

# Chapter 12

## A Harmonized ENC Database as a Foundation of Electronic Navigation

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### ABSTRACT

*The development of ship navigation classically is based on paper charts, positioning systems like sextants, or nowadays GNSS. Lead by IMO and with support by organizations like IHO and IALA, the shipping industry moves towards the future of enhanced and electronic navigation to improve safety and efficiency of ship movement around the world. The basic data layers for this development are electronic vector charts. This data layer needs to be enhanced by a growing number of other data streams to create situational awareness during any voyage, but also allow for improved planning and efficient ship movement to increase safety and reduce pollution by reducing carbon footprint and reduce risk of environmental issues due to accidents. Given that, the aim of e-Navigation is to integrate data streams, leading to information for situational awareness, which enables wise decisions for mariners on ships and support teams on shore.*

### INTRODUCTION

The current discussion on the future of electronic navigation is focusing on the expansion of ECDIS by integrating additional data streams, like AIS or realtime tide information. While this are important aspects, which will be touched on in the chapter, it is important to note that the ENC

data layer is the necessary data layer to enable advanced data display.

The current focus on ENC production has a limited view on coverage within scale bands and on datum code. While this allows concentrated efforts to produce the necessary country coverage to meet the timeframe of the IMO ECDIS mandate, future mariners will require a more solid basis of chart data for their electronic navigation needs. The IMO e-Navigation discussion and the discussions

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in related the IALA e-Navigation Committee are starting to join efforts with the new IHO S-100 and S-101 standards as well as the developing S-10X series of standards. The Hydrographic community needs to take that in account when preparing for the future of electronic navigation to increase safety of navigation in a rapidly changing environment with larger ships and more traffic in areas with specific navigational challenges.

The article will also touch on other aspects relevant for improved safety and efficiency of shipping, which supports emergency response, facilitate ship movement, and prevent accident to occur.

The chapter focus on the following topics (Jeppesen, 2010):

- The ENC data layer as the basis of electronic navigation
- Closing gaps and overlaps in ENC coverage by adjusting cell boundaries
- Moving from a cell based data structure to a seamless database structure
- Integration of Scale-Independent and Scale-Dependent objects
- Adaption of harmonized and flexible data models—an S-10X outlook
- Enabling integration of advanced data streams—an e-NAV outlook

## **The “Electronic” in Ship Navigation**

Since the early 90s of the last century the shipping industry is looking into opportunities to introduce modern technology in shipping. While the development of electronic aids to navigation started to develop in the non-regulated market of private boating, the regulations and the conservative attitude of commercial shipping only very slowly adapted to that idea.

The development of the Electronic Chart Display and Information System (ECDIS) with the associated regulations and performance standards finally created the necessary regulatory basis in

SOLAS chapter V for the systems to find its way to the bridges.

In 2010, the IMO introduced a mandate for ECDIS on certain ship types and sizes within the SOLAS regulation. This mandate is introduced in a phased in approach between 2012 and 2018.

After the change of the century, as this regulation and mandate was developed, the IMO MSC and NAV committees and its working groups realized that ECDIS is a first step, but a new development needs to break ground given the innovations and new technologies available. With this the ‘e-Navigation’ concept was born. This concept broadened the view from a ship focused navigational support to a bridge-shore integrated planning and Navigational concept

e-Navigation is no longer ignoring the fact that a ship is not a complex but isolated organism, which independently sails the seas. e-Navigation realizes that safe and efficient ship movement needs a collaborative approach with all involved stakeholders. It also recognizes the fact that navigation of ships cannot be reduced to avoid groundings and other accidents at sea, but more and more needs to focus on efficient shipping to reduce fuel consumption and carbon footprint. The growing complexity of multi modal transportation needs further coordination of ship movement and more reliable ETAs (Estimated Time of Arrival) to better coordinate on shore resources (IMO, 2009).

All of these demands will only be satisfied by integrated electronic tools on board and on shore as well as the communication between the partners involved. This requires “Electronics” and it requires data integration, which is a paradigm shift for the industry.

## **The Landscape of Electronic Navigation**

In different organizations, involved in safety of life at sea, aspects of navigating a vessel from port to port are discussed. The importance of navigation is highlighted by the International Maritime

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