

Background Paper for Carriage and Use of the Electronic Chart Display and Information System (ECDIS)

This background paper provides guidance to those Australian vessels intending to employ ECDIS to meet the chart carriage requirements of SOLAS Chapter V.

SOLAS Chapter V - ECDIS Equivalency

A revision of SOLAS Chapter V (Safety of Navigation) will enter into force on 1 July 2002. New Regulation 19.2, which lays down the carriage requirements for shipborne navigational systems and equipment, requires (at subparagraphs 2.1.4 and 2.1.5) that:

“2.1 All ships irrespective of size shall have:

- .4 nautical charts and nautical publications to plan and display the ship’s route for the intended voyage and to plot and monitor positions throughout the voyage; **an electronic chart display and information system (ECDIS) may be accepted as meeting the chart carriage requirements of this subparagraph;**
- .5 back up arrangements to meet the functional requirements of paragraph .4, if this function is partly or fully fulfilled by electronic means.”

The revised SOLAS Chapter V Regulation 2.2 also refines the definition of a “nautical chart” to more clearly reflect the electronic charting aspects and the “official” responsibility for their production, quote:

“2 *Nautical chart or nautical publication* is a special-purpose map or book, or a specially compiled database from which such a map or book is derived, **that is issued officially by or on the authority of a Government, authorized Hydrographic Office or other relevant government institution** and is designed to meet the requirements of marine navigation.”

All non-ECDIS electronic chart systems are classified simply as Electronic Charting Systems (ECS). While they may be used as an aid to navigation, ECS cannot be used to meet a mandatory SOLAS carriage requirement for charts. An ECS classification may apply because the system does not comply with the ECDIS performance standards and/or uses chart data from an unofficial source.

AMSA Requirements for ECDIS Carriage

Under the terms of new SOLAS Chapter V Regulation 19.2.1.4, an ECDIS, which meets the performance standards of IMO Resolution A.817(19) as amended, may be accepted by a national administration as complying with the up-to-date charts required by new Regulation 27. The Australian Maritime Safety Authority (AMSA) is the national administration in this context.

The following paragraphs lay down AMSA’s pre-requisites for an Australian flagged vessel intending to use ECDIS to legally meet the chart carriage requirements of SOLAS Chapter V. These will also be laid down in an amendment to Marine Order Part 21.

ECDIS Equipment - Type Approval

Type Approval is the certification process that ECDIS equipment must undergo before it can be considered as complying with the IMO Performance Standards for ECDIS. The process is conducted by recognized type-approval organizations or by marine Classification Societies. Some maritime nations have type-approval programs within their maritime safety administration and most maritime nations recognize the certificates issued by other nations.

A type approval certificate confirms that the particular ECDIS carried complies with the requirements of IMO Resolution A.817(19) Performance Standards for ECDIS (as amended) - including the requirements for suitable back up arrangements in the event of system failure. An IMO-compliant ECDIS will have been tested using IEC 61174 as the standard.

There are no ECDIS type-approval facilities or organizations based in Australia. AMSA, acting as the "Administration", has delegated type approval and certification of marine equipment coming under international convention and standards to six well recognised Classification Societies, these are:

- American Bureau of Shipping (ABS)
- Bureau Veritas
- Det Norske Veritas (DNV)
- Germanischer Lloyd
- Lloyd's Register of Shipping
- Nippon Kaiji Kyokai (NKK).

The European Council Directive 96/98 (EC Standard on Marine Equipment) has created a new certification scheme within Europe and resulted in the replacement of the former national systems in European Union countries by a single certification scheme. It is based on both design and production conformity assessments and any marine equipment, listed in Annex A.1 of the Directive, that has been type approved in one EU member state ('wheelmarked') must be accepted by all other Member States, plus Norway and Iceland.

AMSA's "Instructions to Classification Societies" states that where equipment, required by Marine Orders, is required to comply with Australian standards, equipment complying with an appropriate 96/98 EC MED may also be considered equivalent and acceptable. The intention here is that, in addition to the six Classification Societies with which AMSA has agreements, EC type approved ("wheelmarked") certification of ECDIS will also be acceptable by the Authority. ECDIS type-testing conducted by Bundesamt für Seeschifffahrt und Hydrographie (BSH), the German Hydrographic and Maritime Authority, should therefore qualify for recognition in this context.

Primary System - Back up Arrangements

Section 14 and Appendix 6 to IMO Resolution A.817(19) specify the requirement for adequate independent back-up arrangements. The principal requirements are to:

- enable a timely transfer to the back-up system during critical navigation situations, and
- allow the vessel to be navigated safely until the termination of the intended voyage.

The Appendix lists the functional requirements of the back-up system but not the specific arrangements that may meet these requirements, the onus being on national authorities to produce appropriate guidance.

AMSA considers the following will meet the backup requirements for ECDIS:

- A second 'compliant' ECDIS which must be independent of the main ECDIS and connected to the ship's main power supply, emergency power supply (see SOLAS Chapter II Regulation I/42.4) and to an independent position fixing system input. The back-up ECDIS must have the chart database and voyage plan loaded before commencement of the voyage. In confined waters the back-up arrangements must be in operational mode, or
- An Electronic Charting System providing a display for chart presentation for route monitoring of at least 270mm x 270mm and using ECDIS software and charts, which must be independent of the main ECDIS and connected to the ship's main power supply, emergency power supply with at least 4 hours duration (see SOLAS Chapter II Regulation I/42.4) and to an independent position fixing system input. The ECS must meet the requirements of Appendix 6 (ECDIS back-up requirements). The back-up arrangements for ECDIS must have the chart database and voyage plan loaded before commencement of the voyage. In confined waters the ECS must be in operational mode, or
- A full folio of paper charts that satisfies SOLAS carriage requirements, corrected to the latest available Notices to Mariners, covering the intended voyage and showing the intended voyage plan.

Electronic Navigational Charts (ENCs)

Ships using ECDIS for navigation shall carry Electronic Navigational Charts (ENC) (the official vector charts) or, where official ENC data has not been published, they may use Raster Navigational Charts (RNCs) which are simply raster scans of the paper charts. The ENCs and RNCs must be issued officially by or on the authority of a Government, authorized Hydrographic Office or other relevant government institution and designed to meet the requirements of marine navigation. As such, for the Australian area and for most of the world's sea areas, the so-called derived electronic charts produced by Transas, C-Map, etc (some commercial manufacturers) are not recognised under SOLAS Chapter V as meeting the relevant chart carriage requirements.

For ships fitted with an ECDIS that does not have an RCDS mode of operation, ship's navigation must revert to reliance on a full folio of paper charts for those sections of the voyage not covered by ENCs.

A regular update facility must be established with the provider of the ENCs/RNCs, supported by a subscription agreement note or similar document that can be inspected.

ENC and RNC availability

The Australian Hydrographic Service (AHS) is presently compiling Electronic Navigational Charts (ENCs) with priority on the Great Barrier Reef area including the Coral Sea and the national ports.

As there is so much more information in an ENC than in a paper chart, it will take some time to provide fully compliant coverage for the whole of Australia (and the world). For this reason, the IMO approved Raster Chart Display System (RCDS) mode of operating ECDIS for use in those areas where ENCs have not yet been produced. The RCDS mode of operation is sometimes referred to as ECDIS “dual-fuel operation”.

As mentioned earlier in this paper, RCDS mode relies on Raster Navigational Charts (RNCs), instead of ENCs. RNCs are scanned images of official paper charts and like ENCs are only published under the authority of governments and their hydrographic offices. RNCs can provide some, but not all of the functions of ENCs and it is largely because of these limitations of RNCs compared to ENCs that requires RCDS operation to be complemented by paper charts. See details below.

Australia’s RNCs are known as *Seafarer*[®] RNC. They are scanned images of official Australian paper charts and are published by the AHS on CD-ROM. RNCs are also published by the UK, USA, Canada and a growing number of other countries. In effect, the world is reasonably well covered by official RNCs.

RNCs contain exactly the same information as the official paper charts from which they are derived and maintain the same standards of quality, reliability and government backing. Like ENCs and paper charts, a Notice to Mariners update service supports them. *Seafarer*[®] RNC uses Hydrographic Chart Raster Format (HCRF), which is the same format and standard used by the British Admiralty for its “ARCS” RNCs.

All of Australia’s official paper charts have now been published as *Seafarer*[®] RNC. *Seafarer*[®] RNC chart updates can be obtained by subscription and are supplied monthly on CD-ROM. This allows Notices to Mariners to be applied to RNCs virtually automatically.

ECDIS supports a comprehensive update mechanism to ensure ENCs and RNCs can be kept up to date, with methods such as Notices to Mariners. Chart maintenance is effected automatically via disk update, email message or satellite data transfer.

Further information on the availability of official electronic charts for the Australian region can be obtained at:

www.hydro.gov.au

RCDS Mode - Complementary Paper charts

Where ENC data (the official vector charts) has not been published, official Raster Navigational Charts (RNCs) may be used in ECDIS in the so-called Raster Chart Display System (RCDS) mode of ECDIS operation. However the IMO has ruled that an “appropriate folio of charts” is required to complement this mode of operation. This is a reduced folio intended to supplement the RCDS operation which is seen to

have limitations. These limitations are described in IMO Safety of Navigation Circular 207/99 “Differences between RCDS and ECDIS (Operation)”

(<http://www.amsa.gov.au/imo/secure/circulars/sn/207.pdf>).

This requirement should not be confused with the ECDIS backup option of a full folio of paper charts; obviously any operator who opts for the full folio to back up ECDIS will automatically have covered the “appropriate folio” requirement to complement the RCDS mode.

IMO does not provide any guidance on what may constitute an “appropriate folio”; this is left to the national administration.

AMSA has defined the term “appropriate folio” as follows:

This folio should contain up to date charts to cover those sections of the intended voyage where ECDIS will be operated in the RCDS mode. These charts are to be of a scale that will show sufficient detail of topography, depths, navigational hazards, nav aids, charted routes, and traffic schemes to provide the mariner with ample knowledge of impending navigational complexities and an overall picture of the ship's general operating environment.

As a broad guideline the scale of the charts in this folio should suit the navigational complexity; for example the area from Melbourne to Brisbane could be satisfactorily covered by the AUS “four hundred” (AUS 4xx) series, whereas the Inner Route north of Cairns must have the AUS “eight hundred” (AUS 8xx) series.

The requirement to carry this appropriate folio for backup in the RCDS mode must be met for overseas voyages as it is an IMO ruling and other administrations may enforce it. For voyages within Australia’s EEZ AMSA will consider waiving the requirement to carry this appropriate folio provided the operator submits a satisfactory risk assessment or safety case, indicating what measures and procedures will be adopted to minimise risks when using ECDIS in the RCDS mode of operation.

User Training Requirements

The STCW and ISM Codes put the onus firmly on the shipowner to ensure that mariners on their vessels are competent to carry out the duties they are expected to perform. If a ship has ECDIS fitted, the shipowner has a duty to ensure that users of such a system are properly trained in the operation and use of electronic charts and are familiar with the shipboard equipment before using it operationally at sea.

The following training is considered necessary for an ECDIS user in a ship:

By the STCW 95 implementation date of 1 February 2002 all holders of Australian STCW 95 endorsed Certificates of Competency in the deck department will have been required to complete basic ECDIS training.

Before a watchkeeping officer or master intends to use a compliant ECDIS as the primary means of navigation they should complete a generic ECDIS Operators Course complying with IMO Model Course 1.27 - The Operational Use of Electronic Chart Display and Information Systems (ECDIS).

Additionally, ECDIS type training is to be provided by the shipowner under the terms of the ISM Code. Under the Code, the shipping company has a responsibility to “establish procedures to ensure that new personnel and personnel transferred to new assignments related to safety and protection of the marine environment are given proper familiarisation with their duties. Instructions which are essential to be provided prior to sailing should be identified, documented and given”.

Typically, such ECDIS type training could be achieved through an agreement between the shipowner and the supplying ECDIS manufacturer for a self-tutoring function to be provided with the equipment. Otherwise, a similar arrangement could involve the placing of the ECDIS operating software and type training materials in a computer at the owners’ offices and/or a training establishment.

These requirements are to be part of the vessel’s Safety Management System and are to be strictly adhered to, prior to an officer taking over the responsibility of a watch at sea.

Application for ECDIS Carriage Approval

After 1 July 2002, an ECDIS, which meets the performance standards of IMO Resolution A.817(19) as amended, may be accepted by AMSA as complying with the carriage of up-to-date charts as required by SOLAS Chapter V if the foregoing requirements are met.

Further enquiries regarding the carriage and use of ECDIS in the light of Marine Notice 14 of 2002 should be addressed to:

Manager Ship Inspections
Maritime Operations
Australian Maritime Safety Authority
GPO Box 2181
CANBERRA ACT 2601