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DEVELOPMENT OF AN E-NAVIGATION STRATEGY

Position fixing in e-navigation

Submitted by the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)

SUMMARY

Executive summary:	The document provides information on the necessary redundancy of position fixing systems
Action to be taken:	Paragraph 6
Related documents:	NAV 53/13, paragraph 11; MSC 81/23/10 and IALA Recommendation R-129, on GNSS Vulnerability and Mitigation Measures, December 2004

1 A robust electronic position-fixing system, with redundancy, has been identified as one of the fundamental element that should be in place before e-Navigation can be introduced.

2 The position-fixing system used in e-Navigation is required to provide real-time information in a format usable on board and by shore authorities. It must therefore supply an output in IEC-61162 format.

3 The primary input will undoubtedly be derived from Global Navigation Satellite Systems (GNSS), however potential service interruption due to the vulnerability of GNSS to interference is well documented. This vulnerability can be mitigated by the following means of improving the robustness of the signal:

- Improvements in GNSS, notably more satellite vehicles provided by more than one service provider, operating in several frequency bands, and incorporating interference suppression techniques.

- Differential GNSS and Receiver Autonomous Integrity Monitoring (RAIM), which provide integrity to the GNSS signal, specifically an early indication of GNSS failure situations.

4 There is currently no fully redundant source of position-fixing, however alternative position-fixing can be provided via several techniques, of which the most widespread and developed are:

- terrestrial radionavigation systems, essentially Loran. Where Loran is combined with GNSS, failure of GNSS can be detected. Loran will provide a backup position-fixing source of lesser accuracy. With enhanced or e-Loran this accuracy will be of the order of 8-20 metres. Loran/Chayka coverage is currently limited to particular areas within the northern hemisphere, and the cost of service provision is borne by shore-based authorities.

- Inertial Navigation Systems, which can also be linked with GNSS to provide early indication of GNSS failure and a predictable run-on period. The gain in performance of the integrated system depends not only on the sensor types but also on the degree of coupling. There is a high degree of correlation between the equipment performance and cost, which is entirely borne by the user.

5 The IMO Work Programme submission MSC 81/23/10 'Development of an e-Navigation strategy' (December 2005) defined one of the key structural components of a safe and comprehensive e-navigation policy as "accurate and reliable electronic positioning signals, with fail-safe performance (probably provided through multiple redundancies, eg. GPS, Galileo, differential transmitters, Loran C and defaulting receivers or onboard inertial navigation devices)". Administrations should be encouraged to work through IMO to provide such internationally agreed alternative systems and augmentation.

Action requested of the Sub-Committee

6 The Sub-Committee is invited to note this information and to consider appropriate action.