

EMG White Paper

WHP001/16

May 2016

(First Published Aug 2008)

Type Specific ECDIS - Explained and Uncovered

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Abstract & Aim

As this is a White Paper about the transition from an analogue to a digital way of business, to ensure we achieve the aim it seems appropriate to first define what a White Paper is using a digital encyclopedia – Wikipedia. Wikipedia defines a white paper as “an authoritative report or guide that informs readers concisely about a complex issue and presents the issuing body’s philosophy on the matter. It is meant to help readers understand an issue, solve a problem, or make a decision”. Therefore it is this paper’s aim to not only raise issues with regards to ECDIS Type Specific, but also provide objective information and solutions to many of the problems being faced during the digital transition at sea. For the non-digital natives, or ‘digital fossils’ as they are unfortunately called, the good old fashioned English Dictionary defines a White Paper as “a government or other authoritative report giving information or proposals on an issue”. It would appear the definitions are almost the same, a theme that will be running through this entire paper i.e. the principles of navigation have not changed even during the digital transition! The plan is still to get from A to B safely without hitting anything or grounding, preferably on time, delivering cargo safely. ECDIS regardless of which Type Specific selected is designed to do exactly that if used properly, using well documented procedures, and to some degree, if you select the right ECDIS for the nature of your business.

This report has been produced by a team of experienced ECDIS users and officers who over the years have written many books, publications and articles on ECDIS featuring most of the 38 manufacturers including the IMO adopted ECDIS manual. It has been produced in response to the overwhelming requests from an international client base of over 250 shipping companies that want to understand more about the complex issues relating to the ever developing ECDIS navigation options required on an estimated 50,000+ international trading ships. The core issue of the complexity centres around the perceived varying standards of both the different ECDIS systems, and the associated training standards for the safe and effective transition from paper to ECDIS.

Although some of the 171 Member states and IMO have given guidance on ECDIS Type Specific procedures and training, there has been no definitive documentation addressing these issues and concerns. This paper looks to make the subject more transparent and open with the view of helping shipping companies and increasing safety at sea.

The transition to digital navigation has not been as smooth as perhaps expected, and the readers must understand that it is beyond the capability of the author to change this, or answer the question “should we have made the decision to change from paper to ECDIS”? This question has been heard argued time and time again on every continent from international maritime seminars to company meetings to the dinner table in the evening! Perhaps one of the main reasons for the issues has been the over confidence in our own ability to learn ECDIS. “Can’t we just read the manual”, “I didn’t need to learn how to use my mobile” (although I would argue that

your mobile phone is not your primary means of Navigation on a vessel worth USD 1 Billion....), “The kids will work this out quickly”, and the most common phrase I have heard travelling every continent meeting thousands of seafarers every year “I am an ECDIS expert”. Sadly with the regards to the last quote, very few of those ‘experts’ can tell me the menu structure on their ECDIS where you can turn land ‘off or on’ as a danger during the automatic scan route, and more importantly they can’t prove to me that their Officers know where all the 20 or so safety critical menus such as this one are, and that the System is set up correctly. I am not an expert, nor is my team. It is impossible to proclaim expert status on all 38 manufacturers and all their variants and updates. We are fooling ourselves if we think we can just turn it on and all will be well and we must be careful on self proclaiming as experts simply because we have been using it for a few decades. This White paper makes the point that digital transition nevertheless has happened, like it or not, and the aim now is to deal with the transition as safely as possible to ensure it fulfils the aim of ECDIS – namely: To increase safety at sea.

In summary, this White Paper has been created to help readers understand the issue, solve their problem, and help them make decisions in arguable the most complicated and significant evolution at sea since the transition from sail to steam.

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About the Author

After making the transition from paper to ECDIS navigation in 2004, Mark has been through the digital transition as a seafarer himself. Over the next decade he developed both the IMO 1.27 ECDIS model course and started the first of many type specific syllabuses as it became apparent in 2007 that the manufacturers varied substantially. His syllabus developments were added to the courses to compensate deficiencies in ECDIS, and has always been clear to point out that the equipment alone in no way makes a ship safer or more efficient. In his words “Robust training and procedures make ECDIS navigation safe”. He went on to train the trainers in ECDIS as well as personally deliver hundreds of Approved courses with almost perfection documented feedback.

In 2008 he won the annual Navigators and Directors award for his contribution to the Royal Navy for his role as the subject matter expert in their successful and safe digital transition. In 2009 he founded ECDIS Ltd and produced the first recognised Type Specific syllabus. This syllabus has been used by colleges and companies Worldwide. His company went on to become the largest global independent company in its field, offering over 30 courses to over 250 shipping companies, governments and military clients that span every continent. His company has written various ECDIS publications, including IMO adopted publications such as the ECDIS manual and the world first ECDIS procedure guide which has been adopted by companies worldwide increasing their safety.

In 2016 he was awarded a Fellowship in the Royal Institute of Navigation “In recognition of his significant innovative contribution to the development of the modern digital navigation and bridge team training in the global maritime industry”. He is an Associate Fellow of the Nautical Institute and a Committee member of the London branch and a Fellow of the Institute of Marine Science and Technology. He is a Freeman with the Honourable Company of Master Mariners.

His company, ECDIS Ltd, is now recognised as the independent mark of approval for courses and certification around the World.

About the eMaritime Group

The eMaritime Group is a collective of maritime based services that have been utilised for the production of this report. They range from ECDIS Ltd itself to ECDISregs (330K+ free downloads at the time this paper was written), to eMaritime exchange (Global portal for seagoing users of ECDIS that solves issues and questions through crowd sourcing and sharing knowledge).

A number of other references within the group were also utilised to produce this report. The full range of resources utilised can be found at www.eMaritimeGroup.com

Their free downloadable app available on Apple and Android is called the eMG app and offers up to 50% reduction in STCW courses.

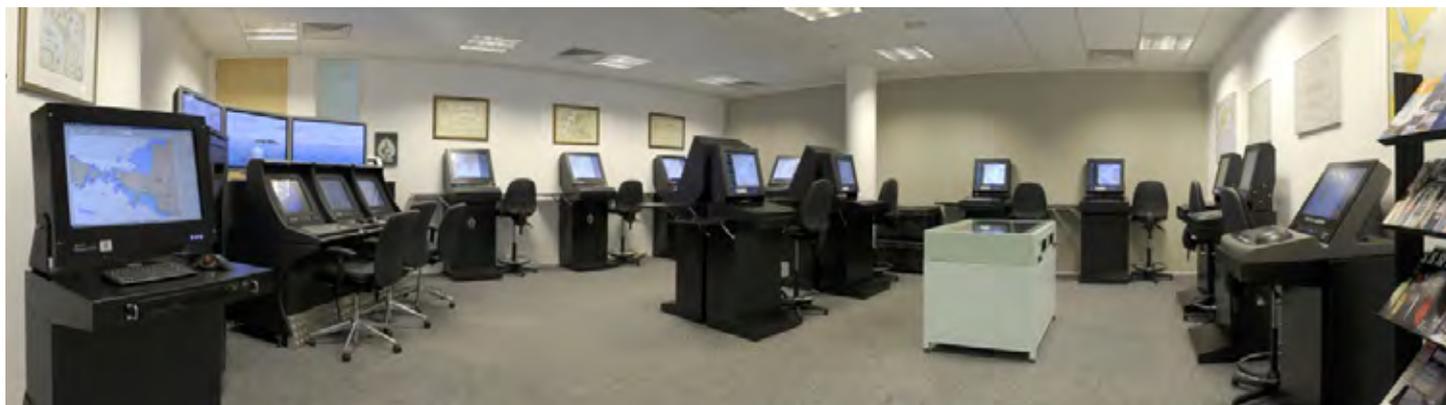
White Papers are distributed freely on request.

**Authorisation of the ECDIS Ltd
Training Manager is required**

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A standard mode to unify all manufacturers?

There is no standard mode, no matter how hard it may have been requested, and many would say needed. There was no standard mode in 1985 when ECDIS was first mentioned. There are 38 ECDIS manufacturers in 2016. They range from 3 left click menus to 16 right clicks, to hidden menus only available when highlighting a cursor on a certain area of the screen. They range in price from EURO 7,000 to EURO 45,000. End-user reports on reliability appears to range from 4 hours to a lifetime of no trouble. Some are compatible with AIO, some are not. They all vary in charting options, and some have moved completely away from the traditional Raster format (such as ARCS) as an option during periods of RCDS mode at sea.



Above: A Type Specific training classroom delivering 8 of the manufactures. In principle, all ECDIS systems are supposed to do the same thing, but do they?

The difference between the manufacturers in both functionality and capability is not getting less, they are getting further apart. There is only a minimum performance standard, but no maximum. Some exceed the minimum by so far that they integrate 20+ sensors including external ships equipment outside of the bridge to the ECDIS.

So what does the end user buy?

This part of the paper looks at the reality of this question and poses a far more interesting one – what do you want from an ECDIS? Some readers may be shouting **“reliability”**, others **“ease of use”**, **“charting options”**, **“good support”**, **“integration to other ships sensors”**, **“advanced functionality** such as auto-contouring and auto-fixing without any external sensors such as GNSS, for example through Echo sounder fixing etc. It would appear you can’t have it all. Sadly, it would appear that the main answer to the question of what do you want from an ECDIS is.....**“best price”**. There often lies the issue spread through our industry where end users, the men and women who actually use the equipment at sea, rarely get a voice into what they get, or how it can be improved so they can do their job better and safer. Price, reliability, good support, and functionality are all very different elements of the wish list when selecting from the 38 manufacturers, which one does the end user want?

The end-user of ECDIS



The different Type Specific ECDIS systems need to account for who is using the equipment.

Who is the modern seafarer?

We have heard much of generation Y and Z, but simpler format grouping the generation divide was popularised by education consultant Prensky in his 2001 article entitled Digital Natives, Digital Immigrants, in which he relates the contemporary decline in American education to educators' failure to understand the needs of modern students.

What are the expectations of the seafarer we are procuring this equipment for, and what is their capacity to learn and use safely. If we follow Prensky's model, a digital Native seafarer is one born after 1980, with technology essentially in his hand. Essentially, here we are in 2016, meaning a 36 year old seafarer is the first generation of mariners 'in Command'.

Perhaps this marks the current generation of seafarers as the 'transformation Generation' and the last chance for traditional seafarers to pass on (or not) their methods, ethics, and ideology before they have gone forever.



The Manufacturers



What did you originally buy a mobile phone to do?

What do you now want and expect it to do?

What do you want, or expect, your modern navigation chart to do?

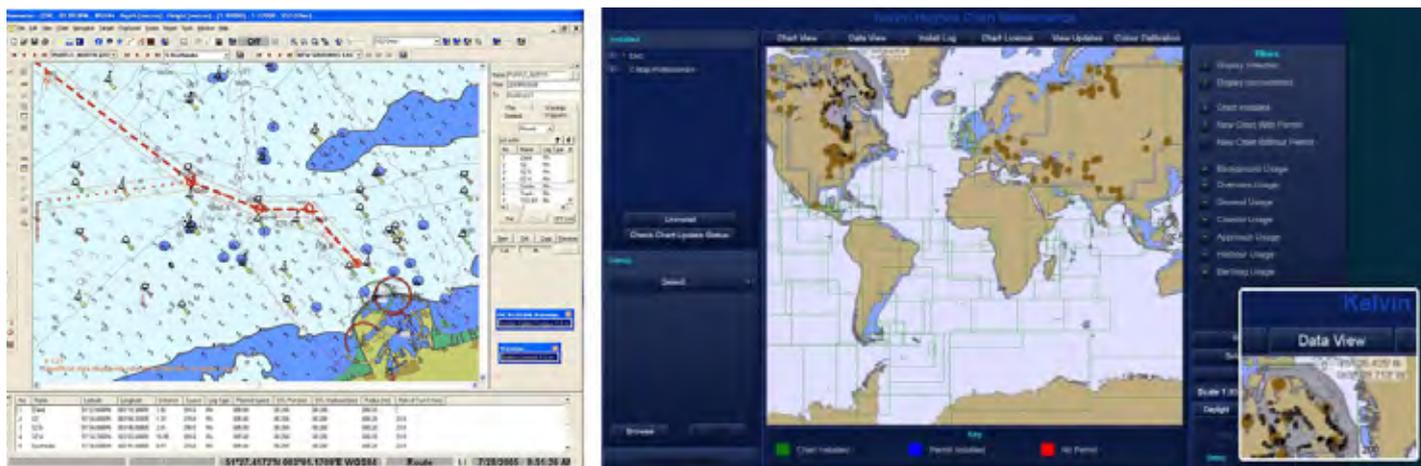
I was told by my mum to buy her a “mobile phone that just makes phone calls please”. Should an ECDIS ENC display simply show land/sea and the same navigational information a paper chart showed? Does the overlay of AIS, ARPA, and the vast array of display options detract the modern seafarer from what is needed for safe navigation, or does it enhance navigation. During this transitional period can a ‘digital immigrant Captain’ understand the Officer of the Watches chart set-up when called in emergency to the bridge in the middle of the night due to a potential risk of collision or grounding.

It is reasonable to assume that the Digital Immigrant was used to paper charts, North up, True Motion. It is reasonable to assume that the 23 year old 2nd Officer has his chart (ECDIS), Course up, Relative Motion, just like his car SatNav. This is the power of the new Digital Native. He/She probably also uses different chart symbols to perhaps those the Captain is used to, and shows many overlays on top of his chart such as shipping and RADAR but doesn’t consider this as ‘clutter’.

Who is right who is wrong? What is safe? Many argue that good procedures and guidance resolve this. The Worlds first ECDIS procedures guide was published by Witherby Seamanship and has successfully been adopted by shipping companies all over the World. However I still reviewing the SMS of digital vessels regularly, and under the chapter for Navigation, I often simply see “This vessel is fitted with ECDIS.” There is no guidance, support or best practice, and often no specific shipping company investment into how their equipment is used in some cases. At this point we can reflect on this paper so far by summarising, in some cases, the end-user doesn’t have say in buying it, but is told to safely use it, with no real support, procedures or company best practice.

The User Interface choice

Moving back to the modern Type Specific ECDIS, it does also pose the question of who is making these ECDIS systems and why are they producing them in the different formats. The 38 manufacturers vary in their operating systems from Windows NT to LINUX, although the majority are still based on the Windows XP or Vista system. This amazingly also offers significant variations in user interface and most importantly 'familiarisation' for the end-user. Now that we have considered who the end user may be, does this make a difference in which ECDIS your company uses?



The traditional Windows menu structure of File/Edit/Save, or the touch screen / graphical style interface?

The difference between the 2 operating systems ECDIS are typically installed on: Windows based systems vs Linux based systems.

Windows based systems are more popular due to being more compatible with hardware and other software. ECDIS software will be able to install and run over the background processes along with other applications. You can lock out the desktop and access to the task menu but they are still their running in the background and still can be accessed with the correct passwords. This does make it easier for applying security updates and patches to software and windows itself but does mean people may be able to access Windows to install own applications and software.

With a Linux based system, it is an open source software that can be very easily customised to run just the application (eg: ECDIS) it has been designed to. This does bring some advantages and disadvantages. The advantage is it is much more secure and slim line, meaning it will only run the software and applications that have been designed and installed. Due to the way you can customise the software it makes it very difficult to install any other software or applications making it much more secure. This can also be a disadvantage too.

Selecting a Manufacturer from a choice of varying capabilities



Do you want the complicated but perhaps time saving option, or the easy one?

The emergence of new technology in the field of maritime operations has seen most facets of fleet operations computerised or digitised in the quest to build, display and manipulate technology to our advantage. It is therefore surprising that many fleets are still navigating using paper charts, as the advantages and efficiencies available if ECDIS systems are used properly for navigation are significant.

Following a number of high profile groundings and the perception that ECDIS systems can save money, many fleets have made the bold decision to embark on a fleet wide ECDIS fit. As the first to do so, they are pioneering the use of ECDIS at sea. In short, these pioneers are showing that it is feasible to trust this new technology and make it work. However, for those that wish to follow their example the task can seem more than a little daunting. Faced with a blank piece of paper you now need to formulate a plan to 'go digital'.

NB: Elements of the below have been taken from an article written by ECDIS Ltd in 2010 and 2011 with their permission.

If we make the assumption that ECDIS (when used as the primary means of navigation) is a part of the 'Critical Equipment' on the bridge, surely we should take the time to construct a plan of how to implement this very specific piece of new equipment? Remember, this is potentially new to not only the Master and 2nd Mate, but also the engineers, shipping company, manning agency, Flag and the entire supporting mechanism to the vessel, who may have never seen the model of Type Specific ECDIS fitted before. Therefore the transition to digital is not a case of simply buying any ECDIS system and hoping for the best. Instead, this should be viewed as a major project that requires significant thought and planning.

The process can be simplified if we break it down one step at a time to ensure that all data is captured:

Step 1 – Capability Requirement i.e. Establish what you need.

Step 2 – Additional Requirement i.e. Consider the wider implications.

Step 3 – Consolidation i.e. Have we missed anything?

Step 4 – Equipment Purchase and Fit i.e. Make a decision on equipment and fit programme.

Step 5 – Training i.e. Start training.

Step 6 – Digital Transition i.e. Go paperless.

Step 1 – Capability Requirement

First, it is necessary to establish exactly what you need with regard to the ECDIS, both in terms of navigation and operations. The point is that making the digital transition is more complicated than just choosing a system to plan a route from port to port - the equipment must be suited to the nature of your operations. Therefore, due consideration must be given to thinking through all the evolutions that were conducted using paper charts to ensure that they can be achieved on ECDIS with suitable back up, redundancy and the robustness that is required in your fleet. A list needs to be made of what your expectations are from ECDIS. If they cannot be met, will you ever truly be able to 'go digital'?

Navigation



Locations I have visited, including maritime conferences and exhibitions, I have heard the same thing; angry seafarers saying “look out of the window”.



At this point of the selection and transition process, honesty is the most important attribute to the reader. There is no point in buying something that you will never understand how to properly use it (me and my fancy SLR camera!), nor is there any point in buying something that misses the key element that you need to go about your daily business (me and my over the top multiple monitors!).

We all navigate very differently, and therefore the Type Specific ECDIS we use may need to be different also. Let's not forget they vary dramatically in functionality and capability. Surely the equipment we use must reflect how we go about our business or we would need re-training in our principles of navigation.



Maritime conferences Worldwide often hear the screams "Navigate by looking out of the window!" Well, hang on a minute, to do that, you need to plan to 'Navigate' by looking out of the window. Navigating by looking out of the window still requires planning on paper, and therefore now ECDIS.

'Navigating by looking out of the window' is not simply keeping the red ones to the left and the other ones to the right.....that's dodgems not navigation? Plus who is to say they are in the right place?

Many look out the window to 'Navigate', equally, just as many look out the window for small objects not painting on RADAR and for special awareness but 'Navigate' by either a RADAR or ECDIS.

Let's look at those who actually navigate by looking out of the window.



This is the art (some would say dying art) of taking a visual bearing from a pelorus to calculate your distance relative to the planned navigation track, further safe water to Port and Starboard, and distance to wheelover, through use of trigonometry. We then have to see if your Type Specific ECDIS can do that.

First though, lets remind ourselves of the art, and then consider if the ECDIS can help us plan to actually navigate looking out of the window.

Step One - Distance off track.

- a) The Navigation track is 045 based on a headmark of a leading light.
- b) When taking a bearing of the leading light it bears 046 and is approximately 1 NM away.
- c) We are approximately 35 yards Port or left of track. If you don't like Yards that can be replaced by 32 metres, 105 feet, 1.16 Shackles, 0.159 Furlongs or even 0.02159 Roman Miles give or take – the point is, traditional mariners that assessed their position by looking out the window and taking bearing had a simple method of doing so, whatever units they were brought up to use!
- d) If it was 2 miles away we would be 70 yards or metres left of track, and so on.

Each degree for each mile is 35 yards or 32 metres of track. High means left or port (four letters in all 3 words which helped me remember!) Low means starboard.

Step Two – Further safe water available.

a) With the above example, we find ourselves 32 metres left of track as the headmark bears 046 not 045, so how much further safe water do we have to port until we ground? The traditional mariner who navigated by looking out the window had pre-planned on the paper chart their limits for being off track, usually based on the same headmark as step one above. For this example, if he/she knew that the 'left limit' was a bearing of 050, on the paper chart it would say "No More Than" or "NMT" 050.

b) This means that a bearing of 046 means there is a further 4 degrees of separation (difference between 046 and 050). Which means that we have a further 128 metres of water "safe" to Port (4 x 32 metres x 1 NM away). If the HeadMark was 2 NM away following the above equation we would have 256 metres of safe water, and so on, and so on.

Step 3 – Distance to Run until the next leg or 'wheelover'.

a) This is the final part, and most would say the easiest part of exactly calculating where you are relative to the navigation track by purely taking a bearing and looking out of the window.

b) The Navigator simply pre-plans on the paper chart the bearing the next headmark will be, at intervals of their choosing. This could be every cable, or just at 1 NM to go, ½ NM to go etc.

Summary

At this point the Navigator knows exactly where they are relative to track, how much further safe water they have available (as they assume they may go off track for shipping), and exactly how long to go until the wheelover.

There is a Step 4 for the advanced navigator however, but this is not a skill that needs to be transferred from Paper to ECDIS – as ECDIS does it automatically for you! This final step is time to wheelover or next leg.

Step 4 – Time to next leg.

Quite simply, the traditional navigator knew that when carrying out step 3 above, if he/she took a bearing of the next headmark and it indicated ½ NM to go (5 cables), they knew that at 10 Knots 5 cables takes approximately 3 minutes (36 seconds a cable). Therefore at this point that can make the wonderful statement:

“32 metres Port of track, a further 128 metres of safe water available to port, 3 minutes until the next alteration”

Usually with the hands in pockets, nice and calm, without looking at a screen or chart.....

Photo of paper chart use of visual bearings and similar planning on some ECDIS systems..... but not all.

Photo of paper chart use of visual bearings and similar planning on some ECDIS systems.....but not all.





Do you need a system that helps you navigate by looking out the window, or a system that helps you navigate safer with technology as you don't necessarily 'Navigate' any more by visual bearings and the windows.

Essentially, you must consider whether or not you wish to transfer all your existing paper navigational methods and procedures to ECDIS. If so, with regard to the equipment, ask yourself the following questions (not exhaustive and in no particular order):

- Can we plan berth to berth?
- Can we utilise headmarks, sternmarks and beam marks in our planning?
- Can we utilise wheel over bearings?
- Can the system construct accurate turns utilising Advance and Transfer?
- Can the system calculate turns when a tidal stream is present?
- Will it accept tidal and environmental information such as Admiralty Total Tide?
- Can it utilise our shape, characteristics and hydrodynamic data for precise navigation?
- Who will produce and input ship specific (perhaps confidential) information into the system?
- How will the navigator brief the port entry and exit if there is no paper chart to display?
- Can we network a printer to print out screenshots (for the navigator's notebook, for example)?
- Can we print out passage plans and related information?
- How are we going to operate in areas of GPS denial?
- Does it work well without GPS?
- Can we manually fix position with visual bearings?
- Can we manually fix position with radar ranges?
- Can we plot a position using transferred position lines?
- Can we plot horizontal and vertical sextant angles?
- Can we accurately define safe water in confined waters?
- Can we construct Limiting Danger Lines?

- Can we construct Clearing Bearings?
- How will navigation be conducted in emergency for example, when operating from the emergency conning position without paper charts?

Of course, not all considerations above will be relevant to you, but care must be taken to ensure that the requirement is captured as not all systems can achieve all of the above list.

Operational

With regard to the operational aspect of ECDIS, consider the following (not exhaustive and in no particular order):

- How are we going to plot our helicopter position?
- How are we going to plot the location of our tenders?
- Can we use the system for management of assets?
- Can we display weapon arcs and effective ranges for onboard security teams (anti-piracy)?
- Can we display overlays to aid counter piracy?
- Can it display bespoke chart products that may be available for your operations?
- Does it offer greater security with regard to login?
- Can I plot different grids for us on operations?
- Can it help with vessel protection with the growing aspiration to use ECDIS for anti-piracy?
- Can it make areas alarmable?
- Can we feed data from onboard command systems in order to improve spatial awareness?
- Can it be utilised for bespoke tasks such as for oil slick plotting, for example?
- Can it be used in conjunction with optimum route planning software?
- Can it be used in conjunction with shipping databases such as Lloyd's Register Fairplay?
- Can the system predict a MOB position using set and drift or is it just a reference point?

ECDIS equipment capability has advanced considerably over the years and varies from system to system. Not all systems will be able to achieve the above lists, but some can. At this stage please consider taking free independent advice from ECDIS Ltd as to the most appropriate system for your needs. However, to reiterate, first and foremost the system will be utilised as a navigation aid. Therefore, it is vital to ensure that the system can reflect your standards of chart work and navigation. If it cannot, then you may have to change your tried and tested methods. Consider that if the chosen system cannot achieve your requirement, does that mean you will be forced to make some paper charts available from time to time? If so, this would clearly defeat the aim, which is after all, to go fully digital.

It is at this early stage that a decision needs to be made as to whether the plan is to equip the fleet with a single equipment solution, or whether different types of equipment spread amongst the fleet will be considered. Clearly, the ramifications of fitting your fleet with varying types of equipment will be enormous, from different levels of capability and an inability to

transfer data between systems to the need to produce multiple training streams for crews, technical training for engineers and so on.

Step 2 – Additional Requirement

Experience has shown me that the cheapest option on initial quote may end up being the most expensive overall when you add in the other elements beyond the initial hardware tender. Training, for example is a significant factor, as is integration of existing sensors and hardware. It may be too late to change once you have bought a system for the fleet so this is where you must ensure the longevity of your system and do as much as possible to future proof it. Ask yourself again, what do you want the ECDIS to do? Let us now consider the bigger picture (not exhaustive and in no particular order):

Hardware

- Is there an ECDIS system that best suits your class of ship (fast ferry, for example)?
- How many vessels require fitting with ECDIS?
- What is the cost of fitting?
- Where are the vessels going to be fitted (fit cost may vary dependent upon location)?
- How many systems do you need – two per ship?
- What screen size do you require for the display?
- What are the requirements for display power, housings and brackets?
- What is the support package available?
- How long does the warranty last?
- Will the systems be networked on a LAN?
- Do you want an additional remote terminal for planning or emergencies?
- Do you need repeats in the Captain's cabin, charthouse or operations room?
- Do you need a repeat in the machinery control room for MARPOL purposes?
- Do you want to store spare parts to support your fleet?
- How much are spare parts?
- What is the availability of spare parts?

Integration

- Do you require integration with a bridge Alarm Management System?
- Can it integrate with existing sensors such as GNSS, Log, Gyro and Echosounder?
- Can it integrate with existing Radar and provide Radar Image Overlay (RIO)?
- Can it integrate with NAVTEX?
- Can it integrate with the existing autopilot or Track Control device?

Remember that the Performance Standards for ECDIS (IMO A.817(19), revised by MSC 232(82)) state that as a minimum, ECDIS should be connected to the ship's position fixing system, to the gyro compass and to the speed and distance measuring device. Note that for ships not fitted with a gyro compass, ECDIS should be connected to a marine transmitting heading device. When connecting to additional sensors, ECDIS should not degrade the performance of any equipment providing sensor inputs, and the connection of optional equipment should not degrade the performance of ECDIS below the set standard.

Software

- Do you need specific planning software?
- Do you require Conning and Docking functionality?
- Do you require navigation tools such as Predictor and Trial Maneuvering?
- Do you require an electronic Logbook function?
- How much are additional software licenses?
- How much are the inevitable upgrades to the software and presentation library?

Charts and Miscellaneous

- Can the manufacturer provide equipment procedures and check-off cards?
- Can the system utilise the charts that you are used to?
- Do you require ENCs and RNCs?
- Do you require DNCs?
- Do you require Ice charts?
- Can it display the Admiralty Information Overlay?
- Will you require an additional (appropriate) folio of paper charts?
- How will folios be updated?
- Will the systems be linked to the internet for updating purposes?
- If connecting to the internet an approved firewall and anti-virus protector are required.

Training

- Is there training available with the manufacturer?
- Is there Flag state approved training on this equipment in accordance with STCW?
- Is there equipment specific training available on this equipment?
- Is there an option to purchase the approved training course to save the cost of time and money in producing one 'in house'?
- Do you require technical training for your engineers and maintainers?

Training is integral to a successful transition from paper charts to ECDIS. Crews need to be properly trained in the use of their system in order to navigate safely. This is not something that can be taken lightly as training cannot be conducted in a few hours. ECDIS presents a step

change in the way we conduct navigation at sea, and as a critical system this needs great care and consideration in order to get the most out of the equipment whilst maintaining safety. The following courses will be required:

- A Flag State approved IMO 1.27 Model ECDIS Course (40 hrs or 5 days).
- Equipment Specific training course if different manufacturer's equipment has been fitted (recommended duration 8 hrs or 1 day).

It is essential that training is considered well in advance of the ECDIS fit to reduce the period of time between training and onboard use to avoid skill fade. Note that some Flag states such as the MCA now require equipment specific training in addition to the 5 day generic ECDIS training course. This ECDIS 'ship specific equipment training' should relate to the make and model of the equipment fitted on the ship on which they are currently serving. That is to say, it will be necessary to attend a training course for each different system a Master or Navigation Officer is expected to operate. Although this has been part of ISM for some time, the MCA specifically states that 'trickle down training' (i.e. one officer training another) is not acceptable as, inevitably, it leads to incomplete knowledge of the equipments capabilities, and especially the lesser used functions, being passed on.

It can be seen therefore, that the training burden is significant if multiple systems are in use throughout the fleet and where Flag State approved generic training is not available on your chosen system. Due consideration must also be given to the fact that the above courses are not necessarily for life as they may need to be undertaken at stated intervals or if the equipment significantly changes.

The training element is going to take a lot of time, particularly with a large fleet. However, you do not need to wait for the fit programme to start before embarking on the training programme. By doing so you will alleviate pressure and have trained personnel ready to begin the next phase of the project.

Step 3 – Consolidation

Now take a step back and make sure that you are not missing anything before purchasing the equipment. What are the key elements that must be satisfied when choosing your ECDIS? You must be able to place a tick in the box next to all of the below questions at the beginning of this adventure, or you are slowly heading towards the inevitable disaster! With regards to the equipment:

Is it ready now?	<input type="checkbox"/>
Is it type approved ECDIS?	<input type="checkbox"/>
Can it integrate with existing sensors?	<input type="checkbox"/>
Can it employ my navigation techniques?	<input type="checkbox"/>
Does it come with a full training solution?	<input type="checkbox"/>
Does it offer proven pedigree and global support?	<input type="checkbox"/>
Have I balanced the best product with the overall price?	<input type="checkbox"/>
Is it 'future proof' and easily upgradeable for new techniques?	<input type="checkbox"/>
Will the whole package allow my fleet to 'go digital' with minimum fuss?	<input type="checkbox"/>

Step 4 – Equipment Purchase and Fit

All the work conducted producing the requirement is now complete and the effort expended will hopefully be rewarded. The next stage is to make a decision on which equipment is the most appropriate for your needs, based upon the work conducted in the earlier steps. If you are intending to conduct training 'in house', then consider Step 5 prior to purchasing equipment as there are additional purchases and considerations to make. Once the decision is made the equipment can be purchased.

When constructing the fit programme consider what ships will be fitted first and last. Of course, this may ultimately depend on the fleet operations, maintenance and refit schedule. It is worthwhile documenting lessons learnt from the first fit so that mistakes are not duplicated throughout the fit. Furthermore, if possible, maintain some form of continuity of fit personnel to ensure that standards are maintained with as few irregularities between ships as possible. Once equipment is fitted it is essential that the equipment is properly integrated with sensors, aligned with Radar Image Overlay (RIO) if applicable and tested with a set to work package to ensure that what you have fitted meets with expectations.

Step 5 – 'In House' Training

If you are considering conducting training yourself, or 'in house' training, then you must consider the time and manpower cost of producing the following:

- A stand alone ECDIS course, bespoke for the equipment purchased.
- Gaining Flag State Course approval.
- Classroom equipment and training consoles.
- Training licenses for software.
- Provision of a bridge simulator.
- Integration of ECDIS into the bridge simulator.
- ECDIS instructors.

All the above takes considerable time, money and most importantly, expertise. I cannot emphasise enough the importance of considering training at the very beginning of the process.

Step 6 – Digital Transition

The final phase of the process is to conduct the transition from navigating with paper charts to being accredited to navigate paperless using ECDIS. Note that this depends upon your Flag State and it is therefore crucial that you seek advice from Flag, who may have to be involved in this process to ensure that you meet their standards. It is recommended that a lead ECDIS inspector be nominated to manage this process and to act as liaison between the Flag authority and the Fleet as required.

It may also be prudent to construct a short 'in-house' accreditation process to risk assess the ship's ability to 'go digital'. This would ultimately ensure that the crew are confident and competent to operate using ECDIS as safe as they could on paper. This is the most enjoyable part of the process as you see the results of good training and planning come to fruition.

The following are examples of assessed serials that could be included as part of any risk assessment process:

- System set-up
- Safety settings
- Administration
- Documentation
- Procedures
- Berth to berth planning
- Pilotage
- Blind Pilotage
- Coastal Navigation

- Anchoring
- Fixing
- Operating without GPS
- Loss of sensors

The risk assessment serials could be conducted in a simulated environment, although the preferred option should always be to conduct them at sea. It is a recommendation that only when you are content that this has been achieved should you authorise the reduction of paper folios down to that required for RCDS mode or in accordance with your company policy.

Summary

Selecting the right ECDIS is the starting point. Everything that follows that is dramatically affected by the capability of the ECDIS you select and to some degree the level of support and training you will need. Depending on the ECDIS you have will also affect the changes you may need to make to company policies and procedures. If you have an ECDIS that cannot perform all the attributes you required on paper, are you going to change the way your entire Fleet Navigate.....or buy a different ECDIS or go back to paper...?

Remember – all 38 conform to a minimum standard, but there is no maximum. The minimum standard may not encompass YOUR standard. Select wisely and please consider the above advice.

The GNSS/GPS argument



It is absolutely true that on all ECDIS systems you can still automatically plot your position without any continuous external input such as GPS. It does not need to know GPS to know where you are or where you are going! All 38 have the ability to navigate in DR mode utilising the ships Gyro and Log which form part of the numerous sensor input into ECDIS.

GNSS frailty and the reliance on GNSS is a common argument against ECDIS, even though the obvious seems to have been overlooked. Paper charts suffer from the same problem, as GNSS frailty also affects the position plotted on the paper chart. Furthermore, reliance on GPS is just as big a problem using paper charts as it is with ECDIS. However, the performance

standards that govern ECDIS (IMO A.817(19), revised by MSC 232(82)) state that ECDIS must be able to calculate the position of own ship using bearing and distance Lines of Position and should also indicate discrepancies between positions obtained by this method and those obtained by continuous positioning systems (MSC 232(82), 11.4.15.1 & 11.4.15.2). Notwithstanding this redundancy in ECDIS, it can be argued that GNSS frailty is not the issue, but instead it is the reliance on GNSS by watchkeepers that is the problem.

For example, when navigating using paper charts it would be foolhardy to plot the ship's position and accept it as correct. Indeed, any OOW worth their salt would conduct an 'idiot check' to ensure that the plotted position was where the ship was expected to be, that is to say, at or near the EP position and that it tied in with other sensors and what they saw out of the window. The OOW would then DR and EP on. Good training and practice bears this out and anyone who does not follow this principle is standing into danger. This practice should be no different when using ECDIS as although the medium of navigation is different, the fundamental principles are the same.

"Roll-up Roll-up, buy your GPS jammers here online....."
Illegal but sadly very easy to make or buy.



ECDIS also provides additional benefits when plotting fixes. When using GNSS a fix can be plotted automatically every second with the accompanying DR/EP calculation displayed. When a manual fix, say by visual or radar means is inserted by the operator, the system automatically plots the DR or EP position. This theoretically makes it possible to plot a visual, radar fix, for example, much quicker than on a paper chart. The only inconsistency is the level of intuitive design of the manual fixing function within the ECDIS, some being better than others. The fact of the matter is that the functionality of ECDIS reduces the navigational workload compared to using a paper chart. However, good training and procedures are required to practice the safe use of ECDIS in this regard so that efficiencies are realised:

- a. In areas without GNSS
- b. In areas of poor GNSS quality
- c. To prove the ECDIS derived position correct
- d. In DR or EP mode

Again, let us put this all in perspective and remember that the plane you fly on for your holiday uses GNSS with the same frailty as ships at sea, but the crew know how to navigate without it. Would you consider not boarding the plane if they didn't? Would you be happy to fly if the Officers on the plane learnt how to use their primary means of navigation by 'playing with it'?

Summary

How likely are you to lose GPS, and if you are, for how long?

Do you need to be prepared for DR mode for a short time, or EP mode for a longer period? Can your ECDIS do both? Answer – not all can integrate predicted tidal stream, not all can input manual tidal stream for automatic calculations.

Training on ECDIS



I received no training in how to use my mobile phone, which is currently an iPhone 6. I did not go on a 5 day (40 hour) Flag State approved generic course on using a mobile phone, nor a 1 day Type Specific training course by a specialist iPhone training company, or apple themselves. Amazing I still know how to make phone calls. Some would argue it is due to the ease of the iPhone interface (which I am sure I could replace with any other modern Android or iOS device and be as user friendly with practice), but I would argue that I picked it up quickly as I had been using phones for a decade before my first ever mobile! However the modern new seafarer has had this equipment thrust upon them, without the years of background and understanding of the principles of navigation, which in most cases are no longer taught.

My navigation training started with how to navigate by looking out of the window using simple trigonometry to know my exact position relative to track, wheel over, and further available safe water to port and Starboard. They were called clearing bearings, and how "in the old days" we navigated by looking out of the window. I do mean navigate by looking out of the window, not simply bouncing between the buoys or by simply knowing the local area. However no, the concept is follow the red line, which you probably did not produce, and don't go off it or someone will shout at you. This is prevalent when you look at the series of recent grounding involving ECDIS, where often they were aground, but on track...

Can we point blame at recent groundings on the different 38 ECDIS manufactures, their usability and interface? Sadly we know that most groundings and collisions take place due to the human element. The award winning 'The Human Element' produced by the MCA addressed key facts before looking at how we can make the human part of navigation safer.

In 1997, a P&I Club reported that human error dominated the underlying causes of major claims. It was responsible for 58% of all such claims – a figure that has not changed for ten years. Over the same period, the other main cause – ship failure – had decreased by two-thirds. In the five years to 2005, an average of 18 ships collided, grounded, sank, caught fire or exploded

every single day. Incredibly, two ships sank every day. The Standard P&I Club estimates that over a recent ten-year period, insurance claims cost the P&I industry US\$15 billion. That's US\$4 million dollars every single day. Over 65% of this vast payout – an amazing US\$10 billion – was for incidents in which humans played the dominant part.

Alarms are undoubtedly on right now, but amazing at the time this photograph was taken, the Officer driving the ship is still asleep on the bridge. If the sounds of a grounding cant wake you, will a 75dB alarm?

Does Type Specific training work?

Introduction

It is difficult to gain a truly impartial view of the state of ECDIS training. Providers do not publish feedback often, and it is understandably quite daunting to so do. It's also tempting when presenting feedback to apply selectiveness to what is published, in order to reinforce points you wish to make at the expense of those you wish to ignore.

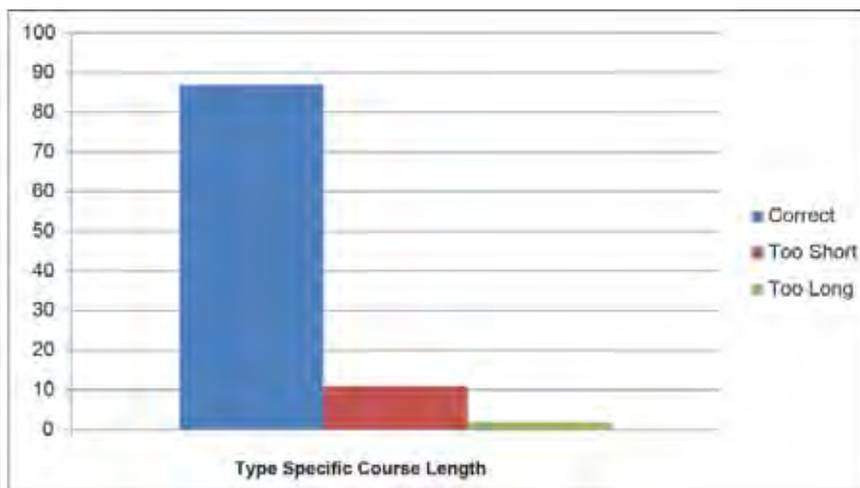
The purpose of this part of the paper is not to provide the picture we wish to paint. It is instead to reflect, to the best of our ability, the perception the customer holds of the state of training for Type Specific ECDIS courses. It is hoped that this will help inform both the provision and development of ECDIS training with a view to ensuring the best service is provided to mariners, no matter who is providing that service.

We will not be providing answers, but we do hope to provide the reader with sufficient information to draw their own conclusions – and comments are provided to provide some analysis to the numbers. The statistics and percentages presented here are constructed from a survey of feedback from 100 Type Specific Course students. This is obviously a fraction of the numbers of students taught, but it is a continuous sample over a fixed period and every student taught during that period has been included regardless of their opinions about the course they attended.

Headlines – Type Specific Training

Course Length

8 Hours of instruction is considered to be the correct duration by 87% of students.



Comment – We conduct one day Type-Specific training courses, which tend to be very long days for both instructor and student. However, it would seem that most students would prefer to complete the work in one day to reduce the amount of time spent away training.

Overall Course Satisfaction

Much like the 1.27 course, the majority of students reported very positively on Type Specific courses as a whole, regardless of the system covered.



Course Content	94.0%
Instructor	96.6%
Facilities	91.2%
Value For Money/Time	92.1%

Comment - The TS course is quite intensive, and people's experience of it frequently varies depending on how well they adapt to it in a very short space of time, and how well they have been prepared for it by previous learning and experience.

Type Specific Course Feedback

Headlines

These are the overall totals in each category for Type Specific training, regardless of the brand of system being covered.

Comment - With the exception of Instructor rating which is almost identical, the percentages here are consistently higher than for the 5 day course. Perhaps the short course length and specific relevance in response to a requirement that students need may go some way to explaining this.

Student Comments

Freehand comments are rarer on Type Specific feedback forms, and tend to reflect a single aspect rather than overall views of the course.

Positive comments:

- Specific training on how to use the ECDIS without GPS, or when it is degraded is very useful
- Good highlighting of system deficiencies and explaining how to work around or with them
- Ability to provide onboard training when requested is welcomed

Negative comments:

- Very intensive
- Lots to cover

Comment - The ability of students to get through the course depends on the quality of the 1.27 course they attended, and how much they retained from it. Sometimes it becomes apparent that the level of general ECDIS knowledge is insufficient, and can result in a recommendation for retraining.

Section 1 – Organisation & Domestic

How well did the timings for the course work for you?

88.4%

Recurring good comments:

- Tough day, but very rewarding.

Recurring negative comments:

- More breaks needed, perhaps run over 16 hours (2 days)

How convenient was the training location?

87.3%

Recurring negative comments:

- Had to fly to UK from abroad to conduct the course

How would you rate the facilities?

95.0%

Recurring good comments:

- Actual equipment from sea
- Very well looked after, luxurious surroundings

Recurring negative comments:

- None

How would you rate the Joining Instructions?

94.2%

Recurring good comments:

- Easy to find
- Free parking just outside front door.

Recurring negative comments:

- Better directions maps from airport
- More local taxi numbers

Section 2 – Course Evaluation

To what degree did the subject matter meet your expectations?

89.0%

Recurring good comments:

- Unbiased training of both the good and bad aspects of the particular ECDIS

Recurring negative comments:

- Needed more background understanding of generic ECDIS before course, therefore struggled on Type Specific course

Was the subject matter informative and helpful?

89.8%

Recurring good comments:

- Good for understanding system operation

Recurring negative comments:

- None

Is what you learned applicable to your current job?

91.2%

Recurring good comments:

- More applicable than most other courses. I use ECDIS every day

Recurring negative comments:

- Still a “paper” ship.

Is what you learned applicable to your professional development?

90.4%

Recurring good comments:

- Covers all aspects from OOW use through to overview needed by Master

Recurring negative comments:

None

How relevant was the subject matter?

92.8%

Recurring good comments:

- Used daily

Recurring negative comments:

- None

Comment – Relevance for Type Specific should, in theory, be approaching 100% both for current job and professional development. It is slightly puzzling as to why it isn't marked as such.

Section 3 – Course Content

How do you rate the quality of the course handout?

90.7%

Recurring good comments:

- Excellent reference guide for the equipment

Recurring negative comments:

- None

How do you rate the quality of the presentation slides?

92.0%

Recurring good comments:

- Straight to the point
- Exactly what navigators and watch keepers need to know

Recurring negative comments:

Need a longer course

How do you rate the quality of the presentations?

93.2%

Recurring good comments:

- Great practical demonstrations from experts of the system
- Good to hear an actual experienced navigator's experience/understanding of the equipment.

Recurring negative comments:

- None

How do you rate the equipment used for the course?

92.6%

Recurring good comments:

- Actual ECDIS equipment

Recurring negative comments:

- Would prefer to share a terminal, rather than one to myself

Comment – This last answer is perhaps the most surprising of the entire survey. However, it is noticeable that students frequently work better when they can discuss it with another, and try to work through problems together.

Section 4 – Trainer Evaluation

How well did the trainer know the subject matter?

97.7%

Recurring good comments:

- No menu left unexplained
- Excellent examination of good and negative aspects of the system

Recurring negative comments:

- None

How well prepared was the trainer?

95.8%

Recurring good comments:

- Having an experienced user from sea makes the difference, you can ask random questions.

Recurring negative comments:

- None

How good was the trainer at transferring his/her knowledge to you?

96.1%

Recurring good comments:

- 'Line at a time' practical exercises help bridge the language gap

Recurring negative comments:

- None

Section 5 – Cost

Was the training good value for the money it cost?

90.0%

Recurring good comments:

- Well worth it, and a great one day course

Recurring negative comments:

- None

Was the training good value for the time it cost?

89.6%

Recurring negative comments:

- Prefer a little longer than an 8 hour course module

Section 6 – Overall

How would you rate the course overall?

90.0%

Recurring good comments:

- Incredibly useful

Recurring negative comments:

- Some lacking generic knowledge made the type specific course difficult at times

What are the chances of you recommending (this training provider)?

93.2%

Recurring good comments:

- Excellent!
- Stats book stuff

Quantifying Training works... or Not.

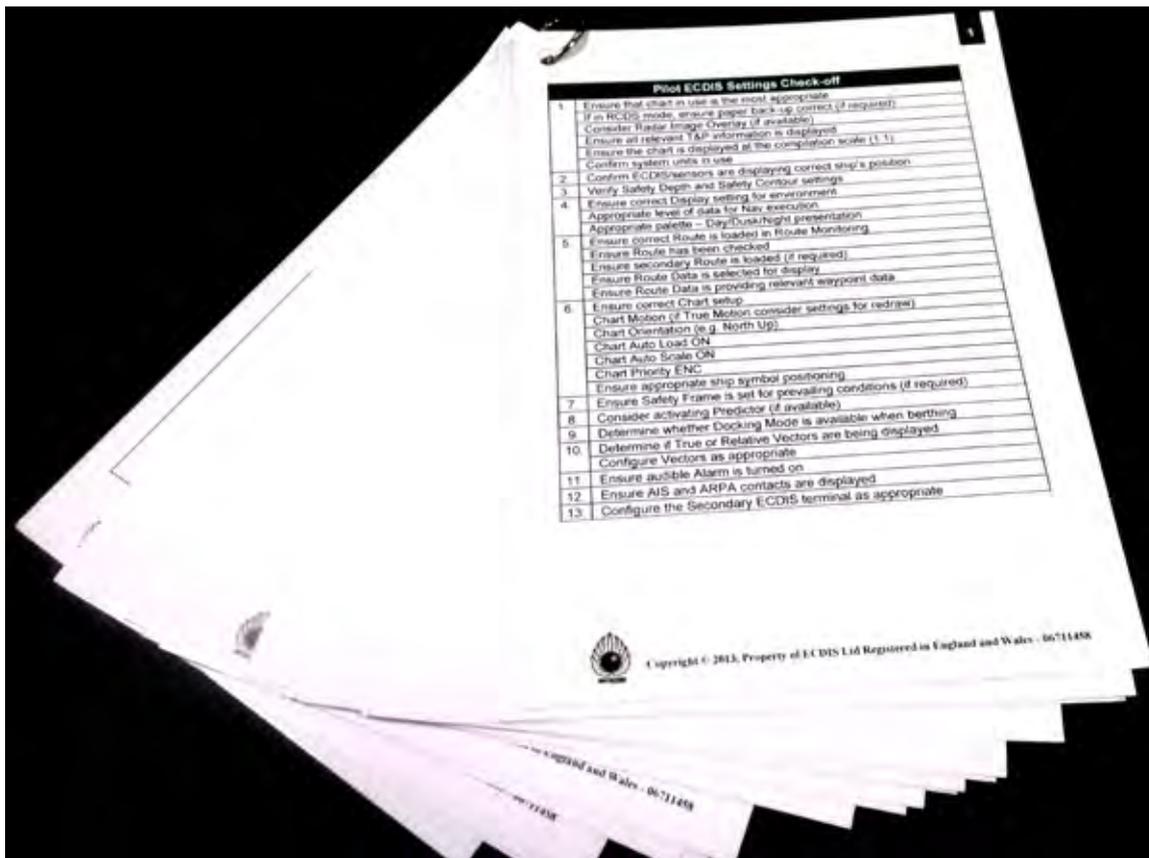


A significant research project is taking place in England on the actual usability of the different ECDIS systems and the impact training actually has on mariners ability to use them efficiently and safely. The project involves monitoring mariners performance pre and post training, monitoring how long mariners take to get to the relevant information they need on the different ECDIS systems, and several bench-marked tests that look at usability and interaction required with each of the manufacturers.

The project which looks at the impact of a wide spread of STCW courses, as well as Type Specific ECDIS may take over a year to complete and submit. However, an update on how the project is performing can be viewed at www.eMaritimeGroup.com/research



On-board Familiarisation check list



We all flatter ourselves that we are wonderful navigator and never forget anything. Sadly this is not totally true the average human being can remember 7 things (this was the premise that the conveyor belt on “the generation game” was based on).

The more pressure we are under the more likely we are to forget something and let’s be honest at sea we are always under pressure. Equally the less frequently we do something the more likely we are to forget a constituent part.

If we take a clue from the aviation industry they employ check off cards all the time so that there is no chance of anything being overlooked.

If we employ the aviation model we should be looking at having check off cards for such routine conditions as:-

- Ocean Passage
- Coastal passage
- Harbour approach
- Pilotage
- Anchoring.

In addition we should have check off cards for “emergency scenarios. In a perfect world there would be cards for all possible scenarios, however, this is not possible but consideration should be given to :-

- Fire on board
- Collision
- Taking water
- Man overboard
- Extreme weather

“other” on board emergency.

Your company may have such cards, which is a desirable situation as it enables the office to consult the same cards as the ship. If not they are commercially available from many providers including eMG group.

Approved Type Specific Training Guaranteed

There are now many forms of Type Specific training available throughout the World, since the first bespoke ECDIS TS packages in 2007 by ECDIS Ltd. TS training is now delivered through a wide spectrum ranging from a full 5 days on a TS based on the model 1.27 course, through to on-board check list and CBT. Naturally if money and separation time

was not an industry we would all want the best and longest training packages, but that is not the case and often the minimum clarification on regulations is what sadly many look to achieve.

It is important to note at this point that the term Type Specific is the term used in the majority World-Wide, but Specific make and model training may also be referred to by some member states as either Familiarisation, Ship Specific training or Equipment Specific training. For the purpose of the below clarification, I am grouping them together as one.

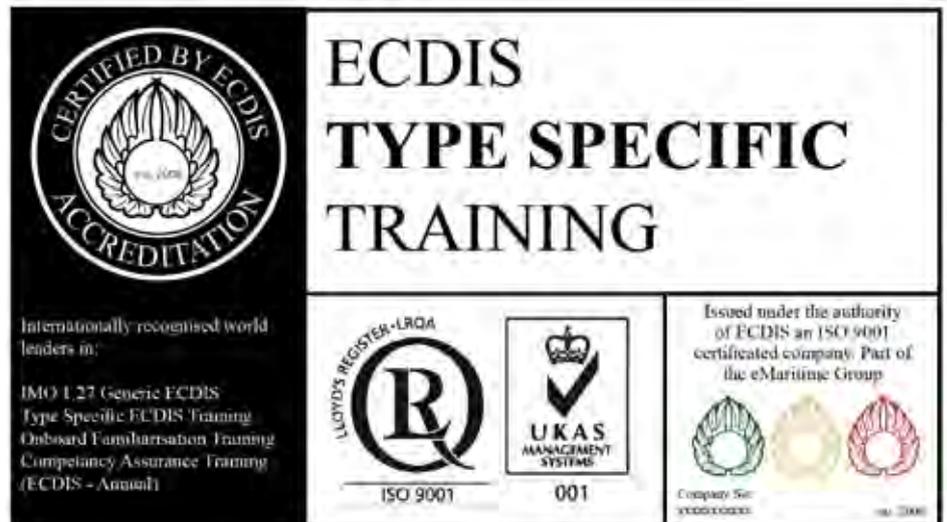
Clarification on Regulations (at time of print)

Without taking the easy way out of a difficult questions, to some degree, what constitutes at Type Specific Training completely depends on both company interpretation of ISM and the interpretation of the 171 IMO Member States and 3 Associate Member states.

However this White Paper wrote produced to try to give guidance in this complicated issues.

Therefore I will refer to the United Kingdom's (UK) current MIN as an example, and then look into the references for more advice to the reader.

Extracts of the current UK MIN which expires on 9th April 2019 is below. The highlighted areas shows the decision on what constitutes ship specific training is placed on the ship owner or operator. Further guidance is provided.



MCA MIN 503(M)

3. ECDIS Ship Specific Training

3.1 ECDIS ship specific equipment training for Deck Officers must relate to the make and model of the equipment fitted onboard the ship which they are currently serving.

The decision on how to deliver ship specific training is now the responsibility of the ship owner or operator.

They must take into account their responsibilities in accordance with ISM code (specifically sections 6.3 and 6.5) and also the STCW convention, Regulation I/14 - 5:

ISM: 6.3 "The Company should establish procedures to ensure that new personnel and personnel transferred to new assignments related to safety and protection of the environment are given proper familiarization with their duties. Instructions which are essential to be provided prior to sailing should be identified, documented and given."

ISM 6.5 "The Company should establish and maintain procedures for identifying any training which may be required in support of the safety management system and ensure that such training is provided for all personnel concerned."

STCW Convention regulation I/14 - 5: Every company shall ensure that: "Seafarers, on being assigned to any of its ships, are familiarized with their duties and with all ship arrangements, installation, equipment, procedures and ship characteristics that are relevant to their routine or emergency duties".

Is it an ISM requirement to refresh ECDIS certifications or best practice?

Under the ISM Code, the shipping company has the responsibility to ensure that: 'all personnel involved in the Company's SMS have an adequate understanding of relevant rules, regulations, code and guidelines' (Section 6.4), and to 'establish and maintain procedures for identifying any training which may be required in support of the SMS and ensure that such training is provided for personnel concerned'.

This means that if a ship is equipped with ECDIS, the company has the duty to ensure that users of such a system are properly trained before using the ECDIS operationally at sea. The STCW Convention puts the onus firmly on the company to ensure that mariners on their ships are competent to carry out the duties they are expected to perform. This means that the operators must be trained to use the particular ECDIS on the vessel.

It is reasonable to assume that ECDIS Manufacturers update their software constantly, such as to conform to the latest S52 Standard. Therefore one could argue that YES it is an ISM

requirement to maintain current knowledge of this evolving equipment, and YES it must be considered best practice.

Therefore should ECDIS TS training be conducted or 'Toped-Up' every year?

Not all manufactures will up to date their software every year. Nor will every year bring a change in charting standards such as a revised S52, S57 or S100. Equally, in those cases, it is also fair to assume that the Officer who completed the training maintained 'currency' in their TS ECDIS by using it on a daily basis.

However, there are often times when the above is not the case, and it could be suggested under the above ISM reference that re-training or re-familiarisation is a reasonable requirement.

There are several options to achieve this and the White Paper goes onto to suggest one model on page 86 called ECDIS Annual Competency Assurance Training which is £200, per Hull, per year, per Specific Type of ECDIS (regardless of crew and Officers numbers who complete)

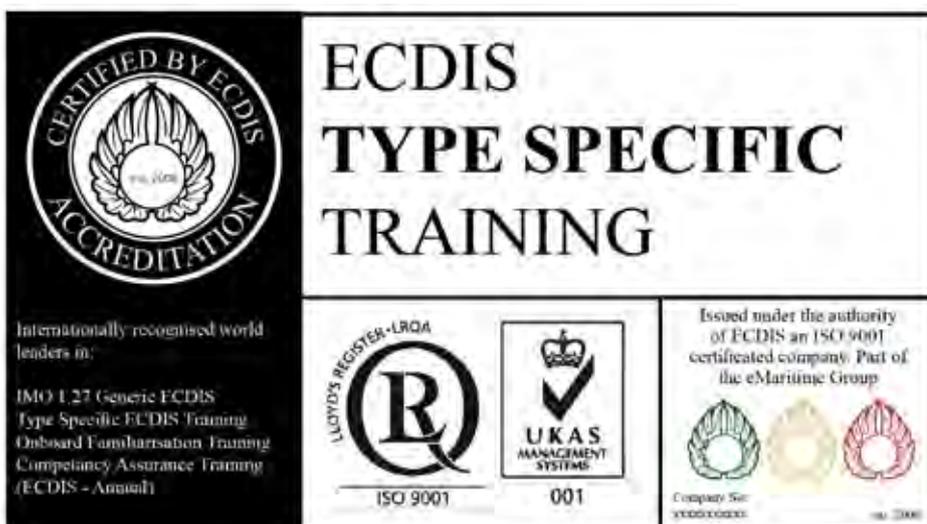
What training is 100% guaranteed accepted and approved?

Nothing can be guaranteed as 100% accepted, and even accepted training does not guarantee that the Officers will use their training well and avoid grounding. Indeed for many of the high profile ECDIS grounding, the Officers had 'approved' TS training.

However, statistically and as an example at ECDIS Ltd they have delivered an 8 hour TS course on all the leading manufacturers for almost a decade with 100% acceptance Worldwide by PSC or Inspectors. I have no doubt TS training providers around the World may share similar statistics but this White Paper does not have the information to provide such statistics.

ECDIS Ltd has produced in the next chapter a template for approved training based on their above statistics on what works, and what is accepted. Training or Shipping companies can

now have their TS courses approved by ECDIS Ltd and issue with the below logo if it conforms to their model course.



ECDIS Type Specific Approval - The Process

ECDIS Ltd has created a simple and process for application and approval.

Course must be submitted (in confidence and copyright) to:

Submission and approval is free.

On application further guidance will be given to certification processes and payment of student certificates. Essentially, ECDIS Ltd will issue the student certificates to the successful 3rd party TS course applications, who will then forward on those certificates (electronic on immediate completion of course and paper by post) to the student. This will ensure standards, certification logging with the ECDIS database, and a process payment of GBP £50 per student certificate.

SUBMITTED TS TRAINING COURSE FRAMEWORK

Scope

1. The course provides Type Specific training in the use of Electronic Chart Display and Information Systems (ECDIS) for those who will be in charge of a navigational watch on vessels equipped with ECDIS.
2. The course is one day in duration and consists of eight hours that includes presentations and practical exercises to ensure the trainee gets comprehensive training in the subject matter. The course is regularly updated to reflect the latest best practice and developments in the field of ECDIS. The course focuses on 'Individual' training rather than 'Team' training. We are not teaching the trainee navigation but are teaching them to utilise existing navigation skills on an ECDIS system with the aim of maximising the potential of that system.
3. The following topics are covered during the course:
 - a. Introduction
 - b. Setting to Work
 - c. Familiarisation Part 1
 - d. Familiarisation Part 2
 - e. Navigation Tools
 - k. Route Planning Part 1
 - l. Route Planning Part 2
 - m. Route Monitoring Part 1
 - n. Route Monitoring Part 2
 - o. Washup and Feedback

Competence Gap to Close

4. ECDIS systems offer numerous benefits compared to conventional navigation and are considered to be a significant step towards safer navigation. In time they will replace paper charts on board many ships. Proper training and education for watchkeepers and navigators are vital if the safety benefits of ECDIS are to be realised. Knowing how to make proper use of electronic chart systems is fundamental to safe navigation. Despite a recent strengthening of regulations, it is apparent that many mariners are being expected to operate these systems without sufficient, or indeed in some cases, any training. At best this means that the efficiencies these systems can bring are not being realised and at worst safety is being put at risk. Experience and investigations show that many mariners are not sufficiently familiar with the basics and proper use of ECDIS. Our ECDIS training course will prepare the Mariner to use a specific ECDIS system to navigate safely.

Learning Objective

5. The Goals of the course are as follows:

- ECDIS equipment familiarisation.
- Operate ECDIS equipment, use the navigation functions and select and assess relevant information.

6. Our objective is to familiarise the mariner with specific ECDIS equipment in order to prepare them to be able to maintain a navigation watch using ECDIS under all operating conditions.

Entry Standards

7. The trainee should have completed an STCW IMO 1.27 Model generic ECDIS course prior to undertaking the course.

8. The course has been designed for candidates for certification as officers in charge of a navigational watch and for experienced nautical officers and other persons with navigational responsibilities. Those attending the course should therefore have experience in performing chartwork and should be able to practice all usual tasks concerning standard navigational procedures and equipment. They should know about the functions and limitations of other navigational equipment.

9. The ECDIS Ltd TS approved course is not aiming to teach customers to navigate using ECDIS. We are teaching them to use ECDIS in order to navigate safely. Therefore, we require the trainee to have the basic navigation knowledge and that they understand what a navigation watch entails. We at ECDIS Ltd are of the opinion that traditional navigation techniques are still relevant in a digital world and as such we will teach the use of existing navigation skills on an ECDIS system.

Learner Conditions

10. ECDIS Ltd welcomes trainees that meet the entry criteria, regardless of background, culture or religion. We advocate that trainees with a variety of different backgrounds, experience, attitudes and values will enhance the course and allows the trainee to contribute to the learning experience. Trainees are therefore encouraged to arrive keen to learn and willing to offer their opinions and experience for the betterment of the course.

Class Limitations

11. The maximum Class Size will be determined on a case by case basis but must be suggested in application.

Trainers, Course Developers and Assessors

12. All instructors and assessors are appropriately qualified and competent to carry out their task. The qualifications of the instructors are in accordance with requirements laid down in section A-I/6 of the STCW Code. All instructors are thoroughly familiar with the operation of the equipment to be used in the course.

13. A list of trainers and a description of their experience, background and qualifications is required in application.

Teaching Facilities and Equipment

14. Training may be conducted at any location at a suitable venue of the customer's choosing. For any location, provision of a classroom equipped with an overhead projector and ample desks and chairs for the trainees is required. The address of our Training Centre is as follows:

ECDIS Ltd,
Ground Floor, Atlantic 3600 Building Parkway,
Solent Business Park, Whiteley, Fareham,
PO15 7AN

When delivering our course at an external location the requirement is stipulated using the criteria at Enclosure 1.

Teaching Aids

15. The following teaching aids will be utilised:

- a. Visual Presentations using Power Point
- b. Manufacturer's Guide
- c. Provision of relevant References

Teaching Methods

16. During the presentation elements of the course trainees are encouraged to interact with the lecturer to ask questions and share experiences with the class where relevant. The instructor will frequently ask questions of individuals and the class as a whole in order to promote discussion of relevant topics, policy and practices.

17. When the trainees are required to conduct practical exercises, the instructor will be on hand to answer any questions and where necessary to help the trainee to complete the task. However, it is always preferable to coach the trainee to solve the problem themselves, as it is deemed that this will enhance the learning experience.

Certificate

18. On successful completion of the course a certificate is issued stating that the holder has completed a course of training that meets the requirement for equipment specific ECDIS training to satisfy ISM and SIRE. Certification includes the following information:

- a. Training course title
- b. Name of training location or operator
- c. Learner's name and date of birth
- d. Trainer's name and signature
- e. Date the training course was completed
- f. A unique number corresponding to the learning programme provider's records of certificates

A sample of our certification is at Enclosure 2.

Enclosures

Enclosure 1 – Assessment of Off Site Venues

Enclosure 2 – Course Certification

Annex (Used as the template for TS course submission to ECDIS Ltd)

- A Training Course Outline
- B Schedule
- C Detailed Teaching Syllabus
- D Examination and Assessment
- E Critique
- F Lesson Plans

ENCLOSURE 1

Assessment Criteria for Suitability of Off Site Venues

Programme being delivered	
Start date	
End Date	
Contact	
Address	
Postal Code	
Email address	
Telephone number	

Fax number	
Assessor Name	
Safety	
There is an adequate fire alarm system	Yes / No
The escape routes have been identified	Yes / No
The escape routes are clearly marked	Yes / No
The evacuation plan is suitable for the number of persons involved	Yes / No
Teaching Environment	
Proposed maximum number of students	
The class room of adequate size for this number of students	Yes / No
There are sufficient suitable desks and chairs for the number of students	Yes / No
Lighting is sufficient for the work involved	Yes / No
Noise levels are low enough not to interfere with delivery of the course	Yes / No
Teaching Facilities	
Electrical sockets (and adaptors if not UK)	Not required / available
Projector screen	Not required / available

Computer Projector	Not required / available
TV / Video / DVD player	Not required / available
Whiteboard and markers	Not required / available
Flip Chart(s) and markers	Not required / available
Photocopier	Not required / available
Printer	Not required / available
	Not required / available
	Not required / available
General Facilities	
Toilet facilities male and female	Yes / No
Adequate heating / cooling	Yes / No
Tea / Coffee facilities	Not required / available
Dining / Restaurant	Not required / available
Telephone available	Not required / available
Remarks	
Assessment	

Evidence attached	Yes / No
Proposed venue suitable	Yes / No
Date Assessment Completed	
Name of Assessor	
Signature of Assessor	

ENCLOSURE 2

Course Certification

ANNEX A

TRAINING COURSE OUTLINE

1. The Training Course outline is provided in the table below. The objectives for the ECDIS subjects are written in *italics* and are understood to be prefixed by the words "The expected learning outcome is that the trainee is able to..."

ECDIS Ltd Type Specific Framework

L = Lecture; D = Demonstration; E = Exercise

	Training Area	Objective	Time	L	D	E
1.1	Introduction	<i>Describe domestic arrangements such as Timings, Toilets, Smoking, Breaks, Fire and Medical Incidents.</i> <i>Course Preview including Goals, Standards and Objectives.</i>	15min	15	-	-
1.2	Setting to Work	<i>Establish instructions and procedures for using ECDIS.</i> Documentation & Procedures Equipment Data Training Administration	30min	30	-	-
1.3 +	Familiarisation Part 1	<i>Operate all basic navigational functions and settings.</i> Switching On/OFF Screen Layout Options Controls Screen Display User Interface/Menu Navigation Interrogate Charted Features & Objects System Units	120min	50	10	60

1.4		Practical Exercise in Familiarisation				(80)
1.5	Familiarisation Part 2	<p><i>Operate all basic navigational functions and settings.</i></p> <p>Presentation of Data</p> <p>Safety Settings</p> <p>Charts</p>	30min	25	5	-
1.6 +	Navigation Tools	<p><i>Use the equipment to show and hide Marine Information Overlays (MIO) and utilize navigation tools.</i></p> <p>Radar Image Overlay (RIO)</p> <p>ARPA</p> <p>AIS</p> <p>Guard Zone</p> <p>Trial Manoeuvring</p> <p>Curved Heading Line</p> <p>Predictor</p> <p>EBLs and VRMs</p> <p>Add Info</p> <p>Manual Corrections</p> <p>Practical Exercise in Navigation Tools</p>	60min	25	5	30
1.7						(30)
1.8 +	Route Planning Part 1	<p><i>To operate all specific functions and obtain all relevant information for passage planning.</i></p> <p>Planning Considerations</p> <p>Port Locator</p>	60min	25	5	30

1.9		<p>Tidal Data</p> <p>Environmental Data</p> <p>Create and Edit a Route</p> <p>Cross Track Distance Alarms (XTD)</p> <p>Schedules</p> <p>Check Route</p> <p>Activate and Display a Route</p> <p>Multiple Route Display</p> <p>Practical Exercise in GC Route Planning</p>				(30)
1.10	Route Planning Part 2	<p><i>Operate functions for visual pilotage.</i></p> <p>Turning Circles</p> <p>Distance To Run</p> <p>Arrival Circles</p> <p>Wheel Over</p> <p>Pilotage Planning</p> <p>Lighthouse Lighting</p> <p>Headmarks and Sternmarks</p> <p>Anchoring</p> <p>Practical Exercise in Route Planning</p>	80	25	5	60
1.11		<p>Practical Exercise in Route Planning</p>				(60)
1.12 +	Route Monitoring Part 1	<p><i>Operate all specific functions for Route Monitoring. Obtain relevant information for navigation and ship safety.</i></p> <p>Customising the Display</p>	80min	25	5	30

1.13		<p>Activate Route Monitor</p> <p>Position Monitoring</p> <p>Safety Frame</p> <p>Velocity Vectors</p> <p>Route Display Options</p> <p>Vessel Track</p> <p>Automatic Track Control</p> <p>MOB!!</p> <p>Log Book</p> <p>Playback</p> <p>Practical Exercise in Route Monitoring</p>				(30)
1.14	Route Monitoring Part 2	<p>Operate the manual for function.</p> <p>Visual Bearings (LOPs)</p> <p>Radar Ranges</p> <p>Accepting a Fix</p> <p>Creating a Manual Fix using Lat & Lon</p> <p>Selecting DR Mode</p> <p>Practical Exercise in Fixing</p>	30	10	5	15
1.15		<p>Practical Exercise in Fixing</p>				(15)
1.16	Washup & Feedback	Complete the Feedback form.	15min	-	-	-
		Total	8½ Hrs	3h50m	40	3%

ANNEX B

TRAINING COURSE SCHEDULE

Time	Day 1
0900	1.1 Introduction
0915	1.2
0930	
0945	1.3
1000	
1015	Familiarisation Part 1
1030	
1045	
1100	
1115	1.4
1130	
1145	1.5
1200	
1215	1.6
1230	
1245	1.7
1300	
1315	LUNCH
1330	
1345	1.8
1400	
1415	1.9
1430	
1445	1.10
1500	
1515	1.11
1530	
1545	Route Planning Exercise
1600	
1615	1.12
1630	
1645	1.13
1700	
1715	1.14 Route Monitoring Part 2
1730	1.15 Fixing Exercise
1745	1.16 Wash-up and Feedback
1800	
1815	

ANNEX C**DETAILED TEACHING SYLLABUS**

All objectives are understood to be prefixed by the words "The expected learning outcome is that the trainee is able to..."

	Learning Objectives	Reference
1.1	Introduction	
	<i>Area objective: Describe domestic arrangements such as Timings, Smoking, Breaks, Fire and Medical Incidents.</i>	
1.1.1	Introduction by instructor and official welcome to the course.	
1.1.2	Introduction by trainees to give the instructor an idea of background and ECDIS experience, if any.	
1.1.3	Describe domestic arrangements such as timings, toilets, smoking, breaks and what to do in the case of fire and medical incidents.	Building Fire Plan
1.1.4	The objectives and goals of the course should be identified. A list of course topics is to be listed and course standards, note taking and question policy are to be explained.	
1.1.5		NI Model Course
1.2	Setting to Work	
	<i>Area objective: Provide recommendations for documentation and procedures concerning ECDIS and ECDIS data. Provide hints, tips and ideas to help the operator ensure that all eventualities have been considered prior to using ECDIS.</i>	

<p>1.2.1</p>	<p><u>Documentation and Procedures</u></p> <p>Describe the content of Standard Operating Procedures (SOPs), not limited to the following:</p> <ul style="list-style-type: none"> - General system set-up - Guidelines on system use - System set-up for Pilotage, Anchoring, Coastal and Open Ocean - Minimum display requirements - Maximum display requirements - Operation in ECDIS, RCDS and ECS modes - Procedures for operating in Pilotage, Anchoring, Coastal and Open Ocean - Route Planning - Route Monitoring - Alarms, Indications/Warnings configuration - Fixing/GPS cross-check frequency - Transition to paper arrangements - System management - Software updating - Updating of data - Data storage - Data back-up - Permit renewal & procuring additional permits - Passwords and system access - Emergency procedures for ECDIS failure - Virus protection policy and use of USB memory sticks - Pre-sailing checks <p>State the importance of Check-off cards to ensure that the system is set up correctly.</p> <p>Describe the environments that should be covered by Check-off cards, namely:</p> <ul style="list-style-type: none"> - Pilotage - Anchoring - Coastal 	<p>ECDIS Ltd SOPs</p>
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	- Open Ocean	
	Highlight the Risk Assessment required by the MCA.	
1.2.2	Establish whether the ECDIS and the back-up equipment are flag state approved systems.	ECDIS Ltd COC
	<u>Equipment</u>	
1.2.3	Establish whether the systems are connected via LAN.	ECDIS Ltd COC
	Determine whether a laptop with ECDIS software is required for planning purposes.	
	Understand the mandatory sensor connections that feed the ECDIS.	
1.2.4	Determine what other sensor connections are available.	MGN 285
1.2.5	Determine the procedure for switching between primary and secondary position fixing systems and the inherent dangers within.	A.817(19)/MSC 232(B2)
	Establish an accurate system setup by configuring ship specific characteristics such as:	
1.2.6	- Length	
	- Breadth	
1.2.7	- Draught	

<p>1.2.8</p>	<ul style="list-style-type: none"> - Load condition - Equipment offsets - AIS data - Radar Image Overlay (RIO) 	<p>A.817(19)MSC 232(B2)</p>
<p>1.2.9</p>	<ul style="list-style-type: none"> - Auto-track settings - Turning radius or Advance and Transfer data 	
<p>1.2.10</p>	<p>Establish procedures for switching between the primary and backup system.</p>	
<p>1.2.11</p>	<p>Data</p> <p>Establish what mode of operation the passage will require:</p> <ul style="list-style-type: none"> - ECDIS - RCDS - ECS <p>Establish whether the data is official.</p> <p>Establish whether data is correctly loaded.</p>	
<p>1.2.12</p>	<p>Determine from Flag the carriage requirements for all modes of ECDIS operation.</p> <p>Determine the frequency of Backup.</p>	

1.2.13	<p>Determine where Base, Update and Backup data discs are stored.</p> <p>Determine how the process of updating will work.</p> <p><u>Training</u></p>	
1.2.14	<p>Discuss training requirements.</p>	
1.2.15	<p><u>Administration</u></p>	S-57, S-61
1.2.16	<p>Discuss equipment specific information that should be available on the bridge.</p>	
1.2.17		
1.2.18		
1.2.19		
1.2.20		

1.2.21		
1.3	<p>Familiarisation Part 1</p> <p><i>Area objective: Operate all basic navigational functions and settings.</i></p> <p><u>The Basics</u></p>	
1.3.1	Determine how the system is switched On/Off.	Manufacturer's Guide
1.3.2	Determine the Screen Layout options available.	Manufacturer's Guide
1.3.3	Demonstrate the use of Controls such as keyboard and mouse.	Manufacturer's Guide
1.3.4	Describe the component parts of the Screen Display.	Manufacturer's Guide
1.3.5	Describe the User Interface/Menu Navigation.	Manufacturer's Guide
1.3.6	Identify all automatic functions required for monitoring ship's safety such as the display of position, heading, course, speed, safety values and time.	Manufacturer's Guide
1.3.7	Determine how to display the Help guide.	Manufacturer's Guide
1.3.8	Establish how to Interrogate Charted Features & Objects.	Manufacturer's Guide

1.3.9	Establish how to set System Units.	Manufacturer's Guide
1.4	<p>Familiarisation Exercise</p> <p><i>Area objective: This exercise should allow the trainee to acquire confidence in operating the ECDIS set.</i></p>	
1.5	<p>Familiarisation Part 2</p> <p><i>Area objective: Operate all basic navigational functions and settings.</i></p> <p><u>Presentation of Data</u></p> <p>Determine how to set and display different palettes such as:</p> <p>1.5.1 - Day - Dusk - Night</p> <p>1.5.2 Determine how to adjust brightness and contrast, and highlight the dangers of doing so.</p> <p>1.5.3 Determine how to set and display Traditional and Simplified symbols.</p>	<p>Manufacturer's Guide</p> <p>Manufacturer's Guide</p> <p>Manufacturer's Guide</p>

1.5.4	Determine how to set and display ECDIS Chart 1.	Manufacturer's Guide
1.5.5	Determine how the system displays range and scale.	Manufacturer's Guide
1.5.6	Establish how the system warns of Overscale.	Manufacturer's Guide
1.5.7	Determine the relevant menu for setting display options.	Manufacturer's Guide
1.5.8	Determine how to set the Safety Depth value.	Manufacturer's Guide
1.5.9	Determine how to set the Safety Contour value.	Manufacturer's Guide
1.5.10	Determine how to set the Shallow and Deep Contour values.	Manufacturer's Guide
1.5.11	Determine how to display two and four depth shades.	Manufacturer's Guide
1.5.12	<p>Highlight the fact that what you see can change and differ due to:</p> <ul style="list-style-type: none"> - Day or night colour scheme - Loaded Chart - Range or Scale chosen - SCAMIN - Base, Standard or All Other - Multi-Depth Shading - Traditional v Simplified Symbology 	Manufacturer's Guide

	<ul style="list-style-type: none"> - Other Text... - Added and Manually Corrected Data - Chart Updated from H.O. - Newer Edition of chart/cell 	
1.5.13	<p><u>Safety Settings</u></p> <p>Establish how Alarms and Indicators/Warnings are generated and where they are displayed.</p>	Manufacturer's Guide
1.5.14	<p>Establish how to acknowledge an Alarm, Indication/Warning.</p>	Manufacturer's Guide
1.5.15	<p>Establish where an Alarm, Indication/Warning can be reviewed once acknowledged.</p>	Manufacturer's Guide
1.5.16	<p>Determine how Alarms, Indications/Warnings can be configured on the system.</p>	Manufacturer's Guide
	<p><u>Charts</u></p>	
1.5.17	<p>Determine how to install licenses on the system.</p>	Manufacturer's Guide
1.5.18	<p>Determine how to install permits on the system.</p>	Manufacturer's Guide
1.5.19	<p>Determine how to install charts on the system.</p>	Manufacturer's Guide

1.5.20	Determine how to update charts on the system.	Manufacturer's Guide
1.5.21	Determine how to ascertain whether an installation was successful.	Manufacturer's Guide
1.5.22	Determine how to view corrections on the system: - ENC - RNC	Manufacturer's Guide
1.5.23	Determine how to load charts on the system: - Manual - Automatic	Manufacturer's Guide
1.5.24	Determine how to remove charts from the system.	Manufacturer's Guide
1.6	Navigation Tools <i>Area objective: Determine how to display Marine Information Overlays and utilise all Navigation Tools.</i>	
1.6.1	Determine how to display Radar Image Overlay (RIO).	Manufacturer's Guide
1.6.2	Determine how to display ARPA tracks and information.	Manufacturer's Guide
1.6.3	Determine how to display AIS tracks and information.	Manufacturer's Guide

1.6.4	Determine how to display a Guard Zone.	Manufacturer's Guide
1.6.5	Determine how to display Trial Manoeuvring.	Manufacturer's Guide
1.6.6	Determine how to display the Curved Heading Line.	Manufacturer's Guide
1.6.7	Establish how to utilise the Predictor tool.	Manufacturer's Guide
1.6.8	Establish how to utilise the EBL and VRM function.	Manufacturer's Guide
1.6.9	Determine how to add, edit and delete: <ul style="list-style-type: none"> - Mariner symbols - Objects - Shapes - Information - Text 	Manufacturer's Guide
1.6.10	Determine how to apply a danger attribute to mariner symbols, objects, shapes, information and text.	Manufacturer's Guide
1.6.11	Determine how to insert S-57 objects.	Manufacturer's Guide
1.7	Navigation Tools Exercise <i>Area objective: The trainees should perform an exercise</i>	

	<i>to gain confidence in construction and editing of Additional information and Manual Corrections.</i>	
1.8	Route Planning Part 1	
	<i>Area objective: To operate all specific functions and obtain all relevant information for passage planning.</i>	
1.8.1	Emphasise that the principles of navigation planning remain unchanged. The navigator must research the route as normal and utilise all available publications as necessary.	Manufacturer's Guide
1.8.2	Demonstrate how relevant route planning information such as chart notes, source data diagrams, sailing directions, tidal and meteorological information is gained from ECDIS and other sources.	Manufacturer's Guide
	Demonstrate the use of the Ports function.	
1.8.3	Demonstrate the use of the Tides function.	Manufacturer's Guide
1.8.4	Demonstrate the display of Environmental Data.	Manufacturer's Guide
1.8.5	Demonstrate how the construction of a route is performed by the input of waypoints, both directly on the ECDIS display and alphanumerically.	Manufacturer's Guide
1.8.6	Demonstrate how the adjustment of a planned route by editing waypoints is performed.	Manufacturer's Guide
	Demonstrate how to set the leg type as Rhumb Line or Great	

1.8.7	<p>Circle.</p> <p>Demonstrate how routes can be linked and exported.</p>	Manufacturer's Guide
1.8.8	<p>Demonstrate how to view information pertaining to the route and setting of route parameters such as planned speed, OTL/XTD, turning data and the waypoint list.</p>	Manufacturer's Guide
1.8.9	<p>Demonstrate how to create a passage plan and times by inserting time specific information in the form of an ETD and ETA.</p>	Manufacturer's Guide
1.8.10	<p>Demonstrate how to save routes.</p>	Manufacturer's Guide
1.8.11	<p>Demonstrate how to Protect and Approve a route.</p>	Manufacturer's Guide
1.8.12	<p>Determine how system route check parameters are configured.</p>	Manufacturer's Guide
1.8.13	<p>Demonstrate how to check a planned route for navigational safety by reviewing a route, displaying and reviewing warnings.</p>	Manufacturer's Guide
1.8.14	<p>Determine how to acknowledge a route check.</p>	Manufacturer's Guide
1.8.15	<p>Demonstrate how supplementary information and text can be added to the route.</p>	Manufacturer's Guide
1.8.16	<p>Demonstrate how to print route information.</p>	Manufacturer's Guide

1.8.17	Demonstrate how to delete routes.	Manufacturer's Guide
1.8.18	Demonstrate how to select the Active Route.	Manufacturer's Guide
1.8.19	Demonstrate how to select the Alternate Route.	Manufacturer's Guide
1.8.20		Manufacturer's Guide
1.8.21		Manufacturer's Guide
1.9	Practical Exercise in Route Planning <i>Area Objective: The trainees should perform an exercise to gain confidence and experience in Great Circle Route planning.</i>	
1.10	Route Planning Part 2 <i>Area objective: Operate functions for visual pilotage.</i>	
1.10.1	Determine how to configure and display Turning Circles.	Manufacturer's Guide
1.10.2	Determine how to display Distance To Run ticks.	
1.10.3	Determine how to display Arrival Circles.	Manufacturer's Guide
1.10.4	Determine how to utilise the Headmark and Sternmark tool.	Manufacturer's Guide

1.10.5	Determine how to create Clearing Bearings.	
1.10.6	Determine how to create Clearing Ranges.	
1.10.7	Determine how to utilise the Lighthouse Lighting tool.	Manufacturer's Guide
1.10.8	Demonstrate a method of anchorage planning utilising anchorage functions.	
1.10.9	Determine how to use Anchor Watch Settings.	Manufacturer's Guide
1.11	<p>Route Planning Exercise</p> <p><i>Area objective: The trainees should perform an exercise to gain confidence and experience in Route planning.</i></p>	
1.12	<p>Route Monitoring Part 1</p> <p><i>Area objective: Operate all specific functions for Route Monitoring. Obtain relevant information for navigation and ship safety.</i></p>	
1.12.1	<p>Demonstrate how to customise the display for Route Monitoring.</p> <ul style="list-style-type: none"> - Display parameters - Safety Depth - Safety Contour 	ECDIS check-off lists

	<ul style="list-style-type: none"> - Overlays - HUP, NUP, CUP - True or Relative Motion - Move Ship - Ahead - Display Reset 	
1.12.2	Emphasise the need to configure Display Reset if in True Motion.	
1.12.3	Determine how to load the route and associated items into all ECDIS systems.	Manufacturer's Guide
1.12.4	Describe the Position Monitoring tools and demonstrate their use.	Manufacturer's Guide
1.12.5	Describe the Safety Frame and demonstrate how to configure it.	Manufacturer's Guide
1.12.6	Demonstrate how to set vessel and contact velocity vectors and explain the relevance of vector time information.	Manufacturer's Guide
1.12.7	<p>Demonstrate how various route display options are configured including:</p> <ul style="list-style-type: none"> - Course - Distance - Distance To Run - Speed 	Manufacturer's Guide

	<ul style="list-style-type: none"> - XTD - Arrival Circles - Turn Radius - Turning Circles - WPT Name - Wheel Over Point - Automatic Leg Advance - WPT Approach Alarm - Ship Symbol/Contour 	
1.12.8	Demonstrate how to configure the vessel's past track, position markers and time marks.	Manufacturer's Guide
1.12.9	Establish the procedure for integrating ECDIS with a track-keeping autopilot and the inherent dangers if not supervised.	Manufacturer's Guide
1.12.10	Demonstrate the various means of activating a MOB marker, what information is available is how to delete it.	Manufacturer's Guide
1.12.11	Demonstrate how to activate an Event marker, what information is available and how to delete it.	Manufacturer's Guide
1.12.12	Explain how the ECDIS logs events and how to manually insert events into the log.	Manufacturer's Guide
	Determine how to review a voyage using the Playback function.	Manufacturer's Guide

1.12.13		Manufacturer's Guide
1.13	<p>Practical Exercise in Route Monitoring</p> <p><i>Area Objective: The trainees should perform an exercise to gain confidence and experience in Route Monitoring.</i></p>	
1.14	<p>Route Monitoring Part 2</p> <p><i>Area objective: Operate the manual fix function.</i></p>	
1.14.1	Determine how to manually input a position fix using Visual Bearings (LOPs).	Manufacturer's Guide
1.14.2	Determine how to manually input a position fix using Radar Ranges.	Manufacturer's Guide
1.14.3	Determine how to accept or cancel a manual fix.	Manufacturer's Guide
1.14.4	Determine how to create a manual fix using Lat & Lon.	Manufacturer's Guide
1.14.5	Determine how to select DR Mode.	Manufacturer's Guide
1.14.6	Determine how to select Primary and secondary position systems.	Manufacturer's Guide
1.15	<p>Practical Fixing Exercise</p> <p><i>Area objective: The trainees should perform an exercise to gain confidence and experience in manually fixing the ship's position by use of visual and radar means.</i></p>	

1.16	Wash up and Feedback <i>Area objective: The instructor should allow the trainees to issue feedback and comments with reference to the course, in particular organisation and domestic arrangements, course evaluation, course content, trainer evaluation, cost and overall impression.</i>	Training Course Critique

ANNEX D

EXAMINATION AND ASSESSMENT

Method of Examination

1. This course is an attendance course only and no grade will be submitted upon completion.

Practical Exercises

2. The course comprises of a number of practical exercises that are designed to build trainee confidence in using the system and consolidating knowledge. The instructions for completing the exercises are built into the exercises. The instructor will be in the classroom during exercises to supervise and observe the trainees and to answer any questions and where necessary to help the trainee to complete the task. However, it is always preferable to coach the trainee to solve the problem themselves, as it is deemed that this will enhance the learning experience. During the supervision of the exercises the instructor will note any shortcomings with trainee performance and remedy accordingly.

ANNEX E

TRAINING COURSE CRITIQUE

1. At the end of the course the trainees are free to comment on the standard of training they have received. This is done using the proforma shown below, which is given to all trainees to complete. The proforma covers the following elements:

- a. Organisation and Domestic
- b. Course Evaluation
- c. Course Content
- d. Trainer Evaluation
- e. Cost
- f. Overall
- g. Any other comments

Student Name	Type of Course
Date of Course	Location of Training

Assessment Criteria:

- 5 Excellent
- 4 Good
- 3 Satisfactory
- 2 Unsatisfactory
- 1 Poor

Please rate the following aspects of the training course.

Organisation & Domestic	Rating	Comments
How convenient was the training location?	5 4 3 2 1	
How would you rate the facilities?	5 4 3 2 1	
How well did the findings for the course work for you?	5 4 3 2 1	
Course Evaluation	Rating	Comments
To what degree did the subject matter meet your expectations?		

	5 4 3 2 1	
Was the subject matter informative and helpful?	5 4 3 2 1	
Is what you learned applicable to your current job?	5 4 3 2 1	
Is what you learned applicable to your professional development?	5 4 3 2 1	
How relevant was the subject matter?	5 4 3 2 1	
Course Content	Rating	Comments
How do you rate the quality of the course handout?	5 4 3 2 1	
How do you rate the quality of the presentation slides?	5 4 3 2 1	
How do you rate the quality of the presentations?	5 4 3 2 1	
How do you rate the equipment used for the course?	5 4 3 2 1	
Trainer Evaluation	Rating	Comments
How well did the trainer know the subject matter?	5 4 3 2 1	
How well prepared was the trainer?	5 4 3 2 1	
How good was the trainer at transferring his/her knowledge to you?	5 4 3 2 1	
Cost	Rating	Comments
Was the training good value for the money it cost?	5 4 3 2 1	

Was the training good value for the time it cost?	5 4 3 2 1	
Overall	Rating	Comments
How would you rate the course overall?	5 4 3 2 1	
What are the chances of you recommending ECDIS Ltd?	5 4 3 2 1	
Any Other Comments		

ANNEX F

LESSON PLANS

1.1 Introduction – 15 mins

The instructor should formally welcome the trainees to the course and introduce himself, giving background and experience of ECDIS. The trainees should then introduce themselves giving a brief background, any experience of ECDIS and stating what they want to get from the course. Domestic arrangements shall be described to cover course timings, location of toilets, smoking area, breaks and what to do in case of fire and medical procedures. The objectives and goals of the course should be identified, course topics listed as well as course standards, note taking and question policy.

1.2 Setting to Work – 30 mins

The main objective is to provide recommendations for documentation and procedures concerning ECDIS and ECDIS data to help the operator ensure that the system is compliant and all eventualities have been considered prior to using ECDIS.

Documentation and Procedures

The provision of relevant documentation and procedures for use with ECDIS should be described in order to show the trainee the advantages of check-off cards and documented procedures for ECDIS failure, redundancy and back-up etc. The instructor should describe possible circumstances that may require a back-up to be utilised and recommended procedures for doing so.

Equipment

The trainee should be reminded of the mandatory sensor elements in ECDIS as specified by the IMO and that optional equipment may be added but neither sensor nor ECDIS must degrade one another. Stress the importance of understanding the system setup such as available connections, sensor inputs, sensor switching and the need for accurate vessel information to be input during installation.

Data

The trainee should have knowledge of the minimum standards for data procurement and data presentation and understand the carriage requirements in all modes of operation such as RCDS mode, for example.

Training

The trainee should be reminded of their responsibilities with regard to ECDIS and the legal requirements with reference to training.

Administration

The instructor should give advice about what ECDIS specific publications should be available to the operator on the bridge.

1.3 Familiarisation Part 1 – 60 mins

The trainee should become familiar with the operation of the ECDIS set, particularly with the basic navigational functions, menu structure and important navigational functions. The trainee should be enabled to obtain information from the ECDIS display, in particular:

- How to find and identify the information such as the ship's position, course and speed, range scale etc.
- How to operate and coordinate all manual functions quickly and safely by using cursor, electronic bearing line, etc., in order to avoid unnecessary delays in critical situations.
- How to switch between different modes.

The instructor should demonstrate the different functions to the trainees.

1.4 Familiarisation Exercise – 60 mins

The trainees should perform an exercise to acquire confidence in operating the ECDIS set.

1.5 Familiarisation Part 2 – 30 mins

The main objective of this section is to enable the trainee to understand, modify and optimise the ECDIS display. The automatic display of the ship's position and track is only safe and valuable in the appropriate chart display. In most situations, the display of all available ENC information would cause information overload and clutter. Instead, it would be ideal to restrict the display of data to all relevant information only. To that end the trainee should know how to select appropriate information for navigational tasks. The instructor should ensure that the trainees get experience in setting up the display and modifying the chart presentation.

Colour Schemes and Symbols

Concerning colours and symbols which differ considerably from those in paper charts, the instructor should ensure that the trainees are familiar with the method of selecting different available palettes such as the day and night presentations. The trainees should be able to pick up more detailed information related to the objects which are indicated by the symbols and know how to display ECDIS Chart 1.

Contents

The trainee should know that the contents displayed depend on the display category and the range scale. The trainee should be familiar with the three different ECDIS display categories 'Base', 'Standard' and 'All Other', as well as other display options and should understand that certain information is not displayed in a certain mode. The trainee should also be familiar with scale warnings provided on the chart display.

Defining Safe Water

The object here is for the trainee to be able to identify charted safe water by utilising the safety contour function. The instructor should also demonstrate how to display the chart at its least cluttered whilst displaying all the information to enable safe navigation.

Alarms and Indicators

Because of the high degree of automation in an ECDIS display, the awareness needed to realise, assess and react properly to indicators and particularly to alarms is vital. The different kinds of alarms and indicators of ECDIS can be divided into three groups:

- An alarm is an alarm or alarm system which announces by audible and visual means, a condition requiring attention (usually a danger). They are either operator configured, when the system detects values outside user-set limits, or when the system detects unacceptable conditions.
- Indications are visual indications giving information about the condition of a system, or equipment (generally status).

Appendix 5 of the performance standards for ECDIS contains a list of ECDIS 'Alarms and Indicators'. The instructor should give examples of the types of alarms and indicators in order to enable the trainees to learn how the alarm settings and alarm levels are applied and what the meaning and importance of the individual indications and alarms are. The instructor shall explain how to retrieve a system message that has been acknowledged. It must be emphasised that Raster charts will not generate automatic alarms, although the user can insert alarmable constructs.

Charts

The instructor should demonstrate the chart updating menu structure and method of handling updates on board by manual, semi-automatic and automatic procedures and how to review and verify current updates. The trainee should know what a Licence and a Permit is, how to install them and should also know how to install and remove charts of various formats and administer these charts in ECDIS.

1.6 Navigation Tools – 30 mins

A clean chart is not adequate for navigation. The objective here is to introduce the concept of adding information to the chart on the ECDIS. ECDIS is designed to be used in conjunction with other navigational equipment and can form part of an integrated navigation system. In such circumstances, Radar Image Overlay (RIO), ARPA and AIS information and specific navigation tools in ECDIS can be effective. Therefore, it is important for the trainee to understand both the advantages and the particular features in order to avoid any risks.

The trainees should be reminded of the possibility that when using RIO there may be a mismatch between the two displays as a whole which may be due to an error in the primary

position fixing system, a displacement of individual objects and a mis-match of vectors (over ground versus through the water). They should also be reminded of AIS limitations including the transmission of the ships positions.

The instructor should demonstrate use of the ECDIS to construct areas, lines, points and text by utilising system features such as Add Info and Manual Correction functions. The instructor should emphasise the importance of managing the system folders and databases in order to ensure data is recalled for use. The trainee should also know how to input manual updates and the need to carefully manage these to ensure expired updates are deleted.

1.7 Practical Exercise on Navigation Tools – 30 mins

The trainees should perform an exercise to gain confidence in construction and editing of Additional information and Manual Corrections.

1.8 Route Planning Part 1 – 30 mins

The objective is for the trainees to be able to operate all specific functions and obtain all relevant information for passage planning in open-ocean and coastal conditions. The instructor should demonstrate the functions available for route planning.

It must be impressed upon the trainees that the principles of navigation planning remain unchanged. The navigator must research the route as normal, keep records and use all available publications as necessary. The instructor should highlight the ability of the ECDIS system to display multiple routes.

The trainees should plan routes by:

- Considering all relevant information (from ECDIS and other aids).
- Utilising the Port Locator function.
- The input of waypoints (using the cursor in the chart or by alphanumeric editing).
- Combining the waypoints to form legs of a continuous track.
- Utilising the Rhumb line or Great Circle functions.
- Editing the route.
- Smoothing and refining the track by the input of advance and transfer, turning data, wheel-over points, etc.
- Specifying Limits of Deviation from track alarms (OTL)/Cross Track Distance (XTD).
- Selecting the safety values (Safety Depth and Safety Contour) on the basis of the ship's dimensions and manoeuvrability.
- Taking notice of and reacting to indications and alarms concerning route planning.
- Checking the route and assessing the safety of the route by utilising route scan (with regard to the ship's safety) and reviewing warnings
- Adding supplementary information.

- Saving, deleting, printing, activating and displaying a route.

1.9 Practical Exercise in Route Planning – 30 mins

The trainees should perform an exercise to gain confidence and experience in Route Planning. The trainee is to be given a Great Circle route planning exercise. They should identify all potential risks of the route and modify the route appropriately.

1.10 Route Planning Part 2 – 30 mins

The objective is for the trainee to operate functions for visual pilotage. The ECDIS system provides tools and functions to enable the mariner to replicate those on a paper chart when conducting pilotage. The instructor should demonstrate the use of turning circles, distances to run, arrival circles and wheelover bearings. The recommended functions for use with pilotage should be pointed out and a method for constructing an anchorage demonstrated, as well as anchorage functions such as Bridge and Safety Swinging Circles and Zone Alarms.

1.11 Practical Exercise in Route Planning – 60 mins

The trainees should perform an exercise to gain confidence and experience in Route Planning.

1.12 Route Monitoring Part 1 – 30 mins

The objective is that the trainees are able to operate the basic ECDIS functions for route monitoring and to obtain relevant information for navigation and the ship's safety. The instructor should highlight the need to set up the display for route monitoring.

The importance of customising the display to include or hide overlays and manual corrections and setting of the safety depth, safety frame, velocity vectors and alarmable conditions should be emphasised. The assessment and handling of safety alarms related to route monitoring (including the pre-setting of limiting values) and appropriate decision making if an alarm is given are of particular importance for the proper use of ECDIS.

The instructor should demonstrate how the various route options are configured such as monitoring and vessel track and what information they provide. The trainee should be told the various means of activating a MOB in the ECDIS, the information available once in the system and how to remove it. They should also know how the mechanism of logging events is accessed and information manually inserted. With regard to automatic track control, the trainee should be reminded of the inherent dangers involved.

The instructor should demonstrate the VDR capabilities of the system with regard to the duration of recording, specifics of recorded data and how to access recordings. The trainee

should also know the procedures related to VDR and other means of recording or capturing data. Ultimately, attention should be drawn to the fact that VDR is a tool for checking whether or not navigation has been properly and responsibly performed.

1.13 Practical Exercise in Route Monitoring – 30 mins

The trainees should perform an exercise to gain confidence and experience in Route Monitoring.

1.14 Route Monitoring Part 2 – 15 mins

The objective is for the trainee to operate route monitoring functions and obtain all relevant information for navigation and ship safety by utilising the visual, radar and manual fix functions. The instructor should emphasise the risk of over-reliance on ECDIS. ECDIS is only a navigational tool which helps to perform the navigational functions and that its limitations, including those of its sensors, make over-reliance on it dangerous.

Emphasis must be placed on the need to keep a proper look-out and to perform periodical checking, especially of the ship's position, by ECDIS independent methods such as tying the position in with visual bearings, radar ranges and depths. With or without the use of ECDIS, all navigational activities have to comply with the basic principles and operational guidance for officers in charge of a navigational watch (STCW, SOLAS). The instructor should describe and demonstrate how to create a manual fix position.

1.15 Practical Fixing Exercise – 15 mins

The trainees should perform an exercise to gain confidence and experience in manually fixing the ship's position by use of visual and radar means.

1.16 Wash up and Feedback – 15 mins

The instructor should allow the trainees to issue feedback and comments with reference to the course, in particular organisation and domestic arrangements, course evaluation, course content, trainer evaluation, cost and overall impression.

Annual Competency Assurance Training (ACAT) for all 38 Manufacturers (£200 per Hull per year, unlimited crew)

CERTIFIED BY ECDIS ACCREDITATION

INTERNATIONALLY RECOGNISED TRAINERS:

- Generic ECDIS
- Type Specific ECDIS
- ECDIS Inspection
- Competency Assurance

ANNUAL COMPETENCY ASSURANCE TRAINING (ECDIS)

LLOYD'S REGISTER-LRQA ISO 9001

UKAS MANAGEMENT SYSTEMS 001

Issued under the authority of ECDIS an ISO 9001 certified company. Part of the eMaritime Group

Company No. XXXXXXXXXX est. 2008

Background

ECDIS Ltd are approximately half way through an International Project to train around 1000 Inspectors and PSC Officers in ECDIS World Wide. Without doubt, it has already dramatically increased the safety of navigation at sea by providing Inspecting Officers with all the relevant questions that need to be asked for all the 35 manufacturers, regardless of what certificates the Officers hold.

www.ecdis.org/inspectors-course

The feedback from Inspectors so far is proving that in most cases Officers cannot practically show inspectors the basic safety features designed to reduce the risk of groundings and in some cases are not even able to show that they are familiar with their Primary Means of Navigation. The Inspectors training that they are receiving is proving beneficial for the industry, albeit not for some shipping companies due to the audits highlighting that some officers lack basic understanding in ECDIS, which is embarrassing when they hold the required 'certificates'. In our experience the lack of understanding comes from both not using the ECDIS on a daily basis, or from deficient Type Specific Training.

ECDIS Ltd has taken ECDIS Quality Assurance one step further as a measurable product for shipping companies and produced for the industry a refreshment assessment tool, for all Officers to remain current on the main navigation safety features of their ECDIS. ECDIS ACAT (Annual Competence Assurance Training) has been designed to assist the industry in increasing

its ECDIS Standards at Sea, not for financial gain. The cost of one ECDIS ACAT programme is £200 per hull, per year. As an example of costing: for a vessel with a crew turnover of 25 Officers per year, this would equate to a cost of only £8 per crew member per year for their specific make and model of ECDIS.

The five modules, which take in total between 30 and 60 minutes to complete, are: 1)

Familiarisation

2) Navigation Tools

3) Route Planning

4) Route Monitoring

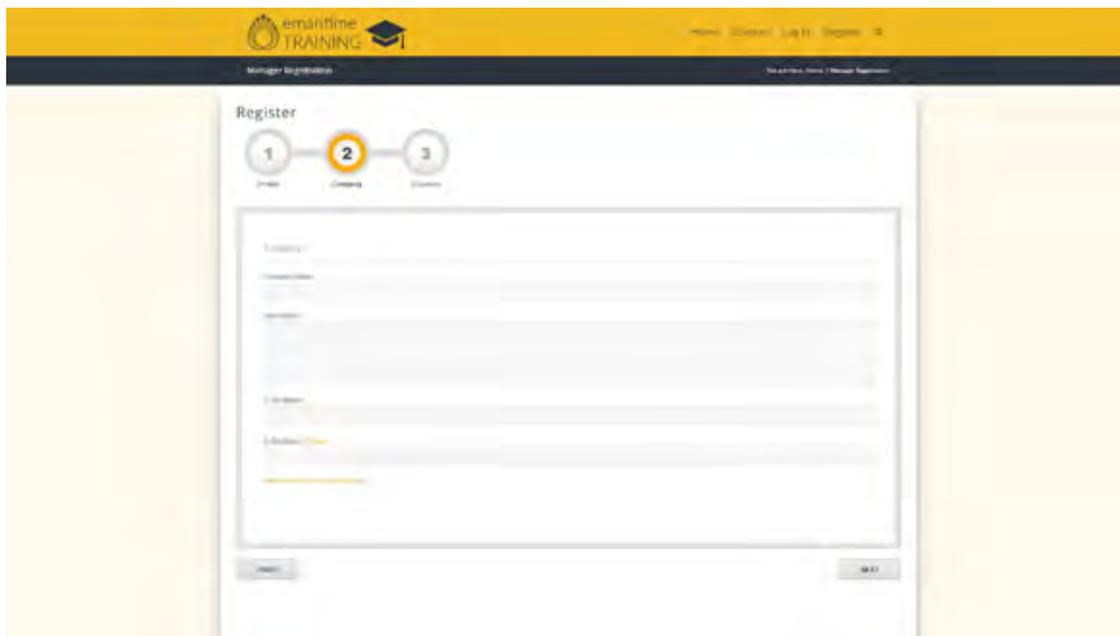
5) Chart Updating

ECDIS ACATs is a reasonable assurance method of assisting the industry as a whole to increase their key knowledge in the Make and Model of their ECDIS and to keep up-to-date with the constantly evolving software from all the manufacturers worldwide. This product also allows the Ship Manager or Operator to have positive control over their Officers Annual Competency Assurance with regards to ECDIS, which in turn would reduce their training safety matrix for navigating with ECDIS.

The process is extremely simple, can be bought online directly, and gives the Ship Operator or Manager direct access to their Officers competencies in ECDIS. The videos at the above link explain the process.



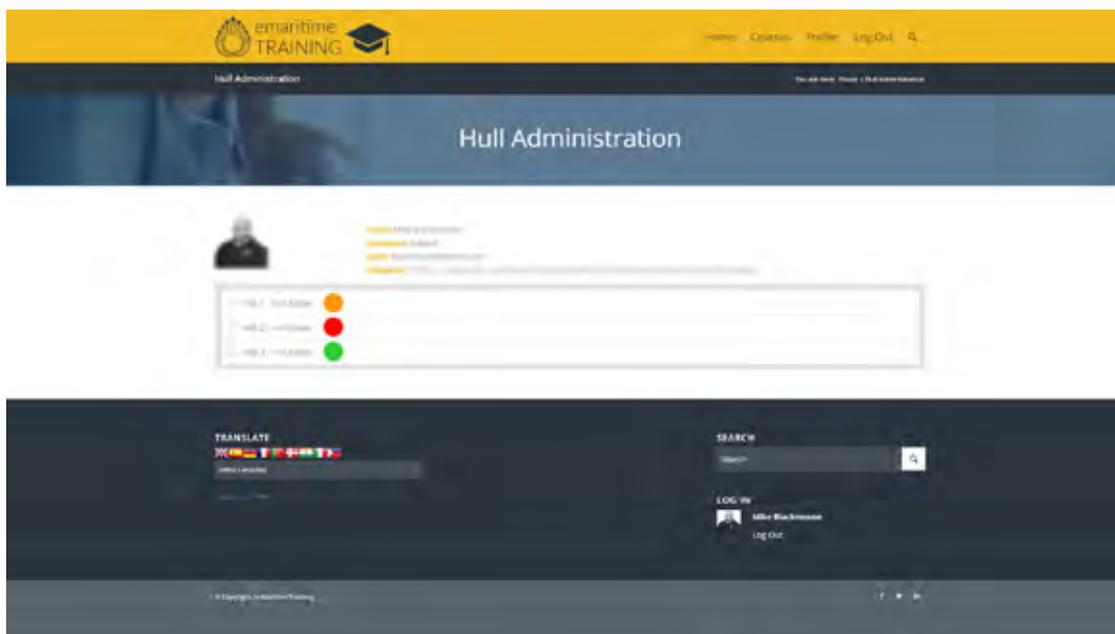
1) Register as you would any website with name, contact details and password



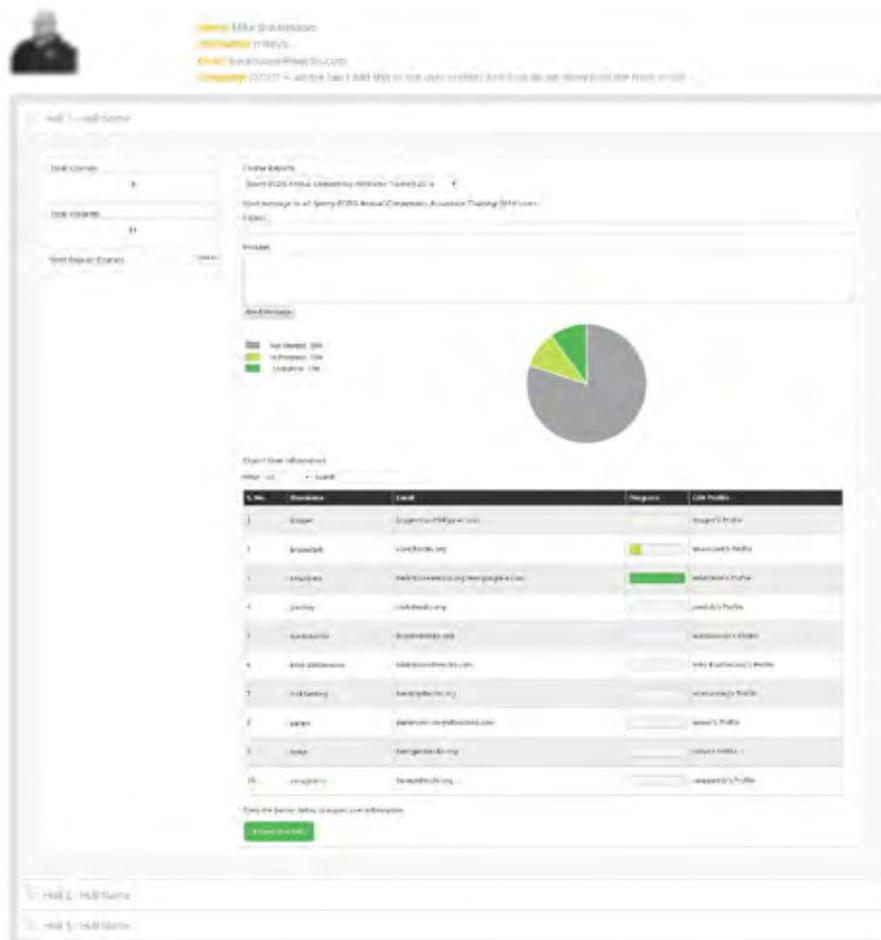
2) On the next screen, you can add as many hulls as you require and add their names.



3) Then on the final screen, you are presented with a list of all available courses, simple drag and drop them onto each hull as required. Then simple make a payment via paypal and you can start managing your hulls instantly!



(Screenshots may be subject to change)



Once registered Ship Operators or Managers are able to view each hull, which is given a colour-coded “traffic light” system which enables them to see clearly the current progress of a hull regarding their training. If nobody on aboard has started any courses yet, it will show red. If at least 1 person has started 1 course it will show amber, and if all crew have completed all courses it will show green.

It is also possible to export this information into a spreadsheet and see specifics regarding crew progress and the ability to contact individual crew members.

The vulnerability of cyber attacks on ECDIS

As maritime cyber security becomes a real issue to tackle with the dramatic increase of internet at sea, this article looks at how two expert companies in their different specialist fields have partnered to provide a simple, inexpensive but secure way of keeping navigation systems safe at sea.

Thousands of vessels now rely upon one of the 38 manufacturers of ECDIS as their primary means of navigation. If we think back to the old days, it was very hard to harm a paper chart, other than the occasional coffee slip or gust of wind from the bridge wing door! However those days are now gone, and the modern bridge is a complicated system of interlinking computers and sensors, often culminating in a very capable but potentially vulnerable ECDIS. The common question asked now, is how safe is that ECDIS from a cyber attack. In 1994 when the World Wide Web (www.) went live, work immediately started on a defence for any attack. Over the next few decades home users and businesses began to protect themselves with both hardware measures, and software measures as we started to feel the effect of malicious viruses. The point being, that protection was a slow learning process that took time to implement, as there was no rush due to the fact that the internet itself was in its infancy stages. However many have said that ECDIS was adopted too quickly into the Maritime industry. This and the recent surge of internet at sea, with constant ship to shore connectivity, has led to the question "are we ready and protected for this?"

A few of the 38 ECDIS providers now provide some integral anti-virus/anti-cyber attack software as part of their latest models, but what is the solution for those who don't, or the legacy ECDIS systems fitted prior to the latest versions? Recently Abatis Ltd, a Cyber Malware Protection System expert and ECDIS Ltd, a provider of training solutions on all the leading ECDIS manufacturers, partnered to run a series of trials into the safety of the ECDIS systems at their facility in Hampshire.

The trials consisted of introducing a series of Malware software and viruses onto a large number of different ECDIS systems through an email attachment from a simulated infected chart update or passage plan that may have been downloaded by a vessel. This trial was initiated due to the increased concerns from ECDIS Ltd's client base of over 150 shipping companies that cyber attacks are indeed very real and several vessels have started to feel the effects of ECDIS crashes at sea due to Malware.

Robyn Harrigan, the training and simulation manager at ECDIS Ltd explains "when the IT staff here first injected the malicious software onto my training floor, and onto some of the ECDIS systems it was quite a heart in mouth moment. Knowing that the Malware is so effective it imbeds itself into the computer and can't simply be removed, it was hard to watch them do it!"



The full video of the initial attack can be watched at www.ecdis.org/cyber

For the next part of the trial, the Abatis software was then fitted to all the leading ECDIS manufacturers and RADAR systems, and the virus was re-injected onto the server. All of the systems tested, that varies in their operating systems from Windows 2000 to XP to Windows 7, appear protected and maintain stability after the attack. However it was made clear that there was still a significant amount of trials yet to take place over the next few months on Linux based systems, and an injection via an auxiliary sensor connected to the ECDIS via LAN.

The final part of the trial, which will be conducted over the next few months, will conduct a hypothetical attack via an automatic software/charts update from a remote website, onto the Bridge simulator, via a planning station. The trial will go as far as to produce an imitation website to host an update, and it will be sent via internet download onto a 3rd party planning station, that is subsequently connected to all the bridge navigation equipment. The trial will be conducted with Abatis anti-malware software, and without it, in a controlled test.

Kerry Davies from Abatis has already successfully helped protect many `shore-side` industries from Network Rail to the NHS. It is hoped that this partnership with ECDIS will help protect thousands of ships around the World.

www.ecdisRegs.com

www.eMaritimeExchange.com

www.ukho.gov.uk/ProductsandServices/ElectronicCharts/Pages/AVCS.aspx

www.wikipedia.org/wiki/Digital_native

www.witherbyseamanship.com/ecdis-procedures-guides-7.html

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