



Marine Notice 06 of 2013

## Reporting of interference-related problems observed with Global Navigation Satellite System receivers

### Purpose

The purpose of this marine notice is to inform ships operating in Australian waters on the reporting of real or perceived interference-related problems with Global Navigation Satellite System (GNSS) receivers on board ships.

### Background

GNSS signals are vulnerable to interference due to their relatively low received signal strength.

Unintentional interference can be caused by phenomena including solar flares, ionospheric effects and radio frequency emissions from radio transmitters. Such interference can cause partial or total loss of the received signal, slower signal acquisition or other adverse effects.

Known methods of intentional interference of GNSS signals include 'jamming' and 'spoofing'.

Results from some jamming trials have demonstrated that GNSS receivers can produce erroneous positions over a wide area resulting in compromises to other systems fed by the GNSS receivers such as Automatic Identification System (AIS). GNSS-connected equipment such as Global Maritime Distress and Safety Signals (GMDSS), Electronic Chart Display and Information Systems (ECDIS), track control systems and Integrated Navigation Systems (INS) may enter an 'alarm state'. Differential Global Positioning System (DGPS) corrections may be incorrect or unavailable in a particular area. Dynamic Positioning (DP) systems and

synchronized/sequential lights on aids to navigation are other systems that may be adversely affected.

Although reports of interference with GNSS signals are relatively rare, ships in Australian waters, in ports and harbours in particular, should monitor the functioning of their GNSS receivers and report any perceived degradation of performance to AMSA.

### Guidance

GNSS uses a ranging process to determine ship's position and any errors in the measured ranges will result in a "weakened" position fix. Dilution of Precision (DOP) is a measure that equates to the quality of the determined position. Position Dilution of Precision (PDOP) and Horizontal Dilution of Precision (HDOP) are two useful indicators that refer to the quality of the three-dimensional and two-dimensional positions respectively.

A general guide to positional accuracy for various DOP values is given below:

PDOP/HDOP < 3 = Good positioning accuracy

PDOP/HDOP 3-6 = Fair positioning accuracy

PDOP/HDOP > 6 = Poor positioning accuracy

Officers in-charge of a navigational watch should be familiar with checking the PDOP and/or HDOP value to ascertain the positioning accuracy being achieved and to ensure it is appropriate for the type of navigation being conducted. Moreover, they should be acquainted with the associated alarms and indications that indicate failure of GNSS receivers on board.

Degradation or loss of GNSS signals in restricted waterways can lead to severe consequences. Mariners are advised not to rely on a single source of positioning information. The importance of using other independent means of position fixing during coastal navigation (e.g. parallel indexing in conjunction with visual bearings and radar ranges) cannot be overstressed.

## Reporting

Ships encountering any suspected interference-related problems with GNSS receivers in Australian waters should report to AMSA (via e-mail to [NauticalAdvice@amsa.gov.au](mailto:NauticalAdvice@amsa.gov.au)) including the following information:

- Ship's identification (i.e. name, call sign and IMO number)
- Name of port, harbour or location
- Position (latitude and longitude) and source of positional information
- Date and time of occurrence (specify UTC or local time)
- Brief description of the problem
- Make and model of GNSS receiver
- Elevation of GNSS antenna above sea level
- Name and position of the person reporting.

Such reports will enable AMSA to gather information and monitor any emerging trends on GNSS interference in Australian waters and to notify the appropriate authorities.

Further enquiries regarding this marine notice can be addressed to:

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