

SUB-COMMITTEE ON STANDARDS OF
TRAINING AND WATCHKEEPING
43rd session
Agenda item 3

STW 43/WP.6/Add.1
3 May 2012
ENGLISH ONLY

DISCLAIMER

As at its date of issue, this document, in whole or in part, is subject to consideration by the IMO organ to which it has been submitted. Accordingly, its contents are subject to approval and amendment of a substantive and drafting nature, which may be agreed after that date.

VALIDATION OF MODEL TRAINING COURSES

Report of Drafting Group 1

Attached in the annex, is annex 1 to the Report of Drafting Group 1 on, Validation of model training courses (STW 43/WP.6).

Note: Deleted text is shown as ~~strikethrough~~ and new text is shown underline.

**Model
Course**

1.27

**Operational use of
Electronic Chart Display and Information
Systems (ECDIS)**

(~~2010~~ 2012 Edition)



IMO

Acknowledgements

This [2010-2012](#) Edition of the IMO Model Course on the operational use of Electronic Chart Display and Information Systems (ECDIS) was developed by the United States Merchant Marine Academy, Kings Point, New York.

IMO wishes to express its sincere appreciation to the governments of the United States of America and Australia for their valuable expert assistance and cooperation.

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Introduction to model courses

■ Purpose of the model courses

The purpose of the IMO model courses is to assist maritime training institutes and their teaching staff in organizing and introducing new training courses, or in enhancing, updating or supplementing existing training material where the quality and effectiveness of the training courses may thereby be improved.

It is not the intention of the model course program to present instructors with a rigid “teaching package” which they are expected to “follow blindly”. Nor is it the intention to substitute audio-visual or “programmed” material for the instructor’s presence. As in all training endeavors, the knowledge, skills and dedication of the instructor are the key components in the transfer of knowledge and skills to those being trained through IMO model course material.

Because educational systems and the cultural backgrounds of trainees in maritime subjects vary considerably from country to country, the model course material has been designed to identify the basic entry requirements and trainee target group for each course in universally applicable terms, and to specify clearly the technical content and levels of knowledge and skill necessary to meet the intent of IMO conventions and related recommendations.

■ Use of the model course

To use the model course the instructor should review the course plan and detailed syllabus, taking into account the information provided under the entry standards specified in the course framework. The actual level of knowledge and skills and the prior technical education of the trainees should be kept in mind during this review, and any areas within the detailed syllabus which may cause difficulties because of differences between the actual trainee entry level and that assumed by the course designer should be identified. To compensate for such differences, the instructor is expected to delete from the course, or reduce the emphasis on, items dealing with knowledge or skills already attained by the trainees. He should also identify any academic knowledge, skills or technical training which they may not have acquired.

By analyzing the detailed syllabus and the academic knowledge required to allow training in the technical area to proceed, the instructor can design an appropriate pre-entry course or, alternatively, insert the elements of academic knowledge required to support the technical training elements concerned at appropriate points within the technical course.

Adjustment of the course objectives, scope and content may also be necessary if in your maritime industry the trainees completing the course are to undertake duties which differ from the course objectives specified in the model course.

Within the course plan the course designers have indicated their assessment of the time that should be allotted to each learning area. However, it must be appreciated that these allocations are arbitrary and assume that the trainees have fully met all entry requirements of the course. The instructor should therefore review these assessments and may need to re-allocate the time required to achieve each specific learning objective.

■ Lesson Plans

Having adjusted the course content to suit the trainee intake and any revision of the course objectives, the instructor should draw up lesson plans based on the detailed syllabus. The detailed syllabus contains specific references to the textbooks or teaching material proposed for use in the course. Where no adjustment has been found necessary in the learning objectives of the detailed syllabus, the lesson plans may simply consist of the detailed syllabus with keywords or other reminders added to assist the instructor in making his presentation of the material.

■ Presentation

The presentation of concepts and methodologies must be repeated in various ways until the instructor is satisfied that the trainee has attained each specified learning objective. The syllabus is laid out in learning-objective format and each objective specifies *what the trainee must be able to do* as the learning outcome.

■ Implementation

For the course to run smoothly and to be effective, considerable attention must be paid to the availability and use of:

- Properly qualified instructors
- Support staff
- Rooms and other spaces; equipment
- Textbooks, technical papers
- Other reference material

Through preparation is the key to successful implementation of the course. IMO has produced "Guidance on the Implementation of IMO Model Courses," which deals with this aspect in greater detail and is included as an attachment to this course.

Part A: Course Framework

■ Scope

This model course intends to provide the knowledge, skill and understanding of ECDIS and electronic charts to the thorough extent needed to safely navigate vessels whose primary means of navigation is ECDIS. The course emphasizes both the application and learning of ECDIS in a variety of underway contexts. ~~This is achieved through sophisticated navigation simulation that provides each trainee with unrestrained access to ownship operations integrated with a complete type approved ECDIS with numerous chart formats installed.~~

The course is designed to meet the STCW requirements in the use of ECDIS, as revised by the 2010 Manila Amendments, specifically as these apply to Tables A-II/1, A-II/2 and A-II/3, and also to revised guidelines pertaining to training and assessment in the operational use of ECDIS in Table B-I (paragraphs 36 through 66), assessment in navigational watchkeeping, and evaluation of competence, both in Table B-II.

It should be understood that this is a generic course which requires a structured and complementary on-board ship specific ECDIS familiarisation for each shipboard ECDIS system on which the navigating officer serves.

■ Objective

Those who successfully complete this course should be able to demonstrate sufficient knowledge, skill and understanding of ECDIS navigation and electronic charts to undertake the duties of a navigational watch officer defined by STCW Code, as amended. This knowledge, skill and understanding should include Column 1 ECDIS competencies of Tables A-II, but is not limited to:

- Knowledge of the capability and limitations of ECDIS operations, and all indicated sub-topics
- Proficiency in operation, interpretation, and analysis of information obtained from ECDIS, and all indicated sub-topics
- Management of operational procedures, system files and data, and all indicated sub-topics

■ Entry Standards

It is assumed that trainees undertaking this course have accomplished some formal instruction in Terrestrial Navigation, have at minimum some familiarization with visual navigation, have accomplished a period of supervised bridge watch-keeping duties, and have prior completion of basic radar/ARPA (MC 1.07). Trainees should also have considerable familiarization with personal computing operating systems, keyboards and mice or trackballs.

■ Course Certificate, diploma or document

Documentary evidence should be issued to those who have successfully completed this course indicating that the holder has completed training in the navigational use and operation of Electronic Chart Display and Information Systems (ECDIS) based on this model course.

■ Course delivery

The outcome of this course may be achieved through various methods, including simulation-based classroom and laboratory training, or in-service training, or combinations of these methods, such that

each trainee is provided ~~unshared~~ access to ~~a type approved an~~ ECDIS with ENC data for all required hours of practice and assessment in a controlled visual underway navigational environment.

Methods of distance learning or computer-based training may be used to supplement the familiarization stages of this course, but should not be substituted for the underway assessment of proficiency

■ Course intake limitations

The maximum number of trainees should depend on the facilities and equipment available, bearing in mind the scope and objectives of this course. ~~In particular, class size should be limited to 1 trainee per ECDIS workstation. For example, where a classroom training environment has 12 ECDIS workstations, the maximum class size is 12 trainees. Where there is an additional ECDIS equipped multiple ownership lab, those ECDIS installations should not be used as substitutions for classroom instruction, nor should it be used to augment the number of trainees taken into the course.~~

~~The instructor- trainee ratio should be limited to 1:12. The ratio for lecturing in an open classroom setting and for practical exercises in an Integrated Navigation Lab should be limited to 12:1. When a class size exceeds 12 trainees, an assistant instructor is required in both settings, qualified to the satisfaction of the lead instructor.~~

■ Staff requirements

~~The following are the minimum qualification for an instructor of an ECDIS course that adheres to the recommendations of this Model Course. The instructor in charge should:~~

- ~~➤ Hold a Master license (certificate of competency, issued by IMO white list flag state) or license at least one level above trainee(s) enrolled in course~~
- ~~➤ Have underway experience as navigator with, and maintainer or supervisor of, type approved ECDIS (extent determined by flag state issuing approval of course)~~
- ~~➤ Have successful completion of Train-The-Trainer course, preferably including the application of simulators in training~~
- ~~➤ Have successful completion of an approved ECDIS training course~~

~~It is also recommended that the instructor in charge of the course should:~~

- ~~➤ Be especially skilled in the particular ECDIS employed in the training course~~
- ~~➤ Have knowledge of the requirements of SOLAS Chapters V/2, V/19, and V/27-20, as amended~~
- ~~➤ Have knowledge of the ECDIS Performance Standards currently in force~~
- ~~➤ Have knowledge of the STCW requirements and guidance on ECDIS, as amended~~
- ~~➤ Be familiar with the current ECDIS equipment and installation requirements of the IEC~~
- ~~➤ Be familiar with the current ENC data transfer standards and presentation libraries of the IHO~~
- ~~➤ Be familiar with current methods of ENC data procurement, permitting, and updating~~
- ~~➤ Be familiar with current IMO recommendations on ECDIS software and other issues~~

~~The following are the minimum qualifications recommended for instructors delivering a course that follows the IMO Model Course 1.27. The instructor in charge should:~~

- ~~.1 hold relevant certificate of competency in the deck department issued by an IMO white list flag state;~~
- ~~.2 have successfully completed an approved ECDIS course;~~
- ~~.3 have completed type specific familiarization relevant to the equipment used for training;~~
- ~~.4 have a detailed knowledge of the requirements of SOLAS chapters V/2, V/19, and V/27-20, as amended;~~

.5 have an up-to-date knowledge of the IMO ECDIS Performance Standards currently in force and knowledge of relevant STCW requirements and guidance;
.6 have an up to date knowledge of ENC's.
.7 be fully aware of current ENC data transfer standards and presentation libraries of the IHO, methods of ENC licensing and updating and current IMO recommendations on ECDIS software and other issues;
.8 have a current relevant teaching qualification or have successfully completed a Train-The-Trainer course, including the application of simulators in training and meets the requirements of STCW regulation I/6 and I/12.

Assistant instructor should have relevant knowledge of ECDIS operation.

■ Teaching Facilities and equipment

ECDIS Classroom (Open Lab)—Lecturing with practical demonstration is conducted in an ECDIS classroom (Open Lab) setting, where each trainee has sole use of a PC workstation with a resident installation of type approved ECDIS; all workstations should be networked to an Instructor Station running an integrated navigation simulation application that delivers to each workstation high fidelity ownship conning controls, navigational aids including GPS, track control capable Autopilot, AIS and radar/ARPA, and a visual scene, all of which are interfaced to the ECDIS. Lecturing without demonstration is conducted in the same ECDIS classroom with the workstations powered down.

Simulation lab—Trainees develop and demonstrate proficiencies in an Integrated Navigation Lab (INL) setting, where each trainee has use (either alone or in groups of no more than two) of an ownship in semi-isolation (Bridge). The Integrated Navigation Lab (INL) should run the same simulation application as in the ECDIS classroom, except that each bridge consists of four uniquely dedicated PCs: ECDIS with trackball and keyboard, conning and control, radar/ARPA, and visualization channel displayed on a large flat screen. As in the ECDIS classroom, all navigation functions should be integrated and interfaced to the ECDIS. There should also be a provision in each Bridge for plotting on standard paper charts, as well as VHF radio, either type approved and de-amplified, or digitally embedded in the simulation software.

While exposure to a variety of ECDIS brands is encouraged, at a minimum, the particular brand and software version of the ECDIS used in the classroom (open lab) environment should match that which is used in the simulation lab. Trainees will benefit from gaining some familiarity with the approaches taken by different manufacturers to the ECDIS Performance Standards, especially with regards to menu structures and value added options. However, the achievement of competency in safe navigation with ECDIS should occur through prolonged and in-depth practice with one particular ECDIS common to both training environments.

Materials—Screen projection through PC and document reader, CBT and PC presentations, hard copy handouts, and sample ECDIS interfaces on CD

Simulation software—The integrated navigation simulation application installed in the ECDIS classroom and Integrated Navigation Lab as outlined above should include type approved ECDIS software to which the simulation delivers sensor input in an underway context. Assessment and evaluation systems built into the simulation software offer considerable benefits, especially by unobtrusive and objective measure of “safe navigation” parameters; its inclusion and application especially in route monitoring exercises is encouraged.

ECDIS simulation equipment must meet all applicable performance standards set out in Regulation I/12 of the STCW Convention and also should meet the guidance in Section B-I/12, as amended
An example of equipment set up for ECDIS training has been provided in appendix 6

ECDIS Classroom/Lab:

The lecture portion of the course can take place in any suitable classroom with adequate desk/seating space for all trainees. Standard classroom facilities must be available such as whiteboard/chalkboard, appropriate projection system, etc.

The practical demonstration and assessment portion of the course must take place in a space equipped to provide a suitable ECDIS simulator work station for each individual trainee. The necessity of mounting display monitors on the desk surfaces requires careful placement of all equipment and projection screens to maintain good visibility for all trainees.

In addition to the trainee work stations there must be an instructor station with dedicated projection system that will allow projection of the exercises and lecture materials. It is strongly recommended that there be display(s) networked to the instructor station, thereby allowing display(s) of ARPA and ECDIS information (or other training material) for the benefit of the trainees.

Note that the lecturing may take place in the same room as the simulation if the space is suitable. This would require adequate visibility around/over the work stations to the whiteboard/chalkboard and projection screens, and adequate work space for taking notes and written examinations.

■ ~~Recommended ECDIS simulation performance standards~~

~~ECDIS is an integrating device, and its use should be mastered in solo watchstanding. It follows that ECDIS simulation should suit solo watchstanding training, and this certainly demands the inclusion of the visual scene at all times. ECDIS simulation equipment should be capable of simulating the operational capabilities of ECDIS which meet all applicable performance standards adopted by the Organization, and should optimally incorporate the means to:~~

- ~~1) handle ENC data, licenses and update files~~
- ~~2) interface with the following emulated or OEM equipment:~~
 - ~~a) position indicator, including emulation of fix quality and, in the instance of GNSS, satellite constellation~~
 - ~~b) alternative position source~~
 - ~~c) heading indicator, true and magnetic, with graphic course recording~~
 - ~~d) speed indicator~~
 - ~~e) depth indicator~~
 - ~~f) ARPA tracked target data~~
 - ~~g) AIS, including control of static data and messaging~~
 - ~~h) radar data including emulated raw video, cursor, EBL and VRM~~
 - ~~i) autopilot capable of control by heading (course), COG, and track, where monitored track may be provided through both instructor control and alternatively through ECDIS at ownship~~
- ~~3) provide radar overlay, with functions operating independently from ownship radar~~
- ~~4) provide audio for navigation and assessment systems when fitted~~
- ~~5) provide VHF communications between all ownships and instructor~~
- ~~6) permit all ownships to interact with one another, depending on the exercise design~~
- ~~7) provide for viewing visual scene by scrolling in all directions horizontally and vertically, or horizontally without scrolling where fixed visual channels cover 360 degrees~~
- ~~8) provide for taking accurate visual bearing~~
- ~~9) permit simultaneous navigation on paper charts associated with area databases as appropriate to ECDIS watchstanding~~
- ~~10) provide adequate and well lit surface for plotting on paper charts as the required means of back-up required for single ECDIS installation~~

~~In order to accomplish the goals of training and assessment included in this 2010 edition to the Model Course, ECDIS simulation should adhere to the foregoing as performance standards.~~

■ ~~An optimal ECDIS training environment~~

It is the intent of this 2010 edition of the Model Course to recognize the growing practice of integrating ECDIS-supported navigation with the visual scene in simulation-based training. Additionally, since such detail surpasses the scope of STCW Code and Guidance, it is the intent also of the Framework to the 2010 edition of this Model Course to specify the optimal physical layout for such simulation training.

There is a fundamental difference between an instructor-led demonstration and practice of ECDIS functionalities, and the unassisted application of ECDIS while faced with navigational decision making. These are separate learning experiences. The following description of an optimal ECDIS training environment proposes that these be conducted separately. Nonetheless, all ECDIS workstations should have the same fully integrated simulation software package. Whether the lesson is being conducted in a classroom environment or the exercise is being conducted in the semi-isolation of a multiple-ownership navigation lab, each network should be designed to run any combination of interacting ownships.

The following description of the classroom and lab is based on an ideal maximum of 12 trainees in a given iteration of the ECDIS training course, such that the entire group could be coached and instructed at once for extended periods in the classroom, and 6 at a time could be assigned solo watchstanding roles in the navigation lab for extended periods.

Optimal ECDIS classroom—Sit-down workstations for coaching (demonstration and practice of ECDIS functionalities)

Part	Function
12 sit-down workstations	<p>Single PC, dual 19" LCD, specified VGA card, Win 7 O.S., ECDIS software and chart data installed on each, to provide:</p> <ul style="list-style-type: none"> ➤ ECDIS-integrated ownships in classroom network, with total navigational and ship control (virtual) functionality in either independent or interactive underway contexts; ➤ ECDIS is displayed on one monitor, while split-screen visual scene and ship controls and instruments including radar are displayed (through menu selection) on the other monitor
1 instructor station	<p>Single PC, dual 19" LCD, Win 7 O.S., simulator instructor control and monitoring software installed, to provide:</p> <ul style="list-style-type: none"> ➤ Design, execution, and playback-debrief of exercises
1 server-/network	<p>Single high-end PC with extra RAM, single 19" LCD, Win Server 2003 O.S., gigabit network, Cat 5e wiring at a minimum, simulator system software installed, including a suitable number of ownship models and training areas, to provide:</p> <ul style="list-style-type: none"> ➤ Full network control (self-contained within classroom setting) ➤ Site for simulation software and all hydrodynamic modeling
Projection system	<p>3 projectors, preferably linked to instructor station and both monitors from at least 1 workstation via matrix switching, to provide:</p> <ul style="list-style-type: none"> ➤ Means for group demonstration of ECDIS functionality, and ownship control, and techniques of ECDIS-based navigation

Optimal ECDIS navigation lab—Semi-isolated ownships for stand-up solo watchstanding (unassisted application of ECDIS while faced with navigational decision-making)

Part	Function
6 stand-up workstations (each with chart table and partitions)	<p>Three PCs, three 19" LCDs, ECDIS software and chart data installed on each ECDIS PC; one PC with specified VGA card and 42" LCD, Win 7 O.S. on all, to provide:</p> <ul style="list-style-type: none"> ➤ ECDIS integrated ownships in lab network, with total navigational and ship control (virtual) functionality in either independent or interactive underway contexts; ➤ ECDIS, conning, radar, and visual scene are displayed separately and continuously ➤ Inclusion of steering and throttle hardware is a preferred enhancement in multiple ownship simulation
1 instructor station	<p>Single PC, dual 19" LCD, Win 7 O.S., simulator instructor control and monitoring software installed, to provide:</p> <ul style="list-style-type: none"> ➤ Design and execution of exercises ➤ Inclusion of remote assessment option is a preferred enhancement in multiple ownship simulation
1 server / network	<p>Single high-end PC with extra RAM, single 19" LCD, Win Server 2003 O.S., gigabit network, Cat 5e wiring at a minimum, simulator system software installed, including a suitable number of ownship models and training areas, to provide:</p> <ul style="list-style-type: none"> ➤ Full network control (self-contained within classroom setting) ➤ Site for simulation software and all hydrodynamic modeling

See Annex 4 of the 2010 edition of the Model Course for a brief example of integrated simulation training for developing proficiencies in ECDIS navigation.

■ Teaching Aids (A)

- A1 IMO Model Course 1.27 (2012⁹ Edition), Electronic Chart Display and Information Systems (ECDIS)
 - A1.1 Course Framework (Part A of the course)
 - A1.2 Instructor Manual (Part D of the course)
- A2 Audiovisual aids: Video/DVD player, visual presentation, document projector, etc.
- A3 Simulator providing ownship functionality in [a visual](#) underway navigational context
- A4 ~~Type approved~~ ECDIS [workstation](#) including ENC data, deriving inputs from simulation or live sensors

A5 Electronic Navigational Chart (ENC) data, various, including permits, and update files

[A6 Raster Navigational Charts \(RNC\) including permits and updates](#)

■ Bibliography (B)

B1 NMEA Interface Standard 0183 v.3.01 (Severna Park, MD, National Marine Electronic Association, 1/2002)

B2 *Facts about electronic charts and carriage requirements*, 2nd Ed. (Finnish Maritime Administration: Primar Stavanger and IC-ENC, 5/2007)

B3 Gale, H. (2009) *From Paper Charts to ECDIS*. London: Nautical Institute

B4 Bole, et al. (2005) *The Radar/ARPA Manual*, 2nd ed., Chapter 10 "Ancillary Equipment". Burlington, MA: Elsevier

B5 *American Practical Navigator* (Bowditch, Pub. No. 9), 2002 Ed., Chapter 14 "Electronic Charts"

B6 Simulator reference manual (Manufacturer, Date)

B7 User's manual accompanying the ~~type approve~~ ECDIS software utilized during the training course (~~Manufacturer, Date~~)

[B8 IEC 61174- Maritime navigation and radiocommunication equipment and systems- Electronic chart display and information system \(ECDIS\)- Operational and performance requirements, methods of testing and required test results, Edition 3.0, International Electrotechnical Commission](#)

[B9 IHO S-66, Facts about electronic charts and carriage requirements, Jan 2010 Edition.](#)

[B10 IHO S-61, Product specifications for Raster Navigational Charts, Edition 1.0](#)

[B11 IHO S-52 Specifications for chart content and display aspects of ECDIS, 5th ed., as amended \(IHB, 12/2001\)](#)

[B12 IHO S-100 Universal Hydrographic Data Model, Ed. 1.0.0 \(Monaco: IHB, 1/2010\)](#)

[B13 IHO S- 57, Electronic Navigational Chart \(ENC\), Edition 3.1](#)

■ Electronic media (E)

~~T4E1~~ ECDIS, Seagull CBT, CD #64

~~T2E2~~ AIS, Seagull CBT, CD #109 v.A, 8/2003

~~T3E3~~ ECDIS Training Course, Videotel CBT #871, 5/2008

■ IMO & regulatory references (R)

R1 *Standards of Training, Certification and [Watchstanding-Watchkeeping](#) for Seafarers (STCW Convention)*, as amended

R2 1974 SOLAS Convention, Regulations V/19, V/20 and V/27, as amended 2009, IMO Res. MSC 282(86)

R3 Revised ECDIS Performance Standards, MSC.232(82), IMO, 12/2006

- R4 ECDIS Performance Standards, IMO Resolution A.817(19) as adopted 11/1995, including Appendices 1 – 5, Appendix 6 as adopted 11/1996 Res. MSC.64(67), and Appendix 7 as adopted 12/1998 Res. MSC.86(70)
- R5 ~~S-52 Specifications for chart content and display aspects of ECDIS, 5th ed., as amended (IHB, 12/2001)~~
- R6 ~~S-100 Universal Hydrographic Data Model, Ed. 1.0.0 (Monaco: IHB, 1/2010)~~
- R5 [IMO MSC.1/ Circ.1391, Operating anomalies identified within ECDIS](#)
- R6 [IMO SN.1/ Circ.266/ Rev. 1, Maintenance of Electronic Chart Display and Information System \(ECDIS\) Software](#)
- R7 *Guidelines for Voyage Planning*, IMO Res. A.893(21)
- R8 COLREGS - International Regulations for Preventing Collisions at Sea, 1972, as amended
- R9 ~~*IMO Model Course 1.27, The Operational Use of ECDIS, 2000*~~

■ Textbooks (T)

- T1 Norris, A. (2010) *ECDIS and Positioning*. London: Nautical Institute
- T2 Weintrit, A. (2009) *The Electronic Chart Display and Information System (ECDIS): An Operational Handbook*. Gydnia: Gydnia Maritime University, [Poland, Balkema Book, CRC Press, Taylor & Francis Group](#).
- T3 Hecht, et al. (~~2006~~2010) *The Electronic Chart*, ~~2nd~~-3rd Ed. Lemmer, The Netherlands: GITC bv
- T4 [The ECDIS Manual, ECDIS Ltd, Witherby Seamanship International, Edition 2012.](#)

Part B: Course Outline and Timetable

■ Overview

The following section presents the topics of the 40-hour ECDIS course in a simplified outline format. The 40 topics are organized into 5 general Subject Areas. The total hours are allocated in the following manner:

Practice & Lecture	Solo Independent ECDIS navigation	Solo_evaluation Evaluation & Exam
27.529.0 hrs	9.08.0 hrs	3.53.0 hrs

The duration allocated to each topic is presented in the Course Timetables, and is repeated in Part C – Detailed Teaching Syllabus, and in Part D – Lesson Plans and Exercises. The Learning Objectives for each topic are presented generally in Part C, and with full detail in Part D.

As defined in Part A – Course Framework, the Classroom (~~open lab~~) setting should provide one workstation for each trainee, and all workstations should be networked to the simulation instructor and server ~~such that each station offers a visual ownship including ECDIS and radar. The Integrated Navigation Lab (INL) should consist of a sufficient number of isolated ownships similarly networked such that all functions run on separate PCs and displays, and is approved by the national authority for ECDIS instruction.~~

~~With an open lab and INL arrangement of teaching facilities, most topics can be very effectively presented in a combination of demonstration and lecture. Further distinction of these modes is therefore not required.~~

■ Course Outline - Total 40.0 hours minimum

Subject Area and topics	Hours
Elements of ECDIS	40.5
1. Course introduction & familiarization plan	
2. Purpose of ECDIS	
3. Value to navigation	
4. Correct & incorrect use	
5. Work station start, stop & layout	
6. Vessel position	
7. Position source	
8. Basic navigation	
9. Heading & drift vectors	
Ex.1 Simulator exercise – open sea (basic integrated navigation)	
10. Understanding chart data	

Subject Area and topics	Hours
11. Chart quality & accuracy	
12. Chart organization	

Subject Area and topics	Hours
<u>Watchstanding Watchkeeping</u> with ECDIS	89.0
13. Sensors	
14. Ports & data feeds	
15. Chart selection	
16. Chart information	
17. Changing the settings	
18. Chart scaling	
19. Information layers	
Ex.2 Simulator exercise – coastal waters (chart display settings)	
20. System & position alarms	
21. Depth & contour alarms	
<u>ECDIS Route Planning and Monitoring</u>	79.0
22. Vessel maneuvering characteristics	
23. Route planning by table	
24. Route planning by chart	
25. Track limits	
26. Checking plan for safety	
Ex.3 Simulator exercise – coastal & confined -restricted waters (navigation alarms & route scheduling)	
27. <u>Additional Navigational Information Embedded tide, current & climate almanac</u>	
28. Route schedule	
29. User charts in route planning	

ECDIS Targets, Charts & System

86.5

- 30. ARPA/ ~~Radar tracked target~~ overlay
- 31. AIS functions
- ~~32. Radar overlay (RIB) functions~~
- ~~33-32.~~ Procuring & installing chart data
- ~~34-33.~~ Installing chart corrections
- Ex.4 Simulator exercise – ~~confined-restricted~~ waters (advanced integrated navigation with ECDIS)
- ~~35-34.~~ System reset & backup
- ~~36-35.~~ Archiving ~~with~~ ECDIS data ~~management utility~~ and data logging
- ~~37.~~ Data logging and logbook
- ~~38.~~ Playback

ECDIS Responsibility & Assessment

6.0

- ~~39-36.~~ Responsibility
- ~~40-37.~~ Effective navigation with ECDIS
- Ev.1 Written evaluation
- Ev.2 Simulator exercise – coastal & ~~confined-restricted~~ waters (underway ECDIS navigation assessment)

■ **Course Timetable – 5 days, 40.0 hours minimum**

Period Day	1st Period (2.0 hours)	2nd Period (4.5-2.0 hours)	3rd Period (2.0 hours)	4th Period (2.5-0 hours)
Day 1	<p>Elements of ECDIS</p> <p>1. course introduction & familiarization plan</p> <p>2. purpose of ECDIS</p> <p>3. value to navigation</p> <p>4. correct & incorrect use</p>	<p>5. work station start, stop & layout</p> <p>6. vessel position</p> <p>7. position source</p>	<p>8. basic navigation</p> <p>9. heading & drift vectors</p> <p>10. understanding chart data</p>	<p>Ex.1 Simulator exercise – open sea (basic integrated navigation)</p>
Day 2	<p>11. chart quality & accuracy</p> <p>12. chart organization</p> <p>Watchstanding Watchkeeping with ECDIS</p> <p>13. sensors</p> <p>14. ports & data feeds</p>	<p>15. chart selection</p> <p>16. chart information</p>	<p>17. changing the settings</p> <p>18. chart scaling</p> <p>19. information layers</p>	<p>Ex.2 Simulator exercise – coastal waters (chart display settings)</p>
Day 3	<p>20. system & position alarms</p> <p>21. depth & contour alarms</p>	<p>ECDIS Route Planning and Monitoring</p> <p>22. vessel maneuvering characteristics</p> <p>23. route planning by table</p>	<p>24. route planning by chart</p> <p>25. track limits</p> <p>26. checking plan for safety</p>	<p>Ex.3 Simulator exercise – coastal & confined-restricted waters (navigation alarms & route scheduling)</p>

<p>Day 4</p>	<p>27. Embedded tide, current & climate almanac Additional Navigational Information</p> <p>28. Route schedule</p> <p>29. Weather charts in route planning</p>	<p>ECDIS Targets, Charts & System</p> <p>30. RPA/ Radar tracked target overlay</p> <p>31. IS functions</p> <p>32. Radar overlay (RIB) functions</p>	<p>33-32. Procuring & installing chart data</p> <p>34-33. Installing chart corrections</p>	<p>Ex.4 Simulator exercise – confined-restricted waters (advanced integrated navigation with ECDIS)</p>
<p>Day 5</p>	<p>35-34. System reset & backup</p> <p>36-35. Archiving with ECDIS data management utility and data logging</p> <p>37. Data logging and logbook</p> <p>38. Playback</p>	<p>ECDIS Responsibility & Assessment</p> <p>39-36. Responsibility</p>	<p>40-37. Effective navigation with ECDIS</p> <p>Ev.1 Written evaluation</p>	<p>Ev.2 Simulator exercise –coastal & confined-restricted waters (underway ECDIS navigation assessment)</p>

Note: Teaching staff should note timetables are suggestions only as regards sequence and length of time allocated to each objective. These factors may be adapted by instructors to suits individual groups of trainees depending on their experience and ability and on the equipment and staff available for training.

Part C – Detailed Teaching Syllabus

The detailed teaching syllabus has been written in learning objective format in which the objective describes what the trainee should do to demonstrate that knowledge has been transferred. All objectives are understood to be prefixed by the words, “The expected learning outcome is that the trainee...”

In order to assist the instructor, reference publications are shown against the learning objectives in addition technical material and teaching aids, which the instructor may wish to use when preparing course material. The material listed in the course framework has been used to structure the detailed teaching syllabus; in particular, teaching aids (indicated by A) and references (indicated by B, E, R, or T) will provide valuable information to instructors.

The abbreviations used are:

add.:	Addendum	p.:	Page
app.:	Appendix	pa.:	Paragraph
art.:	Article	reg.:	Regulation
ch.:	Chapter	sect.:	Section
encl.:	Enclosure	tab.	Table

The following are examples of the use of references:

R1 tab. A-II/2 refers to Table A-II/2 training requirements of STCW 1978, as amended (2010);

AI.2 sect. 1 refers to training section 5 (“Elements of ECDIS”) in the guidance notes of the instructor manual (Part D) of the 2010 edition of this Model Course.

T3 ch.1 refers to Chapter 1 of the textbook edition designated as T3

■ Note

Throughout the course, safe working practices are to be clearly defined and emphasized with reference to current international requirements and regulations. It is expected that the institution implementing the course will insert references to national and/or regional requirements and regulations as necessary.

■ Learning Objectives

Subject Areas and topics have been outlined in Part B. In Part C, the Learning Objectives associated with each topic are provided, along with teaching aids and references. In Part D, the topics are referred to as Lesson Plans, and the Learning Objectives are further described in sufficient detail for the development of an ECDIS Instructor’s Manual. The Learning Objectives are presented in a verb-based manner to facilitate outcomes-driven learning and skills development. All Learning Objectives are understood to be prefixed by the phrase: “The expected learning outcome is that the trainee is able to”

Bear in mind that the overarching competencies to be developed throughout the course are the “use of ECDIS to maintain the safety of navigation” (STCW, [A-II/1](#), [A-II/3](#), Operational Level) and “maintain the safety of navigation through the use of ECDIS and associated navigation systems to assist command decision making” (STCW, [A-II/2](#), Management Level). The ECDIS instructor should strive to present all of the Learning Objectives in or as close to the contexts of underway navigation as possible. Through practice and understanding of these Learning Objectives as tasks to master and apply, the trainee achieves the desired competence and which the instructor may assess in the scored final underway evaluation.

Learning Objectives	Teaching Aid	Reference
<p>Elements of ECDIS (409.5 hours)</p> <p>1. Course introduction & familiarization plan (0.5 hours)</p> <p>1.1. General introductions</p> <p>1.2. Administration</p> <p>1.3. Familiarization with ECDIS learning environment</p> <p>2. Purpose of ECDIS (0.5 hours)</p> <p>2.1. Introduce revised IMO Performance Standards for ECDIS (June 2006, Resolution MSC.232(82))</p> <p>2.2. Differentiate between display options</p> <p>2.3. Identify information types and areas on navigation display</p> <p>2.4. Apply presentation of ECDIS data</p> <p>3. Value to navigation (0.5 hours)</p> <p>3.1. Recognize factors that characterize and modify chart presentation</p> <p>3.2. Recognize factors that characterize and modify the data quality</p> <p>3.3. Manually change scale, area & position of ownship</p> <p>3.4. Evaluate the route monitoring mode of ECDIS operation</p> <p>3.5. Explain the value of ECDIS to navigation</p> <p>4. Correct & incorrect use (0.5 hours)</p> <p>4.1. Use ECDIS within the prevailing navigation situation</p> <p>4.2. Recognize ways to avoid over-reliance on ECDIS</p> <p>4.3.</p>	<p>A1.1 A3 A4</p> <p>A1 A1.2 A2 A3 A4 A5</p> <p>A1.2 A2 A3 A4 A5</p> <p>A1.2 A2 A3 A4 A5</p>	<p>T3 ch.1 B6 B7</p> <p>R3 T1 ch.3 & 10.3 T3 ch.2 B4 ch.10.2 B5 ch.14</p> <p>T1 ch.6.8 T1 ch.8.5 T3 ch.11.1 & 11.2 B4 ch.11.2.2 & 11.2.3 & 11.3</p> <p>T1 ch.8.7 T3 ch.11.3.2 & 7.5 & 8.1.1 B2 B3</p>

Learning Objectives	Teaching Aid	Reference
<p>proficiency in the use of ECDIS includes assessing the integrity of the system and all data at all times</p>		
<p>5. Work station start, stop & layout (4-00.5 hour)</p> <p>5.1. Perform standard PC-ECDIS workstation start</p> <p>5.2. Interpret the ECDIS start windows for sensors requested, sensors found, and selected chart data initializing</p> <p>5.3. Examine alarms (if any) and determine initial conditions of ECDIS readiness for navigation</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.1 T3 ch.7.3 B7</p>
<p>6. Vessel position (0.5 hours)</p> <p>6.1. Review user interface methods</p> <p>6.2. Review display of vessel's position</p> <p>6.3. Examine position information in the display panels</p> <p>6.4. Determine a position fix on the ECDIS chart display panel</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.6.7 B7</p>
<p>7. Position source (1.0 hour)</p> <p>7.1. Review basics of GPSGNSS</p> <p>7.2. Coordinate GPSGNSS antenna position settings</p> <p>7.3. Select position system</p> <p>7.4. Determine fix quality (status) of GPSGNSS</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.2 T3 ch.7.5.5 & 8.1.1 B7</p>

Learning Objectives	Teaching Aid	Reference
<p>8. Basic navigation (1.0 hour)</p> <p>8.1. activate display categories and information layers</p> <p>8.2. monitor vessel safety</p> <p>8.3. activate route monitoring features</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.6.2 B7</p>
<p>9. Heading & drift vectors (0.5 hours)</p> <p>9.1. activate vessel's motion vectors</p> <p>9.2. obtain vessels' course and speed from the positioning system</p> <p>9.3. interpret the movement of the vessel</p> <p>9.4. recognize the effects of gyro error</p> <p>9.5. graphically monitor ownship's approach to isolated dangers by means of a guard ring</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.8.1 R3 R4 B7</p>
<p>Ex.1 Simulator exercise – open sea (basic integrated navigation) (2.5-0 hours)</p>	<p>A3, A4, A5</p>	
<p>10. Understanding chart data (1.0 hour)</p> <p>10.1. define the relevant terminology of ECDIS</p> <p>10.2. describe the differences between electronic chart systems and ECDIS</p> <p>10.3. describe the various electronic chart data formats</p> <p>10.4. explain the relationship between ECDIS data and the information presented on the display</p> <p>10.5. explain that only information stored as objects with corresponding attributes in the database is available for display</p> <p>10.6. describe the chart data selected for display</p>	<p>A1.2 A2 A3 A4 A5 A6</p>	<p>T1 ch.1 & 4 T3 ch.4 & 7.2 & 6 B5 ch.14 B7 B10</p>

<p>11. Chart quality & accuracy (0.5 hours)</p> <p>11.1. Explain what the accuracy of chart data is dependent upon</p> <p>11.2. Explain the problems in ECDIS associated with variant datums</p> <p>11.3. Assess all errors, inaccuracies and ambiguities caused by improper data management</p> <p>11.4. Explain the need and requirement that electronic chart data must be systematically updated for safe navigation</p> <p>11.5. Demonstrate issues pertaining to computer monitor display resolution</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.9 T3 ch.5 B7</p>
<p>12. Chart organization (0.5 hours)</p> <p>12.1. Introduce the organization of chart data distribution</p> <p>12.2. Demonstrate the loading (retrieval) of ECDIS data</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.6.3 T3 ch.10 & 7.2.2 B7</p>

Learning Objectives	Teaching Aid	Reference
<u>Watchstanding Watchkeeping with ECDIS (8-9 hours)</u>		
13. sensors (0.5 hours) <ul style="list-style-type: none"> 13.1. explain the performance limits of devices for position, course over ground, heading, speed, depth, radar, and AIS 13.2. explain the need for selecting sensor data displayed in ECDIS that is appropriate, unambiguous and accurate 13.3. evaluate the impairment of ECDIS performance when sensor performance deteriorates <u>or fails</u> 13.4. explain and analyze various sensor alarms and indications 	A1.2 A2 A3 A4 A5	T1 ch.2.16 & 6.1 & 6.5.1 T3 ch.8 B7
14. ports & data feeds (0.5 hours) <ul style="list-style-type: none"> 14.1. select between primary and secondary position source 14.2. observe automatic change over to secondary position source 14.3. explain the data reference system of each connected sensor 14.4. identify the data port assigned to each connected sensor 14.5. monitor, identify and to a limited extent decode the data stream for each attached sensor 14.6. assess the plausibility of sensor input values to ECDIS 14.7. assess the impact on displayed information when a sensor port is improperly selected 	A1.2 A2 A3 A4 A5	T1 ch.8.2 & 8.3 B4 ch.10.4 B7
15. chart selection (0.5 hours) <ul style="list-style-type: none"> 15.1. demonstrate the variety of methods that chart data can be loaded and changed (<u>called into display</u>) 15.2. assess the inaccuracies and ambiguities caused by improper selection of a chart for display 15.3. display updates in order to review content and to establish their 	A1.2 A2 A3 A4 A5	T1 ch.6.4 & 9.1 T3 ch.5.3 & 7.2 B7 <u>B8</u>

<p>inclusion in the SENC</p> <p>15.4. explain and analyze the data and chart alarms resulting from over-scaling</p> <p>15.5. explain and analyze the data and chart alarms resulting from use of a non-WGS84 datum</p> <p>16. chart information (1.0 hour)</p> <p>16.1. select the task panel and apply the functions suitable for position monitoring, route monitoring, route creation and editing, trial maneuver, creating and accessing user-defined layers</p> <p>16.2. obtain information on charted objects</p> <p>16.3. demonstrate how the presentation of navigation marks is changed according to Own-own Ship-ship position</p> <p>16.4. demonstrate errors of interpretation by the incorrect selection of display categories</p>	<p>A1.2</p> <p>A2</p> <p>A3</p> <p>A4</p> <p>A5</p> <p>A6</p>	<p>T1 ch.6.4.6</p> <p>T3 ch.7.2</p> <p>B7</p> <p>B10</p>
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Learning Objectives	Teaching Aid	Reference
<p>17. hanging the settings (1.0 hour)</p> <p>17.1. annually test the major functions of hardware, keyboard, mouse / trackball, sensor data, and chart data</p> <p>17.2. check and / or select preferred operational settings in the primary task panels and on the primary information panel</p> <p>17.3. evaluate alarm and function status indications</p> <p>17.4. demonstrate errors of interpretation by the incorrect selection of safety values</p> <p>17.5. adjust track length and precision</p> <p>17.6. evaluate the range of information recorded in the log table (voyage recording)</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.6.3 & 8.6 T3 ch.7.6 B7</p>
<p>18. chart scaling (0.5 hours)</p> <p>18.1. demonstrate scaling of electronic chart display</p> <p>18.2. apply the automatic changing of chart scale ratio</p> <p>18.3. apply additional chart scale information</p> <p>18.4. recognize interpretation errors due to scaling</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.6.4 T3 ch.7.2.4 B7</p>
<p>19. information layers (0-51.0 hours)</p> <p>19.1. observe effect on information layers and status indications when chart data is loaded and when chart area is underscaled</p> <p>19.2. review and apply appropriate day/night palette, display category, and scale</p> <p>19.3. select information options in display category of "All other information"</p> <p>19.4. differentiate between information layers, User-user Chart-chart layers, and Event-event graphic</p> <p>19.5.</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.6.5 & 6.9 & 7.3 T3 ch.7.5.6 & 7.2.1 & 7.3.2 B7</p>

	respond to the indicators representing the loss of displayed information		
Ex.2	Simulator exercise – coastal waters (chart display settings) (2.0 hours)	A3, A4, A5	
20.	system & position alarms (0.5 hours)	A1.2 A2 A3 A4 A5	T1 ch.8.3 T3 ch.7.5.3 B7
20.1.	identify and respond to alarms for primary and secondary positioning systems		
20.2.	identify and respond to chart related alarms		
20.3.	identify and respond to ECDIS alarms from autopilot in Track Control		
21.	depth & contour alarms (1.0-5 hour)	A1.2 A2 A3 A4 A5	T1 ch.8.4 & 6.5 T3 ch.7.5 B7
21.1.	describe route monitoring alarms		
21.2.	identify depth-related information		
21.3.	set the safety values for route monitoring		
21.4.	set the limits pertaining to safe water		

Learning Objectives	Teaching Aid	Reference
<p>ECDIS Route Planning and Monitoring (79.0 hours)</p>		
<p>22. vessel maneuvering characteristics (0.5 hours)</p> <p>22.1. select appropriate turning criteria for efficient and effective use of Autopilot in heading control mode</p> <p>22.2. correlate rudder limits in Autopilot with turning radii and rates of turn for curved track planning on ECDIS</p> <p>22.3.22.1. Determine methods of alert for wheel over when approaching waypoints</p> <p>22.4.22.2. The navigator must verify positioning especially when ECDIS is connected to auto pilot</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.8.5 T3 ch.7.5 & 8.3 B7</p>
<p>23. route planning by table (0-51.0 hours)</p> <p>23.1. retrieve a stored route plan</p> <p>23.2. improve an existing route for planning, safety review and monitoring</p> <p>23.3. select the sea areas and the required waters for planning the whole passage</p> <p>23.4. construct a route plan by inputting waypoint data alphanumerically into a route-planning table</p> <p>23.5. adjust the route plan by editing, adding and deleting waypoints inside the table</p> <p>23.6. adjust curved track planning and wheel over indication</p> <p>23.7. establish procedures to name, link, rename, archive, retrieve and delete route files</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.7.1 & 7.5 T3 ch.7.4 B7</p>
<p>24. route planning by chart (42.0 hour)</p> <p>24.1. select the sea areas and the required waters for planning the whole passage</p> <p>24.2.</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.7.2 & 7.3 T3 ch.7.4 B7</p>

<p>construct a route by inputting waypoints directly on the ECDIS display</p> <p>24.3. adjust the route by graphically editing waypoints</p> <p>24.4. obtain track courses and distances from the chart</p> <p>24.5. obtain relevant route planning information</p>		
<p>25. track limits (0.5 hours)</p> <p>25.1. review the alarm settings used as vessel is proceeding along a monitored route</p> <p>25.2. modify the setting of XTE in a previously saved route</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.6.5.3 & 8.3 T3 ch.7.5 B7</p>

<p>selected waypoint on a monitored route</p> <p>29. User charts in route planning (1.9-5 hour)</p> <p>29.1. Review the ECDIS function for creating mariner's notes (User Chart)</p> <p>29.2. Determine effective policy regarding User Charts</p> <p>29.3. Select User Chart for display</p> <p>29.4. Use the graphic editor for creating and modifying a User Chart</p> <p>29.5. Create, save and move an anchor circle guard zone <u>as-on</u> a User Chart</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.7.3 T3 ch.7.3 B7</p>
<p>ECDIS Targets, Charts & System (86.5 hours)</p> <p>30. RPA/ <u>Radar tracked target</u> overlay (0.5 hours)</p> <p>30.1. Examine sensor setup requirements for ARPA <u>tracked</u> targets</p> <p>30.2. Determine speed and heading inputs used in ARPA <u>tracked</u> target data calculations</p> <p>30.3. Access target <u>information</u> display</p> <p><u>30.4.</u> Interpret target symbol features</p> <p><u>330.5 Operate the user interface controls for radar overlay</u></p> <p><u>330.6 Demonstrate sources of image offset</u></p> <p><u>D30.7 Determine source of ECDIS-tracked target data calculations</u></p> <p><u>30.8 Make corrections to own ship's position, using a reference point captured by ARPA.</u></p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.8.4.3 T3 ch.8.2.3 & 8.5 B7 <u>T1 ch.8.4.4</u> <u>T3 ch.8.2.1</u> <u>& 8.2.2 &</u> <u>11.1.5</u></p>

Learning Objectives	Teaching Aid	Reference
<p>31. IS functions (0.5 hours)</p> <p>31.1. describe what the connection of an Automatic Identification System (AIS) to ECDIS enables</p> <p>31.2. examine sensor setup requirements for AIS targets</p> <p>31.3. determine alarms and other settings for AIS targets</p> <p>31.4. access target information display options</p> <p>31.5. interpret AIS target symbol features</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.8.4.5 & 6.9 T3 ch.8.4 B4 ch.10.3 B7</p>
<p>32. Radar overlay (RIB) functions (0.5 hours)</p> <p>32.1. describe the technical function of the radar integrator board (RIB) hardware</p> <p>32.2. examine the main functions of the radar integrator board</p> <p>32.3. operate the user interface controls for radar overlay</p> <p>32.4. demonstrate sources of image offset Determine source of ECDIS tracked target data calculations</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.8.4.4 T3 ch.8.2.1 & 8.2.2 & 11.1.5 B7</p>
<p>33.32. Procuring & installing chart data (1.0-5 hour)</p> <p>32.1. review chart data structure, terminology, and installation procedures.</p> <p>32.2. review chart format requirements for ECDIS</p> <p>32.3. examine data distribution sources for ENC</p> <p>32.4. examine data distribution sources for SENC conversions</p> <p>32.5. examine license structure for various formats, and practice installation</p> <p>32.6. examine license structure for various formats, and practice installation</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.4.4 T3 ch.9.2 & 9.3 & 9.4 B7</p>

<p>32.7-32.6. Extract information on installation history</p>		
<p>34-33. Installing chart corrections (1.0 hour)</p> <p>33.1. explain why electronic chart data is maintained with up-to-date corrections</p> <p>33.2. add or modify a chart object using Manual Correction task</p> <p>33.3. examine production license options for accessibility of automatic updates</p> <p>33.4. install various automatic update formats using various methods</p> <p>33.5. extract information on update history</p> <p>33.5-33.6. Apply Temporary and Preliminary Corrections and Navigational Warnings.</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.4.5 & 6.3 T3 ch.10 B7</p>
<p>Ex.4 Simulator exercise – confined-restricted waters (advanced integrated navigation with ECDIS) (2.5-0 hours)</p>	<p>A3, A4, A5</p>	
<p>35-34. System reset & backup (0.5 hours)</p> <p>34.1. explain the intent of regulations on ECDIS back-up arrangements</p> <p>34.2. perform Discuss back-up procedures in standalone ECDIS failure event</p> <p>34.3. perform Discuss networked back-up procedures in (Master) ECDIS failure event</p> <p>34.4. perform Discuss troubleshooting routines in ECDIS</p> <p>34.5. recognize consequences to navigation safety while troubleshooting,</p> <p>34.6. recognize consequences to data storage while ECDIS PC workstation is down</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.8.7 & 8.8 T3 ch.11.3 & 11.4 B7</p>

Learning Objectives	Teaching Aid	Reference
<p>36-35. Archiving with ECDIS data management utility and data logging (0.5 hours)</p> <p>35.1. Discuss ECDIS data management utility to work with files associated with ECDIS operations</p> <p>35.2. Discuss ECDIS data management utility to transfer selected data files between storage media</p> <p>35.3. Examine requirements and functions of logbook task in ECDIS</p> <p>35.4. Examine display functions of ownship track and tracks of AIS, and ARPA targets</p> <p>35.2-35.5. Perform various hard copy print outs</p>	<p>A2 A4 <u>A1.2</u> <u>A3</u> <u>A5</u></p>	<p><u>T1 ch.8.6</u> <u>T3 ch.7.6 & 13.9</u> B7</p>
<p>37. ata logging and logbook (1.0 hour)</p> <p>35.3. xamine requirements and functions of logbook task in ECDIS</p> <p>35.4. xamine display functions of ownship track and tracks of AIS, ARPA and RIB targets</p> <p>35.5-35.6. perform various hard copy print outs</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T1 ch.8.6 T3 ch.7.6 & 13.9 B7</p>
<p>38. ayback (0.5 hours)</p> <p>38.1. xplain the disruption of ECDIS when operating Playback utility</p> <p>38.2. xplain that no route or route plan is securely associated with any playback</p> <p>38.3. xplain that no chart data is securely associated with any playback</p> <p>38.4. perform a playback of an event or passage specified by date and time</p> <p>38.5. losely observe the position and heading update interval in Playback</p> <p>38.6-38.1. uring playback, analyze the logbook for the quality of navigation</p>	<p>A1.2 A2 A3 A4 A5</p>	<p>T3 ch.7.6 B7</p>

ECDIS Responsibility & Assessment (6.0 hours)		
<p>39-36. Responsibility (4-52.0 hours)</p> <p>36.1. e-examine<u>Review</u> COLREGS —implicit</p> <p>36.2. e-examine <u>Review</u>-SOLAS, as amended —explicit</p> <p>36.3. e-examine <u>Review</u> IMO approval of equipment and installations</p> <p>36.4. e-examine <u>Review</u> IMO carriage requirements</p> <p>36.5. e-examine <u>Review</u> national ECDIS carriage regulations (<u>if applicable</u>)</p> <p>36.6. e-examine <u>Review</u> STCW Code, as amended</p> <p>36.7. e-examine <u>Review</u> flag state (maritime) implementation</p> <p>36.8. e-examine <u>Review</u> IMO training Guidance (and providing review of course)</p> <p><u>36.9.</u> e-examine <u>Review</u> ISM <u>and IMO</u> requirements of ship owners & operators</p> <p><u>36.10.</u> <u>Review IHO relevant regulations.</u></p> <p>36.9-36.11. <u>Review the need to ensure that ECDIS software is kept up to date.</u></p>	<p>A1.2 A2</p>	<p>R1 R3 <u>R5B11</u> <u>R6B12</u> <u>B13</u> R7 T1 ch.5 T3 ch.13.4</p>
<p>40-37. Effective navigation with ECDIS (1.0 hour)</p> <p>37.1. escribe bridge functions incorporating ECDIS</p> <p>37.2. e-examine sample bridge operating procedures addressing ECDIS</p> <p>37.3. efine safe and practical navigation with ECDIS</p> <p>37.4. xamine <u>evolving concepts of e- Navigation with regards to ECDIS Knowledge of the anomalies that ECDIS is susceptible to.</u></p>	<p>A1.2 A2</p>	<p>T1 ch.10.2 T3 ch.7.3 & 8.1 & 11.2 & 16 <u>R5, R6</u></p>
<p>Ev.1 Written evaluation (1.0 hour)</p>		

Ev.2	Simulator exercise – coastal & confined -restricted waters (underway ECDIS navigation assessment) (2.5_0 hours)	A3, A4, A5	
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Part D – Instructor Manual

■ Guidance for instructors

The course outline and timetable (Part B) provide guidance on the time allocation for the course material, but the instructor is free to modify this if it is deemed necessary. The detailed teaching syllabus (Part C) must be studied carefully and, where appropriate, lesson plans or lecture notes compiled with Part D providing the basis from beginning to end of the course. ~~The written and practical exam content and methods are detailed~~ [Evaluation and assessment guidance are provided](#) in Part E.

The lesson plans and exercises of this part are meant to provide the ECDIS navigation instructor with the material for a course instruction manual. Specifically, the Learning Objectives presented in the previous parts of the Model Course document are fleshed out in considerable detail in Part D. The details of this part reflect the views of the course developers with respect to methodology and organization as well as what they consider relevant and important in light of their experience as instructors and as navigator who have succeeded in applying ECDIS to bridge [watchstanding watchkeeping](#). Although the lessons, exercises, and assessment methods should be of value initially, each instructor should develop his/her own methods and ideas, recognize and refine what is successful, and discard that which does not work satisfactorily. It is particularly important for the instructor to adapt content to the specific ECDIS being utilized in the training environment. Despite the ECDIS Performance Standards, there is limited commonality among type-approved ECDIS units. Adaptation is also advised for review of flag state regulations, as appropriate.

As noted in the foregoing parts, this 40-hour course is comprised of 40 Lesson Plans, 4 practice exercises, and a final underway assessment exercise. These are divided according to the five primary stages of the course:

1	Elements of ECDIS (409.5 hours)	Elements
2	Watchstanding Watchkeeping with ECDIS (89.0 hours)	Watchstanding
3	Route Planning (79.0 hours)	ECDIS
4	Charts, Targets & System (86.5 hours)	ECDIS
5	Responsibility (6 hours)	ECDIS

Preparation and planning are the most important criteria in effectively presenting this course. Availability and proper use of course materials is also essential for maximum efficacy in conveying the subject to trainees. The capabilities and limitations of the teaching facilities in use may dictate that the learning objectives be adjusted but it is suggested that this be kept to a minimum.

Due to the considerable challenges and complexities faced by trainees learning to navigate safely using ECDIS, it is vital for the instructor to recognize that successful underway assessments require as much hands-on practice as possible. As discussed in the Introduction to the navigational use of ECDIS (2010 Edition), lecturing and demonstration and the opportunity for individual use applies to nearly all learning objectives in nearly all topics. ~~Whenever an ECDIS unit must be shared amongst trainees, the quality of learning is critically degraded, and leads to likely failure in the final underway assessment.~~ It will, ~~therefore,~~ be necessary for instructors to prepare for the presentation of specific learning objectives in the context of underway scenarios for both classroom demonstration and practice, and for the [sole independent](#) navigation environment. The development of other materials, such as a compilation on a CD of handy reference material, is also strongly suggested. An index of useful files and documents is provided in the “Appendices for the Instructor” part of this course.

■ Lesson Plans: Elements of ECDIS (~~409~~.5 hours)

1. Introduction & familiarization plan (0.5 hours)
 2. Purpose of ECDIS (0.5 hours)
 3. Value to navigation (0.5 hours)
 4. Correct & incorrect use (0.5 hours)
 5. Work station start, stop & layout (~~4.00~~.5 hour)
 6. Vessel position (0.5 hours)
 7. Position source (1.0 hour)
 8. Basic navigation (1.0 hour)
 9. Heading & drift vectors (0.5 hours)
 10. Understanding chart data (1.0 hour)
- Ex.1 Simulator Exercise – Open sea (basic integrated navigation) (2.~~5~~0 hours)
11. Chart quality & accuracy (0.5 hours)
 12. Chart organization (0.5 hours)

1. Introduction & familiarization plan (0.5 hrs)

The [trainee instructor](#) explains the goals of the 40-hour course; and [the trainee](#) becomes familiar with the layout of the ECDIS equipment at the workstations and on the bridge simulator (Refs: T3 ch.1; B6; B7).

1.1. General introductions:

- Define the goals of the course and course certification,
- Verify that all trainees have basic computer skills (objective assessment)
- Explain the course structure and attendance requirements,
- Explain the evaluation process
- Explain that trainees will achieve an understanding of type-approved ECDIS in general, and proficiency specifically in the use of system in use in the course

1.2. Administration:

- Issue study guides and other reference material,
- Review course syllabus

1.3. Familiarization with ECDIS learning environment

- Work station power-up and ECDIS software start and stop,
- Use the projector to show how you will demonstrate ECDIS functions,
- Explain how to get information from the ECDIS User Manuals,
- Explain Help structure within ECDIS software package, and
- Briefly tour classroom and lab used for ECDIS navigation training to see navigation and control equipment.

2. Purpose of ECDIS (0.5 hrs)

The [trainee instructor](#) explains the main characteristics of ECDIS data display, and recognizes which information is constantly displayed by ECDIS and which is selectable (Refs: R3; T1 ch.3 & 10.3; T3 ch.2; B4 ch.10.2; B5 ch.14).

2.1. Introduce revised IMO Performance Standards for ECDIS (June 2006, Resolution MSC.232(82)):

- ECDIS definition,

- Capability of displaying all chart information necessary for safe and efficient navigation,
- Swiftly enables positioning, route monitoring and route planning,
- Provides appropriate alarms and indications.

2.2. Differentiate between display options:

- Electronic navigational chart (ENC) and system ENC (SENC),
- Standard display and display base,
- Display of information other than ENC data.

2.3. Identify information types and areas on navigation display:

- Electronic chart area, Information area, Task panels, other menu options,
- Automatic displays for monitoring ship's safety including position, gyro heading, speed log, time, and safety values, course over ground and speed over ground.

2.4. Apply presentation of ECDIS data:

- Major rules of presentation library,
- Automatic presentation, such as scale, display category, day/night, etc.,
- Modes, such as true motion and North-up.

3. Value to navigation (0.5 hrs)

The trainee recognizes that safe navigation with ECDIS requires the selection and analysis of displayed information that is relevant to the prevailing situation (Refs: T1 ch.6.8; T1 ch.8.5; T3 ch.11.1 & 11.2; B4 ch.11.2.2 & 11.2.3 & 11.3).

3.1. Recognize factors that characterize and modify chart presentation:

- Projection, colors, symbols,
- Assessment of differences.

3.2. Recognize factors that characterize and modify the data quality:

- Accuracy, resolution, completeness,
- Assessment of differences.

3.3. Manually change scale, area & position of ownship:

- Chart (or sea) area and scale,
- Position of own ship relative to display edge

3.4. Evaluate the route monitoring mode of ECDIS operation:

- Route monitoring mode,
- Navigation mode.

3.5. Explain the value of ECDIS to navigation:

- Own ship position with respect to route, shipping lanes, acquired targets, depth contours, soundings, and predicted tides and currents,
- Multi-chart loading, scaling, on-chart object information,
- Centralized information station for navigational bridge team, including ERBL, user layers, radar target tracking, SAR, Navtex, AIS, climate, and port information.

4. Correct & incorrect use (0.5 hrs)

The trainee assesses ~~ECDIS as a tool which aids but does not replace proper navigational watchkeeping the role of ECDIS within the totality of the navigation process.~~ (Refs: T1 ch.8.7; T3 ch.11.3.2 & 7.5 & 8.1.1; B2; B3).

4.1. Use ECDIS within the prevailing navigation situation:

- Name the principles of navigation and operational guidance for officers in charge of a navigational watch (STCW, SOLAS),
 - Review the many areas of bridge operations to which ECDIS may be applied,
 - Situational awareness includes the functioning of navigational aids and the reliability of sensors,
 - ~~ECDIS is only a tool designed to support the mariner performing navigational tasks, ECDIS is a powerful and comprehensive navigational system yet its use does not eliminate the need to verify the information using other means.~~
 - A navigational watch is not to be performed on only one system (mostly unavoidable in this simulation and proficiency training)
- 4.2. Recognize ways to avoid over-reliance on ECDIS
- A system malfunction and data inaccuracy is always a potential,
 - The displayed hydrographic data are not more reliable than the survey data they are based on,
 - The displayed sensor data are not more reliable than the respective originating sensor system,
 - Errors / inaccuracies in one subsystem may degrade others and can potentially render ECDIS useless.
- 4.3. Proficiency in the use of ECDIS includes assessing the integrity of the system and all data at all times.
- However, such use should be integrated into standing a normal watch including a competent visual lookout, and the continued maintenance of good situational awareness.
 - One method of accomplishing this is to go to the ECDIS with a single purpose or query within a strict and brief time limit, rather than to browse or surf menus and information panels. Keeping to a 7-second glance as a scanning technique helps produce an integrative role for ECDIS.
 - Another method is to overcome the problem of partial use – the less thoroughly the ECDIS is used and applied, the less willing the users become to apply ECDIS to navigation, resulting in less familiarity and less trust.

5. Work station start, stop & layout (1-00.5 hr)

The trainee analyzes and assesses the proper functioning of ECDIS during the booting-up process and normal operation (Refs: T1 ch.1; T3 ch.7.3; B7).

- 5.1. Perform standard [PGECDIS workstation](#) start:
- Recognize that some sensor feeds may need to be off or disconnected ~~to~~ [from PGECDIS workstation](#) com ports, and that the [PGECDIS workstation](#) is subject to all normal limitations of hardware, operating system, and memory
 - ECDIS is a navigation aid (~~not a general use PC~~) and has:
 - Potential limitations in hard drive storage, RAM size, power supply interruptions, hardware malfunctions, overall system lockup, etc.,
 - Operating system (typically Windows) boot-up procedures and internal tests,
 - A pre-programmed “dongle” installed in the parallel printer port which enables the registration and use of the ECDIS manufacturer’s products
 - The potential to fail due to incorrect use of OS and ECDIS software.
- 5.2. Interpret the ECDIS start windows for sensors requested, sensors found, and selected chart data initializing:
- Recognize the significance of the ECDIS Activator Key (dongle) and associated license files
 - The ECDIS software boots up (loads) with:
 - A small indicator window against the desktop background, then
 - A full screen panel indication of initialization, then
 - The ECDIS basic display with alarm indicators (if any) requiring acknowledgement.

5.3. Examine alarms (if any) and determine initial conditions of ECDIS readiness for navigation

- The ECDIS initialization screen indicates on-line tests:
 - For date/time, position, heading, and speed log,
 - Displays “Received” when these inputs match expected protocols (“Received” status is not a check on data accuracy),
 - Displays “Aborted” when these inputs are missing or corrupt,
 - Boot-up without inputs will continue, with alarms on ECDIS display,
 - ENC data will be loaded from the chart files as licensed.

6. Vessel position (0.5 hrs)

The trainee operates basic navigational functions and settings pertaining to vessel position information (Refs: T1 ch.6.7; B7).

6.1. Review interface methods:

- Mouse / trackball and device buttons,
- Keyboard and hotkeys,
- Control of standard cursor and free mouse cursor,
- Use of cursor and ERBL on the display.

6.2. Review display of vessel’s position:

- Shift the vessel on the display in navigation mode
- Vessel’s symbols
- Vessel’s [GPSGNSS](#) position information (details reviewed in Lesson 07),
- Track of vessel’s position (details reviewed in Lesson 08),
- Vessel’s motion vectors (details reviewed in Lesson 09).

6.3. Examine position information in the display panels:

- System (tidal height, current, sounding, set and drift at position),
- Route (vessel position on the route),
- Pilot (position relative to next WP as per route schedule data).

6.4. Determine a position fix on the ECDIS chart display panel:

- Manually draw and move bearing lines (LOPs),
- Manually mark position on the display

7. Position source (1.0 hrs)

The trainee recognizes the principle features of [DGPSGNSS](#) as the primary vessel position source (Refs: T1 ch.2; T3 ch.7.5.5 & 8.1.1; B7).

7.1. Review basics of [GPSGNSS](#):

- Satellite constellation, theory, atmospheric interference,
- Signal quality indication, HDOP, data age, station ID,
- Accuracy (2drms probability),
- ~~USCG’s beacons for differential corrections (DGPS).~~

7.2. Coordinate [GPSGNSS](#) antenna position settings:

- Set [GPSGNSS](#) antenna locations from amidships and off centerline (Consistent Common Reference Point – CCRP)
- Switch on primary and secondary position sources by assigning ports for [NMEA/NMEA/IEC 61162](#) data feed

7.3. Select position system

- [Primary or PS4 Primary Position Sensor](#)

- [Secondary or PS2 Secondary Position Sensor](#)
- Auto change (automatic switching to dead reckoning position).

7.4. Determine fix quality (status) of [GPSGNSS](#):

- Position information
- Alarms and indications of disruptions of [GPSGNSS](#) data feed,
- Tracking the discrepancy between [PS1-Primary Position Sensor](#) and [PS2 Secondary Position Sensor](#)
- Monitoring the [GPSGNSS](#) data port,
- Check ship's position by a second independent means.

8. Basic navigation (1.0 hrs)

The trainee operates many of the basic navigational functions and settings (Refs: T1 ch.6.2; B7).

8.1. Activate display categories and information layers:

- Base, Standard, All and Custom
- Spot soundings limit (depths \leq safe setting are displayed as bold),
- Channel limits, fairways, landmarks, special areas, warnings,
- Message "Layers Lost" when any are turned off.

8.2. Monitor vessel safety:

- Recognize position, gyro, speed log, COG, SOG, time,
- Set a safe depth value from sea level with regards to Isolated Dangers
- Set a safe depth contour
- Identify contours shown in Base Display,
- Identify other Base Display information that cannot be turned off.

8.3. Activate route monitoring features:

- Track, log, drift summary, sensor status, target tracks, scale, route information, contours, isolated dangers, special areas, alarm limits,
- Activate day/night color sets, track display, scale bar, vessel symbol,
- Set voyage recording (Logbook) track period, precision, color, history, routing [information](#), filters.

9. Heading & drift vectors (0.5 hrs)

The trainee operates basic navigational functions and settings pertaining to ownship's heading vector, course over ground vector, and guard ring (Refs: T1 ch.8.1; R3; R4; B7).

9.1. Activate vessel's motion vectors:

- Turn either or both vectors on or off,
- Alignment of vessel contour,
- Set vector length.

9.2. Obtain vessels' course and speed from the positioning system:

- COG & SOG may be from position system or from ARPA reference,
- HDG is true or undefined (manual entry only when in DR),
- LOG may be bottom, water, ARPA, or position system referenced.

9.3. Interpret the movement of the vessel:

- The graphical difference between the COG/SOG and the HDG/LOG vectors is the drift angle,
- Display of drift angle reveals vessel momentum in a turn,
- Drift angle in steady state reveals sum of wind and current on vessel.

9.4. Recognize the effects of gyro error:

- Drift angle results from gyro data without any provision for correction,
- Gyro precession due to high-speed turns produces an unreliable HDG display on ECDIS.

9.5. Graphically monitor ownship's approach to isolated dangers by means of a guard ring [or equivalent ECDIS function](#)

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EX - 1. Simulation exercise – open sea (2.5-0 hours)

The trainee operates specific functions constituting task groups for route monitoring in an open sea area, and obtains all relevant information for basic safe integrated navigation.

- Demonstrate the following tasks ~~groups~~ on ECDIS while navigating safely in an open sea setting with non-threatening ARPA targets:
 - Monitor sea area,
 - Use [the](#) pre-defined route [as set by the instructor](#),
 - Check position with pre-defined fix,
 - Select pre-defined user layers,
 - Check settings such as vector time, display reset, information layers, alarms, track, sensors, and ownship configurations.
- Check settings such as vector time, display reset, information layers, alarms, track, sensors, and ownship configurations.

Instructor guidelines

- Conduct simulation exercise according to exercise description:
 - ~~_____~~ Set simulation parameters,
 - [Provide trainees with a pre defined route](#)
 - Brief and debrief trainees.
 - Assess accomplishment of tasks according to exercise description.
- ~~_____ Consider the following options in designing scenarios for Exercise 1 (for descriptions of optimal simulator arrangements, see Part A – course Framework; also App.4 and App. 5 in Appendices for the Instructor):~~

Expected outcomes:

- [Familiarise with the use of ECDIS](#)
- [Navigate with ECDIS](#)
- [Monitor SOG and COG](#)

Option (A) for Exercise 1

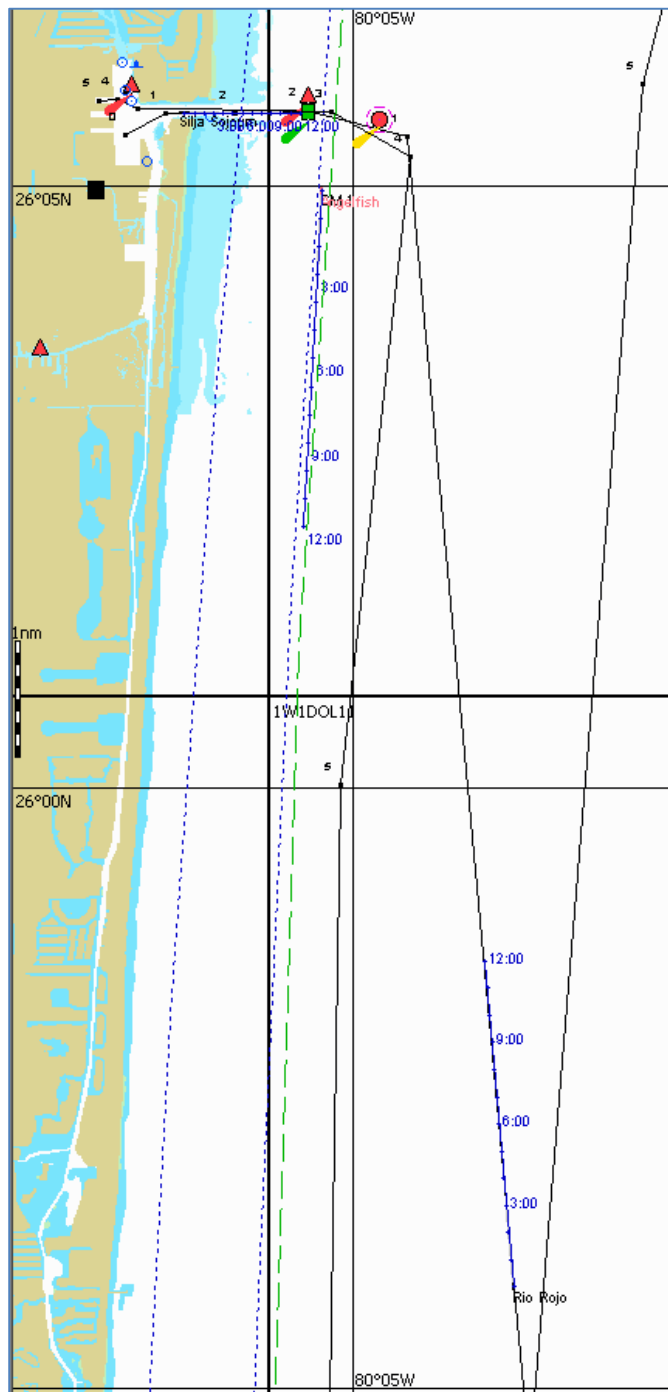
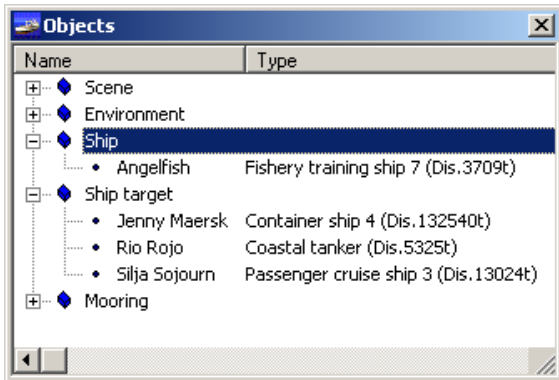
**Piloting in open waters for 1 ownship
(assign 12 times simultaneously)**

Task group:

- Safe navigation through skills integration

Outcomes:

- Navigate with ECDIS
- Monitor SOG & COG
- Apply standing orders: > 1 nm off land
- Stay in counter current
- 1 person watch
- Visual lookout



Option (B) for Exercise 1

Piloting in open waters for 1 ownship (assign 12 times simultaneously)

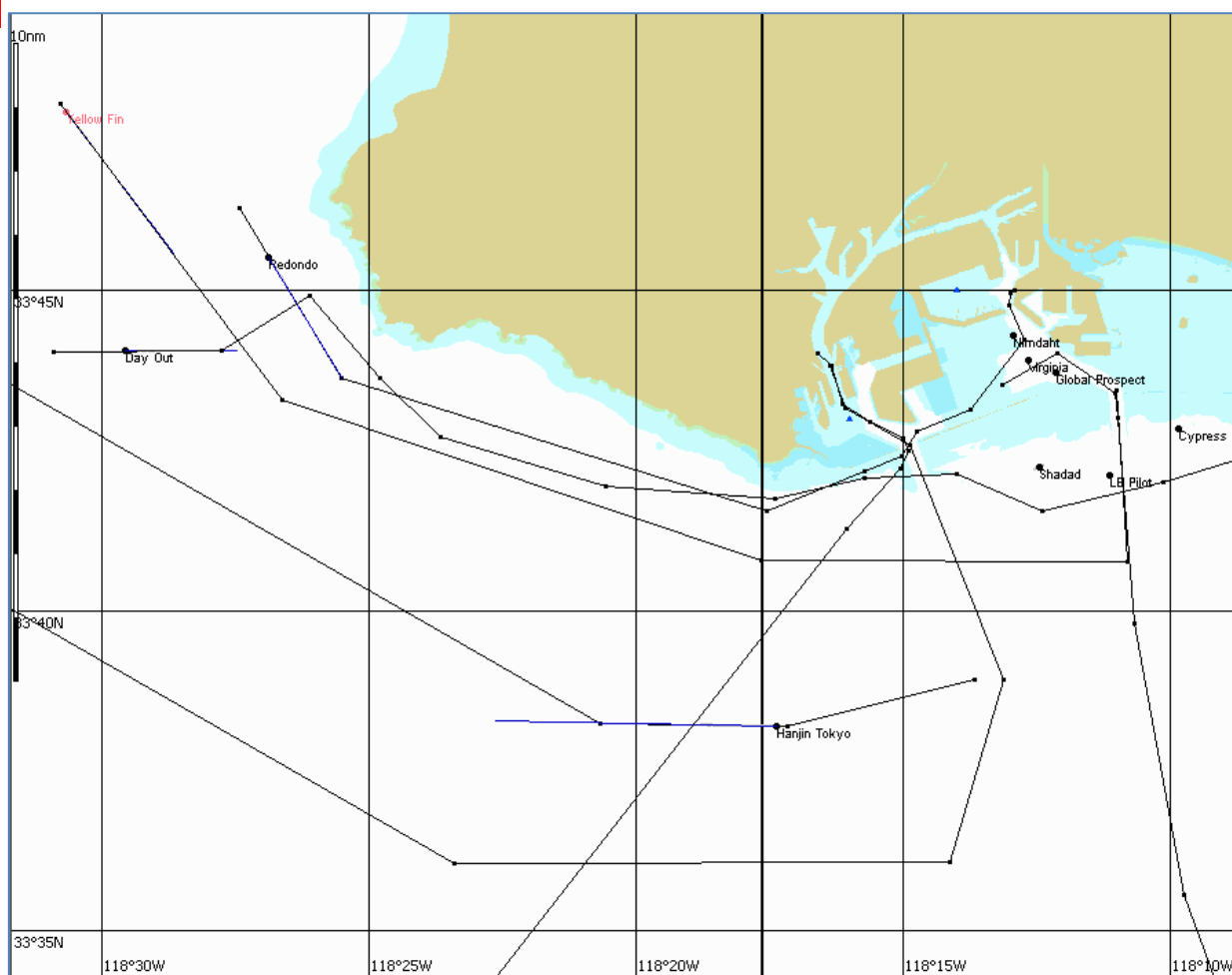
Task groups:

- Safe navigation through skills integration
- Adjust heading to maintain track

Outcomes:

- Navigate with ECDIS
- 1 person watch
- Cooperative navigation
- Visual lookout
- Limited maneuvering

Objects	
Name	Type
Mooring	
Ship	
• Yellow Fin	Fishery training ship 7 (Dis.3.
Scene	
Ship target	
• Chevron Ro...	Oil tanker (Dis.77100t)
• Cypress Gre...	LO-RO ship (Dis.19512t)
• Day Out	Motor yacht 3 (Dis.35.5t)
• Evo Gundvig	Car carrier 5 (Dis.46092t)
• Global Prosp...	Oil tanker (Dis.77100t)
• Hanjin Tokyo	Container ship 15 (Dis.1075.
• LB Pilot	Pilot boat (Dis. 13.5t)
• Minnow	Fast ferry (Dis.3545t)
• Nimdaht	Bulk carrier 1 (Dis.23565t) bl.
• Redondo	Harbour tug (Dis.469t)
• Shadad	LNG 1 (Dis.81549t) bl.
• Virginia	Chemical tanker (Dis.8682t)
Environment	



10. Understanding chart data (1.0 hr)

The trainee describes the types of electronic charts, and explains the characteristics of ECDIS data or system electronic navigational chart (SENC) (Refs: T1 ch.1 & 4; T3 ch.4 & 7.2 & 6; B5 ch.14; B7).

- 10.1. Define the relevant terminology of ECDIS.
- 10.2. Name the differences between electronic chart systems and ECDIS:
 - Different ECDIS systems,
 - ECDIS and ECS,
 - Vector and raster charts.
- 10.3. Describe the various electronic chart data formats:
 - Vector data,
 - Raster data.
- 10.4. Explain the relationship between ECDIS data and the information presented on the display:
 - ECDIS database and its structure,
 - ENC data and the SENC,
 - How manual updates are stored in the database,
 - Steps and responsibilities during ENC creation.
- 10.5. Explain that only information stored as objects with corresponding attributes in the database is available for display.
- 10.6. Describe the chart data selected for display.

11. Chart quality & accuracy (0.5 hrs)

The trainee assesses all errors, inaccuracies and ambiguities in the SENC caused by improper data management (Refs: T1 ch.9; T3 ch.5; B7).

- 11.1. Explain what the accuracy of chart data is dependent upon:
 - Accuracy of survey and all hydrographic data,
 - Shifting of buoys,
 - Coverage and completeness of chart data.
- 11.2. Explain the problems in ECDIS associated with variant datums:
 - Different reference systems used for positioning (time, direction, speed),
 - The effects of datum (horizontal, vertical),
 - Different geodetic coordinate systems.
- 11.3. Assess all errors, inaccuracies and ambiguities caused by improper data management.
- 11.4. Explain the need and requirement that electronic chart data must be systematically updated for safe navigation.
- 11.5. Demonstrate issues pertaining to computer monitor display resolution:
 - Potential distortions in chart scale
 - The amount of information that appears on the screen
 - Display adapter and the Desktop Area Setting,
 - Troubleshooting display problems.

12. Chart organization (0.5 hrs)

The trainee handles ECDIS data at the workstation (this knowledge will be expanded upon and exercised in Lessons 15, 33 & 34) (Refs: T1 ch.6.3; T3 ch.10 & 7.2.2; B7).

- 12.1. Introduce the organization of chart data distribution:
 - Explain the organization of chart data by the processes of procurement (downloading), installation (also applies to updates), selection of chart type (format), initialization, and loading (autoload by position) (reviewed again in Lesson 33)
 - Demonstrate the chart data manager application associated with the type approved ECDIS,
 - Describe the chart data file structure associated with the type approved ECDIS
- 12.2. Demonstrate the loading (retrieval) of ECDIS data:
 - Automatically from the directory of available chart data for the vessel's position
 - Automatically from the directory of available chart data for the cursor location
 - Manually by chart (cell) name from the directory of available data

■ Lesson Plans: ~~Watchstanding~~ Watchkeeping with ECDIS (89.0 hours)

13. Sensors (0.5 hours)
14. Ports & data feeds (0.5 hours)
15. Chart selection (0.5 hours)
16. Chart information (1.0 hour)
17. Changing the settings (1.0 hour)
18. Chart scaling (0.5 hours)
- Ex.2 Simulator Exercise – Coastal (chart display settings) (2.0 hours)
19. Information layers (~~0.5~~1.0 hours)
20. System & position alarms (0.5 hours)
21. Depth & contour alarms (~~1.0~~5 hour)

13. Sensors (0.5 hrs)

The trainee describes the performance limits of sensors and assesses their impact on the safe use of ECDIS (Refs: T1 ch.2.16 & 6.1 & 6.5.1; T3 ch.8; B7).

- 13.1. Explain the performance limits of devices for position, course over ground, heading, speed, depth, radar, and AIS, especially concerning:
 - Availability,
 - Accuracy,
 - Integrity.
- 13.2. Explain the need for selecting sensor data displayed in ECDIS that is appropriate and unambiguous, and accurate.
- 13.3. Evaluate the impairment of ECDIS when sensor performance deteriorates.
- 13.4. Explain and analyze various sensor alarms and indications:
 - Activated when ECDIS receives no data from the external output device,
 - ~~Displayed in the second line of the Information Area~~ Where sensor alarms and indications are displayed as they occur,
 - Use Alarm button or free cursor on 2nd-line message to disable the sound and message from the display,
 - Alarm submenu function remains orange parameter returns to set limits, or when function is deliberately turned off,

- Correct response is to check the operation and connection of the relevant sensor

14. Ports & data feeds (0.5 hrs)

The trainee recognizes and selects data ports, and assesses sensor input values (Refs: T1 ch.8.2 & 8.3; B4 ch.10.4; B7).

- 14.1. Select between primary and secondary position source.
- 14.2. Observe automatic change over to secondary position source.
- 14.3. Explain the data reference system of each connected sensor:
 - Geodetic system,
 - Antenna position,
 - Transducer position,
 - Clock or time source
- 14.4. Identify the data port assigned to each connected sensor
- 14.5. Monitor, identify and to a limited extent decode the data stream for each attached sensor:
 - Select a sensor and monitor the data stream (live or simulated),
 - Generally recognize the sentence syntax associated with the sensor,
 - Where possible, associate data with displayed navigational information
- 14.6. Assess the plausibility of sensor input values to ECDIS.
- 14.7. Assess the impact on displayed information when a sensor port is improperly selected.

15. Chart selection (0.5 hrs)

The trainee demonstrates manual and automatic selection of charts, and explains the potential error of the ECDIS display due to improper chart selection (Refs: T1 ch.6.4 & 9.1; T3 ch.5.3 & 7.2; B7).

- 15.1. Demonstrate the variety of methods that chart data can be loaded and changed (called into display)
 - Automatically,
 - Manually for the presently loaded route,
 - Manually from the total portfolio,
 - Manually displayed by the cursor position
 - During the activity of the operator using the graphics cursor (further detail is provided in Lessons 23 & 24 on Route Planning and in Lesson 29 on User Charts)
- 15.2. Assess the inaccuracies and ambiguities caused by improper selection of a chart for display:
 - When ownship position is on display, chart data list is sorted by scale
 - When ownship position is not on display (viewing elsewhere), chart data list is sorted by name (alpha)
 - ECDIS displays largest scale data (smallest area) on the topmost layer, but the user may prioritize by format, especially ENC to keep ECDIS in the ECDIS mode
 - Automatic chart loading may be switched on or off or held to a user-selected chart (fixed)
- 15.3. Display updates in order to review content and to establish their inclusion in the SENC:
 - Review their contents,
 - Determine that they have been included in the SENC
- 15.4. Explain and analyze the data and chart alarms resulting from overscaling (zooming in) and underscaling (zooming out)

- 15.5. Explain and analyze the data and chart alarms resulting from use of a non-WGS 84 geodetic datum

16. Chart information (1.0 hr)

The trainee matches presentation to situation, and demonstrates how to get the information about the chart and chart objects (Refs: T1 ch.6.4.6; T3 ch.7.2; B7).

- 16.1. ~~Select the task panel and apply Apply~~ the functions suitable for position monitoring, route monitoring, route creation and editing, trial maneuver, creating and accessing user layers:
- Continuous positioning while monitoring navigation,
 - Trial maneuvers,
 - Route planning and scheduling,
 - Creating User Charts,
 - Other functions
- 16.2. Obtain information on charted objects:
- ~~For vector charts, use the Info button and position the acquisition marker box on the object, Navtex symbol, line, zone, free space, or chart frame corner and cycle through information window;~~
 - For raster charts (~~ARCS and BSB~~), information is available only for the same frame size of a matching vector chart as described above
- 16.3. Demonstrate how the presentation of navigation marks is changed according to ownship's position
- 16.4. Demonstrate errors of interpretation by the incorrect selection of display categories

17. Changing the settings (1.0 hr)

The trainee demonstrates how to verify the operational settings and to assess that the navigational process is safe (Refs: T1 ch.6.3 & 8.6; T3 ch.7.6; B7).

- 17.1. Manually test the major functions of hardware, keyboard, mouse / trackball, sensor data, and chart data.
- 17.2. Check and / or select preferred operational settings in the primary-relevant task panels and on the primary information panel:
- Primary task panels
 - Primary information panel
 - Ship, Alarm, Chart, Logbook, ARPA;
 - Configuration, Add Information (user layers), Route
- 17.3. Evaluate alarm and function status indications:
- Alarms, time, position update, heading and speed log;
 - Route keeping, heading vectors, chart scale, track, logbook functions
- 17.4. Demonstrate errors of interpretation by the incorrect selection of safety values:
- Safety depth; Safety contour;
 - Least depth alarm; anti-grounding alarms;
 - Alarms for sailing along a route
- 17.5. Adjust track length and precision
- 17.6. Evaluate the range of information recorded in the log table (voyage recording):
- Check navigational conditions (ownship progress, charts displayed, etc.),

- Check routing events (including manual notations),
- Check system events,
- Display additional data groups

18. Chart scaling (0.5 hrs)

The trainee demonstrates the use of chart scaling and explains and avoids interpretation errors due scale (Refs: T1 ch.6.4; T3 ch.7.2.4; B7).

- 18.1. Demonstrate scaling of electronic chart display:
 - (Scale) and select scale value,
 - With chart autoloader switched on, use ~~←+→ to increase scale (zoom closer), and use ←-→ to decrease scale (zoom out); zoom function~~
 - (Zoom) and use cursor to draw quadrangle around area to view
- 18.2. ~~Apply the automatic changing of chart scale ratio:~~
 - ~~Use a value from -5 to +5 to reset the scale from larger to smaller respectively from the original chart scale (0);~~
 - Use to display electronic chart on the same scale as the original paper chart
- 18.3. Apply additional chart scale information:
 - Horizontal screen span,
 - Display of chart scale, scale bar, and bold-thin scale angle,
 - Calculated range (distance) across screen display for scale in use,
 - Warning messages associated with scale choice
- 18.4. Recognize interpretation errors due to scaling:
 - Overscale of the display will spread out chart and user information with the possible loss of familiar cues for estimating distance
 - Underscale of the display may cause some information to be hidden
 - Underscale with SCAMIN off will result in unacceptable clutter due to data density
 - Verify the selection of the appropriate scale

19. Information layers (0.51.0 hrs)

The trainee demonstrates understanding and proficient use of information layers (Refs: T1 ch.6.5 & 6.9 & 7.3; T3 ch.7.5.6 & 7.2.1 & 7.3.2; B7)

- 19.1. Observe effect on information layers and status indications when chart data is loaded and when chart area is underscaled:
 - Determine native scale of chart data as it is loaded,
 - Observe function of SCAMIN on and off when a chart area is underscaled (zoomed too far out)
 - Observe indication of scale value
 - Layers additional to ENC must not be excessive so as to obscure the standard display
- 19.2. Review and apply appropriate display mode:
 - Day or night presentation,
 - Scale,
 - Display category
- 19.3. Practice selecting information options in display category of "All other information".
- 19.4. Differentiate between information layers, User Chart layers, and Event graphic:
 - Information layers (chart display categories) and User Chart layers,
 - The addition and removal of own chart entries such as manual corrections and voyage planning notes,

- The addition of Event on the display and notations made in Logbook
- 19.5. Respond to the indicators representing the loss of displayed information:
- Layers Lost,
 - Position Dropped

EX - 2. Simulation exercise – open sea (2.0 hours)

The trainee operates specific functions constituting task groups for route monitoring in an open sea area, and obtains all relevant information for basic safe integrated navigation.

- Demonstrate the following task groups on ECDIS while navigating safely in an open sea setting with non-threatening ARPA targets:
 - Monitor sea area,
 - Use pre-defined route [as set by the instructor](#),
 - Check position with pre-defined fix,
 - Select pre-defined user layers,
 - Check settings such as vector time, display reset, information layers, alarms, track, sensors, and ownship configurations.

Instructor guidelines

- Conduct simulation exercise according to exercise description:
 - Set simulation parameters
 - ~~Introduce ECDIS underway score sheet for familiarization (see Part E—Evaluation and Assessment). Provide pre-defined route to the trainee.~~
 - Practice remote monitoring of trainees' ECDIS use
 - Brief and debrief trainees
 - Assess accomplishment of tasks according to exercise description
- ~~Consider the following options in designing scenarios for Exercise 2 (for descriptions of optimal simulator arrangements, see Part A—course Framework; also App.4 and App. 5 in Appendices for the Instructor):~~

Expected outcomes:

- [Navigate with ECDIS](#)
- [Individual watchkeeping](#)
- [Appropriate selection of user layers and alarms](#)
- [Successful fix of manual position](#)

Option (A) for Exercise 2

Piloting in open waters for 12 ownships

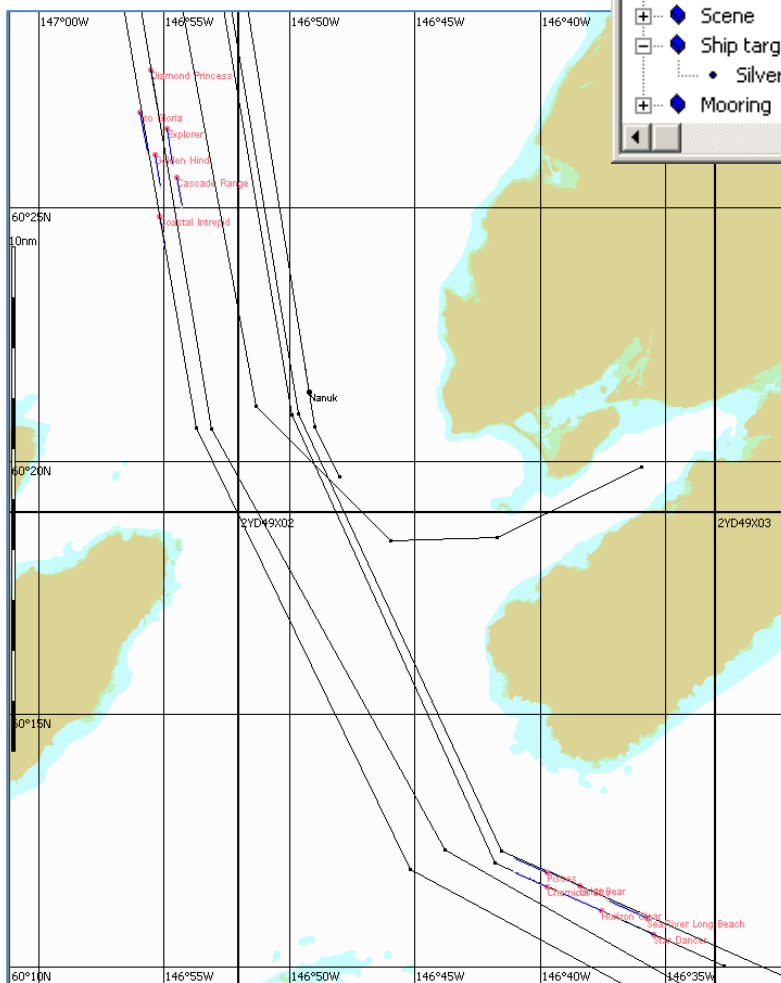
Task groups:

- Safe navigation through skills integration
- Adjust heading to maintain track

Outcomes:

- Navigate with ECDIS
- 1 person watch
- Cooperative navigation
- Visual lookout
- Maneuvering
- Familiarization with underway scoring

Name	Type
Ship	
• Cascade Range	Container ship 11 (Dis.51309t)
• Chemical City	Chemical tanker 2 (Disp.24033)
• Coastal Intrepid	VLCC 3 (Dis.122961t)
• Diamond Princess	Passenger cruise ship 4 (Dis.24841t)
• Explorer	Fishery training ship 7 (Dis.3709t)
• Golden Hind	Training ship (Dis.17160t)
• Horizon Clear	Container ship 1 (Dis.32025t)
• Iso Gloria	Chemical tanker 1 (Dis.25700t) bl.
• Pisces	Fishery training ship 7 (Dis.3709t)
• Polar Bear	VLCC 1 (Dis.159584t)
• SeaRiver Long B...	VLCC 1 (Dis.63430t) bl.
• Star Dancer	Passenger cruise ship 3 (Dis.13024t)
Environment	
Tug target	
• Nanuk	Azimuth tractor tug 1 (bp 77t)
Scene	
Ship target	
• Silver King	Fish boat (Dis.286t)
Mooring	



Option (B) for Exercise 2

**Piloting in open waters for 5 ownships
(assign 2 times simultaneously)**

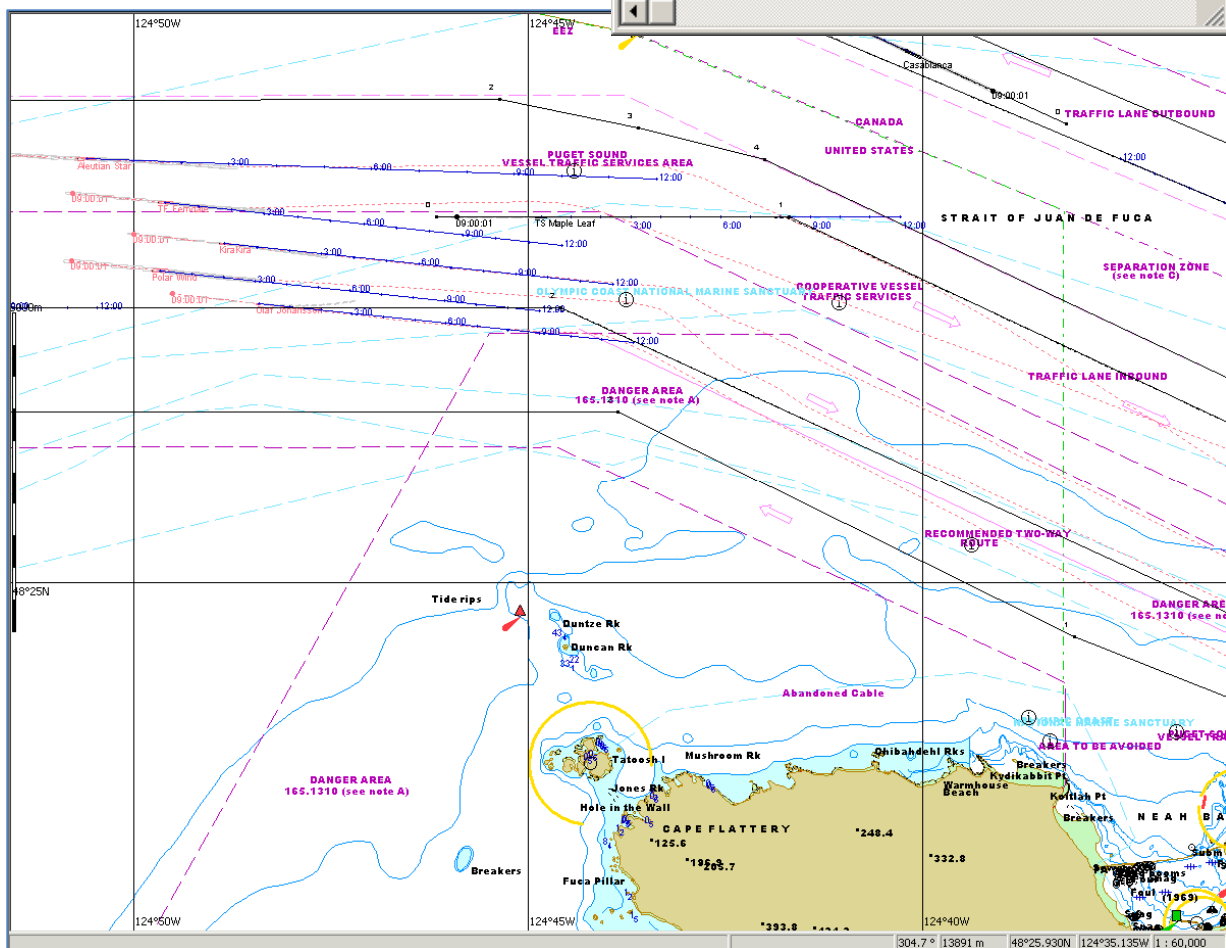
Task groups:

- Safe navigation through skills integration
- Create and apply route
- Adjust heading to maintain track

Outcomes:

- Navigate with ECDIS
- 1 person watch
- Cooperative navigation
- Visual lookout
- Maneuvering
- Familiarization with underway scoring

Name	Type
Environment	
Scene	
Ship	
• Aleutian Star	Container ship 2 (Dis.93130t)
• KiraKira	LO-RO ship (Dis.19512t)
• Olaf Johansson	Stern trawler (Dis.2210t)
• Polar Wind	VLCC 1 (Dis.159584t)
• TF Ferndale	Oil tanker (Dis.30645t) bl.
Ship target	
• Casablanca	LNG 1 (Dis.81549t) bl.
• Grandin Rune	Bulk carrier 3 (Dis.26343t) bl.
• Miss Dawson 2	Fish boat (Dis.286t)
• Prince Rupert	Ro-Ro Passenger Ferry 1 (Dis.18187t)
• Sapphire Princess	Passenger cruise ship 2 (Dis.31085t)
• Swiftsure	Stern trawler (Dis.2210t)
• TS Maple Leaf	Training ship (Dis.17160t)
Mooring	



Option (C) for Exercise 2

Piloting in open waters for 13 ownships

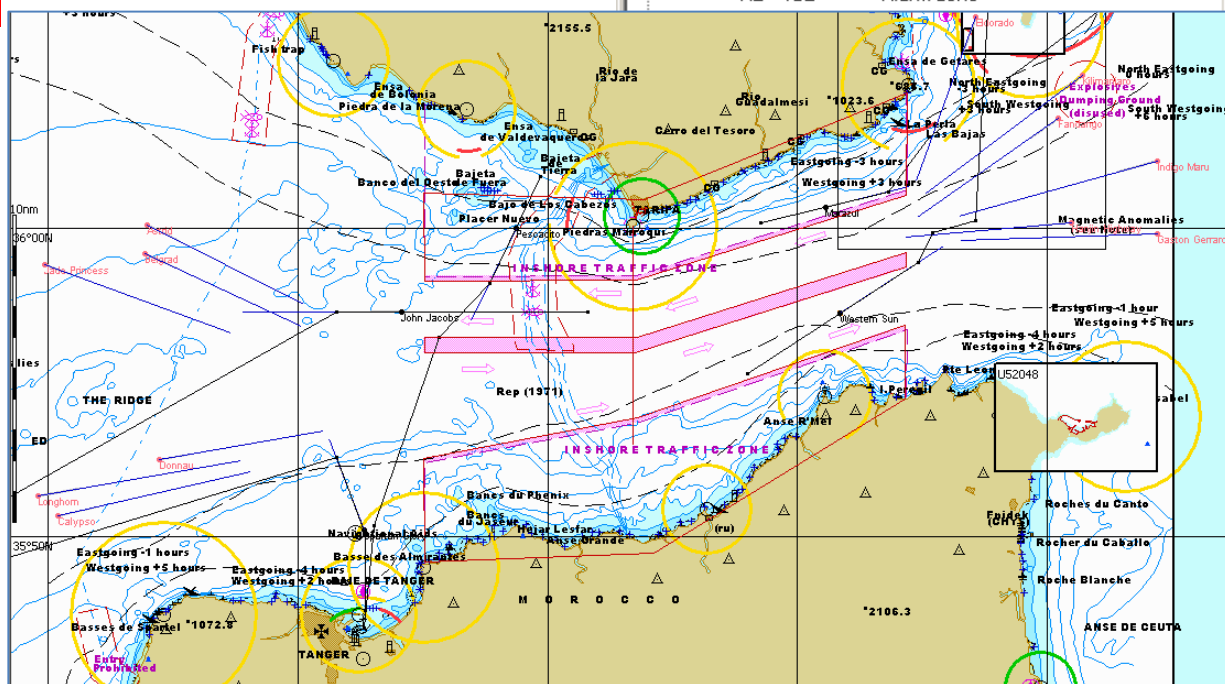
Task groups:

- Safe navigation through skills integration
- Create and apply route
- Adjust heading to maintain track
- Observe TSS rules
- Alarm zones

Outcomes:

- Navigate with ECDIS
- 1-person watch
- Cooperative navigation
- Visual lookout
- Maneuvering
- Familiarization with underway scoring

Name	Type
Environment	
Scene	
Ship	
Astrid	LMG 1 (Dis.81549t) bl.
Belgrad	Passenger car ferry (Dis.11046t)
Calypso	Ro-Ro Passenger Ferry (Dis.7100t)
Donnau	Car carrier 2 (Dis.19587t) bl.
Eldorado	LMG 1 (Dis.81549t) bl.
Fandango	Passenger car ferry (Dis.11046t)
Gaston Gerra..	Ro-Ro Passenger Ferry (Dis.7100t)
Hanjin Highw...	Car carrier 2 (Dis.19587t) bl.
Indigo Maru	Container ship 9 (Dis.188280t)
Jade Princess	Passenger cruise ship 4 (Dis.24841t)
Kilimanjaro	Passenger cruise ship 4 (Dis.24841t)
Longhorn	Container ship 9 (Dis.188280t)
Thunder Knoll	Oil tanker 3 (Dis.67850t)
Ship target	
John Jacobs	Container ship 1 (Dis.32025t)
Marazul	Fisher (Dis.1676t)
Pescadito	Fisher (Dis.1676t)
Spartan Glory	IMT 992 (Dis.5334.2t)
Western Sun	Bulk carrier 1 (Dis.23565t) bl.
TEAS	
AZ - Tarifa Lt	Alarm zone
AZ - TSS N	Alarm zone
AZ - TSS S	Alarm zone
AZ - TSZ	Alarm zone



20. System & position alarms (0.5 hrs)

The trainee explains the status indications and alarms pertaining to system and position, and demonstrates the proper responses (Refs: T1 ch.8.3; T3 ch.7.5.3; B7)

- 20.1. Identify and respond to alarms for primary and secondary positioning systems, such as:
- Primary (Secondary) Failure
 - Prim. (Sec.) Diff. Mode Loss,
 - Prim/Sec Pos Diverge,
 - Echo Ref. Loss,
 - Primary (Secondary) Data not WGS84,
 - Primary (Secondary) Unreliable Position

- 20.2. Identify and respond to chart related alarms, such as:
- Off Chart,
 - No Official Data,
 - Datum Unknown,
 - AG (Anti-grounding) Monitoring Off

- 20.3. ~~Identify and respond to ECDIS alarms from autopilot in Track Control, such as:~~

- ~~Autochange,~~
- ~~Autochange restore~~

The instructor should particularly emphasize which alarms have user settings and teach a sensible approach to establishing suitable settings. In particular, going over the alarm/ indicator setting controls for “approaching an area with special conditions” is highly important as incorrect settings cause very frequent alarms that distract the operator.

21. Depth & contour alarms (1.0-5 hr)

The trainee explains the status indications and alarms pertaining to depth and contours in route planning and monitoring, and demonstrates the proper responses (Refs: T1 ch.8.4 & 6.5; T3 ch.7.5; B7)

- 21.1. Describe route monitoring alarms, such as:
- Crossing a safety contour
 - Prohibited or other area
 - Track error allowance (XTE)
 - Waypoint arrival circle
 - Safety Contour changed,
 - ~~See Sounder Reading~~

- 21.2. Identify depth-related information, such as:
- Safe water depth,
 - Charted obstruction,
 - Depth sounder related alarms
 - Depth from sounder
 - Depth value of Safety Contour

- 21.3. Set the safety values for route monitoring:
- Safety Contour will only utilize an existing depth contour in the chart data
 - Set the value for a Safety Contour to represent preferred underkeel clearance
 - Set the value for Safety Depth
 - Set the value for spot sounding display category

- 21.4. Set the limits pertaining to safe water, such as:
- Apply the ENC option of four shades
 - Shallow Contour should be set to represent nothing less than ownship's deep draft
 - Nav-Navigational Danger

- Depth sounder limit
- Set an advance time for approaching the set safety contour,
- In tidal waters, it is sometimes necessary to navigate in waters less deep than the safety contour. Emphasis should be placed on using all other information mode.

■ Lesson Plans: ECDIS Route Planning and Monitoring (79.0 hours)

- 22. Vessel maneuvering characteristics (0.5 hours)
- 23. Route planning by table (~~0-51.0~~ hours)
- 24. Route planning by chart (~~12.0~~ hours)
- 25. Track limits (0.5 hours)
- 26. Checking plan for safety (0.5 hours)
- 27. ~~Embedded tide, current, wind & climate almanac~~ Additional Navigational Information (0.5 hours)
- 28. Route schedule (0.5 hours)
- 29. User charts in route planning (1.~~0-5~~ hour)
- Ex.3 Simulator Exercise – Coastal waters (2.0 hours)

22. Vessel maneuvering characteristics (0.5 hrs)

The trainee demonstrates the use of ship's particulars in the display of route planning and maneuvering information, and explains the possible errors of interpretation (Refs: T1 ch.8.5; T3 ch.7.5 & 8.3; B7)

~~22.1. Select appropriate turning criteria for efficient and effective use of Autopilot in heading control mode:~~

- ~~• Autopilot parameters for turn radius and for turn rate govern the movement of the vessel with results viewable on ECDIS~~
- ~~• Maneuvers measured on ECDIS may require adjustments in the Autopilot~~

~~22.2. Correlate rudder limits in Autopilot with turning radii and rates of turn for curved track planning on ECDIS~~

- ~~• Turning radius for curved track planning (all waypoints);~~
- ~~• Maneuver data for steering to next route segment when underway using safe speed and wheel over point settings~~

~~22.3-22.1. Determine methods of alert for wheel over when approaching waypoints, such as:~~

- ~~• Turn radius maneuvering characteristics of ownship apply to curved track in ECDIS route planning.~~
- ~~• Arrival circle centered on waypoint with circumference intersecting wheel over point on ECDIS route~~

~~22.4-22.2. The navigator must Discuss the need for the navigator to verify positioning especially when ECDIS is connected to auto pilot~~

- ~~• Generally, only the "observed position" is controlled~~
- ~~• An Where an ECDIS curved predictor is provided, caution to be exercised as it may only project a momentary rate of turn, rather than sophisticated hydrodynamic calculations, and therefore have limited accuracy~~

23. Route planning by table (0-51.0 hrs)

The trainee operates all specific functions and obtains all relevant information for route planning by table (Refs: T1 ch.7.1 & 7.5; T3 ch.7.4; B7)

- 23.1. Retrieve a stored route plan:
 - For use in route monitoring,
 - For planning and review.

- Rename as working route to allow ad hoc changes while underway
 - Obtain track courses and distances from list of waypoints as displayed in the table.
- 23.2. Approve an existing route for planning, safety review and monitoring
- Apply systematic methods of examination
 - Utilize appropriate chart data intended for use along the route
 - Set alarm parameters,
 - Adjust cross track zones
 - Scale in on charts for safety check analysis
 - Check route for date dependent data
- 23.3. Select the sea areas and the required waters for planning the whole passage.
- 23.4. Construct a route plan by inputting waypoint data alphanumerically into a route-planning table.
- 23.5. Adjust the route plan by editing, adding and deleting waypoints inside the table.
- 23.6. Review curved track planning and wheel over indication:
- Ownship maneuvering characteristics,
 - Requirements of planning a safe passage including waypoint spacing
- 23.7. Establish procedures to name, link, rename, archive, retrieve and delete route files:
- Naming, linking and re-naming techniques for Route files
 - Archiving route plans
 - Deleting route plans

24. Route planning by chart (~~12.0~~ hrs)

The trainee operates all specific functions and obtains all relevant information for route planning graphically by chart (Refs: T1 ch.7.2 & 7.3; T3 ch.7.4; B7)

- 24.1. Select the sea areas and the required waters for planning the whole passage.
- 24.2. Construct a route by inputting waypoints directly on the ECDIS display.
- It is advisable to rough-in the route legs at first (using rhumb line and great circle)
 - Fine-tune the waypoint positions, track zones and turn radii using practical navigation considerations, such as for radar and visual navigation, traffic patterns, and ENC data quality indicators (Zone of Confidence)
- 24.3. Adjust the route by graphically editing waypoints.
- 24.4. Obtain track courses and distances from the chart:
- Cursor position,
 - Selection of route segment
- 24.5. Obtain relevant route planning information, such as:
- Ocean wind, wave and surface current information,
 - Tidal heights and currents,
 - Sailing directions (port information),
 - For special situations (anchoring, chart data quality, special areas, pilotage, quarantine, etc.)

25. Track limits (0.5 hrs)

The trainee operates all specific functions and obtains all relevant information for setting track limits in route planning (Refs: T1 ch.6.5.3 & 8.3; T3 ch.7.5; B7)

- 25.1. Review the alarm settings used as vessel is proceeding along a monitored route:
 - Deviation of the current course angle as set in the planned route,
 - XTE (cross track error) exceeds the value set in the route data table
 - Guard vector for crossing safety contour,
 - Guard vector for entering special purpose areas,
 - Guard ring for crossing an isolated danger.
- 25.2. Modify the setting of XTE in a previously saved route:
 - Re-check the route for crossing dangers of navigation according to the setting of XTE zones,
 - Observe the alarm triggering while proceeding along the modified route leg
 - Examine results graphically on appropriate scale chart data.

26. Checking plan for safety (0.5 hrs)

The trainee operates all specific functions and obtains all relevant information for checking a route for the presence of dangers to navigation (Refs: T1 ch.7.4 & 7.7; T3 ch.7.4; B7)

- 26.1. Check a previously created and saved route for crossing dangers of navigation according to the setting of cross-track distance:
 - Safety contours,
 - Isolated dangers,
 - Limits of Special Purpose Areas.
- 26.2. Check the route as it is being created for dangers as listed above
 - Use Safety Check while adding a waypoint and leg along a route
 - Use Safety Check while modifying an existing leg or waypoint
- 26.3. Assess a route plan based on a safety check:
 - Consider all predictable hazards along the track and assess if it is reliably safe,
 - Assess which route should finally be taken,
 - Assess which areas and points of the passage are critical.
 - [Besides using the function for safety checks, the largest scale ENC must be manually checked as there are cases of ECDIS alarm not activating for isolated dangers.](#)

27. ~~Embedded tide, current & climate almanac~~ Additional Navigational Information (0.5 hrs)

~~The trainee operates specific functions pertaining tidal height, currents, and wind and wave calculations pertinent to specific situations such as route selection, anchoring and drifting (Refs: T3 ch.7.5 & 7.7 & 45.1; B7)~~

- 27.1. ~~Discuss various hydro-meteorological data that could be available in the ECDIS database, such as :~~ Determine the force and direction of the true wind:
 - ~~Observe relative wind speed and direction and ownship's heading and SOG~~ Tide
 - Current
 - Climatological
 - Weather
 - Wind
 - Ice,
 - ~~Enable display of wind vector and assess its graphic validity~~

~~27.2. Display the ocean climate wind vectors and lines of equal wave height, selected by month.~~

~~27.3. Display the dynamics of surface currents:~~

- ~~• Zoom out to large area view to locate surface current reference points~~
- ~~• Load by month.~~

~~27.4. Determine the tidal rise and tidal currents:~~

- ~~• At the reference station nearest to ownship position (up to 30 nm),~~
- ~~• At a reference station selected by name or by cursor,~~
- ~~• Use chart display features to predict values.~~

~~27.5. Use Current option in calculating a Route Plan Schedule.~~

~~27.6. Determine bottom type and assess anchor holding ground from information obtained on an appropriately scaled chart.~~

28. Route schedule (0.5 hrs)

The trainee operates all specific functions and obtains all relevant information for route scheduling (Refs: T1 ch.7.5; T3 ch.7.5 & 7.7; B7)

28.1. Observe any deviation from the route schedule setting in use as vessel is proceeding along a route

28.2. Determine expected passage times:

- Use route schedule table for proceeding along a route,
- Apply effects of surface and tidal currents in calculations,
- Calculate schedule from starting ETD and ETA's for waypoints,
- Calculate schedule from starting ETD and Log speeds for waypoints,
- Edit input data as required

28.3. Observe calculations of progress along the planned route:

- Load a route and the route schedule created for that route,
- Monitor the route
- Display route monitoring data on ECDIS information panel
- Display schedule information on ECDIS information panel

28.4. Using the ETA application in ECDIS, calculate time or speed at a selected waypoint on a monitored route:

- Speed to make good (STG) for the indicated waypoint (and display),
- Estimated time of arrival (ETA) at any waypoint

29. User charts in route planning (1.0-5 hr)

The trainee operates all navigational functions pertaining to own (user) chart entries and the use of planning notes (Refs: T1 ch.7.3; T3 ch.7.3; B7)

29.1. Review the ECDIS function for creating mariner's notes (User Chart)

- A User Chart is vector editor for creating added graphic and textual layers with specified attributes in the SENC
- Display of User Chart objects is superimposed (layered) on any chart data without changing it,
- There can be many User Charts maintained in the system directory, but usually only one or two displayed at a time,
- Voyage planning notes and objects called into one layer may be merged into a file called into the other layer, and resaved with or without a new name, to construct a composite file

- A User Chart may also consist of a symbol providing a link to extensive notes and hyperlinked files including photos and documents
- 29.2. Determine effective policy regarding User Charts:
- Purpose of particular file or chart or layer (correction, note, reference, etc.)
 - Content with regard to visible data and links to data files,
 - Naming with regard to purpose and geographic location,
 - ~~Value for using one or both layers (A/B) separately or simultaneously~~
- 29.3. Select User Chart for display:
- Load and unload various user charts already stored in the appropriate directory,
 - Select specific information layers for display,
 - Save, re-save, and re-name user charts (observe naming techniques)
- 29.4. Use the graphic editor for creating and modifying a User Chart:
- Add the many various types of new objects in the required position with care as pertains to use of scale,
 - Edit objects and information,
 - ~~Shift-Move~~ objects,
 - Merge user charts
- 29.5. Create, save and move an anchor circle guard zone ~~as-on~~ a User Chart.
- An anchor circle can include a "danger" attribute triggered by the ECDIS Consistent Common Reference Point (CCRP)
 - The diameter should represent the maximum swing circle of the vessel
 - The User Chart anchor circle should be positioned on the vessel's hawse pipe at the moment the anchor is let go
 - Anchor Guard Zone functions provided on ECDIS (as on [GPSGNSS](#) units) generally do not reference the position of the vessel's anchor or the vessel's swing circle

EX - 3. Simulation exercise – coastal waters (2.0 hours)

The trainee operates specific functions constituting task groups for route monitoring in an open sea area, and obtains all relevant information for basic safe integrated navigation.

- Demonstrate the following task groups on ECDIS while navigating safely in coastal setting with non-threatening ARPA targets:
 - Monitor sea area,
 - Use route created by trainee including route schedule,
 - Select user layers created by trainee
 - Validate own ship's position by alternate means,
 - Check settings such as vector time, display reset, information layers, alarms, track, sensors, and ownship configurations.
 - Assess environmental conditions such as tide, current, wind, waves,
 - Modify the selected route as instructed, check for safety, adjust route schedule.

Instructor guidelines

- Conduct simulation exercise according to exercise description:
 - Set simulation parameters
 - ~~Introduce ECDIS underway score sheet for familiarization (see Part E – Evaluation and Assessment)~~
 - ~~Practice remote monitoring Monitoring~~ of trainees' ECDIS use
 - Brief and debrief trainees
 - Assess accomplishment of tasks according to exercise description
- ~~Consider the following options in designing scenarios for Exercise 3 (for descriptions of optimal simulator arrangements, see Part A – course Framework; also App.4 and App. 5 in Appendices for the Instructor):~~

Expected outcomes:

- Navigate with ECDIS
- Individual watchkeeping
- Appropriate selection of user layers and alarms
- Route successfully monitored
- Radar/ ARPA overlay used
- Successful modification of the route
- Successful creation of route taking into account ship's draft and under keel clearance.

Option (A) for Exercise 3

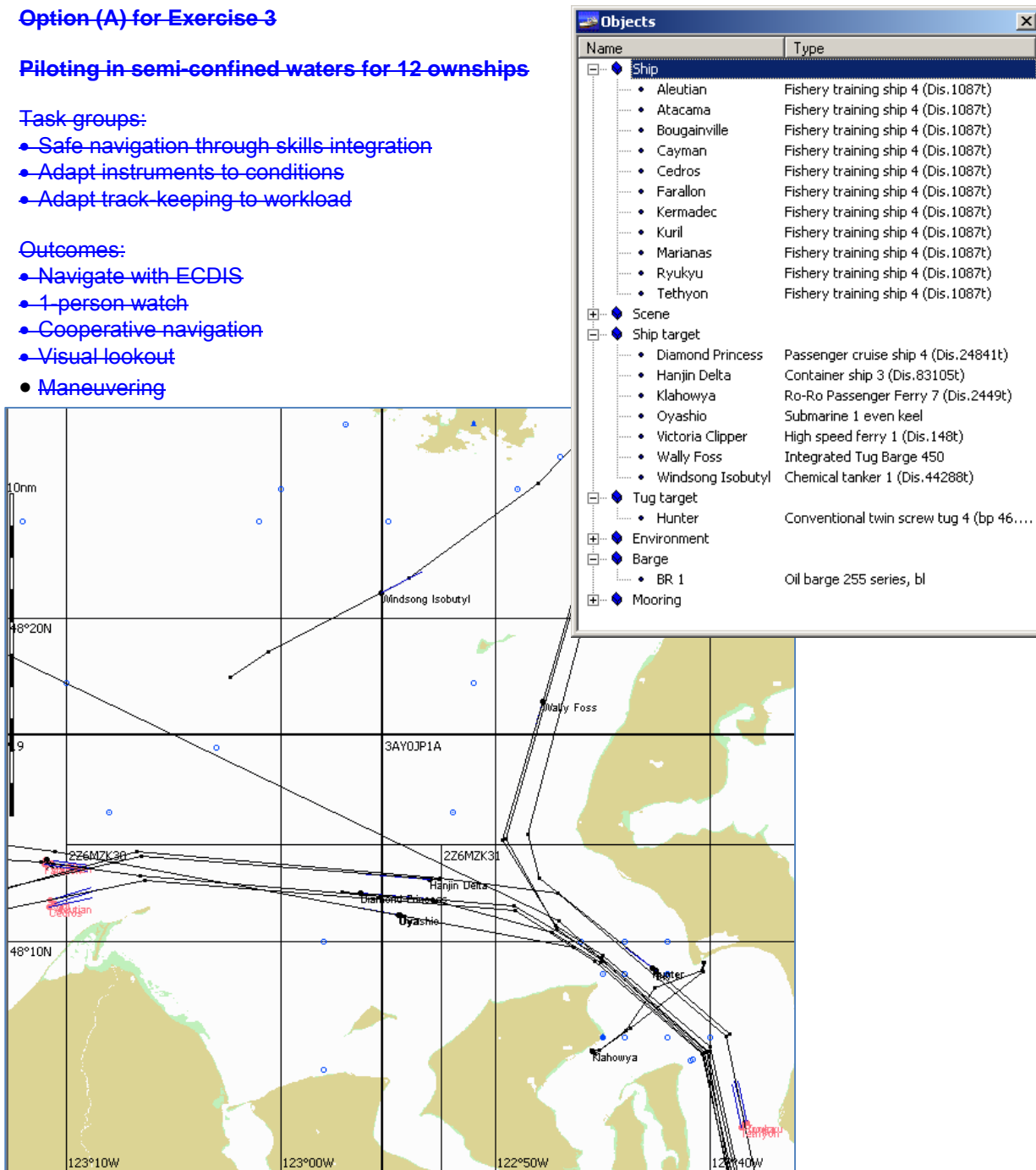
Piloting in semi-confined waters for 12 ownships

Task groups:

- Safe navigation through skills integration
- Adapt instruments to conditions
- Adapt track-keeping to workload

Outcomes:

- Navigate with ECDIS
- 1 person watch
- Cooperative navigation
- Visual lookout
- Maneuvering



Option (B) for Exercise 3

Anchoring in semi-confined waters for 6 ownships (assign 2 times simultaneously for 12 OS)

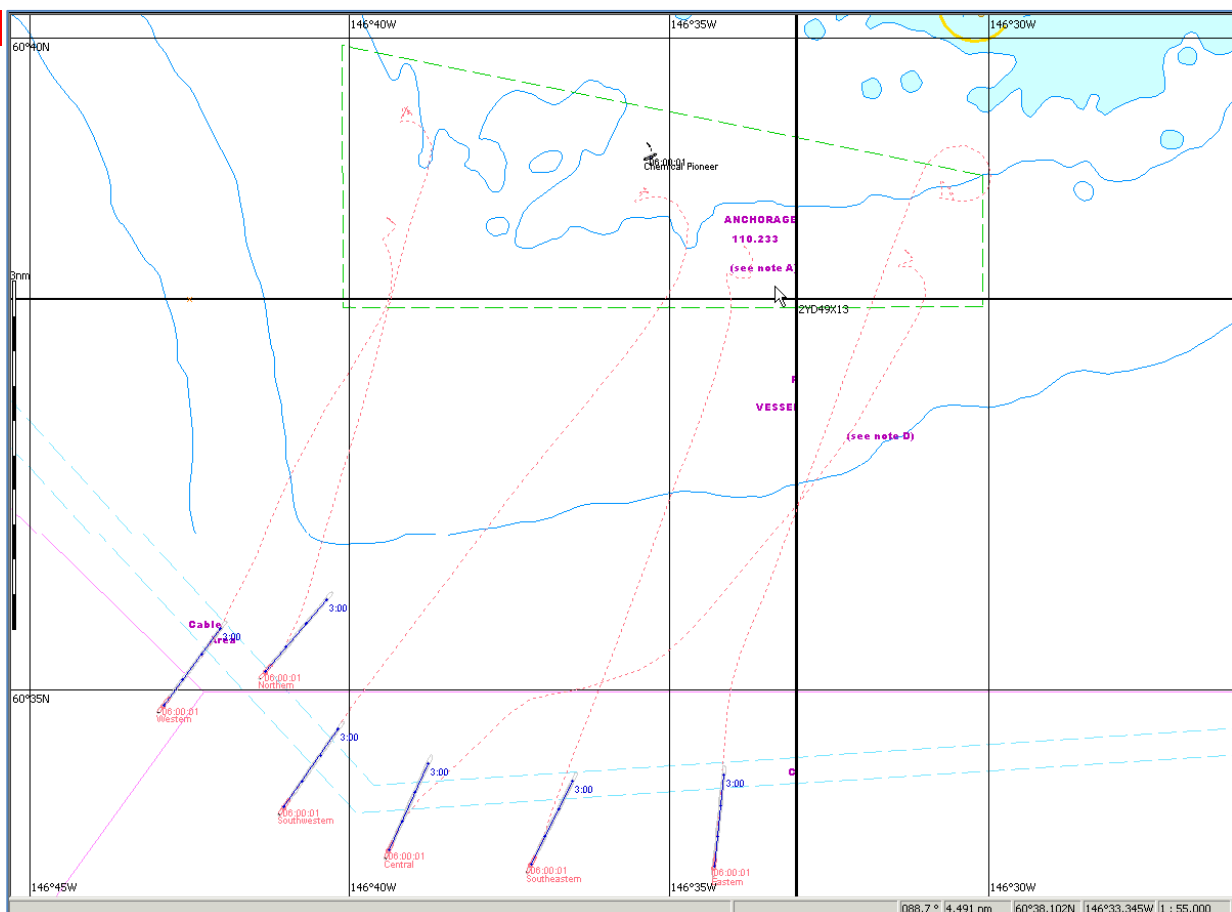
Task groups:

- Safe navigation through skills integration
- Create and apply route
- Adjust heading to maintain track
- Observe anchorage rules
- Apply ECDIS user layer for anchoring

Outcomes:

- Navigate with ECDIS
- 1-person watch
- Cooperative navigation
- Visual lookout
- Maneuvering

Name	Type
Environment	
Ship	
• Central	Shuttle tanker (Dis.152957t)
• Eastern	Shuttle tanker (Dis.152957t)
• Northern	Shuttle tanker (Dis.152957t)
• Southeastern	Shuttle tanker (Dis.152957t)
• Southwestern	Shuttle tanker (Dis.152957t)
• Western	Shuttle tanker (Dis.152957t)
Ship target	
• Chemical Pioneer	Chemical tanker 1 (Dis.44288t)
Scene	
Mooring	



■ Lesson Plans: ECDIS Targets, Charts & System (86.5 hours)

- 30. ARPA/ ~~Radar tracked target~~ overlay (0.5 hours)
- 31. AIS functions (0.5 hours)
- ~~32.~~ [Radar overlay functions \(0.5 hours\)](#)
- ~~33-32.~~ Procuring & installing chart data (1.0-5 hour)
- ~~34-33.~~ Installing charts data (1.0 hour)
- Ex.4 Simulator Exercise – Coastal & ~~Confined Restricted~~ (advanced integrated navigation with ECDIS) (2.5-0 hours)
- ~~35-34.~~ System reset & backup (0.5 hours)
- ~~36-35.~~ Archiving ~~with ECDIS data management utility and data logging~~ (0.5 hours)
- ~~37.~~ [Data logging and logbook \(voyage recording\) \(1.0 hour\)](#)
- ~~38.~~ [Playback \(0.5 hours\)](#)

30. ARPA/ ~~Radar tracked target~~ overlay (0.5 hrs)

The trainee demonstrates the use of ARPA operations in ECDIS (Refs: T1 ch.8.4.3; T3 ch.8.2.3 & 8.5; B7)

- 30.1. Examine sensor setup requirements for ARPA ~~tracked~~ targets:
 - The identity of associated com port(s) and baud rate matched to ARPA output
 - ~~Correct location of sensor reference (Consistent Common Reference Point)~~
 - [It is possible that ships fitted with ECDIS prior 01st January 2009 may not have ARPA overlay feature.](#)
- 30.2. Determine speed and heading inputs used in ARPA ~~tracked target data~~ calculations
- 30.3. Access target ~~information~~ display:
 - Cursor (mouse over)
 - Target table, with sorting options for data fields
 - Target name field in table may provide direct display link on chart
- 30.4. Interpret target symbol features:
 - Identify by number from ARPA ~~A or ARPA B~~, or by writing an alias into target table
 - Vector and green circle at radar-determined position
 - Alarm ~~can may~~ be set when both CPA and TCPA approach limitations are exceeded
 - Vector length the same as set for ownship
 - ~~Target tracks are saved in daily files, and selectable for viewing on display~~
-
- [30.5. Operate the user interface controls for radar overlay](#)
 - [Target tracking](#)
 - [Image recording](#)
 - [The overlay image can be removed from the display by a single interface option](#)
- [30.6. Demonstrate sources of image offset](#)
 - [A mismatch can develop between chart and radar data](#)
 - [Sensor position setup.](#)
 - [Input of radar data \(such as from transceiver problems\)heading misalignment.](#)
 - [Position sensor error.](#)

- [Uncharted and/or incorrectly charted objects, and chart datum error](#)

30.7. [Determine source of ECDIS-tracked target data calculations](#)

- [ECDIS speed and heading inputs are used in ECDIS-tracked target data calculations](#)
- [Radar motion vector may be through the water rather than over ground](#)
- [CPA & TCPA are derived from the ECDIS independently from the radar](#)

30.8 [Make corrections to own ship's position, using a reference point captured by ARPA.](#)

- [Corrections to own ship's position, using a reference point captured by ARPA/RADAR](#)
- [Position check using known object\(s\) utilizing radar navigation techniques](#)

31. **AIS functions (0.5 hrs)**

The trainee demonstrates the use of Automatic Identification Systems in ECDIS (Refs: T1 ch.8.4.5 & 6.9; T3 ch.8.4; B4 ch.10.3; B7)

- 31.1. Describe what the connection of an Automatic Identification System (AIS) to ECDIS enables:
 - Receiving identification and navigation information on other targets transmitting on AIS,
 - Analysis of target's motion over ground
 - Potential control from ECDIS of ownship's Static and Voyage data
 - Data string consists of considerable amount of encapsulated data,
 - [Data string is transmitted by VHF data link \(VDL\) with typical line of sight range limitations](#)
 - [It is possible that ship's fitted with ECDIS prior 01st January 2009 may not have AIS sensor input.](#)
- 31.2. Examine sensor setup requirements for AIS targets:
 - Identity of associated com port(s) and baud rate matched to AIS interface
 - Correct location of sensor reference (Consistent Common Reference Point)
- 31.3. Determine alarms and other settings for AIS targets:
 - Alarms and other settings for AIS targets are set in ECDIS target panel
 - CPA & TCPA calculations on AIS targets are derived from ECDIS speed and heading inputs
- 31.4. Access target [information](#) display options:
 - Cursor ([mouse over](#))
 - Target table, with sorting options for data fields
 - Target name field in table may provide direct display link on chart
- 31.5. Interpret AIS target symbol features:
 - Position of symbol represents the target's transmitted (D)[GPSGNSS](#) antenna position
 - An AIS target is displayed graphically as a green isosceles triangle with heading of vessel (if transmitted), including flag showing direction of turn
 - Additional vector from ECDIS calculation of COG, with length the same as set for ownship
 - Divergence of COG/SOG vector from heading indicator represents target's drift angle
 - Target is processed for collision avoidance by the ECDIS on the same principles as tracked targets
 - Identifier is MMSI number until static [information](#) is established then name and call sign can be displayed (by writing an Alias into Table)
 - ARPA tracking on ECDIS can be correlated with an existing AIS target
 - Alarm can be set when both CPA and TCPA approach limitations are exceeded
 - Target tracks are saved in daily files, and selectable for viewing on display

32. Radar overlay (RIB) functions (0.5 hrs)

The trainee explains the display of radar signal input, and demonstrates the use of radar image in ECDIS (Refs: T1 ch.8.4.4; T3 ch.8.2.1 & 8.2.2 & 11.1.5; B7)

~~32.1. Describe the technical function of the radar integrator board (RIB) hardware~~

- ~~• The RIB functions by means of a hardware module which receives from radar an analog video signal and the digital processing of that signal,~~
- ~~• RIB gain, filters, scaling, and target tracking function independently of the radar transceiver delivering the raw video and trigger~~
- ~~• Is displayed in the SENC as a layer over chart data~~
- ~~• RIB functions on ECDIS permit the continuous recording in the ECDIS PC of the radar picture and motion of tracked targets~~

~~32.2. Examine the main functions of the radar integrator board~~

- ~~• Require sensor setups and involve numerous interfaces on the ECDIS task panel~~
- ~~• Radar signal input,~~
- ~~• Radar target selection,~~
- ~~• Formation of a radar image,~~
- ~~• Target functions~~
- ~~• Radar operation functions independent from radar transceiver~~

~~32.3. Operate the user interface controls for radar overlay~~

- ~~• Target tracking~~
- ~~• Image recording~~
- ~~• The overlay image can be removed from the display by a single interface option~~

~~32.4. Demonstrate sources of image offset~~

- ~~• A mismatch can develop between chart and radar data~~
- ~~• Sensor position setup,~~
- ~~• Input of radar data (such as from transceiver problems) heading misalignment,~~
- ~~• Position sensor error,~~
- ~~• Uncharted and/or incorrectly charted objects, and chart datum error~~

~~32.5. Determine source of ECDIS-tracked target data calculations~~

- ~~• ECDIS speed and heading inputs are used in ECDIS-tracked target data calculations~~
- ~~• Radar motion vector may be through the water rather than over ground~~
- ~~• CPA & TCPA are derived from the ECDIS independently from the radar~~

33.32. Procuring & installing chart data (1.0-5 hrs)

The trainee installs chart license software and chart data of various formats (Refs: T1 ch.4.4; T3 ch.9.2 & 9.3 & 9.4; B7)

~~33-1.32.1. Review chart data structure, terminology, and installation procedures:~~

- ~~• SENC, and various formats~~
- ~~• DNC format corresponds with American MIL-STD-2407 standards, which are based on the "Feature/Attribute Coding Catalogue (FACC)" normative document.~~
- ~~• The operator procures, installs / updates, selects; the ECDIS unit initializes, loads (introduced in Lesson 12)~~

~~33-2.32.2. Review chart format requirements for ECDIS:~~

- ~~• ECDIS requires the use of charts in official formats issued by the properly authorized government hydrographic offices.~~
- ~~• These are currently S 57 specified ENC's (manufactured by the respective regional Hydrographic Offices); S-101 ENC product specification is currently being developed; S-100 IHO~~

universal hydrographic data model has been developed recently to enable the easier integration of hydrographic data and applications into geospatial solutions, and will eventually replace S-57

~~33.3.32.3.~~ Examine data distribution sources for ENC

- Regional/global coordinating centers (RENC) such as Primar (hosted by the Norwegian HO) and IC-ENC (hosted by the UKHO) are engaged in the distribution of ENC data.
- These centers accumulate chart databases from participating hydrographic offices, ensure quality standards are met, and provide the data to distributors for procurement by end users.

~~33.4.32.4.~~ Examine data distribution sources for SENC conversions

- The S 57/ENCs distributed by a SENC service from ENC providers Primar, IC-ENC and NOAA have been converted to CD8 SENC format for simplified installation and updating.
- The process of converting S-57 (ENC) format charts to SENC format is subject to DNV and IHO requirements.

~~33.5.32.5.~~ Examine license structure for various formats, and practice installation

- License / permit structure depends on the chart data format
- License / permit installation generally occurs through the chart data management utility associated with the ECDIS:
 - ~~Proprietary / private vector format may install directly from data file~~
 - ~~ENC chart data in DX-90 format installs from ENC_ROOT folder using chart management utility~~
 - ~~BSB raster chart data installs from BSB_ROOT folder using chart management utility~~
 - ~~US military data in VPF format (DNC) requires chart management utility~~
 - ~~Admiralty Raster Chart format (ARCS) requires chart management utility~~

~~33.6.32.6.~~ Extract information on installation history

- Installation history is retained during installation
- History includes the addition and deletion of individual charts/cells
- History file is generally accessible through the chart data management utility associated with the ECDIS

34.33. Installing chart corrections (1.0 hr)

The trainee applies manual and automatic updates (corrections) to electronic charts, and assesses the importance of updating (Refs: T1 ch.4.5 & 6.3; T3 ch.10; B7)

~~34.1.33.1.~~ Explain why electronic chart data is maintained with up-to-date corrections:

- The safety of navigation requires data that is maintained with up-to-date corrections
- The responsibility of seaworthiness as defined by SOLAS requires charts for the intended voyage that are up to date

~~34.2.33.2.~~ Add or modify a chart object using Manual Correction task or appropriate ECDIS function:

- Using the Manual Correction task in ECDIS, a chart object layer may be added or modified
- The manual correction may include attributes and links, may be concealed, may be made time-active, and may be deleted

~~34.3.33.3.~~ Examine production license options for accessibility of automatic updates:

- Chart data licensing options may include services for automatic updating
- Sometimes referred to as maintenance in reference to proprietary chart data

~~34.4.33.4.~~ Install various automatic update formats using various methods

- Using chart managing utility associated with the ECDIS program, install the following depending on availability:
 - ~~Procured or downloaded update files for proprietary chart data~~
 - Procured or downloaded ENC updates

- ~~Downloaded DNC update patch files~~
- ~~Procured or downloaded BSB and NDI raster update patch files~~
- ~~Procured or downloaded ARCS-RNC update patch files~~
- ~~Procedure for applying T&P notices and navigational warnings. The overlay of the T&P Notice/ Navigational warning is designed to be displayed as an additional information layer on top of a standard ECDIS chart display.~~
- ~~Explain that caution must be exercised when performing chart and other updates. These should not be done during transits through restricted waters or high traffic areas and should preferably be conducted prior commencement of voyage.~~

~~34.5.33.5. Extract information on update history~~

- ~~Installation history is retained during updating~~
- ~~History includes the addition and deletion of individual charts/cells~~
- ~~History file is generally accessible through the chart data management utility associated with the ECDIS~~

EX – 4. Simulation exercise – confined-restricted waters (2.0 hours)

The trainee obtains all relevant information for safe navigation and operates specific functions for collision avoidance while route monitoring in confined-restricted waters

- Demonstrate the following task groups on ECDIS while navigating safely in a confined-restricted waters setting with threatening multiple targets in specified waters:
 - Monitor sea area,
 - Use route created by trainee including route schedule,
 - Select user layers created by trainee
 - Validate own ship's position by alternate means when there is loss of one or more sensor inputs;
 - Check settings such as vector time, display reset, information layers, alarms, track, sensors, and ownship configurations.
 - ~~Use ECDIS features to assess target threats and execute course and/or speed alterations to avoid collision (or advise conn if working in 2-person team in SAR exercise, where ECDIS operator is advising the conn)~~
 - Comply with COLREGS
 - ~~Comply with bridge procedures established by trainee and/or instructor~~
 - Use of Man Overboard (MOB) function

Instructor guidelines

- Conduct simulation exercise according to exercise description:
 - Set simulation parameters
 - ~~In SAR exercise (Option A), consider assigning 2 trainees per ownship, where one is the ECDIS operator and the other makes conning decisions~~
 - ~~Sharing of ECDIS route can be accomplished copying a route file into the source folder on the other ECDIS units~~
 - ~~Conduct practice grading on ECDIS underway score sheet for (see Part E— Evaluation and Assessment)~~
 - Practice remote monitoring-Monitoring of trainees' ECDIS use
 - Brief and debrief trainees
 - Assess accomplishment of tasks according to exercise description
 - Simulate loss of one or more sensor inputs
 - Simulate a Man Overboard situation
 - Use dead reckoning
- ~~Consider the following options in designing scenarios for Exercise 4 (for descriptions of optimal simulator arrangements, see Part A— course Framework; also App.4 and App.5 in Appendices for the Instructor):~~

Expected outcomes:

- Navigate with ECDIS
- Individual watchkeeping
- Successful route planning
- Route monitoring
- Successfully fixing of position using alternate means
- Successful recovery of Man Overboard.

Option (A) for Exercise 4

Piloting in open but congested waters for 6 ownships

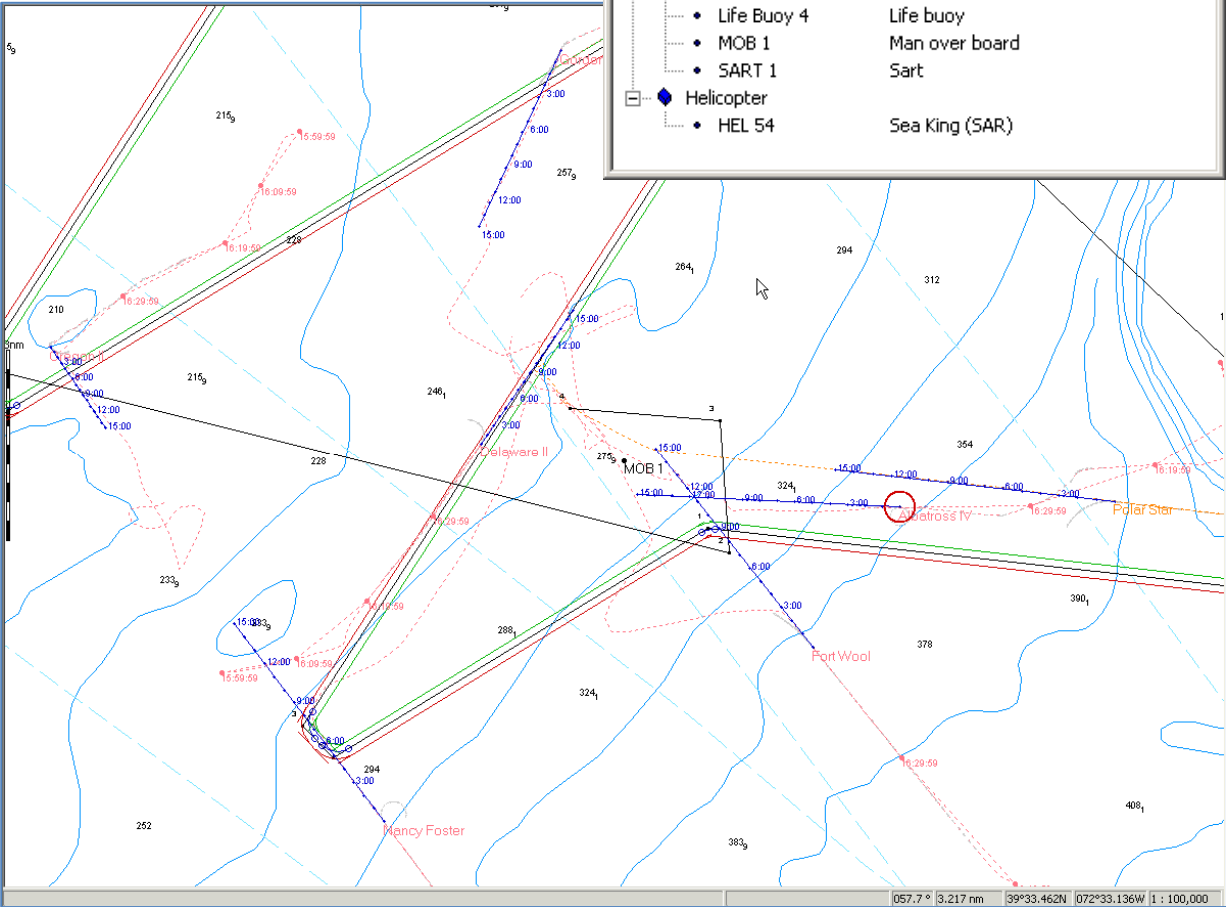
Task groups:

- Safe navigation through skills integration
- Adapt ECDIS route to SAR (on scene command vessel creates route, other vessels retrieve and apply that route)
- Adjust heading to maintain track
- Find MOB

Outcomes:

- Share ECDIS route
- 1 or 2 person watch
- Cooperative navigation
- Team & communications
- Visual lookout
- Maneuvering
- Familiarization with underway scoring

Name	Type
Environment	
Scene	
• Buoy	Scene buoy
• Polar Star route	Route
• RT 1	Route
• RT 2	Route
Ship target	
• Davisville	OSV 1 (Dis.5334t)
Ship	
• Albatross IV	Fishery training ship 4 (Dis.1087t)
• Delaware II	Fishery training ship 4 (Dis.1087t)
• Fort Wool	Multirole support ship (Dis.2250t)
• Gordon Gunter	Research ship (Dis.2630t)
• Nancy Foster	Fishery training ship 4 (Dis.1087t)
• Oregon II	Fishery training ship 4 (Dis.1087t)
• Polar Star	Stern trawler (Dis.2210t)
Mooring	
Rescue	
• Life Buoy 1	Life buoy
• Life Buoy 2	Life buoy
• Life Buoy 3	Life buoy
• Life Buoy 4	Life buoy
• MOB 1	Man over board
• SART 1	Sart
Helicopter	
• HEL 54	Sea King (SAR)



Option (B) for Exercise 4

Piloting in confined waters for 13 ownships

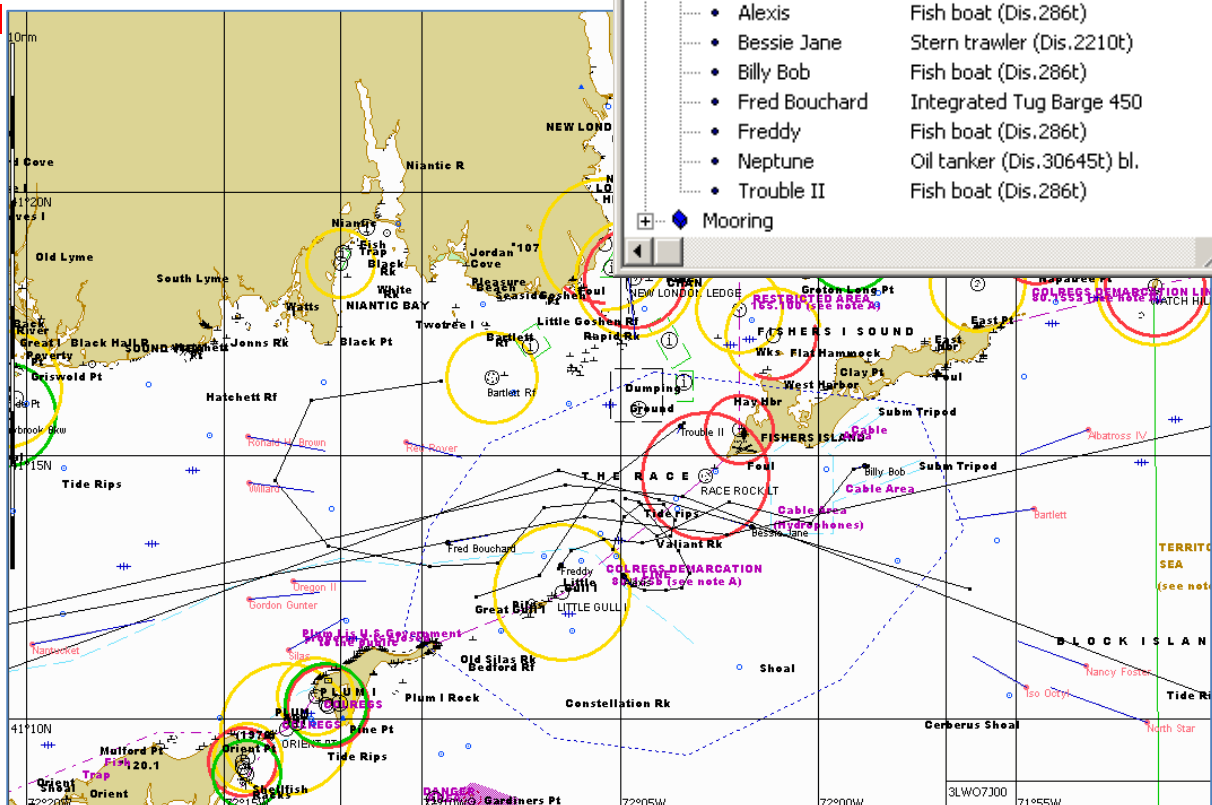
Task groups:

- Safe navigation through skills integration
- Adapt instruments to conditions
- Adapt track-keeping to workload
- Create and apply route
- Adjust heading to maintain track

Outcomes:

- Navigate with ECDIS
- 1 person watch
- Cooperative navigation
- Visual lookout
- Maneuvering
- Familiarization with underway scoring

Name	Type
Scene	
Environment	
Ship	
Albatross IV	Fishery training ship 4 (Dis.1087t)
Bartlett	OSV 3 (Dis.5291t)
Billy Mumford	Multirole support ship (Dis.2250t)
Gordon Gunter	Research ship (Dis.2630t)
Iso Octyl	Chemical tanker (Dis.8682t)
Nancy Foster	Fishery training ship 4 (Dis.1087t)
Nantucket	Ro-Ro Ferry 2 (Dis.25598t)
North Star	FSV 1 (Dis.812.7t)
Oregon II	Fishery training ship 4 (Dis.1087t)
Red Rover	Fish boat (Dis.286t)
Ronald H. Brown	Fishery training ship 1 (Dis.3300t)
Silas	Ro-Ro Passenger Ferry 2 (Dis.560t)
Willard	Fisher (Dis.1676t)
Ship target	
Alexis	Fish boat (Dis.286t)
Bessie Jane	Stern trawler (Dis.2210t)
Billy Bob	Fish boat (Dis.286t)
Fred Bouchard	Integrated Tug Barge 450
Freddy	Fish boat (Dis.286t)
Neptune	Oil tanker (Dis.30645t) bl.
Trouble II	Fish boat (Dis.286t)
Mooring	



Option (C) for Exercise 4

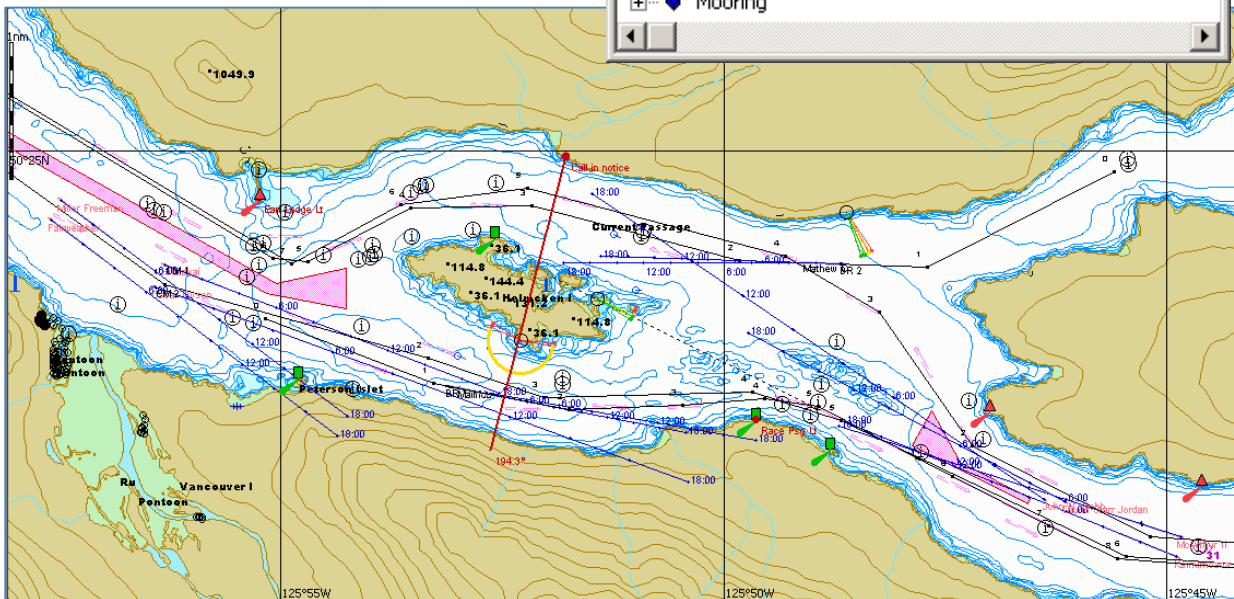
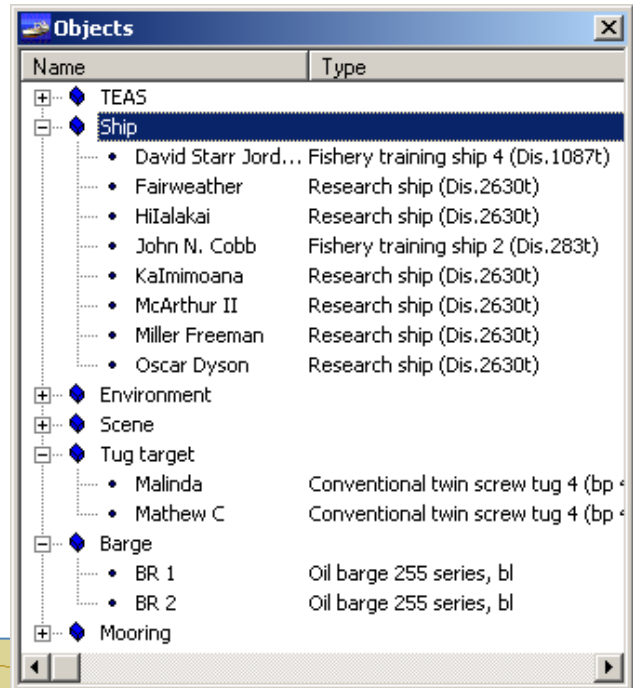
Piloting in confined waters for 8 ownships

Task groups:

- Safe navigation through skills integration
- Adapt instruments to conditions
- Create and apply route
- Adapt track keeping to workload
- Adjust heading to maintain track
- Observe TSS rules
- Alarm zones

Outcomes:

- Navigate with ECDIS
- 1 person watch
- Cooperative navigation
- Visual lookout
- Maneuvering
- Familiarization with underway scoring



35.34. System reset & backup (0.5 hrs)

The trainee performs basic troubleshooting and uses the back-up system in the case of ECDIS failure (Refs: T1 ch.8.7 & 8.8; T3 ch.11.3 & 11.4; B7)

~~35.1-34.1.~~ Explain the intent of regulations on ECDIS back-up arrangements

- The regulations on ECDIS back-up arrangements intend that backup is ensured through electronic and/or paper chart options
- The installation of a duplicate set of ECDIS equipment combined in a single computer network where each ECDIS [PC workstation](#) is connected to the navigational sensors and assigned "Master" or "Slave" status, guarantees interchangeability without loss of data in case of failure of one of the systems
- The availability of an updated paper chart collection is required where a single set of ECDIS equipment is installed (standalone), or when ENC coverage for the intended route is unavailable, such as when raster or proprietary chart data is provided instead of ENC data
- The purpose of the backup arrangement is to preserve the safety of navigation in the event of degradation or loss of the ECDIS as the primary means of navigation

~~35.2-34.2.~~ [Perform-Discuss](#) back-up procedures in standalone ECDIS failure event:

- Charts include the planned route
- Regular plotting of ship's position when navigating within restricted waters

~~35.3-34.3.~~ [Perform-Discuss](#) networked back-up procedures in (Master) ECDIS failure event:

- Includes prior equalizing of route, chart data and user data

~~35.4-34.4.~~ [Perform-Discuss](#) troubleshooting routines in ECDIS, such as for:

- Damaged initialization and configuration files,
- Integrity of cables and com ports integrity,
- Sensor assignment and configuration

~~35.5-34.5.~~ Recognize consequences to navigation safety while troubleshooting:

- Includes track display, autopilot functions and other systems deriving data feed from ECDIS

~~35.6-34.6.~~ Recognize consequences to data storage while ECDIS [PC workstation](#) is down:

- Despite continuous functioning of sensors, the consequence while ECDIS-[PC workstation](#) is down is that all data storage ceases.
- There will be a gap graphically on the display upon restoration of ECDIS-[PC workstation](#) and a corresponding gap in electronic logbook data

36.35. Archiving ~~with ECDIS data management utility~~ and Data logging (0.5 hrs)

~~The trainee stores and retrieves files on the same workstation and transfers certain files between workstations (Refs: B7)~~

~~36.1-35.1.~~ [Use-Discuss](#) ECDIS data management ~~utility~~ to work with files associated with ECDIS operations:

- Select many groups of navigational data files (logbook, ownship tracks, target tracks, user charts, routes, ship model, system log, S57 log)
- ~~Convert from binary to text (can be subsequently opened in word processing programs for formatting, printing or archiving)~~
- ~~Convert formats~~
- ~~View and print various converted data files directly within utility~~

~~36.2-35.2.~~ [Use-Discuss](#) ECDIS data management ~~utility~~ to transfer select data files between storage media:

- Recognize ECDIS directory structure for file retrieval and storage
- Recognize which files can be copied or moved to other directories or drives
- ~~Copying files into the ECDIS program via Data Tool~~
 - ~~Would normally be done only for user layer files and route plan files created in another ECDIS installation (such as on another vessel);~~
 - ~~Requires familiarity with the directory structure in ECDIS;~~
 - ~~Copying and moving files is easily done with standard PC methods, but conversions in and out of binary or text requires the ECDIS data management utility~~

35.3. Review requirements and functions of logbook task in ECDIS, such as:

- Voyage recording consists of 24-hour data files, changing dates at GMT midnight
- A complete status check of all alarm functions and many setup conditions upon date change
- Collection of all fields upon:
 - Waypoint and Watch change (basic),
 - Manually triggered Event,
 - Screen coordinates change due to display reset (true and relative motion) and scale change
 - Change in chart data displayed
 - Change in alarm status and condition
- Chart data field includes displayed chart number (if ENC, also source, edition, date and cell)
- Does not include Route or Route Schedule used in monitoring

35.4. Review display functions of ownship track and tracks of AIS, ARPA and overlay targets:

- Includes position and heading data up to every second, but possibly less frequent depending on the ECDIS and its settings
- Ownship track history from alternate date may be displayed instead of current date - creating ambiguity if unintentional
- No matter what track date is displayed, current track for six minutes will be displayed
- Targets tracked on ARPA, radar overlay and AIS (as connected sensors) will be included in track file

37. Data logging and logbook(1.0 hr)

The trainee explains the meaning of voyage recording (Refs: T1 ch.8.6; T3 ch.7.6 & 13.9; B7)

37.1. Examine requirements and functions of logbook task in ECDIS, such as:

- ~~Voyage recording consists of 24-hour data files, changing dates at GMT midnight~~
- ~~A complete status check of all alarm functions and many setup conditions upon date change~~
- ~~Collection of all fields upon:~~
 - ~~Waypoint and Watch change (basic),~~
 - ~~Manually triggered Event,~~
 - ~~Screen coordinates change due to display reset (true and relative motion) and scale change~~
 - ~~Change in chart data displayed~~
 - ~~Change in alarm status and condition~~
- ~~Chart data field includes displayed chart number (if ENC, also source, edition, date and cell)~~
- ~~Does not include Route or Route Schedule used in monitoring~~

37.2. Examine display functions of ownship track and tracks of AIS, ARPA and RIB targets:

- Includes position and heading data up to every second, but possibly less frequent depending on the ECDIS and its settings
- Ownship track history from alternate date may be displayed instead of current date—creating ambiguity if unintentional
- No matter what track date is displayed, current track for six minutes will be displayed
- Targets tracked on ARPA, radar overlay and AIS (as connected sensors) will be included in track file

37.3. Perform various hard-copy print outs, such as:

- Direct from ECDIS logbook task
- Direct from ECDIS route-planning and route-schedule task
- Screen-capture of display, including chart-area and information-panels

38. Playback (0.5 hrs)

The trainee operates the functions pertaining to voyage recording, specifically the reconstruction and playback of selected situations (Refs: T3 ch.7.6; B7)

38.1. Explain the disruption of ECDIS when operating Playback utility

- Operating Playback utility runs all normal ECDIS functions but also bypasses all inputs,
- Results in the complete disruption of all route-monitoring and data-logging

38.2. Explain that no route or route plan is securely associated with any playback

- No route or route plan is securely associated with any playback; there will be no indication of any route plan(s) in the track files
- However, during playback, normal recording of Waypoint approaches in logbook can aid in determining the route in use

38.3. Explain that no chart data is securely associated with any playback

- No chart data is securely associated with any playback; there may be no record of chart formats enable or disabled in system setup
- However, during playback, the chart data displayed is captured in logbook with every entry
- Chart data available at the time of the selected track file can only be deduced by reviewing chart installation and update history file

38.4. Perform a playback of an event or passage specified by date and time

- Select a previous exercise or real vessel track file for review
- In Playback utility, select date for file to observe, start then pause, then advance to desired time by moving cursor
- Observe the construction of the past track, including tracked target data through targets task

38.5. Closely observe the position and heading update interval in Playback

- During playback, analyze the updating interval for position and heading

38.6. During playback, analyze the logbook for the quality of navigation:

- Alarms and responses
- Chart data in use
- Operational settings in use

■ Lesson Plans: ECDIS Responsibility & Assessment (6.0 hours)

39-36. Responsibility (1-52.0 hours)

40-37. Effective navigation with ECDIS (1.0 hour)

Ev. - 1 Written evaluation (1.0 hour)

Ev. – 2 Simulation evaluation – coastal & [confined-restricted](#) waters ([2-52.0](#) hrs)

39.36. Responsibility ([4-5-2.0](#) hrs)

The trainee describes the essential legal aspects and responsibilities in the use of ECDIS (Refs: R1; R3; [R5B11](#); [R6B12](#); R7; T1 ch.5; T3 ch.13.4)

39.1.36.1. [Re-examine-Review](#) COLREGS —implicit

- There is no specific mention of ECDIS (or position fixing or AIS) in the COLREGS, yet.
- However, ECDIS use is implied in the phrase “all available means” (Lookout (5), Risk of Collision (7)) occurring in Conduct of Vessels in Any Condition of Visibility - Rules 4-10

39.2.36.2. [Re-examine-Review](#) SOLAS, as amended —explicit

- Operating ECS and ECDIS without complete or updated chart data has been considered a contributing factor in several recent casualties. SOLAS V/2, V/19 & V/27 regulations address:
 - The carriage of charts
 - The equivalency of ENC format vector charts and paper charts
 - The non-equivalency of any other format
- SOLAS V/19 was amended in [6/09 June 2009](#) to [require-mandate](#) ECDIS [carriage requirement on ships](#) (see MSC.282(86))

39.3.36.3. [Re-examine-Review](#) IMO approval of equipment and installations

- Equipment and installations are specified in IEC 61174 ed. 3.0, ECDIS operational and performance requirements, methods of testing and required test results [for purchase];
- Other references to installations include:
 - IMO's revised ECDIS Performance Standards, MSC.232(82);
 - See also SN.1/Circ.266/Rev.1 (12/ 2010) on ECDIS software maintenance;
 - See also SN.1/Circ.265 (10/2007) on bridge design

39.4.36.4. [Re-examine-Review](#) IMO carriage requirements

- ~~SOLAS ch. V Reg. 19.2.10 and 19.2.11 as amended by resolution Annex 1 of MSC 86/26), adopted [6/2009 June 2009](#), (also MSC.282(86)) makes the carriage of ECDIS mandatory in a phase-in schedule from [7/2012 July 2012](#) through [7/2018 July 2018](#). [See also details from the recent International ECDIS Conference, \(Singapore, 10/09\)](#).~~
- ~~For the run-up to this development, the following are explanatory. The NAV subcommittee 53rd session (7/07) extensively debated the pros and cons of an ECDIS carriage requirement; see also DNV article advocating carriage (5/07) and DNV Technical Report No. 2008-0048~~

39.5.36.5. [Re-examine-Review](#) national ECDIS [carriage](#) regulations ([where applicable](#))

- ~~For US regulations for charts carriage, and permissibility of ECDIS on SOLAS vessels (on international voyages) see 33CFR164.33(a)(1) & 67 FR 53383, 8/15/02 [USCG-2002-13057], as extended 69 FR 42192, 7/14/04 [Ships calling ports may need to abide by national regulations governing ECDIS](#).~~

39.6.36.6. [Re-examine-Review](#) STCW Code, as amended

- International ECDIS training requirements are now included in STCW 2010 Part A (Code) through the Manila Amendments [of 6/2010 2010](#), effective [4/2012 01st January 2012](#) with a 5-year [grace-transition](#) period.
- The basic STCW competence requires maintaining the safety of navigation using ECDIS, with differences in application [between junior and senior deck officers for operational and management level deck officers](#):
 - Table A-II/1, Navigation at the operational level, ≥500 GT
 - Table A-II/2, Navigation at the management level, ≥500 GT
 - Table A-II/3, Navigation at the operational level, <500 GT

~~39.7. Re-examine flag state (maritime) implementation~~

- ~~• In the U.S., NVIC 02-03 Carriage of Navigation Equipment by Ships on International Voyages outlines the interim acceptance for meeting SOLAS carriage requirements regarding the use of ECDIS for primary means of navigation on board foreign vessels in U.S. waters.~~
- ~~• NVIC 02-03 is considered temporary guidance until U.S. navigation regulations are formally amended to also include U.S. registered vessels. (See also IEC doc on ECDIS, Section 2.12.)~~

~~39.8.36.7. Re-examine Review~~ IMO training Guidance (and providing review of course)

- A detailed outline for training and assessment in the operational use of ECDIS is now included in the STCW 2010 Manila Amendments, Part B: Guidance, but is not to be regarded as required or enforceable;
- See also SN.1/Circ.207/Rev.1 "Differences between RCDS and ECDIS";
- This Revised Model Course 1.27 (2010 edition), will provide national authorities with a detailed training course for guidance in assessment and certification in the primary STCW competence regarding ECDIS: Maintain the safety of navigation through the use of ECDIS

~~39.9.36.8. Re-examine Review~~ ISM and IMO requirements of ship owners & operators

- Under the terms of the ISM Code (International Ship Management Code), the ship owner or operator has a responsibility to ensure that personnel are given proper familiarization with their duties.
- ~~If a ship is equipped with a compliant an approved ECDIS, as the primary means of navigation at sea, the ship owner has to provide ECDIS training to ensure that ECDIS users are both properly trained and familiar with the shipboard equipment before it is used. Future impacts on insurance and liability are possible. (See also IEC doc on ECDIS, Section 3.3) (Ref: Paragraphs 6.2,6.3,6.5 of ISM Code)~~
- Under the terms of the STCW Convention, Regulation I/14:

Responsibilities of companies

1 Each Administration shall, in accordance with the provisions of section A-I/14, hold companies responsible for the assignment of seafarers for service on their ships in accordance with the provisions of the present Convention, and shall require every such company to ensure that:

.....seafarers, on being assigned to any of its ships, are familiarized with their specific duties and with all ship arrangements, installations, equipment, procedures and ship characteristics that are relevant to their routine or emergency duties;

40.37. Effective navigation with ECDIS (1.0 hr)

The trainee describes how ECDIS is used effectively in navigation (Refs: T1 ch.10.2; T3 ch.7.3 & 8.1 & 11.2 & 16)

~~40.1.37.1. Describe bridge functions incorporating ECDIS~~

- ECDIS can be used in support of many important bridge functions, but such support requires its own skill and knowledge facility, and constitutes an additional bridge function:
 - Visual monitoring – effective lookout, verify visual contact
 - Planning – charts, updates, routes, weather forecasts, weather routing
 - Piloting – course changes, dead reckoning, vessel position, radar overlay, position history, alarm history
 - Maneuvers – conditions (wind, tide, current, ice, climate data), vessel characteristics, docking, anchoring, lightering, canal transit
- ~~Traffic collision threat analysis, target data (ARPA, AIS, overlay tracking), verify ARPA target presentation, trial maneuver, COLREGS application, track history~~
- At anchor – monitor position, monitor other traffic, tidal current trends

40.2.37.2. Re-examine-Review sample bridge operating procedures addressing ECDIS

- Simplified bridge operating procedures addressing ECDIS should include (but should not be limited to) the following:
 - Maintain visual lookout supplemented by ARPA & ECDIS
 - Validate correct functioning of electronic instruments at regular intervals
 - Manage chart database and updates
 - Maintain voyage plans & files (consistent with approved and filed copies)

40.3.37.3. Define safe and practical navigation with ECDIS

- Safe and practical navigation with ECDIS should include (but should not be limited to) the following:
 - Use of ECDIS unit itself:
 - Make setup choices for specific conditions
 - Recognize that bridge team members may be viewing the ECDIS for widely differing purposes, therefore setups should be accommodating
 - Perform visual scanning techniques applied to ECDIS pages/screens
 - Use of instruments integrated with the ECDIS (centralization of information):
 - Cross check (trust but verify) displayed information by all other available means
 - Verify settings and functions of sensors connected to ECDIS
 - Acknowledgement of the “Problem of Partial Use” (unfamiliarity with the unit and/or procedures may lead to distracting problem solving attempts at inopportune times, or to a disuse of the unit altogether, neither of which improves the safety of navigation). Therefore, navigators should:
 - Know what can and cannot be accomplished before the need arises
 - Know that limited or restricted use results in unverified and unintended settings
 - Perform on ECDIS anything done on a paper chart
 - Perform on ECDIS things that cannot be otherwise done as effectively or efficiently
 - Performance of ECDIS could be affected in following cases:
 - ECDIS in operation comprises hardware, software and data. It is important for the safety of navigation that the application software within the ECDIS works fully in accordance with the Performance Standards and is capable of displaying all the relevant digital information contained within the Electronic Navigational Chart (ENC)
 - ECDIS that is not updated for the latest version of IHO Standards may not meet the chart carriage requirements as set out in SOLAS regulation V/ 19.2.1.4
 - Any ECDIS which is not upgraded to be compatible with the latest version of the Product specification or the S-52 Presentation Library may be unable to correctly display the latest charted features. Additionally, the appropriate alarms and indications may not be activated even though the features have been included in the ENC. Similarly any ECDIS which is not updated to be fully compliant with the latest version of the S-63 Data Protection Standard may fail to decrypt or to properly authenticate some ENCs, leading to failure to load or install.

40.4.37.4. Examine evolving concepts of e-navigation with regards to ECDIS

- With regards to ECDIS, the evolving concepts of e-navigation appear to be leading toward a thorough and uniform level of competence, reliability and usage of ECDIS in all aspects of navigation. The e-navigation strategy implementation also depends upon ENC availability, coverage, consistency and quality (NAV 56/8/7).
- Comprehensive practice with ECDIS is essential for achieving one of the stated purposes of e-navigation, namely, to prevent the overburdening and distraction of the seafarer.
- “The vision behind the e-navigation strategy ... is to integrate existing and new navigational tools, in particular electronic tools, in an all-embracing transparent, user friendly, cost-effective and compatible system that will contribute to enhanced navigational safety ... while

simultaneously reducing the burden on the navigator.” NAV 56 summary (7/2010)

Anomalies in the use of ECDIS

- Trainees should be fully aware of the nature, risk and methods taken to resolve ECDIS anomalies. In particular it should be understood that as a software driven system ECDIS will remain susceptible to future anomalies and that advice and guidance regarding this matter will from time to time be made available to ships.
-

EV – 1 Written evaluation (1.0 hr)

The trainee shows knowledge and comprehension in the learning areas of ECDIS that could not be otherwise demonstrated by workstation tasks or in simulation exercises

- Correctly answer questions:
 - Each written evaluation will consist of at least 25 questions (see ECDIS Theory Test Sample in Part E, below)
 - The selection of questions cover all segments of the course requiring assessment in learning dimensions of knowledge and comprehension,
 - Each evaluation will reflect a similar distribution of questions drawn from the learning objectives listed above.

Instructor guidelines

- Administer written evaluation according to defined procedures
- Score performance according to standards and measures as defined
- While grading exam, trainees should be offered a course critique to complete
- Passing score should be set at 70%

Ev. – 2 Simulation evaluation – coastal & confined restricted waters (2.5-0 hrs)

The trainee successfully completes a simulated transit (See example of Trainee's Evaluation on Simulator, Appendix 5)

The trainee operates specific functions for route monitoring in coastal and confined waters, and obtains all relevant information for safe navigation

- Demonstrate the following task groups on ECDIS while navigating safely in coastal & confined setting with potentially threatening targets in specified waters:
 - Monitor sea area,
 - Use route created by trainee including route schedule,
 - Select user layers created by trainee
 - Validate own ship's position by alternate means,
 - Check settings such as vector time, display reset, information layers, alarms, track, sensors, and ownship configurations.
 - Use ECDIS features to assess target threats and execute course and/or speed alterations to avoid collision
 - Modify route as instructed, checking for safety and adjusting schedule,
 - Assess tide and current, adjust ETA for timed arrival at waypoint as instructed,
 - Comply with COLREGS
 - Comply with bridge procedures established by trainee and/or instructor

Instructor guidelines

- Conduct simulation exercise according to exercise description:
 - Set simulation parameters
 - Define unsafe navigation as that involving a clear violation of minimum under keel clearance or CPA, where such a violation will require a retake of the underway evaluation
 - Conduct grading on ECDIS underway score sheet for (see Part E—Evaluation and Assessment)
 - Remotely monitoring of trainees' ECDIS use for grading of all tasks listed on the score sheet
 - Brief trainees
 - Passing score should be set at 70%
 - Debrief each trainee who experiences a violation of safe navigation to ensure understanding prior to attempting a second evaluation

- Consider the following options in designing scenarios for Underway Evaluation (for descriptions of optimal simulator arrangements, see Part A – course Framework; also App.4 and App. 5 in Appendices for the Instructor):

Option for Underway Evaluation

Piloting in semi-confined waters for 6 ownships

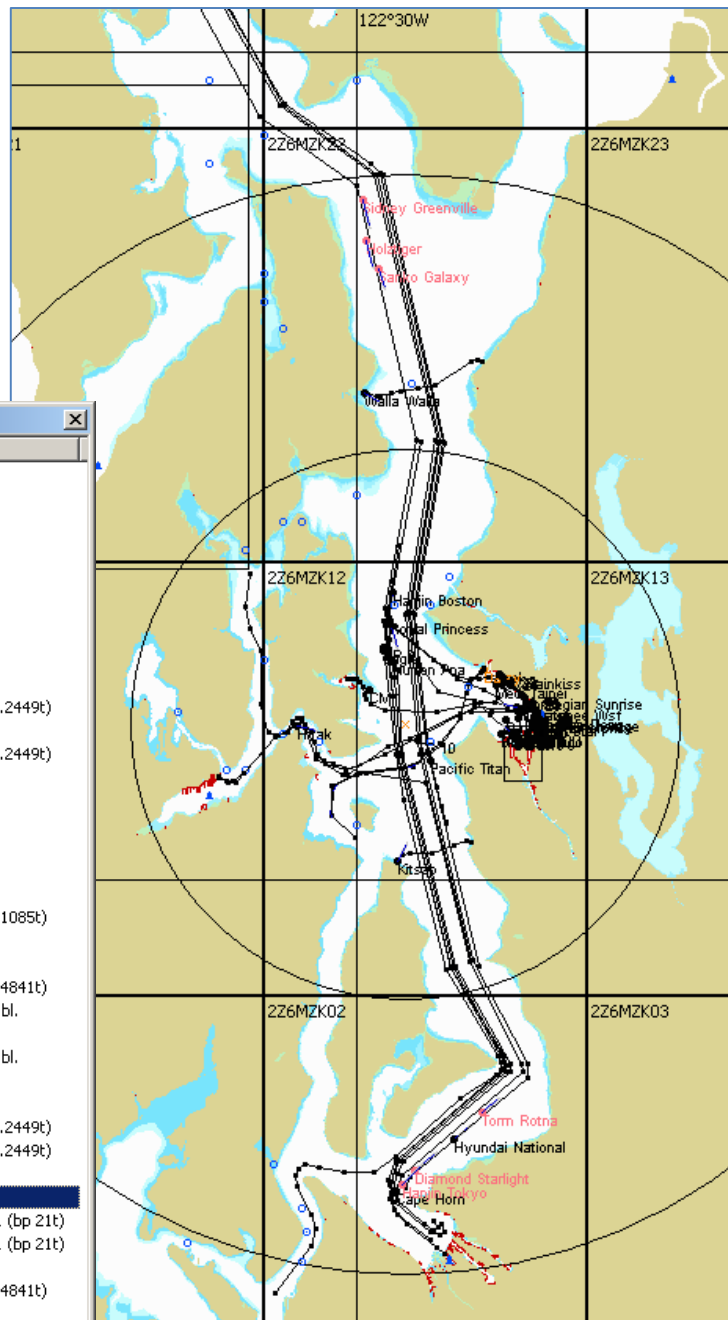
Task groups:

- Create route (from prior lesson) and apply route; modify route underway
- Safe navigation through skills integration
- Adapt instruments to conditions
- Adapt track-keeping to workload
- Comply with VTS and TSS rules

Outcomes:

- Navigate with ECDIS
- 1 person watch
- Cooperative navigation
- Visual lookout
- Maneuvering
- ECDIS Competency Assessment (use of all ECDIS functions is observed and scored)

Objects	
Name	Type
◆ Barge	
◆ Environment	
◆ Mooring	
◆ Scene	
◆ Ship target	
• Cape Horn	Fisher (Dis.1676t)
• Da Ming Hu	VLCC 1 (Dis.159584t)
• Daisy	Yacht (Dis.286t)
• Hanjin Boston	Container ship 3 (Dis.83105t)
• Horizon Anchorage	Container ship 1 (Dis.32025t)
• Hyak	Ro-Ro Passenger Ferry 7 (Dis.2449t)
• Hyundai National	Container ship 1 (Dis.32025t)
• Kitsap	Ro-Ro Passenger Ferry 7 (Dis.2449t)
• Laurel	Yacht (Dis.286t)
• Medi Taipei	Bulk carrier 2 (Dis.76800t) bl.
• MOL Dynamic	Container ship 1 (Dis.32025t)
• MOL Enterprise	Container ship 1 (Dis.32025t)
• MW Rainkiss	Bulk carrier 1 (Dis.33089t)
• North Star	Container ship 2 (Dis.93130t)
• Norwegian Sunrise	Passenger cruise ship 2 (Dis.31085t)
• Nurten Ana	LO-RO ship (Dis.19512t)
• Pacific Titan	Integrated Tug Barge 450
• Royal Princess	Passenger cruise ship 1 (Dis.24841t)
• Santiago	Container ship 2 (Dis.41172t) bl.
• TG 10	Coastal tanker (Dis.5325t)
• TG 19	Container ship 2 (Dis.41172t) bl.
• TG 20	Bulk carrier 1 (Dis.23565t) bl.
• TG 21	Destroyer (Dis.4675t)
• Walla Walla	Ro-Ro Passenger Ferry 7 (Dis.2449t)
• Wenatchee Wsf	Ro-Ro Passenger Ferry 7 (Dis.2449t)
• Xin Dan Dong	LO-RO ship (Dis.19512t)
◆ Tug target	
• Barbara	Conventional twin screw tug 1 (bp 21t)
• Eagle	Conventional twin screw tug 1 (bp 21t)
◆ Ship	
• Diamond Starlight	Passenger cruise ship 1 (Dis.24841t)
• Hanjin Tokyo	Container ship 5 (Dis.86900t)
• Holtzger	Container ship 5 (Dis.86900t)
• Sanko Galaxy	Bulk carrier 4 (Dis.104510t)
• Sidney Greenville	Container ship 3 (Dis.83105t)
• Torm Rotna	Bulk carrier 3 (Dis.26343t) bl.



Part E –Evaluation and Assessment

■—Introduction

Consistent with the inclusion of detailed training objectives for ECDIS into the 2010 Manila Amendments to STCW, the evaluation plan that follows addresses instrument-related competencies along with proficiencies on integration of ECDIS with navigational practices. It is consistent with the intent of STCW that demonstration of skills and practical understanding is determined by direct observation, while knowledge and theoretical understand is determined through written examination in a variety of question styles.

■—Proficiency checklists and score sheet

Where proficiencies are specified for a specific make and model of ECDIS, the instructional designer adapting the Model Course should apply the task or concept to the specific ECDIS available in training. This will be particularly appropriate for the Proficiency Checklist that follows in this Part. The specific tasks of that document should, in fact, be used as a method to validate the transference and transferability of skills between one specific ECDIS unit and another. It is well suited to the classroom or open lab training environment. The Simulation Checklist, on the other hand, provides a less specific method, but no less focused, more suitable for evaluating and scoring underway skill sets during solo navigation exercises. For a more specific approach to scoring ECDIS proficiencies, a sample score sheet and associated tally sheet are provided. These rely on the grouping of tasks introduced through the Simulation Checklist.

This Part contains the following evaluation and assessment tools:

- Proficiency Checklist for type approved ECDIS
- Simulation Evaluation Proficiency Checklist
- Sample ECDIS underway score sheet
- Sample ECDIS evaluation tally
- ECDIS Mid-course Exam – Open reference
- ECDIS Theory Test – Sample

Introduction

The effectiveness of any evaluation depends on the accuracy of the description of what is to be measured.

The learning objectives that are used in the detailed teaching syllabus, Column 3 - Methods for demonstrating competence - and Column 4 - Criteria for evaluating competence - in Tables A-II/1, A-II/2 and A-II/3 of the STCW Code, set out the methods and criteria for evaluation.

Instructors should refer to these when designing the assessment.

It is consistent with the intent of STCW that demonstration of skills and practical understanding is determined by direct observation, while knowledge and theoretical understand is determined through written examination in a variety of question styles.

STCW 2010 Code

The training and assessment of seafarers required under the Convention are administered, supervised and monitored in accordance with the provisions of Regulation I/6 of the STCW Convention.

Assessment is also covered in detail in IMO Model Courses [3.12 & 6.09A].

Assessment Planning

Assessment planning should be specific, measurable, achievable, realistic and timebound (SMART).

Some methods of assessment that could be used depending upon the course/qualification are as follows and all should be adapted to suit individual needs:

- observation (In oral examination, simulation exercises, practical demonstration);
- questions (written or oral);
- tests;
- simulation (also refer to section A-I/12 of the STCW code 2010);

Validity

The evaluation methods must be based on clearly defined objectives, and must truly represent what is meant to be assessed; e.g. against only the relevant criteria and the syllabus or course guide. There must be a reasonable balance between the subject topics involved and also, in the testing of trainees' KNOWLEDGE, UNDERSTANDING AND PROFICIENCY of the concepts.

Reliability

Assessment should also be reliable (if the assessment was done again with a similar group/learner, would similar results be achieved). Different group of learners may have the same subject at different times. If other assessors are also assessing the same course/qualification, there is need to ensure all are making the same decisions.

To be reliable an evaluation procedure should produce reasonably consistent results, no matter which set of papers or version of the test is used.

If instructors are assessing their own trainees, they need to know what they are to assess and then decide how to do this. The "what" will come from the standards/learning outcomes of the course/qualification they are delivering and the "how" may already be decided for them if it is in assignments, tests or examinations.

The instructors need to consider the best way to assess the skills, knowledge and attitudes of their learners, whether this will be formative and/or summative and the validity and reliability of the assessment.

All work assessed should be valid, authentic, current, sufficient and reliable; this is often known as VACSR – "valid assessments create standard results":

- valid – the work is relevant to the standards/criteria being assessed;
- authentic – the work has been produced solely by the learner;
- current – the work is still relevant at the time of assessment;
- sufficient – the work covers all the standards/criteria;
- reliable – the work is consistent across all learners, over time and at the required level.

It is important to note that no single method can satisfactorily measure knowledge and skill over the entire spectrum of matters to be tested for the assessment of competence. Care should therefore be taken to select the method most appropriate to the particular aspect of competence to be tested, bearing in mind the need to frame questions which relate as realistically as possible to the requirements of the officer's tasks at sea.

Compiling assessments

Whilst each examining authority establishes its own rules, the length of time which can be devoted to assessing the competence of candidates for certificates of competency is limited by practical, economic and social restraints. Therefore a prime objective of those responsible for the organization and administration of the assessment system is to find the most efficient, effective and economical method of assessing the competency of candidates. An examination system should effectively test the breadth of a candidate's KNOWLEDGE, UNDERSTANDING AND PROFICIENCY of the subject areas pertinent to the tasks he is expected to undertake. It is not possible to examine candidates fully in all areas, so in effect the

assessment samples a candidate's KNOWLEDGE, UNDERSTANDING AND PROFICIENCY by covering as wide a scope as is possible within the time constraints and testing his depth of KNOWLEDGE, UNDERSTANDING AND PROFICIENCY in selected areas.

The assessment as a whole should assess each candidates comprehension of principles, concepts and methodology; ability to apply principles, concepts and methodology; ability to organize facts, ideas and arguments and abilities and skills in carrying out the tasks to perform in the duties he or she is to be certificated to undertake.

All evaluation and testing techniques have their advantages and disadvantages. An examining authority should carefully analyse precisely what it should be testing and can test. A careful selection of test and evaluation methods should then be made to ensure that the best of the variety of techniques available today is used. Each assessment shall be that best suited to the learning outcome or ability to be assessed.

Quality of test items

No matter which type of test is used, it is essential that all questions or test items used should be as brief as possible, since the time taken to read the questions themselves lengthens the examination. Questions must also be clear and complete. To ensure this, it is necessary that they be reviewed by a person other than the originator. No extraneous information should be incorporated into questions

■ Proficiency Checklist for type approved ECDIS

These tasks are most effectively mastered by:

- Following a developmental sequence, and
- Practicing them in navigational contexts (in other words, when underway).
- References: Type approved ECDIS User Manual
- Other ECDIS docs: *Technical; Operating Principles; Software Description*

Basic Tasks

*User
Manual*

1	Identify all Control panels, Task panels, Operational panel buttons, Multi-panel	
2	Enable / disable auto-hide (Show) of Control panel; move Control panel windows	
3	Set screen color palette – Day / night / etc.;	
4	Open all Tasks – leave open and become familiar with Tabs for each Task panel	
5	Set orientation of Main display – N / H / C	
6	Set mode of Main display – TM / RM	
7	Select Dual display – alignment / mode / orientation / scale choice	
8	Drop and return ownship symbol – View, then Ahead, F8, icon, Position Dropped	
9	Reposition ownship in Relative Motion	
10	Use ERBL – offset; info window; from ownship for CPA & TCPA; VRM options	
11	Select vector length – fixed / variable	
12	Select chart by position & when position is dropped – active list / table	
13	Find / load chart anywhere – View (Review) & Enter repeatedly	
14	Select Chart Autoload options – on / fix / off	
15	Set Chart Autoscale – on / off; manual scaling in Chart Area window	
16	Select correct scale to show chart layers – Zoom, use + & -, scale, “zoom box”	

17	Select chart display categories — Shift-F7 / Shift-F8 [hot keys]	
18	Obtain chart object information — vector chart, user chart (Add Info)	
19	Set Antigrounding — Safety Contour / Depth	
20	Set Area approach — category selection, time before approach	
21	Set Navigational danger approach — distance	

Overall Presentation of Display

22	Select position & time from best available source	
23	Cancel / verify / modify position offset	
24	Select chart & scale appropriate to location	
25	Create uncluttered display, depending upon context and conditions	
26	Choose Main or Dual display in best mode & orientation to view ownship	
27	Load a pre-checked and approved Route for monitoring; load existing schedule	
28	Select Safety Parameters appropriate to location, route monitored and traffic	

Intermediate Tasks

*User
Manual*

29	Create route plan – rough draft, save, WP editor, scaling with + & -	
30	Edit route plan – Focus on Route, fine tune, data entry, link, delete	
31	Adjust distance calculations in route planning	
32	Perform safety check in route planning – Function Panel / Check Editor	
33	Create & modify Route Schedule ETD, ETA, speeds – Function Panel / Schedule	
34	Select Route Data in Multi-panel	
35	Use waypoint selection – auto / manual	
36	Set / select Route Monitoring alarms – Monitoring / Navigational Alarms	
37	Select Route Monitoring features to show – Monitoring / Route Monitoring	
38	Select Navigation Alarm features to show – Monitoring / Navigational Alarms	
39	Observe alarm condition (Alarm panel) – active / general / area	
40	Set Time Zone for ship's time	
41	Select time icon to display – UTC / ship's time	
42	Observe & assess target information – display buttons, Target Table, tracks, View	
43	Sort targets in table – name, alias, CPA, TCPA	
44	Select AIS target identifier; set AIS voyage data; manage AIS messages	
45	Search for targets listed in table	
46	Set & select target alarm – CPA & TCPA	
47	Assess dangerous target(s) – graphically	
48	Set anchor watch guard ring & alarm	
49	Select tidal information (Task / Tides) – Diagram, table, find place	
50	Observe tide & current information – Multi-panel Environment Data	

51	View Logbook — Select date & event groups (filter); go to logbook entry on chart	
52	Make manual entry in the Ship Log — Event button, enter remarks	
53	Unload & load existing Add Info charts — Info panel A & B, Task panel	
54	Select Add Info features to show / hide	
55	Create Add Info with attributes — name & save, view hidden / danger	
56	Edit existing Add Info chart — resave, delete, restore, merge, object search	
57	Select Manual Correction features to show / hide	
58	Manual Correction — show all / hide all / go to / shift / delete objects	
59	Create Manual Corrections with attributes — view / hidden / timing / attached file	
60	Activate Man Overboard function — interpret course to steer to return	

Navigator Tasks

*User
Manual*

61	Install / delete chart data – Chart manager	
62	Install chart updates – proprietary chart format (TX-97, for example)	
63	Install chart updates – ENC chart format (S-57)	
64	Create & modify User Graphic configuration	
65	Select chart data formats for initialization – Advanced Databases	
66	Modify sensor attachments – ports, rate	
67	Modify ownship setup	
68	Select System Time by GPS	
69	Select Entry timing for automatic log entry – configure watch cycle	
70	Copy files using Data tool – between hard drive and external media	
71	Convert (.txt) & View <u>Logbook</u> files using Data Tool; Print log selection	
72	Import ECDIS <u>Add Info</u> files using Data Tool – .cra copied as .ai	
73	Import ECDIS <u>Route</u> files using Data Tool – .rte copied as .rt3	
74	Convert (.cvt) & View <u>Route to Text</u> files using Data Tool; Print route plan	
75	Create SAR date – load as Route to monitor	
76	———— Copy route plan to external media from route planning	
77	View and copy route plan as Excel table from route planning	
78	Delete route plan(s) – Route panel, Windows Explorer, Data Tool	
79	View track history graphically from Route Monitoring	
80	Playback – select date, start position. Cursor data entry	
81	Set up network configuration – Master & Slave (Slave in Backup mode)	
82	Equalize route files from Master to Slave station	
83	Equalize Add Info files from Master to Slave station	
84	Equalize manual updates from Master to Slave station	

85	Connect AIS Pilot Plug – configure for positional information	
86	Set DR for AIS targets	
87	Set & delete training targets	

■ Simulation Evaluation Proficiency Checklist

Trainee: _____		A. _____	B. _____	C. _____	D. _____	E. _____	F. _____	G. _____	H. _____	I. _____	J. _____	K. _____	L. _____
Bridge : _____													
Simulation Evaluation													
Task (see following pages for details)													
1.	<i>Use all nav systems interfaced with ECDIS</i>												
2.	<i>Verify settings of interfaced sensors</i>												
3.	<i>Check that settings conform to procedures</i>												
4.	<i>Monitor info on ECDIS for safe navigation</i>												
5.	<i>Verify position by alternate means</i>												
6.	<i>Adjust settings to suit conditions</i>												
7.	<i>Use ECDIS-managed track control autopilot</i>												
8.	<i>Maneuver using accepted navigation practice</i>												
9.	<i>Manage contacts by AIS & radar interface*</i>												
10.	<i>Assess environmental factors*</i>												

Score each task 3, 2, or 1 according to Evaluation Methods listed below. Max score = 30 pts. Minimum passing score = 21 pts (70%).

Trainee name/ID & score			
A			
B			
C			
D			
E			
F			
G			
H			
I			
J			
K			
L			

NOTES: Methods for evaluating competence: Assessment of evidence obtained from approved ECDIS simulator training in underway scenarios utilizing ship control, visual scene and sensors providing integrated input to ECDIS including radar, target tracking, positioning, and AIS. (See also STCW B-I/12, Guidance regarding the use of simulators, and B-II/1 and B-II/2, Guidance regarding the certification of officers.) Criteria for evaluating competence: Information obtained from ECDIS is correctly interpreted and analyzed taking into account the limitations of the equipment and prevailing circumstances and conditions.

Use all navigation systems interfaced with ECDIS — [Uses most/all = 3; uses some = 2; uses none = 1]

- 1— Determine what ECDIS functions are integrated with other navigation systems in the particular installation
— Examples: Position from AIS-DGPS; time from GPS; radar overlay (RIB); radar tracked targets; autopilot track control; compasses;

Verify settings of interfaced sensors — [Verifies most/all = 3; verifies some = 2; verifies none = 1]

- 2— Routinely inspect sensors interfaced to ECDIS for correct settings and functioning
— Examples: GPS allowable fix quality; depth mode for echo sounder (DBK, DBS); ECDIS route display enabled on radar;

Check that settings conform to procedures — [Checks most/all = 3; checks some = 2; checks none = 1]

- 3— Check the following settings on ECDIS in an efficient manner and ensure they conform to established procedures:
a.— Alarm parameters for areas, anti-grounding, contacts, time functions
b.— Completeness of chart data, chart licensing status, and chart update status
c.— Navigation system backup arrangements

Monitor ECDIS information for safe navigation — [Monitors most/all = 3; monitors some = 2; monitors none = 1]

- 4— Monitor the following information on ECDIS in a manner that contributes to safe navigation:
a.— Sea area
b.— Position
c.— Navigation information
d.— Route monitoring
e.— Chart information
f.— Contact information
g.— Status of alarms and indicators

~~Verify position by alternate means~~ [Confirms by two alternates = 3; confirms by one alternate = 2; confirms by no alternates = 1]

~~5~~ Confirm the accuracy of vessel position on ECDIS by alternate means

~~Examples: Radar overlay; radar cursor (or VRM/EBL); secondary position source (PS2) by alternate GPS, Loran, etc.); visual LOPs;~~

~~Adjust settings to suit conditions~~ [Adjusts most/all = 3; adjusts some = 2; adjusts none = 1]

~~6~~ Adjust the following settings and values on ECDIS to suit the present conditions:

- ~~a. Sea area display, mode and orientation~~
- ~~b. Chart display categories~~
- ~~c. Chart selection, scale, and automatic functions~~
- ~~d. Route plan and/or route schedule~~
- ~~e. User created information layers~~
- ~~f. AIS interface functions~~
- ~~g. Radar overlay~~

~~Use ECDIS-managed track control autopilot~~ [Effective use of track control = 3; some use of track control = 2; no use of track control = 1]

~~7~~ Adjustments made to ECDIS-controlled track keeping functions to maintain safety of navigation

~~Examples: Adjust autopilot parameters; re-align route plan intended for track control & perform safety check prior to Monitoring; verify track control;~~

~~Maneuver using accepted navigation practice~~ [Effective maneuvers = 3; some inefficiencies in maneuvers = 2; unsafe maneuvers = 1]

~~8~~ Decisions to amend course and/or speed are both timely and in accordance with accepted navigation practice

~~Examples: Use ECDIS trial maneuver for maneuver planning; use CPA/TCPA alarms on ECDIS; apply COLREGS; observe transit restrictions for given port;~~

~~Manage contacts by AIS & radar interface*~~ [Effective contact management = 3; some inefficiencies in contact management = 2; unsafe/no contact management = 1]

~~9~~ Identify contacts repeated on ECDIS from AIS and/or radar, and communicate with contacts by text messaging through ECDIS-AIS interface

~~(* Interfacing is recommended but not required.)~~

~~Assess environmental factors*~~ [Effective use of available functionality = 3; some use of available functionality = 2; no use of available functionality = 1]

~~10~~ In addition to onboard environmental sensors interfaced with ECDIS, access port supported binary messaging, and real time tidal gauge data

~~(*Functionality is optional through ECDIS licensing and by regional availability.)~~

■ ~~Sample ECDIS underway score sheet~~

~~**Task groups**—The task groups shown below provide organization and flexibility to scoring underway proficiencies in ECDIS. These are meant to isolate significant skill sets directly related to effective ECDIS navigation. The groups that focus on ECDIS account for using critical interfaces on ECDIS (1), procedural setups (3), relevant info (4), all position options (5), and making adjustments (6). The other groups account for externals critical to effective ECDIS navigation.~~

No.	Task Group	Focus
1	Use all navigation systems interfaced with ECDIS	On ECDIS
2	Verify settings of interfaced sensors	Other sensors
3	Check that setting conform to procedures (briefing)	On ECDIS
4	Monitor information on ECDIS for safe navigation	On ECDIS
5	Verify position by alternate means	On ECDIS
6	Adjust settings to suit conditions and adapt to changing conditions	On ECDIS
7	Use ECDIS-managed track control autopilot	On autopilot
8	Maneuver according to accepted navigational practice and with regard to COLREGS	Conning & situational awareness
9	Responses to role play with regards to ECDIS use	Situational awareness with VTS on ECDIS
10	Manage AIS and assess environmental conditions	On ECDIS (optional)

~~The last group (On ECDIS: manage AIS and assess environmental conditions) is considered optional for two reasons: First, AIS messaging and environmental factors such as tidal current cycles may not suit all evaluation exercise scenarios, and second, not all Integrated Multiple Ownship Simulators can be expected to include this functionality, although they should since these are commonly a vital and integral aspect of navigation in confined and semi-confined waters.~~

~~**Sample score sheet**—The sample score sheet shown below is meant for each trainee in the underway evaluation. Instructions are to: Score 3 (all), 2 (some), or 1 (not enough), or leave blank if n/a. Scoring 0 on [*] (in Task group 8) represents a Critical Fault. In that instance, the trainee should retake the evaluation because it is always plausible that better use of ECDIS would have mitigated the dangers related to close quarters and proximity to shoal water. An important consideration used in this scoring scheme is to avoid a penalty for un-scored tasks, unless the entire Task Group is un-scored.~~

~~The scoring could be kept simple with the use of integers, or decimal values could be used for finer differentiation. Consistency in either case is essential. The values recorded in the underway score sheet are applied in the evaluation tally with weighted averages for each Task Group.~~

ECDIS Underway Score Sheet				
1.10000 = Average of weights				
Scoring: Leave blank if n/a; Enter: 3 (all), 2 (some), 1 (not enough);				
- Entering 0 on [*] (in Task group 8) triggers Critical Fault (retake evaluation)				
<i>Task groups:</i>		score	comment	
<i>Use all navigation systems interfaced with ECDIS — on ECDIS</i>				
1	Tag targets	-	-	4
1.5	Acquire radar targets	-	-	2
	DGPS on PS1	-	-	3
<i>Verify settings of interfaced sensor — other sensors</i>				
2	GPS HDOP recorded	-	-	4
1.0	Sounder set to DBK	-	-	5
	Speed log set to BT	-	-	6
	PS2 unit on & initialized	-	-	7
	Radar displaying route	-	-	8
	AP settings adjusted for Track Control	-	-	9
<i>Check that setting conform to procedures (briefing) — on ECDIS</i>				
3	Anti-grounding parameters set	-	-	10
1.5	Vector length set	-	-	11
	Route monitored	-	-	12
	Route waypoints named & displayed	-	-	13
	Route XTE zones set for passage	-	-	14
	Ship Time Zone set	-	-	15
	Paper chart backup: route, DR, notes	-	-	16
<i>Monitor information on ECDIS for safe navigation — on ECDIS</i>				
4	EC look-ahead — occasional	-	-	17
1.5	EC scale adjusted — occasional	-	-	18
	EC chart choice	-	-	19
	Route Data panel displayed	-	-	20
	Query tracked targets, chart objects	-	-	21
	Acknowledge alarms	-	-	22
<i>Verify position by alternate mean — on ECDIS</i>				
5	Cursor from radar on EC	-	-	23
1.0	PS2 input into EC (if on)	-	-	24
	Radar overlay — occasional	-	-	25
	Paper chart: plot visual & radar fixes	-	-	26

<i>Adjust settings to suit conditions and adapt to changing conditions — on ECDIS</i>				
6	Set day/night palette	-	-	27
1.5	Custom layers set for low clutter	-	-	28
	Dual panel— full screen + MultiPanel	-	-	29
	Route plan schedule set for ETAs	-	-	30
	ETA + speed made good on MultiPanel displayed	-	-	34
	CU/HU/NU mode, RM/TM	-	-	32
	Revise route as needed	-	-	33
	Add Info layers used & revised	-	-	34
	Radar overlay adjusted	-	-	35
	<i>Use ECDIS-managed track control autopilot — on autopilot</i>			
7	Track Control—occasional	-	-	36
0.5	TC turns follow safe radius on EC	-	-	37
<i>Maneuver according to accepted navigational practice and with regard to COLREGS — conn & situational awareness</i>				
8	VHF contact made	-	-	38
1.0	Proactive passing arranged	-	-	39
	[*] Safe CPA at all times	-	-	40
	Safe turns executed	-	-	44
	Safe speed at all times	-	-	42
	[*] Safe DBK at all times	-	-	43
	Nav lights on	-	-	44
	Fog signals on	-	-	45
	Rough Log completeness	-	-	46
<i>Responses to role play with regards to ECDIS use — situational awareness with VTS on ECDIS</i>				
9	Provide ETA on request	-	-	47
1.0	Provide revised plan on request	-	-	48
	Provide environmental info on request	-	-	49
	Call in to VTS on request	-	-	50
<i>Manage AIS and assess environmental conditions — on ECDIS (optional)</i>				
10	AIS messaging managed from EC	-	-	51
0.5	RIB targets tracked on EC	-	-	52
	Display tide & current info on EC	-	-	53
	Query tide & port info on EC	-	-	54
-	-	-	-	

■ ~~Sample ECDIS evaluation tally~~

~~**Evaluation tally**— For each trainee, a score is delivered to each Task Group on the evaluation tally directly from the underway score sheet:~~

$$\{1\} \text{—} \textit{Task Group} = \textit{Avg of tasks} * \textit{Weight}$$

~~As noted above, blank entries for specific tasks in the underway score sheet are disregarded in this initial averaging per Task Group. The intent is to provide a flexible scoring system in the event that certain devices are not included in the integrated simulation. On the other hand, simply entering a zero value in place of a blank will cause that entry to be included in the average, significantly penalizing omitted behaviors, and rendering the scoring system far more rigorous. Such a choice should be left to the training course developer, and should not be directly dictated by a scoring system. The formulation here yields to the scorer (0 or blank).~~

~~Each trainee's total score is represented by the average of non-zero values:~~

$$\{2\} \text{—} \textit{Avg} = \Sigma \textit{Task Group scores} / \Sigma \textit{Weights [excluding \#10 if blank]}$$

~~The achievement of each trainee by percentile is determined by utilizing 3 as the maximum possible score for any given task in the score sheet:~~

$$\{3\} \text{—} \textit{Score \%} = \textit{Avg [non-zero]} / 3$$

~~There is considerable value in tracking the average scores by Task Groups over a succession of underway evaluation exercises, in particular to aid in assessing and validating the outcomes of the ECDIS navigation training overall. For example, certain Task Groups may show under-performance over several iterations, indicating the need for revised emphasis of certain tasks in the underway context. Likewise, the overall score for the evaluation exercise can be determined and tracked.~~

~~For each Task Group across all trainees:~~

$$\{4\} \text{—} \textit{Max score} = \textit{Task Group Weight} / 3$$

~~For the non-zero values of each Task Group:~~

$$\{5\} \text{—} \textit{Task Group Avg} = \textit{Avg [formula 2]}$$

~~For the tally of each Task Group by percentile:~~

$$\{6\} \text{—} \textit{Task Group \%} = \textit{Task Group Avg} / \textit{[formula 4]}$$

~~For the overall evaluation score:~~

$$\{7\} \text{—} \textit{Score} = \textit{[formula 5]} / \Sigma \textit{Weights [excluding \#10 if blank]}$$

ECDIS evaluation tally

Trainee:								Session:
		A	B	C	D	E	F	
Bridge:		-	-	-	-	-	-	
Date:		-	-	-	-	-	-	
Simulation Evaluation								
Task (see underway score sheet for details)								Avg.
1	Use all nav systems interfaced with ECDIS	-	[1]	-	[4]	-	-	
2	Verify settings of interfaced sensors	-	-	-	[5]	-	-	
3	Check that settings conform to procedures	-	-	-	-	[6]	-	
4	Monitor info on ECDIS for safe navigation	-	-	-	-	-	-	
5	Verify position by alternate means	-	-	-	-	-	-	
6	Adjust settings to suit conditions	-	-	-	-	-	-	
7	Use ECDIS-managed track control autopilot	-	-	-	-	-	-	
8	Maneuver using accepted navigation practice	-	-	-	-	-	-	
9	Manage contacts by AIS & radar interface*	-	[2]	-	-	[7]	-	
10	Assess environmental factors*	-	[3]	-	-	-	-	
Average (non-zero):		-	-	-	-	-	-	-
Score (%):		-	-	-	-	-	-	-

■ **ECDIS Mid-course Exam - Open reference**

Multiple choice: Select the best answer and cite Revised P.S. (MSC.232(82))

1. ~~The **primary function** of ECDIS is to:~~

- ~~a. Eliminate the need to use paper charts.~~
- ~~b. Reduce the number of persons on the bridge.~~
- ~~c. Contribute to safe navigation~~
- ~~d. Computerize shipboard navigation~~

~~C — PS 1.1~~

2. ~~An important **benefit** of ECDIS is:~~

- ~~a. Simple and reliable updating of the ENG~~
- ~~b. Reducing navigational workload~~
- ~~c. Providing appropriate alarms or indications~~
- ~~d. All of the above.~~

~~D — a) PS 1.4, b) PS 1.5, c) PS 1.8~~

3. ~~Which of the following is **mandatory equipment** that must be connected to ECDIS?~~

- ~~a. Radar/ARPA~~
- ~~b. Positional navigation sensors (e.g., GPS)~~
- ~~c. Track control (autopilot)~~
- ~~d. AIS~~

~~B — PS 2.1, 10.5.7, 12.2~~

4. ~~Aside from the requirements for the Display Base and Standard Display, who selects the display categories of the "**All other information**" display level?~~

- ~~a. The hydrographic office issuing the ENG data~~
- ~~b. The ECDIS manufacturer~~
- ~~c. The mariner~~
- ~~d. All of the above~~

~~C — PS 2.1, Appx. 2 Item 2.3~~

5. ~~Which of the following is "**equivalent to an up-to-date paper chart.**"?~~

- ~~a. The ENG~~
- ~~b. The SENG~~
- ~~c. The ECDIS display~~
- ~~d. Official updates in digital format~~

~~D — PS 2.3~~

Short answer: Write a brief explanation (2 lines) and cite the relevant P.S. paragraph

6. What is the difference between an **ENC** and the **SENC**?

ENC—database issued by hydrographic office that contains all chart info needed for safe navigation; may contain supplemental info [PS 2.2]

SENC—database transformed by ECDIS; equivalent to up-to-date paper chart; may contain info from other sources [PS 2.3]

7. What is the difference between **Standard Display** and a **Display Base**?

Standard Display—level of SENC info shown when ECDIS first turned on; used for route planning; can be modified by mariner depending on needs [PS 2.4]

Display Base—level in info that cannot be removed from display; required at all times; not intended for safe navigation [PS 2.5]

8. What is meant by the term “**single operator action**”?

Note: Mentioned in IMO PS but not adequately defined!

Examples: Standard Display [PS 3.3], Remove radar info [PS 6.2]

Also: “shown on demand” [PS 9.5], “displayed on demand” [PS Appx.2 Item 3]
—— “manually on demand” (or Event) [PS 10.5.12.1]

9. In regard to the **scale of the display**, what are two important indications that an ECDIS must show?

1. Info that is displayed at larger scale than ENC [PS 5.1]

2. Ship’s own position covered by ENC at larger scale [PS 5.2]

10. What is the difference between an **Indication** and an **Alarm**?

Alarm—announced by audible and/or audible & visual means; a condition that requires attention
[PS Appx. 5]

Indicator—a visual indication about condition of system or equipment
[PS Appx. 5]

~~11. In the Route Planning Mode, what are the four primary ways to **adjust a planned route**?~~

- ~~1. Adding waypoints~~
- ~~2. Deleting waypoints~~
- ~~3. Changing the position of waypoints~~
- ~~4. Alphanumerically & graphically [all PS 10.4.2]~~

~~12. During **Route Monitoring**, what are the two primary things that should always appear on the ECDIS display?~~

- ~~1. Selected route~~
- ~~2. Own ship's position [both PS 10.5.1]~~

~~13. In terms of voyage recording, what are two major **types of data that must be recorded** at one minute intervals during the previous 12 hours?~~

- ~~1. Record of own ship's track; time, position, heading, speed [PS 10.6.1.1]~~
- ~~2. Record of official data used (e.g., ENC) [PS 10.6.1.2]~~

~~14. What are the two primary **reasons for backup arrangements** in case of ECDIS failure?~~

- ~~1. Safe take-over of ECDIS functions; avoid critical condition [PS 14.1]~~
- ~~2. Safe navigation for remaining part of voyage [PS 14.2]~~

~~15. What is meant by "**ship's safety contour**"?~~

~~Selected from depth contours provided; more emphasis shown (**bold**) than other contours [PS 3.8]~~

~~Indication provided during route planning [PS 10.4.4]~~

~~Alarm given if approaching within a specified time period [PS 10.5.3]~~

~~Default safety contour: 30m or next deeper [PS 3.8.1]~~

Multiple choice: (Questions 16-35 are typical of those presented on certificate examinations.)

16. If the electronic chart is part of an ECDIS, it must display the minimum data required by IMO/IHO, to include all of the following EXCEPT _____.
- a. Hydrography
 - b. aids to navigation
 - c. tidal currents**
 - d. regulatory boundaries
17. Which of the following must the electronic chart of an ECDIS display, as required by IMO/IHO?
- a. Hydrography
 - b. Ferry routes
 - c. Regulatory boundaries
 - d. All of the above**
18. ECDIS units incorporate Digital Chart Data Formats, which include _____.
- a. vector only
 - b. raster only
 - c. vector and raster**
 - d. imposed viewing
19. Which of the following are data layer categories to be displayed on ECDIS?
- a. ECDIS warnings and messages
 - b. Hydrographic Office data
 - c. Notice to Mariners information
 - d. All of the above**
20. Which of the following data layer categories is NOT displayed on ECDIS?
- a. Notice to Mariners information
 - b. ECDIS warnings and messages
 - c. Ship hydrodynamic information**
 - d. Hydrographic Office data
21. The database resulting from (1) the transformation of the electronic navigational chart (ENC) by ECDIS for appropriate use, (2) the updates to the ENC by appropriate means, and (3) the additional data added by the mariner, is called the _____.
- a. Display base information
 - b. Standard display information
 - c. System electronic navigational chart**
 - d. Chart display information

22. ~~The database information that should be shown when a chart is first displayed on ECDIS is the _____.~~
- ~~a. Display base information~~
 - b. Standard display information**
 - ~~c. System electronic nautical chart~~
 - ~~d. Chart display information~~
23. ~~The level of database information which cannot be removed from the ECDIS display and consists of information which is required at all times in all geographic areas and under all circumstances is the _____.~~
- a. Display base information**
 - ~~b. Standard display information~~
 - ~~c. System electronic nautical chart~~
 - ~~d. Chart display information~~
24. ~~ECDIS must give an alarm for which of the following cases?~~
- ~~a. When the specified limit for deviation from the planned route is exceeded~~
 - ~~b. If the ship, within a specified time set by the watch officer, is going to cross a safety contour~~
 - ~~c. If the ship, within a specified time set by the watch officer, is going to cross the boundary of a prohibited area~~
 - d. All of the above**
25. ~~ECDIS must give an alarm for which of the following cases?~~
- a. If the ship is going to reach a critical point on the planned route**
 - ~~b. When the speed of a dangerous target exceeds a set limit~~
 - ~~c. If the ship's ETA has changed beyond the set limit~~
 - ~~d. All of the above~~
26. ~~ECDIS must give an alarm for which of the following cases?~~
- ~~a. When the speed of a dangerous target exceeds a set limit~~
 - b. When the specified limit for deviation from the planned route is exceeded**
 - ~~c. If the ship's ETA has changed beyond the set limit~~
 - ~~d. None of the above~~
27. ~~Chart information details to be used in ECDIS should be the latest edition of information originated by a government authorized hydrographic office and conform to the standards of (the) _____.~~
- ~~a. International Maritime Organization~~
 - b. International Hydrographic Organization**
 - ~~c. NASA~~
 - ~~d. US Coast Guard~~
28. ~~An ECDIS is required to display which information?~~
- ~~a. Radar targets~~
 - ~~b. ARPA vectors~~
 - c. Hydrographic data**
 - ~~d. All of the above~~

~~29. ECDIS must have the capability to preserve the record of the voyage track for the previous~~

- ~~a. 4 hours~~
- ~~b. 6 hours~~
- c. 12 hours**
- ~~d. 24 hours~~

~~30. Which data must ECDIS be able to record at one-minute intervals?~~

- ~~a. Position~~
- ~~b. Electronic navigational chart source~~
- ~~c. Course made good history~~
- d. All of the above**

~~31. An ECDIS is required to display which information?~~

- a. Soundings**
- ~~b. Waypoints~~
- ~~c. Meteorological data~~
- ~~d. Radar targets~~

~~32. An ECDIS is required to display which information?~~

- ~~a. Water temperature~~
- ~~b. Climatology data~~
- ~~c. Speed of advance~~
- d. Depth contours**

~~33. Which data must ECDIS be able to record at one-minute intervals?~~

- a. Course made good history**
- ~~b. Estimated time of arrival~~
- ~~c. Speed through the water~~
- ~~d. Shaft RPM~~

~~34. ECDIS must be able to perform all of the following EXCEPT _____.~~

- ~~a. Determine true bearing and distance between two geographical points~~
- b. Determine magnetic compass deviation**
- ~~c. Transform a local datum to the WGS '84 datum~~
- ~~d. Convert "graphical coordinates" to "display coordinates"~~

~~35. Which of the following must an ECDIS system be able to perform?~~

- ~~a. Conversion of "graphical coordinates" to "display coordinates"~~
- ~~b. Transformation of local datum to WGS '84 datum~~
- ~~c. Calculation of true azimuth and distance between two geographical points~~
- d. All of the above**

■ **ECDIS Theory Test – Sample**

Name: _____ Date: _____

Read the question carefully, and then select the best answer. Mark the test. Each question = 4 points.

1. A faulty GPS position presents — (a great risk / no risk) — to navigation with ECDIS.
2. ECS is not intended to comply with the up-to-date chart requirements of SOLAS:
True / False.
3. RCDS is a mode of operation using raster data, whereas the ECDIS mode uses official vector data: — True / False.
4. When zooming out (“underscaling”) on an ECDIS using vector chart data, all information layers remain on the display: — True / False.
5. ENC data and official updates are transformed into the SENC database:
True / False.
6. Except for Display Base, the operator selects chart data for display that is relevant to the current passage: **True / False.**
7. GPS position information is not correlated to any particular geodetic datum:
True / False.
8. The position of own ship on ECDIS is unreliable if the position sensor and the displayed chart information have different geodetic coordinate systems:
True / False.
9. Vector chart data is organized according to points, lines and polygons that are geo-referenced and have coded attributes: — True / False.
10. Match all of the following conditions to the resulting alarm or indication:

Position system failure	1
Route planning across the safety contour	2
Larger scale ENC available	3
Actually crossing the safety contour	4

a	Indication only (visual only)
b	Alarm (audible or audible & visual)

1 → a-or-b 2 → a-or-b 3 → a-or-b 4 → a-or-b

11. a) ~~Zooming in very close on an ECDIS is called “overscaling”:~~ ~~True / False~~ **True / False**
b) ~~When zooming in very close on an ECDIS displaying a vector chart, some chart objects may be dropped from the display as lost layers:~~ ~~True / False.~~ **True / False.**
12. ~~Automatic updates are transformed into the SENC in a manner invisible to the user:~~ ~~True / False.~~ **True / False.**
13. ~~ENC updates may be viewed on the ECDIS display:~~ ~~True / False~~ **True / False**
14. a) ~~Manual corrections are transformed into the SENC as a user added information layer:~~ ~~True / False~~ **True / False**
b) ~~The user cannot alter the contents of manual corrections:~~ ~~True / False~~ **True / False**
15. ~~Vessels subject to SOLAS requirements must carry charts for the intended voyage that are issued by an official hydrographic office and that are up to date:~~ ~~True / False.~~ **True / False.**
16. ~~Chart data used by an ECDIS meeting SOLAS requirements is produced according to IHO S-57 edition 3 specifications:~~ ~~True / False.~~ **True / False.**
17. ~~Which of the following is a performance standard for the display of SENC information?~~
a. ~~Information contained in the Display Base can be easily removed from the display.~~
b. ~~The selected safety depth is always displayed, even with spot soundings turned off.~~
c. ~~**The selected safety contour is displayed with greater emphasis than other contours.**~~
d. ~~When a chart is first displayed, the Standard Display at the smallest scale is presented.~~
18. ~~Identify the orientation and mode of display required by the Performance Standards:~~
a. ~~Ship’s draft plus under keel clearance.~~
b. ~~**North-up orientation and true motion mode.**~~
c. ~~Overwriting of the track file every 24 hours.~~
d. ~~Any orientation in either true or relative mode.~~
19. ~~Which of the following reflects the statement that ECDIS only supports the mariner in performing navigational tasks?~~
a. ~~Without official updated ENC data for the intended voyage, ECDIS does not replace paper charts.~~
b. ~~ARPA targets do not show up on ECDIS unless they are acquired and tracked.~~
c. ~~ECDIS does not take the place of a proper lookout.~~
d. ~~**All of the above.**~~

20. Which of the following statements best describes manual chart corrections for ECDIS?
- a. ~~Manual corrections constitute user information layers, added by the mariner, with no automatic record of installation.~~
 - b. ~~Manual corrections are included in the CD that vessels receive periodically from NGA (formerly NIIMA).~~
 - c. ~~When U.S. Notice to Mariners are downloaded from the NGA website, the .pdf and .jpg files are automatically installed into the ECDIS chart database.~~
 - d. ~~All of the above.~~
21. What error may occur in the ECDIS if hydrographic or chart survey data is inaccurate?
- a. ~~The vessel's geographic position may not match the charted display.~~
 - b. ~~Own ship may not be navigating in safe water, despite the information on the ECDIS display.~~
 - c. ~~Radar overlay and chart data may appear to be mismatched.~~
 - d. ~~All of the above.~~
22. If it is thought or known that floating aids to navigation (buoys) have shifted, how should this be interpreted on ECDIS?
- a. ~~Charted buoy locations are always more reliable than own ship's GPS position information.~~
 - b. ~~ECDIS always shows the actual location of buoys.~~
 - c. **Physical buoy positions may differ from charted locations on ECDIS, as with any type of chart information.**
 - d. ~~Buoy position changes are never included in ENC updates.~~
23. If the ECDIS monitor's resolution is poor or improperly set, what may be affected on ECDIS?
- a. ~~Chart scale may be misrepresented.~~
 - b. ~~Chart features may not be shown in the intended color.~~
 - c. ~~Fineness of detail may be lost.~~
 - d. ~~All of the above.~~
24. Which of the following reference systems affect the information on ECDIS?
- a. ~~Draft of vessel entered into sounder that is connected to ECDIS.~~
 - b. ~~Physical location of scanner for ARPA connected to ECDIS.~~
 - c. ~~Geodetic system used in the creation of the chart data.~~
 - d. ~~All of the above.~~
25. With radar overlay on ECDIS, what can be the cause(s) of radar echoes not matching the charted position of a fixed object?
- a. ~~Incorrect input of ship's position fixing device (GPS).~~
 - b. ~~Improper coordinate setting of radar antenna, conning station or ship's dimensions.~~
 - c. ~~Either the Chart Display Category is in Base Display or the scale is so small that it is showing Layers Lost.~~
 - d. ~~All of the above.~~

Appendices for the ECDIS Instructor

This Part of the Model Course includes the following appendices:

- **Appendix 1: Introduction ~~of to the~~ Operational use of ECDIS**
- **Appendix 2: ECDIS Performance Standard references**
- **Appendix 3: ECDIS Carriage Requirements**
- **Appendix 4: STCW ~~Manila Amendments on~~ Regulation I/12 and Section A-I/12 and B-I/12 on use of simulators for ECDIS training**
- **Appendix 5a: ~~Training scenario types and scenario success~~ Example of Trainee's Proficiency Checklist on use of ECDIS**
- **Appendix 5b: Example of Trainee's Evaluation on Simulator**
- **Appendix 6: ~~Integrated navigation training example~~ Example: Equipment set up for ECDIS training**

Appendix 1

Introduction to the operational use of ECDIS

This document is the first revision to the original ECDIS Model Course 1.27 published by the IMO in 2000. In the intervening decade, several considerable advances have occurred:

- Comprehensive improvements in type-approved ECDIS, including software, chart data, [PCECDIS workstation](#) hardware, and integration with critical ship functions
- Widespread experience in effective navigation with ECDIS aboard vessels
- Publication of textbooks, articles and information booklets on ECDIS
- Development of simulation that makes available to each trainee [a-certifiedan ECDIS workstation](#) in an underway context with vessel controls [and full visualization](#)
- Amendments to STCW requiring competency in the use of ECDIS for all [Watch-watchkeeping Officers-officers](#) wherever type-approved units are installed
- The advent of track control autopilots deriving control information from ECDIS
- The advent of paperless bridges where a new generation of [apprentice mates/watchkeeping officers](#) gain little or no practice in backup skills such as paper plotting of LOPs

~~The purpose of this Introduction is to explain in some detail:~~

- ~~➤ The importance of revising the ECDIS Model Course to establish specific minimal performance standards in the a use of ECDIS,~~
- ~~➤ How the lessons and practice can be effectively structured to produce the ECDIS proficiencies specified in the 2010 STCW Manila amendments~~
- ~~➤ Optimal simulation classroom and lab arrangements to achieve these outcomes~~

~~■ ECDIS-centered navigation training~~

~~The mastery of ECDIS can only really occur in the context of navigation. The primary objective of ECDIS training should be the effective integration of ECDIS-based digital and graphical information into the ongoing navigational situation. An important outcome of ECDIS training should be that ECDIS-based information is not the source of navigation, but a collecting point of navigational information, some repeated, some unique.~~

~~To train on ECDIS as if its information were the source of navigation is to risk the disintegration of navigational awareness, analysis and decision making. Although this may seem self evident to maritime trainers and educators who have stood navigational watches using ECDIS, such loss of integration is often the de facto outcome of training that is not properly conducted.~~

~~Seafarers who developed their navigational skills in the 20th Century may be able to keep ECDIS-centered training in the context of visual navigation. They may be able to regard the risks to safe navigation that are posed by exclusive focus on ECDIS for prolonged periods of time. However, seafarers developing their navigational skills in the 21st Century are likely to misapprehend the supportive role intended for ECDIS unless they are specifically trained and individually assessed in integrative skills.~~

~~ECDIS can be a very effective tool for introducing and illustrating general concepts of navigation, i.e., cartography, projections, direction, distance, depth, position fixing, plotting, sailings, deduced reckoning, buoyage, tides and currents, ocean currents. ECDIS is, by definition, an integrative tool. The attempt to present it outside the context of navigation results inevitably in its use as a substitution for navigation. On the other hand, when a navigation training program is centered on ECDIS, navigation training remains the focus and ECDIS remains a supportive tool.~~

■ ECDIS practice & training

Following a decade of ECDIS use onboard and of certified ECDIS training around the world, several shortcomings in practice and training have become evident. The correction of these items is a primary goal of this revised edition of the ECDIS Model Course:

- ECDIS training cannot presume the existence of skills in visual navigational
- ECDIS training will eventually serve to introduce cartography and other basics of terrestrial navigation
- ECDIS use demands efficient interaction with all source sensors
- ECDIS functions and documentation are typically not designed by seafarers and therefore should not be expected to describe system use in a navigational context or priority of importance to navigation
- Improvements in ECDIS are impeded by the type approval process; the fact that this has not been the case with ECS should be incorporated into ECDIS training
- The single query approach to ECDIS must be emphasized and practiced when underway to the point of habit (this is referred to as the "7-second glance" method in Lesson 4)
- All ECDIS functions must be explored to overcome the common situation where the user is trapped by an unfamiliar page or menu (this is referred to as the "Problem of Partial Use" in Lesson 4)
- The trainee must learn to regard ECDIS as if it were controlling the vessel's rudder, as eventually this integration with track control autopilot will become commonplace and reliable
- Even where Track Control integration with ECDIS is not enabled, ECDIS presentations may nonetheless include a "predictor" vector that is highly accurate when based on vessel particulars; in such instances, the ECDIS presents maneuvering information that is new in form, unique to the ECDIS, and immediately vital to the watch team, and so should be incorporated into the training when possible
- ECDIS in its present stage of type approval is likely to be the final 2-D presentation in the evolution of navigation; its ongoing successful integration of vessel control and live chart data updates and real-time depth display is leading the way toward Augmented Reality for seafarers where navigation displays will be visualized in 3-D presentations; in other words, now is the time to learn how to reliably navigate with ECDIS
- All electronic chart data, in the near term, has not been created equal, and specification details will continue to evolve, such as Zones of Confidence
- ECDIS will always be about chart data, from user choices of cells and formats, to online updates and real-time licensing, to trustworthy indications of survey validity
- ECDIS training is most effective at establishing safe navigational practices when it is taken as the opportunity to teach new seafarers how to navigate by repeatedly integrating their scans of the horizon, vessel environment, instrument data and graphics
- ECDIS must be taught as a tool meant to enhance rather than impede safe decision making
- Reliable ECDIS installations by definition promote the deterioration of plotting skills on paper charts, such as of LOPs derived from radar and visual bearings; even with enhanced user tools on new ECDIS units, such plotting is likely to be applied as the occasional double check, at most; one countermeasure to this is the constant rehearsal of paper and electronic chart navigation during every aspect of ECDIS training (see Exercises 1-4 & Underway Evaluation)
- ECDIS users must be trained in seeking and swiftly resolving ambiguities in sensor data and its presentations, especially as it applies to visually derived information; the visual scene must therefore be included in the ECDIS training environment, and critically applied whenever possible, e.g., variable visibility, aids to navigation, prominent points, tidal conditions, contact aspect, contact data, unreliable data for position and heading and speed, etc.
- Trainees must repeatedly rehearse the setup and adaptation of ECDIS and its connected sensors as underway conditions change
- ECDIS operators should realize that all members of a watch should have something meaningful to look at, including remote displays provided for the Master and for the engineering watch; in other words, the operator should be able to adapt the ECDIS to not only the

navigational purpose at the moment, but also to changing navigational points of view without suffering any loss of situational awareness

- Dividing a training course into "generic" ECDIS training (any aspect not requiring an actual ECDIS) and "type-specific" training (some selected functionality of a particular ECDIS) has produced regrettable outcomes:
 - The course is not taught as navigation using ECDIS
 - The course divests itself of responsibility for teaching and assessing the underway use of ECDIS,
 - The 3 or 4 day course making little or no use of one ECDIS unit per trainee in an integrated visual navigation setting cannot be effective in achieving the minimum objectives of the Model Course, original or revised
- Competency by the letter and the spirit of STCW means unequivocally that the trainee must be assessed individually during the course on one or another type approved ECDIS, (the same issue was settled long ago with regards to radar, ARPA and GMDSS training)
- The issue of ECDIS competency is especially relevant under the Manila Amendments to the STCW Convention and Code through:
 - Details of expected outcomes,
 - Application to all deck watch-officers sailing where ECDIS is fitted,
 - Through reference to this Model Course as presently revised
- As best practices evolve regarding ECDIS use, discussion and practice involving applicable COLREGS must be included in ECDIS training, especially where AIS and radar information can be combined in the ECDIS display (see Lessons: 3, 13, 31, 32, 36, 37, 39, 40, Proficiency Checklist, and Evaluation Checklist)
- In e-Navigation, a role is envisioned for ECDIS that is quite ubiquitous, and implies a thorough and uniform level of competence, reliability and usage. One purpose of e-Navigation aims to prevent the overburdening and distraction of the seafarer; as such, principles and practices of e-navigation must be included in ECDIS training (see Lesson 40)

■ Reliance on ECDIS

Past ECDIS training has focused on ECDIS functionality and the importance of training users to avoid over-reliance on a computer-based navigation system.

These are somewhat valid considerations, when properly qualified, but they are counter effective approaches to training. The over-arching goal of ECDIS training should be, in fact, to enable a very high degree of reliance on ECDIS as a supportive tool. This presumes an approach to the limitations inherent in every aspect of navigation, to include all instruments and sensors and visual assessments. This also presumes that ECDIS functionalities are presented for their value and priority to navigational tasks. In its most mature implementation, becoming more prevalent with most newly built ships, ECDIS is installed with the intent of effectively applying rudder through Track Control.

With this in mind, there are three crucial and related points to remember when learning and teaching ECDIS:

- At the end of the day, it is not ECDIS you are learning or teaching, but navigation using ECDIS
- What navigation actually is varies widely across the spectrum of ECDIS users, their vessels, and their waterways
- No one ECDIS setting can possibly suit all circumstances; this means that it is paramount to emphasize and practice the adjustment of settings appropriate to changing conditions, such as when changing between open and confined waters, changes in ambient light, monitoring and changing route information, etc.

All of these points require that the ECDIS trainee becomes skilled in adapting the ECDIS to a wide variety of conditions and to changes in conditions while navigating in a visual environment. In fact, the fundamental desired outcome should be that the use of ECDIS enhances rather than interferes with the safety of navigation.

ECDIS training provides nothing short of comprehensive practice in safe navigation. ECDIS training should therefore focus on the supportive tasks ECDIS has proven to perform, including:

- Positioning, route monitoring, passage planning and route making
- Contact management
- Monitoring of environmental and sensor conditions
- Integration with radar, AIS and autopilot

Without being methodically assimilated into the training, these capabilities quickly become overwhelming to the ECDIS user. Without practice in a comprehensive course, the ECDIS user will develop partial skills even over the long term, and relegate the ECDIS to a secondary role in navigation. Thus the admonition to avoid over-reliance is perpetuated.

The fallacy in this all too common circumstance is that ECDIS itself is unreliable. However, in a comprehensive training approach to ECDIS such as this revised Model Course proposes, trainees can discover for themselves the great extent to which ECDIS can be relied upon to improve the safety of navigation.

Keeping ECDIS training in the context of navigation means that the various functions of the device should be introduced in their order of priority to the overall project of navigation, rather than for their appeal as presented by the manufacturer. Broadly speaking, the training should approach three stages in fairly strict succession:

- 1— Basic (display presentation for the watch) — [Lessons 1 through 20]
- 2— Intermediate (adjustment of settings & data for passage) — [Lessons 21 through 31]
- 3— Navigator (tasks for person in charge of ECDIS) — [Lessons 32 through 35]

The Proficiency Checklist that has been developed for inclusion in this 2010 edition to the Model Course aims to keep this developmental process clearly in focus throughout the training on ECDIS. With its more than 80 items, the Checklist, in fact, firmly establishes the importance of learning ECDIS with an ECDIS unit running in simulation where there is no dire consequence to standing an inattentive watch while experimenting with ECDIS.

■ ECDIS competency

There are two significant changes with regards to ECDIS in the Manila Amendments to the STCW Code:

- The Officer of the Watch at both management and operational levels serving aboard vessels larger and smaller than 500 GT fitted with ECDIS must be certified in the operational use of ECDIS
- Competence in ECDIS is defined in its use to maintain the safety of navigation, while the knowledge, understanding and proficiency in the various tables is defined as:
 - Table A-II/1: "Navigation using ECDIS: Knowledge of the capability and limitations of ECDIS" and "Proficiency in operation, interpretation, and analysis of information obtained from ECDIS"
 - Table A-II/2: "Management of operational procedures, system files and data"
 - Table A-II/3: "Thorough knowledge of and ability to use ECDIS"(Tables A-II/1, A-II/2, and A-II/3, as amended, are included as Appendix 3 in the Annex to the Instructor Manual.)

~~The intent and specific criteria of the amended STCW Code on ECDIS is plain to see. Any Officer in Charge of a Navigational Watch (OIC) must be able to monitor information on ECDIS in a manner that contributes to safe navigation, while any Chief Mate or Master must be able to also establish, apply and monitor operational procedures for using ECDIS.~~

~~Where these skills are acquired and assessed using approved ECDIS simulator training, or its equivalent, the simulator and the associated ECDIS course of instruction must be able to produce a navigational environment where unsafe events will occur when ECDIS information is incorrectly monitored and when ECDIS operating procedures are inadequately applied.~~

~~In other words, it is the unsafe navigational events in a given scenario, where preventable by proper operation of ECDIS, which should determine the baseline competency. Interwoven with this is the opportunity to practice and apply the very many specific ECDIS functions that add up to proper operation, and which will help avoid distractions resulting from unfamiliarity with ECDIS.~~

~~The methods for demonstrating this competence require either ECDIS simulator training or its equivalent in underway experience. One purpose of this revised Model Course is to establish the high importance of replicating that underway navigational experience with ECDIS in simulator training, or its equivalent. It is fair to state that ECDIS simulator training that does not meet the "underway standard" cannot possibly satisfy the letter or intent of the revised STCW Code. It is therefore appropriate that the learning and assessment objectives of this revised Model Course and its Framework should deliver a practical demonstration of this underway standard. (See Evaluation Checklist in the Evaluation Plan of the proposed Revised Model Course, as it is applicable to some degree in every exercise.)~~

~~Perhaps the most significant challenge facing instructional design for ECDIS use is the recognition that the mastery of navigational functionality of the device does not equate to skillful and safe navigation with ECDIS. Because ECDIS is an integrative device by its structure and purpose and placement in integrated bridge systems, the use of it and its use in the various acts of navigation cannot be separated for very long.~~

~~The consequence of training on ECDIS outside of its navigational context is to develop skills that depend upon not having any other navigational distractions. This may be the most undesirable outcome imaginable for training in the use of ECDIS. Regrettably, this particular approach, common to part-task training everywhere, has taken hold in most instances of ECDIS certified training worldwide.~~

~~The STCW Manila Amendments, however, now define the fundamental competence in ECDIS as a navigation function at both levels: Maintain the safety of navigation through the use of ECDIS (See Appendix 3 in the Appendices for the Instructor). As with many other STCW navigational competencies, this desired outcome of ECDIS use must be demonstrated as a solo act, and that fact demands that safe navigation with ECDIS is practiced, and ultimately evaluated, in a solo navigational environment.~~

~~Many general aspects of navigation must be evaluated when ECDIS competence is kept in its integrated context, as well as the use of specific ECDIS functions at the right time and place. Indirectly, the behavior that is being assessed is the trainee's ability to divide attention evenly amongst all navigational aids and systems, not least being the visual scene.~~

~~When considering the STCW criteria for evaluating ECDIS competence as desired outcomes, Table A-II/1 requires:~~

- ~~➤ Monitoring appropriate information~~
- ~~➤ Interpreting that information correctly~~
- ~~➤ Controlling the vessel's speed and autopilot~~
- ~~➤ Utilizing effective communications,~~

~~Likewise, Table A-II/2 requires (in the same evaluation):~~

- Making and using operational procedures
- Making navigation safe by minimizing risk

Such training should encourage the application of judgment and the development of situational awareness.

■ Simulation in STCW

As given under Section A-I/12, Standards governing the use of simulators, the STCW Code requires that any simulator used for mandatory simulator-based training "be capable of simulating the operating capabilities of shipboard equipment concerned, to a level of physical realism appropriate to training objectives and assessment objectives." The content of this section of the Code has not been altered in the Manila Amendments.

As given under Section B-I/12, Guidance regarding the use of simulators, as amended, performance standards for non-mandatory simulation equipment used for training and/or assessment of competence or demonstration of skills in navigation and watchkeeping and in ship handling and maneuvering should "provide a realistic visual scenario by day or by night" This is in addition to meeting all applicable performance standards set out in section A-I/12. Here also, the content has not been altered from STCW-95.

However, as given under Section B-I/12, Guidance regarding the use of simulators, significant details regarding training and assessment in the operational use of the ECDIS has been added in the Manila Amendments. The source of this section of STCW is STCW.7/Circ.10, June 2001 (STW 32 and MSC 74). The Guidance section recognizes the necessity gaining practical skills on individual ECDIS simulators.

Although this guidance as STCW.7/Circ.10 predates the cost-effective technology now available for individual ownership workstations integrated with the visual scene and all instrumentation including type-approved ECDIS, the intent to promote navigational understanding and skill with ECDIS is fully relevant. "The main objective of simulator exercises is to ensure that trainees understand their responsibilities in the operational use of ECDIS in all safety-relevant aspects and are thoroughly familiar with the system and equipment used" (Section B-I/12, paragraph 47, as amended).

■ Effective ECDIS simulation

ECDIS is unlike any other navigational aid in its ability to capture the user's attention for extended periods of time. Absorption in menus, functional tasks, and potential ambiguities in information can swiftly undermine the safety of navigation even where the user has the best intentions of standing a vigilant watch. ECDIS is an encyclopedia of live information both graphic and textual, in the medium of a PC display whose near total capture of the digital age has evolved on the basis of surfing, browsing, interacting, storing, retrieving—in general, of being captivating.

Effective ECDIS training demands that each user develops the practical discipline of approaching the ECDIS with a single question to resolve at any one time—confirm position, present track tendency, confirm progress in a critical turn, next course to steer, ETA to upcoming waypoint, chart information, contact data, adjustment to display, adapting the route to changes in plans, etc. Developing this single-point query approach helps ensure that the ECDIS serves as an aid to navigation, such that its reliability can be efficiently verified.

For this form of training, each trainee in an ECDIS course adhering to this edition of the Model Course should optimally be provided with their own live ECDIS to operate and their own vessel to operate through simulation, the navigational functions of which are fully integrated.

This approach is necessary for the progressive development of skills and for the assessment of their achievement in the underway context of navigation. There is, in this optimal approach to the training, no

~~place for multiple users on one ECDIS, or an ECDIS that is not receiving underway sensor input, or an underway environment devoid of an integrated visualization of the scene.~~

~~For all of the foregoing reasons, ECDIS simulation performance standards and the description of an optimal ECDIS training environment have been included in the Part A – Course Framework of this 2010 edition of Model Course 1.27.~~

Appendix 2

ECDIS Performance Standard references

The current electronic chart display and information system performance standards adopted by the Organization are:

- Resolution MSC.232(82), revision to the previous Performance Standards:
 - Applying to new ECDIS equipment installations on or after 1 January 2009
- Resolution A.817(19), Performance Standards for Electronic Chart Display and Information System (ECDIS); resolution MSC.64(67), annex 5, amending resolution A.817(19); resolution MSC.86(70), annex 4, amending resolution A.817(19):
 - Applying to ECDIS equipment installations between 1 January 1996 and 1 October 2009;

Appendix 3

ECDIS Carriage Requirements

ANNEX 1

RESOLUTION MSC.282(86) (adopted on 5 June 2009)

ADOPTION OF AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974, AS AMENDED

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING FURTHER article VIII(b) of the International Convention for the Safety of Life at Sea (SOLAS), 1974 (hereinafter referred to as the Convention), concerning the amendment procedure applicable to the Annex to the Convention, other than to the provisions of chapter I thereof,

HAVING CONSIDERED, at its eighty-sixth session, amendments to the Convention, proposed and circulated in accordance with article VIII(b)(i) thereof,

1. ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the Convention, the text of which is set out in the Annex to the present resolution;
2. DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the said amendments shall be deemed to have been accepted on 1 July 2010, unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have notified their objections to the amendments;
3. INVITES SOLAS Contracting Governments to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2011 upon their acceptance in accordance with paragraph 2 above;
4. REQUESTS the Secretary-General, in conformity with article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the Annex to all Contracting Governments to the Convention;
5. FURTHER REQUESTS the Secretary-General to transmit copies of this resolution and its Annex to Members of the Organization, which are not Contracting Governments to the Convention.

ANNEX

AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974, AS AMENDED

[. . .]

CHAPTER V
SAFETY OF NAVIGATION

Regulation 19 – Carriage requirements for shipborne navigational systems and equipment

3 In paragraph 2.1, the existing subparagraph .4 is replaced by the following:

“.4 nautical charts and nautical publications to plan and display the ship’s route for the intended voyage and to plot and monitor positions throughout the voyage. An electronic chart display and information system (ECDIS) is also accepted as meeting the chart carriage requirements of this subparagraph. Ships to which paragraph 2.10 applies shall comply with the carriage requirements for ECDIS detailed therein;”.

[. . .]

5 After the existing paragraph 2.9, the new paragraphs 2.10 and 2.11 are added as follows:

“2.10 Ships engaged on international voyages shall be fitted with an Electronic Chart Display and Information System (ECDIS) as follows:

- .1 passenger ships of 500 gross tonnage and upwards constructed on or after 1 July 2012;
- .2 tankers of 3,000 gross tonnage and upwards constructed on or after 1 July 2012;
- .3 cargo ships, other than tankers, of 10,000 gross tonnage and upwards constructed on or after 1 July 2013;
- .4 cargo ships, other than tankers, of 3,000 gross tonnage and upwards but less than 10,000 gross tonnage constructed on or after 1 July 2014;
- .5 passenger ships of 500 gross tonnage and upwards constructed before 1 July 2012, not later than the first survey* on or after 1 July 2014;
- .6 tankers of 3,000 gross tonnage and upwards constructed before 1 July 2012, not later than the first survey* on or after 1 July 2015;
- .7 cargo ships, other than tankers, of 50,000 gross tonnage and upwards constructed before 1 July 2013, not later than the first survey* on or after 1 July 2016;
- .8 cargo ships, other than tankers, of 20,000 gross tonnage and upwards but less than 50,000 gross tonnage constructed before 1 July 2013, not later than the first survey* on or after 1 July 2017; and
- .9 cargo ships, other than tankers, of 10,000 gross tonnage and upwards but less than 20,000 gross tonnage constructed before 1 July 2013, not later than the first survey* on or after 1 July 2018.

2.11 Administrations may exempt ships from the application of the requirements of paragraph 2.10 when such ships will be taken permanently out of service within two years after the implementation date specified in subparagraphs .5 to .9 of paragraph 2.10.”

* Refer to the Unified interpretation of the term “first survey” referred to in SOLAS regulations (MSC.1/Circ.1290).

[. . .]

Appendix 4

STCW Manila Amendments Regulation I/12 and Section A-I/12 and B-I/12 on ECDIS use of simulators for ECDIS training

Regulation I/12

Use of simulators

1 The performance standards and other provisions set forth in section A-I/12 and such other requirements as are prescribed in part A of the STCW Code for any certificate concerned shall be complied with in respect of:

- .1 all mandatory simulator-based training;
- .2 any assessment of competency required by part A of the STCW Code which is carried out by means of a simulator; and
- .3 any demonstration, by means of a simulator, of continued proficiency required by part A of the STCW Code.

Section A-I/12

Standards governing the use of simulators

PART 1 – PERFORMANCE STANDARDS

General performance standards for simulators used in training

1 Each Party shall ensure that any simulator used for mandatory simulator-based training shall:

- .1 be suitable for the selected objectives and training tasks;
- .2 be capable of simulating the operating capabilities of shipboard equipment concerned, to a level of physical realism appropriate to training objectives, and include the capabilities, limitations and possible errors of such equipment;
- .3 have sufficient behavioural realism to allow a trainee to acquire the skills appropriate to the training objectives;
- .4 provide a controlled operating environment, capable of producing a variety of conditions, which may include emergency, hazardous or unusual situations relevant to the training objectives;

- .5 provide an interface through which a trainee can interact with the equipment, the simulated environment and, as appropriate, the instructor; and
- .6 permit an instructor to control, monitor and record exercises for the effective debriefing of trainees.

General performance standards for simulators used in assessment of competence

2 Each Party shall ensure that any simulator used for the assessment of competence required under the Convention or for any demonstration of continued proficiency so required shall:

- .1 be capable of satisfying the specified assessment objectives;
- .2 be capable of simulating the operational capabilities of the shipboard equipment concerned to a level of physical realism appropriate to the assessment objectives, and include the capabilities, limitations and possible errors of such equipment;
- .3 have sufficient behavioural realism to allow a candidate to exhibit the skills appropriate to the assessment objectives;
- .4 provide an interface through which a candidate can interact with the equipment and simulated environment;
- .5 provide a controlled operating environment, capable of producing a variety of conditions, which may include emergency, hazardous or unusual situations relevant to assessment objectives; and
- .6 permit an assessor to control, monitor and record exercises for the effective assessment of the performance of candidates.

Additional performance standards

3 In addition to meeting the basic requirements set out in paragraphs 1 and 2, simulation equipment to which this section applies shall meet the performance standards given hereunder in accordance with their specific type.

Radar simulation

4 Radar simulation equipment shall be capable of simulating the operational capabilities of navigational radar equipment which meets all applicable performance standards adopted by the Organization* and incorporate facilities to:

- .1 operate in the stabilized relative-motion mode and sea- and ground-stabilized true-motion modes;

* See relevant/appropriate performance standards adopted by the Organization.

- .2 model weather, tidal streams, current, shadow sectors, spurious echoes and other propagation effects, and generate coastlines, navigational buoys and search and rescue transponders; and
- .3 create a real-time operating environment incorporating at least two own-ship stations with ability to change own ship's course and speed, and include parameters for at least 20 target ships and appropriate communication facilities.

Automatic Radar Plotting Aid (ARPA) simulation

5 ARPA simulation equipment shall be capable of simulating the operational capabilities of ARPAs which meet all applicable performance standards adopted by the Organization^{*}, and shall incorporate the facilities for:

- .1 manual and automatic target acquisition;
- .2 past track information;
- .3 use of exclusion areas;
- .4 vector/graphic time-scale and data display; and
- .5 trial manoeuvres.

PART 2 – OTHER PROVISIONS

Simulator training objectives

6 Each Party shall ensure that the aims and objectives of simulator-based training are defined within an overall training programme and that specific training objectives and tasks are selected so as to relate as closely as possible to shipboard tasks and practices.

Training procedures

- 7 In conducting mandatory simulator-based training, instructors shall ensure that:
 - .1 trainees are adequately briefed beforehand on the exercise objectives and tasks and are given sufficient planning time before the exercise starts;
 - .2 trainees have adequate familiarization time on the simulator and with its equipment before any training or assessment exercise commences;
 - .3 guidance given and exercise stimuli are appropriate to the selected exercise objectives and tasks and to the level of trainee experience;
 - .4 exercises are effectively monitored, supported as appropriate by audio and visual observation of trainee activity and pre- and post-exercise evaluation reports;

- .5 trainees are effectively debriefed to ensure that training objectives have been met and that operational skills demonstrated are of an acceptable standard;
- .6 the use of peer assessment during debriefing is encouraged; and
- .7 simulator exercises are designed and tested so as to ensure their suitability for the specified training objectives.

Assessment procedures

8 Where simulators are used to assess the ability of candidates to demonstrate levels of competency, assessors shall ensure that:

- .1 performance criteria are identified clearly and explicitly and are valid and available to the candidates;
- .2 assessment criteria are established clearly and are explicit to ensure reliability and uniformity of assessment and to optimize objective measurement and evaluation, so that subjective judgements are kept to the minimum;
- .3 candidates are briefed clearly on the tasks and/or skills to be assessed and on the tasks and performance criteria by which their competency will be determined;
- .4 assessment of performance takes into account normal operating procedures and any behavioural interaction with other candidates on the simulator or with simulator staff;
- .5 scoring or grading methods to assess performance are used with caution until they have been validated; and
- .6 the prime criterion is that a candidate demonstrates the ability to carry out a task safely and effectively to the satisfaction of the assessor.

Qualifications of instructors and assessors*

9 Each Party shall ensure that instructors and assessors are appropriately qualified and experienced for the particular types and levels of training and corresponding assessment of competence as specified in regulation I/6 and section A-I/6.

* The relevant IMO Model Course(s) and resolution MSC.64(67), *Recommendations on new and amended performance standards*, may be of assistance in the preparation of courses.

Section B-I/12

Guidance regarding the use of simulators

TRAINING AND ASSESSMENT IN THE OPERATIONAL USE OF ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEMS (ECDIS)

Introduction

36 When simulators are being used for training or assessment in the operational use of Electronic Chart Display and Information Systems (ECDIS), the following interim guidance should be taken into consideration in any such training or assessment.

37 Training and assessment in the operational use of the ECDIS should:

- .1 incorporate the use of ECDIS simulation equipment; and
- .2 conform to standards not inferior to those given in paragraphs 38 to 65 below.

38 ECDIS simulation equipment should, in addition to meeting all applicable performance standards set out in section A-I/12 of the STCW Code, as amended, be capable of simulating navigational equipment and bridge operational controls which meet all applicable performance standards adopted by the Organization, incorporate facilities to generate soundings and:

- .1 create a real-time operating environment, including navigation control and communications instruments and equipment appropriate to the navigation and watchkeeping tasks to be carried out and the manoeuvring skills to be assessed; and
- .2 realistically simulate “own ship” characteristics in open-water conditions, as well as the effects of weather, tidal stream and currents.

39 Demonstrations of, and practice in, ECDIS use should be undertaken, where appropriate, through the use of simulators. Training exercises should preferably be undertaken in real time, in order to increase trainees’ awareness of the hazards of the improper use of ECDIS. Accelerated timescale may be used only for demonstrations.

General

Goals of an ECDIS training programme

40 The ECDIS trainee should be able to:

- .1 operate the ECDIS equipment, use the navigational functions of ECDIS, select and assess all relevant information and take proper action in the case of a malfunction;

- .2 state the potential errors of displayed data and the usual errors of interpretation; and
- .3 explain why ECDIS should not be relied upon as the sole reliable aid to navigation.

Theory and demonstration

41 As the safe use of ECDIS requires knowledge and understanding of the basic principles governing ECDIS data and their presentation rules as well as potential errors in displayed data and ECDIS-related limitations and potential dangers, a number of lectures covering the theoretical explanation should be provided. As far as possible, such lessons should be presented within a familiar context and make use of practical examples. They should be reinforced during simulator exercises.

42 For safe operation of ECDIS equipment and ECDIS-related information (use of the navigational functions of ECDIS, selection and assessment of all relevant information, becoming familiar with ECDIS man-machine interfacing), practical exercises and training on the ECDIS simulators should constitute the main content of the course.

43 For the definition of training objectives, a structure of activities should be defined. A detailed specification of learning objectives should be developed for each topic of this structure.

Simulator exercises

44 Exercises should be carried out on individual ECDIS simulators, or full-mission navigation simulators including ECDIS, to enable trainees to acquire the necessary practical skills. For real-time navigation exercises, navigation simulators are recommended to cover the complex navigation situation. The exercises should provide training in the use of the various scales, navigational modes, and display modes which are available, so that the trainees will be able to adapt the use of the equipment to the particular situation concerned.

45 The choice of exercises and scenarios is governed by the simulator facilities available. If one or more ECDIS workstations and a full-mission simulator are available, the workstations may primarily be used for basic exercises in the use of ECDIS facilities and for passage-planning exercises, whereas full-mission simulators may primarily be used for exercises related to passage-monitoring functions in real time, as realistic as possible in connection with the total workload of a navigational watch. The degree of complexity of exercises should increase throughout the training programme until the trainee has mastered all aspects of the learning subject.

46 Exercises should produce the greatest impression of realism. To achieve this, the scenarios should be located in a fictitious sea area. Situations, functions and actions for different learning objectives which occur in different sea areas can be integrated into one exercise and experienced in real time.

47 The main objective of simulator exercises is to ensure that trainees understand their responsibilities in the operational use of ECDIS in all safety-relevant aspects and are thoroughly familiar with the system and equipment used.

Principal types of ECDIS systems and their display characteristics

48 The trainee should gain knowledge of the principal types of ECDIS in use; their various display characteristics, data structure and an understanding of:

- .1 differences between vector and raster charts;
- .2 differences between ECDIS and ECS;
- .3 differences between ECDIS and RCDS*;
- .4 characteristics of ECDIS and their different solutions; and
- .5 characteristics of systems for special purposes (unusual situations/emergencies).

Risks of over-reliance on ECDIS

49 The training in ECDIS operational use should address:

- .1 the limitations of ECDIS as a navigational tool;
- .2 potential risk of improper functioning of the system;
- .3 system limitations, including those of its sensors;
- .4 hydrographic data inaccuracy; limitations of vector and raster electronic charts (ECDIS vs RCDS and ENC vs RNC); and
- .5 potential risk of human errors.

Emphasis should 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.

Detection of misrepresentation of information

50 Knowledge of the limitations of the equipment and detection of misrepresentation of information is essential for the safe use of ECDIS. The following factors should be emphasized during training:

- .1 performance standards of the equipment;

* SN/Circ.207/Rev.1 – Differences between RCDS and ECDIS.

- .2 radar data representation on an electronic chart, elimination of discrepancy between the radar image and the electronic chart;
- .3 possible projection discrepancies between an electronic and paper charts;
- .4 possible scale discrepancies (overscaling and underscaling) in displaying an electronic chart and its original scale;
- .5 effects of using different reference systems for positioning;
- .6 effects of using different horizontal and vertical datums;
- .7 effects of the motion of the ship in a seaway;
- .8 ECDIS limitations in raster chart display mode;
- .9 potential errors in the display of:
 - .9.1 the own ship's position;
 - .9.2 radar data and ARPA and AIS information;
 - .9.3 different geodetic coordinate systems; and
- .10 verification of the results of manual or automatic data correction:
 - .10.1 comparison of chart data and radar picture; and
 - .10.2 checking the own ship's position by using the other independent position-fixing systems.

51 False interpretation of the data and proper action taken to avoid errors of interpretation should be explained. The implications of the following should be emphasized:

- .1 ignoring overscaling of the display;
- .2 uncritical acceptance of the own ship's position;
- .3 confusion of display mode;
- .4 confusion of chart scale;
- .5 confusion of reference systems;
- .6 different modes of presentation;
- .7 different modes of vector stabilization;

- .8 differences between true north and gyro north (radar);
- .9 using the same data reference system;
- .10 using the appropriate chart scale;
- .11 using the best-suited sensor to the given situation and circumstances;
- .12 entering the correct values of safety data:
 - .12.1 the own ship's safety contour,
 - .12.2 safety depth (safe water), and
 - .12.3 events; and
- .13 proper use of all available data.

52 Appreciation that RCDS is only a navigational aid and that, when operating in the RCDS mode, the ECDIS equipment should be used together with an appropriate portfolio of up-to-date paper charts:

- .1 appreciation of the differences in operation of RCDS mode as described in SN.1/Circ.207/Rev.1 "Differences between RCDS and ECDIS"; and
- .2 ECDIS, in any mode, should be used in training with an appropriate portfolio of up-to-date charts.

Factors affecting system performance and accuracy

53 An elementary understanding should be attained of the principles of ECDIS, together with a full practical knowledge of:

- .1 starting and setting up ECDIS; connecting data sensors: satellite and radio navigation system receivers, radar, gyro-compass, log, echo-sounder; accuracy and limitations of these sensors, including effects of measurement errors and ship's position accuracy, manoeuvring on the accuracy of course indicator's performance, compass error on the accuracy of course indication, shallow water on the accuracy of log performance, log correction on the accuracy of speed calculation, disturbance (sea state) on the accuracy of an echo-sounder performance; and
- .2 the current performance standards for electronic chart display and information systems adopted by the Organization*.

* See relevant/appropriate performance standards adopted by the Organization.

Practice

Setting up and maintaining display

54 Knowledge and skills should be attained in:

- .1 the correct starting procedure to obtain the optimum display of ECDIS information;
- .2 the selection of display presentation (standard display, display base, all other information displayed individually on demand);
- .3 the correct adjustment of all variable radar/ARPA display controls for optimum display of data;
- .4 the selection of convenient configuration;
- .5 the selection, as appropriate, of required speed input to ECDIS;
- .6 the selection of the timescale of vectors; and
- .7 performance checks of position, radar/ARPA, compass, speed input sensors and ECDIS.

Operational use of electronic charts

55 Knowledge and skills should be attained in:

- .1 the main characteristics of the display of ECDIS data and selecting proper information for navigational tasks;
- .2 the automatic functions required for monitoring ship's safety, such as display of position, heading/gyro course, speed, safety values and time;
- .3 the manual functions (by the cursor, electronic bearing line, range rings);
- .4 selecting and modification of electronic chart content;
- .5 scaling (including underscaling and overscaling);
- .6 zooming;
- .7 setting of the own ship's safety data;
- .8 using a daytime or night-time display mode;
- .9 reading all chart symbols and abbreviations;

- .10 using different kinds of cursors and electronic bars for obtaining navigational data;
- .11 viewing an area in different directions and returning to the ship's position;
- .12 finding the necessary area, using geographical coordinates;
- .13 displaying indispensable data layers appropriate to a navigational situation;
- .14 selecting appropriate and unambiguous data (position, course, speed, etc.);
- .15 entering the mariner's notes;
- .16 using north-up orientation presentation and other kinds of orientation; and
- .17 using true- and relative-motion modes.

Route planning

56 Knowledge and skills should be attained in:

- .1 loading the ship's characteristics into ECDIS;
- .2 selection of a sea area for route planning:
 - .2.1 reviewing required waters for the sea passage, and
 - .2.2 changing over of chart scale;
- .3 verifying that proper and updated charts are available;
- .4 route planning on a display by means of ECDIS, using the graphic editor, taking into consideration rhumb line and great-circle sailing:
 - .4.1 using the ECDIS database for obtaining navigational, hydro-meteorological and other data;
 - .4.2 taking into consideration turning radius and wheel-over points/lines when they are expressed on chart scale;
 - .4.3 marking dangerous depths and areas and exhibiting guarding depth contours;
 - .4.4 marking waypoints with the crossing depth contours and critical cross-track deviations, as well as by adding, replacing and erasing of waypoints;
 - .4.5 taking into consideration safe speed;

- .4.6 checking pre-planned route for navigational safety; and
- .4.7 generating alarms and warnings;
- .5 route planning with calculation in the table format, including:
 - .5.1 waypoints selection;
 - .5.2 recalling the waypoints list;
 - .5.3 planning notes;
 - .5.4 adjustment of a planned route;
 - .5.5 checking a pre-planned route for navigational safety;
 - .5.6 alternative route planning;
 - .5.7 saving planned routes, loading and unloading or deleting routes;
 - .5.8 making a graphic copy of the monitor screen and printing a route;
 - .5.9 editing and modification of the planned route;
 - .5.10 setting of safety values according to the size and manoeuvring parameters of the vessel;
 - .5.11 back-route planning; and
 - .5.12 connecting several routes.

Route monitoring

57 Knowledge and skills should be attained in:

- .1 using independent data to control ship's position or using alternative systems within ECDIS;
- .2 using the look-ahead function:
 - .2.1 changing charts and their scales;
 - .2.2 reviewing navigational charts;
 - .2.3 vector time selecting;
 - .2.4 predicting the ship's position for some time interval;

- .2.5 changing the pre-planned route (route modification);
- .2.6 entering independent data for the calculation of wind drift and current allowance;
- .2.7 reacting properly to the alarm;
- .2.8 entering corrections for discrepancies of the geodetic datum;
- .2.9 displaying time markers on a ship's route;
- .2.10 entering ship's position manually; and
- .2.11 measuring coordinates, course, bearings and distances on a chart.

Alarm handling

58 Knowledge and ability to interpret and react properly to all kinds of systems, such as navigational sensors, indicators, data and charts alarms and indicator warnings, including, switching the sound and visual alarm signalling system, should be attained in case of:

- .1 absence of the next chart in the ECDIS database;
- .2 crossing a safety contour;
- .3 exceeding cross-track limits;
- .4 deviation from planned route;
- .5 approaching a waypoint;
- .6 approaching a critical point;
- .7 discrepancy between calculated and actual time of arrival to a waypoint;
- .8 information on under-scaling or over-scaling;
- .9 approaching an isolated navigational danger or danger area;
- .10 crossing a specified area;
- .11 selecting a different geodetic datum;
- .12 approaching other ships;
- .13 watch termination;
- .14 switching timer;

- .15 system test failure;
- .16 malfunctioning of the positioning system used in ECDIS;
- .17 failure of dead-reckoning; and
- .18 inability to fix vessel's position using the navigational system.

Manual correction of a ship's position and motion parameters

59 Knowledge and skills should be attained in manually correcting:

- .1 the ship's position in dead-reckoning mode, when the satellite and radio navigation system receiver is switched off;
- .2 the ship's position, when automatically obtained coordinates are inaccurate; and
- .3 course and speed values.

Records in the ship's log

60 Knowledge and skills should be attained in:

- .1 automatic voyage recording;
- .2 reconstruction of past track, taking into account:
 - .2.1 recording media;
 - .2.2 recording intervals;
 - .2.3 verification of database in use;
- .3 viewing records in the electronic ship's log;
- .4 instant recording in the electronic ship's log;
- .5 changing ship's time;
- .6 entering the additional data;
- .7 printing the content of the electronic ship's log;
- .8 setting up the automatic record time intervals;
- .9 composition of voyage data and reporting; and
- .10 interface with a voyage data recorder (VDR).

Chart updating

61 Knowledge and skills should be attained in:

- .1 performing manual updating of electronic charts. Special attention should be paid to reference-ellipsoid conformity and to conformity of the measurement units used on a chart and in the correction text;
- .2 performing semi-automatic updating of electronic charts, using the data obtained on electronic media in the electronic chart format; and
- .3 performing automatic updating of electronic charts, using update files obtained via electronic data communication lines.

In the scenarios where non-updated data are employed to create a critical situation, trainees should be required to perform *ad hoc* updating of the chart.

Operational use of ECDIS where radar/ARPA is connected

62 Knowledge and skills should be attained in:

- .1 connecting ARPA to ECDIS;
- .2 indicating target's speed vectors;
- .3 indicating target's tracks;
- .4 archiving target's tracks;
- .5 viewing the table of the targets;
- .6 checking alignment of radar overlay with charted geographic features;
- .7 simulating one or more manoeuvres;
- .8 corrections to own ship's position, using a reference point captured by ARPA; and
- .9 corrections using the ARPA's cursor and electronic bar.

See also section B-I/12, Guidance regarding the use of simulators (pertaining to radar and ARPA), especially paragraphs 17 to 19 and 36 to 38.

Operational use of ECDIS where AIS is connected

63 Knowledge and skills should be attained in:

- .1 interface with AIS;
- .2 interpretation of AIS data;

- .3 indicating target's speed vectors;
- .4 indicating target's tracks; and
- .5 archiving target's tracks.

Operational warnings, their benefits and limitations

64 Trainees should gain an appreciation of the uses, benefits and limitations of ECDIS operational warnings and their correct setting, where applicable, to avoid spurious interference.

System operational tests

65 Knowledge and skills should be attained in:

- .1 methods of testing for malfunctions of ECDIS, including functional self-testing;
- .2 precautions to be taken after a malfunction occurs; and
- .3 adequate back-up arrangements (take over and navigate using the back-up system).

Debriefing exercise

66 The instructor should analyze the results of all exercises completed by all trainees and print them out. The time spent on the debriefing should occupy between 10% and 15% of the total time used for simulator exercises.

Table A-II/1 ————— Function: Navigation at the operational level

Column 1 Competence	Column 2 Knowledge, understanding and proficiency	Column 3 Methods for demonstrating competence	Column 4 Criteria for evaluating competence
<p>Use of ECDIS to maintain the safety of navigation</p> <p>Note: Training and assessment in the use of ECDIS is not required for those who serve exclusively on ships not fitted with ECDIS</p> <p>These Limitations shall be reflected in the endorsements issued to the</p>	<p><i>Navigation using ECDIS</i></p> <p>Knowledge of the capability and limitations of ECDIS operations, including:</p> <ul style="list-style-type: none"> .1 a thorough understanding of Electronic Navigational Chart (ENC) data, data accuracy, presentation rules, display options and other chart data formats .2 the dangers of over reliance .3 familiarity with the functions of ECDIS required by performance standards in force <p>Proficiency in operation, interpretation, and analysis of information obtained from</p>	<p>Examination and assessment of evidence obtained from one or more of the following:</p> <ul style="list-style-type: none"> .1 approved training ship experience .2 approved ECDIS simulator training 	<p>Monitors information on ECDIS in a manner that contributes to safe navigation</p> <p>Information obtained from ECDIS (including radar overlay and/or radar tracking functions, when fitted) is correctly interpreted and analysed, taking into account the</p>

<p>seafarer concerned</p>	<p>ECDIS, including:</p> <ul style="list-style-type: none"> .1 use of functions that are integrated with other navigation systems in various installations, including proper functioning and adjustment to desired settings .2 safe monitoring and adjustment of information, including own position, sea area display, mode and orientation, chart data displayed, route monitoring, user created information layers, contacts (when interfaced with AIS and/or radar tracking) and radar overlay functions (when interfaced) .3 confirmation of vessel position by alternative means .4 efficient use of settings to ensure conformance to operational procedures, including alarm parameters for anti-grounding, proximity to contacts and special areas, completeness of chart data and chart update status, and backup arrangements .5 adjustment of settings and values to suit the present conditions .6 situational awareness while using ECDIS including safe water and proximity of hazards, set and drift, chart data and scale selection, suitability of route, contact detection and management, and integrity of sensors 		<p>limitations of the equipment, all connected sensors (including radar and AIS where interfaced), and prevailing circumstances and conditions</p> <p>Safety of navigation is maintained through adjustments made to the ship's course and speed through ECDIS-controlled track-keeping functions (when fitted) Communication is clear, concise and acknowledged at all times in a seamanlike manner</p>
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Table A-II/2 — Function: Navigation at the management level

Column 1 Competence	Column 2 Knowledge, understanding and proficiency	Column 3 Methods for demonstrating competence	Column 4 Criteria for evaluating competence
<p>Maintain the safety of navigation through the use of ECDIS and associated navigation systems to assist command decision-making</p> <p>Note: Training and assessment in the use of ECDIS is not required for those who serve exclusively on ships not fitted with ECDIS.</p> <p>This limitation shall be reflected in the endorsement issued to the seafarer concerned</p>	<p>Management of operational procedures, system files and data, including:</p> <ul style="list-style-type: none"> -1 manage procurement, licensing and updating of chart data and system software to conform to established procedures -2 system and information updating, including the ability to update ECDIS system version in accordance with vendor's product development -3 create and maintain system configuration and backup files -4 create and maintain log files in accordance with established procedures -5 create and maintain route plan files in accordance with established procedures -6 use ECDIS log book and track history functions for inspection of system functions, alarm settings and user responses -7 use ECDIS playback functionality for passage review, route planning and review of system functions 	<p>Assessment of evidence obtained from one of the following:</p> <ul style="list-style-type: none"> -1 approved in-service experience -2 approved training ship experience -3 approved ECDIS simulator training 	<p>Operational procedures for using ECDIS are established, applied, and monitored</p> <p>Actions taken to minimize risk to safety of navigation</p>

Table A-II/3 — Function: Navigation at the operational level

Column 1 Competence	Column 2 Knowledge, understanding and proficiency	Column 3 Methods for demonstrating competence	Column 4 Criteria for evaluating competence
<p>Plan and conduct a coastal passage and determine position</p> <p>Note: Training and assessment in the use of ECDIS is not required for those who serve exclusively on ships not fitted with ECDIS. These limitations shall be reflected in the endorsement issued to the seafarer concerned</p>	<p><i>Navigation</i></p> <p>Thorough knowledge of and ability to use ECDIS</p>	<p>Examination and assessment of evidence obtained from one or more of the following:</p> <ul style="list-style-type: none"> -1 approved training ship experience -2 approved ECDIS simulator training 	

Appendix 5a

Training scenario types and scenario success

Training Scenario types with various ship types and various geographic and environmental settings include:

- Some or all ownships operating in a large port area,
- Some or all ownships operating in open or coastal waters with converging traffic patterns
- Smaller groups transiting narrow passages in converging or opposing patterns,
- Group SAR operations that are visually demanding and ECDIS dependent

Simple dynamics requiring effective use of ECDIS can include changes in passage requirements, environmental conditions, vessel types, task emphasis through procedural orders, etc.

Scenarios can vary between 15 minutes and more than 100 minutes depending on the number and depth of task elements involved

For example, six ships approach an anchorage at about the same time (an additional group can be run in parallel):

- All practice ship handling, visual navigation, communications, contact management
- All practice specific tasks on ECDIS

For example, two ships each with one assist tug (four ownships) entering a basin or channel is exponentially more complex than one ownship with an instructor controlling a tug and numerous target ships (additional groups of four can be run in parallel, depending on simulator capability):

- Two trainees conn ships, two trainees conn tugs
- All practice visual navigation, communications, maneuvering, lines, etc.

All of the foregoing scenario types apply ECDIS in a wide variety of navigational tasks

The following concerns are crucial to the success of such scenarios:

- Limit number ownships involved to preserve event realism and plausibility
- Embedding automatic assessment of selected variables
- Clearly established desired outcomes provided per ownship, especially through assessed value of actions taken & not taken
- Suiting workload to size of conning team (one or two)
- Responsibility of conn to keep detailed record of events and actions
- Provisions for backup means — alternate position and traffic plotting, etc.
- Opportunity to plan passage
- Opportunity to check instrument configuration
- Exercise debrief in classroom setting, to include playback with ownships re-assigned, systematic self review of critical events per ownship

Example of Trainee's Proficiency Checklist on use of ECDIS

These tasks are most effectively mastered by:

- Following a developmental sequence, and

- Practicing them in navigational contexts (in other words, when underway).
- References: Type approved ECDIS *User Manual*
- Other ECDIS docs: *Technical; Operating Principles; Software Description*

Basic Tasks

1__	Identify all information panels and functions	
2__	Enable / disable display of panels and functions	
3__	Set screen color palette – Day / night / etc.;	
4__	Become familiar with how to open panels and functions	
5__	Set orientation of Main display – N / H / C	
6__	Set mode of Main display – TM / RM	
7__	Select Dual display – alignment / mode / orientation / scale choice	
8__	Learn how to return to ownship display.	
9__	Reposition ownship in Relative Motion	
10__	Use of EBL and VRM.	
11__	Select vector length	
12__	Select different chart formats	
13__	Load specific charts	
14__	Select Chart options if available such as auto-load, auto scale, fixed	
15__	Select correct scale to show chart layers- Use of zoom function	
16__	Select chart display categories and layers	
17__	Obtain chart object information (vector chart)	
18__	Set Antigrounding – Safety Contour / Depth	
19__	Set Antigrounding cue or equivalent ECDIS function	

Overall Presentation of Display

20__	Select position & time from best available source	
21__	Cancel / verify / modify position offset	
22__	Select chart & scale appropriate to location	
23__	Create uncluttered display, depending upon context and conditions	
24__	Choose most appropriate display, orientation and motion	
25__	Load a pre-checked and approved Route for monitoring; load existing schedule	
26__	Select Safety Parameters appropriate to own ship location, route and environment.	
27__	If in TM, select appropriate chart setting/ look ahead value.	

Intermediate Tasks

28	Create route plan – rough draft, save	
29	Edit route plan – Focus on Route, fine tune additional data entry	
30	Adjust distance calculations in route planning	
31	Perform safety check	
32	Create & modify Route Schedule ETD, ETA, speeds – Function Panel / Schedule	
33	Select appropriate panel for display of route monitoring data	
34	Select the appropriate active way point.	
35	Set / select Route Monitoring alarms – Monitoring / Navigational Alarms if available to do so.	
36	Select appropriate display layers for route monitoring	
37	Select relevant Navigation Alarms	
38	Observe alarm condition (Alarm panel)	
39	Set Time Zone for ship's time	
40	Select time icon to display – UTC / ship's time	
41	Observe & assess target information	
42	Configure ARPA settings.	
43	Configure AIS settings	
44	Set anchor watch guard ring & alarm	
45	Select tidal information from vector charts	
46	View Logbook if available.	
47	Make manual entry in the Ship Log if available	
48	Unload & load existing user charts	
49	Create a user chart object	
50	Edit a user chart object	
51	Insert a manual correction	
52	Delete a manual correction	
53	Activate Man Overboard function and view available data	

Navigator Tasks

54	Install / delete chart data	
55	Install chart updates for RNCs.	
56	Install chart updates for ENC's.	
57	Modify ownship settings.	
58	Toggle between UTC and local time	
59	Import data files	
60	Export data files	
61	Print route plan	
62	Create SAR date if option is available	
63	Delete route plan(s)	
64	View track history graphically	
65	Playback files if option is available	
66	Select DR mode	

Appendix 5b

Example of Trainees Evaluation on Simulator

The trainee operates specific functions for route monitoring in coastal and restricted waters, and obtains all relevant information for safe navigation

- Demonstrate the following task groups on ECDIS while navigating safely in coastal & restricted setting with multiple targets in specified waters:
 - Monitor sea area,
 - Use route created by trainee including route schedule,
 - Select user layers created by trainee
 - Validate own ship's position by alternate means,
 - Check settings such as vector time, display reset, information layers, alarms, track, sensors, and ownship configurations.
 - Use ECDIS features to assess target threats and execute course and/or speed alterations Modify route as instructed, checking for safety and adjusting schedule,
 - Assess tide and current, adjust ETA for timed arrival at waypoint as instructed,
 - Comply with COLREGS

Instructor guidelines

- Conduct simulation exercise according to exercise description:
 - Set simulation parameters
 - Define unsafe navigation as that involving a clear violation of minimum under keel clearance or CPA, where such a violation will require a retake of the underway evaluation
 - Monitoring of trainees' ECDIS use for grading of all tasks listed on the score sheet
 - Brief trainees
- Debrief each trainee

Appendix 6

Integrated navigation training example **Example: Equipment set up for ECDIS training**

The following description of integrated navigation training provides an example of how proficiencies in ECDIS may be developed with proven success.

In order to accommodate 150 trainees per year, 2 integrated navigation labs (INL) are configured, each with 16 isolated ownships (32 total). Additionally, a classroom (open lab) with 24 workstations, and another classroom with 18 workstations are also configured. All four labs have the same fully integrated simulation software package installed. Each lab is designed to run any combination of interacting ownships, depending on the exercise design.

The coaching on equipment and exercise review are conducted in the classrooms (open lab, Figure 1, below). Although each trainee sits at a dual-display desktop configuration, all of the same conning capabilities are present, including full visualization. In this environment, familiarization with tasks and functionalities are accomplished in a group manner that assures all trainees are developing the required skills.

Each ownship in the integrated navigation labs (INL) consists of the visual scene on a 42" display, conning including autopilot with track control and other navigation instruments, ECDIS and radar, VHF, and chart table (Figure 2, below). Sound is also integrated. Each ownship is in a 9ft x 5ft cubicle, where the conning officer stands. Space in each cubicle is sufficient for a team of two. The optimal training in the labs is in solo watchstanding with ECDIS, paper chart backup, and all other navigational aids.

The real learning for each trainee, however, takes place in the semi-isolated multiple ownships of the INL. The integration means there is always a visual scene for the underway context. The multiple ownships allow for a wide variety of scenarios, from single ownship exercises run simultaneously in parallel, to a single exercise with all ownships interacting as well as with target vessels from the instructor. In any case, specific learning objectives can be achieved by clustering task elements that support the overarching goal of safe navigation.



Figure 1 24-workstation integrated navigation classroom for coaching in ECDIS functionalities and navigation



Figure 2 16-workstation Integrated Navigation Lab (INL) for solo ECDIS navigation and assessment

1 Equipment specification for ECDIS Training

The following equipment specifications describe an example setup for ECDIS training, other systems may be equally acceptable provided the system can deliver equal functionality. Provided there is sufficient equipment and an acceptable layout the "ECDIS ship mini-simulator" may be used for all relevant exercises in the course. If a full bridge simulator is used for the final passage plan exercises; the trainee will be required to undertake individual watchkeeping duties.

2 Equipment specification for ECDIS classroom Training

This equipment is for ECDIS workstation classroom training to allow demonstration and practice of ECDIS functionalities. The number of workstations required will depend on the number of trainees on the course and the time needed to complete the required exercises. There is to be a sufficient number of workstations for each trainee to be able to adequately interact with the equipment and achieve the learning outcomes.

3 Trainee Workstation to include:

- i) workstation with dual monitor display to meet minimum ECDIS display requirements, compatible operating system sufficient to run ECDIS software and electronic chart data;
- ii) workstation to be integrated into server network with navigational and ship control functionality to allow trainee interact with other trainees and the instructor's workstation;
- iii) the ECDIS display is to be provided on one monitor;
- iv) the other monitor to provide information on ship controls, navigational instruments and radar. This could be on either a split screen or menu selection or both. For added realism, the system may also show visuals from a bridge lookout perspective if split-screen functionality is provided;
- and
- v) the ECDIS display to be able to show both radar and AIS data along with the chart data.

4 Instructor Workstation to include:

- i) single workstation with either dual monitor display to meet minimum ECDIS display requirements or a single larger display able to offer display requirement equivalent functionality through split-screen capability; and
- ii) workstation with simulator instructor controls and monitoring software that is able to design exercises locally and execute and playback these exercises at any workstation; provided the hardware has sufficient capability, the instructor's workstation and server/network may be contained in one unit.

5 Server/Network to include:

- i) server system of sufficient capability to store and run the required software and data;
- ii) simulator system software installed with suitable ownship models of different characteristics and geographical sea and coastal training areas;
- iii) full network control, which is interfaced with the installed simulator software and hydrodynamic modelling data; and
- iv) the transfer of data between various hardware components may be either hard-wired or using wi-fi provided there is sufficient bandwidth and

continuity of service.

6 Projection Display

A projection or other visual system to be provided so that exercises for group demonstration of ECDIS functionality, ownship control and techniques of ECDIS-based navigation can be displayed for instruction, feedback and other discussions.

7 Equipment specifications for ECDIS navigational mini ship simulator

This equipment to be designed to assess the trainee's watchkeeping capability using ECDIS on a ship's bridge. This will include realistic simulation of the execution and monitoring stages of the passage plan created in earlier exercises.

8 Trainee ECDIS ownship mini simulator for use in route monitoring exercises:

- i) workstation with ECDIS software and chart data installed with compatible operating system sufficient to run installed ECDIS software and electronic chart data;
- ii) three displays that can separately display ECDIS data on the first screen, radar on the second screen, and with engine control navigational equipment on the other;
- iii) the ECDIS, conning, radar scenes to be capable of being displayed separately and continuously;
- iv) the workstation to be connected to an ECDIS integrated ownship network with navigational and ship control functionality and to have the capability to operate in either an independent or interactive way; and
- v) the ECDIS display to be able to show both radar and AIS data along with the chart data.

9 Instructor Workstation for a mini simulator to include:

- i) workstation with suitable display and compatible operating system with installed simulator instructor control and monitoring software; and
 - ii) workstation to be capable of designing and executing exercises.
- Note: in a multiple ownship set-up, it is preferable that the instructor's workstation is remote from the trainee's ownship simulator.

10 Server/Network for a mini simulator to include:

- i) server system of sufficient capability to store and run the required software and data; and
- ii) simulator system software with suitable ownship models, geographical training areas and hydrodynamic modelling data, to provide full network control of exercises used on the workstations.