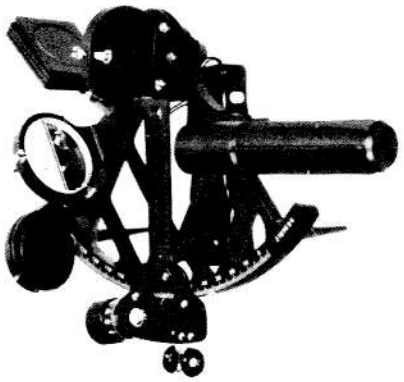
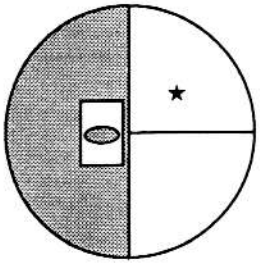
Instructions for Practice Bubble Horizon





VIEW THROUGH THE SCOPE

The Practice Bubble Horizon (PBH)

At long last, here is a way to effectively practice taking sights without having a natural (sea) horizon, and without spending hundreds of dollars for a Professional Bubble Horizon. With this, you can use the same sextant you will take to sea, and use it in a normal manner to take sights from your backyard. It differs from the more expensive professional bubble horizon in that it is not as accurate, is unlighted, and has less light gathering.The Practice Bubble Horizon fits the following modern metal sextants: Astra IIIB, C. Plath, Cassens & Plath, and Tamaya (full sized).

How it works

The scope is of zero-magnification, and is mounted on the sextant in place of the regular telescope as shown above. An ordinary spirit level is reflected by a mirror to appear upright in the left side of the scope. The remainder of the left side is opaque. The right side admits a view of the outside world as reflected by the sextant's index mirror (when using a whole horizon mirror, a horizontal view is also seen superimposed). The right side is divided by a horizontal hairline. The sextant is held such that the bubble appears alongside the hairline (as shown), and the celestial body is brought down to the hairline by movement of the micrometer drum. A reading is then taken and the time noted in the normal manner. The problem of focusing simultaneously on both the celestial body and the much nearer bubble is solved by using a slit aperture in the eyepiece. This acts like a lens to keep the bubble in focus without altering the image of the celestial body.

Installation

The PBH is installed in place of the regular telescope, and in the same manner.

What You Should See

Set the sextant arm at zero degrees. Looking through the scope, you should see the following:

A. The scope should be sighting generally through the center of both the horizon mirror, and the reflected image of the index mirror. If the scope seems too close to the body of the sextant, loosen the knob, and move it outboard as necessary. If the scope seems to be aiming too high or low (ie. the upper or lower portion of the mirror frames are obstructing the view), the problem may be with the scope mount on the sextant. Put the regular scope back on the sextant, and see if the problem exists with it too. If so, you may need to readjust the angle of the scope mount on the sextant.

B. The horizontal hairline should appear horizontal (not tilted to one side).

If a problem persists with A or B above, please return the PBH to Celestaire, with a description of the problem (a drawing will help).

Normal Operation

NOTE - USING A BUBBLE HORIZON DOES NOT REQUIRE A HEIGHT OF EYE CORRECTION.

Using the PBH is a two step process. First, bring the bubble to the hairline. This brings the sextant to a nearly level position. A correction called Sextant Installation Correction (SIC) must be determined to account for variation in different sextant designs and tolerances. This correction is discussed below, and may vary from a few minutes of arc to a degree or two. Second, bring the celestial body to the hairline by moving the sextant micrometer drum. Apply the SIC, IC, and refraction correction to the sextant reading (Hs) to obtain observed height (Ho).

The bubble is illuminated by ambient light, and should be sufficient for all normal observations. Occasionally, when bright sunlight falls directly on the bubble, the light may seem too bright. In this case, a small piece of masking tape placed over the outside portion of the bubble glass may help.

Determining the SIC

The SIC may be determined by either the Known Position method, or the Natural Horizon method. Once determined, the SIC should remain constant providing the scope fits snuggly and positively on the sextant (ie. the fit is not sloppy). Before determining the SIC, ensure that the regular sextant IC is adjusted to zero.

Known Position Method

Simply take several observations from a known geographical position, and compute a line of position or fix normally. You may attribute the average error to the scope installation, and subtract this as a correction to future observations.

Natural Horizon Method

Place all of the horizon sunshades so as to block the view of the natural horizon through the horizon mirror. Put the bubble on the hairline in the normal manner. Bring the natural horizon level to the hairline by movement of the micrometer drum. Next, find the Dip correction from Table A2 of the Nautical Almanac, for your height of eye above the horizon you are using. Now carefully turn the drum to increase the sextant reading by this amount. The resulting reading is the error which you may subtract as a correction to future observations.

Capabilities

The scope is unlighted which prevents its use after dark. The bubble is exposed to ambient light, which is adequate for use during daytime, and the normal star observing period (twilight) when both stars and outside features are discernable. The slit aperature slightly reduces the eye's natural light gathering to the extent that faint stars may be more difficult to ascertain. Test results with the Practice Bubble Horizon show repeatable observations to an accuracy of 2 minutes of arc under ideal conditions. Under normal conditions, and until practice is obtained, errors of up to seven minutes may not be uncommon. Although this is quite good, and rivals that of many more expensive bubble horizons; its accuracy cannot be relied upon for all lighting conditions. Accordingly, we recommend this product for practice purposes only, and not for serious navigation.