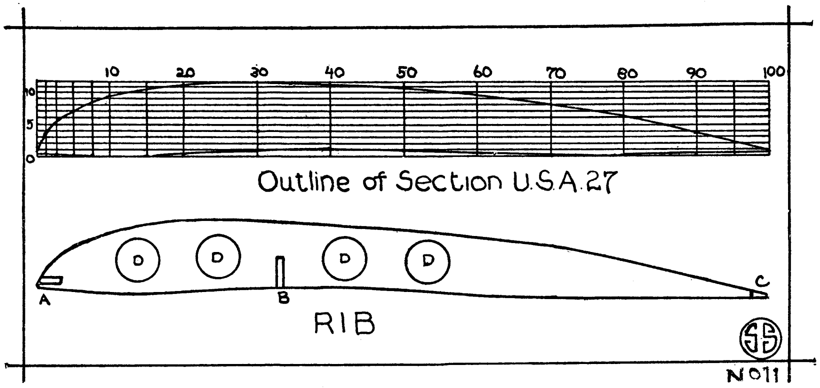
AVIATION

Building and Flying Model Airplanes



Making the Wing of SS-2

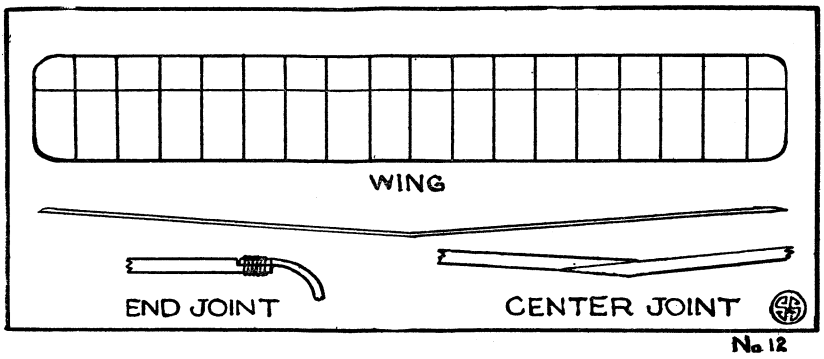
This is the eighth of a series of articles by Paul Edward Garber, telling how to make model airplanes. Mr. Garber is in charge of aeronautics at the Smithsonian Institution.

In the early days of aeronautical history airplanes were equipped with flat wings, but after a study of the anatomy of birds and of aerodynamics, the curved wing was adopted as being more efficient. Whereas the flat wings exerted a lift only because of the pressure on the under surface, it was found that curved wings in addition to the pressure on the bottom, utilized a vacuum on the top surface, and thus increased the wing efficiency. The next step was to find the most efficient curvature for the top surface, and what shapes of upper and lower surfaces produced the best results whether the object desired was speed, or lift, or combinations of these two factors. Thus there have been evolved many wing sections. When a new one is designed an accurately made pattern of it is placed in a sensitive balance in a variable air stream, and its actions noted. The results are published and are available to aircraft designers. The sections are given reference names and numbers such as Eiffel 15 or Clark-Y, meaning the number of the experiment conducted by that particular designer or laboratory.

One of the most efficient wing sections is the U. S. A.-27. When used in a wing it imparts to the airplane an excellent degree of speed and lift, with very little resistance. It has been used on many prominent airplanes, including the Douglas World Cruisers, which circumnavigated the world in 1924. We will use this section on our model.

The drawing shows the shape of this wing section. The upper drawing illustrates how the shape may be accurately copied. We will use a wing with a width of 5¼ inches, therefore on a sheet of paper draw a line this long. With a pair of dividers, divide the line into 10 spaces and number the divisions from 0 to 100 as shown. With the dividers still set at 1/10 of the line's length, extend them below the line and draw a line equal to the top line at this point. Divide the distance between the lines into ten spaces and draw a line across from each division, and add two lines equally spaced below the tenth. Next draw vertical lines downward from the marks 0 to 100. This practically completes the preparation for the drawing, but for the sake of better accuracy divide the first space in half and each of these again in half and finally the first of these smaller spaces, in half. The space between 90 and 100 is to be halved also. For clarity, you may mark these smaller divisions in the first space 1¼;

(*Just turn the page*)



METEOROLOGY

St. Louis Tornado Typical

The tornado that devastated parts of St. Louis on September 29 was not an unusual storm from the standpoint of the meteorologist, except for the fact that it unfortunately occurred in a densely populated area.

Like most of the tornado disturbances for which the Mississippi region is noted, the recent storm left in the wake at least four affected localities, according to unofficial reports reaching the main office of the U. S. Weather Bureau at Washington. Tornadoes were reported at Muskogee, Okla., in northwestern Arkansas, at St. Louis, and near Danville, Ill. A line running northeast can be drawn through these places indicating that the general storm giving rise to the local tornadoes moved in this direction. This is another confirmation of the meteorological belief that the tornado storm travels from the southwest to the northeast.

The spinning whirls of destructive winds are not themselves in the center of the general storm giving rise to them. In the recent disturbance the "low" area where the barometer registered the least atmospheric pressure was somewhat to the northwest of the point of destruction. On the morning of the St. Louis tornado the "low" was in western Nebraska, in the evening, twelve hours later, it had moved to southeastern Minnesota and the next morning it was northeast of Lake Superior.

The most vicious storm on earth, exceeding in violence the tropical hurricane, the tornado is fortunately of short duration and covers only a small area of the earth's surface. At any one place the storm does not last more than a few minutes.

At St. Louis a wind velocity of 72 miles an hour was officially measured by the Weather Bureau station over a period of five minutes but it it probable that gusts at the storm center were much higher. From the destruction caused and the way bridges, houses and other heavy objects are handled by the wind, the velocities must reach 400 to 500 miles an hour in some tornadoes.

The cause of the tornado is essentially the same as that of a severe hail or thunder storm. From the west or northwest comes cold air which overrides warm, moisture laden air from the south or southwest. The surface of contact of the two winds is a slanting one, so that

(*Just turn the page*)

St. Louis Tornado Typical

(*Continued from page* 237)

about a hundred miles east of the trough, as the line of contact at the ground surface is called, the two winds clash at a height of about a mile. It is at about this point that the so-called funnel-shaped cloud usually forms, whirling like a top and carrying within it reduced pressure which causes houses in its path literally to blow up because of the released pressure within them. The warm air beneath, charged with moisture and immense energy, sets up a most violent convection and vertical overturning of the atmosphere which results in the typical tornado vortex, an immense eddy in the ocean of air.

Due to the limited area affected by the tornado and the impossibility of predicting just where it will occur, the Weather Bureau does not attempt to issue forecasts of these storms other than to warn of "severe local storms." If tornadoes were definitely predicted hundreds of thousands of people might be unnecessarily worried and the loss due to this condition might greatly exceed the damage that might be prevented.

About a hundred tornadoes occur each year in the United States, and they take a toll of about 300 lives yearly on the average. The tornado season for most of the country is from March to October.

Little can be done to protect against the tornado, but meteorologists give this advice:

If you see the tornado cloud advancing toward you, run northward or toward the northwest, in the direction of your left hand as you face the coming storm.

If there is a "cyclone" cellar or tornado cave, get into it as soon as possible.

In a frame house the best thing to do is to go to the southwest corner of the basement. A frame house is likely to be taken off its foundations intact.

In a brick or masonry structure, do not go to the cellar as that is the most dangerous place. The tornado will disintegrate the brick house at once, whirling the debris into the basement.

Science News-Letter, October 8, 1927

The oldest lighthouse in the United States, at Sandy Hook in New York Harbor, was first lighted in 1764.

The last entry in George Washington's diary, made the day before his death, was a short note on the weather.

Building Model Airplanes

(*Continued from page* 237)

2½; 5; and 7½, and similarly the next to the last subdivision may be marked 95. The horizontal lines are to be marked from 0 to 12, from the bottom up. The screen is now ready for marking the points of intersection of the wing outline.

To draw the upper and lower surface lines use the following table, wherein the first column indicates the vertical lines, the second column indicates the position on this line where the upper surface of the wing intersects, and the third column indicates where the lower surface of the wing intersects. For instance, the tabulation: 20—11, 1/3—1/3, means that on vertical line 20 a mark is to be made 1/3 of a space beyond the eleventh horizontal line and 1/3 of a space above the zero line to indicate where the upper and lower surfaces, respectively, cross. Using this method plot every position.

Vertical line	Upper surface	Lower surface
0	1 4/5	1 4/5
1 1/4	3 4/5	1/2
2 1/2	5 1/10	1/3
5	7	1/5
7 1/2	8 1/5	1/10
10	9 1/5	0
20	11 1/3	1/3
30	12	1
40	11 1/2	1 1/5
50	10 4/5	4/5
60	9 1/2	1/4
70	8	1/10
80	6	1/20
90	3 3/5	1/5
95	2	1/2
100	3/5	3/5

Connect the various marks which you have made on the screen and the resulting outline will be that of the U. S. A.-27 wing section.

Take the drawing which you have made and paste it on a piece of tin. With a pair of shears cut out the wing section, making a tin pattern. Next procure the following material:

1 sheet Japanese tissue paper, 38" x 16".

1 pc. pine wood 36" x ¼" x 1/16".

2 pcs. balsa wood 34" x ⅛" x 1/16".

1 pc. of bamboo, the remnant of that used for the wing.

18 balsa slats 5¼" x ⅝" x 1/16".

Thread, Ambroid, banana oil.

On each of the balsa slats draw the outline of the tin pattern and cut out the rib. A cut should be made in the front and on the bottom of each rib to accommodate the front wing edge and the spar, as shown at A and B of the lower drawing. The rib may be lightened by making holes with a metal tube such as is used to hold the rubber on a lead pencil. Balsa wood is so soft that if the tube is placed on the wood and spun around the hole will be made, as shown at D in the same drawing.

The pine spar should now be cut in the center and rejoined as shown in the detail drawing above of the center joint. The angle formed should be such that the ends of the spar will be one inch above level. The ribs are now Ambroided to the pine spar, two inches apart. This should be carefully done so that all are in the same line. The front balsa edge is inserted in the front cut, and Ambroided in place. The rear edge is Ambroided directly to the rear of the ribs, as shown in the drawing at C. A piece of bamboo ⅛" x 1/16" x 9" is curved to make the shape of the wing end. Bamboo may be easily curved by holding it in the heat of a candle flame, and forming it as the fibers give. This curved shape is carefully split in half, making two identical ends, and these are bound and Ambroided to the ladder-like frame as shown in the detail drawing of the end joint.

The wing is now completed and may be covered. To do this coat the top of the center sections with banana oil and over them lay the center of a piece of Japanese tissue paper, 38" x 6". Stretch the paper tightly over the frame, pulling it smooth to preserve the shape. Proceed with each section and finally fasten the paper snugly to the bamboo ends. The under surface is covered in the same manner. In all of these covering operations, pull the paper particularly taut along the length of the wing, in order to keep the curvature correct, and to prevent "saddles" between the ribs. If desired, the wing may now be painted with collodion or a thin solution of airplane "dope." Both banana oil and collodion are drug store articles. Airplane dope is sold by model airplane supply houses or by airplane dealers, advertised in aircraft magazines. It is thinned by adding acetone, which is another drug store article. This treatment of the paper tightens it and makes it more air-tight.

Lay the wing where it will not get distorted. In the next article we will describe the elevator for this model.

Science News-Letter, October 8, 1927

Canaries have been kept as pets since the sixteenth century.

Jawbones of whales are used by Eskimos as roofing material.