



## MKIV VARIOMETER

After World-wide use for many years, Cambridge Variometers have been developed and refined to the point that they represent virtually a standard in the field of such equipment, for performance, versatility, and reliability.

Cambridge now introduces the next generation, the new MKIV Total Energy Compensated Variometer.

Utilising the latest in high-technology and packaging techniques, the MKIV Variometer combines unequalled performance with a highly readable round-scale display.

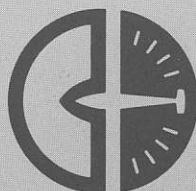
The Internal TE Compensation on the MKIV Variometer utilises the techniques developed by the well-known PIROL Air Data Computer, and offers outstanding compensation at all speeds, independent of altitude. The MKIV Variometer does not require external probes, or any flasks whatsoever.

The MKIV Variometer is compatible with the MKIV Director, and with all other Cambridge accessories, as appropriate.



Cambridge Variometers were used by Winners of innumerable competitions, including the Champions of the 1974 (Waikerie), 1976 (Rayskala), and 1978 (Chateauroux) World Contests.

The Record speaks for itself.



BUSINESS  MEMBER

Cambridge Aero Instruments, Inc.

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Telex 948503 CAI BLRC

Outstanding features of the MKIV Variometer include the following:

- ✓ 80mm (3") circular read-out provides the maximum scale length and pointer movements possible. This results in the pilot really being able to see the pointer move, see its accelerations and its trends. This is an important aspect of an instrument being used to center in thermals.
- ✓ Unique packaging technique presents all switches and controls on the front face of the instrument.
- ✓ Accurate, well-damped TE Compensation at all sail-plane speeds, independent of altitude, and adjustable to different ships Pitot-Static systems by a fine-trim on the front face.
- ✓ Outstanding zero-stability (known as Zero-drift) performance. Guaranteed to be better than  $\pm 0.3$  knot (30 FPM), short-term, over a temperature range of  $0^{\circ}$  to  $130^{\circ}\text{F}$  ( $-18^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$ ). This characteristic is virtually unequalled by any comparable instruments, and ensures that UP is UP, and DOWN is DOWN, under all circumstances. This is a continuing problem with most instruments, particularly the older generation of Electronic TE Compensated instruments.
- ✓ 3 Ranges and 2 Damping speeds are standard, covering most soaring conditions likely to be encountered.
- ✓ Part of the unique Cambridge building block approach. When used with a MKIV Director, the resulting MKIV System becomes an outstanding full 3-indicator system with no mode-switching or other confusing pilot actions required.
- ✓ Compatible with Cambridge Audios, Audio Directors, and Integrators. Speed Ring available.

#### Ordering Information

CPT50S . . . . . Knots Version  
CPT60S . . . . . Feet/Min. Version  
CPT40S . . . . . Meters/Sec. Version

#### WARRANTY

All Cambridge Variometer Systems are guaranteed for use in sailplanes and motor-gliders only, for a period of TWO years from date of purchase. This warranty includes all parts and labor costs only, and is valid only if returned to CAI Inc. The Warranty is void if the instrument has been misused outside its limitations.

**NOTE:** The system is not fused. External fuse of  $\frac{1}{4}$  amp. is advised.

The Cambridge MKIV Variometer has the following basic options and controls:

80mm (3.125") size.

Knots, Feet/Min, and Meters/Sec. Calibrations available.

Three Ranges are standard as follows: (selected by switch)

Knots . . . 20, 10, and 5 knots.

Feet/min . . . 2000, 1000, 500 FPM

Meters/Sec . . . 10, 5, 2.5 m/s

Two response speeds are standard: (selected by switch)

1.5 seconds . . . fast

3.0 seconds . . . slow for choppy conditions

Internal Total Energy Compensation, electronic, adjustable by screw-driver on front face.

A Repeater for a Second cockpit is available.

#### Specifications

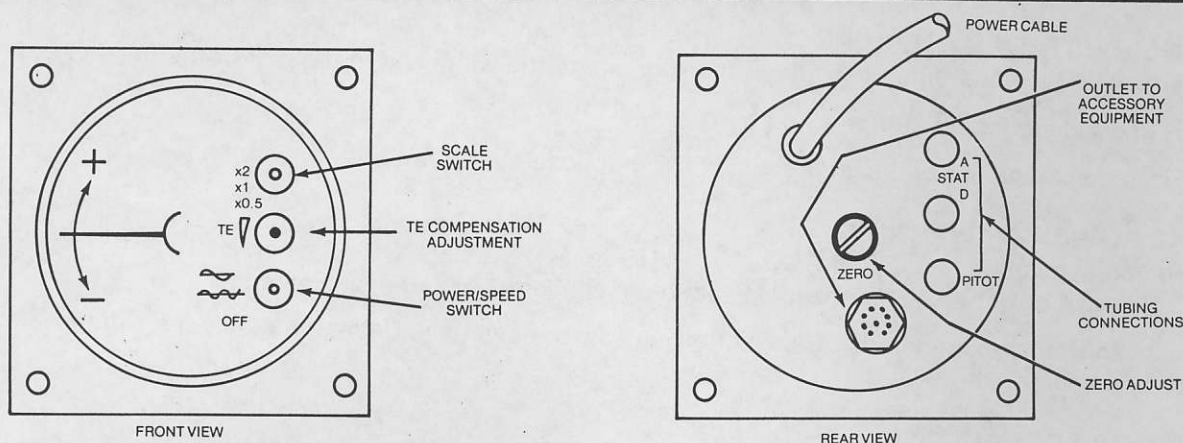
|                        |                                                                   |
|------------------------|-------------------------------------------------------------------|
| Sensitivity:           | $\pm 20, 10, 5$ knots, selectable, or equivalent.                 |
| Zero Stability:        | $\pm 0.3$ Knot over $0^{\circ}$ F to $130^{\circ}$ F, short-term/ |
| Operating Temperature: | $-20^{\circ}$ F to $+130^{\circ}$ F                               |
| Power Requirements:    | 25m/a from 11-18 volts DC Supply.                                 |
| TE Compensation:       | Internal, electronic, pilot trimmable.                            |
| Response-Speed:        | 1.5 and 3 seconds, selectable.                                    |
| Dimensions:            | 80mm (3.125") standard diameter, 15 cm (6") long.                 |
| Pressure Connections:  | Pitot and Static, via 5mm (3/16") bore tubing.                    |



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## CONTROLS

### Scale Switch

- Switch up — x2 — Reading x2
- Switch center — x1 — Reading as seen
- Switch down — x0.5 — Reading x half

### Power/Speed Switch is as follows:

- Switch up — instrument on, 3 seconds response
- Switch center — instrument on, 1.5 seconds response
- Switch down — instrument off

### TE Compensation Adjustment:

- Set at factory to 100% compensation
- Screwdriver adjust clockwise to increase toward 110%
- Screwdriver adjust counter-clockwise to decrease toward 80%

## MOUNTING

The variometer mounts into a 3-1/8" (80mm) standard panel opening. Space behind panel required is 7" (18cm), including outlets.

## POWER

The cable provided *MUST* be used to power the instrument, or serious radio interference problems could be encountered.

Pick up the battery connections wherever convenient, preferably at the panel.

To make connections, remove excess shielding material, strip outside jacket back 3 or 4 inches, and connect per following

- Black Wire \_\_\_\_\_ to Battery — (negative)
- Clear Wire (red on some cables) \_\_\_\_\_ to Battery + (positive)
- Bare Wire (shield) \_\_\_\_\_ Per Chart Below.

|                                                                                 | Vario only                         | Vario with panel mounted auxiliary equip. (Nav. Audio, etc.) |
|---------------------------------------------------------------------------------|------------------------------------|--------------------------------------------------------------|
| non-conductive instrument panel or metal panel not grounded to battery negative | connect shield to battery negative |                                                              |
| metal panel which is grounded to battery negative (for example, via radio case) | connect shield to battery negative | no                                                           |

Note: Due to the uniqueness of each installation it is permissible to connect the shield, or not, to battery negative for best radio interference rejection.



## TUBING CONNECTIONS

Use 3/16" (5mm) bore tubing as follows:  
PITOT outlet to ship's Pitot.

Stat. A & Stat. D outlets are connected together AT THE INSTRUMENT with the "Tee" junction provided, and hooked to the ship's Static.

## CHOICE OF STATICS ON SHIP

Statics may be located in the nose, in the fuselage under the wing, and in the rear of the fuselage.

*NEVER* use the statics under the wing.

Rear-fuselage statics perform best in most ships, but nose statics are better in some.

## INITIAL POWER UP WARNING

After *initial* installation in your ship, DO NOT PLUG IN ANY ACCESSORIES (such as a MKIV Director) until a power-up sequence (next section) has been completed successfully.

THEN, switch off, and plug in the Accessories, and switch on again. Repeat this *only* if a wiring change has been made.

## POWER-UP SEQUENCE

Switch instrument on. During first minute or so, instrument may go Full + or Full -, or one followed by the other. Allow instrument about 3 to 5 minutes to settle down around zero. Then with a screwdriver, adjust the zero (on the rear of instrument) to bring needle to zero. This should require attention only rarely.

## TE COMPENSATION

The compensation is about 3% per complete turn of the adjustment.

The instruments are factory adjusted to 100% compensation. If a different degree of compensation is required, make a first approximate adjustment on the ground, based on 3%/turn. Then, make a fine adjustment in the air.

As a guideline, if rear fuselage, tail statics, or PRANDTL tube is used, 100%, as set at factory, is approximately right.

If nose-statics are used, 85% is a good starting point for the adjustment. To do this, turn five (5) turns CCW from the initial setting, and make fine adjustments in the air.

## TE COMPENSATION ADJUSTMENT IN THE AIR

To check adjustment, proceed as follows (try and find reasonably smooth air for this). Set scale to x1.

Gently and steadily increase speed in a dive. Avoid a rapid pitch attitude change which would create unusual 'G' Forces. Settle down at a new steady speed (say 30 or 40 knots increase). Observe behavior of variometer during this maneuver.

The variometer, if correctly compensated, will steadily increase in sink during the speed increase, to settle at a sink reading corresponding to the new steady speed.

If during the period of *INCREASING* speed, the variometer does not increase in sink, or only slightly, or perhaps even goes in the opposite (+) direction, and then quickly goes to the correct sink reading when the new speed is steady, the variometer is *OVER*-compensated.

Turn the TE adjustment counter-clockwise a little and try again.

If during the period of *INCREASING* speed, the variometer increases in sink to more than the correct sink reading, and then comes *BACK* up to the correct sink reading once the speed settles down again, the variometer is *UNDER*-compensated.

Turn the TE adjustment clockwise a little and try again.

Eventually, you should be able to carry out a series of zooms and dives with the variometer gently following the airspeed indicator, according to the ship's polar.

Make the adjustments only a little at a time. Trying to do these tests in sinking, rising or turbulent air is confusing, so try and find smooth, neutral air. Quick push-overs or pull-ups affect 'G' forces significantly, and erroneous compensation can result momentarily in TE Compensation systems of any kind.

Once the TE compensation is satisfactorily set, leave it alone!