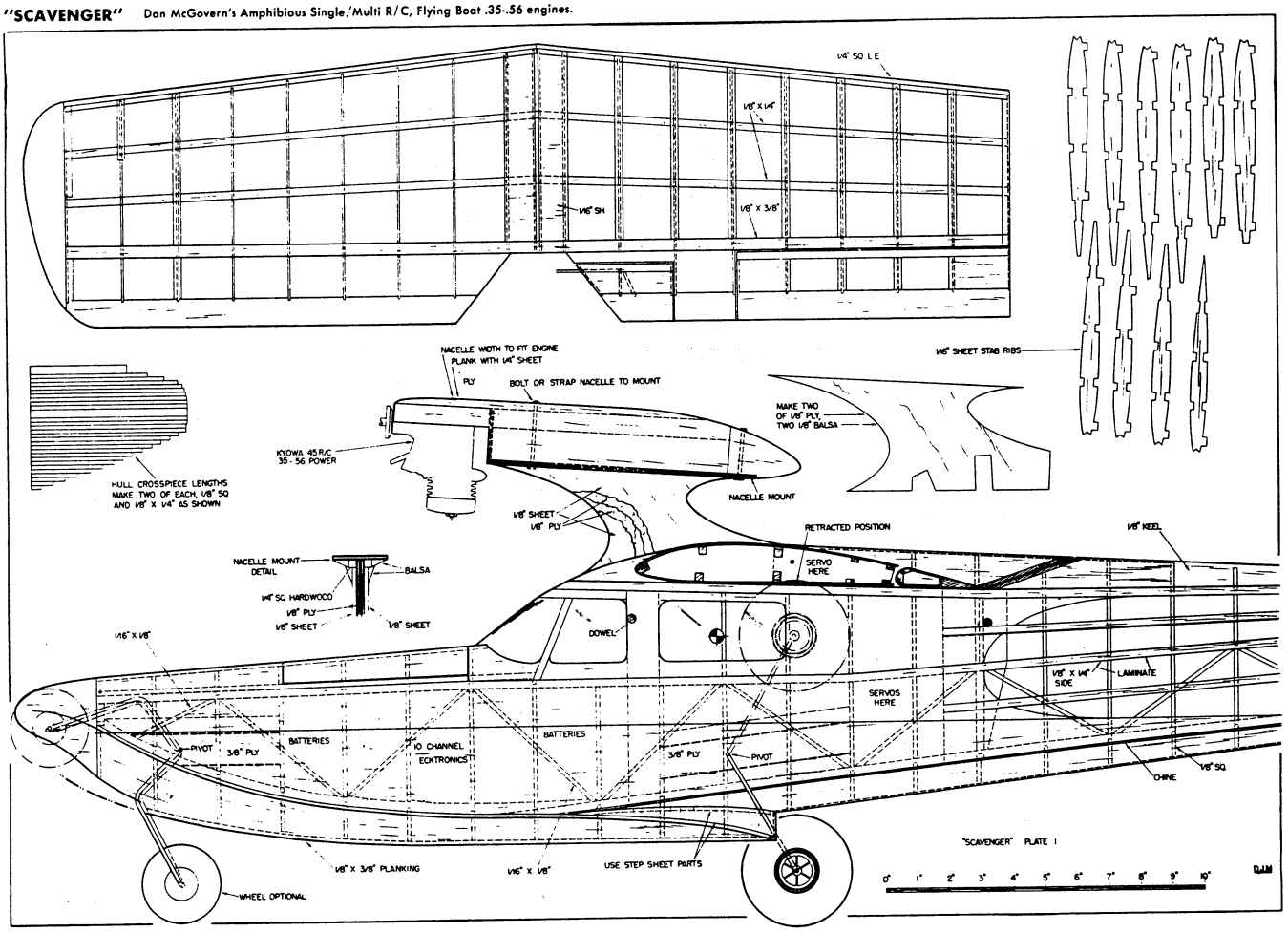


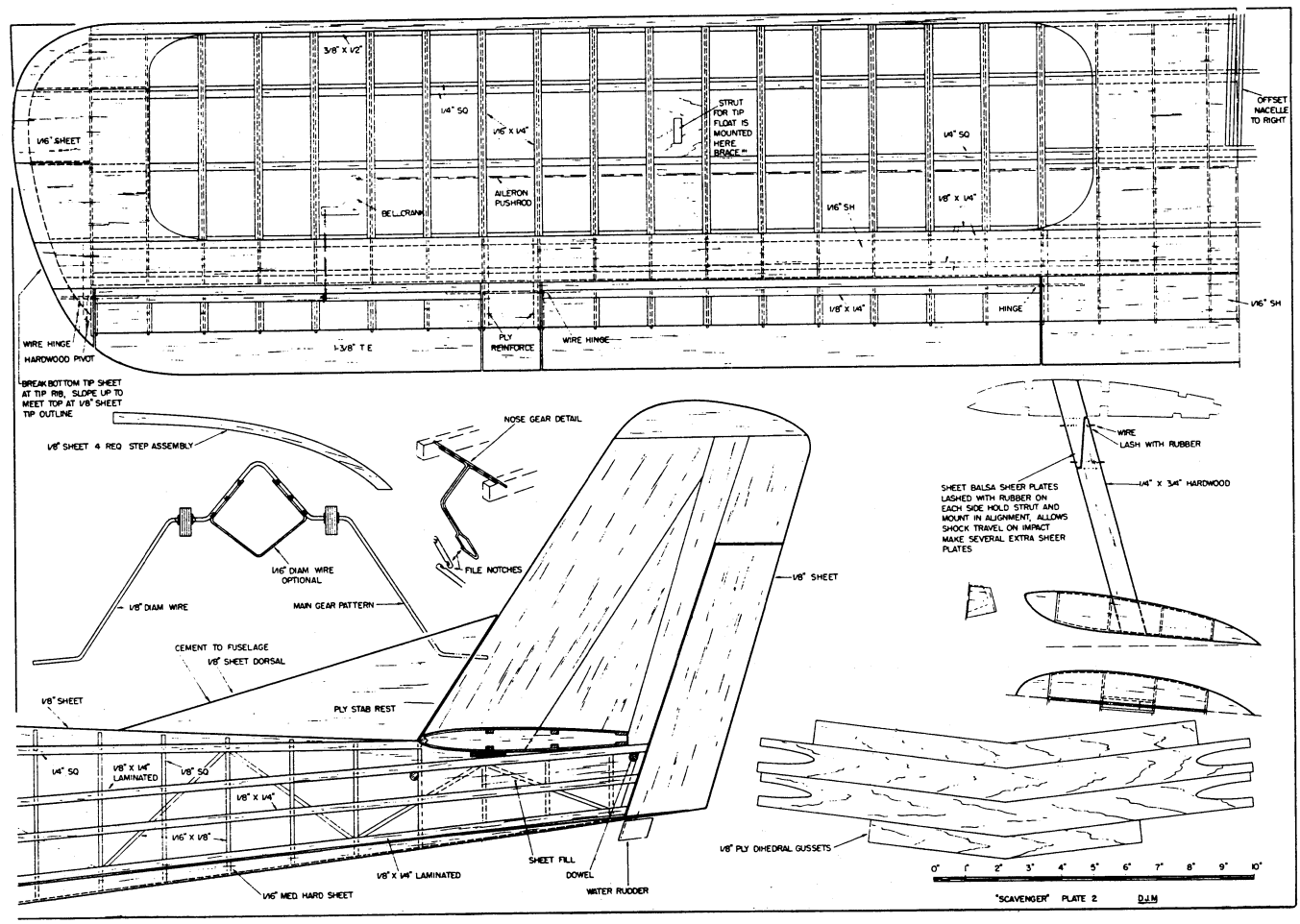
SHEET 2

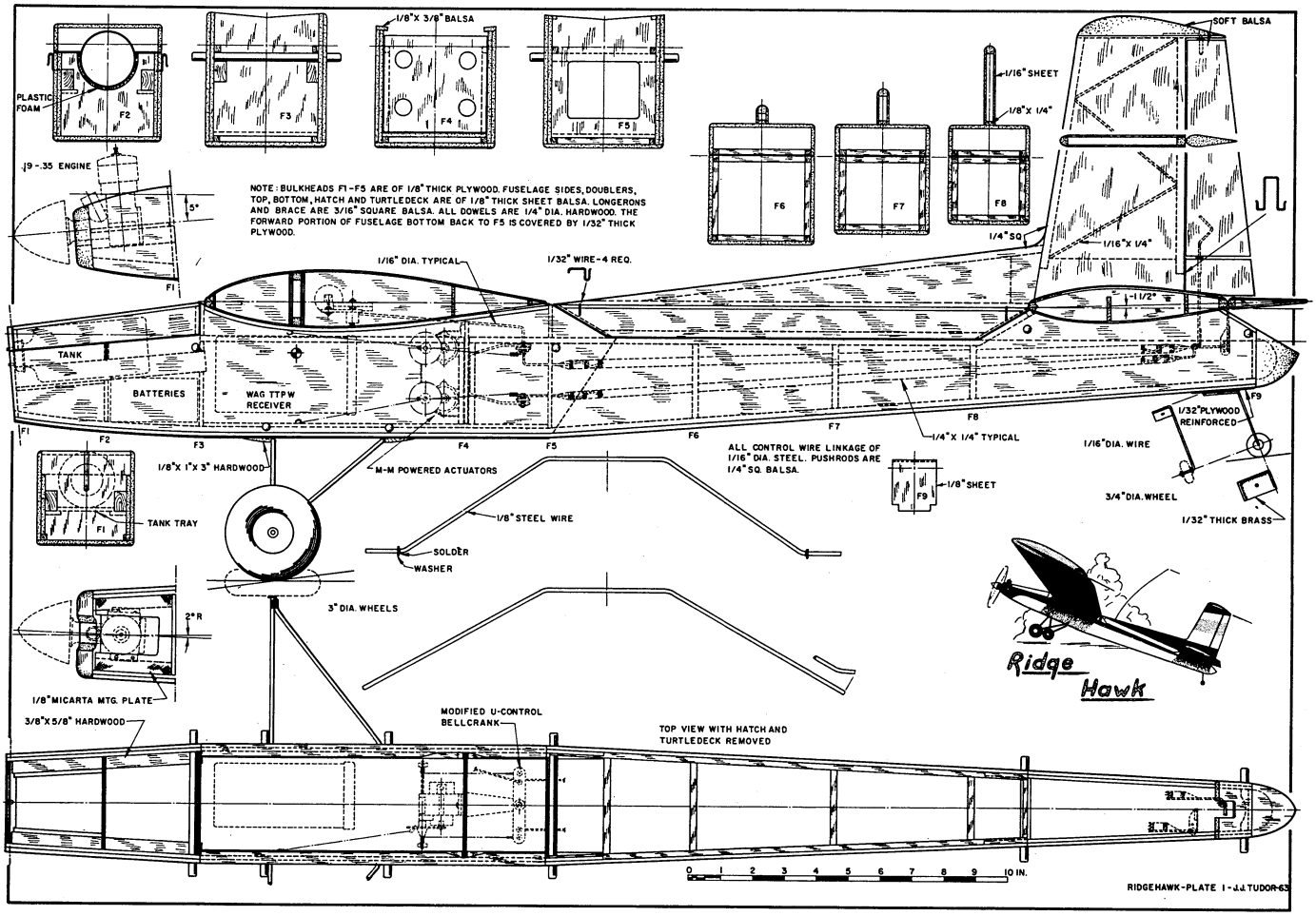

STAB PLAN
5/16"X3/8" LEADING EDGE
1/16" SHEET PLANKING-TOP AND BOTTOM
1/16"X 1/4" RIB CAPSTRIPPING
5/16"X3/8" TRAILING EDGE
1/8" PLYWOOD BRACE
RECESS
CLEVIS
1/16" NOTCHING
ELEVATOR 3/16" SOFT SHEET
1/32" DIAM. HINGE WIRE
ELEVATOR CONTROL HORN POSITION
1/32" I.D. ALUM. TUBING HINGE WIRE GUIDES
CLOTH TAPE
1/16" PLY. INSET
TYP. STAB SECT.
ELEVATOR
S-1
1/16" HARD SHEET
TRIM AFTER ASSEMBLY
INCHES
NOTE: USE BALSA UNLESS OTHERWISE SPECIFIED.
SOFT TIP BLOCK
BASIC FUSELAGE SIDE ASSEMBLY
F-18 POSITION
STAB DOUBLER
F-17 POSITION
MAIN FUSELAGE SIDE
F-3
F-6
F-7
1/16" SH. DIAGONAL DOUBLERS
1/16" PLY. L.G. BRACING
3/16" DIAM. STAB DOWEL SOLDER
ELEV. HORN POS.
"B"
"A"
1/16" I.D. TUBING
RUDDER HORN POS.
NOTE: ALL THRUST SETTINGS 0° ON ORIGINAL DESIGN.
FUSELAGE TOP VIEW
"ORBIT" RECEIVER LOCATED HERE
1/4" DIAM. L.G. DOWEL
ELEVATOR TORQUE ROD
3/32" HARD SHEET FUSELAGE SIDES
MOTOR SERVO
TRIM SERVO
RUDDER SERVO
ELEV. SERVO
1/16" SH. DIAGONAL DOUBLERS
WING SUPPORTS
RUDDER TORQUE ROD
FUSELAGE FORMERS & SECTIONS
F-20
3/16" SH.
F-4
F-5
1/16" PLY.
F-15
F-21
F-22
F-23
SECT. A-A
SECT. F-13
1/8" PLYWOOD
SECT. F-17
SECT. B-B
SECT. C-C
SECT. F-16
F-19 3/16" SH.
F-7 3/16" SH.
3/16" SH. FIN
RUDDER 3/16" SH.
3/16" SH. INSERT
CLOTH TAPE HINGES
3/16" SH. BASE FIN SUPPORT
"A"
"B"
"C"
WING CENTERSECTION
7"-8" COMM. PLASTIC CANOPY
F-5 3/16" SH.
F-6 - 3/16" SH.
SOFT TOP BLOCK (HOLLOW DOTTED LINE)
.35 TO .45 ENGINE SHOWN INVERTED
3/8"X 17/32" HDWD. ENGINE MOUNTS
2-1/2" DIAM. SPINNER
F-15
F-20
C.G.
WING SUPPORTS
3/32" SH. STAB FAIRING
STAB POSITION
3/32" PLY. DOWEL SUPPORT
3/32" SH. CROSSGRAIN TOP PLANKING
3/32" SH. STAB DOUBLER
F-6
F-19
F-4
F-7
FUEL TANK
BATTERIES
MAIN FUSELAGE SIDE ASSEMBLY JUNCTION
1/16" PLY. PLATFORM
1/16" PLY. PLATFORM
F-18
1/8" PLY. DOWEL SUPPORT
1/4" SQ. VERTICAL BRACING
11/16" O.D.
FUSELAGE SIDE ENDS HERE
1/8" DIAM. PIANO WIRE
1/4" SQ. BRACING
TOP FLITE STEERABLE NOSEWHEEL ASSEMBLY RECOMMENDED
TWO PLY 1/8" SH. LAMINATED
3/16" SH. (TWO PLY)
ANGLEPIECE
1/16" PLY. BRACING
1/16" SH. DIAGONAL DOUBLERS
1/8" PLY. STOPS
1/8" PLY. L.G. MOUNT
1/4" SQ. PLATFORM BRACES
1/2"X 1/2" TRIANGLE LONGERONS (TOP AND BOTTOM)
3/32" SH. CROSSGRAIN BOTTOM PLANKING
"CITATION"
DESIGNED BY: JOHN ROTH
SHEET NO. 1
NOSE WHEEL STRUT LAYOUT
FUSELAGE SIDE VIEW
2-1/2" DIAM. NOSE WHEEL
2-3/4" DIAM. MAIN WHEELS
BEND AND SOLDER
1/16" DIAM. WIRE SPREADERS
MAIN L.G. STRUT LAYOUTS
1/8" DIAM. WIRE
FRONT STRUT
REAR STRUT
END VIEW
TRUE LENGTH
P.D.G.

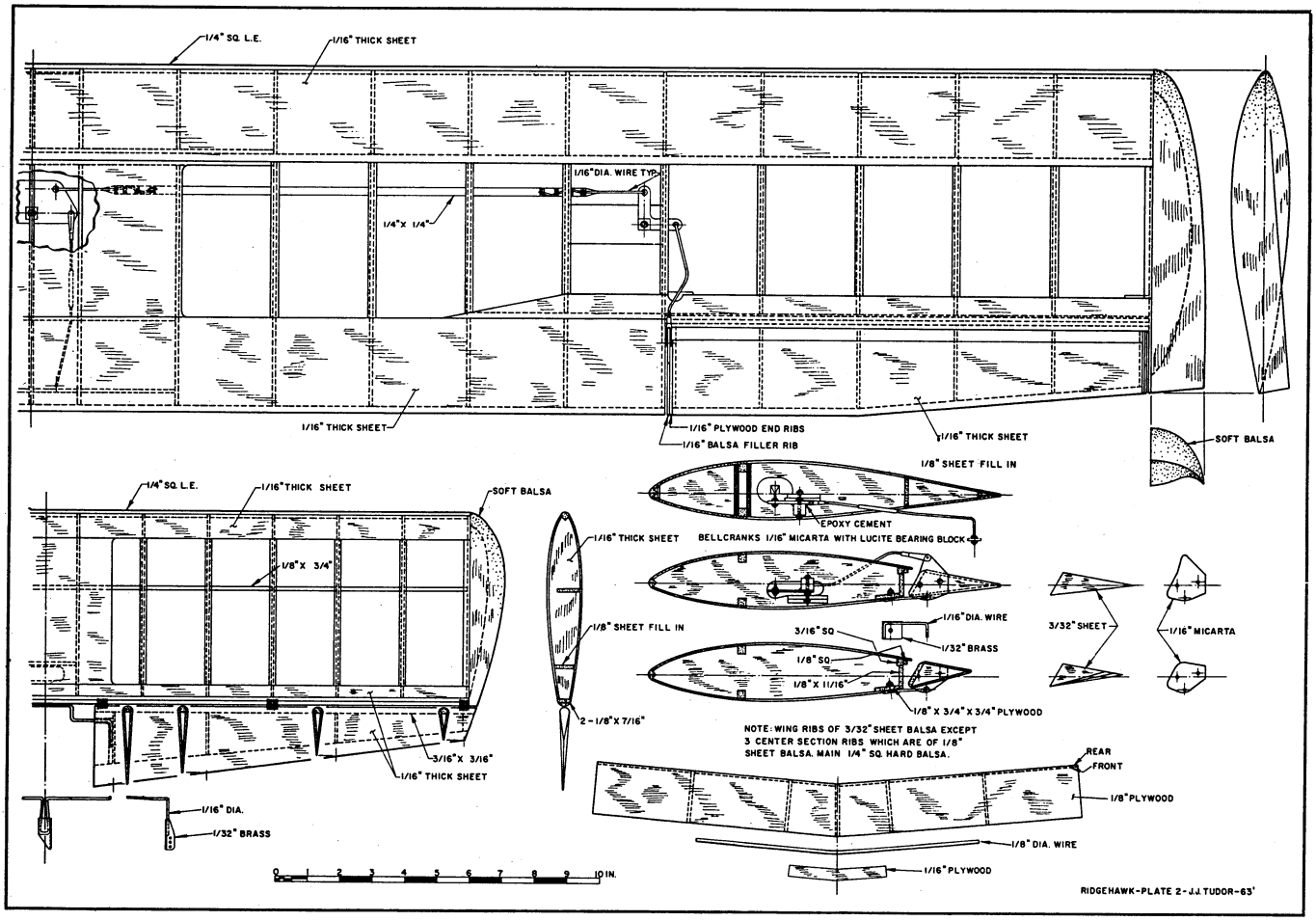

1/8" PLYWOOD
F-22
F-23
F-24
1/16" PLANKING TOP & BOTTOM
3/8" SQ. LEADING EDGE
1/8" SH.
1/16" I.D. BRASS TUBING
1/8" SH. FILL-IN
R-1A
1/16" PLYWOOD JOINERS
R-2
R-3
RIGHT WING PLAN
TOP FLITE NYLON FITTINGS
1/4" SQ. MAIN WING SPARS
DRILL .050"
.072"
3/32"
1/16" PLYWOOD MOUNT
BONNER SERVO
1/8" PLYWOOD SUPPORT CEMENTED TO TOP PLANKING
1/16" DIAM. WIRE ACTUATING ROD
1/16" SH. VERTICAL WEBBING BETWEEN RIBS
1/16"X 1/4" RIB CAP STRIPS
1/16" PLYWOOD PLATFORM
3/32" SH.
1/16" DIA. WIRE PUSH ROD
3/16" SQ. RAILS
1/16" SH. VERTICAL WEBBING BETWEEN RIBS
3/32" SH. WING T.E. SPAR
3/16" SQ. REAR WING SPARS
R-1B
ELEVATOR-RUDDER CONTROL HORN
5/16"
7/16"
.072" DRILL
1/8" PLYWOOD JOINERS
LEAVE OPEN ON BOTTOM FOR ACCESS
CLOTH TAPE HINGES
THREADED ROD
THREAD INSIDE
NYLON OR METAL CLEVIS DETAIL
R-1C
TRAILING EDGE BRACING 1/8"x 3/8" TAPERED BETWEEN RIBS
MICARTA CONTROL HORN
A-3
A-1
1/16" SH. AILERON LEADING EDGE
1/16" SH. TOP & BOTTOM
1/16" VENEER OR PLYWOOD REINFORCEMENT
PLANKING CUT AWAY FOR CLARITY
R-2A
3/16" SH. LAMIN. OR SOFT BLOCK
AILERON ASSEMBLY DETAIL
SOLDER WASHER
3/16" SQ. RAIL
HINGE POINT
1/16" PLYWOOD
CLEVIS
1/16" MICARTA AILERON CONTROL HORN
3/32" SH.
LEFT WING PLAN
.040" I.D. ALUM. TUBING
3/16" SQ. REAR WING SPARS
3/32" SH. WING T.E. SPARS
1/16"x5/8" PUSHROD LEAD-OUT
1/8" SH. FILL-IN
APPROX. 7" PLASTIC CANOPY
MAIN SPARS
REAR SPARS
WEBBING DETAIL
1/16" SH. VERTICAL WEBBING
.040" DIAM. HINGE WIRE
1/16" SH. TOP AND BOTTOM
3/32" SH. FILL-IN
17-7/8"
AILERON L.E.
1/16" X 1" X 17-7/8"
WING TRAILING EDGE SPAR
3/32" X 27/32" X 17-1/4"
17-1/4"
REMOVE TABS AFTER ASSEMBLY
1/16" PLYWOOD
FRONT SPAR JOINER (FRONT FACE)
REAR SPAR JOINER (REAR FACE)
FRONT DIHEDRAL JOINERS
REAR FACE
FRONT FACE
DIHEDRAL SKETCH
4"
"CITATION"
DESIGNED BY: JOHN ROTH
SHEET NO. 2
INCHES
P.D.G.

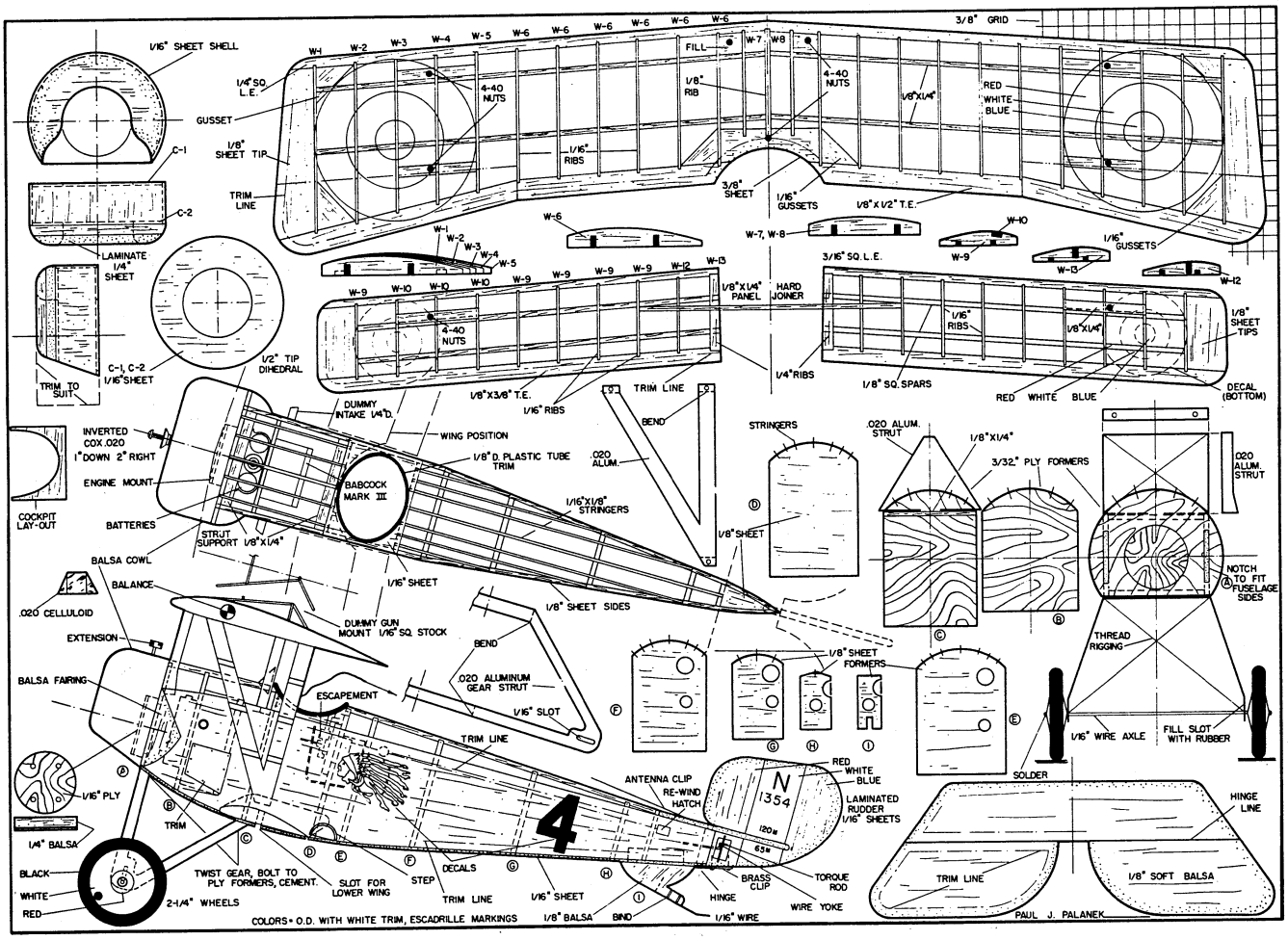
"SCAVENGER" Don McGovern's Amphibious Single/Multi R/C, Flying Boat .35-.56 engines.

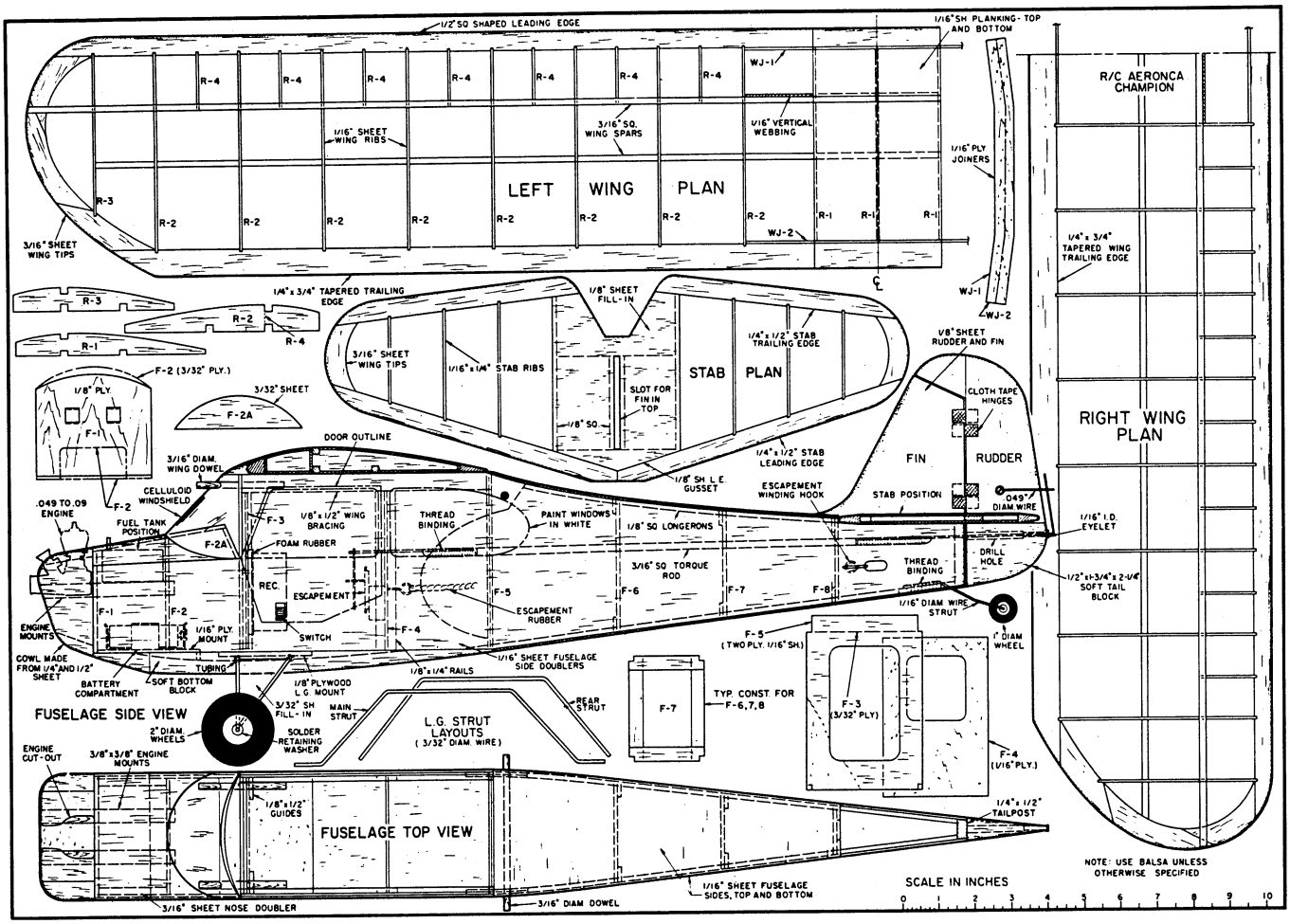


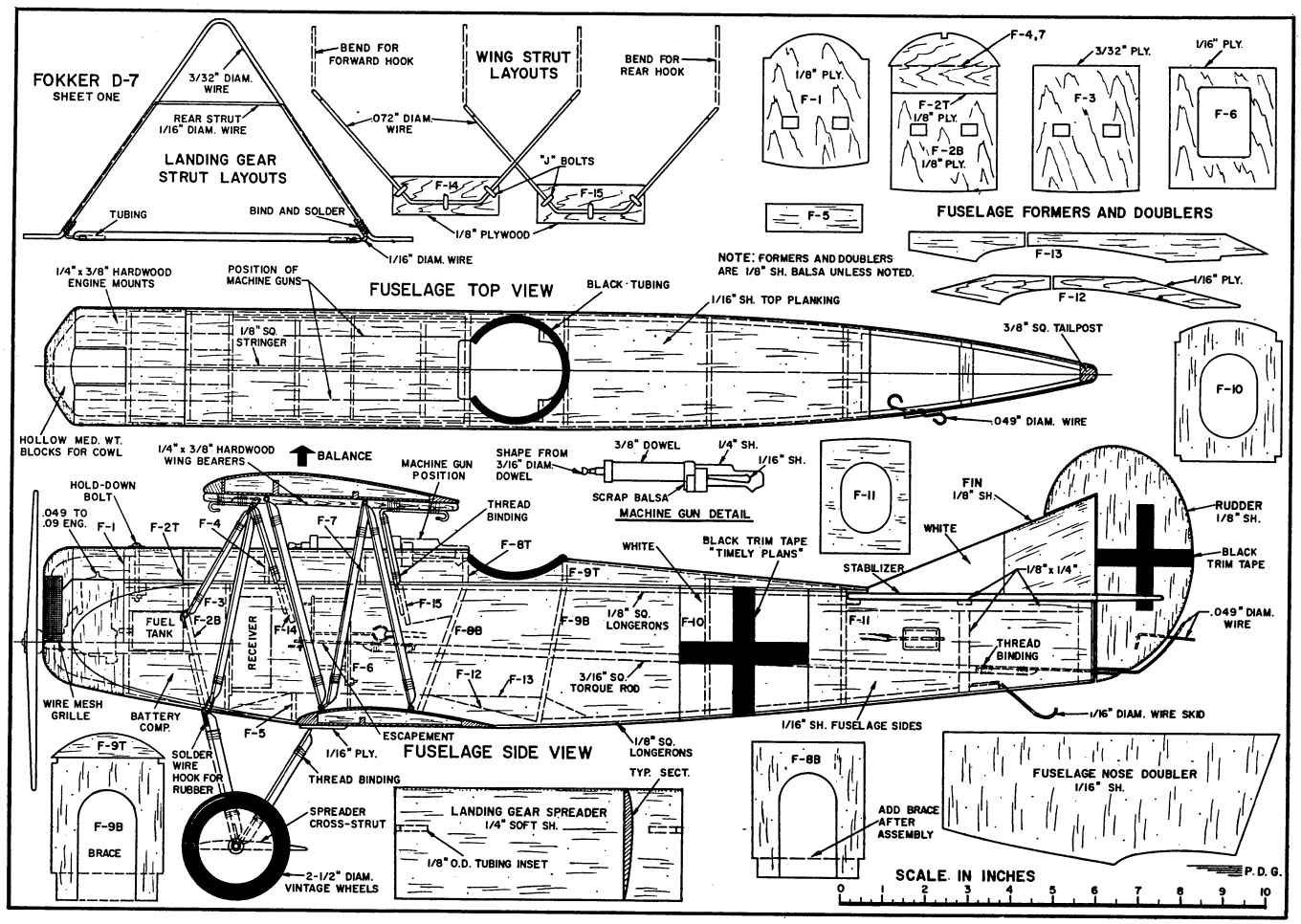


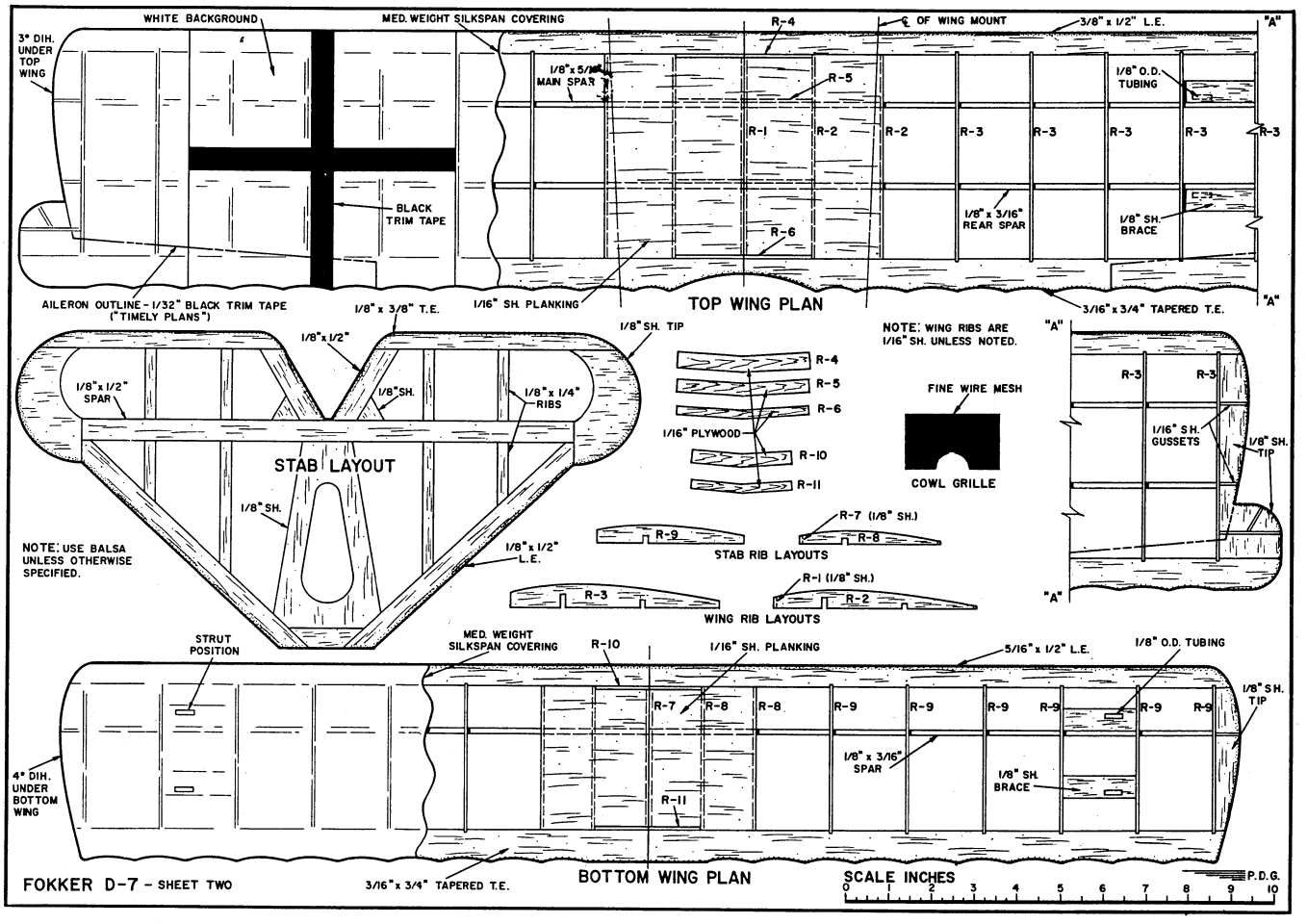

PLASTIC FOAM
F2
F3
1/8"X 3/8" BALSA
F4
F5
SOFT BALSA
1/16" SHEET
1/8"X 1/4"
F6
F7
F8
1/4" SQ.
1/16"X 1/4"
.19-.35 ENGINE
5°
F1
NOTE: BULKHEADS F1-F5 ARE OF 1/8" THICK PLYWOOD. FUSELAGE SIDES, DOUBLERS, TOP, BOTTOM, HATCH AND TURTLEDECK ARE OF 1/8" THICK SHEET BALSA. LONGERONS AND BRACE ARE 3/16" SQUARE BALSA. ALL DOWELS ARE 1/4" DIA. HARDWOOD. THE FORWARD PORTION OF FUSELAGE BOTTOM BACK TO F5 IS COVERED BY 1/32" THICK PLYWOOD.
1/16" DIA. TYPICAL
1/32" WIRE-4 REQ.
1-1/2"
TANK
BATTERIES
WAG TTPW RECEIVER
F9
1/32" PLYWOOD REINFORCED
1/4"X 1/4" TYPICAL
1/16" DIA. WIRE
1/8"X 1"X 3" HARDWOOD
M-M POWERED ACTUATORS
ALL CONTROL WIRE LINKAGE OF 1/16" DIA. STEEL. PUSHRODS ARE 1/4" SQ. BALSA.
1/8" SHEET
3/4" DIA. WHEEL
1/32" THICK BRASS
TANK TRAY
1/8" STEEL WIRE
SOLDER
WASHER
3" DIA. WHEELS
2"R
1/8" MICARTA MTG. PLATE
3/8"X 5/8" HARDWOOD
MODIFIED U-CONTROL BELLCRANK
TOP VIEW WITH HATCH AND TURTLEDECK REMOVED
Ridge Hawk
0 1 2 3 4 5 6 7 8 9 10 IN.
RIDGEHAWK-PLATE 1-J.J.TUDOR-63

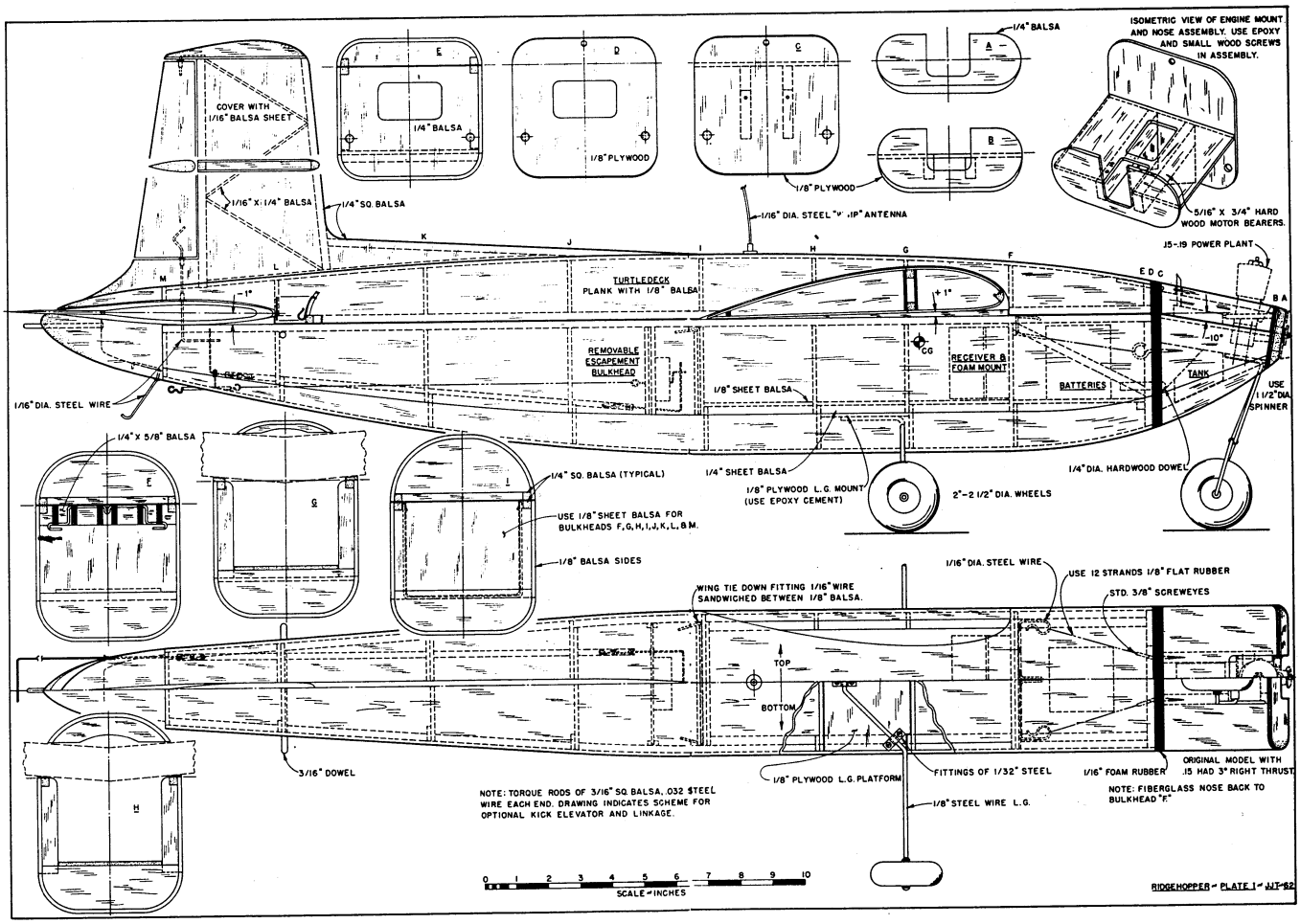

1/4" SQ. L.E.
1/16" THICK SHEET
1/16" DIA. WIRE TYP.
1/4"X 1/4"
1/16" THICK SHEET
1/16" PLYWOOD END RIBS
1/16" BALSA FILLER RIB
1/16" THICK SHEET
SOFT BALSA
1/8" SHEET FILL IN
EPOXY CEMENT
BELLCRANKS 1/16" MICARTA WITH LUCITE BEARING BLOCK
1/4" SQ. L.E.
1/16" THICK SHEET
SOFT BALSA
1/8"X 3/4"
1/16" THICK SHEET
1/8" SHEET FILL IN
1/16" DIA. WIRE
3/16" SQ
1/32" BRASS
1/8" SQ
1/8"X 11/16"
1/8" X 3/4" X 3/4" PLYWOOD
3/32" SHEET
1/16" MICARTA
2-1/8"X 7/16"
3/16"X 3/16"
1/16" THICK SHEET
1/16" DIA.
1/32" BRASS
NOTE: WING RIBS OF 3/32" SHEET BALSA EXCEPT 3 CENTER SECTION RIBS WHICH ARE OF 1/8" SHEET BALSA. MAIN 1/4" SQ. HARD BALSA.
REAR
FRONT
1/8" PLYWOOD
1/8" DIA. WIRE
1/16" PLYWOOD
0 1 2 3 4 5 6 7 8 9 10 IN.
RIDGEHAWK-PLATE 2-J.J.TUDOR-63

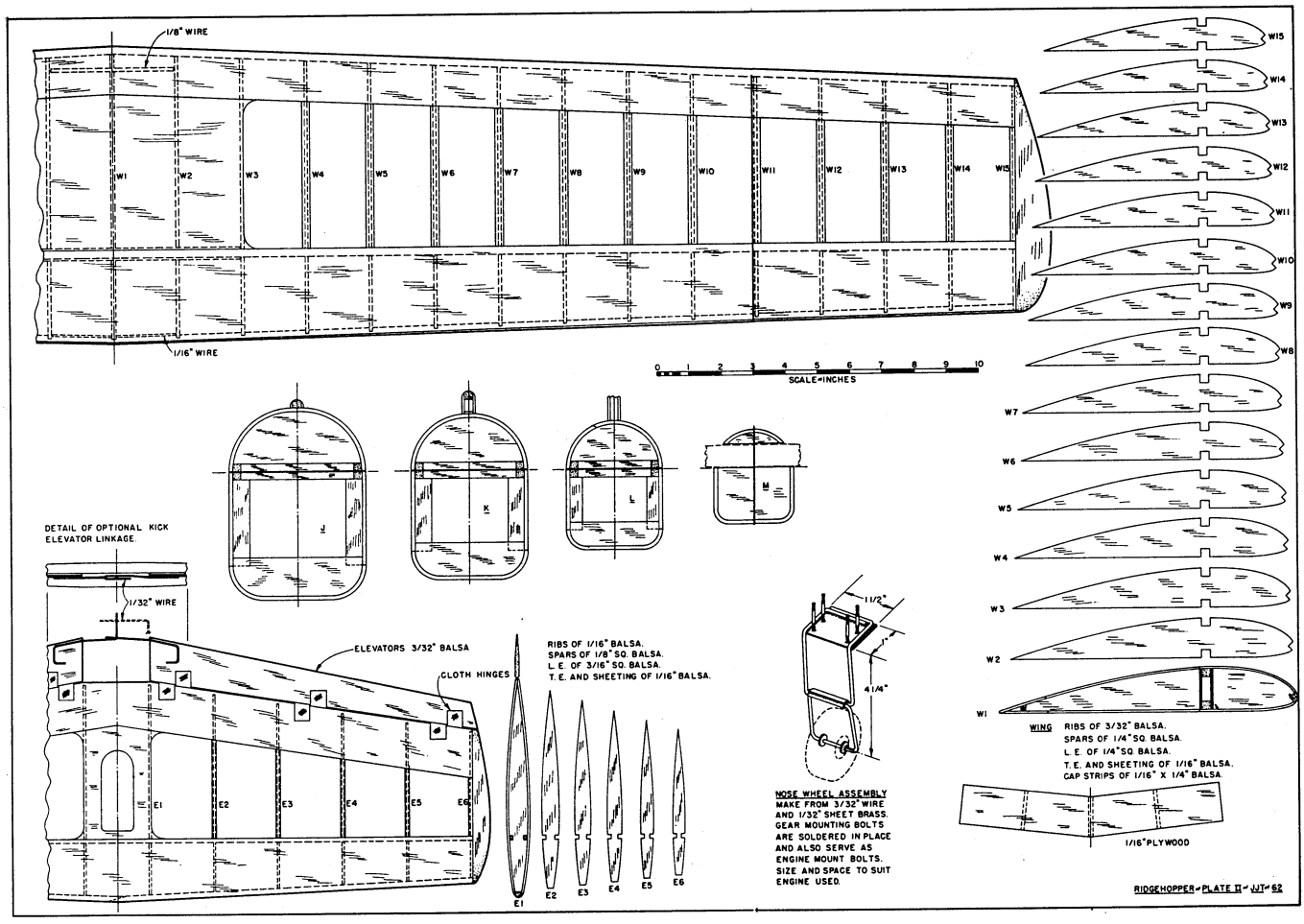

1/16" SHEET SHELL
1/4" SQ. L.E.
GUSSET
C-1
1/8" SHEET TIP
C-2
TRIM LINE
LAMINATE 1/4" SHEET
C-1, C-2 1/16" SHEET
TRIM TO SUIT
1/2" TIP DIHEDRAL
W-1 W-2 W-3 W-4 W-5 W-6 W-6 W-6 W-6 W-6 W-6
3/8" GRID
FILL
W-7 W-8
4-40 NUTS
1/8" RIB
1/16" RIBS
3/8" SHEET
1/16" GUSSETS
1/8" X 1/2" T.E.
1/8" X 1/4"
RED WHITE BLUE
W-6
W-1 W-2 W-3 W-4 W-5
W-7, W-8
W-10
W-9
W-13
W-12
3/16" SQ. L.E.
W-9 W-10 W-10 W-10 W-9 W-9 W-9 W-9 W-12 W-13
1/8" X 1/4" HARD PANEL JOINER
4-40 NUTS
1/8" X 3/8" T.E.
1/16" RIBS
1/4" RIBS
1/8" SQ. SPARS
1/8" SHEET TIPS
DECAL (BOTTOM)
DUMMY INTAKE 1/4" D.
WING POSITION
INVERTED COX .020 1° DOWN 2° RIGHT
ENGINE MOUNT
1/8" D. PLASTIC TUBE TRIM
.020 ALUM.
BABCOCK MARK III
1/16" X 1/8" STRINGERS
COCKPIT LAY-OUT
BATTERIES
STRUT SUPPORT 1/8" X 1/4"
BALSA COWL
1/16" SHEET
BALANCE
.020 CELLULOID
DUMMY GUN MOUNT 1/16" SQ. STOCK
1/8" SHEET SIDES
EXTENSION
BEND
.020 ALUMINUM GEAR STRUT
1/16" SLOT
BALSA FAIRING
ESCAPEMENT
TRIM LINE
1/16" PLY
1/4" BALSA
TRIM
BLACK
WHITE
RED
2-1/4" WHEELS
TWIST GEAR, BOLT TO PLY FORMERS, CEMENT.
SLOT FOR LOWER WING
STEP
DECALS
TRIM LINE
1/16" SHEET
1/8" BALSA
BEND
HINGE
1/16" WIRE
WIRE YOKE
BRASS CLIP
TORQUE ROD
ANTENNA CLIP
RE-WIND HATCH
RED WHITE BLUE
LAMINATED RUDDER 1/16" SHEETS
SOLDER
HINGE LINE
TRIM LINE
1/8" SOFT BALSA
PAUL J. PALANEK
COLORS = O.D. WITH WHITE TRIM, ESCADRILLE MARKINGS
STRINGERS
.020 ALUM. STRUT
1/8" X 1/4"
3/32" PLY FORMERS
.020 ALUM. STRUT
NOTCH TO FIT FUSELAGE SIDES
THREAD RIGGING
1/8" SHEET FORMERS
1/16" WIRE AXLE
FILL SLOT WITH RUBBER
4

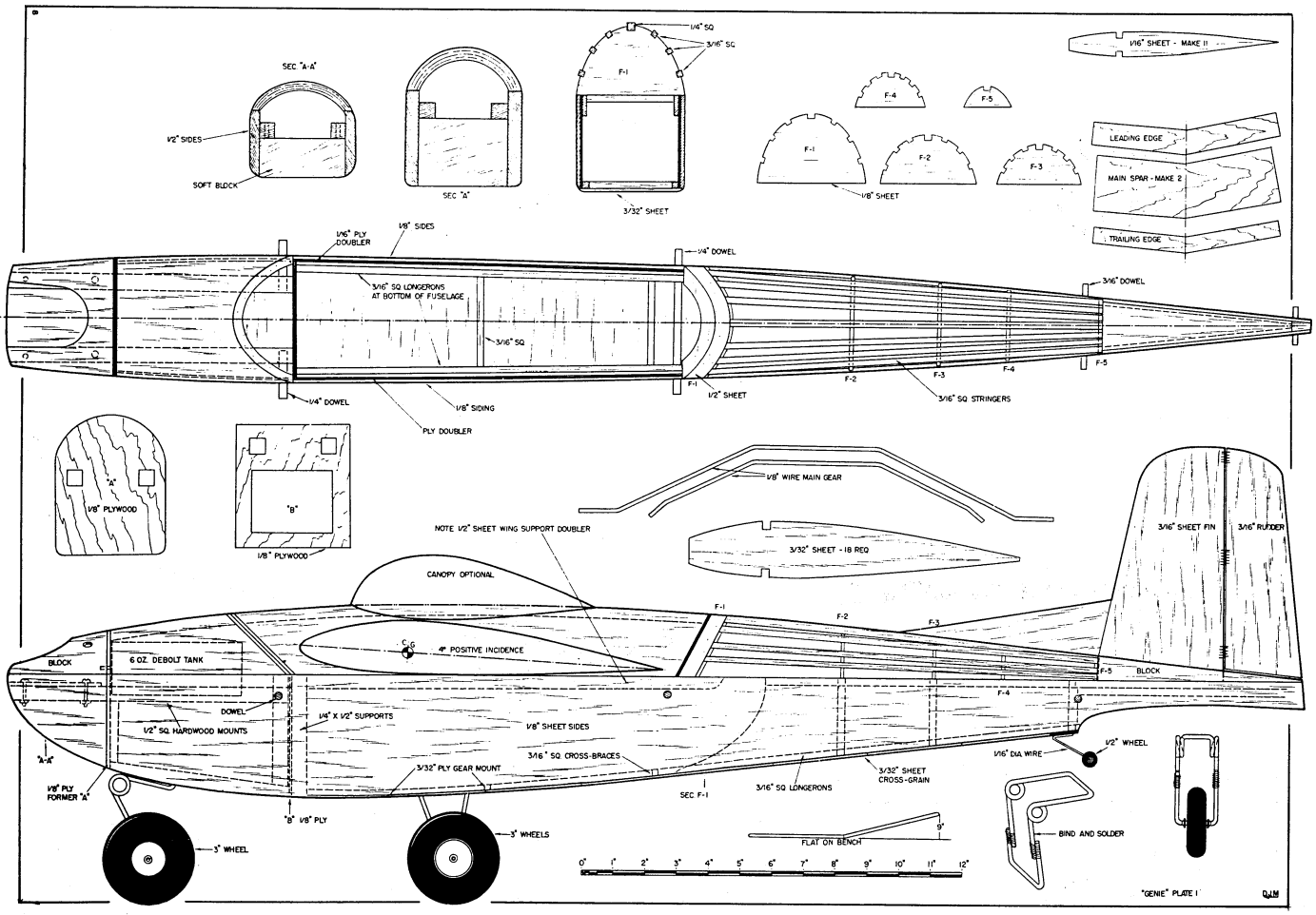

1/2" SQ SHAPED LEADING EDGE
1/16" SH PLANKING - TOP AND BOTTOM
R-4 R-4 R-4 R-4 R-4 R-4 R-4
WJ-1
1/16" SHEET WING RIBS
3/16" SQ. WING SPARS
1/16" VERTICAL WEBBING
1/16" PLY JOINERS
LEFT WING PLAN
R-3 R-2 R-2 R-2 R-2 R-2 R-2 R-2 R-2 R-1 R-1 R-1
WJ-2
3/16" SHEET WING TIPS
1/4" x 3/4" TAPERED TRAILING EDGE
1/8" SHEET FILL-IN
1/4" x 3/4" TAPERED WING TRAILING EDGE
R-3 R-2 R-1 R-4
3/16" SHEET WING TIPS
1/16" x 1/4" STAB RIBS
STAB PLAN
1/4" x 1/2" STAB TRAILING EDGE
1/8" SHEET RUDDER AND FIN
F-2 (3/32" PLY.)
1/8" PLY.
3/32" SHEET
F-2A
F-1
SLOT FOR FIN IN TOP
1/8" SQ.
CLOTH TAPE HINGES
R/C AERONCA CHAMPION
RIGHT WING PLAN
3/16" DIAM. WING DOWEL
DOOR OUTLINE
CELLULOID WINDSHIELD
1/4" x 1/2" STAB LEADING EDGE
1/8" SH L.E. GUSSET
ESCAPEMENT WINDING HOOK
FIN
RUDDER
STAB POSITION
.049" DIAM WIRE
.049 TO .09 ENGINE
FUEL TANK POSITION
1/8" x 1/2" WING BRACING
THREAD BINDING
PAINT WINDOWS IN WHITE
1/8" SQ LONGERONS
1/16" I.D. EYELET
F-3
F-2A
FOAM RUBBER
3/16" SQ TORQUE ROD
THREAD BINDING
DRILL HOLE
1/2" x 1-3/4" x 2-1/4" SOFT TAIL BLOCK
REC.
ESCAPEMENT
F-5
F-6
F-7
F-8
ESCAPEMENT RUBBER
1/16" DIAM WIRE STRUT
1" DIAM WHEEL
ENGINE MOUNTS
F-1
F-2
1/16" PLY MOUNT
SWITCH
F-4
F-5 (TWO PLY. 1/16" SH.)
1/16" SHEET FUSELAGE SIDE DOUBLERS
COWL MADE FROM 1/4" AND 1/2" SHEET
TUBING
1/8" x 1/4" RAILS
BATTERY COMPARTMENT
SOFT BOTTOM BLOCK
1/8" PLYWOOD L.G. MOUNT
FUSELAGE SIDE VIEW
3/32" SH FILL-IN
MAIN STRUT
L.G. STRUT LAYOUTS (3/32" DIAM. WIRE)
REAR STRUT
F-7
TYP. CONST. FOR F-6, 7, 8
F-3 (3/32" PLY)
F-4 (1/16" PLY.)
2" DIAM. WHEELS
SOLDER RETAINING WASHER
ENGINE CUT-OUT
3/8" x 3/8" ENGINE MOUNTS
1/8" x 1/2" GUIDES
FUSELAGE TOP VIEW
1/4" x 1/2" TAILPOST
3/16" SHEET NOSE DOUBLER
3/16" DIAM DOWEL
1/16" SHEET FUSELAGE SIDES, TOP AND BOTTOM
NOTE: USE BALSA UNLESS OTHERWISE SPECIFIED
SCALE IN INCHES
0 1 2 3 4 5 6 7 8 9 10

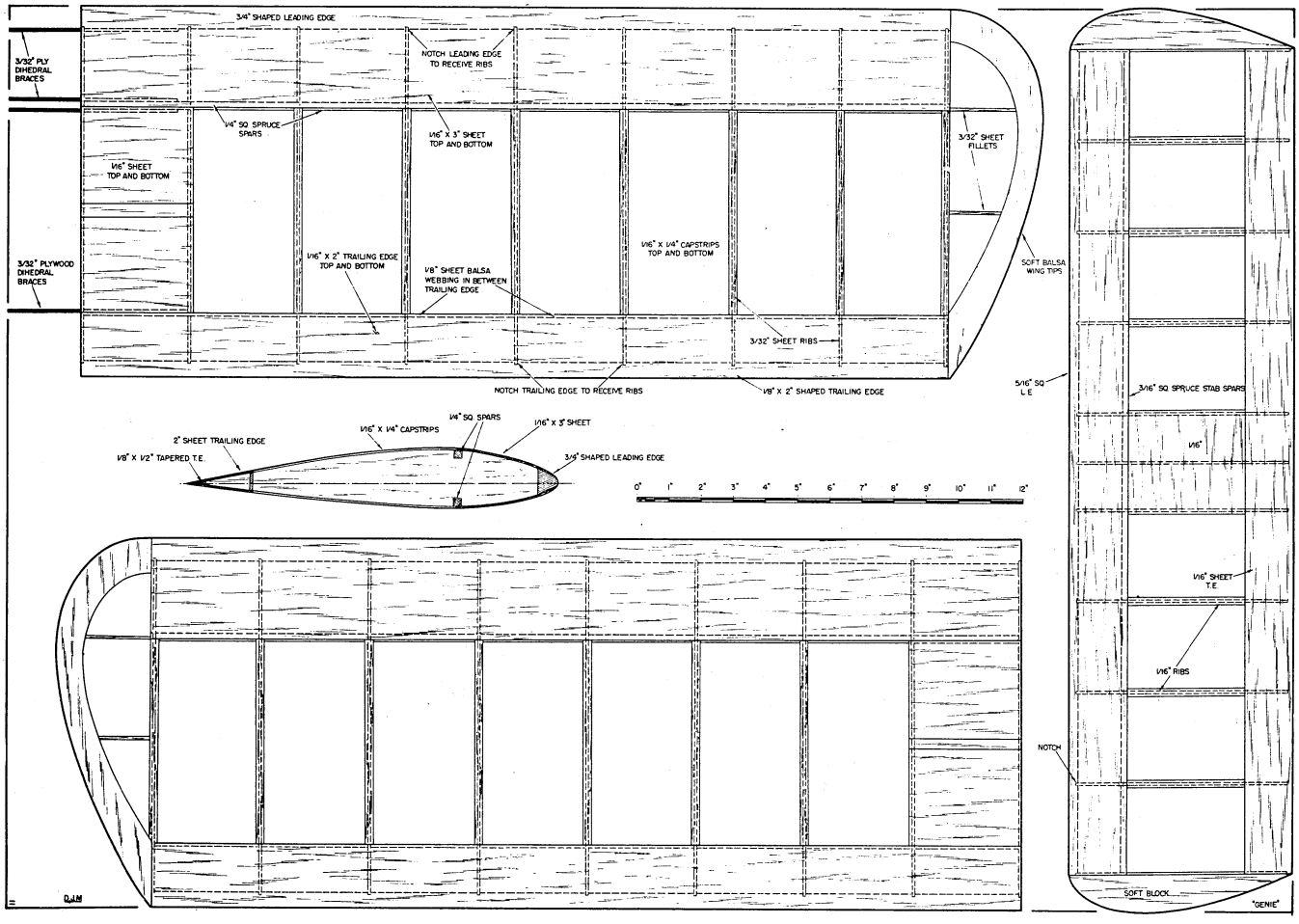

FOKKER D-7
SHEET ONE
LANDING GEAR STRUT LAYOUTS
3/32" DIAM. WIRE
REAR STRUT 1/16" DIAM. WIRE
TUBING
BIND AND SOLDER
1/16" DIAM. WIRE
WING STRUT LAYOUTS
BEND FOR FORWARD HOOK
BEND FOR REAR HOOK
.072" DIAM. WIRE
"J" BOLTS
F-14
F-15
1/8" PLYWOOD
F-1
1/8" PLY.
F-4,7
F-2T
1/8" PLY.
F-2B
1/8" PLY.
3/32" PLY.
F-3
1/16" PLY.
F-6
F-5
FUSELAGE FORMERS AND DOUBLERS
NOTE: FORMERS AND DOUBLERS ARE 1/8" SH. BALSA UNLESS NOTED.
F-13
F-12
1/16" PLY.
FUSELAGE TOP VIEW
1/4" x 3/8" HARDWOOD ENGINE MOUNTS
POSITION OF MACHINE GUNS
BLACK TUBING
1/16" SH. TOP PLANKING
1/8" SQ. STRINGER
3/8" SQ. TAILPOST
.049" DIAM. WIRE
F-10
HOLLOW MED. WT. BLOCKS FOR COWL
1/4" x 3/8" HARDWOOD WING BEARERS
BALANCE
MACHINE GUN POSITION
SHAPE FROM 3/16" DIAM. DOWEL
3/8" DOWEL
1/4" SH.
1/16" SH.
SCRAP BALSA
MACHINE GUN DETAIL
F-11
FIN 1/8" SH.
RUDDER 1/8" SH.
WHITE
BLACK TRIM TAPE
HOLD-DOWN BOLT
.049 TO .09 ENG.
F-1
F-2T
F-4
F-7
THREAD BINDING
F-8T
F-9T
BLACK TRIM TAPE "TIMELY PLANS"
STABILIZER
1/8" x 1/4"
F-3
FUEL TANK
F-2B
F-14
RECEIVER
F-15
F-8B
F-9B
1/8" SQ. LONGERONS
F-10
F-11
.049" DIAM. WIRE
F-6
F-12
F-13
3/16" SQ. TORQUE ROD
THREAD BINDING
WIRE MESH GRILLE
BATTERY COMP.
F-5
ESCAPEMENT
1/16" SH. FUSELAGE SIDES
1/16" DIAM. WIRE SKID
F-9T
SOLDER WIRE HOOK FOR RUBBER
1/16" PLY.
FUSELAGE SIDE VIEW
1/8" SQ. LONGERONS
THREAD BINDING
TYP. SECT.
F-9B
BRACE
SPREADER CROSS-STRUT
LANDING GEAR SPREADER 1/4" SOFT SH.
1/8" O.D. TUBING INSET
2-1/2" DIAM. VINTAGE WHEELS
F-8B
ADD BRACE AFTER ASSEMBLY
FUSELAGE NOSE DOUBLER 1/16" SH.
SCALE IN INCHES
0 1 2 3 4 5 6 7 8 9 10
P.D.G.

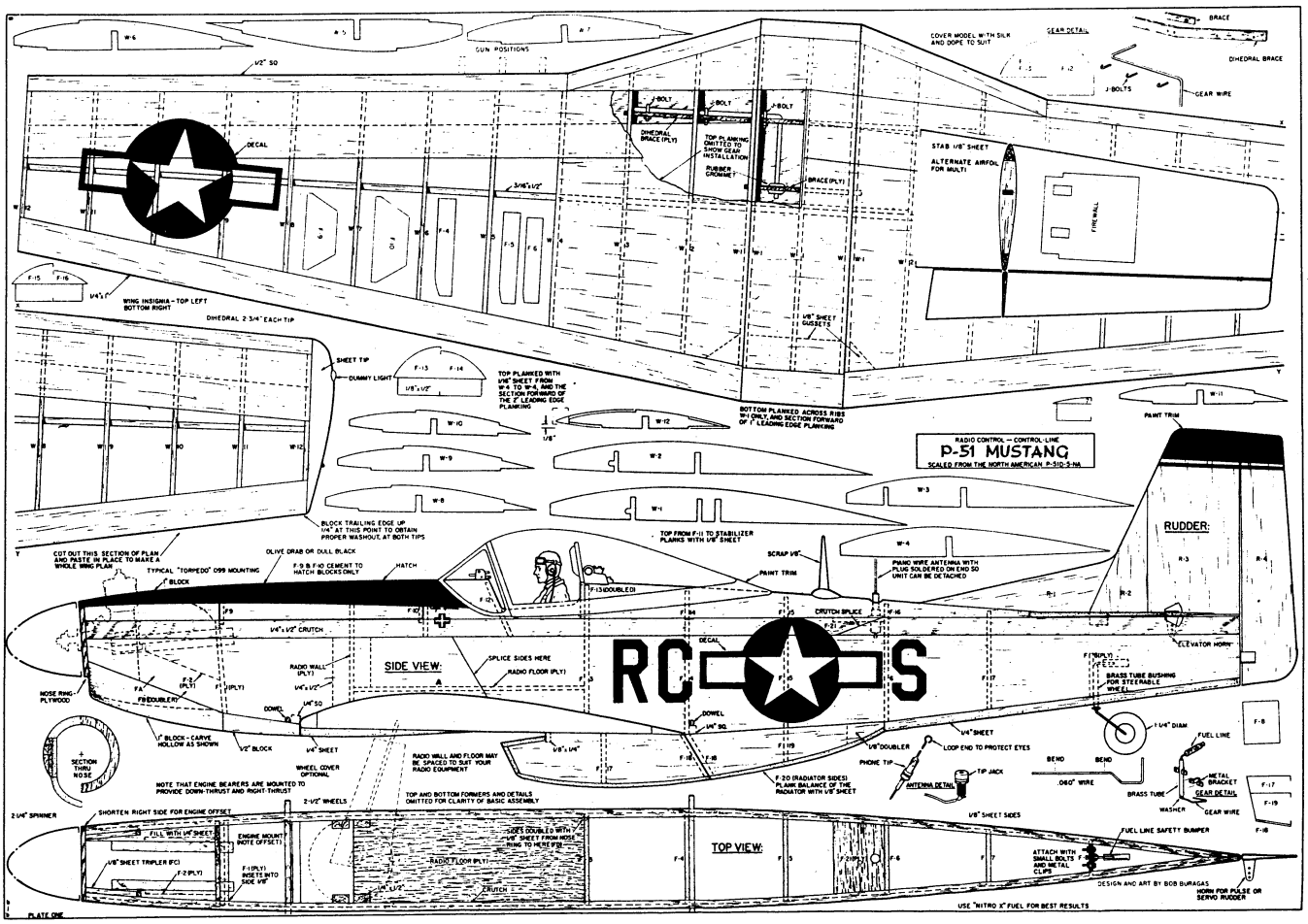

WHITE BACKGROUND
MED. WEIGHT SILKSPAN COVERING
R-4
℄ OF WING MOUNT
3/8" x 1/2" L.E.
"A"
3° DIH. UNDER TOP WING
1/8" x 5/16" MAIN SPAR
R-5
1/8" O.D. TUBING
R-1
R-2
R-2
R-3
R-3
R-3
R-3
R-3
BLACK TRIM TAPE
1/8" x 3/16" REAR SPAR
1/8" SH. BRACE
R-6
AILERON OUTLINE - 1/32" BLACK TRIM TAPE ("TIMELY PLANS")
1/8" x 3/8" T.E.
1/16" SH. PLANKING
TOP WING PLAN
3/16" x 3/4" TAPERED T.E.
"A"
1/8" SH. TIP
1/8" x 1/2"
1/8" x 1/2" SPAR
1/8" SH.
1/8" x 1/4" RIBS
STAB LAYOUT
1/8" SH.
NOTE: USE BALSA UNLESS OTHERWISE SPECIFIED.
1/8" x 1/2" L.E.
R-4
R-5
R-6
1/16" PLYWOOD
R-10
R-11
NOTE: WING RIBS ARE 1/16" SH. UNLESS NOTED.
FINE WIRE MESH
COWL GRILLE
R-9
R-7 (1/8" SH.)
R-8
STAB RIB LAYOUTS
R-3
R-1 (1/8" SH.)
R-2
WING RIB LAYOUTS
"A"
R-3
R-3
1/16" SH. GUSSETS
1/8" SH. TIP
"A"
STRUT POSITION
MED. WEIGHT SILKSPAN COVERING
R-10
1/16" SH. PLANKING
5/16" x 1/2" L.E.
1/8" O.D. TUBING
1/8" SH. TIP
R-7
R-8
R-8
R-9
R-9
R-9
R-9
R-9
R-9
1/8" x 3/16" SPAR
1/8" SH. BRACE
R-11
4° DIH. UNDER BOTTOM WING
FOKKER D-7 - SHEET TWO
3/16" x 3/4" TAPERED T.E.
BOTTOM WING PLAN
SCALE INCHES
0 1 2 3 4 5 6 7 8 9 10
P.D.G.

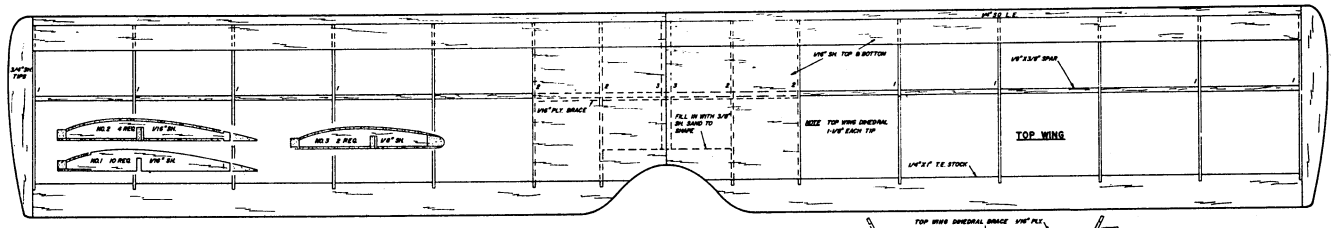

ISOMETRIC VIEW OF ENGINE MOUNT AND NOSE ASSEMBLY. USE EPOXY AND SMALL WOOD SCREWS IN ASSEMBLY.
COVER WITH 1/16" BALSA SHEET
1/4" BALSA
1/8" PLYWOOD
1/16" X 1/4" BALSA
1/4" SQ. BALSA
1/16" DIA. STEEL "V" .IP" ANTENNA
5/16" X 3/4" HARD WOOD MOTOR BEARERS.
J5-.19 POWER PLANT
TURTLEDECK PLANK WITH 1/8" BALSA
REMOVABLE ESCAPEMENT BULKHEAD
CG
RECEIVER & FOAM MOUNT
BATTERIES
TANK
USE 1 1/2" DIA SPINNER
1/16" DIA. STEEL WIRE
1/8" SHEET BALSA
1/4" SHEET BALSA
1/4" DIA. HARDWOOD DOWEL
1/8" PLYWOOD L.G. MOUNT (USE EPOXY CEMENT)
2"-2 1/2" DIA. WHEELS
1/4" X 5/8" BALSA
1/4" SQ. BALSA (TYPICAL)
USE 1/8" SHEET BALSA FOR BULKHEADS F,G,H,I,J,K,L,& M.
1/8" BALSA SIDES
1/16" DIA. STEEL WIRE
USE 12 STRANDS 1/8" FLAT RUBBER
WING TIE DOWN FITTING 1/16" WIRE SANDWICHED BETWEEN 1/8" BALSA.
STD. 3/8" SCREWEYES
TOP
BOTTOM
3/16" DOWEL
1/8" PLYWOOD L.G. PLATFORM
FITTINGS OF 1/32" STEEL
1/16" FOAM RUBBER
ORIGINAL MODEL WITH .15 HAD 3° RIGHT THRUST
NOTE: FIBERGLASS NOSE BACK TO BULKHEAD "F"
1/8" STEEL WIRE L.G.
NOTE: TORQUE RODS OF 3/16" SQ. BALSA, .032 STEEL WIRE EACH END. DRAWING INDICATES SCHEME FOR OPTIONAL KICK ELEVATOR AND LINKAGE.
SCALE-INCHES
RIDGEHOPPER-PLATE I-JJT-62

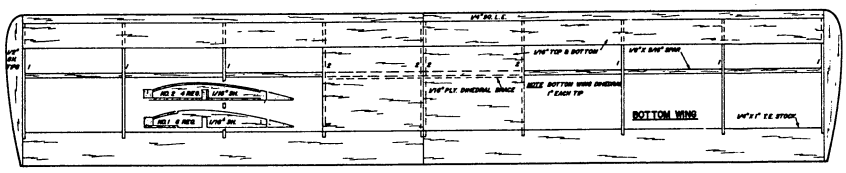

1/8" WIRE
1/16" WIRE
W1
W2
W3
W4
W5
W6
W7
W8
W9
W10
W11
W12
W13
W14
W15
SCALE-INCHES
DETAIL OF OPTIONAL KICK ELEVATOR LINKAGE.
1/32" WIRE
ELEVATORS 3/32" BALSA
CLOTH HINGES
E1
E2
E3
E4
E5
E6
RIBS OF 1/16" BALSA.
SPARS OF 1/8" SQ. BALSA.
L.E. OF 3/16" SQ. BALSA.
T.E. AND SHEETING OF 1/16" BALSA.
1 1/2"
4 1/4"
NOSE WHEEL ASSEMBLY
MAKE FROM 3/32" WIRE AND 1/32" SHEET BRASS. GEAR MOUNTING BOLTS ARE SOLDERED IN PLACE AND ALSO SERVE AS ENGINE MOUNT BOLTS. SIZE AND SPACE TO SUIT ENGINE USED.
WING RIBS OF 3/32" BALSA.
SPARS OF 1/4" SQ. BALSA.
L.E. OF 1/4" SQ. BALSA.
T.E. AND SHEETING OF 1/16" BALSA.
CAP STRIPS OF 1/16" X 1/4" BALSA.
1/16" PLYWOOD
RIDGEHOPPER-PLATE II-JJT-62

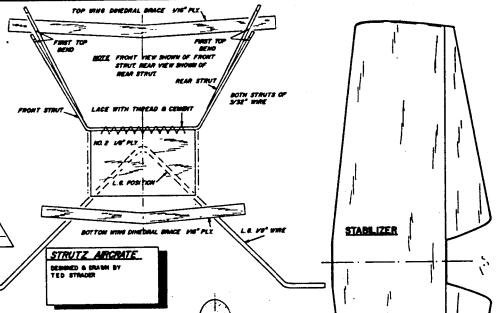

SEC "A-A"
1/2" SIDES
SOFT BLOCK
SEC "A"
1/4" SQ
3/16" SQ
F-1
3/32" SHEET
F-4
F-5
F-1
F-2
F-3
1/8" SHEET
1/16" SHEET - MAKE II
LEADING EDGE
MAIN SPAR - MAKE 2
TRAILING EDGE
1/16" PLY DOUBLER
1/8" SIDES
1/4" DOWEL
3/16" SQ LONGERONS AT BOTTOM OF FUSELAGE
3/16" SQ
3/16" DOWEL
1/4" DOWEL
1/8" SIDING
PLY DOUBLER
F-1
1/2" SHEET
F-2
F-3
F-4
F-5
3/16" SQ STRINGERS
"A"
1/8" PLYWOOD
"B"
1/8" PLYWOOD
1/8" WIRE MAIN GEAR
NOTE 1/2" SHEET WING SUPPORT DOUBLER
3/32" SHEET - 18 REQ
3/16" SHEET FIN
3/16" RUDDER
CANOPY OPTIONAL
F-1
F-2
F-3
C.G.
4° POSITIVE INCIDENCE
BLOCK
6 OZ. DEBOLT TANK
F-5
BLOCK
F-4
DOWEL
1/2" SQ. HARDWOOD MOUNTS
1/4" X 1/2" SUPPORTS
1/8" SHEET SIDES
3/16" SQ CROSS-BRACES
1/16" DIA WIRE
1/2" WHEEL
"A-A"
3/32" PLY GEAR MOUNT
3/32" SHEET CROSS-GRAIN
SEC F-1
3/16" SQ LONGERONS
1/8" PLY FORMER "A"
"B" 1/8" PLY
3" WHEEL
3" WHEELS
FLAT ON BENCH
9°
0" 1" 2" 3" 4" 5" 6" 7" 8" 9" 10" 11" 12"
BIND AND SOLDER
"GENIE" PLATE I
D.M.

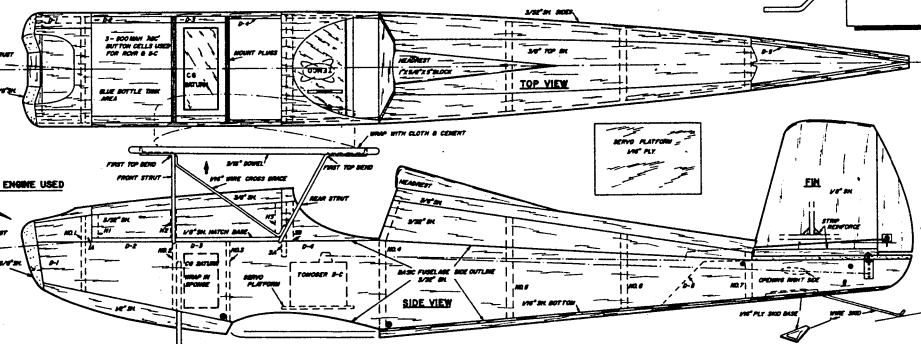

3/4" SHAPED LEADING EDGE
3/32" PLY DIHEDRAL BRACES
NOTCH LEADING EDGE TO RECEIVE RIBS
1/4" SQ SPRUCE SPARS
1/16" X 3" SHEET TOP AND BOTTOM
1/16" SHEET TOP AND BOTTOM
3/32" SHEET FILLETS
1/16" X 2" TRAILING EDGE TOP AND BOTTOM
1/16" X 1/4" CAPSTRIPS TOP AND BOTTOM
1/8" SHEET BALSA WEBBING IN BETWEEN TRAILING EDGE
3/32" PLYWOOD DIHEDRAL BRACES
SOFT BALSA WING TIPS
3/32" SHEET RIBS
NOTCH TRAILING EDGE TO RECEIVE RIBS
1/8" X 2" SHAPED TRAILING EDGE
5/16" SQ L.E.
3/16" SQ SPRUCE STAB SPARS
1/16"
1/4" SQ SPARS
1/16" X 1/4" CAPSTRIPS
1/16" X 3" SHEET
2" SHEET TRAILING EDGE
1/8" X 1/2" TAPERED T.E.
3/4" SHAPED LEADING EDGE
0" 1" 2" 3" 4" 5" 6" 7" 8" 9" 10" 11" 12"
1/16" SHEET T.E.
1/16" RIBS
NOTCH
SOFT BLOCK
"GENIE"
D.M.

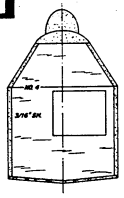

RADIO CONTROL — CONTROL-LINE
P-51 MUSTANG
SCALED FROM THE NORTH AMERICAN P-51D-5-NA
SIDE VIEW:
TOP VIEW:
RUDDER:
RC S
DESIGN AND ART BY BOB BURAGAS
PLATE ONE

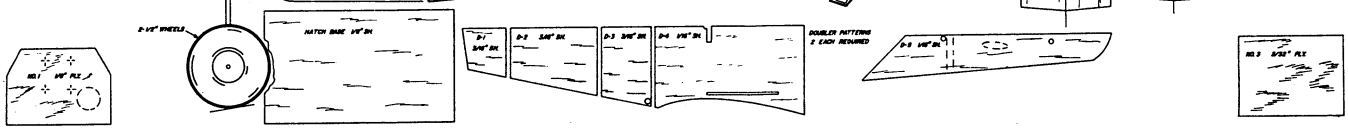

TOP WING

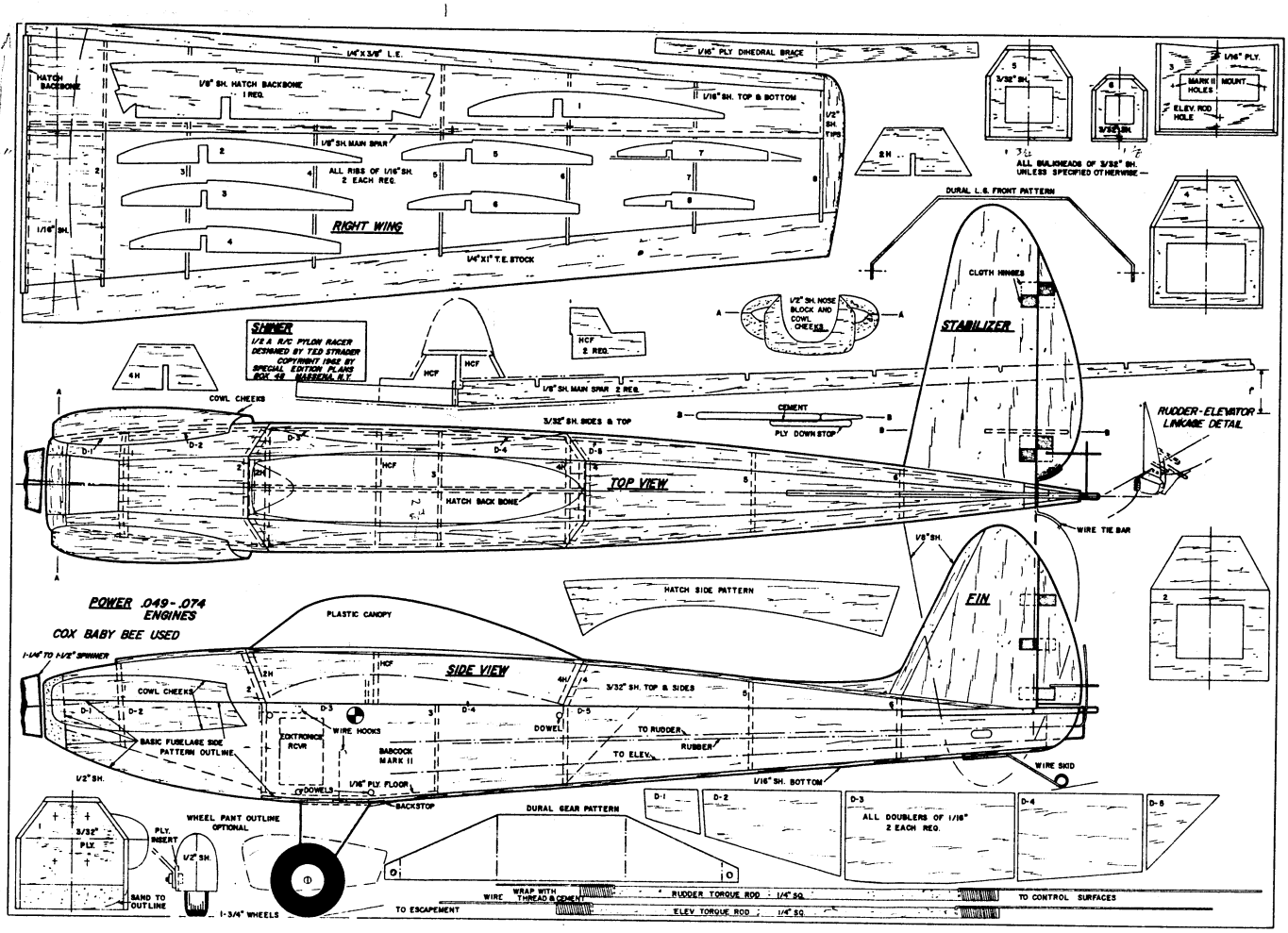

BOTTOM WING

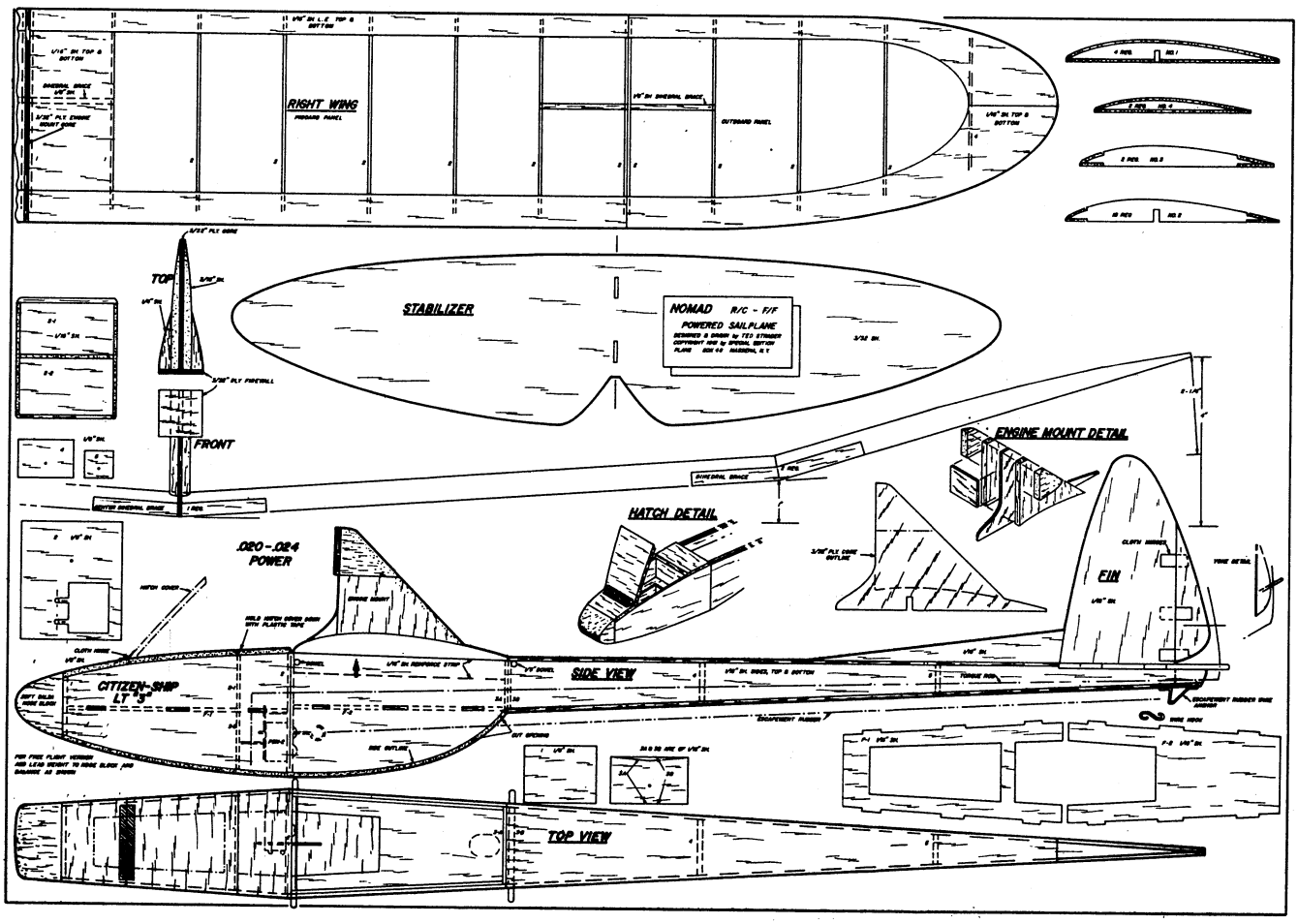

STABILIZER

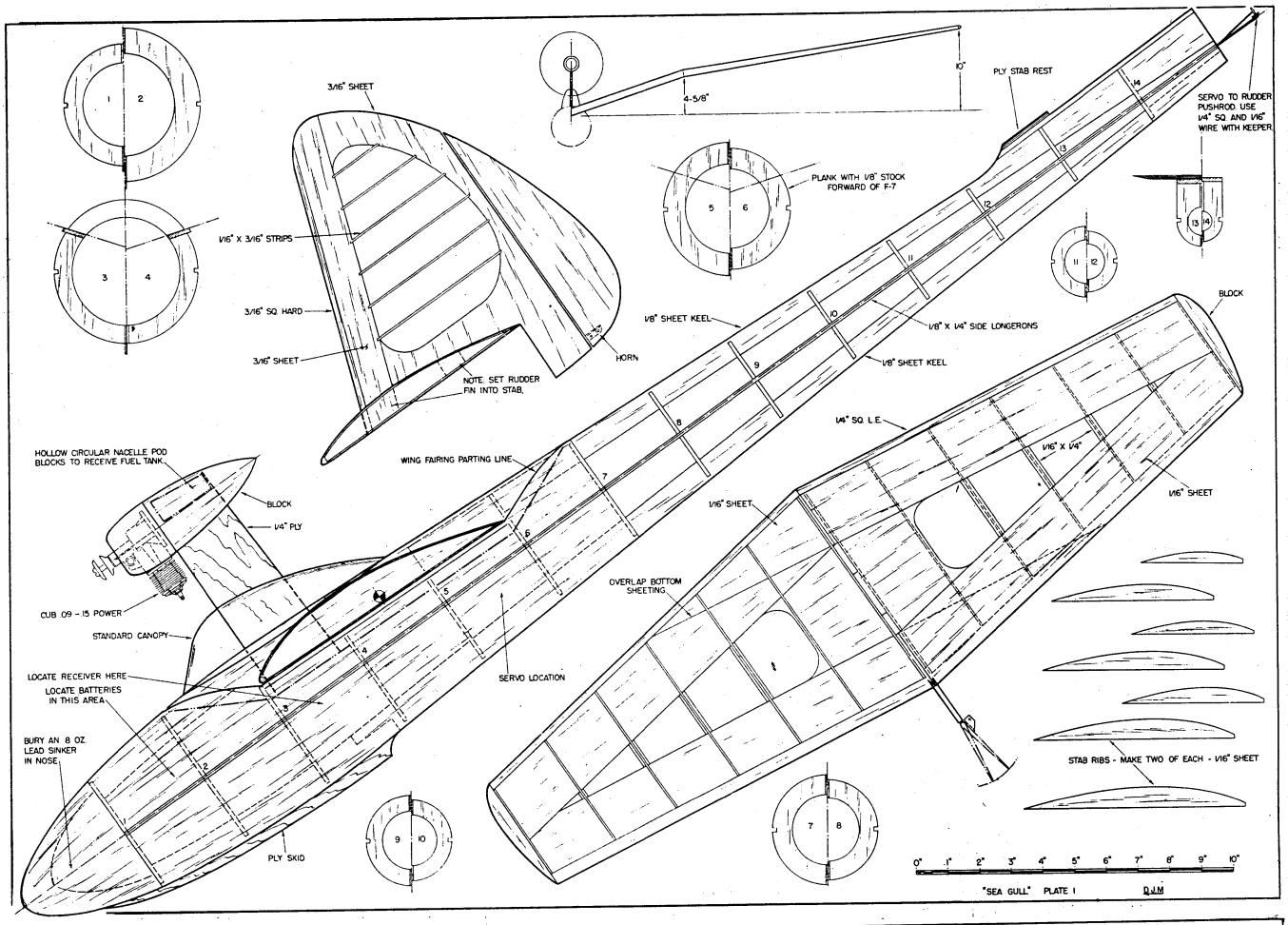

TOP VIEW
SIDE VIEW
FOX .09 ENGINE USED

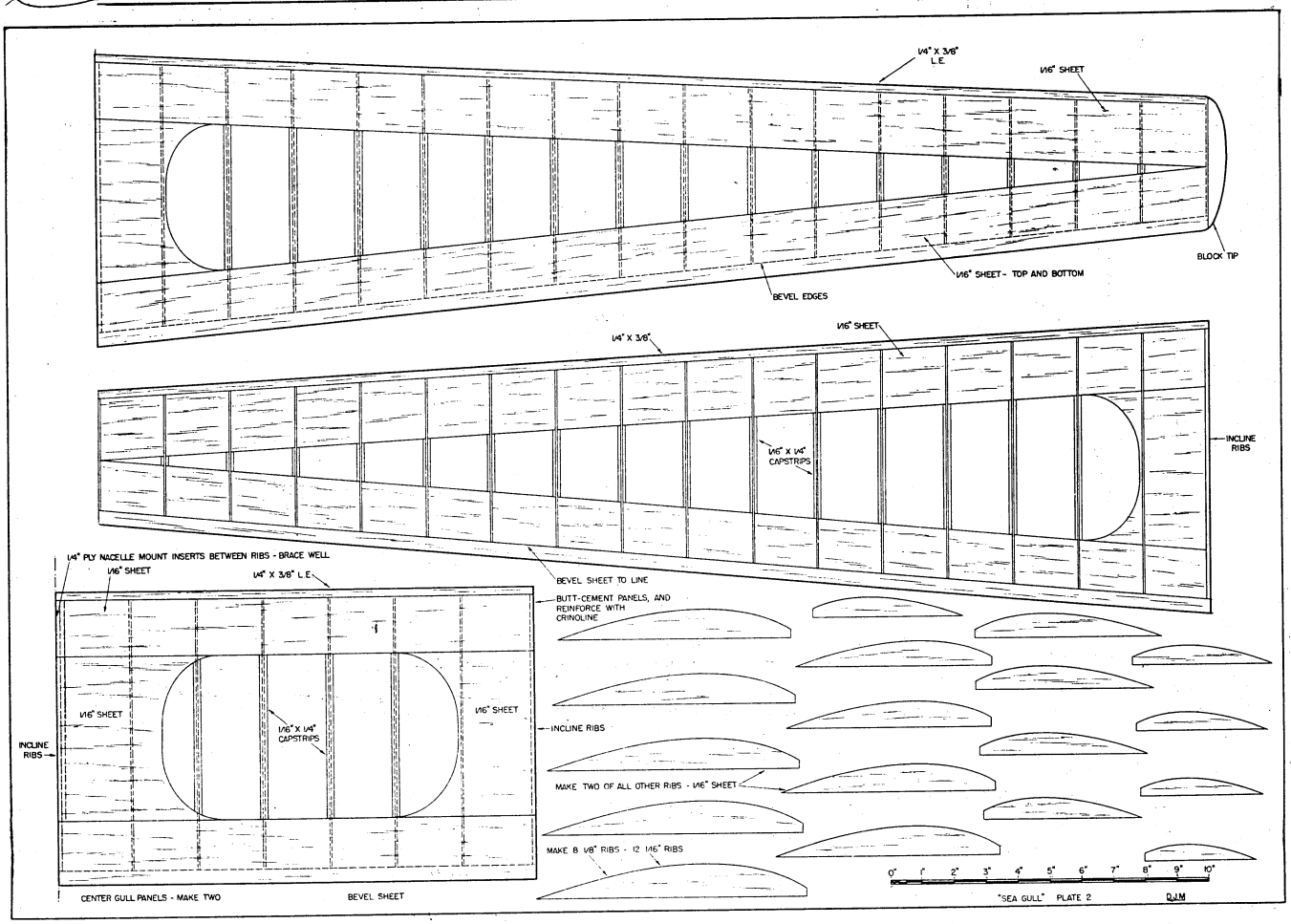

FIN




1/4" X 3/8" L.E.
1/16" PLY DIHEDRAL BRACE
HATCH BACKBONE
1/8" SH. HATCH BACKBONE 1 REQ.
1/16" SH. TOP & BOTTOM
1/8" SH. MAIN SPAR
ALL RIBS OF 1/16" SH. 2 EACH REQ.
RIGHT WING
1/4" X 1" T.E. STOCK
1/16" SH.
1/2" SH. TIPS
1/16" PLY.
MARK II MOUNT HOLES
ELEV. ROD HOLE
ALL BULKHEADS OF 3/32" SH. UNLESS SPECIFIED OTHERWISE
DURAL L.G. FRONT PATTERN
SHIMER
1/2 A R/C PYLON RACER
DESIGNED BY TED STRADER
COPYRIGHT 1962 BY SPECIAL EDITION PLANS
BOX 49 HARRENA, N.Y.
HCF
2 REQ.
1/2" SH. NOSE BLOCK AND COWL CHEEKS
CLOTH HINGES
STABILIZER
COWL CHEEKS
1/8" SH. MAIN SPAR 2 REQ.
3/32" SH. SIDES & TOP
CEMENT
PLY DOWN STOP
RUDDER-ELEVATOR LINKAGE DETAIL
TOP VIEW
HATCH BACK BONE
WIRE TIE BAR
1/8" SH.
FIN
POWER .049 - .074 ENGINES
COX BABY BEE USED
HATCH SIDE PATTERN
PLASTIC CANOPY
1-1/4" TO 1-1/2" SPINNER
SIDE VIEW
3/32" SH. TOP & SIDES
WIRE HOOKS
DOWEL
TO RUDDER
TO ELEV.
RUBBER
BASIC FUSELAGE SIDE PATTERN OUTLINE
ECTRONICS RCVR
BABCOCK MARK II
1/16" PLY FLOOR
DOWELS
BACKSTOP
1/16" SH. BOTTOM
WIRE SKID
1/2" SH.
3/32" PLY
PLY. INSERT
WHEEL PANT OUTLINE OPTIONAL
BAND TO OUTLINE
1-3/4" WHEELS
DURAL GEAR PATTERN
ALL DOUBLERS OF 1/16" 2 EACH REQ.
WRAP WITH WIRE THREAD & CEMENT
TO ESCAPEMENT
RUDDER TORQUE ROD 1/4" SQ.
ELEV. TORQUE ROD 1/4" SQ.
TO CONTROL SURFACES


RIGHT WING
STABILIZER
NOMAD R/C - F/F
POWERED SAILPLANE
TOP
FRONT
ENGINE MOUNT DETAIL
HATCH DETAIL
.020 - .024 POWER
FIN
SIDE VIEW
CITIZEN-SHIP LT's
TOP VIEW


3/16" SHEET
10"
4-5/8"
PLY STAB REST
SERVO TO RUDDER PUSHROD USE 1/4" SQ. AND 1/16" WIRE WITH KEEPER
PLANK WITH 1/8" STOCK FORWARD OF F-7
1/16" X 3/16" STRIPS
3/16" SQ. HARD
3/16" SHEET
HORN
NOTE: SET RUDDER FIN INTO STAB.
1/8" SHEET KEEL
1/8" X 1/4" SIDE LONGERONS
BLOCK
1/4" SQ. L.E.
1/16" X 1/4"
1/16" SHEET
HOLLOW CIRCULAR NACELLE POD BLOCKS TO RECEIVE FUEL TANK
WING FAIRING PARTING LINE
BLOCK
1/4" PLY
CUB .09 - .15 POWER
STANDARD CANOPY
LOCATE RECEIVER HERE
LOCATE BATTERIES IN THIS AREA
BURY AN 8 OZ. LEAD SINKER IN NOSE
SERVO LOCATION
OVERLAP BOTTOM SHEETING
STAB RIBS - MAKE TWO OF EACH - 1/16" SHEET
PLY SKID
0" 1" 2" 3" 4" 5" 6" 7" 8" 9" 10"
"SEA GULL" PLATE 1 DJM


1/4" X 3/8" L.E.
1/16" SHEET
BLOCK TIP
1/16" SHEET - TOP AND BOTTOM
BEVEL EDGES
1/4" X 3/8"
1/16" SHEET
1/16" X 1/4" CAPSTRIPS
INCLINE RIBS
1/4" PLY NACELLE MOUNT INSERTS BETWEEN RIBS - BRACE WELL
BEVEL SHEET TO LINE
BUTT-CEMENT PANELS, AND REINFORCE WITH CRINOLINE
INCLINE RIBS
MAKE TWO OF ALL OTHER RIBS - 1/16" SHEET
MAKE 8 1/8" RIBS - 12 1/16" RIBS
CENTER GULL PANELS - MAKE TWO
BEVEL SHEET
0" 1" 2" 3" 4" 5" 6" 7" 8" 9" 10"
"SEA GULL" PLATE 2 DJM