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RECOGNITION OF THE JAPANESE REGIONAL NAVIGATION SATELLITE SYSTEM QUASI-ZENITH SATELLITE SYSTEM (QZSS) AND DEVELOPMENT OF PERFORMANCE STANDARDS FOR SHIPBORNE SATELLITE NAVIGATION SYSTEM RECEIVER EQUIPMENT

Comments on document NCSR 8/4/1 – Satellite-Based Augmentation Systems

Submitted by Australia and New Zealand

SUMMARY

Executive summary:	This document comments on document NCSR 8/4/1 on draft Performance standards for shipborne satellite navigation system receiver providing position, navigation and time data and associated information (China et al.). It also provides information on Satellite-Based Augmentation Systems (SBAS).
Strategic direction, if applicable:	2
Output:	2.12
Action to be taken:	Paragraph 22
Related documents:	Resolutions A.915(22); A.1046(27); MSC.112(73), MSC.113(73), MSC.115(73); MSC.233(82); MSC.379(93); MSC.401(95); MSC.432(98); MSC.449(99); MSC 98/20/3, MSC 98/23; MSC.1/Circ.1575, SN.1/Circ.274, SN.1/Circ.329, SN.1/Circ.334; NCSR 5/23; NCSR 7/23 and NCSR 8/4/1

Introduction

1 This document is submitted in accordance with the provisions of paragraph 6.12.5 of the *Organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies* (MSC-MEPC.1/Circ.5/Rev.2) and provides comments on document NCSR 8/4/1 on draft performance standards for shipborne satellite navigation system receivers providing position, navigation and time data and associated information (China et al.).

Comment

2 The co-sponsors support the work submitted by China, Germany, India and Poland (NCSR 8/4/1). The draft performance standards' functional approach and modular structure is sound. Document NCSR 8/4/1 makes numerous references to augmentation. For example:

- Paragraph 5: "The presented approach supports seamless integration and harmonization of receivers for other and future radio satellite navigation systems and technologies, into one common performance standard."

- Module B – Functional requirements, section B.2.5: "the automated selection and application of augmentation and correction data fed into data processing in order to improve the performance of output data provision."

- Module D – Interface requirements, section D.1.2: "be capable of receiving augmentation data in accordance with international standards;"

3 However, there is no explicit mention or inclusion of Satellite-Based Augmentation Systems (SBAS) in document NCSR 8/4/1. The decision of MSC 98 (paragraph 21 hereunder refers), and the narrow scope of the task to develop these guidelines, meant document NCSR 8/4/1 could not include SBAS.

Global Navigation Satellite Systems and SBAS

4 Over the years, the Organization has recognized compliant Global Navigation Satellite Systems (GNSS) as components of the World-Wide Radionavigation System (WWRNS). It has also developed performance standards for shipborne receiver equipment – for individual GNSS and, more recently, multi-system receivers.

5 SBAS use geostationary satellites and can augment GNSS signals over wide, continent-sized areas. GNSS users can take advantage of SBAS, where signal reception permits. SBAS provides enhanced performance over stand-alone GNSS. It improves the accuracy and reliability of GNSS by correcting signal errors and providing information on the accuracy, integrity and availability of GNSS signals.

6 Radio beacon Differential GPS (DGPS) meets IMO requirements for accuracy and integrity for marine navigation in harbours areas and coastal waters. However, its coverage is limited to Medium Frequency (MF) radio ranges and is a 1990s technology. Australia, the United States and Japan have recently discontinued their radio beacon DGPS service. The United Kingdom and Ireland have stated that their DGPS service will cease in early 2022.

7 With some decline in the provision of terrestrial radio beacon DGPS, and the availability of SBAS (including SBAS-enabled GNSS receivers), the co-sponsors believe there are sound reasons for considering the development of an IMO performance standard for SBAS reception in marine GNSS receiver equipment. IMO imprimatur will recognize the growing use of SBAS and the decline in the availability of DGPS.

8 The co-sponsors suggest interested Member States may want to collaborate and develop an appropriate new work proposal for MSC to consider.

IMO recognition and inclusion in the Organization's work

9 SBAS can make many new and emerging maritime-based activities safer. However, the co-sponsors are of the view that the lack of IMO recognition of SBAS is a major impediment to its uptake in the maritime sector.

10 There is increasing use of electronic navigation on board ships. SBAS can support the growing needs for accuracy in some maritime operations and in the uptake of automation. For example, large cruise ships need high accuracy positioning to manoeuvre in anchorages and harbours. We envisage a future maritime world where a number of navigation and operational tasks involving automation will need high levels of position accuracy, integrity and continuity.

11 IMO is progressing a Regulatory Scoping Exercise (RSE) for Marine Autonomous Surface Ships (MASS). The RSE aims to determine how the safe, secure and environmentally sound operation of MASS may be introduced in IMO instruments. The RSE is expected to touch on a range of issues, including the human element, safety, security and interactions with ports. It is vital the RSE considers positioning accuracy and integrity requirements as well.

12 Historically, SBAS has been established primarily to support the aviation industry. SBAS providers publicly declare its aviation performance parameters. Maritime stakeholders and equipment manufacturers will benefit from a similar formal declaration for use of SBAS in the maritime sector. Without this, SBAS will continue to be developed to serve aviation requirements and terrestrial applications, with little or no recognition of the needs of the maritime sector.

13 The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Guideline G1152 (SBAS Maritime Service) describes all elements of an SBAS relevant to maritime administrations. It notes standards for (type approval) tests do not exist yet, but are expected to be available in the future (section 5.1). It also states "IALA is developing an approach that will allow augmentation service providers to recognize a maritime user" (section 2, page 6).

14 Without recognition for maritime use, SBAS providers will design and enhance their systems to meet aviation needs, without consideration of the needs of the maritime sector. Additionally, with limited use of SBAS in the maritime sector, there is risk developments in approved receiver hardware will fall behind those in the aviation sector.

Receiver standards

15 Flag and port States require GNSS equipment to be of an approved type. This requirement is fulfilled when ships' equipment has a type approval certificate, based on an IEC (or similar) test standard. Importantly, though, as it is not currently possible to test SBAS functionality (against a standard), industry does not know whether receivers are functioning correctly and whether mariners can rely on the SBAS information.

16 The co-sponsors understand the European GNSS Agency (ESA) is currently progressing a proposal for an IEC test standard for SBAS receiver equipment.

Navigation requirements

17 Resolution A.1046(27) on *Worldwide Radionavigation System* outlines the operational requirements for a worldwide radionavigation system. The resolution is now a decade old.

18 Resolution A.915(22) on *Revised maritime policy and requirements for a future global navigation satellite system (GNSS)* of 2002 foreshadows SBAS. It adds: "without augmentation, GNSS accuracy does not meet the requirements for navigation in harbour entrances and approaches or restricted waters". Further, "GPS does not provide instantaneous warning of system malfunction" (annex, paragraph 2.1.1.4). Finally, there is mention the resolution should be reviewed periodically (which has, so far, not been conducted). Resolution A.915(22) also states: "augmentation provisions should be harmonised worldwide to avoid the necessity of carrying more than one shipborne receiver or other devices" (annex, paragraph 3.1.3).

19 Modern GNSS and their augmentation systems (e.g. Dual Frequency Multi Constellation SBAS) can easily exceed the requirements stipulated in the older resolutions. However, current and future user needs, in particular the needs of automation (e.g. MASS), will require more stringent parameters than those stipulated in resolution A.1046 (27).

MSC 98 decision

20 In 2017, Austria and several other European States submitted a proposal for a new output on the application of EGNOS in the maritime field (MSC 98/20/3). The sponsors sought recognition of EGNOS as a future component of the WWRNS.

21 However, MSC 98 (MSC 98/23, paragraph 20.26) did not agree with the proposal, stating "the provisions of resolution A.1046(27) on Worldwide Radionavigation System applied to new radionavigation systems capable of providing adequate position information, but not for augmentation systems."

Action requested of the Sub-Committee

22 The Sub-Committee is invited to note this information, in particular the comments on document NCSR 8/4/1, and take action, as appropriate.