

7th CSPCWG Meeting
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Paper for Consideration by CSPCWG
GPS vulnerability – consequences for charting

Submitted by:	UK (Chairman)
Executive Summary:	If GPS is vulnerable in its operation or reception, can the design of a chart's content act to mitigate the risk for the navigator?
Related Documents:	S-4 Part B Section 300: Topography
Related Projects:	CSPCWG Work Plan item A5

Introduction / Background

Noting the increasing reliance on satellite navigation systems such as GPS, its potential absence, interruption, jamming or 'spoofing' could create a significant risk to navigators. How should this risk affect our perception of the value of topographic detail contained in nautical charts?

A discussion is timely noting the next significant S-4 review is that of Part B Section 300: Topography.

Analysis / Discussion

The vulnerability of satellite navigation systems such as GPS, GLONASS, Galileo, and Compass has been given intermittent visibility but perhaps is not widely recognized. Two particular recent journal articles have brought the matter back into focus and these are shared with CSPCWG:

- *GPS Jamming: A Clear and Present Danger*, Navigation News (The magazine of the [UK] Royal Institute of Navigation), issue March/April 2010, pp12-14 [© RIN 2010]
- *GPS Jamming and the Impact on Maritime Navigation*, Grant et al, The Journal of Navigation', Vol.62, No.2, pp 173-187, April 2009 [© RIN 2010].

The second article reports a trial conducted by the General Lighthouse Authorities of the UK and Ireland relating to practical experiences encountered when GPS signals to a vessel were disturbed.

In reviewing the content of charts, some question the value and relevance to the primary user of the depiction of land and topography. This questioning may be increasing as traditional position-fixing methods are superseded by GPS. The compilation of topographic detail in a new chart can take significant time and the maintenance of such detail is, thereafter, an ongoing commitment to keep the chart up to date and credible in the users' eyes. But acknowledging the referenced vulnerabilities, what if any are the consequences and lessons for the compilation of charts (paper and ENC)?

It is also noted that chart-producing HO's adopt different approaches to the amount of topographic detail included in charts. For example, some use near facsimile copies of land maps, some make particular selections, some make extensive generalizations (eg use of coloured tints to portray large urban areas). These differing practices may be influenced by the HO's historic practice, by the available source data (eg land maps, hydrographic surveys, imagery), the navigational purpose of the particular

chart or series of charts (ie the portrayal of topography is scale dependent) and other factors.

In some geographic areas and navigation environments, the value of land detail may be judged more significant than in other areas.

Landmarks, whether natural or man-made, formally or informally, have probably always been used as aids to navigation by mariners when in sight of the coast.

Conclusions

In developing further the specification for nautical charts, it is useful to discuss the scope for enhancing the guidance given to chart compilers on the appropriate level of topographic detail to be included. And how might the usage, reliance and vulnerability of GPS influence this guidance?

There is an opportunity within the review of S-4 Part B Section 300 to incorporate any such guidance and principles within a new draft.

Recommendations

None

Justification and Impacts

To provide guidance to CSPCWG officers and the WG as it prepares to review and redraft S-4 Part B Section 300.

Action required of CSPCWG

The CSPCWG is invited to discuss this matter and provide guidance.