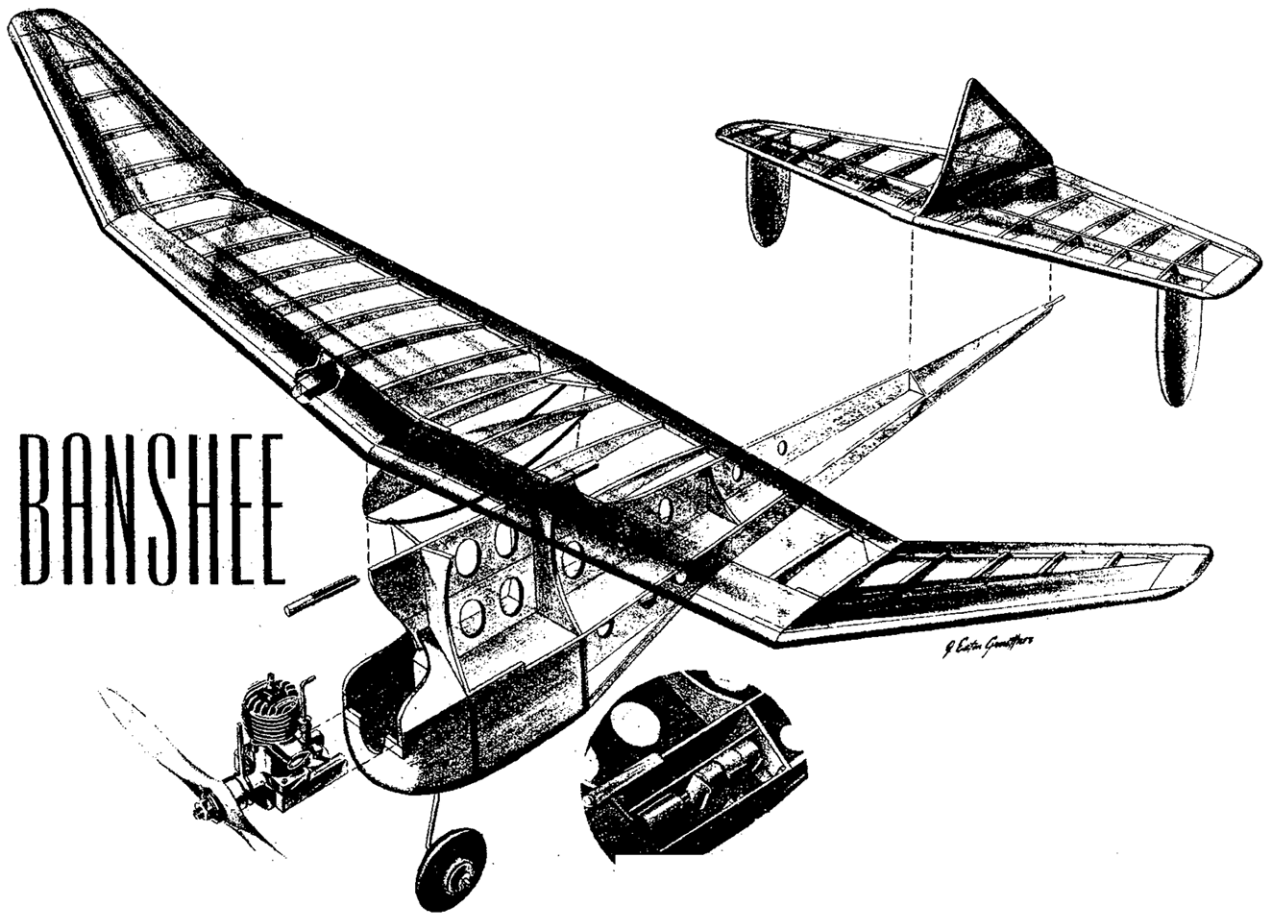
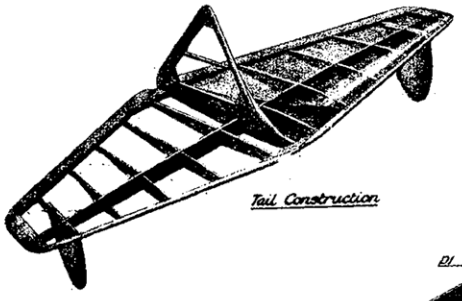
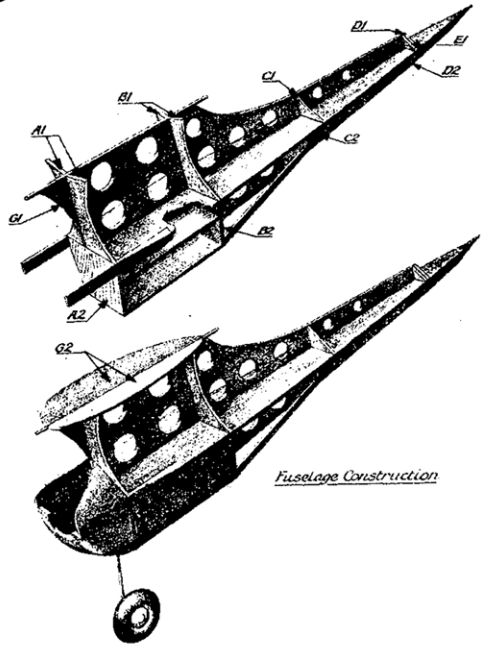
BANSHEE





Tail Construction



Fuselage Construction

BANSHEE

By Lt. Leon Shulman

GUARANTEED FLIGHT PERFORMANCE, PLUS RADICALLY NEW CONSTRUCTION BY A DESIGN EXPERT

● The clean lines and well developed design with reduced drag is very apparent in these two views of the model.

(*While the Banshee is a comparatively old model in years (the design was developed in 1941), it still is far ahead of all the models to date. The climb, we can safely state, is the fastest we have ever seen. The altitude gained in this climb guaranteed an out-of-sight flight every time the model was flown.*—Model Editor.)

THE Banshee, with its weird, high-pitched wail, has astonished many a builder with its extremely fast climb and surprisingly flat glide. The Banshee has entered only two meets (you know, the war and all that) but it won both with the longest, most consistent flights of the meet. The best performance was turned in with three flights of six minutes each, all official.

The present Banshee design was achieved after several experiments with a rudderless design that would be spin-proof. This design featured a stabilizer that was one-half the wing area and was of the inverted polyhedral type. After several modifications, this type of stabilizer was laid aside and the present, conventional type used. The Banshee has proven to be more stable and more consistent in flight in its present form than the present-day designs. This can be attributed to its force arrangement and clean design.

Theory: The theory upon which the Banshee is based has been proven practical by past designs. Past experience has shown that a low wing loading

is one of the most important factors that can induce long, contest-winning flights. This requirement was given prime consideration in the design, with the existing AMA rules kept in mind.

To allow the finished design to climb exceptionally fast for the power used, and to permit flat glide as well, demanded that the frontal area of the model be as small as possible. Few designers take the frontal area into consideration. I can safely state that frontal area, wing loading, and power loading are the three factors which directly determine the qualities of a sound design. The smaller each is in quantity the more efficient the model. The frontal area of the Banshee was kept to a minimum by careful design of all three components of the plane. The wing was designed using an exceptionally thin and stable airfoil with a simple and sturdy construction, light in weight. The fuselage was to have an exceptionally clean curvature which, along with its small frontal area, would disturb as little air as possible in its forward flight. This demanded a type of structure that previously had never been used. (The structure is covered later on in this article.) The tail surfaces were to have a thin cross-section, as is practical for warp-free surfaces. A symmetrical airfoil was used to keep drag down to a minimum. All this took into account the general features of the basic design.

The center of gravity, center of lateral area, line of thrust, center of lift, and center of resistance had to be located so that all these forces would work in harmony to insure a smooth flight path. With the center of gravity as the basis for locating these forces, the center of lateral area was placed slightly behind and above the center of gravity.

The line of thrust was placed in a line with the center of gravity and the center of lateral area. This angle of the line of thrust to the horizontal base line was found to be five degrees. The center of lift was located 10% of the fuselage length in front of the center of gravity. This position was chosen to insure a smooth flight path under most flight conditions. This location would allow the model to have a graceful flight curve from take-off to landing. Locating the center of lift farther forward would cause the model to have an erratic nosing up or looping tendency at high speeds (while climbing) and, when stalled, to fall farther before it would recover. Placing the center of lift farther back would not allow the model to climb at a satisfactory angle and would cause a steep spiral turn downward in event of too much rudder offset. The center of resistance was located about 5% above and in a line vertical with the center of gravity. This too allowed for a fast climb and, in general, a smooth flight path without any erratic tendencies.

A tail moment of 55% of the wing span has proven very satisfactory in past designs and also was employed in the Banshee. A stabilizer having about 35% of the wing area has also proven ample in the past and was used on the design. The symmetrical airfoil cross-section of the stabilizer and the two-degree positive incidence setting would allow all the forces to exert their desired effect. The rudder was designed using a thin cross-section so that it, too, would not increase the induced drag. The sub-rudders were made larger than usual to allow take-offs in a short space and landings with minimum damage. The sub-rudders allow the model to stand at a slight positive angle so that the ship would jump off the ground, eliminating a long roll on one wheel, before being air borne.

The wing outline was to be of the tapered trailing edge type so that the center of lift could still be kept forward on the fuselage and a low-drag, yet pleasing, outline be used.

Facts on Construction: This radically new type of structure I have named the "X" Type structure. This was the method of construction developed after many previous experiments, and its success and practicability assure that the Banshee fuselage may be built in one-third the time and with one-third the labor required to build the present type. The completed fuselage, when covered, includes the motor bearers, and houses all the ignition units rigidly so that vibration or even major crashes will not damage the ignition system. At a contest, this feature is extremely important since soldering wires cannot be readily accomplished on the field. A trap door is used on the bottom of the fuselage so that the battery box is easily accessible. The fuselage covering has a smooth and lasting finish with two cross layers of light Silkspan or one layer of silk. Either type of covering when applied wet makes an easier and neater job of it. The motor bearers are built right into and are part of the structure. The motor mounts are cut to size so that any class "A" or class "B" engine can be used. This type of mounting has a great tendency to absorb engine vibration and yet allows moderate thrust adjustments on the field. An added feature is that another or different engine can be placed in the nose in a matter of a few minutes. This allows the same plane to be powered by another engine in an emergency.

The wing structure presented a problem since a very thin airfoil was used. A deep spar couldn't be used since it would cause the airfoil to be distorted after covering and aging. A thin spar is used instead and only on the upper curve. The thin spar and the sheet balsa leading edge provides sufficient strength.

The tail surfaces are conventional in structure. A deep sturdy spar and ribs sanded to shape from strips of balsa give the stabilizer a simple and strong structure. The straight tapered leading and trailing edge further simplify the building and allow for a warp-free surface. The rudder is triangular in shape and being flat in cross-section the building time is merely a matter of a few minutes.

The wing and tail surfaces should be covered with Silkspan and given two coats of thick dope or three coats of thin dope. No more than this amount is needed since it would further tighten the covering and make it less flexible. The fuselage should be doped twice that amount since less rough treatment is afforded it.

Flying the Banshee: With common sense and good judgment, test flying the Banshee is like taking out your old favorite model and putting it through its paces. If the incidence and thrust adjustments are used as shown, the Banshee will require very little adjusting.

A slight amount of right rudder and warp-free surfaces will allow the Banshee to climb up with a slight right turn and gracefully soar into its right-turning glide after motor shut-off.

If the completed model doesn't fly according to Hoyle, don't hesitate to increase or decrease incidence in the surfaces or change the thrust adjustments; not no two ships can be built exactly alike to fly alike. Use the down thrust always. Without it, the Banshee is just another gas job.