

for 15 years: but it would be much better if a wider sample were used, for example by including other fleets besides that of the UK – provided that comparable statistical bases could be established. A first step in this might be to identify, possibly through IMO, the number of countries whose statistics could be used for such purposes.

It should, therefore, be stressed that the methods suggested in this paper are intended for discussion and improvement. They are not intended as criticisms of any statistical authority and it is hoped that constructive criticism will lead to their improvement.

REFERENCES

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KEY WORDS

1. Statistics.
2. Safety.

‘Position Fixing in a Fast Moving Ship by Culmination of a Celestial Body’

from James N. Wilson

A recent paper on this subject by Ranta¹, in common with many others, ignores a fundamental method by which the time of meridian transit can be exactly calculated relative to the time of maximum altitude. The author has used a complicated approach to arrive at an answer which can be very simply computed. He joins countless others in recognizing via computer a phenomenon not widely understood, despite the fact that it is axiomatic. Alas, he also succumbs, albeit with awesome mathematics, to the brute force approach for obtaining a solution.

A paper of my own in 1985² describes this exact method. I have since been reminded that a similar derivation was in the Admiralty Manual of Navigation, Volume III, out of print for several decades. The phenomenon referred to above, and described in my paper, is succinctly described in Bowditch's American Practical Navigator, and undoubtedly other publications. Unfortunately, as noted above, the phenomenon is still not widely understood. More articles by author Ranta *et al.* must help in alerting navigators that vessel motion, even at sailboat speeds and moderate latitudes, affects calculation of the time of meridian passage relative to the time of maximum altitude. Author Ranta's reference to the 'Classical Method' could have mentioned Bowditch's note to the effect that it is for a stationary observer with no change in declination. As noted in my paper, with observations of the Moon, being stationary is insignificant, due to the often large hourly changes in declination.

Author Ranta's curve fitting of a very sparse set of observations is crucial. Alas, he bases some extremely precise calculations on an insignificant amount of data, considering

the usual errors in celestial observations. Like many others, he seems more concerned with the mathematics than with the process of determining an accurate position. Any navigator determining his position by so few observations would be deemed irresponsible. As I note in my paper, at least five observations before and after meridian transit are required to achieve any reasonable accuracy in determining longitude.

The geometric approach described in my paper achieves results similar to those presented, with a bit more manual work, but without reliance on batteries. I did a freehand fairing of author Ranta's data and found a maximum altitude of $18^{\circ} 08' 6''$ – essentially identical to his published results. Author Ranta made my calculation of longitude simple by having equal altitudes before and after meridian passage – something I've never been able to achieve at sea. With these data, I calculated the time of meridian transit as 10-53-26. Author Ranta's results are scattered around this exact value, testifying to the relative accuracy of his statistical approach. Author Ranta may like to use the real data in my paper to further his study of this topic.

In summary, I think computers are wonderful, but I abhor their application to brute force solutions where fundamental methods apply. Author Ranta's is the fifth violation I have noted concerning this phenomenon since the publication of my paper. Further, I believe that authors should use real data to support their approach, since the use of hypothetical data to support a hypothesis results in another hypothesis, which makes the data irrelevant. I delayed publication of my paper until I had successfully used the method in both the northern and the southern hemispheres. That summarizes my faith in theory, especially my own.

REFERENCES

- ¹ Ranta, M. (1990). Position fixing in a fast moving ship by culmination of a celestial body. *This Journal*, 43, 276.
- ² Wilson, J. N. (1985). Position from observation of a single body. *Navigation*, 32, 85.

KEY WORDS

- ¹ Astro.
2. Marine navigation.

from Dr Helmut Knopp

I would like to make the following comments on Professor Ranta's article which appeared in the May 1990 issue of the *Journal*.

1. There are basically three methods to determine longitude at LAN:
 - (a) the equivalent altitude method;
 - (b) to adjust each observation according to the movement of the ship and to determine the maximum of the resulting curve;
 - (c) to determine the maximum of the curve of the unadjusted observations and to calculate from this apparent culmination the time of the true culmination and hence the longitude.