begins to glide in an amazingly short time, usually less than one second. The towplane then vacates the area and the glider follows the bird as closely as possible. If the glider begins to circle without chasing the bird, the bird will frequently approach and circle with the glider, as though the bird thought the glider had found lift. The glider pilot transmits altitude, velocity and temperature readings via radio to a tape recorder on the ground. This system works well when the bird chooses to fly fast enough, which is about fifty percent of the time. Unfortunately, one of the favorite gliding speeds of the Black Vulture is just below the stalling speed of the TG-2. The pilot can nurse the TG-2 down to almost the bird's speed in this quiet atmosphere in straight flight, but if a turn is started it becomes necessary to recover from a spin before the bird can be followed again. Since the bird will now be at least 100 feet above the glider no more readings can be made unless the bird decides to see how things are down where the glider is. This doesn't happen very often. With our present equipment, this system is useful only in the speed range above 32 mph.

The second system is a photographic technique in which tame birds are flown near the ground and is useful in the speed range below 20 mph. The subject glider was designed to cover the gap in the speed range from 20 to 32 mph and to equal or exceed the performance of the birds in this range.

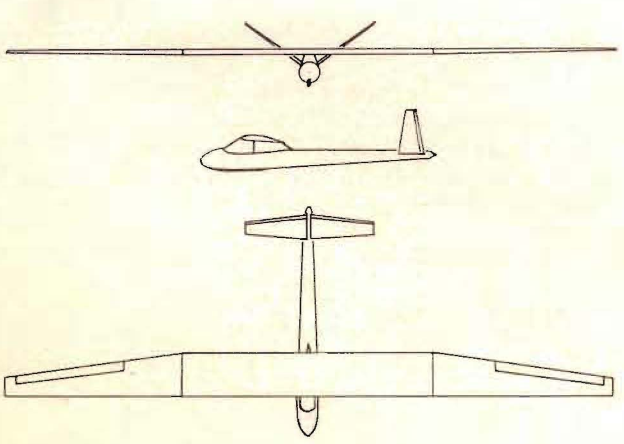
The design of this glider was evolved after much testing and calculation of the strength and weight of all components. Research was done on all the lightweight machines for which data was available.

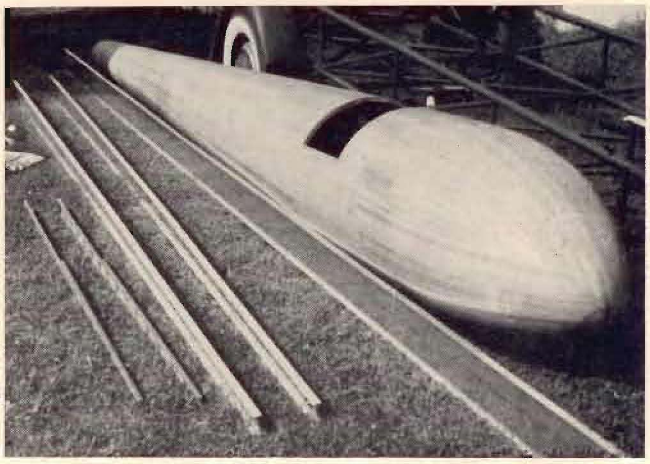
The calculated performance figures are:

Stalling Speeed—20.5 mph
Maximum L/D—33.9
Minimum Sink—0.93 ft./sec.

These figures assume that the ideal, smooth wing contour is used and that the remainder of the structure is smooth and aerodynamically clean. All these assumptions will not be met and we expect the real glider to fall somewhat short of the theoretical figures. After the machine is flight tested we will measure its true performance and report it as a sequel to this article.

The three-piece wing has an area of 230 sq. ft. and an aspect ratio of 16. The Wortmann airfoil was suggested by Bruce Carmichael who has also been kind enough to check my performance figures. The spar is built up of 7075—T6 aluminum sheet and angles riveted together. Plywood and spruce ribs are spaced 6 inches forward and 12 inches aft of the spar. Plywood covers the leading edge of the wing forming a D-tube with the spar. In order to improve the wing contour the plywood extends to 50 percent chord on the upper surface. The ribs and spars are finished and it is estimated that the complete wing will weigh 87 pounds, including the plastic film covering of 100 gage white Tedlar (a DuPont material similar to Mylar).





The construction, thus far, of the Vanderbilt University research sailplane. The extreme lightness is evident from the components.

The fuselage is circular in section at all stations and is constructed of 1/8-in. balsa wood covered on both sides with fiberglass and epoxy resin. The shell is stiffened with rings of the same construction and weighs 35 pounds, not including the pilot's seat and controls. The fuselage was constructed in two female molds, one for each side. The balsa wood was carefully fitted in place and the inner layer of fiberglass and the stiffening rings applied. Then these two halves were cemented together with epoxy resin. The outer layer of fiberglass was then spirally wrapped around the fuselage from one end to the other with generous edge overlap. A three-foot-long full-size section of the fuselage just forward of the tail was built and tested prior to construction of the entire unit. The test section easily withstood all the calculated loads imposed upon it.

The 110-degree V-tail surfaces are of the all-moving type with a 20-percent flap which moves through twice the angle of the main surfaces. Two steel tubes attached to the fuselage form the support and axles for these surfaces.

The pylon will be made from steel tubing which will support the windows and windshield. The fairing aft of the pilot is of the balsa—fiberglass material. The controls are all of large diameter aluminum push-pull tubes, bell cranks, etc.

In order to produce a safe machine and one which can be subjected to careful ground handling without undue damage a load factor of 6 was used in the calculations. The design speed of 60 mph was used to allow aero tow with Garland Pack's superior J—3 Cub towplanes.

A mountain of work remains to be done but we hope to complete this glider by July, 1966, in order to use it in our work during the summer.