ECDIS

electronic | chart | display | information | system

HAND BOOK

DEAR READER,

Your ECDIS Implementation is imminent!

During the last two decades there has been a constant flow of new carriage requirements for Bridge equipment; in most cases giving a burden for ship owners and crew. ECDIS can reverse this situation if it's properly installed, optimized for a particular vessel and manned by a well-trained crew.

It can bring added value to a ship owner as well as for a crew, in addition to enhanced safety and fulfilling the ECDIS Carriage Requirement.

We've combined our expertise with customer experience and lessons learned over more than 10 years of ECDIS installation and use. This guide will give you some hints and ideas to show how ECDIS can optimize your operations, saving time and money.

Proper transition to ECDIS takes time. So do as many ship owners have already done – get started now to benefit from your ECDIS installation from day one. And let us help you to manage any challenges along the way.

TRANSAS ECDIS TEAM

E C D I S

**We all know what ECDIS stands for: Electronic Chart Display and Information System.
But it can be much more! Allow us to show you the ECDIS system from another perspective.**

E **FFICIENT ROUTE AND VOYAGE PLANNING.** Tools for automatic Route and Voyage planning from Port A to B via C can be integrated as a part of your ECDIS. Optimizing the schedule taking into consideration the latest weather forecast (weather-routing) and using integrated environmental databases for Tides and Currents will allow the vessel to proceed along the route at the safest economical speed and arrive at its final destination on time. Calculation of safety parameters, automatic printing of reports and plans that fulfill all international requirements for voyage planning will enhance the quality of the planning and save hours during preparation of the voyage.

C **HART MANAGEMENT AND DIGITAL PUBLICATIONS.** ECDIS provides unique tools for management of charts and nautical publications in digital format. This includes ordering updates as well as the preparation of reports. Within a few seconds they can be sent ashore or be included as an integrated part of the voyage plan by showing the current status of the vessels charts and nautical publications. Online chart ordering and delivery enables the ship owner to minimize the chart portfolio. Providing a tailor made coverage for the particular voyage, together with online chart corrections, will generate significant savings.

D **ISPLAY OF INFORMATION.** ECDIS uniquely combines information from different sources in one display. Optimized chart presentation gives a perfect background for display of vital information. This could be weather information, online targets, No Go areas, for example Piracy or MARPOL areas, and additional navigation data. All this can be made visible just by a single key operation. With predefined layouts enabling easy shifting between presentations and online updating of the data, there is no better tool than ECDIS for efficient presentation of information of interest – decision making cannot be easier and safer.

I **NTEGRATION.** With ECDIS installed,the integration of all navigational sensors and relevant data on one spot of the bridge has become reality. Other mandatory systems like Bridge Navigation Watch Alarm System (BNWAS) can be an integrated part of ECDIS. Running several applications like RADAR, ECDIS, CONNING, AMS, E-LOG Book on the same workstation gives the officer quick access to all information in a single position (for example, on the bridge wing during mooring operations). ECDIS also provides redundancy and improves efficiency by avoiding duplication of work, such as route entry in several

systems. Integration of ECDIS with the vessel's communication system enables online communication from Ship to Shore for the exchange of data and reports. With a module for fuel optimization, integrated with the vessel's propulsion system, the optimization of speed along the route brings environmental and economic benefits.

S **AVINGS.** With proper set up and use, streamlined procedures (ISM) on the vessel and in the shipping company as well as a trained and motivated crew, ECDIS is an investment with huge potential for cost savings. At the same time, efficiency and safety are increased. Savings can be immediately visible, with its biggest potential in the areas of charts and nautical publications, fuel consumption and time spent on planning and preparation of reports. Det Norske Veritas (DNV) Report 'Effect on ENC Coverage on ECDIS Risk Reduction' from 2007 already evaluated that ECDIS is a cost effective risk control option for large passenger ships and all other vessel types involved in international trade, with a significant potential to save lives by reductions the frequency of collision and grounding. The grounding frequency reductions achievable from implementing ECDIS vary between 11% and 38% for the selected routes. This variation is due to variations in ENC coverage. According to DNV, ECDIS represents a net economic benefit itself. **Claes Möller, Fleet Manager of Tärntank Ship Management AB** comments: 'With ECDIS implementation in Tärntank Ship Management vessels, when the vessel transferred from paper charts and books to SENC and ADP we can say that our cost for Charts and Nautical Publication was reduced dramatically by more efficient charts ordering'.

LET US GIVE YOU SOME MORE EXAMPLES FROM OUR CUSTOMERS' EXPERIENCE

ECDIS in combination with Fuel Saving System, detailed weather and current forecast enable us to proceed along the route with the most economical speed. Recording, analysis of data for a series of voyage makes it possible to better predict and optimize the speed for different part of the voyage. ECDIS and the Fuel Saving System is a motivation factor for the officers to minimize fuel consumption. Our savings are estimated to 3–5%. I think that for a vessel that change from planning and monitoring on paper charts to ECDIS with Fuel Saving System, savings can easily exceed 10% of the fuel consumption.
Wiggo Lander, Captain, Stena Germanica

Our conclusion today is that it's been a long but rewarding way, since our Navigation officers and crew report back that the system makes them feel more secure and that the operation of the vessel is safer.
*Capt. Tor-Arne Tönnesen,
Maritime Superintendent, Solvang*

 With the new IMO Requirements, Dual ECDIS without paper charts as a back-up will save money. It's an easy calculation – not even that ENCs are cheaper than paper charts but if you go halfway you will have double expenses for both paper and ENC. With ECDIS implementation In Nordic Tankers we also reduced time for chart corrections and passage planning by 5 to 10 hours per week.
*Soren Andersen, Marine Superintendent, SQE,
Nordic Tankers Marine A/S*

We decided very early to install dual ECDIS onboard our fleet of gas tankers. Our main goal was to increase the safety of navigation but also to reduce the workload for the crew onboard by removing the time consuming task of paper chart corrections. Both goals have been achieved. The ECDIS provides an excellent overview for the navigators with all important navigational information present on a single screen and the chart workload has been drastically reduced.
Rolf Andersen, Head of Nautical & IT, Lauritzen Kosan A/S

IMO REQUIREMENTS

IMO RESOLUTION A.817 (19)

"Electronic Chart Display and Information System (ECDIS) means a navigation information system which, with adequate back up arrangements, can be accepted as complying with the up to date chart required by regulation V/19 and V/27 of the 1974 Safety of Lives at Sea (SOLAS) Convention."

An ECDIS system must at least be connected to an electronic position fixing system (EPFS), a gyro and a log. The connection must be made in such a way and by a certified engineer to ensure that a single fault error cannot influence the system, which means the connection must be made directly to the sensor.

As an ECDIS is a computer based system it must be protected by a UPS (uninterruptible power supply) capable of handling a 45 second blackout during a switch from the vessel's main to back-up power source without rebooting.
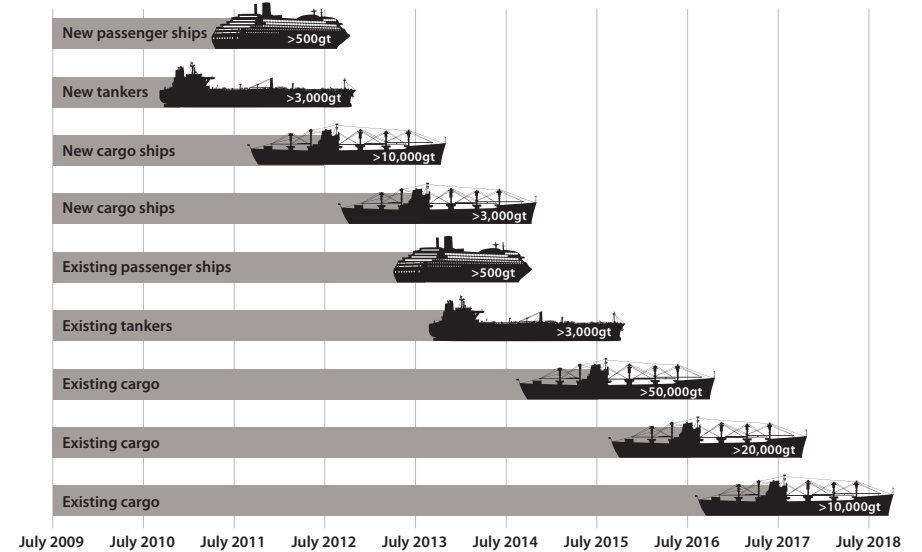
IMO SOLAS V/19

2.1   All ships irrespective of size shall have:

2.1.4 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.

2.1.5 Back-up arrangements to meet the functional requirements of subparagraph 2.1.4, if this function is partly or fully fulfilled by electronic means.

ECDIS CARRIAGE REQUIREMENT

The carriage requirement means an ECDIS must be fitted. This does not automatically enable the vessel to sail paperless as the requirement is for a single ECDIS. A single ECDIS can be used for navigation but it requires a backup by paper charts or a secondary ECDIS.

New passenger ships	>500gt
New tankers	>3,000gt
New cargo ships	>10,000gt
New cargo ships	>3,000gt
Existing passenger ships	>500gt
Existing tankers	>3,000gt
Existing cargo	>50,000gt
Existing cargo	>20,000gt
Existing cargo	>10,000gt

July 2009   July 2010   July 2011   July 2012   July 2013   July 2014   July 2015   July 2016   July 2017   July 2018

RULES AND REGULATIONS CONNECTED TO ECDIS

1995-11 IMO Resolution A.817(19) ECDIS Performance Standards

1996-12 MSC.64(67) Amendment to Resolution A.817 (19) Apex. 6 Back-up

2006-12 MSC.232(82) Adoption of ECDIS Performance Standards

1998-12 MSC.86(70) Apex. 7 RCDS Mode

2004-12 MSC 191 (79) Presentation of Navigation Related Information

2008-09 IEC 61174 ed.3 ECDIS Requirements and Testing

2007-04 IEC 61162-1 ed.3 Processing of Input Data

2002-08 IEC 60945 ed.4 Maritime Navigation Equipment Requirements

2007-01 IHO S-57 ed.3.1.2 Transfer Standard for Digital Hydrographic Data

2007-09 IHO S-32 Appendix 1 Glossary of ECDIS Related Terms

2008-01 IHO S-52 Ed.4.3 ECDIS Presentation Library

1999-01 IHO S-61 RNC Product Specifications

2008-03 IHO S-63 Ed.1.1 Data Protection

- Type-approved system
- Official charts – ENC/SENC/ARCS
- Chart corrections
- Approved installation
- Updated procedures (ISM)
- Training

COMPLIANT

USEFUL TIPS...

DECISION MAKING. The decision about installing an ECDIS should be made well in advance, to allow enough time for system purchasing, actual onboard installations, ECDIS related ISM procedure preparation and crew training.

- Keep in mind that close to the mandatory implementation time some manufacturers may not be able to supply systems immediately and will require a longer delivery time. The same problem may be applicable to the availability of certified installation engineers and crew training courses.

A decision regarding suppliers for all above mentioned categories should be made in advance of the implementation date.

- Some suppliers can provide a high quality, integrated ECDIS system covering all necessary items and assist you with implementing a plan to make sure your vessels will comply by the required date.

FLAG STATE. Check your Flag States requirements for back-up arrangements and power supply.

ELECTRONIC NAVIGATION CHARTS

In order to be able to sail paperless, you need to use Electronic Navigation Charts. Today, there are two kinds of official digital charts available, Electronic Navigational Charts (ENC) and Raster Navigational Charts (RNC). Official RNCs are digital raster copies of official paper charts. Electronic Navigation Charts are official vector charts. Only a national Hydrographic Office (HO) can produce or authorize the production of RNCs and ENCs of its own territorial waters. Charts must be produced in accordance with the International Hydrographic Organization's (IHO) product specification for S-57 ENCs.

According to the IMO performance standard, ECDIS operated in the Raster Chart Display System (RCDS) mode meets the chart carriage requirements for areas where ENCs are not available. However, for these areas an appropriate portfolio of up-to-date paper charts should be carried onboard in accordance with the Flag State requirements. Using an ECDIS in the RCDS mode in areas where there are suitable ENCs available is not allowed.

ENCs meet SOLAS chart carriage requirements when they are kept up-to-date and used on a type-approved ECDIS with an adequate back-up arrangement. A vector chart is a database, where different objects are encoded. Your chart software may sort these objects in categories and display them in layers.

There are many advantages of vector charts:
- Automatic alarm generation is possible
- Optional information can be displayed (customized settings)
- Zoom option with no deterioration of the readability
- They are easy to correct
- They require little memory capacity (quick loading)
- Information can be added (files, pictures etc.)
- Good readability in all presentation modes like Head-up, North-up, Course-up
- Presentation is adapted according to the safety parameters of your vessel

Although the worldwide ENC coverage is improving quickly, it does not yet cover all sea areas in the necessary scale. This is the reason why private companies develop their own vector chart folios, such as Transas Marine TX-97 charts or C-Map CM93. These nautical charts are not accepted as the basis for primary navigation under the SOLAS convention.

All ECDIS manufacturers have different graphic layouts and hardware. But there's one thing they all have in common; they all read and use S-57 ENC chart format and transfer it into their own SENC format – System Electronic Navigation Chart format. This means when an ENC chart is loaded into the system, it becomes a SENC chart. ENCs are supplied on CDs or DVDs. The quarterly issued Base-Set includes all available charts. They are sent to the vessel 4 times per year.

The licence period for ENCs is 3, 6, 9 or 12 months. Additional Chart data may be added to the licence at any point during the licence period and there is no requirement for all data to expire at a common date. This allows the users to hold only the data which is appropriate for their operations at any given time. Some countries do not allow data to be licensed for a shorter period than 12 months.

RECOMMENDATION WHEN PURCHASING OFFICIAL CHARTS

- If your vessel is sailing on the spot market we recommend you purchase your charts for 3 months (if allowed by the producing Hydrographic Office).
- If your vessel is sailing on the same trade you should choose 12 month subscriptions. A 12 month subscription is cheaper than buying 3 month subscriptions on a quarterly basis.

During the licence period, an Update CD may be supplied weekly to enable your licensed data to be maintained for New Editions and Notices to Mariners. You will also be provided with all corrections within the licensed cells. These updates can be sent by post or e-mail; or they can be downloaded from your chart supplier's webpage.

When the ENC licences expire, you will not lose the display of the charts, but you will no longer be able to load and apply updates. Unless the licence is renewed, the charts will not be updated for Notices to Mariners and will not meet SOLAS chart carriage requirements. Licence renewal can be arranged by your chart supplier.

USEFUL TIPS...

CHART SUPPLY. The vessel's folio of required charts should always be up to date before a voyage. Appropriate charts should be ordered and installed on every ECDIS onboard.

- Check if your chart supplier can support you with the preparations, and that they keep records regarding previously supplied charts to avoid double orders. Time delivery and online service is an additional benefit, especially if a vessel changes its trade area.
- Some ECDIS manufacturers supply ECDIS with pre-loaded SENCs which save a lot of time on conversion, but make sure that the SENCs are properly licensed. Pre-loaded does not mean licensed.
- If your vessel is able to send and receive email attachments at sea, you should update the charts for the remaining part of your voyage every week.
- Check if prompt delivery is available using the internet instead of by ordinary mail. It is important that immediate collection update and chart delivery is available as well as assistance with chart collection preparation and maintenance.

ISM SYSTEM

Implementation of ECDIS is not just a matter of getting equipment installed, charts and updates in place and providing some basic training for a crew and then – "off they go". Implementation of ECDIS and, in the end transition from paper charts to navigation by Electronic Chart, is a fundamental change in routines and procedures, mainly for the vessel but also for the shipping company operations. All work that has been done in paper chart to fulfill requirements for Voyage Planning and Monitoring, as well as preparation of reports, should now be done in ECDIS – and it's a different way of doing it.
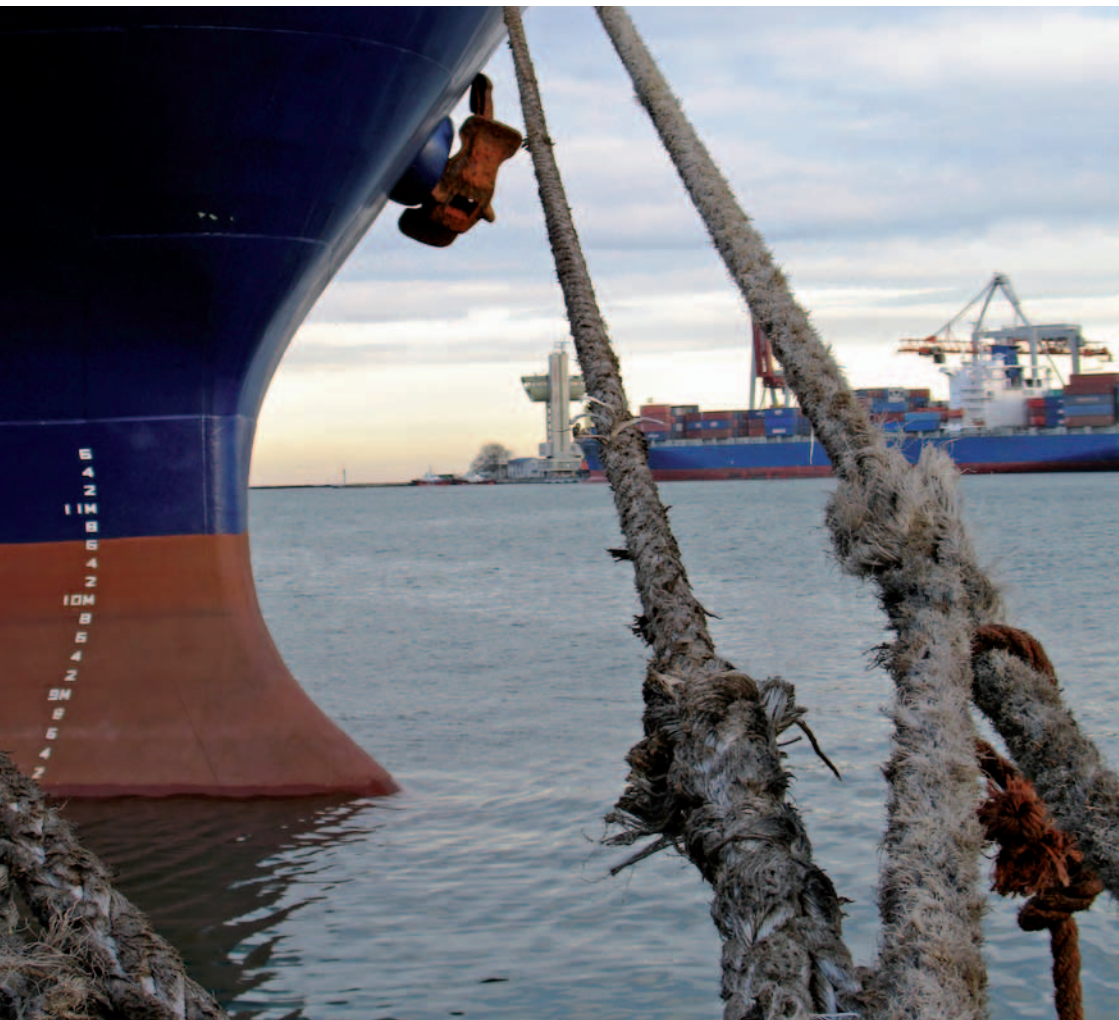
> **The International Safety Management Code (ISM Code), as described by IMO, stands for the International Management Code for the safe operation of ships and pollution prevention. The objectives of the code are to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment and to property. The requirements mandate an onboard and ashore Safety Management System (SMS) under which each vessel and company operates and demonstrates compliance for Port State Inspection.**

Therefore, changes in the ISM code are required where at least the following routines, procedures and checklists must be up to date;

- Voyage Planning
- Pre-Departure Routines
- Pre-Arrival Routines
- Watch Keeping Routines
- Voyage and Monitoring Routines
- Emergency Routines for Breakdown
- Maintenance and Chart Correction Routines
- Service and Support Routines

It is vital that this work is planned and started well in advance of the installation of an ECDIS. This will secure a safe and problem-free transition to navigation using type-approved ECDIS.

USEFUL TIPS...

ISM CODE INTEGRATION. Navigational procedures shall be reflected in the ship's SMS and ECDIS use is part of it. It can be done by your own personnel and crew or ordered through shipping industry subcontractors specializing in this type of work . It should be done before or right after the system installation when a trained crew is available on board.

- Some suppliers can provide training to certify your ship's crew and work with you to ensure an easy implementation of the new procedures on board. After the successful implementation on 1 or 2 ships, the new procedures can be easily transferred to the entire fleet if the same equipment is installed and the same chart provider selected.

TRAINING

Crucial to implementing ECDIS is the appropriate training for the crew and relevant managerial staff ashore. All bridge officers should have general ECDIS training that follows the IMO Model Course 1.27. Additional equipment-specific training for the ECDIS model in use onboard is required for every ship, according to the ISM Code. Until the 1st of January 2012, when the new STCW code will include mandatory ECDIS training, two important shipping regulations must be followed.

The IMO Standards for Training Certification and Watchkeeping (STCW) require the OOW to possess a "thorough knowledge of and ability to use navigational charts and publications" and also "skills and ability to prepare for and conduct a passage, including interpretation and applying information from charts, must be evident". The STCW is currently written around paper charts but it is clearly stated in the SOLAS convention that "ECDIS is considered to be included under the term charts". For some Flag States it is entirely evident that if ECDIS is in use as the primary means of navigation,

the user must demonstrate the same degree of knowledge as when working on paper charts. Therefore the officers of e.g. Isle of Man and UK registered ships need to have an IMO Model Course 1.27 certificate.

The second important regulation is the **IMO´s International Safety Management code (ISM).** It states: "The company should establish procedures that personnel (…) are given proper familiarization with their duties and equipment". This strict wording refers to the training of users of safety-related equipment, such as ECDIS. They must receive appropriate training to the systems in use on a particular vessel prior to use at sea.

An ECDIS manufacturer should be able to provide both generic and equipment specific training either onboard or ashore with a designated crew of highly qualified trainers. Some manufacturers even offer computer based or distance learning concepts which can be combined with simulator training ashore. This may save some

National authorities may require ECDIS training for vessels in their flag registries, or visiting their ports. The European Union has provided "Guidelines for Port State Control on Electronic Charts" with the Paris Memorandum of Understanding (PSC MOU). Port State control is authorised to determine if "Master and deck watchkeeping officers are able to produce appropriate documentation that generic and type-specific ECDIS familiarization has been undertaken."

Inspections might require physical demonstrations of competency by your crew as well as evidence of inclusion of ECDIS operation procedures in your onboard safety management systems.

Some commercial operators' vetting schemes have similar demands and non-compliance with their requirements could ban your vessel from trade. ECDIS training may also affect liability and insurance. You should also talk to your classification society and insurance/P&I club to see if they have any further requirements. An ECDIS manufacturer will be able to assist you.

time and money while maintaining a high quality of training. Make sure your selected training institute is following the IMO and manufacturer recommended training scheme and is certified by external auditors.

In order to enjoy a smooth transition from paper charts to ECDIS we recommend training designated personnel ashore. Major ECDIS manufacturers should be able to provide technical training and Train the Trainer courses for internal equipment specific training. This enables the shipping company to solve minor difficulties by themselves and provide ISM Code compliant training to the crew.

If you want to use ECDIS as a primary means of navigation, it's essential to understand your Flag State's requirements for certification. Under existing regulations you will need to obtain a certificate of equivalency to allow ECDIS to be used and fulfill the SOLAS chart carriage requirement. As a second step your crew needs to prove the knowledge and competency of ECDIS and its proper use.

USEFUL TIPS...

CREW TRAINING. In accordance with the above mentioned rules your crew should have appropriate knowledge of the use of navigational equipment and charts. When selecting a crew training supplier, you should pay attention that he is able to provide the same ECDIS as used onboard your vessel. Some ECDIS suppliers can offer you an international network of partnering training institutes. Make sure all your crew receives the same high level of training. Manage the crew training within the schedule of equipment installation and ISM code integration.

● There are many ECDIS suppliers on the market and it would be more efficient if navigators are trained with the same equipment to be installed onboard. Moreover, for large companies it could be worthwhile to employ in-house trainers and simulation equipment for knowledge refreshment and crew tests.

● From the 01st January 2012, all officers onboard ECDIS fitted vessels must have new STCW compliant ECDIS training. As a 5 year interim phase applies, qualified training institutes will become very busy. Make sure you book your courses well in advance.
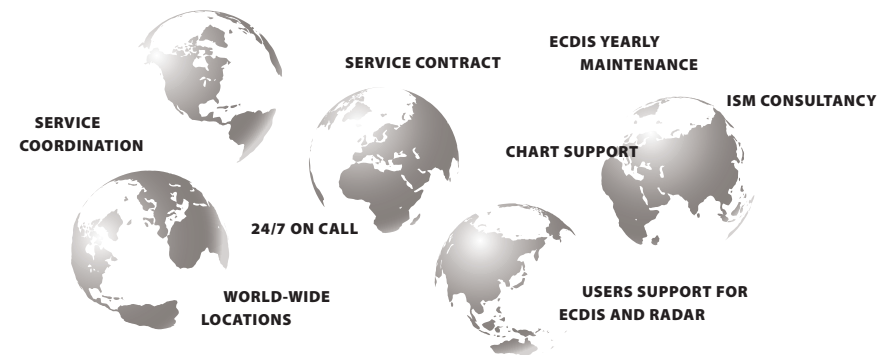
SERVICE AND MAINTENANCE

Service is a vital issue when selecting your ECDIS supplier. It's an important advantage to choose a manufacturer with a global service network and certified engineers able to support a shipping company any time and anywhere.

The following should be considered:

- ECDIS annual Service program should be implemented
- ECDIS supplier needs to have easy access to support vessels sailing paperless
- ECDIS supplier needs to offer 24/7 support
- Supplier has service locations in the biggest ports worldwide

SERVICE CONTRACT

ECDIS YEARLY MAINTENANCE

ISM CONSULTANCY

SERVICE COORDINATION

CHART SUPPORT

24/7 ON CALL

WORLD-WIDE LOCATIONS

USERS SUPPORT FOR ECDIS AND RADAR

USEFUL TIPS...

INSTALLATION ARRANGEMENTS. Select a proper supplier for your system installation. The systems should only be installed and set up by certified engineers. Try to synchronize the installation activity with equipment delivery to avoid "dead time".

- Be aware that the installation should follow ECDIS requirements in regard to power and sensor data supply. Many ECDIS suppliers do not provide a warranty if the system was not properly installed.

SERVICE. While general ECDIS requirements do not state this, in the event of a system fault a vessel may be considered unseaworthy.

- Check if your ECDIS supplier has 24/7 worldwide service available for the equipment you are going to install on your vessels.

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