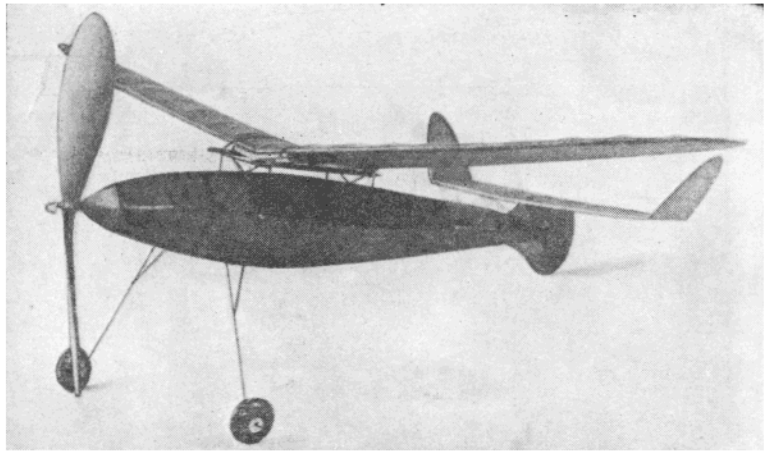


The Baby Duration Trainer

Complete Data From Which You Can Build a Duration Trainer of 100 Sq. In. Wing Area or Contest Models of Larger Size



The completed model gives high performance and is very stable



It is a beautiful climber and does not lose altitude by erratic maneuvers

IT DIDN'T take this little job long to get used to the ozone. She flew "right off the bat" and has been one of the writers most constant fliers to date. A steep climb characterizes the ship and the glide couldn't be much more desirable. As an all-weather flyabout that can take a beating and put up a real performance, this is the ship to build; and its construction requires no super experience. The day this plane made its swell 5'3" flight it had rained slightly. The sky was overcast and the writer would not even have thought of flying it except that he promised to meet some friends at the field. At the time the plane was equipped with an experimental 10" propeller, and 14 strands of 1/8" rubber. Without any testing, the plane was given 580 turns and released. A bit of extreme speed was expected and the plane didn't fail us. It shot up to 100 feet, did a complete and perfect loop whizzing down within 10 feet of the

By FELIX GILBERT

ground. The loop completed, it proceeded to spiral up to 300 feet at quite a rate. The sky had now cleared slightly and the plane caught a thermal over the field. With stopwatch in hand and head pointed skyward, the writer followed the plane by walking under it at a normal rate. The wind was negligible and the drift was only about 1,000 feet or less. After flying over a wooded area in the park, the plane finally glided down, being careful to miss every tree except one which it hit head-on about a foot over the ground and two feet from the highway, for which it was headed. Thus a perfect flight was made, a tree saved the model, though clumsily, and there was no damage.

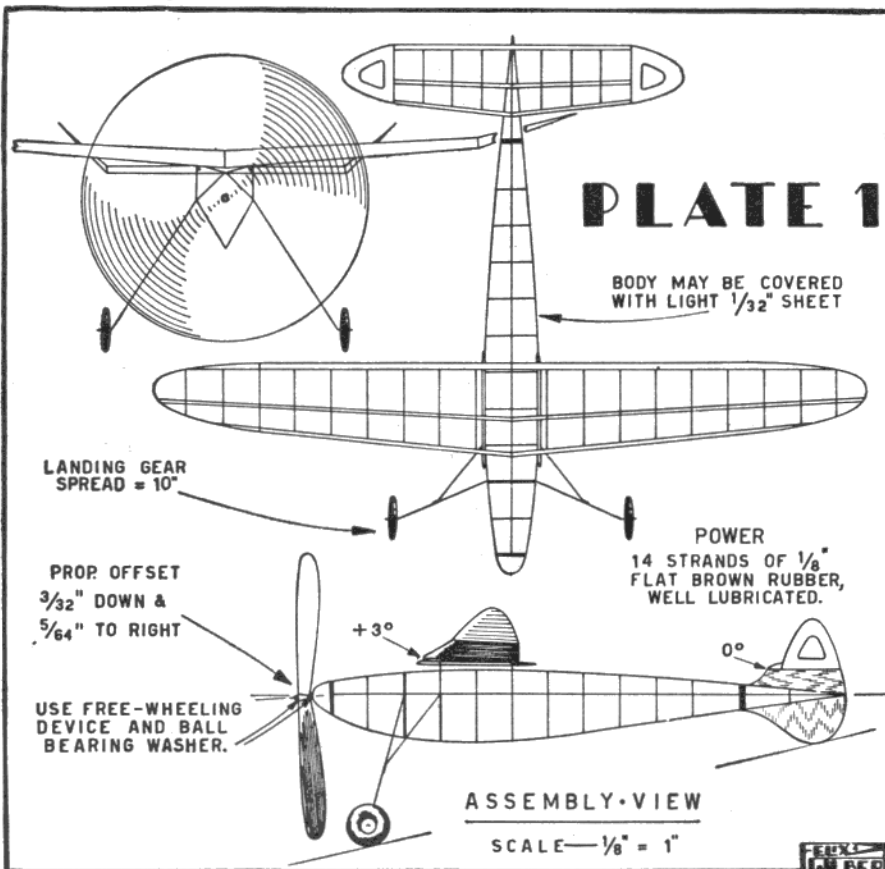
The plane is very graceful in appearance with its taper wing, diamond body, and twin-tip tail which is a variation of the double-rudder type and has been found to work very well. The original was completely covered with tissue, but it is suggested that the builder cover the body with 1/32" sheet as well as the two center wing panels. This will not only improve the looks, but materially increase the strength.

The original plane was designed just as a sport model. Those who want to build it as a contest model need merely build the small extra center section shown on the small plate, and glue it between the wing halves when assembling the model. This will give the wing the few needed square inches of area to bring the model within N.A.A. specifications. The area will be slightly over 100 square inches.

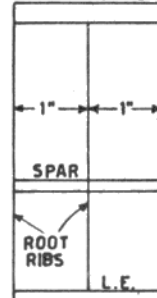
Builders who would like a larger model may scale up the plans. The area will be

150 square inches, by increasing the dimensions shown on the plans by 25 percent. A very simple method of scaling up the plans is to use dividers or proportional dividers. Since the plans are 1/3 actual size, scaling up the reduced drawings four times will give a model with a wing area of 170 square inches.

If the model is to be between 100 and (Continued on page 36)



TRAILING EDGE



CENTER SECTION FOR WING (OPTIONAL) INSERT TO RAISE AREA TO 100"



generate lift in sufficient quantity to have the plane fly properly. In the case of curved wings, the movement of the Center of Pressure is directly opposite to that existing on flat wings. At low angles of attack the Center of Pressure will act at a point indicated in Figure No. 12 by A. If the angle of attack of the curved wing is increased so that it assumes the dotted position, the Center of Pressure will move forward to a position B. Thus, if an airplane equipped with a curved wing increases its angle of attack, the Center of Pressure on the wing will move forward. This movement will tend to increase the angle of attack and nose up the plane still further. In other words, it creates an unstable condition.

This is one of the greatest problems with which airplane designers must contend, and is responsible to the greatest measure for the existence of horizontal tail surfaces.

Next month we will tell you something about the effect of speed on a plane and how the lift varies with any changes in velocity.

Table of Camber Factors for Various Wing Sections

Wing Section	Factor
Grant M-7	0.1140
" M-8	0.1048
" M-9	0.0932
" M-10	0.0838
" G-7	0.1135
" G-8	0.0994
" G-9	0.0883
" G-10	0.0795
Eiffel 400	0.0762
N.A.C.A. M-12	0.0538
Grant X	0.0885
" X-8	0.0777
" X-9	0.0692
" X-10	0.0623
" X-12	0.0533
" X-14	0.0457
" X-16	0.0393
Clark Y	0.0630
Clark Y Upper	0.0740
R.A.F.-32 Lower	

The Baby Duration Trainer

(Continued from page 17)

150 square inches, use stock of the size specified on the drawing. If it is 170 square inches, use 1/8" square for the body and correspondingly larger sizes for the other wood.

Wing

A full size drawing of the wing should be made by following the dimensions on plate 2. Notice that the trailing edge is straight. Use this as a reference line in the layout. The ribs must now be plotted carefully. A table of ordinate values will be found in the September 1938 issue of MODEL AIRPLANE NEWS on page 36. The same article also gives explicit instructions for plotting the ribs. Ordinates for the Clark Y tail sections will be found on page 35 of the October 1938 issue of MODEL AIRPLANE NEWS. When the ribs are plotted and cut out (they are plotted on paper and transferred to balsa wood afterwards), assemble the two wing halves. Cut the leading and trailing edges to shape, pin them on the full sized layout, glue the tips in place and hold with pins. Then the ribs may be cemented in their respective positions. When the halves are dry they are lifted from the board. (Put

waxpaper over drawing to prevent frame from sticking.) The tips must be cut off and reglued with the proper amount of dihedral shown. Use pins to hold in place. Then the main dihedral is formed. Check all the settings for accuracy. When all the dihedral is in place and dry, the spars of hard balsa are glued into the notches in the ribs. The wing structure is now complete. Reinforce all the spar joints with cement. Note also that all the dimensions and wood sizes are on the drawing, so they are not repeated here.

Tail

The elevator is built just like the wing except that there is no dihedral at the center, so the spar and trailing edge are in one piece. It is assumed that the tail ribs and wing ribs were plotted and cut out in one operation. Such a method would save time. Also since the surfaces are small, it might be a suggestion to build the tail and wing simultaneously. To make the tail tips, make a full size pattern by scaling up the right tip on plate 2 which is graphed. Draw 1/2" squares on some thin cardboard and then draw a dot on each side of each corresponding square where a line of the tip passes through the one on the drawing. Connecting the dots will give the outline. This is transferred to a piece of 1/8" x 3" balsa and cut out. Note that two are required. The tips are then streamlined, sanded and glued in place, checking the angle they make with the board with a 45 degree triangle.

Fuselage

The diamond type body is a streamlined version of the old box-type and has proven its worth. It is not very hard to build, but it has its own peculiar method of construction. To begin with, a top view of the fuselage should be drawn up using the dimensions given on that view on plate 2. Draw in all the cross-brace and jig positions. Before the body can be built up the jigs must be cut out; all the dimensions and instructions for this process being clearly shown on the main plate. Note that the tail hook bulkhead is the only permanent jig. The tail hook is bent and inserted into the bulkhead before the latter is glued in its place along the body. Make the hook of .034 music wire. Make it the locking type hook and before it is fastened to the bulkhead run some protective rubber tubing around it.

To start construction of the body, pin the two side longerons of 3/32" square on the outline. Glue the bottom halves of the jigs in their respective positions. Don't glue in the tail hook bulkhead now. Taking a third strip of 3/32" square, fit it in the notches in the jigs, running the full length of the body. Taper it where it meets the tail end and make a permanent joint here. Put a small drop of cement in each notch of each jig to hold it temporarily in place. Now fill in all the cross-braces and allow to dry. The perspective view of the lower right-hand corner of plate shows this preliminary process clearly. When all the joints are firm take out all the pins and lift this bottom half of the body off the board.

Now glue on the tops of the jigs, this time putting the tail bulkhead in place. The same operation as explained before is repeated here, and this will result in a complete, accurately made fuselage. When this

is dry all the jigs except the very last have to be cut out of their positions with a razor and slipped out of the openings in the frame. All joints on a structure of this type must be especially strong. The .034 wire landing gear is now bent. Looking at it from the front it consists of two "M" shaped pieces; the rear having shorter legs than the front, with the axles bent into the front piece.

Observe that the landing gear is bent forward looking at the side. In the braces where the landing gear struts attach cut shallow "V" grooves to accommodate the wire. Cement the pieces into the grooves and bind with thread. Now recement. The front and rear struts are similarly connected with each other half-way down. The wheels are made as according to plate 2; well streamlined, painted and attached. The wire wing mount is shown in complete detail on the drawing and special perspective and is attached to the body frame just like the landing gear.

The tail block and sub-rudder are both made of 1/4" plywood made by laminating two sheets of 1/8" balsa. They should both be glued in place before being given the proper section and the fuselage should be covered before they are given the final sanding. A "V" cut is made in the sub-rudder. The bamboo outline is glued into this and held down with pins till dry. Then the pins are removed and the balsa around it is sanded so that the bamboo will look integral with the rudder.

Propeller

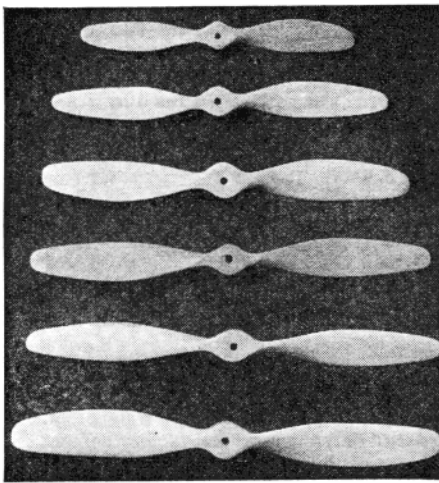
The prop dimensions are shown on the drawing and should be laid out on the balsa accordingly. It might be a good idea to make three propellers; a 10", a 11", and the 12" shown. If the first breaks replace it with one of another size; noting any difference in performance and speed. The propeller of course is of the standard right-hand type. All the different sizes would be carved from 1" x 1 1/2" blocks. The prop is finished down with three to five coats of dope or banana oil and should then be painted silver. Make it strong at the hub.

Covering

Now that the whole framework is done, covering is the next logical step. Cover the wing and tail with a bright tissue. Red or orange are recommended for visibility, though any color may be used. Apply tissue to frame with banana oil. Spray with water to tighten. When no moisture is left on the covering, apply three coats of banana oil or dope.

To cover the body, obtain some 1/32" medium soft sheet balsa. Cut to approximate shape and cover one side at a time. Apply cement quickly over the particular side to be covered, place the balsa on top and hold in place with an abundance of pins. The diagonally opposite side may be covered next. When these two are dry the pins are removed, and they are roughly trimmed down so as not to interfere with the covering of the remaining two sides. When all the body is covered, carve a nose block to shape and drill a hole in it to accommodate the prop shaft. The nose block is slipped in place and the whole body is sanded down smoothly. When finished sanding it should look as if the nose block is part of the body, and the tail block and

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sub-rudder are molten into the contour. Use ten-nought sandpaper for a final finish and then apply three to five coats of banana oil with intermediate sandings.

Assembly

Before the tail is glued to the top of the tail block, cut away part of the tissue on the bottom at the center so that the wood of the tail will make a direct contact with the wood of the block. It may now be cemented in place and should be lined up accurately and carefully. The wing is held in place with a rubber band of 1/8" flat rubber. The propeller should use a good free-wheeling device and possibly a ball-bearing washer. Otherwise use about six bronze washers. Put a long bushing in the nose block and smaller ones into the front and back of the propeller. See that all bearing friction is minimized. The propeller shaft should end in a locking hook so that extreme rubber tension will not straighten it out. Use 12 to 14 strands of 1/8" flat brown rubber that may be lubricated with castor oil, glycerine, green soap or any other popular "lube."

Flying

If the model has been well built it should fly "off the workshop table." Test by adjusting for a good glide first. See that the prop has the down and right thrust specified on the assembly plate. Wind up a few turns by hand, launch the ship and note the reaction. If satisfactory, increase the turns gradually; 800 is about the limit on 14 strands but this is enough to get the model out-of-sight on a favorable day. If the test flight is not perfect work on the wing and prop adjustments till everything is O.K. Your efforts should be recompensed by a compact and beautiful little soaring job.

They Gave the World Wings

(Continued from page 7)

A life-saving station was situated at Kill Devil Hill nearby and that was all that marked the location. Sand dunes stretched for miles along the coastline. It was a wind location not far from the Cape, but it was admirably suited to the needs of Wilbur and Orville Wright, who, possessed with an idea, set out to demonstrate the value of the machine they had made.

Trouble started early for the Wrights at Kill Devil Hill. Only a few days after their arrival motor trouble developed and it was necessary for one of them to return to Dayton for the repair parts. Orville Wright set out immediately for his home town to get the necessary motor shaft. It was the 11th of December before he returned with the new material.

For the next few days both brothers were busy trying out the new equipment and getting the plane in readiness.

On the night of December 16, 1903, a cold wind came from the north and by the next morning ice had formed on small puddles of water about the ground. Hoping the wind would die down sufficiently to enable a test flight, the two men waited impatiently for a turn for the better.

By ten in the morning, conditions had not changed and the signal was given to the life-saving crew stationed in the Light House to come over and help.

There was unquestioned danger in an attempted flight into the high wind. Both,

however, were anxious to try their machine. A flip of a coin decided who was to be at the controls and Orville won.

He lay down on the fuselage rail of the plane and took the controls. The wire on the ground track was released and the machine started into the face of the twenty-seven mile wind and was held almost motionless. Wilbur ran alongside to hold the wing and balance the craft on the runway.

For forty feet the machine ran along and by the time it had reached the end of the tract it had risen to a height of ten feet. This was a rather erratic air trip, up and down, due to the inexperience of the pilot, but it must be remembered that this was the first flight ever made by man. Much schooling is needed on the subject.

At times the machine was ten feet in the air. Then, it swerved into the ground with undulating motions. One hundred and twenty feet from the starting place the plane struck the earth. The initial flight had lasted twelve seconds, but it was the first made in history, in which a machine carrying a man had raised itself, by its own power, into the air in full flight, had sailed upward without reduction of speed and finally had landed at a point as high as that from which it had started.

"Our laboratory experiments made that first flight possible," emphasizes Orville Wright today, "the same is true now, the most important advances in the airplane itself again are coming from the study of aerodynamics."

Early Experiments

The thought of soaring through the air like the birds appealed to the Wright Brothers at first more than the thought of a power-driven machine. Consequently they devoted most of their early attempts to gliding. Besides they had seen from the experiments of others the wasteful extravagance of mounting delicate machinery on wings and they knew not enough yet to accomplish this, nor had enough money to finance such costly experimentation. For this reason the Wrights in early periods of their experimentation belonged to the gliding school of thought concerning flying.

It was no easy matter to glide through the air, which they soon found out when they graduated from the kite flying stage into the actual gliding experiments.

There were many methods of gliding:

Some placed the center of gravity far below the wings in the belief that the weight would naturally seek to remain at the lowest point. This was good reasoning, the Wrights thought, since it was true that the pendulum tended to seek the lowest point. But also like the pendulum it tended to oscillate in a manner destructive to all stability. Therefore, a more satisfactory system, especially designed for lateral balance, had to be found.



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