Leaflet 91

ADVANCE INFORMATION ON THE TEMPERATURE AND GRAVITY COMPENSATED BAROMETER

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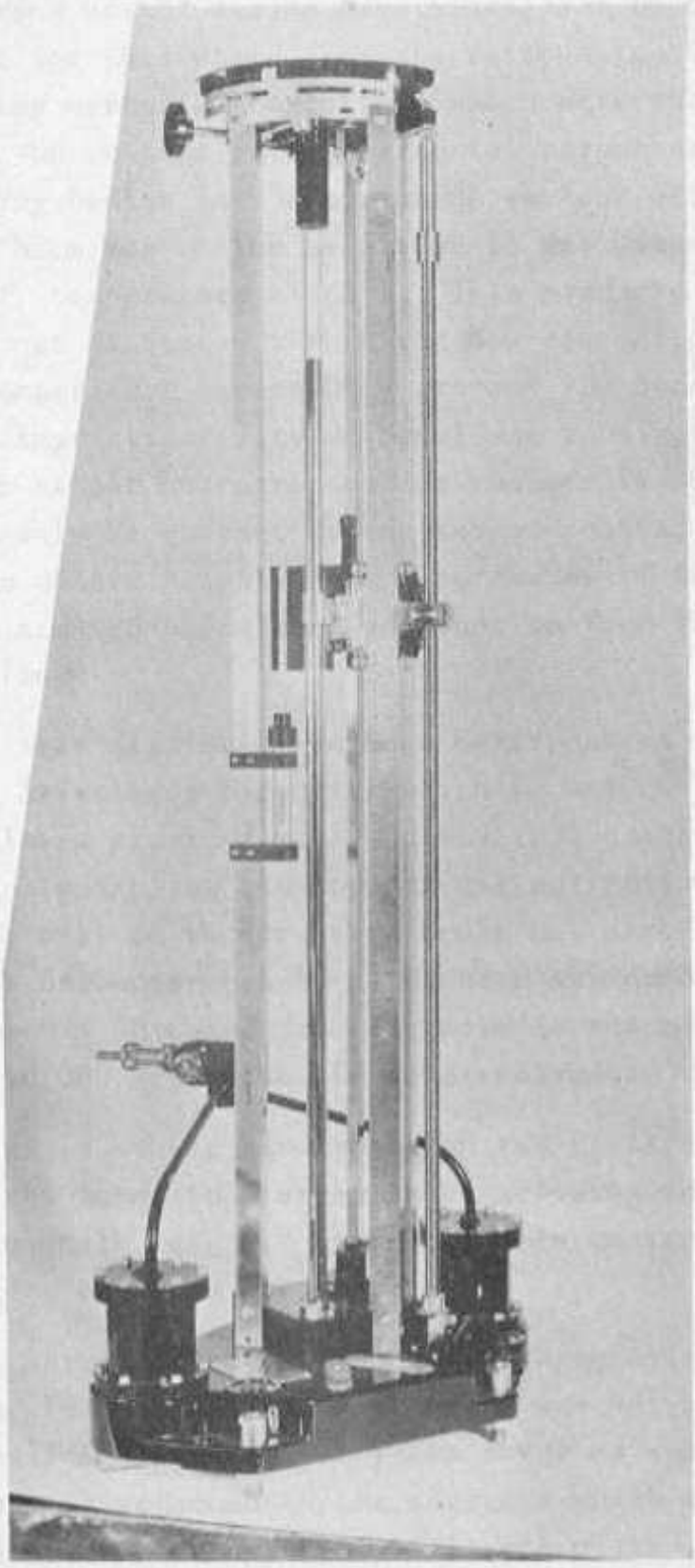

TEMPERATURE & GRAVITY COMPENSATED BAROMETER

Barometers which are used for the checking of altimeters and other instruments bearing height scales have since 1955 become very slow in use. The reason for this stems from the rationalisation of the conventions governing mercurial barometers which were internationally agreed in 1954. Up to that date a mercurial barometer used for altimeter checking had an inch scale which was correct at 62°F when gravity was 980·62cm/sec^2. The height scale was however correct at a latitude of 51½°, temperature of 62°F. This produced errors when the conditions were not as stated. When the new conventions were adopted the reference temperature became 0°C, gravity 980·665cm/sec^2. This resulted in the impracticability of providing a height scale, which being non linear cannot be corrected for changes in temperature and gravity and can only be correct at one set of conditions. The only way therefore to obtain heights from a barometer is to correct the pressure to 0°C and 980·665cm/sec^2 and then to find the appropriate height from tables.

To overcome this difficulty we have developed at the request of the Ministry of Aviation a barometer which is not only accurate but quick to use. It is provided with a mechanical compensating system which automatically applies the appropriate correction for temperature and gravity, not only to the pressure scale but also to the height scale. Thus the barometer can be used under any conditions of temperature from 0 - 50°C and from the pole to the equator and at any altitude up to 10,000 feet with the same accuracy.

The barometer is of the Kew type with two cisterns symetrically disposed about the tube, this arrangement allowing the tube to be exposed over its whole length. Pressures down to zero and heights up to 140,000 feet may thus be read.

The tube is surrounded by a "cage" of three square brass bars one of which carries the scales of pressure and height. A carriage provided with ball bearing contact faces moves up and down the scale bar. A split nut is attached to the carriage which engages with a stainless steel screw running the full length of the scale bar. The screw is rotated by a conveniently placed hand wheel on the base.

Thus the carriage can be moved up and down the whole length of the scale under slow motion control, but quick movement may be made by opening the split nut and moving the carriage by hand to a new position. Releasing the nut re-engages it on the screw.

The mercury meniscus sighting ring is attached to one side of the carriage on a small slide so that the lower edge of the ring may be raised or lowered relative to the zero of the vernier on the carriage. This relative movement of the ring to vernier zero froms the basis of the compensation. A cranked lever is pivoted on the carriage, one end of which lies underneath the sighting ring slide, the other end touches a flat bar to the rear of the scale bar. When this bar is vertical movement takes place between the sighting ring and the vernier zero. Thus if the barometer were in fact at 0°C and 980·665cm/sec^2 it would be reading correctly at any point on the scale. If the bar is now inclined from the vertical then relative movement between sighting ring and vernier zero does take place, its magnitude depending on the angle of tilt of the flat bar. By controlling the angle of tilt, therefore, the exact correction may be applied. A subsidiary scale and vernier enables the exact amount of correction applied to be read off in pressure units.

To set the inclination of the corrector bar, the correction is split into three components, temperature, latitude and height above sea level, with three scales engraved with the appropriate ranges of 0-50°C, 0-90° latitude and 0-10,000 feet above sea-level. The correction for temperature which has to be applied to a Kew barometer includes a factor, the Kew error, depending on the construction of the barometer which does not have to be applied to the gravity correction. This correction is applied by, in effect, pivoting the corrector bar from two different centres, one to make compensation for the Kew error and the other where this does not apply.

The corrector bar is moved by a rack and pinion actuated by a hand wheel at the top of the instrument. An index pointer moves over the temperature scale when this wheel is turned. To set the gravity correction, which is a constant at the barometer station and does not have to be altered once set, the following is carried out. A metal arc bearing the altitude scale is moved to read the correct height against

a fixed index. This scale carries an index against which is set the latitude on a similar arc immediately above the first. The top edge of the latitude scale carries the temperature scale. When these two settings have been made the temperature index is moved to read 0°C. The carriage is moved to indicate zero pressure and the corrector bar pivot moved until the Applied Correction vernier reads zero.

To use the barometer the thermometer on the instrument is read and the appropriate reading set on the temperature scale, then any reading on the pressure and height scales will have the appropriate correction applied to it.

The base of the instrument is a rigid close grained iron casting with levelling screws and bubbles. Stainless steel pipes connect the cistern tops to a shut off valve ready for connection to a pump and vacuum chamber. The instrument is packed in a strong pyramid wooden case with carrying handles.

T 10480 TEMPERATURE AND GRAVITY COMPENSATED BAROMETER
Range 1100 to 0mb and -1000 to +140,000ft
ICAO and WADC 1952

T 10482 NPL Certificate

T 10484 Special transport case, pyramid shape

HEIGHT	49in	122·5cm
NETT WEIGHT	96lbs	43·5kg
GROSS WEIGHT	153lbs	69·4kg
PACKED	49 x 23 x 18in	122·5 x 57 x 45cm

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