United States Coast Guard

Office of Navigation Systems

"We Help Mariners Get There"

ECDIS vs ECS, which is best

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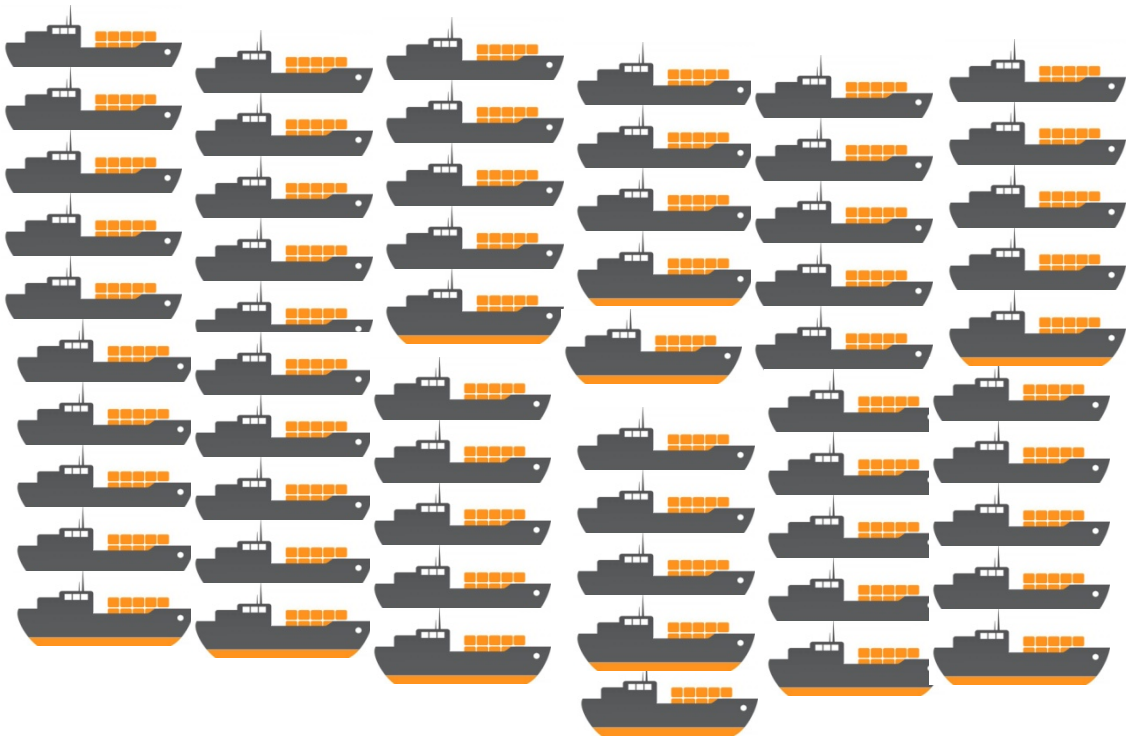
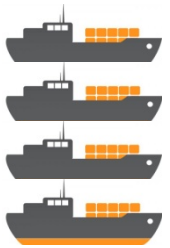
- **Why discuss Electronic Charts Systems, when ECDIS is mandated per SOLAS?**

The SOLAS Fleet x100





USA
SOLAS
Fleet

Congressional Mandate

On the navigable waters of the United States, each…

- Self-propelled commercial vessel of at least 65 feet,
- Towing vessel of more than 26 feet and 600 hp,
- Passenger vessels as determined by the USCG,
- Any other vessel deemed necessary for the safe navigation of the vessel.

shall be equipped with and operate an **AIS** (2002) and **ECS** (2004) under regulations prescribed by the USCG.

Why AIS & ECS?

Per CG&MT'04 Congressional Report

Sep'93, *Mauvilla* strikes Big Bayou Canot Railroad Bridge causing the *Sunset Limited* derailment; killing 47 pax & crew

- ECS tied to a GPS will help prevent such accidents
- Use of raster charts until vector become available
- AIS should be integrated with ECS

Another Congressional Mandate… on use of VDRs

Section 420 of the Coast Guard and Maritime Transportation Act of 2006 (Public Law 109-241) directed the Secretary of the Department in which the Coast Guard is operating to study the use of voyage data recorders (VDR) on ferries over 100 gross regulatory tons and carrying more than 399 passengers between two points not more than 300 miles apart.

USCG VDR Study

Based upon the findings of this study, particularly the significant costs associated with the use of VDRs, the Coast Guard recommends against requiring the use of VDRs or Simplified Data Voyage Recorder (S-VDRs) on ferries 100 gross tons and above, carrying more than 399 passengers between two points not more than 300 miles apart.

Rather, the Coast Guard recommends requiring these vessels to capture the types of information recorded by a voyage data recorder (Table 1) ... to that end, the Coast Guard recommends a review of Electronic Chart System (ECS) and Automatic Identification System (AIS) equipment to determine how they can be used or modified to capture the relevant information.

Table 1: Required VDR/S-VDR input signals

Data To Be Recorded	VDR	S-VDR
Bridge audio and one VHF radio communications	Yes	Yes
Date, time, position from the ship's GPS	Yes	Yes
Ship's heading from the ship's gyro compass	Yes	Yes
Speed from the ship's speed measuring device (speed over ground or through the water)	Yes	Yes
Radar picture from the ship's radar	Yes	Record radar if off the-shelf RGB interface is available, otherwise record AIS data*
Automatic Identification System (AIS)	Not required	AIS not required if radar is recorded
Depth information from the ship's echo sounder	Yes	Yes, if the data is available in IEC format**
Engine demand and response signals	Yes	Yes, if the data is available in IEC format
Main alarms, fire alarms, bilge alarms, etc…	Yes	Yes, if the data is available in IEC format
Watertight and fire door status	Yes	Yes, if the data is available in IEC format
Rudder order and response from ship's helm	Yes	Yes, if the data is available in IEC format
Wind and speed direction	Yes	Yes, if the data is available in IEC format
Hull stresses and acceleration	Yes, if the ship is fitted with these sensors	Yes, if the data is available in IEC format

Why RTCM ECS?

The requirements for RTCM ECS include requirements that are "above and beyond" the requirements specified in International Standards, for example:

- RTCM ECS meets the requirements for ECDIS back-up arrangements;
- RTCM ECS meets additional requirements for voyage data recording, and shall provide a Human-Machine Interface (HMI) for an AIS Minimum Keyboard and Display (MKD); and
- RTCM ECS meets requirements for interfacing with AIS and displaying information from AIS.
    - NOTE Interfacing with AIS is an option for ECDIS.

4 Classes of RTCM ECS

In order to apply different levels of functionality to within this Standard, four classes of RTCM ECS are defined:

- Class A RTCM ECS are intended to qualify as back-up arrangements for ECDIS and as a primary means of navigation for ships that operate offshore. They are required to display electronic chart information and eMSI; and to provide voyage planning, voyage monitoring and voyage recording functionality.
- Class B RTCM ECS are also intended to serve as a primary means of navigation for ships that operate offshore. They are not required to have all of the navigational functionality of a Class A ECS, but are also required to display electronic chart information and eMSI; and to provide voyage planning, voyage monitoring and voyage recording functionality.

RTCM ECS Class C and D and size

- Class C RTCM ECS are intended to plot and monitor the position of ships that do not generally operate offshore. They are not required to have all of the functionality of a Class B ECS. They are required to display electronic chart information and eMSI, but are not required to provide voyage planning or voyage monitoring functionality; and
- Class D RTCM ECS are intended to plot the position of ships that do not operate offshore. They are not required to have all of the functionality of a Class C ECS. They are required to display electronic chart information and plot a ship's position, but are not required to display eMSI, or to monitor the ship's position or to provide voyage planning or voyage monitoring functionality.
- ECS display equipment shall provide at least the following minimum operational display area:
  - (A) 250 millimeters horizontal and 250 millimeters vertical
  - (B) 200 millimeters horizontal and 200 millimeters vertical
  - (C) 150 millimeters horizontal and 150 millimeters vertical
  - (D) 100 millimeters horizontal and 100 millimeters vertical

RTCM ECS some things go beyond ECDIS, others not

- (A B C D) ECS may provide the distress alert and dedicated distress button specified in subclause 4.2.1.8 of IEC 60945.
- (A B C D) The means for the protection may be provided by separate equipment (e.g., a UPS).
- (B C D) If ECS is portable but capable of being powered by ship's power, the test in subclause 10.5 of IEC 60945 shall apply.
- (A) ECS shall be categorized as protected from the weather.
- (B C D) ECS shall be categorized as either portable or protected from the weather.
- ECS (B C D) may establish an alternative priority for the layering of, for example, NtMs and other eMSI such as Radio Navigational Warnings, radar and AIS information, and information input by the user e.g., points/lines/areas, and users color-fill area data).

RTCM ECS Allows for Dynamic Bathymetry

- If the ECS is using vector format electronic chart information that includes detailed bathymetric information, it may adjust the display of depth information for actual (or predicted) water levels (e.g., tidal height, flood stage)
  - If an adjustment for actual water levels is provided, ECS shall:
  - be capable of accepting water level data (e.g., provided via forecast or AIS ASM*);
  - provide a persistent indication that the adjustment has been applied;
  - provide a persistent indication of the time that the adjustment is valid;
  - be capable of providing the details of the adjustment to the user, on demand, including the source of the adjustment and the basis for the adjustment (i.e., whether the adjustment is to actual water levels or to predicted water levels); and
  - provide means or method to disable the adjustment by a single user action.

* an environmental or a meteorological and hydro-graphic data message (IMO SN.1/Circ.289)

RTCM ECS some things go beyond ECDIS, others not

- (A B C D) ECS shall provide a graphical representation of own ship; but
- (C D) ECS need not be capable of displaying own ship's true scaled outline.
- (A B C D) If the ECS superimposes alphanumeric data, information or text on the operational display area, such data, information and text shall be temporary and moveable
- Target portrayal, are based upon the minimum screen size specified
- (A B) ECS shall be capable of displaying radar video images and tracked radar targets.
- (A B C) ECS shall be capable of displaying reported AIS targets.
- (D) ECS need not be capable of displaying radar video images, tracked radar targets or reported AIS targets.

RTCM ECS Addresses Cyber-Security

All automatic execution from removable external data source (REDS) including USB auto-run shall be prohibited. Manual execution of any type of files from REDS shall only be possible after passing a **user-**authentication before for accessing executable content on the REDS. The manual execution shall be possible only for the files which are verified before execution using digital signature or special keys.

RTCM ECS will support GMDSS and ENAV

- (A B) ECS should be capable of accepting eMSI in the following formats, according to the applicable IEC 61162 or NMEA interface standard(s):
  - NRM - NAVTEX Receiver Mask Command
  - NRX - NAVTEX Received message
  - SM1 – SafetyNET Message, All Ships/NavArea
  - SM2 – SafetyNET Message, Coastal Warning Area
  - SM3 – SafetyNET Message, 7269 Circular Area Address
  - SM4 – SafetyNET Message, Rectangular Area Address
  - SMB – IMO SafetyNET Message Body
- (A B) ECS shall be capable of accepting route data in the following formats, according to the applicable IEC 61162 or NMEA interface standard(s)
- (C) ECS should be capable of accepting route data in the following formats, according to the applicable IEC 61162 or NMEA interface standard(s)

RTCM ECS AIS Requirements

- (A B) ECS shall provide a HMI for an AIS MKD, which should be consistent with the requirements specified in IEC 61993-2 as applicable to navigational display equipment.
- (A B C) ECS shall accept AIS messages in the following formats, according to the applicable IEC 61162 or NMEA interface standard(s)
- (A B C) ECS shall accept the input of AIS ASM identified by the competent authority for the designated area(s) where the ECS are intended for use.
- (D) ECS should accept the input of AIS ASM identified by the competent authority for the designated area(s) where the ECS are intended for use.
- (A B C) ECS should be capable of outputting AIS ASM identified for use by the competent authority for the designated area(s) where the ECS are intended for use.

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Thank You

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