THE BLUMENAUER VARIOMETER - EFA 1/3 VARIOMETER/SPEED TO FLY/INTEGRATOR SYSTEM

The efa 1/3 is a further development of the proven eta 1 system by J. Orgen Blumenauer, providing the pilot with simultaneous visual indications of an extremely rapid variometer, integrator (30 seconds) and best speed to fly reading between thermals. In addition to the three visual indicators, there is a variable audio signal, switchable to reflect either the vario or the speed to fly indicator. Simply by flying the needle, or audio signal at zero, the pilot can keep his sailplane at optimum speed. "Expected" thermal strength can be fed into the system. The efa 1/3 is available with calibrations for most current sailplanes. It is basically an electric variometer with an integrated electric pitot pressure meter. The efa 1/S provides advanced instrumentation, simpliflying flight operations significally, thereby, allowing the pilot to devote more attention to strategy.

As stated, in addition to the audio signal, the instrument presents three indications simultaneously:

A-1 Variometer

A~2 Speed to fly

A-3 Average Rate of Climb of the Last 30 Seconds (Integrator)

While flying between thermals the pilot has available to him an extremely rapid variometer reading, an optimum speed to fly suggestion and the average rate of sink for the last 30 seconds. While thermalling, the latter indication translates to the average climb of about the last two 360° turns.

A switch on the control panel permits the pilot to choose between an audio signal reflecting the variometer reading, or, an indication of the optimum speed to fly. Another switch allows the pilot to select between 2 wing loadings (i.e. with or without ballast).

The efa 1/3 also permits adjustments for average thermal strength from zero to five m/s (0-1000 ft/m). It also allows for adjusting the zero position, continuous adjustment of the audio volume and for changing the time lag coefficient between 0.6 - 4.0 seconds. The instrument is not subject to error due to temperature changes.

Variometer A-1

By turning S-1 to the right, the instrument is switched on. Depending on outside temperature, 10 to 20 minutes are required O to heat the reference chamber to the operating temperature of 55 C. During this period the instruments ~'ill indicate climb. When the correct operating temperature has been reached, the zero reading can be fixed by turning the screw adjustment. (S-3, it allows for 20 turns) **The zero position should not be set during the heating phase.** Once set, zero will be precisely reestablished automatically after each heat up phase. The damping switch (S-2), allows for varying the time lag coefficient of the variometer between 0.6 and 4.0 seconds.

Speed to Fly Indicator A-2 -

The expected rate of climb in the nèxt thermal should be set using the McCready switch. The following settings are possible:

m/s	ft/m	kts
O	O	0
.5	100	1
1.0	200	2
1.5	300	3
2.0	400	4
2.5	500	5
3.0	600	6
4.0	800	8
5.0	1000	10

The ballast switch (S-6) allows for setting the instrument for two different wing loadings. (with and without ballast) The pilot should fly at that speed at which the needle of the speed to fly instrument (A-2) or the audio signal (if selected) is at zero. If the needle is above zero, he is flying too fast, below zero, too slowly. For example, if the McCready switch (S-5) is set at 2 m/s, and the airspeed indicator indicates ~ 1 m/s, one is flying too fast e.g., as if one expected 3 m/s climb. In general, the following rule applies. The current speed is correct for an expected thermal strength equal to the sum of the McCready switch setting (S-S) and the airspeed instruments reading. (A-2) ~

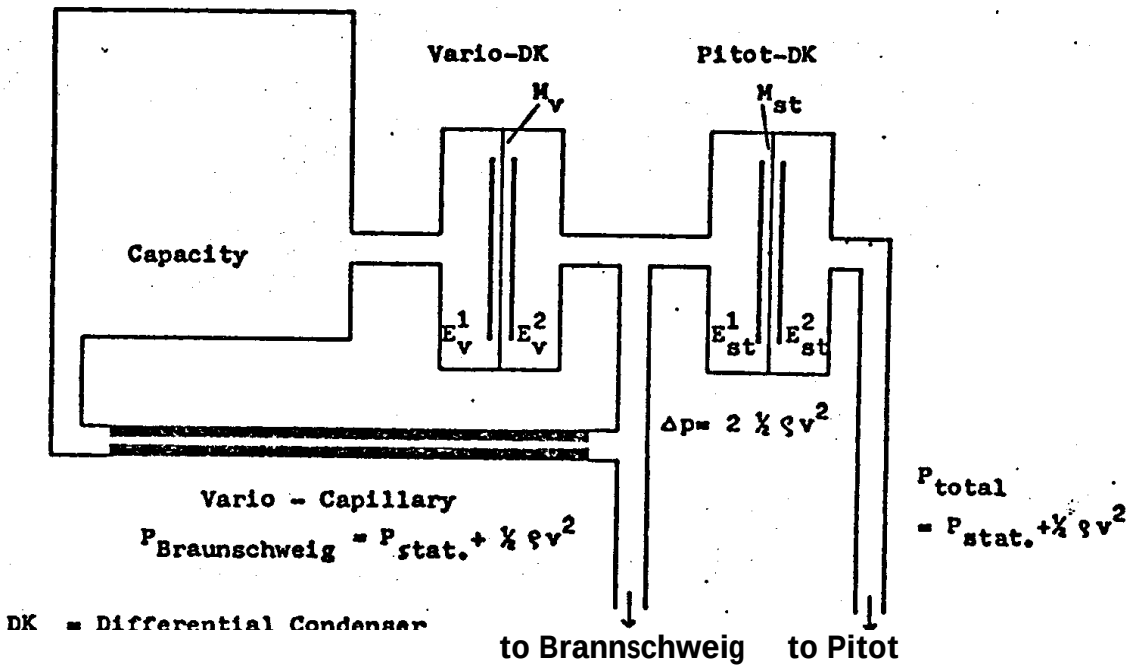
The audio indication (toggle switch S-4) can be switched to read the variometer (A-1) or the speed to fly (A-2) instruments. The audio range varies from about -4 m/s (-800 ft/m) to 10 m/s. (2000 ft/m) The climb indication is interrupted. The interrupter starts at zero, or when the instrument to which the audio unit is switched indicates zero.

Integrator A-3

The integrator (A-3) reflects the average rate of climb of the preceding 30 seconds of flight.

Special Characteristics of the eta 1/3 P . .

The variometer portion of the instrument works much like a mechanical variometer, and pitot pressure portion of the instrument much like an airspeed indicator. The variometer consists of a capacity, a capillary and a flexible metal membrane. While in a mechanical variometer, the flex of the membrane is transmitted to the needle via a geared rod, the eta 1/3 measures the membrane flex electrically without mechanical touch. In the pitot pressure instrument a metal membrane is flexed by double pitot pressure. The resulting flex is also measured electrically. This type of pitot pressure measurement avoids the meter current normally flowing proportional to total pressure.



DX ~ Differential Condenser

Mv - Varlo-Membrane

Ev ~ Condenser Faceplates of MV

Mst - Pitot-Membrane

Est - Condenser Faceplate of M.stat

As is shown in the diagram, the variometer membrane, together with the condenser faceplates form a differential condenser, whose discord depends on the flex of the membrane, which is the measure of the rate of climb. The flex of the pitot pressure membrane, or the discord of the pitot pressure differential condenser is a measure of total pressure.

Installation Instructions The efa 1/3 variometer requires three standard size round (27 inch) holes for the variometer (A-1), speed to fly (~-2) and integrator (A-3) read out instruments. The control panel, which is mounted on the core instrument, is installed in a standard size large round hole in the instrument panel. The efa 1/3 requires a connection to pitot pressure and a second to a Braunschweig tube.

The tubes of the instrument are appropriately coded. In addition, the efa 1/3 requires a power source of 108 to 15 V DC. The current is internally stabilized at 9 V: the average drain is about 32 m A's,

Operating Instructions

The control panel includes the following switches:

S-1 on and off; volume (turning knobs)

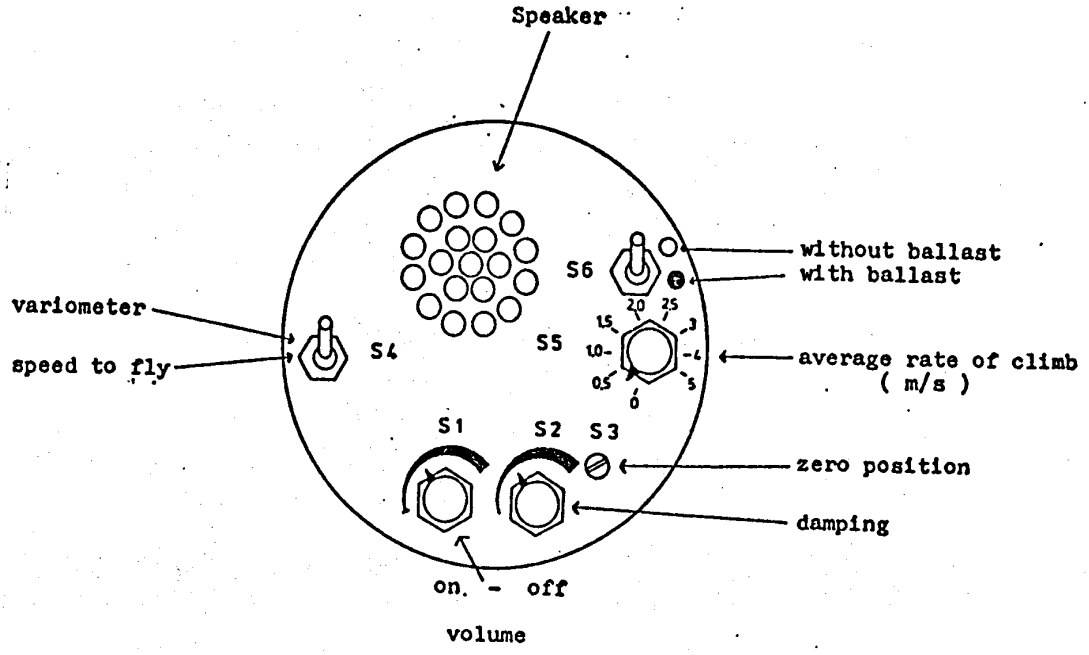
S-2 damping - (turning knobs) (at high speed damping is doubled automatically)

S-5 McCready switch (turning knobs)

S-3 screw adjustment to set the zero position

S-4 toggle switch audio-vario or audio-speed to fly.

S-6 toggle switch to select wingloading (with or without ballast)



The core instrument consists of the two differential condensers, the vario capillary and two capacity meters. The entire unit is housed in a Dewar-container, in which the temperature is maintained by a thermostat at exactly 55° C. The Dewar-container also houses the capacity of the variometer. This explains the climb indication of the variometer during the heating phase of the unit. The variometer works, therefore, independent of fluctuations of outside temperature. The heating current is .7 m A per 1° C difference between 55° C, and the outside temperature. For example, at -20° C (-4O F) the heating current is about 50 m A and at 25° C (77° F) about 20 m A. Without the heating current, the unit uses, depending on volume, between 12 and 20 m A. Therefore, the normal operating current is about 600 m A for a period of 3 to 6 minutes.

Technical DATA for the eta 1/3

Core Unit: Length 175 mm
Diameter 80 mm
Fits normal size instrument panel hole (3 1/8 in.)

3 Indicators: length 65 mm each
Diameter 60 mm each
Fits standard size small 2 ~ inch hole in instrument panel.

Electric Current: 10.5 - 15 Volts DC
Operating current internally stabilized at 9 Volts.
Current drain about 35 m A.
Current drain atter s;vitching on for 3-6 minutes about 600 m A-.

Range of Instrument Reading: -S to +5 m/s or –
- 10 to +10 kts or
-1000 to +1000 ft p/m -

Measuring Range of the Audio Indicator: -5 to 10 m/s or
-8 to +20 kts or
~800 to +2000 ft p/m

Time Lag Coefficient of the Variometer: Adjustable from 0.6 to 4.0 seconds

Time Lag Coefficient of the Integrator: 30 seconds

Altitude Error of the Variometer: None

Compass Disturbance: The speaker has a magnetic influence range of about 25 centimeters or 9 3/4 inches. The read-out instruments effect the compass to about 15 centimeters or just under 6 inches. Beyond this range the influence on the compass is less than 5°.