INTERNATIONAL MARITIME ORGANIZATION

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# COMPREHENSIVE REVIEW OF THE 1978 STCW CONVENTION AND CODE

## Proposed addition of navigational competence to navigate safely in a Global Navigation Satellite System (GNSS) compromised environment

**Submitted by INTERTANKO**

**SUMMARY**

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| *Executive summary:* | The feed from a Global Navigation Satellite System (GNSS) into various bridge equipment, particularly the Electronic Chart Display and Information System (ECDIS), has become a critical component and the navigators have often relied upon to a too great an extent. In many areas around the world GNSS signals are unreliable due to external interference. This document proposes a new competence to place navigation in a GNSS impacted environment firmly within the competences of all those undertaking a navigational watch. |
| *Strategic direction, if applicable:* | 6 |
| *Output:* | 6.17 |
| *Action to be taken:* | Paragraph 10 |
| *Related documents:* | HTW 9/15 and HTW 10/6 |


## Introduction

1 The revision of the 1978 STCW Convention and Code provides an opportunity to bring real world situations into the updated Convention. One area that is of great concern is the over-reliance on the information displayed on bridge equipment and in particular the ECDIS which is exasperated by the increase in the jamming of GPS and other GNSS signals in various places around the world.

2 The Correspondence Group, in document HTW 10/6, identified a series of areas which should be considered under the comprehensive review of the STCW Convention. Whilst this proposed competence could be considered under a series of those areas, INTERTANKO believes that it may not easily slot in as it relates to an existing issue where a gap exists in the current Convention. Therefore, this submission is made under this agenda item as an example of one area which requires attention in the comprehensive review.

**Over-reliance leading to accidents**

3 There have been many instances where the bridge team have placed too much trust in the information displayed on the equipment without considering either the errors it may contain or the use of other equipment to cross-check against. The following are just a selection of those related to over-reliance:

.1 In a report by the UK Marine Accident Investigation Branch (MAIB) of the grounding of the 4,426GT Swedish flagged dry cargo vessel **Skagern**, the recommendation was made that:

"In this age of the GPS and push-button navigation, it is all too easy to be lulled into a false sense of security and assume the position indicated is correct. The wise navigator will invariably check it against something else, even if it is only a DR, EP or a sounding. As soon as something does not add up, a more detailed cross-check will usually reveal the reason for the discrepancy."

https://assets.publishing.service.gov.uk/media/5e7df42a86650c743d2f6d25/2000-SD1-MAIBSafetyDigest.pdf

.2 Similarly, in the MAIB's investigation of the collision between the Panamanian registered refrigerated cargo vessel **Atlantic Mermaid** which collided with the Cypriot-registered general cargo vessel **Hampoel,** it recommended to:

"Advise all its masters of the dangers of over-reliance on GPS for passage monitoring, without due reference to the working chart"

https://assets.publishing.service.gov.uk/media/547c7118ed915d4c100000db/atlantic-mermaid-and-Hampoel.pdf

.3 The joint Nautical Institute and Royal Institute for Navigation publication *Navigator*, issue 22, details many instances of over-reliance on GPS and the impact that has on groundings. In this publication it is stated that:

"GPS is an invaluable aid to navigation. However, the exclusive use of GPS in coastal or confined waters may not always be appropriate and is often a contributory factor in ship groundings. Full use of radar ranges and bearings, visual bearings and transits should also be made as a primary means of fixing the vessel's position."

https://www.nautinst.org/uploads/assets/726ff2d2-0587-4fe2-b5ea7986b8fb242b/Issue-22-Accidents.pdf

.4 In the **Sanchi** and **CF Crystal** collision on 6 January 2018, leading to the death of 35 seafarers and jointly investigated by the Maritime Safety Administration (MSA) of China, the maritime authorities of the Islamic Republic of Iran, Panama, and Hong Kong, China, both vessels relied excessively on AIS to identify, monitor and assess the risk of collision, while **CF Crystal** used AIS as the only means of information for collision avoidance. The Hong Kong, China flag concluded there were 20 to 25 degrees differences of Course Over Ground (COG) and 2 to 3 knots differences of speed over ground between the AIS information received by other vessels and the readout of the Voyage Data Recorder, leading to inaccurate closest point of approach data determining risk of collision, and

false sense of security. Since AIS position is GPS-based, this was objective evidence of GPS over-reliance, not just for position monitoring, but even collision avoidance.

https://www.mardep.gov.hk/en/msnote/pdf/msin1817anx1.pdf

**Problems with jamming and spoofing of GNSS**

4 Jamming and spoofing of GNSS has increased particularly in areas where conflict has occurred or where military vessels are operating. The unfortunate effect of that is that GNSS inputs into ECDIS may not be reliable leading to assumptions on navigational safety which may not be accurate. A particular issue is that the system may not realize that the position input is unreliable and so may not alarm. So, whilst there is an item related to alarms for ECDIS in the ECDIS training syllabus under paragraph 58.16 of section B-I/12 of the STCW Code, without an alarm being raised the navigator may be under a false assumption that it is correct.

5 The navigators, if they are navigating exclusively with the use of the ECDIS and not independently verifying position by other means, may be leading the ship into danger. Members of INTERTANKO reported that during sailing navigational audits, even well-trained and experienced officers of the watch were sometimes observed unable to recognize the failed GNSS input into the ECDIS, and act on this failure promptly and comprehensively enough to satisfy the expectation of the auditor and ensure safe navigation.

6 The competences currently within the STCW Convention and the guidance within the Code for ECDIS training do highlight the need to cross-reference and cross-check equipment and understand the problems related to poor inputs. However, due to the manner in which the system may not alarm and to address the specific concerns related to over-reliance, including lack of familiarity and skill to operate in a GNSS compromised environment, it is INTERTANKO's view that a new competence is required.

**Proposal for a new competence**

7 INTERTANKO proposes that the means to address this new phenomenon is to insert a new competence on navigating in a GNSS impacted environment into table A-II/1 so that all those trained for navigating at the operational level will need to demonstrate their knowledge, understanding and proficiency in such an environment and this is contained in the annex.

8 The competence builds upon reinforcing the idea that traditional navigational tools such as parallel indexing and comparison between radar returns and GNSS indicated position are key attributes in maintaining safe navigation and situation awareness. Further, it requires the navigator to take into account other warnings to build their knowledge of the position of the ship and the status of the equipment.

**Consequential amendments to the STCW Code**

9 Several amendments may also be required for the STCW Code and, in particular, section B-I/12, paragraph 49 of the ECDIS training related to "Risks of over-reliance on ECDIS" and within section B-II/1, paragraph 11, where a new point 11 should be added stating:

Monitor navigation in a GNSS impacted environment.

**Action requested of the Sub-Committee**

10 The Sub-Committee is requested to consider the proposal for a new competence on navigating in a GNSS impacted environment as contained in the annex.

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# ANNEX

## Function: navigation at the operational level

| Column 1<br>**Competence** | Column 2<br>**Knowledge, understanding and proficiency** | Column 3<br>**Methods for demonstrating competence** | Column 4<br>**Criteria for evaluating competence** |
|---|---|---|---|
| Navigate safely in a Global Navigation Satellite System (GNSS) compromised environment. | Ability to recognize when GNSS has become unreliable including the monitoring of navigational notices.<br><br>Knowledge of effects of unreliable GNSS input into bridge equipment such as AIS or ECDIS.<br><br>Understands the actions to take if the GNSS position input becomes unreliable.<br><br>Understanding of which navigational equipment is unaffected and use that to plot the ship's position and monitor the track of the ship.<br><br>Understanding on various error and loss of GNSS in circumstances.<br><br>Understanding on position verification in case unreliable date identified at sea and while in coastal water.<br>Understanding of the necessary setting of the GNSS equipment which affects the accuracy of the position i.e. Horizontal Dilution of Position (HDOP), Receiver Autonomous Integrity Monitoring (RAIM) and use of Satellite-based augmentation systems (SBAS) | Examination and assessment of evidence obtained from both of<br>the following methods:<br><br>.1 approved training ship experience; and<br><br>.2 approved simulator training. | A full assessment is made of the information on electronic navigational equipment observing any significant difference between, a radar overlay, DR position and GNSS fix.<br><br>Verification on indication of unreliability of GNSS data and output – Time/loss of signals/jamming is carried out.<br><br>In coastal waters, monitors differences between expected depths and those indicated by echo sounder are checked whilst monitoring track using methods such as parallel indexing, and plotting using radar ranges and bearings as well as visual cross bearings.<br><br>Ability to transfer position data from all available means, other means than position from primary means on ECDIS is demonstrated.<br><br>Navigational notices warning of a GNSS compromised environments are taken into account.<br><br>Decisions to maintain safe navigation are made.<br><br>Understanding checking and inputting the correct setting of the GNSS receiver is shared. |