From the rear it has graceful and stable lines

With its inverted motor and cabin it is neat and realistic

How to Build a Pee Wee Gas Model

Here's What You Have Been Looking For-A 45 Inch Model for "Small" Engines That Is Easy to Build, Easy to Carry and Easy to Fly

By **MALCOLM ABZUG and RICHARD WACHTELL**

This gives you an idea of its size

IT SEEMS only a short while ago that my collaborator and myself were members of that large group of model builders who liked the idea of gasoline-powered models but were unable to grow enthusiastic over their clumsiness, their short life and their high cost of construction and up-keep. However, at that time as if in answer to our unspoken supplication, the first small engine appeared on the market, the Elf engine, and in a few months, the first Shrimpo was dodging pop flies at the local ball park. But this first model, and the second for that matter, were far from perfect for reasons that will follow shortly, and the third Shrimpo, the present one, was designed and completed at the end of last fall. After a few test flights winter set in, and veteran modelers will have no trouble recognizing the peculiar feeling suffered by model builders on getting up in the morning and listening to the wind howl outside while looking at a fine outdoor ship in the pink of condition just a-settin' .... just a-settin'. Foolhardiness and ingenuity overcame prudence, and in a week, we found ourselves possessors of the first indoor gas job ever built. The trick was accomplished with a nine foot high jump pole that was heavily weighted at one end, a ten foot length of tough fish cord, and a bronze bushing in these relative positions:

The pole stood in the center of the floor of a small gymnasium. The cord led from the pole to the wing tip of the "indoor plane" where it passed through a small bronze bushing at the center of pressure of the wing. A retainer at the top of the pole to prevent the cord from coming off and four strong, hard walls completed the picture. With engine barely popping over and set for a run of 45 seconds, the S-3 rolled along the polished floor and gaining speed, picked up. Once in the air, for some unaccountable reason, the engine revived up, and in a few seconds, the pictures we were going to take would have shown a big blur at the end of a fish curd. By the time that the more timid spectators were retreating towards the doors of the room, the engine cut and when the plane touched the floor it was almost capsized by an immense concerted sigh of relief. One more flight like this and miraculously, all our impatience for the spring vanished and the S-3 was gently and respectfully consigned to the shelf from which it had come. You may be very sure that the next flights took place in the wide open spaces, but it was only after quite a few long, soothing, outdoor flights that I was able to carry the S-3 into a room without breaking out into a clammy sweat and looking furtively for a door. As the indoor flights were notable for speed and danger, the outdoor flights were distinguished by absolute dependability and consistency.

In the first stages of adjustment, the model was unintentionally placed in what are dangerous positions for any model; steep right and left banks. The model was not harmed on landing. Flights are uniformly fine, and climbs of over one hundred feet in the space of 45 seconds followed by long flat glides are usual. In take-offs, the S-3 actually beats the proverbial model: takes off on a dime and has a nickel left. The small size of this gas job has led us to make the wing in one piece and the tail an integral part of the fuselage. This considerably facilitates setting up for flight, and yet causes no inconvenience in transportation.

The S-3 meets all N.A.A. specifications for a Class D fuselage model.

CONSTRUCTION

Fuselage

But hold on for a minute. Before you pick up one piece of balsa, there is one thing that you must understand. The S-3 is a gas job, That sounds obvious but consider it for a few moments. Did you ever hear of anyone skimping on glue or cutting holes and scallops in the longerons of a ten foot gas job? You didn't, and if your 44 inch gas job is going to be successful, no one will be able to say that you lightened it up in this manner. By making believe that your job is only an exaggerated rubber-powered model, you not only leave the job open to a major structural disaster, you are just begging for the opportunity to see a fine looking ship slowly go to pieces before your eyes; a process which is impossible to stop. Of course the model must be kept reasonably light. This is accomplished by using medium outdoor stock throughout (the kind you would use on an outdoor weight rule model) except where otherwise specified. The sizes of the balsa used in this model are sufficiently large to permit this.

The fuselage framework is built of 3/16 square medium hard stock and all joints receive an extra coating of glue for strength. Pay special care to the alignment of the various members in the fuselage, as all settings are based on the fuselage framework. When the framework is completed, cut the two motor mount bulkheads labeled No. 3 and No. 4 out of 1/32 thick birch plywood or its equivalent in hard balsa, and glue them securely in place with cement. These two bulkheads hold the motor runners in place and also provide a secure base for the landing gear as well as strengthening the fuselage in cross section. The motor runners are next secured in place. If the bulkheads are plywood, these tapered bass strips are glued with casein glue. The cowl for the inverted Elf engine which is used on this ship, is built up around the motor mount. The first step is to cement the two balsa bulkheads labeled No. 1 and No. 2 in place and to cover them with soft 1/16 sheet balsa. Then cut out pattern No. 5 in soft 1/16 sheet balsa, bending it in place as shown, securely cementing it down. Then temporarily attach the rough blank of the hinged engine cover in place, and when dry, sand and cut it down so that it follows the lines of the fuselage and yet can fully enclose the motor. Pry it off and cover it with a good grade of silk, not necessarily the lightest available, using cement. Hollow it out carefully and replace it on the hinges that are used throughout on this model, the wire and tubing type. Be sure to place the hinges in the correct positions. Exactly the same procedure is followed in building the "trouble door" at the bottom of the cowl. When the entire cowl is assembled and covered with silk, it will look very realistic and yet offer easy access to the motor; an important feature when flying in very cold or warm weather. (Ask the man who owns one !) It is assumed that when the fuselage sides were still pinned down to the plans, you installed the tail mount. If you have, the next step is to mount a solid landing gear and tail skid into your plane. The landing gear wires are bent from 1/16 round piano wire to the exact size shown and are bound to 3/16 square balsa strips which are in turn lashed and cemented to the fuselage framework and bulkheads. No shock travel is provided for in this small gas job landing gear and performance proved that there was no necessity for it. The junction of the three landing gear wires near the wheel is firmly wrapped with flat rubber and shellacked and painted over to prevent oil and greese from reaching it. In spite of these precautions, the best rubber grows rotten after a while, and must be replaced. The same precaution applies to the rubber band that holds the trouble door in place. The last thing to he done before the fuselage is covered is to build in a firm, tight battery box and to install the wiring circuit. It is also best to put the windshield and windows in place before covering.

The fuselage is covered with a good grade of light bamboo paper. The covering is tightened with water and a thin coat of dope is applied and sanded over when dry with ten-nought sandpaper. Two thin coats of colored dope completes the job. The windshield outline as well as separations between colors should he traced with 3/16 wide black tissue strips that are doped on. The best wheels for this gas job are air wheels of a 2-5/8" to a 3" diameter, which are slipped on to the axles and are held in place with rubber bound on the ends of the axle. If you were careful in building and coloring the fuselage, and if your cowl has been accurately made to expose only the prop and speed controls, your S-3 won't have to be ashamed of itself in any company.

Wing

All the spars in the wing are very generously sized, and medium balsa will give it an ample safety factor. The main spar used in this wing is the super-strong box type, but it is fairly light. Its construction is quite simple, being no more nor less than two 1/16 sheet balsa side-plates separated at top and bottom by two 1/16 x 1/8 balsa strips. This spar is built up before the rest of the wing is attempted and is left to dry while the ribs and tips are being cut. The rib section, the R.A.F. 32, is cut 18 times in 1/16 soft sheet balsa, and the tips are cut from 3/16 medium balsa stock. When the leading and trailing edges have been cut, shaped and sanded, the work of assembling the wing takes place, one half at a time. In this process, the ribs are first glued on to the spar, then the leading and trailing edges are attached, the tips are added and shaped, and the small spars for the support of the sheet balsa leading edge, as well as the edge itself, are added to the wing structure. This sheet edge is made of very soft 1/16 sheet balsa and goes on very easily when held in place with pins. When all the joints are dry, the entire wing is sanded carefully and thoroughly, and the final checkup of the joints takes place. The wing is covered and finished like the fuselage and should not weigh more than two ounces when completed.

The gas tank for the Elf engine is mounted in the wing and connects to the float chamber with a flexible rubber tubing than can be clamped to restrict the engine run to 45 seconds. The wing contains 275 square in. of area.

Tail

The tail is highly tapered and looks very fine when mounted on the fuselage; it is efficient as well. The stabilizer is built up around an 1/8 square spar, and with the exception of this member, it is made of very soft balsa. Rectangles made of 1/16 sheet balsa measuring 5/8" deep and the length of the ribs they represent are slipped onto the spar in their respective positions and glued. The leading and the trailing edges are added next and the ribs are trimmed to streamline shape. When this has been done, the stabilizer is pinned to the plans and the tips and other spars are added. Lastly comes the sheet balsa leading edge and center section and the final careful sanding of the framework. The construction of the rudder is very similar to that of the stabilizer, except that it lacks a spar in the center. The tail is covered and finished like the wing, and like the wing, great care must be taken to forestall any tendency to warping. When the tissue is tightening on the evaporation of water that was sprayed on, most warps occur. To prevent them at this stage, weight the surfaces down to a flat board with books, flatirons, or anything that is handy. The finished and painted stabilizer is slipped into its position in the tail mount and securely cemented into place. The same goes for the rudder, and as a final touch, fillets are worked around the junctures of tail surfaces and fuselage. Make these of strips of bamboo paper in successively graduated widths. Starting with the smallest, these are cemented in place and smoothed down with a finger. (This method was originated by Ted Foti.) Do not forget to add a piece of soft 1/16 sheet balsa to the trailing edge of the rudder as shown. This little flap comes in very handy later on in adjusting the plane. Color the wings and tail to contrast with the fuselage. On the original S-3, the fuselage was light blue and the wings and tail orange; a very effective and visible combination.

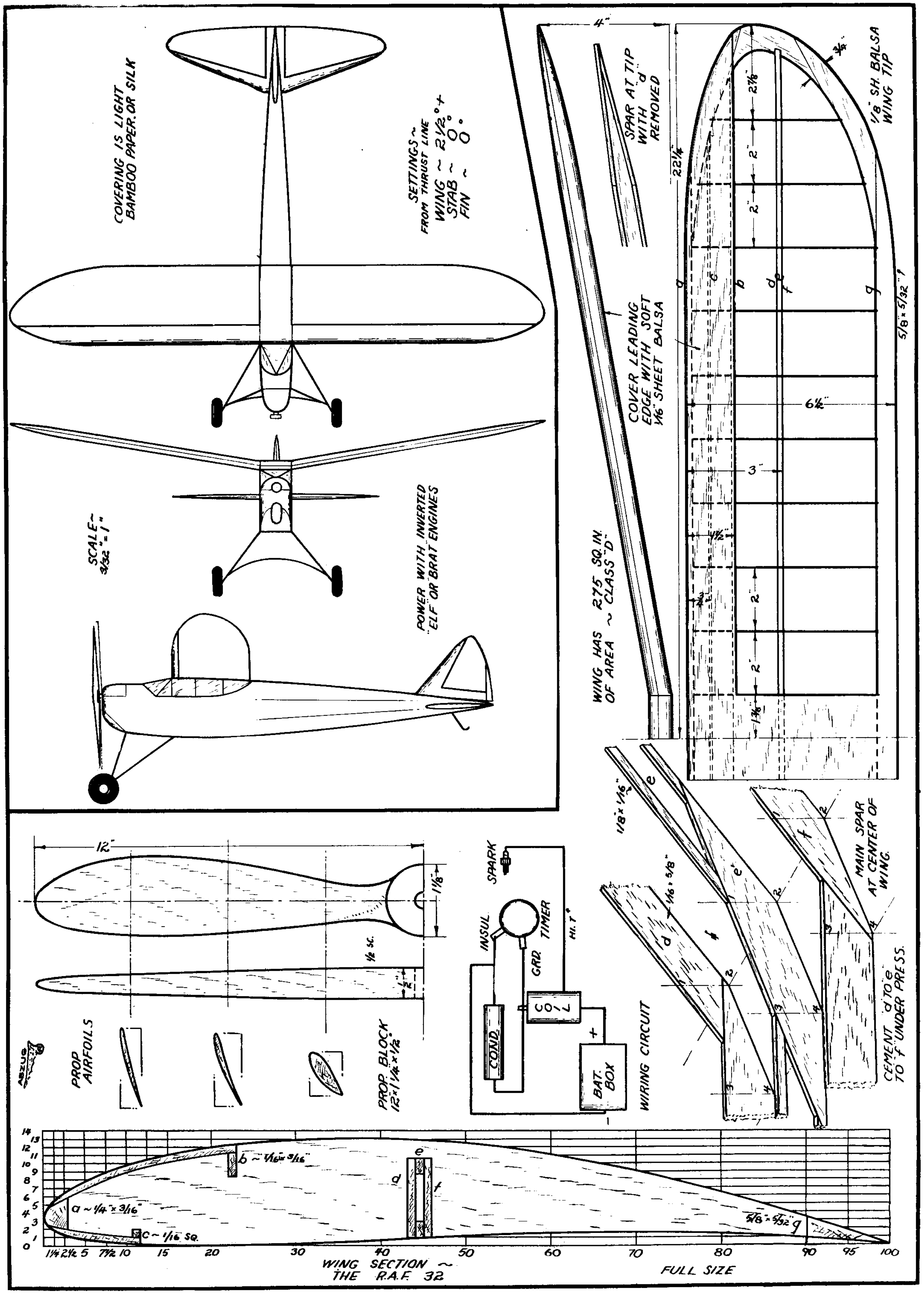
Miscellaneous

As was suggested before, install the wiring circuit and the battery box before covering the fuselage. If you have made up your mind to be extremely painstaking and meticulous in building any part of your gas job, choose the wiring circuit as the object of your labor. (That is unless you actually enjoy cranking an engine for hours provoking occasional pops.) Use a good grade of wire, such as Packard ignition wire, and make clean soldered joints wherever possible. Strive for a wiring circuit that is as much a part of your gas job as the longerons in the fuselage are. This type of a setup, along with the large door in the side of the fuselage will settle your ignition troubles for all time. A twelve inch prop is used on this model. It is made of basswood and follows the blank outline shown on the plans. This outline need not be rigorously adhered to, but use approximately the same area on your prop. It must be, of course, statically as well as dynamically balanced. Don't spoil a good job with a rough and pitted finish. Finish this prop as you would a large rubberpowered prop; with dope, shellac and fine sandpaper. Do not be discouraged from spending several hours just making one prop by the thought that it will soon be shattered in a rough landing. These small gas jobs seem to be very easy on props; we used the same prop on all three shrimpos. Those of you who are familiar with the subject of mechanics should be able to relate this fact to moments of forces and solve this phenomenon quite easily. There is a good physical explanation for the fact that one of our models glided head-on into a baseball backstop only nicking the prop slightly.

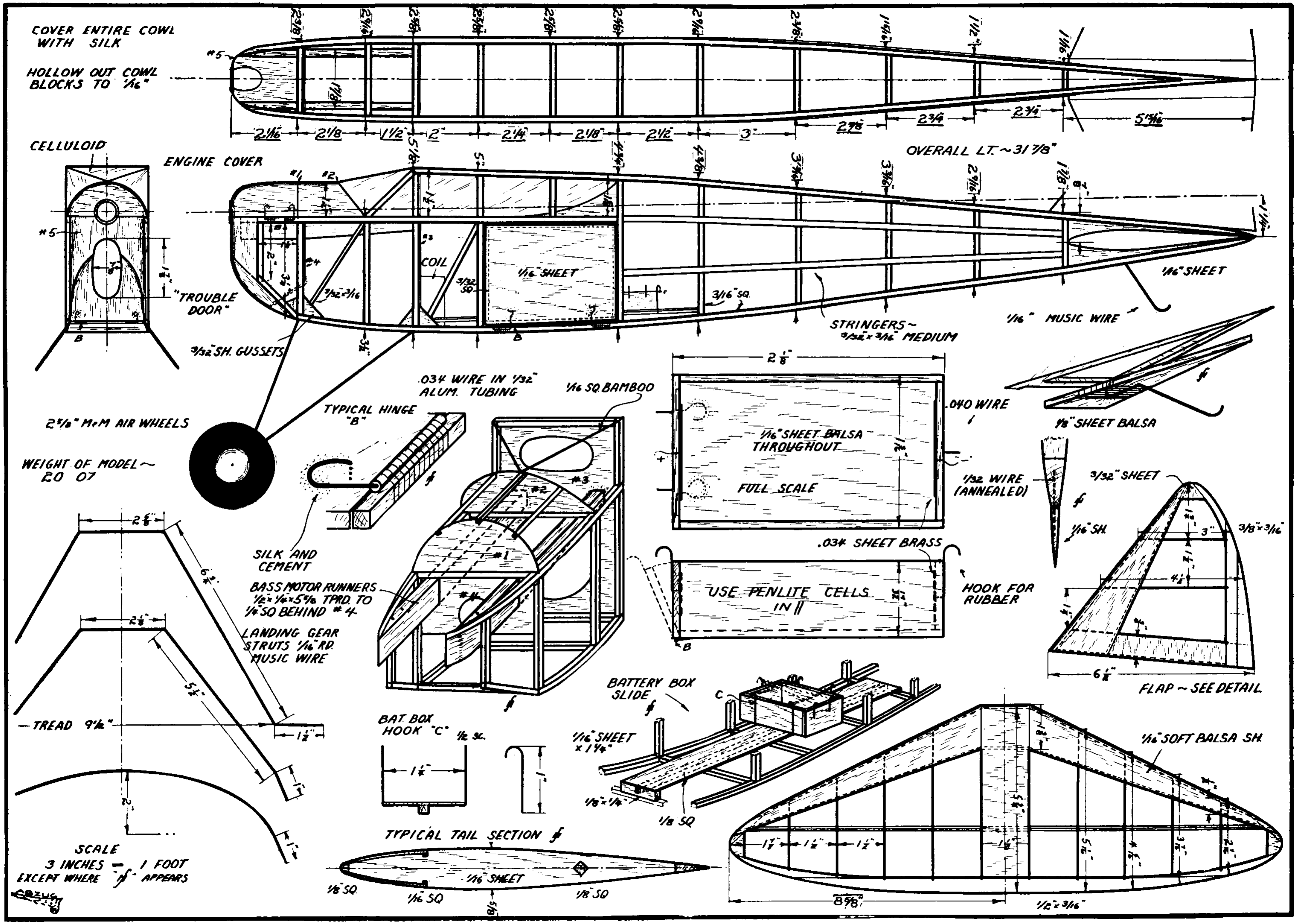
There are many ways to test a gas job. There is only one best way. Here it is. Take the assembled plane, ready for powered flight, to the top of a moderate slope. Before letting her take to the air for the first time, be sure it balances longitudinally when suspended at the wing tips at a point 1/3 back from the leading edge. Shift the wing or the battery box, or both, to secure balance. Then, heading the model into the wind, give it a gentle shove down the hill. Keep this up until you can have the model just lift off the ground and barely skim along for ten to twenty feet, depending on the steepness of the hill. On these first test glides strive for a fast, level glide that is as nearly straight as poissible. *The model must not show the slightest tendency to stall!* When this adjustment is reached, set the model down in a large clearing and start the engine. At this point instructions have to cease, for your conduct in the next minute or so is purely a personal matter. Some fellows will stumble along with their eyes glued to the model, oblivious of trees, bystanders or baseballs, and shout instruction and comment to what they soon discover is a somewhat deaf model. I know, because that is what I do. However, when a sensible gas-jobber test-flies his model, he loses all personal feelings as soon as the wheels leave the ground, and retains but a faint academic interest in the proceedings. The latter method allows the builder to devote all his attention to the performance of his model, and his subsequent adjustments can be much finer. As a final bit of advice, remember that your gas job is a sensitive, finely balanced machine, and it must be treated as such. Do not harm the future of gas job building with careless, sloppy flying. We suggest that you register your model with the I.G.M.A.A. as soon as it is completed.

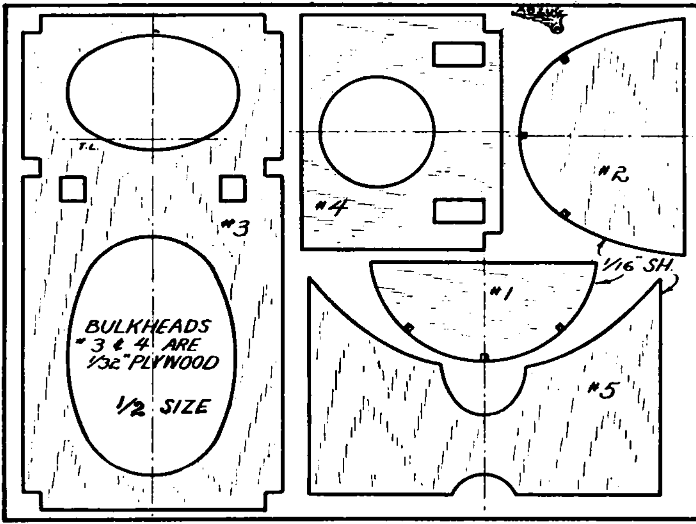
Lots of luck and many happy landings!

Scanned From November 1937 Model Airplane News



COVERING IS LIGHT BAMBOO PAPER, OR SILK
SETTINGS ~ FROM THRUST LINE
WING ~ 2 1/2° +
STAB ~ 0°
FIN ~ 0°
SCALE ~ 3/32" = 1"
POWER WITH INVERTED "ELF" OR "BRAT" ENGINES
SPAR AT TIP WITH "d" REMOVED
COVER LEADING EDGE WITH SOFT 1/16" SHEET BALSA
WING HAS 275 SQ. IN. OF AREA ~ CLASS "D"
1/8" SH. BALSA WING TIP
5/8 x 5/32
22 1/4"
6 1/2"
MAIN SPAR AT CENTER OF WING.
CEMENT "d" TO "e" TO "f" UNDER PRESS.
1/8 x 1/16
1/16 x 5/8
SPARK
INSUL.
TIMER
GRD.
HI. T.
COIL
COND.
BAT. BOX
WIRING CIRCUIT
12"
1 1/8"
1/2 SC.
PROP BLOCK 12 x 1 1/4 x 1 1/2
PROP AIRFOILS
a ~ 1/4" x 3/16"
b ~ 1/16" x 3/16"
c ~ 1/16 SQ.
5/8" x 5/32" g
WING SECTION ~ THE R.A.F. 32
FULL SIZE


COVER ENTIRE COWL WITH SILK
HOLLOW OUT COWL BLOCKS TO 1/16"
CELLULOID
ENGINE COVER
"TROUBLE DOOR"
3/32" SH. GUSSETS
COIL
1/16" SHEET
3/16" SQ.
STRINGERS ~ 3/32" x 3/16" MEDIUM
1/16" MUSIC WIRE
OVERALL LT. ~ 31 7/8"
2 3/8" M+M AIR WHEELS
WEIGHT OF MODEL ~ 20 OZ
.034 WIRE IN 1/32" ALUM. TUBING
TYPICAL HINGE "B"
1/16 SQ. BAMBOO
SILK AND CEMENT
BASS MOTOR RUNNERS 1/2" x 1/4" x 5 5/8 TPRD. TO 1/4" SQ BEHIND #4
LANDING GEAR STRUTS 1/16" RD. MUSIC WIRE
TREAD 9 1/2"
SCALE 3 INCHES = 1 FOOT EXCEPT WHERE "ff" APPEARS
1/16" SHEET BALSA THROUGHOUT
FULL SCALE
.040 WIRE
1/32 WIRE (ANNEALED)
.034 SHEET BRASS
USE PENLITE CELLS IN ||
HOOK FOR RUBBER
1/8" SHEET BALSA
3/32" SHEET
1/16" SH.
3/8" x 3/16"
FLAP ~ SEE DETAIL
BATTERY BOX SLIDE
1/16" SHEET x 1 1/4"
1/8" x 1/4"
1/8 SQ
BAT. BOX HOOK "C" 1/2 SC.
TYPICAL TAIL SECTION
1/16" SHEET
1/8" SQ.
1/16 SQ
1/16" SOFT BALSA SH.
1/2" x 3/16"



#3
T.L.
BULKHEADS
#3 & 4 ARE
1/32" PLYWOOD
1/2 SIZE
#4
#2
1/16" SH.
#1
#5