

# Resilient Positioning, Navigation and Timing

## Proposal for an IALA Forum

### 1 Background

Maritime risk is increasing globally. The trends are for larger and faster ships, fewer and less experienced crew, more crowded coastal waters and a growing reliance on satellite navigation with resulting loss of traditional sea-going skills. Today, over 80% of accidents are caused by human error. The International Maritime Organization's (IMO) response is e-Navigation: a digital environment that will improve safety and security at sea and help protect the marine environment.

e-Navigation will bring a step-change to maritime operations: as currently envisaged, the system will be based on Global Navigation Satellite Systems (GNSS) with communications and electronic charts integrated on a single screen; the backup system will be radar and physical aids to navigation – lighthouses and buoys.

GNSS will be assumed to be so reliable that mariners will not expect it to fail. They will become even less familiar with the use of backup systems and may be unable to cope safely with a sudden GNSS failure. What is needed is an independent, dissimilar and complementary backup to GNSS that keeps e-Navigation running, taking over seamlessly when GNSS fails.

IALA's input to the IMO Gap Analysis on e-Navigation showed that accurate and reliable positioning is essential to almost every activity identified. The need for resilient positioning to support e-Navigation is recognised by IMO, but views the discussion of particular systems as premature.

IALA is the only international body representing and coordinating those providing position services for maritime purposes. Given the current lack of resiliency and the lengthy processes required to coordinate provision of systems, it is proposed that IALA should lead a Forum for discussion of these matters.

Recognising that the need for Resilient PNT applies to almost every area of human activity, it is not a cause that IALA can pursue in isolation, hence this proposal for a Forum.

# 1 Introduction

## 1.1 Overall Objective

The proposed Forum would bring together organisations with an interest in positioning, navigation and timing (PNT) to prepare a strategy for achieving resilient PNT in support of activities across all sectors.

## 1.2 IALA Objective

This strategy would provide the basis for policies to assist IALA Members to achieve their shared objective of delivering a reliable, efficient and cost-effective aids to navigation (AtoN) service for the benefit and safety of all mariners.

# 2 Relevance to e-Navigation

e-Navigation is the future concept for maritime navigation aimed at improving safety and security at sea and protection of the marine environment. e-Navigation depends on robust and resilient positioning services, provided primarily by Global Navigation Satellite Systems. However, GNSS are vulnerable to disruption by natural causes, as well as accidental and deliberate interference.

A reliable, efficient and cost-effective positioning service must mitigate the vulnerability of satellite navigation systems, if it is to ensure that e-Navigation meets its objectives.

e-Navigation will bring a fundamental step-change to the concept of operations used for maritime navigation; but there is a clear single point of failure, if e-Navigation relies solely on satellite navigation systems for its positioning, navigation and timing inputs.

The IMO Maritime Safety Committee has stated that “e-navigation systems should be resilient and take into account issues of data validity, plausibility and integrity for the systems to be robust, reliable and dependable. Requirements for redundancy, particularly in relation to position fixing systems should be considered” (MSC 85/26, Annex 20).

In the e-Navigation environment the sudden reversion to traditional visual and radar navigation methods in congested and confined waters is a genuine concern as it could be beyond the experience of future watch-keepers and thus would potentially be unsafe. For these reasons an independent, dissimilar Position, Navigation & Timing backup system needs to be considered.

## 3 Proposed Forum on Resilient PNT

### 3.1 Summary

IALA should invite organisations with an interest in Positioning, Navigation and Timing to discuss a strategy for achieving resilient PNT. The Forum would consider the options and aim to build a consensus on a preferred solution, which would likely be a mix of systems, allowing the appropriate services to be provided in all parts of the World.

### 3.2 Strategic Objectives

- **Institutional:** Establish an international consensus on the PNT services that need to be provided and facilitate regional coordination for provision of these services, where required
- **Regulatory:** Assist with the introduction of international and regional regulatory frameworks for provision of resilient positioning services
- **Financial:** Advise on the funding mechanisms and best practice for the most cost effective development and provision of positioning services.
- **Technical:** Encourage development of technology for provision of operational positioning services
- **User:** Work with industry to encourage the availability and take-up (including training) of integrated user receiving equipment

### 3.3 Organisation of Forum

The need for resilient PNT spans all sectors of human activity, therefore the Forum should embrace all interested organisations. The most practical way to achieve this may be to organise it in association with an international, cross-sector conference, such as the European Navigation Conference (ENC) or the (US) Institute of Navigation (ION) GNSS.

It would be important for IALA to join up with other like-minded organisations, in order to involve a wide range of interest groups. An obvious candidate would be the International Association of Institutes of Navigation (IAIN) which is known to recognise the need for resilient PNT.

The European Group of Institutes of Navigation (EUGIN) also shares this concern and as it organises ENC, that would seem to be a good option for the venue. It is noted that ION GNSS is a very large and busy conference, at which arrangements could be more difficult.

It is planned to approach IAIN and EUGIN to confirm their interest and if this proposal receives support from IALA an initial meeting will be held to discuss arrangements.

### 3.4 Planned outcome of Forum

#### **An agreed strategy reflecting:**

1. Consensus on the need for resilient PNT;
2. Consolidated cross-sector support for alternative mixes of systems
3. Commitment to trials, if necessary, to demonstrate performance of alternatives;
4. Support and facilitation for regional and international recognition, cooperation and coordination frameworks.