

# e-Navigation

## Frequently Asked Questions

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**Note:** These FAQ's are maintained up-to-date by the IALA e-Navigation Committee at its biannual meetings usually held during March and September. e-Navigation is a rapidly evolving IMO concept and IALA takes all reasonable efforts to reflect the most current IMO decisions in these FAQ's.

### 1 WHAT IS e-NAVIGATION?

e-Navigation is an International Maritime Organization (IMO) led concept based on the harmonisation of marine navigation systems and supporting shore services driven by user needs.

e-Navigation is currently defined as:

*'e-Navigation is the harmonised collection, integration, exchange, presentation and analysis of maritime information onboard and ashore by electronic means to enhance berth to berth navigation and related services, for safety and security at sea and protection of the marine environment'*

### 2 WHAT WILL e-NAVIGATION DELIVER?

It is envisioned there will be at least three broad significant outcomes from e-Navigation that are currently being used as the basis of establishing user needs. These are represented by ship based systems, shore based systems and a communications infrastructure as outlined here:

- Onboard navigation systems will be developed that benefit from the integration of own ship sensors, supporting information, a standard user interface, and a comprehensive system for managing guard zones and alerts. Core elements of such a system will include high integrity electronic positioning, Electronic Navigational Charts (ENC) and an analysis capability to reduce human error, actively engaging the mariner in the process of navigation while preventing distraction and overburdening.
- The management of vessel traffic and related services from ashore will be enhanced through better provision, coordination, and exchange of comprehensive data in formats that will be more easily understood and utilised by shore-based operators in support of vessel safety and efficiency.
- An infrastructure designed to enable authorised seamless information transfer onboard ship, between ships, between ship and shore and between shore authorities and other parties with many attendant benefits.

### 3 WHAT DOES THE 'e' IN e-NAVIGATION STAND FOR?

It is generally accepted that the IMO concept of 'e-Navigation' can be thought of as a brand, without the need for 'e' to be specifically defined.

The concept of e-Navigation was proposed by IMO Member States in 2006 as a process for the harmonisation, collection, integration, exchange and presentation of maritime information. As such, the 'e' could have stood for 'enhanced' or 'electronic', but this would unnecessarily limit what can be done within e-Navigation. It must be noted that generic electronic marine navigation already exists in many forms and should not be confused with this specific IMO initiative.

#### **4 WHAT ARE THE CORE OBJECTIVES OF e-NAVIGATION?**

The IMO have agreed that the core objectives of an e-Navigation concept should:

- facilitate safe and secure navigation of vessels having regard to hydrographic meteorological and navigational information and risks;
- facilitate vessel traffic observation and management from shore/coastal facilities, where appropriate;
- facilitate communications, including data exchange, among ship to ship, ship to shore, shore to ship, shore to shore and other users;
- provide opportunities for improving the efficiency of transport and logistics;
- Support the effective operation of contingency response, and search and rescue services;
- demonstrate defined levels of accuracy, integrity and continuity appropriate to a safety-critical system;
- integrate and present information onboard and ashore through a human interface which maximizes navigational safety benefits and minimizes any risks of confusion or misinterpretation on the part of the user;
- integrate and present information onboard and ashore to manage the workload of the users, while also motivating and engaging the user and supporting decision-making;
- incorporate training and familiarization requirements for the users throughout the development and implementation process;
- facilitate global coverage, consistent standards and arrangements, and mutual compatibility and interoperability of equipment, systems, symbology and operational procedures, so as to avoid potential conflicts between users; and
- be scalable, to facilitate use by all potential maritime users.

#### **5 WHAT IS THE COMPELLING NEED FOR e-NAVIGATION?**

There is a clear and compelling need to equip the master of a vessel and those ashore responsible for the safety of shipping with modern, proven tools to make maritime navigation and communications more reliable and user friendly and thereby reducing errors. However, if current technological advances continue without proper co-ordination there is a risk that the future development of marine navigation systems will be hampered through a lack of standardisation onboard and ashore, incompatibility between vessels and an increased and unnecessary level of complexity.

#### **6 WHAT ARE THE BENEFITS OF e-NAVIGATION?**

According to the IMO Strategy, the main broad benefits of e-navigation are expected to be:

- Improved safety, through promotion of standards in safe navigation supported by:
  - improved decision support enabling the mariner and competent authorities ashore to select relevant unambiguous information pertinent to the prevailing circumstances;
  - a reduction in human error through provision of automatic indicators, warnings and fail-safe methods;
  - improved coverage and availability of consistent quality Electronic Navigational Charts (ENCs);
  - introduction of standardized equipment with an S-Mode\* option but without restricting the ability of manufacturers to innovate;
  - enhanced navigation system resilience, leading to improved reliability and integrity; and

- better integration of ship and shore-based systems; leading to better utilization of all human resources.
- Better protection of the environment both by:
  - improving navigation safety as above, thereby reducing the risk of collisions and groundings and the associated spillages and pollution;
  - reducing emissions by using optimum routes and speeds; and
  - enhancement of ability and capacity in responding and handling of emergencies such as oil spills.
- Augmented security by enabling silent operation mode for shore-based stakeholders for domain surveillance and monitoring;
- Higher efficiency and reduced costs enabled by:
  - global standardization and type approval of equipment augmented by a 'fast track' change management process (in relation to technical standards for equipment);
  - automated and standardized reporting procedures, leading to reduced administrative overhead;
  - improved bridge efficiency allowing watch keepers to maximize time to keeping a proper lookout and embrace existing good practice, e.g., using more than one method to ascertain the ship's position; and
  - integration of systems that are already in place, precipitating the efficient and coherent use of new equipment that meets all user requirements.
- Improved human resource management by enhancing the experience and status of the bridge team.

## **7 WHAT ARE THE USER NEEDS?**

e-Navigation, as agreed by the IMO, is a 'User Led' initiative, and the users include those who navigate vessels of all sizes and types, and a broad section of shore based authorised users. At the IMO Safety of Navigation Sub-committee (Nav55) during July 09, it was agreed that the preliminary shipboard needs included:

- improved ergonomics;
- greater standardisation of interfaces;
- better familiarisation training;
- more effective display of NAVTEX and other MSI;
- alert/alarm management;
- improved reliability and better indication of reliability;
- more standardised and automated reporting facilities;
- improved target detection;
- more effective guard zones;
- reduction of administrative burden; and
- more automated updating of essential information.

Shores based needs are currently being developed with the assistance of IALA and are anticipated to fall into the categories of:

- better data collection for marine domain awareness;
- more effective information management;

- better provision of information to vessels;
- greater quality assurance;
- more effective sharing of information between authorised shore users to reduce the burden on seafarers and improve logistic management; and
- To support Search and Rescue (SAR) operations by improving access to relevant information and ensuring effective communication.

It is understood that improvements in all these areas will not solely rely on technology, but will require attention to training and procedures as well.

## **8 WHAT EXISTING ISSUES AND TRENDS IN THE MARITIME INDUSTRY LED TO THE CALL FOR e-NAVIGATION?**

- There is an increasing demand by coastal states to seek more information from vessels transiting waters under their jurisdiction, adjacent waters and beyond, to manage the risks they pose and to have a positive means of communicating with them;
- There is an increasing tendency by port and coastal states to implement more rules/requirements for vessels arriving in and/or transiting waters within their jurisdiction;
- There is an increasing tendency between coastal states for regional co-operation;
- The volume of information being exchanged among ships and shore organisations is increasing;
- Environmental concerns and future regulatory requirements are expected to continue to acquire ever-higher importance;
- Security concerns are continuing to have an impact on maritime and other modes of transport;
- Diversification of port services (e.g. pilotage, linesmen, tugs, etc...) will increase; therefore co-ordination of allied services will become increasingly important;
- Competency of marine personnel will continue to vary and skill fade for infrequently used skills is an acknowledged factor;
- The use of new technology may necessitate changed training requirements and operational procedures;
- The use of formalised and increasingly precise systems to manage traffic at sea and in ports will grow;
- Although additional Global Navigational Satellite Systems (GNSS) services (e.g. Galileo) will become available and robustness will increase, such space-based systems will also be vulnerable to jamming and unintentional interference;
- Ship design and technology will continue to evolve;
- There will be increasing demands for rapid and predictable transportation and cargo handling schedules;
- The attractiveness of inland waterways as a means of transportation will increase;
- The competition for the use of navigable waters (high seas, coastal and inland) will continue to increase (e.g. High Speed Craft, larger and faster commercial ships, recreational vessels, offshore structures, and renewable energy systems).

## **9 WHO WILL e-NAVIGATION IMPACT?**

e-Navigation is a broad, long-term concept, involving many stakeholders and having the potential to impact on the entire maritime community. , however amongst those likely to be affected are mariners, marine pilots, equipment manufactures, Vessel Traffic Services (VTS), RCCs, Coastal

States, Port States and Flag States, Hydrographic Offices, ship owners, ship operators and ship charterers. Further, the development of e-Navigation will have a significant impact on all facets of training and the modification of operating procedures.

#### **10 DOES e-NAVIGATION PERTAIN ONLY TO SOLAS VESSELS AND EQUIPMENT?**

No, IMO intends that e-Navigation be 'scalable' and could benefit all vessels.

#### **11 WHEN WILL e-NAVIGATION HAPPEN?**

e-Navigation is an evolutionary and dynamic concept that will continue to develop as new user needs arise and emerging technological opportunities become available. In December 2008 the IMO Maritime Safety Committee adopted an e-Navigation 'Strategy'. This plan calls for an 'Implementation Plan' comprising user needs; architecture; and making use of Gap, Cost – Benefit and Risk Analysis, to be developed by 2012. This implementation plan may set timetables for the initial phases of e-Navigation implementation. It is expected that the strategy will embody a framework for continuously assessing how best to meet user needs with evolving technology and the use of cost benefit analysis.

#### **12 WILL e-NAVIGATION HELP PROTECT THE MARINE ENVIRONMENT?**

Yes, e-Navigation will bring improvements to navigation safety through the reduction of risk, and so help protect the marine environment from shipborne pollution stemming from collisions and groundings.

Further work and analysis is being carried out to determine if e-Navigation may have uses to help reduce carbon, sulphur and nitrogen emissions from ships through more efficient vessel routing and handling, and how e-Navigation could be used as an audit tool for the measurement of emissions offset claims and credits trading.

#### **13 I HAVE A FULLY APPROVED AND COMPLIANT ECDIS ON MY SHIP – DOES THIS MEAN I ALREADY HAVE e-NAVIGATION?**

No. However, Electronic Chart Display and Information System (ECDIS) is anticipated to form an important enabler for e-Navigation.

#### **14 HOW DOES CURRENT WORK OF THE IMO ON ECDIS, INS/IBS AND THE IALA WORK ON VESSEL TRAFFIC SERVICES FIT WITH e-NAVIGATION?**

The systems and technologies that are being developed and used within ECDIS, Integrated Navigation Systems (INS), Integrated Bridge Systems (IBS), and VTS developments will form key elements of the over-arching strategy for e-Navigation in order to harmonise the collection, integration, exchange and presentation of maritime information onboard and ashore.

#### **15 ARE THERE TRAINING IMPLICATIONS FOR e-NAVIGATION?**

Yes, e-Navigation will involve the use of technology hand-in-hand with appropriate procedures, and as such there will need to be significant changes to training that is given to all users, ashore and afloat.

#### **16 HOW WILL e-NAVIGATION AFFECT SMALL COMMERCIAL AND RECREATION VESSELS?**

There will be implications for small commercial and recreational craft since e-Navigation is intended to be scalable across all vessels in order to improve safety for the entire maritime community. Benefits for smaller vessels are expected to include improved navigational capability and vessel detection by all.

#### **17 HOW WILL e-NAVIGATION CHANGE TRADITIONAL NAVIGATION?**

The vision for e-Navigation is to enhance the best practices of traditional navigation, by better integrating humans and machines to take advantage of both their unique skills. Electronics have proven excellent at continually monitoring and checking mundane routines such as comparing various sources of navigation inputs, a task that most mariners can't accomplish as quickly and eventually find tedious. Humans excel in intuitive skills and addressing abstract challenges such

as ship handling and resource management. The enhancements brought in by e-Navigation are to optimise the support technical systems give to the human decision making process for the safe operation of shipping.

With the advent of electronic navigation (not to be confused with e-Navigation) such as electronic charts and positioning systems, the role of the mariner has changed without the change being holistically addressed by the maritime community. These conditions also exist with shore-side operations. e-Navigation is a process that seeks to reassess these roles and ensure that mariners and shore operators are actively engaged in the process of navigation and not just monitoring it. This will enable mariners and operators ashore to make better decisions, supported by robust electronic technology and information management systems that reduce existing distractions.

## **18 DOES e-NAVIGATION IMPLY A REDEFINITION OF AUTHORITY ONBOARD A SHIP AT SEA?**

No. e-Navigation will not change the responsibilities of the persons onboard the vessel with regard to the safe navigation of the vessel.

## **19 WHAT ARE SOME OF THE EXPECTED CONSEQUENCES OF e-NAVIGATION?**

The following are possible consequences of e-Navigation:

- There will be more efficient and harmonised data transfer between ships, and between ships and shore;
- There will be improved communication facilities between shore and ship to exchange information such as polling and a positive means to offer warnings, advice and directions to ships;
- Automation of polling ships for the provision of information without the need for human intervention;
- Advances in technology will make possible the detection, identification, and precise tracking of vessels outside existing VTS areas. These will include Long Range Identification and Tracking (LRIT) as well as terrestrial and satellite-based reception of AIS signals;
- Comprehensive and effective risk assessment using e-Navigation will increasingly become the basis for the safe management of navigation;
- There will be greater management and organisation of vessel traffic within the limits of liability;
- There will be an increased need to assure and certify the competency of mariners and shore-side users so as to make best use of e-Navigation facilities;
- In areas of high density or co-existing commercial and recreational traffic, there may be an application within e-Navigation to better manage recreational and small craft to ensure the safety of navigation for all.

## **20 WILL e-NAVIGATION BECOME A 'SERVICE'?**

No. Instead, it will be a framework of technical and operational services that will aim to harmonise and provide capabilities to enhance the exchange and sharing of navigational information within the maritime domain.