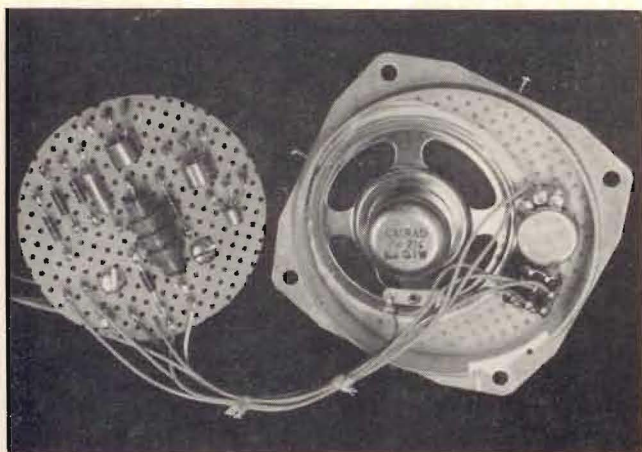


NACA 66 series, can be considered. Incidentally, these forms have to be modified a little in order that the sudden transition to turbulent flow at about 60% chord does not lead to the separation of the laminar boundary layer. Nor can the problems of construction be neglected. It is desirable to have the center of gravity near the axis of rotation, i.e. at 20 to 25% chord. The construction required has thus to be extremely light in order that a surface finish adequate to maintain laminar flow behind the axis is achieved. Sweep back of the fin is undesirable as this exerts an unfavorable influence on the laminar boundary layer. Above all, one should not allow the fin to begin with a gradual fairing from the fuselage, but should only use a short fairing. The tapered fin fairing, because of its small angle, carries the turbulence of the fuselage boundary layer outwards, and that part of the surface of the tailplane covered with turbulent flow is increased unnecessarily.

AUDIO-PAGE

by Pat Page

So you want an audio attachment for your electric variometer? Well, here's one inexpensive solution for about 15 American dollars. I will not dwell on the technical aspects of the unit other than to say that it uses a standard relaxation oscillator employing a uni-junction transistor and is driven by a DC amplifier. This may sound very professional, but I can only claim credit for its application to soaring instrumentation since the circuit is old stuff.



One method of mounting the electronic components of the audio system can be seen in this photo.

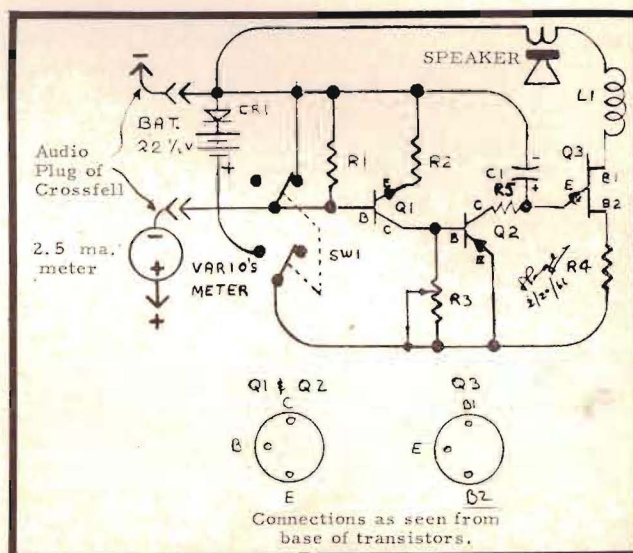
Any person with a bare minimum of electronics knowledge should be able to assemble the unit without much trouble. It is adapted to the Crossfell variors, but there is no reason why any variometer using a meter of similar sensitivity (2.5 ma. movement) should not work in a similar manner. A friend went to the extent of designing his own electric variometer using the audio unit. I have used the prototype for over two years without any modifications or repairs required. As far as I know three pilots will be using it or modifications of same, in the '66 Nationals, plus my partner, Dick Sisley, in our K-8.

Its low-duty-cycle ticking pulses are very pleasant to the ear. It allows you to listen to the wind, if you care for that sort of thing, without tiring your brain.

The points covering the reduction of drag given in this paper are neither complete nor, in their entirety, new. Also, in many places, general, rather than detailed recommendations have had to be made. Despite this, consistent application of the above principles, which are, after all, relatively simple to apply without tremendous technical requirements, should lead to a noticeable improvement in performance.

This chance is given not only to the designer but to every glider pilot who regards his glider with not only loving, but knowledgeable eyes.

References—Ref. 1, Summary of the influence of the airfoil polar on the performance of sailplanes by Dr. F. X. Wortmann and K. Schworer. Ref. 2. Some laminar profiles for sailplanes by Dr. F. X. Wortmann. English translations of both articles appeared in *Soaring*, January, 1964 pages 6 and 14. (See also OSTIV Publ. VII.)



Wiring diagram for the Page audio unit.

For practical reasons I kept the circuit to a bare minimum. Some of the local gents are dolling it up by adding frequency and volume controls, differential amplifiers plus the added touch of gold-braided, diamond-studded switch handles. The next move is up to you.

If you care and dare build an Audio-Page send a stamped, self-addressed envelope to Pat Page, 393 Cronin Drive, Santa Clara, California. I will send you somewhat more detailed information about the device including an assembly manual and a full bill of materials with prices. Since I am not in the business of selling soaring aids please do not expect me to spend time answering any assembly questions, nor get mad about poor service.

The circuit and its performance can and will be improved by someone, but since there is a real need for an inexpensive audio unit, I feel that its publication will allow many a pilot to get one and many others to chop it to pieces to design a better one yet.

Let me say in closing that, once you get accustomed to an audio attachment to your variometer, you won't be able to fly without it and not miss the comfort and safety that it brings.