

Forum

'Vertical Sextants give Good Sights'

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Mark Dixon suggests (Forum, Vol. 50, 137) that nobody thus far has attempted to quantify the errors from tilt that arise while observing with the marine sextant. The issue in fact, with the related problem of what exactly is the axis about which the sextant is rotated whilst being 'rocked' (to define the vertical), was the subject of a lively controversy in the first two volumes of this *Journal* some fifty years ago. Since the consensus of opinion seems to have been that the maximum error does not necessarily occur at 45 degrees, whereas Dixon's table suggests that it does, some reiteration of the arguments may be in order.

In Vol. 1 (p. 179), Commander Middendorp of the Royal Netherlands Navy, describing an exercise involving some 190 midshipmen, discusses the problem of defining the vertical by rocking the sextant in different sea states. He proposes a table very similar to Dixon's which suggests the maximum errors will occur at 45 degrees.

G. M. Clemence, Director of the US Nautical Almanac Office (1, 366) disputes Middendorp's findings and in particular questions the axis around which the observer is supposed to rotate the sextant to find the vertical. On the basis of a new table he concludes that altitudes near 45 degrees are not especially to be avoided. Worlledge (2, 82) agrees with Clemence's strictures on Middendorp but believes Clemence to have misjudged what the observer does in practice, which is to face the object squarely which has the effect of making the angle at the pole of the tilted sextant a right angle instead of that at the zenith. He suggests corrections on this score to Clemence's table, but believes that the navigator in practice will never have an accurate measurement of tilt so that it becomes academic to lay down figures. Nevertheless, he concludes, for any given angle of tilt, the greater the altitude the greater the error and high altitudes should be regarded with suspicion.

Middendorp (2, 338) then concedes that he had been mistaken in thinking the tilt error was necessarily greater at 45 degrees and accepts that the axis of rotation is horizontal, not from the eye to the body observed; but he still prefers small altitudes. Clemence (2, 339) responds gracefully to Worlledge whose view he accepts 'as nearly correct as practicable to formulate at present'. On the axis of rotation, he believes that individuals almost certainly follow different practices so that no mathematical treatment will be entirely adequate.

Brett Hilder (2, 339) of the Burn Phelps Line in Australia, in a robust final contribution, finds the idea of a horizontal axis ridiculous. Keeping the Sun (for instance) in view while rocking the sextant shows, he believes, that the axis can only be from the eye to the body observed. He illustrates the point tellingly with an illustration of the fore-staff. He confesses himself 'blinded by science and confounded by mathematics' so far as the previous correspondence is concerned but on the whole supports Middendorp.

A discreet editorial note drawing the correspondence to a close (penned I think by D. H. Sadler, Superintendent of H.M. Nautical Almanac) suggests that the divergence of view about the axis of rotation might be reconciled by the fact that a tilt about a horizontal axis and a shift in azimuth about a vertical axis are equivalent to a rotation round the direction to the body observed.

As most practising sextant navigators will be aware, there is now a useful optical device on the market which eliminates the need to rock the sextant about its (or any other) axis.