

DEVELOPMENT OF A BLUEPRINT FOR COMPUTER BASED TRAINING (CBT) IN THE USE OF ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEMS (ECDIS)

EXECUTIVE SUMMARY

GENERAL

The United Kingdom Maritime and Coastguard Agency (MCA) initiated a Research Project to **'Develop a blueprint for a Computer Based Training (CBT) programme in Electronic Chart display and Information Systems (ECDIS).'**

This report considers the application of the IMO Model Course¹ as a template to develop an appropriate Computer Based Training (CBT) package to provide appropriate training in the use Electronic Chart Display and Information Systems (ECDIS), with a measurable and quantifiable outcome.

Common sense and maritime expertise combined with the tenets of the ISM Code clearly indicates that familiarisation training on such vital navigational equipment as an ECDIS is a necessity, considering that incompetent operation of ECDIS could impact adversely on the safety of life and protection of the marine environment.

BACKGROUND

With the growing adoption of ECDIS, there is an increasing number of officers who need to be trained in their use.

Given the flexibility of the labour market, it is highly likely that officers may arrive on board a ship without experience or training. The Officer of the Watch (OOW) who has received recognised, formal training in the use of the bridge equipment at his disposal is, potentially, a safer officer than his counterpart who has not received training.

In the expectation that, in the near future under possible Flag State requirements or amendments to STCW95, officers on ships fitted with ECDIS will be required to complete an ECDIS training programme, the IMO ECDIS Model Course will serve as an ideal platform for such training.

CBT has significant potential to deliver an appropriate and effective training programme, in particular for Officers with little or no previous experience in the use of ECDIS.

With a CBT package available on board a ship, for example, an officer with little or no experience of ECDIS would be able to carry out the CBT package in his own time with measurable and verifiable results. Alternatively, prior to appointment of a new officer with no or limited experience of ECDIS, this CBT package could be made available by access to the Internet for shore based training.

¹ IMO Model Course 1.27 'THE OPERATIONAL USE OF ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEMS (ECDIS)'

TRAINING NEEDS ANALYSIS

In Part A of the IMO Model Course it clearly states

*"Every master, chief mate and officer in charge of a navigational watch on a ship fitted with ECDIS should have completed a course in the use of ECDIS."*²

STCW AND ELECTRONIC CHART SYSTEMS

"In the STCW95 Convention, no particular formal emphasis is placed on ECDIS systems. Instead they are considered to be included under the term "charts" (Table A-II/1). Following the functional approach, the officer in charge of a navigational watch must have *"thorough knowledge of and ability to use navigational charts and publications, ..."* Criteria for evaluating competency are stated as *"The charts selected are the largest scale suitable for the area of navigation and charts and publications are corrected in accordance with the latest information available"*. In Section B-II/1 (Assessment of abilities and skills in navigation watchkeeping), a candidate for certification must provide evidence of skills and ability to prepare for and conduct a passage *"including interpretation and applying information from charts"*³

THE NEED FOR TYPE SPECIFIC TRAINING

A number of other National Administrations have recognised the possible need for "type training". For example, Australia has suggested that

*"Past experience and problems with the variation in types of radar, ARPA and DGPS/GPS controls and displays suggests that the lack of commonality in ECDIS user interfaces to ECDIS software between the manufacturers will lead to major safety incidents. The operator must be trained to use his particular ECDIS or, as past experience suggests, major accidents will occur. It is therefore a reasonable suggestion that some form of ECDIS "type training" would be a sensible safety requirement."*⁴

Officers on board ships at the time of installation of an ECDIS generally benefit from close liaison with the manufacturers' representatives but, in many cases, officers joining later will have to rely on 'cascade training', i.e. passing on knowledge from one officer who has been trained to his relief who has not. This training method is fraught with the potential for serious errors to creep into the use of any systems and, in the case of ECDIS, may lead to significant errors of navigation.

IMO MODEL COURSE AND CBT DEVELOPMENT

The Purpose of the IMO Model Course is

*"... to enhance safety of navigation by providing the knowledge and skills necessary to fully utilize the features of ECDIS. ..."*⁵

The 'theoretical' aspects of the model course - i.e. those that are covered by suggested 'lecture' sessions - would be addressed through information screens and an accompanying reference text. The trainee's knowledge would be assessed through multiple-choice questions within the CBT package. Practical aspects - 'demonstration' and 'exercise' tasks - would be addressed through structured exercises within the ECDIS system.

² ibid, page 6

³ This paragraph is quoted in its entirety from IMO Model Course 1.27, Introduction, p.1: IMO Requirements, §(b) Competence requirements

⁴ AMSA ECDIS POLICY (Consult), Nov. 2001

⁵ IMO Model Course, p.2

OUTLINE COURSE DEVELOPMENT

The CBT package can be developed into three distinct modules linking the seventeen subject headers of the Model Course as shown in the diagram FIG. 2 - INTRODUCTION, ROUTE PLANNING AND ROUTE MONITORING and ADDITIONAL FEATURES AND FUNCTIONS.

SUBJECT MATTER

A logical, seamanlike approach to the suggested training programme has been adopted. Rather than follow the strict order of subject matter as set out in the IMO Model Course, potential thoughts and questions of a navigating officer being faced with a new piece of equipment, such as ECDIS have been suggested. The CBT package should answer those thoughts and questions in an integrated manner.

Those questions are detailed within the body of the report.

MODULE 1. 'INTRODUCTION': This module looks at 'information' subjects within the Model Course that are closely linked to each other. They can be covered by information screens and multiple choice questions at the end of the section to verify the trainee's understanding and knowledge of the subject.

MODULE 2. 'ROUTE PLANNING AND ROUTE MONITORING': Within this module, it is suggested that the majority of the trainee's input should be related to practical exercises utilising a particular system. (Where this training package is carried out on board a ship, this input would be relevant to that system in use on a day-to-day basis.)

The Route Planning and Route Monitoring exercises can be structured to demonstrate the trainee's capabilities with respect to the IMO Model Course recommendations, as well as allowing for 'fault finding and rectification' - either through use of an inbuilt simulation programme or through appropriate multiple-choice questions.

MODULE 3. 'ADDITIONAL FEATURES AND FUNCTIONS': this module looks at the recording and information management capabilities of ECDIS, as well as considering the presentation of other navigational information, such as radar and AIS.

'OVER RELIANCE ON ECDIS' is a subject matter in its own right in the IMO Model Course and it is addressed in each of the three modules.

CERTIFICATION

Successful completion of the training package may provide a trainee with a form of certificate of completion, approved by a Flag State administration or other certifying body. In the absence of specific Flag State requirements, the CBT package could be submitted to The Nautical Institute or similar professional body for accreditation and validation. This would ensure that a common standard is applied to all training completed in line with these proposals.

CONCLUSION

The development of a CBT package in line with the blueprint established by this project has significant potential to deliver measurable, achievable training in the use of ECDIS in particular for officers with limited or no previous experience in the use of ECS.

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1 INTRODUCTION

Until such time as statutory training requirements are introduced and enforced, CBT has significant potential to deliver measurable, achievable training in the use of ECDIS.

The Officer of the Watch who has received recognised, formal training in the use of the bridge equipment at his disposal is, potentially, a safer officer than his counterpart who has not received training. His understanding of the equipment, including appreciation of its advantages and limitations, and his confidence in its operation and application reduces the chances of navigational errors that may lead to loss of life, damage to property or to the marine environment.

The CBT package will be designed in order to provide practical, verifiable evidence that the trainee is capable and competent in the use of ECDIS. It will be based around the requirements of the IMO Model Course. [The inter-relationship between the various subjects in the IMO Model Course is shown in the accompanying diagram FIG. 1⁶]

It is essential that the end product has a visually and intellectually stimulating appearance and a sense of progress in order to promote and maintain trainee interest. With additional duties on board ship, he will not wish to spend a large amount of his off-watch time in front of a computer screen to demonstrate a skill or knowledge that he may already have.

However, the CBT package development will recognise that it may not be necessary to implement all the subject matter. With training being carried out on board ship, it can be assumed that the trainee is familiar, to a greater or lesser degree, with the ECDIS equipment fitted on board his ship. As a navigating officer, he will be using the ECDIS as a practical navigational tool on a day-to-day basis.

Detailed development of the course material is outlined below in conjunction with suggestions and recommendations on the format of a CBT package, test questions and appropriate practical exercises. The inter-relationship between the various subjects covered by the IMO Model Course is maintained as previously proposed.

Detail is also given on the technical aspects of the CBT development and proposals on how to incorporate the required material into the visually stimulating format previously suggested. A preview CD is included that contains a number of 'information screens', as well as on-screen activities and screen captures .

It should be noted that references to procedural actions are made on the basis of the processes required by this programme. As noted in the introduction to the IMO Model Course, the lack of common user interfaces between system manufacturers will lead to differences in these processes. If this blueprint should be adopted for wider application, the procedural details would have to be amended to each system.

1.1 TRAINING NEEDS ANALYSIS

In Part A of the IMO Model Course 'THE OPERATIONAL USE OF ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEMS (ECDIS)'⁷ it clearly states

"Every master, chief mate and officer in charge of a navigational watch on a ship fitted with ECDIS should have completed a course in the use of ECDIS."⁸

⁶ Model Course, p. 12

⁷ IMO Model Course 1.27

⁸ *ibid*, page 6

1.1 STCW AND ELECTRONIC CHART SYSTEMS

"In the STCW95 Convention, no particular formal emphasis is placed on ECDIS systems. Instead they are considered to be included under the term "charts" (Table A-II/1). Following the functional approach, the officer in charge of a navigational watch must have *"thorough knowledge of and ability to use navigational charts and publications, ..."* Criteria for evaluating competency are stated as *"The charts selected are the largest scale suitable for the area of navigation and charts and publications are corrected in accordance with the latest information available"*. In Section B-II/1 (Assessment of abilities and skills in navigation watchkeeping), a candidate for certification must provide evidence of skills and ability to prepare for and conduct a passage *"including interpretation and applying information from charts"*⁹

1.2 THE ISM CODE AND TRAINING REQUIREMENTS

Under the ISM Code¹⁰, the shipping company has a responsibility to *"establish procedures to ensure that new personnel and personnel transferred to new assignments related to safety and protection of the marine environment are given proper familiarisation with their duties. Instructions which are essential to be provided prior to sailing should be identified, documented and given"*¹¹.

Additionally, the company has to:

- *"ensure that all personnel involved in the Company's Safety Management System (SMS) have an adequate understanding of relevant rules, regulations, codes and guidelines"*¹²;
- *"establish procedures for identifying any training which may be required in support of the SMS"*¹³;

Under the Section dealing with Emergency Preparedness,

*"the Safety Management System must provide for measures to ensure that the Company's organisation can respond at any time to hazards, accidents and emergency situations (ECDIS failure?¹⁴) involving its ships."*¹⁵

It would appear, therefore, that even in the absence of specific legislation for ECDIS training, there is a clear obligation on shipowners to ensure that mariners sailing with ECDIS are properly trained to safely use such equipment.

1.3 THE NEED FOR TYPE SPECIFIC TRAINING

In the Introduction to the IMO Model Course, it refers to 'Potential Problems' and states that

*"Due to a lack of standardized ECDIS user interfaces, there is considerable product differentiation."*¹⁶

Officers on board ships at the time of installation of an ECDIS generally benefit from close liaison with the manufacturers' representatives but, in many cases, Officers joining later will have to rely on 'cascade training', i.e. passing on knowledge from one officer who has been trained to his relief who has not. This training method is fraught with the potential for serious errors to creep into the use of any systems and, in the case of ECDIS, may lead to significant errors of navigation. With a CBT package available on board a ship, for example, an officer with little or no experience of ECDIS would be able to carry out the CBT package in his own time with measurable and verifiable results.

⁹ This paragraph is quoted in its entirety from IMO Model Course 1.27, Introduction, p.1: IMO Requirements, §(b) Competence requirements

¹⁰ 'The International Code for the Safe Operation of Ships and for Pollution Prevention', now Ch. IX of SOLAS 2001.

¹¹ ISM Code, §6.3

¹² *ibid*, §6.4

¹³ *ibid.*, §6.5

¹⁴ own suggestion

¹⁵ ISM Code., §8.3

¹⁶ IMO Model Course, p4

Common sense and maritime expertise combined with the tenets of the ISM Code clearly indicate that familiarisation training on such vital navigational equipment as an ECDIS is a necessity, noting that incompetent operation of ECDIS could impact adversely on the safety of life and protection of the marine environment.

*"Past experience and problems with the variation in types of radar, ARPA and DGPS/GPS controls and displays suggests that the lack of commonality in ECDIS user interfaces to ECDIS software between the manufacturers will lead to major safety incidents. The operator must be trained to use his particular ECDIS or, as past experience suggests, major accidents will occur. It is therefore a reasonable suggestion that some form of ECDIS "type training" would be a sensible safety requirement."*¹⁷

1.4 CERTIFICATION

ECDIS systems store voyage plans, chart portfolios and other navigation information and it is envisaged that, in line with the requirements of the IMO Model Course, the CBT package would require practical exercises in such tasks. Additionally, ECDIS systems record data files that, in effect, provide evidence of the Route Monitoring aspects of the Model Course.

On completion of the CBT package the trainee would be required to download to disc his training record - appropriate instructions would be incorporated into the programme - and to send it to be ratified by the system developer, by a Flag State administration or other certifying body.

In the Australian proposals, it is suggested that

"Certification would be required to verify the successful completion of type training and that the ECDIS user was fully competent in the operation of the system. There are number of options for issuing type training certificates based upon a specific manufacturers ECDIS [] including:

- *Certificate issued by the trainee's employer;*
- *Certificate issued by the Masters of the trainee's vessel;*
- *Certificate printed out automatically on an attached printer on successful completion of a manufacturers computer-based interactive learning and assessment package."*¹⁸

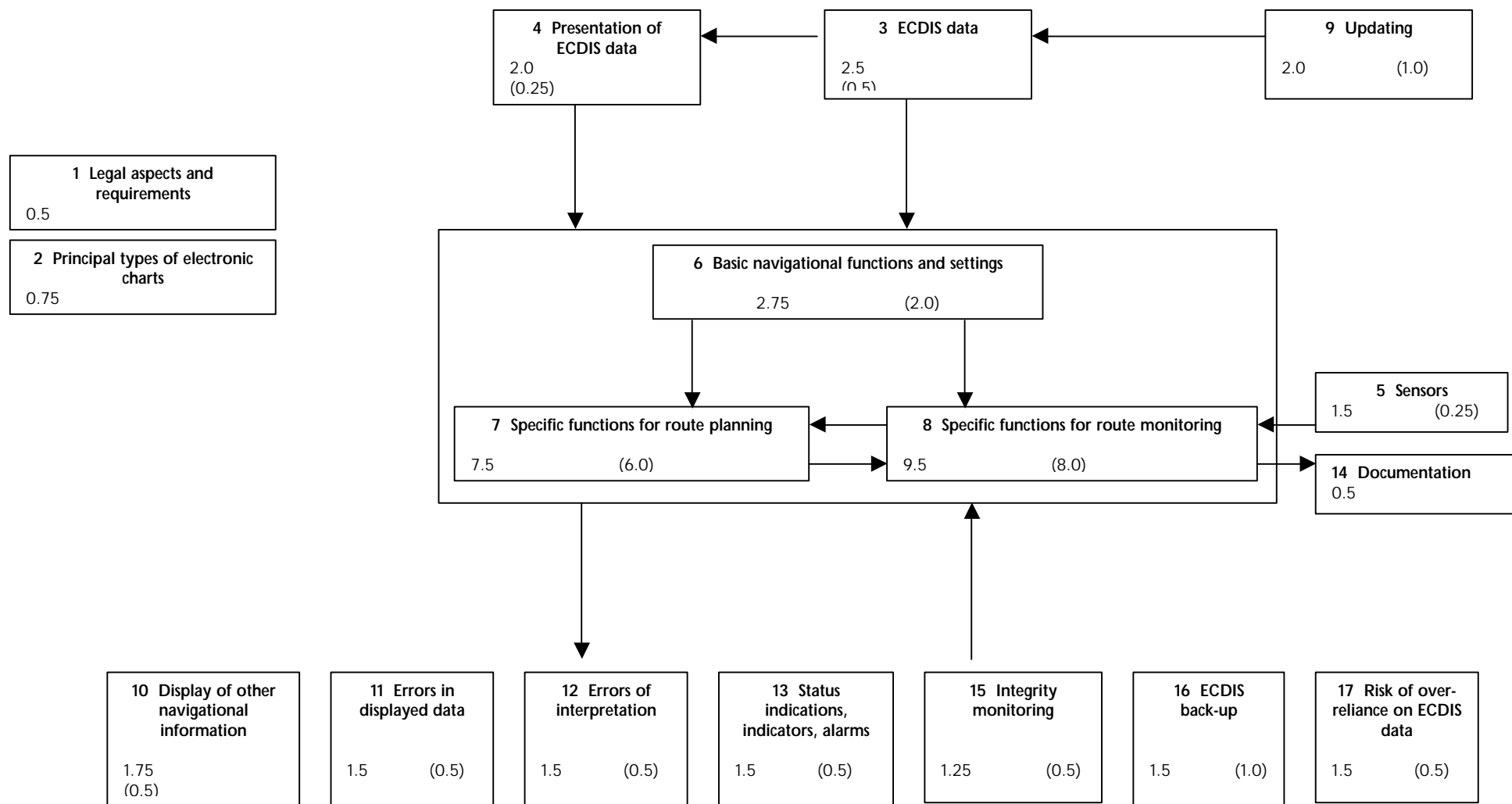
While the third option may be considered to be the most desirable, in the absence of specific Flag State requirements for certification, the CBT package could be submitted to The Nautical Institute or similar professional body for accreditation and validation. This would ensure that a common standard is applied to all training completed in line with these proposals. All records would be held by the accreditation organisation. (The Nautical Institute already have a number of schemes in place to provide certification to industry-adopted standards in the absence of international or statutory requirements.)

On submission of suitable training records and downloaded data, successful completion of the training package may provide a trainee with a form of certificate of completion, approved by a Flag State administration or other certifying body.

¹⁷ AMSA ECDIS POLICY (Consult), Nov. 2001
¹⁸ AMSA ECDIS POLICY (Consult), Nov. 2001, p.p10-11.

FIG. 1 - INTER-RELATIONSHIPS BETWEEN PRINCIPAL ECDIS SUBJECTS (TAKEN FROM IMO MODEL COURSE P.12)

FIGURES IN THE BOXES REPRESENT RECOMMENDED HOURS - TOTAL AND (EXERCISE BASED)



2 IMO MODEL COURSE RECOMMENDATIONS

OBSERVATIONS ON THEIR IMPACT ON CBT DEVELOPMENT

The IMO Model Course proposes a training time of 40 hours¹⁹: this is equivalent to a full week at a shore based establishment and does not take into account any previous knowledge or experience of any ECDIS system.

In the outline below, the **recommended** training times for each subject are given and the figures in brackets represent 'exercise time'.

1. LEGAL ASPECTS AND REQUIREMENTS 0.5 HOURS

The detailed requirements under this section can be incorporated into an 'INTRODUCTION' section. Essentially, this is an 'information' module within the Model Course and can be covered by information screens and multiple choice questions at the end of the section to verify the trainee's understanding and knowledge of the subject.

2. PRINCIPAL TYPES OF ELECTRONIC CHART 0.75 HOURS

Given that the CBT package will probably be carried out on board ship, the trainee should be familiar with these. 'Demonstration' charts could be incorporated into the CBT package for those unfamiliar with electronic charts.

This subject can be incorporated within the 'INTRODUCTION' section, again with multiple-choice questions at the end of the section to verify the trainee's understanding and knowledge of the subject. However, the practical exercises within the ROUTE PLANNING AND ROUTE MONITORING section will also address this section in detail.

3. ECDIS DATA 2.5 HOURS (0.5 HOURS)

This is essentially similar to section 1 with a small recommended practical element.

This can be incorporated within the 'INTRODUCTION' section, again with multiple-choice questions at the end of the section to verify the trainee's understanding and knowledge of the subject. With reference to section 3.7 - LOADING AND STORING OF ECDIS DATA - of the syllabus²⁰, this can be included within the ROUTE PLANNING exercises.

4. PRESENTATION OF ECDIS DATA 2.0 HOURS (0.25 HOURS)

Given that

*"The main objective of this section is to enable the trainee to understand, to modify and to optimise the ECDIS display. The automatic display of the ship's position and track is only safe and valuable in the appropriate chart display"*²¹

this section can be incorporated into the ROUTE PLANNING AND ROUTE MONITORING exercises.

¹⁹ IMO Model Course, p.11

²⁰ *ibid.*, p.16

²¹ *ibid.*, §4.4, p.30

5. SENSORS

1.5 HOURS

*"One of the major advantages of ECDIS is the automatic and real-time presentation of own ship's position, course and speed in the chart. The officer will tend to "believe what he sees." It is extremely important that the trainee has profound knowledge of the performance and limits of all sensors involved in ECDIS (position, depth, course and speed; even radar). Safe navigation is only possible if the navigator is always conscious of the reliability and accuracy of "what he sees". Otherwise, if a sensor input is erroneous, the safety of the ship may easily be in danger."*²²

Outline information on the overall set-up of an ECDIS system, giving the relationship between the various elements comprising the system, will be included into the 'INTRODUCTION' section. It may be appropriate to introduce a limited number of multiple-choice questions at the end of the section to verify the trainee's understanding and knowledge of the subject. However, as can be seen from FIG. 1, Sensors are an integral part of the 'operational' function of ECDIS and are closely related to Route Monitoring. Therefore, the majority of this section can be incorporated into the ROUTE MONITORING exercises.

6. BASIC NAVIGATIONAL FUNCTIONS AND SETTINGS 2.75 HOURS (2.0 HOURS)

Given that the CBT package will probably be carried out on board ship, the trainee should be familiar with these. However, as noted above, the problem of the lack of standardised ECDIS user interfaces is mentioned in the introduction to the IMO Model Course but is not dealt with in the content of the course.

Where a trainee is undertaking this CBT package by access to the Internet, for example, prior to appointment of a new officer with no or limited experience of ECDIS, reference to the Operations Manual may be crucial.

It is considered desirable that the system's Operations Manual be incorporated in electronic form into the CBT package so that the trainee may make reference to the manual where he is unsure of a particular action or function. Alternatively, it may be appropriate to incorporate video clips of system controls to demonstrate the automatic and manual functions outlined in sub-sections 6.1 and 6.2, as well as changes to Vectors, including text referring to their benefits and drawbacks. (§6.5).

Through careful structuring of the material of the CBT package, the detailed requirements of this section can be incorporated into the ROUTE PLANNING and ROUTE MONITORING exercises.

7. SPECIFIC FUNCTIONS FOR ROUTE PLANNING

7.5 HOURS (6.0 HOURS)

8. SPECIFIC FUNCTIONS FOR ROUTE MONITORING 9.5 HOURS (8.0 HOURS)

The greatest emphasis within the Model Course is given in the sections on ROUTE PLANNING and on ROUTE MONITORING. These are associated with the section on "Basic Navigational Settings and Functions" (section 6) along with those on Sensors (§5) and Documentation (§14).

Within the Model Course, these sections account for 14 hours recommended exercise time.

It is considered that these joint objectives may be achieved without the need for either a full-mission simulator or in real-time: this would be unrealistic and unnecessarily time-consuming, particularly where the training is carried out on board the ship. These objectives can be realised through appropriately structured exercises.

9. UPDATING

2.0 HOURS (1.0 HOURS)

*"The trainee should know which kinds of update exist and how the ship can receive these updates. He should update the ship's ENC and be thoroughly aware of the importance and his responsibilities concerning updating because updating is one of the most essential subjects of ECDIS."*²³

The theoretical aspects can be addressed within the 'INTRODUCTION' module.

²² *ibid*, §4.5, p.31

²³ *ibid.*, §4.9, p.34

The practical elements of this section can be incorporated in the ROUTE PLANNING AND ROUTE MONITORING exercises.

10. DISPLAY AND FUNCTION OF OTHER NAVIGATIONAL INFORMATION 1.75 HOURS (0.5 HOURS)

The theoretical aspects can be addressed within the 'ADDITIONAL FEATURES AND FUNCTIONS' module.

The practical elements of this section, in particular Automatic Track Keeping, can be incorporated in the 'ROUTE PLANNING AND ROUTE MONITORING' exercises.

11. ERRORS IN DISPLAYED DATA 1.5 HOURS (0.5 HOURS)

The theoretical aspects can be addressed within the 'INTRODUCTION' module.

The practical elements of this section can be incorporated in the 'ROUTE PLANNING AND ROUTE MONITORING' exercises.

12. ERRORS OF INTERPRETATION 1.5 HOURS (0.5 HOURS)

*"The trainee should be made aware of errors that are not inherent in the ECDIS system or in its connected units, but result from misunderstanding, inexperience or careless observation by the operator ("human error")."*²⁴

The theoretical aspects can be addressed within the 'INTRODUCTION' section.

The practical elements of this section can be incorporated in the 'ROUTE PLANNING AND ROUTE MONITORING' exercises.

13. STATUS INDICATIONS, INDICATORS AND ALARMS 1.5 HOURS (0.5 HOURS)

"The importance of alarm handling when using ECDIS for route planning and route monitoring has already been stressed. ... Because of the high degree of automation in an ECDIS display, the awareness needed to realize, assess and react properly to indicators and particularly to alarms is vital. ..."

*An explanation can be given in lectures and demonstrations, but a more efficient approach would be the use of "alarm situations" during simulator exercises."*²⁵

The theoretical aspects can be addressed within the 'INTRODUCTION' module.

The practical elements of this section can be incorporated in the ROUTE PLANNING AND ROUTE MONITORING exercises.

14. DOCUMENTATION 0.5 HOURS

*"The performance standards for ECDIS require "voyage recording", i.e. a feature to store and reproduce certain elements to reconstruct the navigation (own ship's past track) and to verify the official database used (ENC source, edition, date, cell and update history). The recorded information cannot be manipulated."*²⁶

This can be explained within the 'ADDITIONAL FEATURES AND FUNCTIONS' module and a practical requirement for the trainee to recover the voyage recording of one of the Route Monitoring exercises can be incorporated.

15. INTEGRITY MONITORING 1.25 HOURS (0.5 HOURS)

The theoretical aspects can be addressed within the 'INTRODUCTION' module.

²⁴ *ibid.*, §4.12, p.35

²⁵ *ibid.*, §4.13, p.35

²⁶ *ibid.*, §4.14, p.36

The practical elements of this section can be incorporated in the ROUTE PLANNING AND ROUTE MONITORING exercises.

16. BACK-UP

1.5 HOURS (1.0 HOUR)

"The back-up system will have a major impact on the ship's safety in the case of an ECDIS blackout. It is very important that the trainee is able to achieve a safe and fast takeover of the ECDIS system by the back-up system ...

During the exercises, an ECDIS breakdown should be demonstrated and the trainees should perform the takeover and navigate using the back-up system and its reduced functional capabilities."²⁷

This quotation is self-explanatory and the subject can be covered in both the INTRODUCTION module and the ROUTE PLANNING AND ROUTE MONITORING exercises .

Given that the CBT package will not have its own back-up system, this will probably be incorporated into multiple-choice questions throughout the CBT package.

17. RISK OF OVER-RELIANCE ON ECDIS

1.5 HOURS (0.5 HOURS)

" ... ECDIS is only a navigational tool which helps to perform the navigational functions and that its limitations, including those of its sensors, make over-reliance on it dangerous."

"Emphasis must be placed on the need to keep a proper look-out and to perform periodical checking, especially of the ship's position, by ECDIS-independent methods. With or without the use of ECDIS, all navigational activities have to comply with the basic principles and operational guidance for officers in charge of a navigational watch (STCW; SOLAS)."²⁸

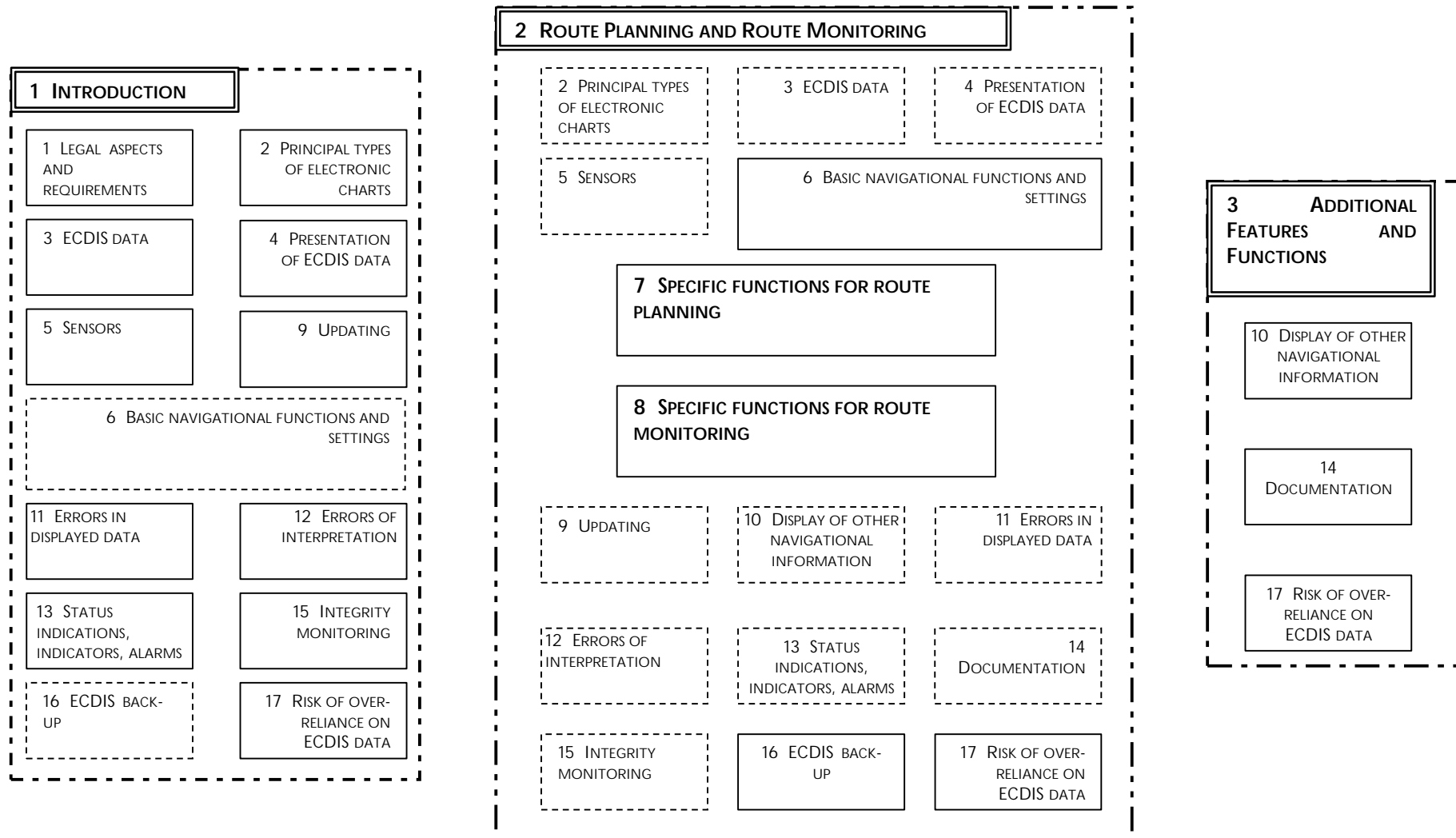
This element must be introduced at the beginning of the 'INTRODUCTION' module and must be re-emphasised in each of the other sections. Within the ROUTE PLANNING AND ROUTE MONITORING exercises where failure modes are introduced, it will be essential that the trainee can demonstrate what actions he would take in the event of a 'real' failure.

²⁷ *ibid.*, §4.16, p.36

²⁸ *ibid.*, §4.17, pp36/37

FIG. 2 - RELATIONSHIP BETWEEN SUBJECTS IN CBT PACKAGE

PRINCIPAL SUBJECTS ARE IN 'SOLID' BOXES, SECONDARY SUBJECTS IN 'DASHED' BOXES



3 DETAILED CONTENTS OF 'BLUEPRINT' CBT PACKAGE.

In developing the specifics of the material to be included into the CBT package, close attention has been given to the recommendations of the IMO Model Course. FIG. 2 above proposes the inter-relationship between subject headings in the IMO Model Course and 'modules' for a CBT package.

3.1 THE IMO MODEL COURSE

The Purpose of the IMO Model Course is

*"... to enhance safety of navigation by providing the knowledge and skills necessary to fully utilize the features of ECDIS. ..."*²⁹

Furthermore, the stated Objective of the IMO Model Course

"A trainee successfully completing this course will be able to use ECDIS for his navigational watch. He will be able to operate ECDIS equipment, use the navigational functions of ECDIS, select and assess all relevant information and take proper action.

The trainee will acquire and develop a knowledge and understanding of the basic principles governing the safe operation of ECDIS, including ECDIS data and their presentation, as well as the system-related limitations and potential dangers.

He will be able to generate and maintain displays, to operate all basic navigational functions and all specific functions for route planning as well as route monitoring, to use and select proper navigational data and to display the data in the appropriate manner. He will also be able to perform updating.

He will be able to analyse nautical alarms during route planning and route monitoring as well as sensor alarms. He will be able to assess the impact of the performance limits of sensors on the safe use of ECDIS and to appreciate that the back-up system is only of limited performance. He will be able to assess errors, inaccuracies and ambiguities caused by improper data management. Thus, he will be aware of errors in displayed data, errors of interpretation and the risk of over-reliance on ECDIS and be able to take proper action.

*In addition, he will have knowledge of the principal types of electronic chart and the essential legal aspects of the use of ECDIS."*³⁰

3.2 SUBJECT MATTER

*"The model course has been designed to specify clearly the technical content and levels of knowledge and skill necessary to meet the technical intent of IMO conventions and related recommendations. However, it is not the intention of the model course to present instructors with a "rigid teaching package" which they are expected "follow blindly". Instead, flexibility is necessary."*³¹

A logical, seamanlike approach to the suggested training program has been adopted. Rather than follow the strict order of subject matter as set out in the IMO Model Course, potential thoughts and questions of a navigating officer being faced with a new piece of equipment, such as ECDIS have been suggested. The CBT package should answer those thoughts and questions in an integrated manner.

²⁹ IMO Model Course, p.2

³⁰ *ibid*, p.5

³¹ *ibid.*, p.3

Those thoughts and questions can be considered to fit within the proposed modules as follows:

Module 1. INTRODUCTION

- A. THERE IS AN ELECTRONIC CHART SYSTEM ON THE BRIDGE:**
 - a. Is an ECDIS required ?
 - b. What is it for ?
 - c. What does it look like when it is switched on ?
 - d. What can it do ?
 - e. Can it do everything ? Can the paper charts be dispensed with ?

- B. HOW DOES IT WORK ?**
 - a. Whose idea was this ?
 - b. Who set the rules ?
 - c. Is this an ECDIS or an ECS ?
 - d. What do the different types of chart mean and when can they be used?
 - e. What indications are there that the charts are up-to-date ?
 - f. What are the potential sources of errors ?
 - g. What training is required in the use of this equipment ?

- C. WHAT INDICATIONS ARE THERE THAT THE ECDIS IS WORKING CORRECTLY ?**
 - a. How is this checked ?
 - b. Can it check itself ?
 - c. What's that noise ?
 - d. What is that message on the screen ?
 - e. What action is required if it all goes wrong ?

Module 2. ROUTE PLANNING AND ROUTE MONITORING

- A. USING PAPER CHARTS, HOW IS THE ROUTE PLANNED?**
 - a. Which charts should be used?
 - b. Where are they ?
 - c. Are they up-to-date ?
 - d. What about new Notices to Mariners, Temporary and Preliminary Notices, Navtex warnings etc. ?
 - e. Where initial action is required?
 - f. What controls are used to apply this route ?
 - g. How can the safety of the chosen route be checked?
 - h. How are extra details included in the Voyage Plan ?
 - i. Can the Voyage Plan be printed?
 - j. What if ... ?

k. How much reliance be placed on this system ?

B. THE VOYAGE HAS COMMENCED

a. Is this the required route ?

b. Where is the present position?

c. How does the ECDIS indicate what is safe and what is not ?

d. What's that noise ?

e. Can the voyage be recorded?

f. How much reliance should be placed on ECDIS?

Module 3. ADDITIONAL FEATURES AND FUNCTIONS

A. WHAT ADDITIONAL INFORMATION IS NEEDED ?

a. What other information can this system display?

b. What can go wrong ?

c. What interpretation errors are possible ?

d. How much reliance should be placed on the information ?

4 APPLICATION OF THE REQUIREMENTS OF THE IMO MODEL COURSE

If we take the questions above as they stand, we can apply the appropriate sections of the IMO Model Course as follows:

Module 1. INTRODUCTION

QUESTION	IMO REF.	SUBJECT MATTER
A. THERE IS AN ELECTRONIC CHART SYSTEM ON THE BRIDGE:		
a. Is an ECDIS required ?	1.1	Carriage Requirements
b. What is it for ?	1.3	Performance Standards
c. What does it look like when it is switched on?	2 / 6	Principal types of electronic chart / Basic navigation functions and settings
d. What can it do ?	6	Basic navigation functions and settings
e. Can it do everything ? Can the paper charts be dispensed with ?	5 / 17 / 1.2	Sensors / Over-reliance on ECDIS / Equivalency
B. HOW DOES IT WORK ?		
a. Whose idea was this ?	1.3	Performance Standards
b. Who set the rules ?	1.3	Performance Standards
c. Is this an ECDIS or an ECS ?	1.2	Definition of ECDIS and ECS
d. What do the different types of chart mean and when can they be used ?	1.2 / 2	Equivalency / Principal types of electronic charts
e. What indications are there that the charts are up-to-date ?	1.4 / 9	Data procurement / Updating
f. What are the potential sources of errors?	17	Over-reliance on ECDIS
g. What training is required in the use of this equipment ?	1.5	Training requirements
C. WHAT INDICATIONS ARE THERE THAT THE ECDIS IS WORKING CORRECTLY ?		

QUESTION	IMO REF.	SUBJECT MATTER
a. How is this checked?	15	Integrity Monitoring
b. Can it check itself ?	15	Integrity Monitoring
c. What's that noise ?	13	Alarms and Indicators
d. What is that message on the screen ?	13	Alarms and Indicators
e. What action is required if it all goes wrong ?	16	Back up

Module 2. ROUTE PLANNING AND ROUTE MONITORING

QUESTION	IMO REF.	SUBJECT MATTER
A. USING PAPER CHARTS, HOW IS THE ROUTE PLANNED		
a. Which charts should be used ?	2 / 7.1	Principal types of electronic charts / sea area selection
b. Where are they ?	3.7 / 6	Loading and storing / Basic navigational functions and settings
c. Are they up-to-date ?	6 / 9	Basic navigational functions and settings / Updating
d. What about new Notices to Mariners, Temporary and Preliminary Notice's, Navtex warnings etc. ?	6.3	Own Chart Entries
e. Where initial action is required ?	7.1	Sea Area Selection
f. What controls are used to apply to this route ?	7.5 / 7.7	Curved Track Planning / Safety Values
g. How can the safety of the chosen route be checked?	7.8 / 7.9	Check for navigational safety / Ultimate Route
h. How are extra details included on the Voyage Plan ?	7.6	Planning notes
i. Can the Voyage Plan be printed ?	6	Basic navigational functions and settings

QUESTION	IMO REF.	SUBJECT MATTER
j. What if ... ?	16	Back up
k. How much reliance be placed on this system?	17	Over-reliance on ECDIS
B. THE VOYAGE HAS COMMENCED		
a. Is this the required route?	8.2	Required Route
b. Where is the present position ?	8.5	Check measurements
c. How does the ECDIS indicate what is safe and what is not ?	8.5	Look Ahead
d. What's that noise ?	8.6 / 13	Alarms / Alarms and Indicators
e. Can the voyage be recorded ?	14	Voyage Recording
f. How much reliance should be placed on ECDIS?	17	Over-reliance on ECDIS

Module 3. ADDITIONAL FEATURES AND FUNCTIONS

QUESTION	IMO REF.	SUBJECT MATTER
A. WHAT ADDITIONAL INFORMATION IS NEEDED ?		
a. What other information can this system display ?	10	Display and function of other navigational information
b. What can go wrong ?	11	Errors in Displayed Data
c. What interpretation errors are possible ?	12	Errors of Interpretation
d. How much reliance should be placed on the information ?	17	Over-reliance on ECDIS

5 DETAILED DEVELOPMENT CRITERIA

This section of the report sets out the detailed criteria to be included under the suggested 'Reference' questions above.

5.1 MODULE 1 - INTRODUCTION

As stated above, the sections of the IMO Model Course contained within the proposed 'INTRODUCTION' module are 'information' subjects within the Model Course that are closely linked to each other. They can be covered by information screens and multiple choice questions at the end of the section to verify the trainee's understanding and knowledge of the subject.

QUESTION	IMO REF.	SUBJECT MATTER	
A. I HAVE AN ELECTRONIC CHART SYSTEM ON THE BRIDGE:			
a. Is an ECDIS required ?	1.1	CARRIAGE REQUIREMENTS	REFER to SOLAS Ch. V, as amended. ³²
b. What is it for ?	1.3	PERFORMANCE STANDARDS	REFER to IMO Performance Standard ³³ and the reference to contribute to safe navigation.
c. What does it look like when I switch it on ?	2 / 6 [10.2] 14	PRINCIPAL TYPES OF ELECTRONIC CHART / BASIC NAVIGATION FUNCTIONS AND SETTINGS / [DISPLAY AND FUNCTION OF OTHER NAVIGATIONAL INFORMATION] DOCUMENTATION	Differentiate between raster and vector charts. Given that the CBT package will probably be carried out on board ship, the trainee should be familiar with the basic navigational functions and settings. However, an introduction to the various levels of operation may be included at this point, including a reference to the 'type specific' nature of the CBT package. It may be appropriate to incorporate video clips of system controls to demonstrate the automatic and manual functions outlined in sub-sections 6.1 and 6.2, as well as changes to Vectors, including text referring to their benefits and drawbacks. (§6.5). (If the trainee is unfamiliar with the type specific nature of the CBT package, he will have an opportunity here to familiarise himself with these functions.) REFER to the functionality offered under "Own Chart Entries" (§§6.3) but this will be covered in greater and practical detail during part 2 of the CBT package when looking at Route Planning and Route Monitoring. [EXPLAIN how auto track-keeping works.] OUTLINE how automatic voyage recording is achieved and how the results may be called up.
d. What can it do ?			

³² SOLAS, Amendments 2000, Ch. V, Reg. 19, 2.1.4, 2.1.5

³³ IMO Resolution A.817(19) as amended by Resolutions MSC64(67) and MSC86(70)

QUESTION	IMO REF.	SUBJECT MATTER	
e. Can it do everything? Can the paper charts be dispensed with?	5 / 17 / 1.2	SENSORS / OVER-RELIANCE ON ECDIS / EQUIVALENCY	<p>The trainee must know what sensors are available, and the advantages and disadvantages of each.</p> <p>Outline minimum requirements for sensors - i.e. GPS, speed log and gyro. REFER to A.817(19), 12.2</p> <p>EXPLAIN that other sensors may be included to enhance the capability.</p> <p>The mariner must realize that the accuracy of any ECDIS system will vary with sensor accuracy, chart accuracy, user settings, and other system variables. The prudent mariner should frequently use other available methods, independent of ECDIS, to determine the vessel's position, course and speed.</p> <p>LOOK OUT OF THE WINDOW !!</p>
B. HOW DOES IT WORK ?			
a. Whose idea was this?	1.3	PERFORMANCE STANDARDS	<p>REFER to IMO Performance Standard, IHO Special Publications S-52³⁴ and S-57³⁵ and to IEC 61174³⁶.</p> <p>EXPLAIN the roles of each of these bodies and their interconnection.</p>
b. Who set the rules?	1.3	PERFORMANCE STANDARDS	
c. Is this an ECDIS or an ECS?	1.2 / 2 3 / 4	DEFINITION OF ECDIS AND ECS	<p>Using the definition of ECDIS from IMO Res. A.817(19), EXPLAIN the difference between ECDIS and ECS, emphasising the fact that there must be adequate back-up paper charts when working in RCDS mode.</p> <p>REFER to official and unofficial chart sources.</p> <p>INCLUDE a cautionary note about only using official data - if not, use alternative primary navigation means.</p> <p>Sections 3 and 4 of the IMO Model Course are extensive in their reference to the more technical aspects of ENC's and ECDIS. It will be necessary here to go into significant detail to EXPLAIN these but this detail must be tempered by a need not to 'bore' the trainee and lose his interest.</p> <p>Specific details are given below at p 31.</p>
d. What do the different types of chart mean and when can they be used?		ECDIS DATA PRESENTATION OF ECDIS DATA	

³⁴ International Hydrographic Organization Special Publication No. 52 - Specifications for Chart Contents and Display Aspects of ECDIS

³⁵ International Hydrographic Organization Special Publication No. 57 - Transfer Standard for Digital Hydrographic Data

³⁶ International Electrotechnical Commission publication 61174 "Maritime navigation and radiocommunications equipment and systems - Electronic Chart Display and Information Systems (ECDIS) - operational and performance requirements, methods of testing and required results."

QUESTION	IMO REF.	SUBJECT MATTER
e. What indications are there that the charts are up-to-date ?	1.4 / 9	<p>DATA PROCUREMENT / UPDATING</p> <p>EXPLAIN the need for a responsible approach to the use of sensible and valid data, including the need to ensure that all charts in use are up to date.</p> <p>EXPLAIN updating procedures both from the 'functional' aspect - how is it carried out - and from the technical aspect - how does a hydrographic office produce updates etc.</p> <p>EXPLAIN that verification of chart data - 'Legend' - can be obtained at any time when the system is in use.</p>
f. What are the potential sources of errors?	11 12 17	<p>ERRORS IN DISPLAYED DATA</p> <p>ERRORS OF INTERPRETATION</p> <p>OVER-RELIANCE ON ECDIS</p> <p>EXPLAIN that it is extremely important that the user understands and acknowledges the potential for system errors and malfunctions, including errors in displayed data, errors of interpretation, incorrect user set-up, or improper configuration or calibration of system parameters.</p>
g. What training is required in the use of this equipment ?	1.5	<p>TRAINING REQUIREMENTS</p> <p>EXPLAIN that in the STCW Convention no particular formal emphasis is placed on ECDIS systems. However, the IMO have developed a Model Course, in which it clearly states that</p> <p><i>"Unlike charts, ECDIS is a complex navigation system of a highly sophisticated level which includes not only a large number of navigational functions, but also components of a complex computer-based information system ... care must be taken when navigating with ECDIS and using its navigational functions to avoid misinformation and malfunctions."</i> ³⁷</p> <p><i>"Every master, chief mate and officer in charge of a navigational watch on a ship fitted with ECDIS should have completed a course in the use of ECDIS."</i> ³⁸</p> <p>EXPLAIN that these are only recommendations.</p>

³⁷ IMO Model Course, p.1

³⁸ *ibid*, p.6

QUESTION	IMO REF.	SUBJECT MATTER	
C. WHAT INDICATIONS ARE THERE THAT THE ECDIS IS WORKING CORRECTLY ?			
a. How is this checked ?	15 / 5	INTEGRITY MONITORING / SENSORS	<p>EXPLAIN that the system will perform its own integrity monitoring during boot up and that the user has the capability to check the system during operation.</p> <p>It is also desirable to incorporate information regarding the sensor inputs to the system, its possible network framework and the implications of the network on sensor redundancy.</p>
b. Can it check itself ?			
c. What's that noise ?	13	ALARMS AND INDICATORS	<p>Use definitions from A.817(19), Appx. 5 to differentiate between ALARMS and INDICATORS.</p> <p>REFER to lists in Appx. 5 for items to generate Alarms and Indicators.</p>
d. What is that message on the screen ?			
e. What action is required if it all goes wrong ?	16	BACK UP	<p>EXPLAIN that individual systems will have individual back-up arrangements and that the user needs to be aware of what these arrangements would be on his own ship.</p> <p>REFER to the need to make periodic back up of data, as with any other computer system - e.g. 'File Manager' option.</p>

5.2 STUDENT TEST 1

At the end of this section it will be necessary to incorporate a test of the trainee's understanding of his progress so far.

The CBT package will contain a library of questions and the test will consist of selecting at random say, 8 questions from a pool of 12. (See pp 43 - 44 below for more information on the software and visual application of this subject matter to the CBT package.)

This will take the form of a multiple-choice questionnaire.

As an example, the questions may take the form below:

GENERAL ECDIS KNOWLEDGE, INCLUDING LEGAL ASPECTS ETC.

1	What is the difference between an ENC and other electronic charts ?
A	An ENC has more navigational features than any other electronic chart
B	An ENC is an officially approved vector chart
C	An ENC is an officially approved raster chart
D	An ENC is easier to view than other electronic charts

4	How many 'layers' of digital information can a raster chart display ?
A	It depends on how much memory the system has
B	One
C	Up to nine
D	It depends on which authority issued the chart

5	The Performance Standards for ECDIS were set by
A	ILO
B	IHO
C	IMO
D	United Kingdom Hydrographic Office

7	What is considered to be a potentially significant risk when using ECDIS?
A	The ECDIS will reduce manning causing increased stress among the officers.
B	The users may rely too heavily on ECDIS and not be aware of the conditions that can affect the accuracy of the displayed information.
C	The ECDIS may cause dangerous situations because navigators will now plot courses through narrow passages previously considered too restricted.
D	There are no significant risks associated with ECDIS.

In determining the content of the questions, we have taken heed of "*Bloom's Taxonomy*"³⁹ (see also Appendix 3) so that the trainee's answer to the question should reflect the desired outcome of the relevant section of the IMO Model Course. (See pp. 44 - 45 below for more information on the development of questions and exercises.)

The full library of questions is included with this report at Appx. 1.

³⁹ Bloom, BS(Ed.)(1956) "*Taxonomy of Educational Objectives: The classification of educational goals; Handbook 1, cognitive domain.* New York; Toronto. Longmans, Green.

DETAILED DEVELOPMENT CRITERIA (CONTD.)

5.3 MODULE 2 - ROUTE PLANNING AND ROUTE MONITORING

Within this module of the CBT package, it is suggested that the majority of the trainee's input should be related to practical exercises utilising a particular system. (Where this training package is carried out on board a ship, this input would be relevant to that system in use on a day-to-day basis.)

As can be seen in FIG. 2 above, the principal sections of the IMO Model Course to be addressed in this section relate particularly to ROUTE PLANNING (§7) and ROUTE MONITORING (§8). These are associated with the section on "BASIC NAVIGATIONAL SETTINGS AND FUNCTIONS" (§6) and "DOCUMENTATION" (§14). SENSORS (§5) also have a significant part to play in this section.

[It is perhaps interesting to note at this stage that the recommendations to instructors in the IMO Model Course for §§7 and 8 revolve principally around 'DEMONSTRATE' and 'EXPLAIN'. It would seem appropriate, therefore, to utilise screen capture demonstrations of functionality in the initial stages of this section for demonstration and information screens for explanation.]

With respect to ROUTE PLANNING, the recommendations in the IMO Model Course include that

*"the course should contain three comprehensive route planning and monitoring lessons with increasing complexity (open sea, coastal, pilotage). At the beginning, the training should start with simple exercises in fairly easy conditions as described in the scenario for "open sea". The workload should be increased as the trainees exhibit greater skill."*⁴⁰

and, with respect to ROUTE MONITORING,

*"The route monitoring should take place in real time, preferably using a full-mission navigation simulator."*⁴¹

It is considered that these joint objectives may be achieved without the need for either a full-mission simulator or in real-time. At §D2.3 of the IMO Model Course it states:

ECDIS workstation versus "full-mission simulator"

"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."*⁴²

For ROUTE MONITORING, to do so in real-time would be unrealistic and unnecessarily time-consuming for training in a shipboard environment. In considering the 'area objective' for §8 of the IMO Model Course, it states that

*"The trainee shall be able to operate all specific functions for route monitoring and obtain all relevant information for navigation and for the ship's safety."*⁴³

It is considered that these objectives can be realised through appropriately structured exercises.

Given that the students will be carrying out this CBT package in connection with equipment that, in all probability, they are already familiar with, it is suggested that the number of exercises be reduced to two. The first exercise would be a relatively straightforward Voyage Plan from one pilot station to another, while the second would require planning within pilotage waters, as well as the incorporation of appropriate additional functions.

⁴⁰ IMO Model Course , §4.7, p.33

⁴¹ *ibid*, §4.8, p.33

⁴² *ibid*, p. 26

⁴³ *ibid*, p. 19

The ROUTE PLANNING AND ROUTE MONITORING exercises can be structured to demonstrate the trainee's capabilities with respect to the recommendations above, as well as allowing for 'fault finding and rectification' - either through use of an inbuilt simulation programme or through appropriate multiple choice questions. (See also pp. 45 & 48 below.)

Before detailing the appropriate exercises, the CBT package must address the theoretical and hypothetical questions raised earlier. Appropriate test questions would need to be incorporated into this module before the trainee proceeds to the practical exercises.

QUESTION	IMO REF.	SUBJECT MATTER	
A. USING PAPER CHARTS, HOW IS THE ROUTE PLANNED?			
a. Which charts should be use ?	2 / 7.1	PRINCIPAL TYPES OF ELECTRONIC CHARTS / SEA AREA SELECTION	Outline types of chart available, as noted in §1.A.d. ENCOURAGE the use of VECTOR charts. (This would serve as a reminder of the 'official' nature of ENC's and their implication on ECS vs. ECDIS.)
b. Where are they ?	3.7 / 6	LOADING AND STORING / BASIC NAVIGATIONAL FUNCTIONS AND SETTINGS	EXPLAIN how charts are stored as 'single charts' or in 'portfolios'. EXPLAIN that safety checking will only take place on charts in a selected portfolio for the whole route. Use video clips for sea area selection / chart selection etc.
c. Are they up-to-date ?	6 / 9	BASIC NAVIGATIONAL FUNCTIONS AND SETTINGS / UPDATING	EXPLAIN Updating procedures from the hydrographic office and from the system. Also EXPLAIN the use of the 'Legend' option in system to call up chart legend with appropriate information.
d. What about new Notices to Mariners, Temporary and Preliminary Notice's Navtex warnings etc. ?	6.3	OWN CHART ENTRIES	EXPLAIN that the user may enter his own information - "Mariner's Notes" - and that these may be incorporated into the safety checking, even if they are placed on an RNC.
e. Where is the initial action required ?	7.1	SEA AREA SELECTION	EXPLAIN the possibility for 'Go To Posn' options of stored positions for ease of plotting.
f. What controls are used to apply to this route ?	7.5 / 7.7	CURVED TRACK PLANNING / SAFETY VALUES	EXPLAIN that the system will allow the user to enter safety critical criteria into the Voyage Plan which will assist with the safety checking and route monitoring. Include reference to Own Ship speed, min and max speeds and XTE. REFER to definitions previously described in §1, in particular Safety Depth, Safety Contour.

QUESTION	IMO REF.	SUBJECT MATTER	
g. How can the safety of the chosen route be checked ?	7.8 / 7.9	CHECK FOR NAVIGATIONAL SAFETY / ULTIMATE ROUTE	Given that appropriate safety values have been entered into the Voyage Plan, EXPLAIN how the system checks along the route. EXPLAIN 'Validate' and the possible need to amend the route until errors and warnings are no longer extant.
h. How are extra details included on the Voyage Plan ?	7.6	PLANNING NOTES	EXPLAIN that the system allows the user to enter Notes into the Voyage Plan, as well as entering 'Critical Points' that produce an on-screen warning.
i. Can the Voyage Plan be printed ?	6	BASIC NAV FUNCTIONS AND SETTINGS	EXPLAIN the option to Print Plan from the Voyage Plan Edit sub-menu, using appropriate screen capture video if req'd.
j. What if ... ?	16	BACK UP	EXPLAIN the option to save and transfer that information via the network or by floppy disk. REMINDE that, as back-up arrangements will vary from ship to ship, it is essential that the trainee is familiar with the appropriate measures on his own ship.
k. How much reliance can be placed on this system ?	17	OVER-RELIANCE ON ECDIS	Incorporate an appropriate 'reminder' screen.
B. THE VOYAGE HAS COMMENCED.			
a. Is this the required route ?	8.2	REQUIRED ROUTE	EXPLAIN the selection of the required route from the Voyage Plan sub-menu - Load Plan.
b. What is the present position?	8.4 [6.2, 6.3]	CHECK MEASUREMENTS	The system is provided with EBL and VRM options - EXPLAIN how these can be used to check the ship's plotted position from visual / radar range and bearing. [This also allows the option to demonstrate the difference in position presentation on screen.]
c. How does the ECDIS indicate what is safe and what is not ?	8.5	LOOK AHEAD	EXPLAIN that, once a Voyage Plan is started, the automatic safety checking will generate alarms and warnings along the track, dependent upon the value set for 'Look Ahead' time, as well as safety depth and safety height. EXPLAIN that if not tracking on a loaded plan, this safety checking is changed.
d. What's that noise ?	8.6 / 13	ALARMS / ALARMS AND INDICATORS	Give more specific detail and examples from the information given at §1.

QUESTION	IMO REF.	SUBJECT MATTER	
e. Can the voyage be recorded?	14	VOYAGE RECORDING	EXPLAIN how the contents of automatic voyage recording are called up, including the option to view several tracks from different position input sources.
f. How much reliance should be placed on ECDIS?	17	OVER-RELIANCE ON ECDIS	REMIND the user of the need to check own ship's position by 'external' means. Also to maintain a plot on paper charts.

DETAILED DEVELOPMENT CRITERIA (CONTD.)

5.4 MODULE 3 - ADDITIONAL FEATURES AND FUNCTIONS

There are a number of subject areas within the IMO Model Course that do not neatly fit into the previous two modules. They are probably best summed up by the first question below 'What else do I need to know?'

This module looks at the recording and information management capabilities of ECDIS, as well as considering the presentation of other navigational information, such as radar and AIS.

QUESTION	IMO REF.	SUBJECT MATTER	
A. WHAT ADDITIONAL INFORMATION IS NEEDED. ?			
a. What other information can this system display ?	10	DISPLAY AND FUNCTION OF OTHER NAVIGATIONAL INFORMATION	EXPLAIN that radar information may be overlaid into the system, depending upon the options taken up on installation. REFER to the need to be aware that, if this is available on the system, that errors can occur due to radar offsets and the input of specific information in the own ship set up - e.g., incorrect position of radar scanner. REFER also to the possibility that AIS information may be displayed in ECDIS.
b. What can go wrong ?	11	ERRORS IN DISPLAYED DATA	REFER back to references on chart / hydrographic data accuracy in §1 . REFER also to sensor accuracy and the need to check own ship's position by 'external' means.
c. What interpretation errors are possible ?	12	ERRORS OF INTERPRETATION	EXPLAIN the errors of interpretation due to: <ul style="list-style-type: none"> - different modes of vector stabilization - overscale of the display - neglecting the 95% probability of the accuracy standard of the fixing sensor - automatic track-keeping features such as the continuous display of own ship's position on the pre-planned track - difference between true north and gyro north. Avoid errors of interpretation by verifying the selection of: <ul style="list-style-type: none"> - a common reference system - the appropriate scale - the sensors best suited for the given situation - the safety values - display categories - usage, etc.
d. How much reliance should be placed on the	17	OVER-RELIANCE ON ECDIS	Incorporate an appropriate 'reminder' screen. REMIND the user of the need to check own ship's position by 'external' means.

QUESTION	IMO REF.	SUBJECT MATTER
informatio?		

6 IMO MODEL COURSE SYLLABUS - A COMPARISON WITH THE CBT PROPOSALS

In the IMO Model Course it states that

"All [learning] objectives are understood to be prefixed by the words "The expected learning outcome is that the trainee is able to ..."44

In assessing the relevance of the proposed CBT material to the appropriate sections of the IMO Model Course syllabus, the table below outlines the specific learning objectives and provides an indication of how that may be achieved within the CBT package.

AREA OBJECTIVE AND SYLLABUS OUTLINE	CBT REFERENCE	CBT APPLICATION AND TRAINEE TASK
1. DESCRIBE THE ESSENTIAL LEGAL ASPECTS AND RESPONSIBILITIES IN THE USE OF ECDIS		
1.1 CARRIAGE REQUIREMENTS: Explain the SOLAS (chapter V) carriage requirements concerning the carriage of paper charts	1.A.a	'Information screens' associated with multiple choice questions will address these topics.
1.2 EQUIVALENCY: Explain the equivalency of ECDIS and paper charts to make it clear that only ECDIS using the official ENC entitles him to navigate without paper charts	1.A.c 1.B.c, 1.B.d	
1.3 PERFORMANCE STANDARDS: Outline the IMO performance standards for ECDIS	1.A.b 1.B.a, b	
1.4 DATA PROCUREMENT: Explain and accept his responsibilities with regard to "data procurement"	1.B.e	
1.5 TRAINING REQUIREMENTS: Explain and accept the training requirements concerning the operation of navigation equipment	1.B.g	
2. STATE THE MAIN CHARACTERISTICS OF PRINCIPAL TYPES OF ELECTRONIC CHART (VECTOR AND RASTER)		
State: - the differences between different ECDIS systems - the differences between ECDIS and ECS - the differences between vector and raster charts	1.A.c, 1.A.d 1.B.c, 1.B.d	'Information screens' associated with multiple choice questions will address these topics.

⁴⁴ IMO Model Course, p.15

AREA OBJECTIVE AND SYLLABUS OUTLINE	CBT REFERENCE	CBT APPLICATION AND TRAINEE TASK
	2.A.a	Route Planning and Route Monitoring exercises will ensure appropriate selection.
3. EXPLAIN ALL SAFETY-RELEVANT AS WELL AS OTHER MAJOR CHARACTERISTICS OF ECDIS DATA SUCH AS DATA CONTENTS, HANDLE ECDIS DATA ON BOARD AND ASSESS ALL ERRORS, INACCURACIES AND AMBIGUITIES CAUSED BY IMPROPER DATA MANAGEMENT.		
3.1 TERMS AND DEFINITIONS: Describe the terms and definitions used in the context of ECDIS, such as S-52, S-57, "object-oriented" data, "vector data", presentation-independence of data, ENC and SENC	1.B.c, 1.B.d	'Information screens' associated with multiple choice questions will address these topics.
3.2 DATA STRUCTURE AND DATABASE: Explain <ul style="list-style-type: none"> - the data structure and databases of ECDIS, including objects and their attributes (object catalogue) - that the display is a portrait of ECDIS data, i.e. only the information contained and structured in the objects/attributes is available for display - how manual updates are entered in the database 		
3.3 ENC CREATION: Outline the steps and responsibilities during ENC creation		
3.4 DATA QUALITY: Explain why chart data quality is dependent on factors such as (survey-)accuracy, updatedness, coverage and completeness of chart data Assess that the data quality is doubtful due to the change of the factors named above		
3.5 REFERENCE SYSTEMS: Explain the different reference systems used for positioning (including time, direction, speed) and associated problems in ECDIS as well as the effects of horizontal and vertical datum		
3.6 DATA DISTRIBUTION: Outline the organization of chart data distribution	1.B.c, 1.B.d 2.A.b	Route Planning and Route Monitoring exercises demonstrate the trainee's ability to select appropriate charts and store them in an associated portfolio.
3.7 LOADING AND STORING: Demonstrate the loading and storing of ECDIS data by calling up the directory of available chart data and by importing data for the waters in question		

AREA OBJECTIVE AND SYLLABUS OUTLINE	CBT REFERENCE	CBT APPLICATION AND TRAINEE TASK

AREA OBJECTIVE AND SYLLABUS OUTLINE	CBT REFERENCE	CBT APPLICATION AND TRAINEE TASK
4. EXPLAIN THE MAIN CHARACTERISTICS OF THE DISPLAY OF ECDIS DATA AND SELECT PROPER INFORMATION FOR THE NAVIGATIONAL TASKS		
4.1 PRESENTATION LIBRARY: Explain the major rules for presentation contained in the presentation library for ECDIS Apply the major rules for presentation to the display presentation		'Information screens' associated with multiple-choice questions will address this topic.
4.2 SCOPE AND SELECTION OF CHART DATA (DISPLAY CATEGORIES): Describe the scope and selection of chart data to be displayed Select the relevant information contents by the display categories "Display base", "Standard display" and "All other information" Apply the different possibilities of selection of the sea area	1.A.c	
4.3 AUTOMATIC PRESENTATION RULES: Outline the meaning of automatic presentation rules for ECDIS Select and apply appropriate display modes such as: <ul style="list-style-type: none"> - display category - scale - day or night presentation assess the resulting differences in information	1.B.c, 1.B.d	Route Planning and Route Monitoring exercises demonstrate the trainee's ability to select and apply the suitable mode of presentation. Multiple choice questions demonstrate his ability to assess the differences.
4.4 MODES OF PRESENTATION: Identify the different modes of presentation such as: <ul style="list-style-type: none"> - true or relative motion - north-up or course-up stabilization select and apply the suitable mode of presentation for the actual situation		

AREA OBJECTIVE AND SYLLABUS OUTLINE	CBT REFERENCE	CBT APPLICATION AND TRAINEE TASK
5. DESCRIBE THE PERFORMANCE LIMITS OF SENSORS AND ASSESS THEIR IMPACT ON THE SAFE USE OF ECDIS		
5.1 PERFORMANCE LIMITS Explain the performance limits concerning availability, accuracy and integrity of all navigational sensors connected to ECDIS (i.e. devices to determine position, course, speed and depth as well as radar) Assess the impairment of ECDIS performance in the case of deterioration in sensor performance	1.A.e 1.C.a	'Information screens' associated with multiple choice questions will address these topics.
5.2 FALL-BACK SENSOR SYSTEMS Select and use an appropriate fall-back sensor system by switching to it or alternatively notice automatic switch-over and use of the fall-back system	1.C.a	
5.3 DATA REFERENCE SYSTEM Explain the data reference system of each connected sensor (e.g. geodetic system, position of antenna and transducer)		
5.4 SELECTION OF APPROPRIATE AND UNAMBIGUOUS SENSOR DATA Explain the need for selection of appropriate and unambiguous sensor data displayed in ECDIS		
5.5 PLAUSIBILITY OF SENSOR INPUT Assess the plausibility of sensor input values to ECDIS		

AREA OBJECTIVE AND SYLLABUS OUTLINE	CBT REFERENCE	CBT APPLICATION AND TRAINEE TASK
6. OPERATE ALL BASIC NAVIGATIONAL FUNCTIONS AND SETTINGS		
6.1 AUTOMATIC FUNCTIONS Identify all automatic functions required for monitoring ship's safety such as the display of position, heading/gyro course, speed, safety values and time	1.A.c, 1.A.d	Route Planning and Route Monitoring exercises demonstrate the trainee's ability to 'navigate' his way through the various functions of the system.
6.2 MANUAL FUNCTIONS Demonstrate: <ul style="list-style-type: none"> - how manual functions and elements such as cursor, electronic bearing line and range rings are used - how a position which was not automatically determined is marked on the ECDIS display - how position-fixing methods are applied within ECDIS (line of position) - how the range scale and/or the scale is changed, how own ship's safety values such as "safety contour" or "safety depth" are set 	1.A.c, 1.A.d 2.A.b 2.B.b	
6.3 OWN CHART ENTRIES <ul style="list-style-type: none"> - how own chart entries like "Mariner's notes" or events are applied - how own chart entries are removed 	2.A.d 2.B.b	
6.4 PRESENTATION OF NAVIGATIONAL MARKS Demonstrate how the presentation of navigation marks is changed	1.A.c, 1.A.d	
6.5 VECTOR TYPES Demonstrate the two vector types indicating the ship's motion over the ground and through the water and their benefits and drawbacks		

AREA OBJECTIVE AND SYLLABUS OUTLINE	CBT REFERENCE	CBT APPLICATION AND TRAINEE TASK
7. OPERATE ALL SPECIFIC FUNCTIONS AND OBTAIN ALL RELEVANT INFORMATION FOR ROUTE PLANNING FROM ECDIS		
7.1 SEA AREA SELECTION Demonstrate how the sea areas and the required waters for planning the whole passage are selected for display	2.A.a 2.A.e	Voyage Planning and Route Monitoring exercises demonstrate the trainee's ability to plan a route, to assess its navigational safety and to modify it as necessary so that the final route is one which can be safely followed.
7.2 ROUTE PLANNING INFORMATION Demonstrate: <ul style="list-style-type: none"> - how relevant route planning information such as sailing directions, tidal or meteorological information is gained from ECDIS and other sources - how information required for specific situations such as anchoring is obtained 	2.A.f 2.A.h	
7.3 CONSTRUCTION OF A ROUTE Demonstrate how the construction of a route is performed by the input of waypoints, both directly on the ECDIS display and alphanumerically	2.A.e 2.A.f	
7.4 ADJUSTMENT OF A PLANNED ROUTE Demonstrate how the adjustment of a planned route by editing waypoints is performed	2.A.g	
7.5 CURVED TRACK PLANNING Demonstrate: <ul style="list-style-type: none"> - how curved track planning is performed by the input of turning radii, wheel-over points/lines and safe speeds - how courses and distances of the track are obtained from the chart by different methods such as cursor position, selection of legs or recalling the waypoint list - how time marks are set - how track limits are set 	2.A.f	
7.6 PLANNING NOTES Demonstrate: <ul style="list-style-type: none"> - how planning notes such as courses, rudder angles and speeds to be maintained in a specific area are applied - how expected passage times are determined - how current is to be considered when plotting a track in the ECDIS display 	2.A.h	

AREA OBJECTIVE AND SYLLABUS OUTLINE	CBT REFERENCE	CBT APPLICATION AND TRAINEE TASK
7.7 SAFETY VALUES Assess which safety values are to be selected in accordance with the ship's dimensions and the manoeuvring parameters to be applied	2.A.f	
7.8 CHECK FOR NAVIGATIONAL SAFETY Demonstrate how a planned route is checked for navigational safety	2.A.g	
7.9 ULTIMATE ROUTE Assess: <ul style="list-style-type: none"> - if a track is reliably safe by considering all predictable hazards along it - which ultimate route is to be taken - which points/areas are critical 	2.A.g	
8. OPERATE ALL SPECIFIC FUNCTIONS FOR ROUTE MONITORING AND OBTAIN ALL RELEVANT INFORMATION FOR NAVIGATION AND FOR THE SHIP'S SAFETY		
8.1 MONITORED AREA Demonstrate how a monitored area is selected, left and returned to	1.A.d	Voyage Planning and Route Monitoring exercises demonstrate the trainee's ability to: <ul style="list-style-type: none"> - select an appropriate route - to verify his own displayed position by external means - to change parameters that will affect the display of alarms and indicators - to assess current and wind information presented to him by ECDIS.
8.2 REQUIRED ROUTE Demonstrate how the required route is selected, called up and, if necessary, modified	2.B.a	
8.3 VECTOR-TIME Demonstrate how a predicted position can be generated by setting a "vector-time" and explain the relevance of "vector-time" information	1.A.c	
8.4 CHECK MEASUREMENTS Demonstrate how check measurements of the ship's position, independent of the ECDIS equipment including its sensors, are performed and plotted in ECDIS	2.B.b	
8.5 LOOK-AHEAD FUNCTION Explain the relevance of the "look-ahead" function and demonstrate how the "look-ahead" function is performed	2.B.c	

AREA OBJECTIVE AND SYLLABUS OUTLINE	CBT REFERENCE	CBT APPLICATION AND TRAINEE TASK
<p>8.6 ALARMS</p> <p>Explain how the alarms concerning route monitoring are triggered, e.g.,</p> <ul style="list-style-type: none"> - by crossing a safety contour or prohibited area - by violation of the set limits for deviation from arrival at a critical point of the route <p>Demonstrate how alarms are set with regard to their presentation and their alarm levels</p> <p>Assess the significance of the different alarms concerning route monitoring</p>	2.B.d	
<p>8.7 CURRENT AND WIND</p> <p>Demonstrate how values for current and wind which are obtained from external sources are applied to ECDIS</p>	1.A.e	
<p>9. PERFORM UPDATES AND APPRECIATE THE IMPORTANCE OF UPDATING</p>		
<p>9.1 PRODUCTION AND DISTRIBUTION OF UPDATES</p> <p>Outline:</p> <ul style="list-style-type: none"> - how the production of updates by national Hydrographic services is performed - how the distribution of updates by regional data centres is organised and executed 		<p>'Information screens' associated with multiple choice questions will address these topics.</p>
<p>9.2 MANUAL, SEMI-AUTOMATIC AND AUTOMATIC UPDATING</p> <p>Explain the essentials of manual, semi-automatic and automatic updating</p>	1.B.e	
<p>9.3 PERFORMING UPDATES ON BOARD</p> <p>Perform updates on board by:</p> <ul style="list-style-type: none"> - performing the manual and semi-automatic updating procedures - indicating how items which are added to, removed from or altered on the original ENC are marked and indicated - displaying updates in order to: <ul style="list-style-type: none"> • review their contents and • ascertain that they have been included in the SENC 	2.A.c	<p>Route Planning and Route Monitoring exercises demonstrate the trainee's ability to verify the validity and currency of the latest update information within the system.</p>
<p>9.4 UPDATING AND SAFE NAVIGATION</p> <p>realize that only continuously updated data allow safe navigation</p>		<p>Multiple choice questions will address this topic.</p>

AREA OBJECTIVE AND SYLLABUS OUTLINE	CBT REFERENCE	CBT APPLICATION AND TRAINEE TASK
10. EXPLAIN THE DISPLAY AND POSSIBLE DANGERS AND DEMONSTRATE THE FUNCTION OF OTHER NAVIGATIONAL INFORMATION		
10.1 RADAR SUPERIMPOSITION Demonstrate how radar superimposition is employed Explain and assess possible offsets of radar echoes of fixed charted objects from their charted position	3.A.a	With appropriate simulation input to the CBT package, it would be possible to incorporate radar and transponder information into the Voyage Planning and Route Monitoring exercises. Where this is not possible, 'Information screens' associated with multiple choice questions will be incorporated to address these subjects.
10.2 AUTOMATIC TRACK-KEEPING Indicate how automatic track-keeping is employed Describe the potential dangers of the automatic track-keeping mode	1.A.c 1.A.d	
10.3 USE OF TRANSPONDERS Demonstrate the use of information from transponders	3.A.a	
11. EXPLAIN THE POTENTIAL ERRORS OF DISPLAYED DATA AND TAKE PROPER ACTION		
11.1 POTENTIAL ERRORS IN THE ECDIS DISPLAY Explain the potential errors of the ECDIS display due to: <ul style="list-style-type: none"> - inaccurate hydrographic data - poor resolution - the shifting of buoys 	1.b.f 3.A.b	'Information screens' associated with multiple choice questions will address these topics.
11.2 POTENTIAL ERRORS IN THE DISPLAY OF OWN SHIP'S POSITION Explain that potential errors introduced by: <ul style="list-style-type: none"> - inaccurate input from the electronic position-fixing system - inaccurate input of radar data - different geodetic co-ordinate systems - reference position of sensors on board may result in errors in the display of own ship's position 	1.A.e	
11.3 CORRECTNESS OF DISPLAYED DATA Check the correctness of displayed data: <ul style="list-style-type: none"> - by comparing ECDIS and radar information - by checking the ship's position by means of a second independent position-fixing system 	2.B.b	Route Planning and Route Monitoring exercises demonstrate the trainee's ability to verify his own displayed position by external means.

AREA OBJECTIVE AND SYLLABUS OUTLINE	CBT REFERENCE	CBT APPLICATION AND TRAINEE TASK
12. EXPLAIN THE POTENTIAL ERRORS OF INTERPRETATION AND TAKE PROPER ACTION TO AVOID THESE ERRORS		
<p>Explain the errors of interpretation due to:</p> <ul style="list-style-type: none"> - different modes of vector stabilization - overscale of the display - neglecting the 95% probability of the accuracy standard of the fixing sensor - automatic track-keeping features such as the continuous display of own ship's position on the pre-planned track - difference between true north and gyro north <p>Avoid errors of interpretation by verifying the selection of:</p> <ul style="list-style-type: none"> - a common reference system - the appropriate scale - the sensors best suited for the given situation - the safety values - display categories - usage, etc. 	<p>1.B.f 3.A.c</p>	<p>'Information screens' associated with multiple choice questions will address these topics.</p>
13. EXPLAIN THE STATUS INDICATIONS, INDICATORS AND ALARMS FOR DIFFERENT KINDS OF SITUATION AND TAKE PROPER ACTION		
<p>13.1 DEFINITION AND MEANING OF INDICATORS AND ALARMS</p> <p>Outline the definition and meaning of status indications, indicators and alarms related to ECDIS, including the areas for which ECDIS should provide an alarm or indication</p>	<p>1.A.c 1.A.d</p>	<p>'Information screens' associated with multiple choice questions will address these topics.</p>
<p>13.2 NAUTICAL INDICATIONS / ALARMS AND SENSOR ALARMS</p> <p>Explain and analyse:</p> <ul style="list-style-type: none"> - the nautical indications during route planning - the nautical alarms during route monitoring - the sensor alarms and indications, and apply appropriate measures in the case of their occurrence 		
<p>13.3 DATA AND CHART ALARMS</p> <p>Explain and analyse the data and chart alarms resulting from a non-WGS 84 geodetic datum or overscale setting</p>		

AREA OBJECTIVE AND SYLLABUS OUTLINE	CBT REFERENCE	CBT APPLICATION AND TRAINEE TASK
14. UNDERSTAND THE MEANING OF VOYAGE RECORDING AND OPERATE THE CORRESPONDING FUNCTION		
14.1 AUTOMATIC VOYAGE RECORDING Outline the essentials of automatic voyage recording	1.A.c 1.A.d 2.B.e	'Information screens' associated with multiple-choice questions will address these topics. Additionally, Route Monitoring exercises will require the trainee to look into the 'Playback' facility to observe his progress.
14.2 RECONSTRUCTION OF PAST TRACK Demonstrate: <ul style="list-style-type: none"> - how the contents of automatic voyage recording are called up, in particular: <ul style="list-style-type: none"> • how a past track is constructed; • how the database use is verified • how possible selections of, for example, recording media or recording intervals are carried out 		
15. ANALYSE AND ASSESS THE FUNCTIONING OF ECDIS		
15.1 ON-LINE TEST Outline <ul style="list-style-type: none"> - the proceeding of the on-line test during booting - the on-line system check during normal operation 	1.C.a 1.C.b	Route Planning and Route Monitoring exercises demonstrate the trainee's ability to perform function tests verifying the validity of the chart data and to verify the proper functioning of the ECDIS display.
15.2 MANUAL AND VISUAL TESTS Perform <ul style="list-style-type: none"> - manual tests of the major functions of hardware, MMI and sensor data - visual tests of chart data 		
15.3 VERIFICATION OF PROPER FUNCTIONING Recognize all status indications <p>verify:</p> <ul style="list-style-type: none"> - the proper functioning of the ECDIS display and the position-fixing system by comparing ECDIS and radar objects or back-up positioning system - that all received updates are contained in the ECDIS display Assess that the navigation process is safe		

AREA OBJECTIVE AND SYLLABUS OUTLINE	CBT REFERENCE	CBT APPLICATION AND TRAINEE TASK
16. NAVIGATE AS SAFELY AS POSSIBLE USING THE BACK-UP SYSTEM IN THE CASE OF AN ECDIS FAILURE		
16.1 TAKEOVER BY BACK-UP SYSTEM Perform: <ul style="list-style-type: none"> - a safe takeover by the back-up system - a safe transfer of all relevant passage planning data from the ECDIS to the back-up system - a transfer of all relevant updates immediately to the back-up system 		If the CBT package is to be used in a 'stand alone' environment, it will be difficult to incorporate a practical demonstration of takeover by the back-up system.
16.2 REDUCED FUNCTIONAL CAPABILITIES Explain the reduced functional capabilities which are available with the back-up system Appreciate that the back-up system is only of limited performance and that the back-up system should be replaced by a properly functioning ECDIS as soon as possible.	1.C.e 2.A.j	'Information screens' associated with multiple choice questions will address these topics.
16.3 PERIODICAL FUNCTION TEST Explain that periodical function tests and practice of the takeover procedure are necessary in order to verify proper functioning of the back-up device in an emergency case		
<hr/>		
17. ASSESS THE LIMITS OF ECDIS AS A TOOL WHICH DOES NOT RELEASE THE NAVIGATOR FROM PROPER WATCHKEEPING		
Recognize: <ul style="list-style-type: none"> - that a potential risk of improper functioning of the system and of data inaccuracy is inherent in the system - that the displayed hydrographic data are not more reliable than the survey data on which they are based - that the displayed sensor data are not more reliable than the respective sensor systems they originate from - that ECDIS is only a tool that supports the mariner in the performing of the navigational tasks - that errors / inaccuracies in one system may influence the performance of other subsystems and potentially render the ECDIS useless Perform a navigational watch which is not based on only one system Assess <ul style="list-style-type: none"> - the integrity of the system and all data at all times - that he should also use other available aids to navigation and determine which ones are appropriate 	1.A,.e 1.B.f 2.A.k 2.B.f 3.A.d	Over-reliance on ECDIS has been stressed throughout the CBT package. Suitable multiple choice questions at various points within the package will allow the trainee to confirm his appreciation of the inherent limitations and restrictions associated with the use of ECDIS. They will also demonstrate his appreciation of the specific legal requirements relating to the carriage of paper charts in support of ECDIS and the difference between ECDIS and ECS.

7 CBT PACKAGE DEVELOPMENT

7.1 GENERAL

In developing an 'outline' CBT presentation, it was decided to use an off-the-shelf software programme.

As has been previously stated, it is essential to develop the CBT package with a visually stimulating format in order not to lose the interest and commitment of the trainee. This programme will allow for a variety of visual inputs, including background pictures, screen capture videos, photographs and the like.

Screen-capture 'video clips' would have the option to be shown on demand if the trainee is not familiar with the particular system on which he is training. It is proposed to record these using a software programme.

7.2 PRESENTATION OF TEXT - 'INFORMATION SCREENS'

It is desirable to allow the trainee to determine his own pace when working through the package.

This CBT package could be used by any navigating officer of any nationality and so careful consideration would need to be given to any assumptions made about his ability to read or understand the English language.

The software used in the trial allows for the presentation of text in a variety of ways: for example, it can be shown as a full text document, it can be shown 'page by page' (dependent upon the screen area assigned to it) or it can be shown paragraph by paragraph. It is also possible to automate the presentation such that the choice of mode referred to above can be associated to a 'time line' such that each section is displayed for a given period before proceeding to the next. Similarly, the software has the option to include voice narration of appropriate sections, particularly text.

For both these visual and audio options, consideration was given to other CBT packages that utilise these functions and their perceived attraction to the trainee. Where automatic 'page turning' occurred and/or audio commentary was applied, it was found to be too slow for a native English speaker but possibly too fast for a non-native English speaker.

In general terms, to provide the CBT package with universal attraction, it was felt that the assumption that the trainee could read English was more valid than that concerning his understanding of the spoken word. In conclusion, it was decided that text should be displayed by paragraph or by page with the facility for the trainee to display subsequent sections when he has read and understood it.

7.3 'INFORMATION SCREENS'

Much of the 'theoretical' requirements of the IMO Model Course can be addressed through 'information screens'. In particular, these subjects are mainly dealt with in '**MODULE 1 - INFORMATION**' and relate to the following sections of the IMO Model Course:

- | | |
|-------------------------------------|---|
| 1. LEGAL ASPECTS; | 2. PRINCIPAL TYPES OF ELECTRONIC CHART; |
| 3. CHARACTERISTICS OF ECDIS DATA; | 4. DISPLAY OF ECDIS DATA; |
| 5. SENSORS; | 9. UPDATING; |
| 10. OTHER NAVIGATIONAL INFORMATION; | 11. ERRORS OF DISPLAYED DATA; |
| 12. ERRORS OF INTERPRETATION; | 13. ALARMS AND |
| INDICATORS; | |
| 14. VOYAGE RECORDING; | 16. BACK-UP; |
| 17. OVER-RELIANCE ON ECDIS. | |

For the trainee on board a ship who is already using ECDIS as a day-to-day navigational tool, it may be argued that much of this material may be considered, at worst, to be potentially irrelevant and, at best, somewhat distracting and uninteresting. It will be essential, therefore, to cover the material in sufficient detail without being boring and to ensure that the range of multiple choice questions incorporated into the various test programmes validate the trainee's understanding of these subjects.

As noted above, the detail required under §§ 3 and 4, in particular, have the potential to generate a significant amount of text. As can be seen from the sample screens included with this report, extensive use of graphics should help to maintain the trainee's interest. Similarly, it is considered that the 'seamanlike' approach outlined above in dealing with the subjects by related issues will do the same.

It is proposed that, on each screen, reference to the appropriate section of the IMO Model Course is included.

7.4 TESTS AND EXERCISES

The software used in the trial has the capability to select material at random from an appropriate database. It is intended that the route planning exercises and test questions would be written into this database and the programme encoded to generate an appropriate random selection at the required locations.

It is desirable that this random element is utilised throughout the package to provide a degree of protection against possible cheating by a number of trainees on the same ship. If the 'test' is the same on every occasion, it will be easy enough to copy the requirements for the task on the first occasion and to pass them on to the next trainee.

It is possible to store scores from multiple choice questions within the system - either to floppy or hard disk - and to print them out.

7.5 STUDENT TESTS

At p. 25 above, an example was given of a possible multiple choice questionnaire to be included as a 'TEST' module to be incorporated into the CBT package. Multiple choice questions have been adopted as the most practical method to use within a CBT environment: the trainee's scores can be immediately recorded and feedback can be provided to him. There is no need for lengthy text entries to be made by the trainee or to be read by the assessor.

There is a need for several of such tests to be included in order to verify the trainee's understanding of the 'theory' aspects of ECDIS. These relate to the subjects listed above under 'Information Screens' and it can be seen from the library of questions in Appendix 1 below that these subjects are covered in some detail.

To ensure that the desired answers to these questions reflect the trainee's knowledge according to the objectives of each section, consideration was given to the principles expressed in "*Bloom's Taxonomy*." In that, he identified six levels within the cognitive domain, from the simple recall or recognition of facts, at the lowest level, through increasingly more complex and abstract mental levels, to the highest order which he classified as evaluation. These processes are explained in the table below.

These principles apply also to the practical exercises outlined below.

Looking at the '*Question cues*' given in the table at Appendix 3 below, it can be seen that the objectives of the IMO Model Course and the questions and exercises in the CBT package relate to the medium and higher levels of the taxonomy, viz. application, analysis, synthesis and evaluation. In some cases, the practical exercises will involve a combination of more than one level.

7.6 RECORDING OF PROGRESS

This software used in the trial has the capability to track the trainee's progress through the CBT package. This can be developed to provide a printout at the end of a training session to allow the trainee to assess his own progress and the amount of material that he still has to cover.

7.7 ROUTE PLANNING AND ROUTE MONITORING EXERCISES

A number of 'standard' ports were selected and are listed in Appendix 2. They were assigned either 'LEVEL 1' or 'LEVEL 2'.

Given that the students will be carrying out this CBT package in connection with equipment that, in all probability, they are already familiar with, it is suggested that the number of exercises can be reduced to two. The first ('LEVEL 1') would be a relatively straightforward Voyage Plan from one pilot station to another, while the second ('LEVEL 2') would require planning within pilotage waters, as well as the incorporation of appropriate additional functions, such as 'mariner objects'. Examples of these exercises are given at Appendix 2.

7.7.1 AVAILABILITY OF CHARTS FOR THE CBT PACKAGE

Consideration was given to the availability of appropriate electronic charts at all scales and usage levels (plan, harbour, etc.).

With respect to 'LEVEL 2' UK ports, it was considered desirable that official ENC's be available for these ports which would allow the trainee the opportunity to gain experience with, and to demonstrate his familiarity with ENC's.

Discussions were held with UKHO to consider the provision of a 'training portfolio' of mixed ENC's and RNC's to cover the required complexity of the recommended planning exercises. UKHO have developed a 'training portfolio', on the understanding that it is only for use with this project. This consists of unencrypted ENC's and standard RNC's.

8 TECHNICAL CHALLENGES

8.1 OPERATING SYSTEMS:

This blueprint for a CBT package in the use of ECDIS has made an assumption that it should be possible to run two programmes on the same computer at the same time.-CBT and ECDIS. Given that most ECDIS systems and the trial package for the CBT development work - both work through Windows NT or Windows 2000 operating platforms, it is thought that the trainee should be able to swap between the two environments utilising the *ALT+TAB* function.

Further work would be required with systems manufacturers and developers to determine if the two programmes could be combined into a single programme.

8.2 SIMULATOR INPUT:

At the outset of the development project, it was hoped to acquire access to a suitable simulator package to provide sensor input information to the ECDIS system, as well as possible radar overlay and other functionality. This has not been possible to date.

8.3 CHEATING:

If this blueprint for a CBT package is seen to be a viable proposition, it will be essential in further development work to consider the options to be incorporated to avoid the possibility of fraudulent test and exercise results being submitted for external certification.

For example, a new 2nd Officer has joined a vessel fitted with ECDIS for the first time. His owners and managers are committed to ensuring that all officers are trained in the use of the equipment but he is finding it difficult to come to terms with the practical use of the ECDIS. His colleagues, however, have already completed the CBT package and have recorded their own answers to the tests and exercises. Without secure procedures, these 'old' results could be submitted with the new officer's name and details for certification.

The random access of test questions and exercises by the software is an initial step in this direction but there are other options, including fingerprint recognition log-on systems, that could be considered.

9 CONCLUSION

CBT has significant potential to deliver measurable, achievable training in the use of ECDIS .

The Officer of the Watch who has received recognised, formal training in the use of the bridge equipment at his disposal is, potentially, a safer officer than his counterpart who has not received training. His understanding of the equipment, including appreciation of its advantages and limitations, and his confidence in its operation and application reduces the chances of navigational errors that may lead to loss of life, damage to property or to the marine environment.

Successful completion of the training package may provide a trainee with a form of certificate of completion, approved by a Flag State administration or other certifying body that would be recognised and accepted by other Flag and Port State Inspectors.

APPENDIX 1 - LIBRARY OF TEST QUESTIONS FOR USE WITH CBT PACKAGE

(This library may be added to as the package is developed further.)

GENERAL ECDIS KNOWLEDGE, INCLUDING LEGAL ASPECTS ETC.

1	What is the difference between an ENC and other electronic charts ?
A	An ENC has more navigational features than any other electronic chart
B	An ENC is an officially approved vector chart
C	An ENC is an officially approved raster chart
D	An ENC is easier to view than other electronic charts

2	What do the initials RNC stand for ?
A	Royal Navy Commission
B	Raster Navigational Chart
C	Regional Navigation Centre
D	Radio Navigation Centre

3	When does an ENC become a SENC ?
A	When it is updated with new navigational information
B	When it is converted in the ECDIS
C	When it has been issued by a RENC
D	When it has been approved by IMO

4	How many 'layers' of digital information can a raster chart display ?
A	It depends on how much memory the system has
B	One
C	Up to nine
D	It depends on which authority issued the chart

5	The Performance Standards for ECDIS were set by
A	ILO
B	IHO
C	IMO
D	UKHO

6	The Performance Standards for Electronic Charts were set by
A	ILO
B	IHO
C	IMO
D	UKHO

7	What is considered to be a potentially significant risk when using ECDIS?
A	The ECDIS will reduce manning causing increased stress among the officers.
B	The users may rely too heavily on ECDIS and not be aware of the conditions that can affect the accuracy of the displayed information.
C	The ECDIS may cause dangerous situations because navigators will now plot courses through narrow passages previously considered too restricted.
D	There are no significant risks associated with ECDIS.

8	What actions should the user take when both the paper chart and the BA raster chart displayed are based on European 1950 datum with a WGS-84 offset note provided?
A	Check to see if the known offset is being applied to the displayed raster chart.
B	Switch the GPS unit to EUR 1950 datum if available.
C	Apply offset as listed when plotting WGS-84 fixes on the paper chart.
D	A & C are correct, but B is not correct.

9	An ECDIS compliant electronic chart is best described as...
A	An ARCS chart with latest Updates applied
B	A DC format vector chart digitised from a corrected paper chart
C	A vector chart from C-Map
D	A vector chart that complies with the S-57 standard

10	What abbreviation has been established by the IMO to describe the chart data that must be loaded into a compliant ECDIS?
A	ENC
B	ARCS
C	BSB
D	DNC

11	What general category of electronic chart will normally include layers of data including objects or features that can be turned off to reduce clutter on the display?
A	Raster
B	Vector
C	ARCS
D	BSB

12	Which statement is accurate with regard to using raster charts with ECDIS?
A	Raster charts may be used in areas where suitable vector data cannot be obtained, but the SOLAS regulation for carriage of corrected paper charts will remain in force in these areas.
B	A type approved ECDIS can never be configured to display raster charts.
C	Raster charts may be used if no vector charts are available. The raster charts relieve the vessel of the paper chart carriage requirements provided the raster chart is issued under authority of a Governmental Hydrographic office and has the latest corrections applied.
D	Raster charts may be used, but only when the chart is based on the same datum as the primary position sensor.

13	When in charge of a navigational watch using ECDIS the mariner should...
A	Remain stationed at the ECDIS at all times.
B	Check ECDIS accuracy as often as practical, using methods independent of ECDIS to determine vessel position.
C	Take any steps necessary to permanently disable audible alarms.
D	Petition company management for additional duties, since all essential navigation functions are now handled by ECDIS.

14	Which type of raster chart will allow the user to change the deep water from white to black when selecting night, dusk, or day-black background colours?
A	HCRF format charts from UKHO (ARCS).
B	BSB format charts from NOAA or Maptech.
C	BSB format charts from CHS or NDI.
D	Only vector charts have this ability to change colours for Day / Dusk / Night viewing.

15	What window automatically appears in the chart display area to indicate a potential problem with the displayed chart, such as not being ECDIS compliant data?
A	The "Chart Legend" window
B	The "Chart Warnings" window
C	The "Alarm Display" window
D	The "Operator Message" window

16	What does the abbreviation 'ECDIS' mean ?
A	Electronic Chart Data Integration Scheme
B	Electronic Chart Display and Information System
C	Electronic Chart Display System
D	Electronic Chart Data Information Standard

17	What is the reference of the international standard for the exchange of data in maritime digital electronic charts ?
A	S-52
B	S-57
C	S-75
D	S-84

18	What is the reference datum for GPS ?
A	WGS
B	WGS 72
C	OSGB 36
D	WGS 84

19	Which type of chart is considered to contain intelligent spatial data ?
A	Raster
B	Vector
C	Digitised
D	Paper

20	The difference between a local datum and WGS-84 may be:
A	Up to 100m
B	Several nautical miles
C	Up to 500 m
D	Up to 1000 m

21	A Raster Navigational Chart (RNC) may be considered to be a representation of the paper chart
A	Digital
B	Analogue
C	Electronic facsimile
D	Computerised

22	An Electronic Chart System (ECS) is a system which displays chart data
A	In compliance with the IMO Performance Standard for ECDIS
B	In conjunction with data from radar and other sensors
C	But does not comply with the IMO Performance Standard for ECDIS
D	And will comply with future revisions of the IMO Performance Standards for ECDIS

23	When using any electronic navigation system, it is important for the operator to understand ...
A	Its functions
B	Its features
C	Its capabilities
D	Its limitations

24	When completing a Voyage Planning exercise, it is essential to ...
A	Store the plan
B	Make a printed copy of the plan
C	Check ownship criteria applied to the plan
D	Validate and check all route data

25	When ownship position is in error, what will be the effect on displayed information ?
A	Nothing
B	ECDIS will give a warning
C	All positions, bearings, courses etc. will be in error
D	ECDIS will shut-down

26	An ellipsoid is formed when ...
A	An ellipse is rotated about its minor axis
B	A circle is rotated about its N/S axis
C	An ellipse is rotated about its major axis
D	A circle is rotated about its E/W axis

27	The surface of an ellipsoid is ...
A	Uneven
B	Regular in direction E/W
C	Regular
D	Regular in direction N/S

28	A geoid refers to ...
A	A mathematical model of the earth's surface
B	A satellite derived model
C	Actual size and shape of the earth
D	A theoretical model

29	The earth is sometimes referred to as an 'oblate spheroid'. What is the approximate ratio of 'flattening' to make it so ?
A	0
B	1/100
C	1/300
D	1/600

30	In which document will you find the Performance Standards for ECDIS
A	IMO Resolution A.817(19)
B	IHO special Publication S-52
C	IHO Special Publication S-57
D	IMO Resolution A.877

31	The accuracy of a raster navigational chart (RNC) is the same as ...
A	The paper chart
B	A transverse mercator chart
C	A digitised chart
D	An ENC

APPENDIX 2 - STANDARD PORTS AND ROUTE PLANNING AND ROUTE MONITORING EXERCISES

2.A 'STANDARD PORTS' FOR USE IN THE 'TRAINING PORTFOLIO'

PORT	'LEVEL'	'LOCATOR'	BA CHART	LAT	LONG
LISBON	1	Cascais pilot	3220	38 41.15 N	009 24.25 W
LA ROCHELLE	1	Chauveau buoy	2743	46 06.45 N	001 16.00 W
LE HAVRE	1	Digue Nord	2990	49 29.13 N	000 05.40 E
FALMOUTH	1	Tidal diamond 'D'	154	50 08.50 N	005 01.50 W
DOVER	1	Off Western Entrance	1698	51 06.50 N	001 20.00 E
CARDIFF	1	Breaksea pilot	1152	51 20.85 N	003 19.00 W
EUROPOORT	1	Maas Center	122	52 00.10 N	003 53.30 E
BELFAST	1	Fairway buoy	1753	54 41.90 N	005 44.50 W
GLASGOW	1	Little Cumbrae	2131	55 43.10 N	004 59.50 W
ABERDEEN	1	Fairway buoy	1446 P1	57 09.30 N	002 01.85 W
BERGEN	1	Store Marstein pilot	3009	60 08.60 N	005 00.90 E
CADIZ	2	Darsena de Poniente	86	36 32.10 N	006 17.10 W
SOUTHAMPTON	2	Off 106 Berth	2041	50 54.25 N	001 25.80 W
MILFORD HAVEN	2	Texaco No. 2	3274	51 42.00 N	005 01.70 W
CORK	2	Whitegate No. 1	1777	51 50.00 N	008 15.80 W
FELIXSTOWE	2	Shotley Spit buoy	2693	51 57.25 N	001 18.00 E
LIVERPOOL	2	Langton lock	3490 P1	53 26.25 N	003 00.75 W
EMDEN	2	Westerems buoy	3509	53 36.20 N	006 20.70 W
HULL	2	King George Dock ent.	109	53 44.30 N	000 16.70 W
STAVANGER	2	No. 6 berth	3002 P1	58 58.50 N	005 43.50 E

From the table above, a matrix has been drawn up to indicate potential route planning exercises that may be created at each level, as below. The exercises may be planned from 'either end', thus increasing the potential number of routes. Some systems have the functionality to 'reverse the route' and, if so, this would also allow for demonstration of that functionality by the trainee.

Level 1

	GLASGOW	BELFAST	CARDIFF	FALMOUTH	DOVER	ABERDEEN	BERGEN	EUROPOORT	LE HAVRE	LA ROCHELLE	LISBON
GLASGOW			1								
BELFAST			1								
CARDIFF	1	1									
FALMOUTH					1			1			1
DOVER				1		1		1			
ABERDEEN					1		1	1	1		
BERGEN						1		1		1	1
EUROPOORT				1	1	1	1			1	
LE HAVRE						1				1	1
LA ROCHELLE					1		1	1	1		
LISBON				1			1		1	1	

Routes at Level 1 36

Level 2:

	LIVERPOOL	MILFORD HAVEN	CORK	SOUTHAMPTON	FELIXSTOWE	HULL	EMDEN	STAVANGER	CADIZ
LIVERPOOL			2		2			2	
MILFORD HAVEN				2		2	2		2
CORK	2				2	2		2	
SOUTHAMPTON		2					2		2
FELIXSTOWE	2		2				2		2
HULL		2	2					2	2
EMDEN		2		2	2				2
STAVANGER	2		2			2			
CADIZ		2		2	2	2	2		

Routes at level 2 34

2.B IMO MODEL COURSE §7 - ROUTE PLANNING EXERCISES

2.B.1 As an example, a 'LEVEL 1' exercise may contain instructions as follows:

1. **CREATE** an appropriate chart portfolio for a voyage from **CARDIFF** (BREAKSEA PILOT) to **GLASGOW** (LITTLE CUMBRAE PILOT STN), following any official traffic separation schemes.
2. Use and store the following positions as reference points when plotting the Voyage Plan:
CARDIFF - 51° 20.85 'N 003° 19.0 ' W
GLASGOW - 55° 43.1 ' N 004° 59.5 ' W
3. **SAVE** the portfolio as: **CARDIFF –GLASGOW1**.
4. Use the following parameters: **SAFETY CRITERIA**:
 Safety Depth: 10m; Safety contour: 15m
 XTE: 183 m Speed: 16.5 kts; Turn radius: 0.75m.
5. **CREATE** a Voyage Plan for this passage and **SAVE** with the name **CDFGLA1**.
6. Your **FIRST WAYPOINT** should be in the vicinity of the Breaksea Pilot Stn.
7. Your **FINAL WAYPOINT** should be 1.0 nm x 225° from Cumbrae Elbow Lt/Ho.
8. **INSERT** waypoints between the departure and arrival points making sure that track and turn parameters are as specified.
9. Enter **ETD**: Date: _____ Time: _____ Zone: _____
10. After entering the above ETD,
 - a. What is the ETA at the final waypoint ?
 Date: _____ Time: _____
 - b. What is the course, distance and duration of the leg between WP 4 and WP5 ?
 Course: _____ Dist: _____ Duration: _____
11. What is the total number of Waypoints ? _____
12. **CLEAR** the Portfolio<>VP link and then **SAVE** the VP. What warning(s), if any, were displayed when saving the plan ? Why were they displayed ?
 Warning(s): _____
 Reasons: _____
13. What is the total distance and duration of the Voyage Plan ?
 Distance: _____ Duration: _____
14. **PRINT** the Voyage Plan.

Considering those instructions, the table below indicates the references within the IMO Model Course that apply.

INSTRUCTION	IMO REF.	INSTRUCTION	IMO REF.	INSTRUCTION	IMO REF.
1	7.1	2	7.3	3	7.3
4	7.5, 7.7	5	7.8	6	7.3
7	7.3	8	7.3, 7.4	9	7.6
10a, b	7.6	11		12	7.8, 7.9
13	7.6	14	7.5		

2.B.2 At 'LEVEL 2', the exercise would become more complex. As an example:

1. Create an appropriate chart portfolio for a voyage from **MILFORD HAVEN** (TEXACO NO. 2) to **IMMINGHAM** (IMMINGHAM OIL TERMINAL, NO. 2). The portfolio should contain official vector charts where available.
2. Save the portfolio as: **Milford – Immingham 1**.
3. Use and store the following positions as reference points when plotting the Voyage Plan:

MILFORD HAVEN -	51° 42.000' N	005° 02.000' W
IMMINGHAM -	53° 37.850' N	000° 09.750' W
4. CREATE a Voyage Plan for this passage, following any official traffic separation schemes and **SAVE** with the name **MIL-IMM1**. You should aim to pass 4.0 nm x 180°.0 from LIZARD POINT Lt/ Ho and to cross the Dover Straits TSS in the vicinity of the F3 buoy.
5. Use the following parameters:
SAFETY CRITERIA: Safety Depth: 15m; Safety contour: 20m
XTE: 185 m Speed: 16.5 kts; Turn radius: 0.75m.
6. Your FIRST and FINAL WAYPOINTS should be in the vicinity of the berths.
7. The Milford Haven pilot will be disembarked approx. 205° x 2.75' from ST. ANN'S HEAD Lt./Ho. and, after dropping the pilot, the Chief Engineer has requested that you do not proceed at more than 8.5 kts for the first two hours,. Thereafter, you may resume full sea speed (16.5kts).
8. You can expect to encounter large ocean-going racing yachts in the vicinity of the Lands End TSS and you should annotate the chart accordingly.
9. Construction works are taking place in the area of the LANCELOT Gas Field and a restricted area has been established as follows:

Lat. 53° 25.000' N	Long. 001° 23.500' E
Lat. 53° 25.000' N	Long. 001° 25.500' E
Lat. 53° 23.000' N	Long. 001° 25.500' E
Lat. 53° 23.000' N	Long. 001° 23.500' E

"Construction works in progress - all ships keep clear from 270000UTC to 312359UTC"

PLOT this Restricted Area on appropriate charts.
10. You should enter the River HUMBER from the Deep Draught Pilotage point at manoeuvring Full Ahd (12.5kts). ENTER a CRITICAL POINT 40 mins before arrival at the Pilot Boarding Point with the notation:

"Give E/R 30 mins notice. Call MASTER"
11. Modify waypoints according to expected speeds as follows:

From berth to 'C/E clearance' - spd. 8.5 kts, turn radius 0.25 nm;

From Pilot boarding point to berth - spd. 12.5 kts, turn radius 0.25 nm.
12. If your **ETD** is 27th Sept. 2002 @ 0915 hrs UTC, what will be the ETA at the northern entrance to the Lands End TSS, assuming you maintain planned speed ?

Date: _____ Time: _____
13. Enter "MILFORD1" as the name for WPT_1 and "IMMINGHAM" as the name for the FINAL WPT.

14. Determine the largest scale ARCS chart for each WPT and also which charts will be used on the next leg. Enter **WPT NOTES** in the following format:

WPT: BA**** ; leg BA***, BA**** etc.

(where the first chart listed is the largest scale chart available for the WPT position and the remaining charts are those for the next leg.)

List any ENC's used in the Voyage Plan.

15. Modify the Voyage Plan to sail through the 'Off CASQUETS' TSS
16. Enter the following modified description: **MIL-IMM via Casquets**
17. If your **ETD** is 27th Sept. 2002 @ 1915 hrs UTC, what will be the ETA at the Pilot Stn., assuming you maintain planned speed ?

Date: _____ Time: _____

18. Use "SAVE AS" to save the plan with the following new name: **MIL-IMM2**
19. Use SYSTEM - FILE MANAGER to copy saved voyage plan to floppy disk.

As with the 'level 1' exercise above, the table below indicates the references within the IMO Model Course that apply.

INSTRUCTION	IMO REF.	INSTRUCTION	IMO REF.	INSTRUCTION	IMO REF.
1	2, 7.2	2	7.3	3	7.3
4	7.8	5	7.5, 7.7	6	7.3, 7.4
7	7.4	8	6.3	9	6.3
10	7.9	11	7.6	12	7.6
13	7.6	14	7.4	15	7.4
16	7.6	17	7.8	18	7.6
19	6, 14				

2.C IMO MODEL COURSE §8 - ROUTE MONITORING EXERCISES

In order to assess a trainee's capability to monitor a voyage plan and to appropriately deal with Alarms and Indicators the IMO Model Course recommends the use of a full-mission simulator running in real-time. As previously explained, this would represent an unacceptably tedious task for the CBT trainee to effectively achieve.

The Sperry-Marine VMS-VT ECDIS programme, for example, has the capability for the user to enter manual data with respect to speed, position, course etc. and to run the programme accordingly. This would allow a trainee to load a Voyage Plan and to monitor its progress.

In the absence of a full-mission simulator or an inbuilt simulation programme, this facility may be used in conjunction with appropriate instructions to fulfil the requirements of §8.

2.C.1 For example, using the Voyage Plan from Milford Haven to Immingham via the Casquets TSS outlined above, instructions may be as follows.

1. **LOAD** the Voyage Plan **MIL-IMM2**. Set **ETD** to today's date at 1200 UTC.
2. Using the 'Go To Pos' function, choose Milford Haven.
3. Using **MANUAL SENSORS**, set the following criteria and **CHECK** that all sensor inputs are set to **MANUAL**:

Posn.:	POSITION ON CHART	
Heading:	270.0°	Course: 270.0°
SOG:	8.5 kts	STW: 8.8 kts
Draft:	10.2m	
Set:	087.5°	Drift: 0.75 kts
Wind dirn:	225.0°	Wind speed: 8.5 kts

Set **VECTOR** time to 6 min.

4. **START** Plan - Add RTP close to WPT2.
5. When clear of Milford Haven pilotage area, **STOP** plan and go to WPT off **GREENWICH** buoy.
6. **PLOT** own ship's posn from a radar range and bearing of **GREENWICH** buoy of 6.5' x 080.5°.
7. Rejoin the Voyage Plan.
8. Adjust **VECTOR TIME** to 18 min.
9. **CHANGE** display to **NIGHT** colour palette.
10. **CHANGE** Posn Sensor input from Manual to GPS 1:
What alarm is received ? _____
What else changes on the screen ? _____
11. **CHANGE** Set & Drift to 135.0° x 7.0 kts.
What Indicator is received ? _____
How can you rectify this ? _____
12. **OFFSET** the centre of the chart to the left hand edge of the screen and **ZOOM OUT**:
What chart information is received ? _____
What information is contained in the **CHART WARNINGS** dialogue box ? _____

13. *Return to DAY BRIGHT display.*
14. *STOP Plan:*
What alarm message is received ? _____
What indicator is received ? _____
15. *Go to File Manager. COPY Voyage Plan and Data Log to floppy disk.*

As with the Route Planning exercises above, the table below indicates the references within the IMO Model Course that apply.

INSTRUCTION	IMO REF.	INSTRUCTION	IMO REF.	INSTRUCTION	IMO REF.	INSTRUCTION	IMO REF.
1	8.2	2	6	3	5, 6, 8.3	4	8.2
5	8.2	6	8.4	7	8.2	8	8.3
9	3, 4, 6	10	13.2	11	13.2	12	13.3
13	3, 6	14	13.2, 13.3	15	6, 14		

APPENDIX 3 - BLOOM'S TAXONOMY

COMPETENCE	SKILLS DEMONSTRATED
KNOWLEDGE	<ul style="list-style-type: none"> • observation and recall of information • knowledge of dates, events, places • knowledge of major ideas • mastery of subject matter <p><i>Question Cues:</i> list, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.</p>
COMPREHENSION	<ul style="list-style-type: none"> • understanding information • grasp meaning • translate knowledge into new context • interpret facts, compare, contrast • order, group, infer causes • predict consequences <p><i>Question Cues:</i> summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend</p>
APPLICATION	<ul style="list-style-type: none"> • use information • use methods, concepts, theories in new situations • solve problems using required skills or knowledge <p><i>Questions Cues:</i> apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover</p>
ANALYSIS	<ul style="list-style-type: none"> • seeing patterns • organization of parts • recognition of hidden meanings • identification of components <p><i>Question Cues:</i> analyse, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer</p>
SYNTHESIS	<ul style="list-style-type: none"> • use old ideas to create new ones • generalize from given facts • relate knowledge from several areas • predict, draw conclusions <p><i>Question Cues:</i> combine, integrate, modify, rearrange, substitute, plan, create, design, invent, what if?, compose, formulate, prepare, generalize, rewrite</p>
EVALUATION	<ul style="list-style-type: none"> • compare and discriminate between ideas • assess value of theories, presentations • make choices based on reasoned argument • verify value of evidence • recognize subjectivity <p><i>Question Cues:</i> assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize</p>