

MODEL COURSE 7.06

Officer in Charge of a Navigational Watch on a Fishing Vessel

2008 Edition



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Introduction

■ Purpose of the model courses

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

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

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

■ Use of the model course

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

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

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

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

■ Lesson plans

Having adjusted the course content to suit the trainee intake and any revision of the subject objectives, the instructor should draw up lesson plans based on each detailed syllabus. The detailed syllabus contains specific references to the textbooks or teaching material proposed to be used in the course. An example of a lesson plan is given for guidance only. Where no adjustment has been found necessary in the learning objectives of a detailed syllabus, the lesson plans may simply consist of the detailed syllabus with key words or other reminders added to assist the instructor in making his or her presentation of the material.

■ Presentation

The presentation of concepts and methodologies must be repeated in various ways until the instructor is satisfied that the trainee has attained each specific learning objective or training objective. The syllabus is laid out in learning objective format and each objective specifies a required performance or, what the trainee must be able to as the learning or training outcome. Taken as a whole, these objectives aim to meet the knowledge, understanding and proficiency specified in the functional skill/knowledge requirements relating to the 1995 STCW-F Convention.

■ Implementation

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

- Properly qualified instructors
- Support staff
- Rooms and other spaces
- Workshops and equipment
- Suggested reference material, textbooks, technical papers
- Other reference material.

Thorough preparation is the key to successful implementation of the course. IMO has produced a booklet entitled “Guidance on the implementation of IMO model courses”, which deals with this aspect in greater detail and is included as an attachment to this model course.

In cases where the requirements for some or all of the training in a particular subject is covered by another IMO model course, an appropriate reference will be made to the other model course.

■ Course objective

This model course has been developed to meet the standards of training for officers in charge of a navigational watch required by regulation II/2 of the 1995 STCW-F Convention. The material in this model course comprises the three functions as set out in regulation II/2 and has been written in such a manner so as to clearly identify the training objectives and

outcomes of each function and give Administrations the opportunity to arrange the course structure best suited to their particular needs.

On successful completion of the course and meeting the minimum standard of competence for the officer in charge of a navigational watch including the requisite watchkeeping experience, officers will be competent to take the responsibility of a watchkeeper for the safety of the vessel, fishing vessel personnel and the catch.

They will also be aware of their obligation under international agreements and conventions concerning safety and the protection of the marine environment and will be able to take the practical measures necessary to meet those obligations.

The teaching schemes should be carefully scrutinized to ensure that all of the tabulated training outcomes are covered, that repetition is avoided and that essential underpinning knowledge at any stage has already been covered. A certain amount of duplication under different subjects will probably occur. Providing it is not excessive, the different approaches can provide useful reinforcement of work already learned. Care should be taken to see that items not included in the syllabus, or treatment beyond the depth indicated by the objectives, have not been introduced except where necessary to meet additional requirements of the Administration. The teaching scheme should be adjusted to take account of those matters and the timing of any modular courses (such as training in Fire fighting, Medical care) which are to be included.

■ Entry standards

Entrants should meet the minimum age for certification (18 years), obtain the minimum of 1 year of approved education and training, and also satisfy the Administration concerned as to medical fitness, including eyesight and hearing in accordance with regulation 2.2.

■ Course certificate

On successful completion of the course and demonstration of competence, a document may be issued certifying that the holder has met the standard of competence specified in regulation 2 of chapter II of the 1995 STCW-F Convention. A certificate may be issued only by Administrations or other organizations approved by the Administration.

■ Course intake limitations

Class sizes should be limited to not more than 24 in order to allow the instructor to give adequate attention to individual trainees. Larger numbers may be admitted depending on the availability of additional instructors, equipment and facilities to provide meaningful training. Where practical exercises and group activities are included in the course framework, it will be necessary to consider restraints on class size.

■ Staff requirements

The course should preferably be conducted under the control of an instructor who is qualified in the tasks for which training is being conducted and have appropriate training in instructional techniques and training methods, assisted by other appropriately trained staff. Guidance

on requirements for teaching staff is given in chapter 2 paragraph 2.5 of the FAO/ILO/IMO Document for Guidance on Training and Certification of Fishing Vessel Personnel.

■ Teaching facilities and equipment

A classroom equipped with an overhead projector and a blackboard or flipchart should be provided for teaching the theory of the course and holding group discussions. Multi-media equipment, where available, will be an advantage. Additional spaces for practical instruction, demonstrations and workshop exercises should also be made available, as appropriate.

For ease of reference, more information on facilities and equipment required to deliver the specific functional elements will be provided under the subject elements.

■ Teaching aids and textbooks

Textbooks and other publications may be used to deliver the training course. The framework in each function contains lists of specified textbooks which are referred to in the syllabus appropriate to the learning objectives. Other textbooks may also be considered equally suitable; however, the chosen books should assist trainees to achieve the learning objectives.

Details of additional books which would provide useful library references and further background reading are included where appropriate under each subject.

References to books are made in the syllabuses of the individual subject elements to aid both instructors and trainees in finding relevant information and to help in defining the intended scope and depth of the subject to be covered.

Every effort has been made, where possible, to quote the latest editions of the publications mentioned but newer editions might exist. Instructors should therefore always try to use the latest edition for preparing and delivering their courses.

It is suggested to course instructors that they should provide, where possible, some appropriate visual aids such as videos and CDs concerning the subject matter to aid trainees in their learning.

■ Computer applications

In view of the rapid growth of information technology (IT) and widespread use of computers aboard ship, it is recommended that, at the discretion of the Administration, computer applications should be included where possible for training skippers and chief mates. If this topic has not been covered already during training as officer in charge of a navigational watch, some basic training would also be required.

Training will depend upon the computer facilities available and the needs and aptitude of the trainees and could include topics such as the use of IT applications for communications (e-mail, databases, etc), the internet, intranets and the world-wide web (www.), automatic monitoring, data-recording and alarm systems.

The use of multi-media applications can enhance learning in topics in many areas of knowledge for junior officers and other crew members. Many of the IMO rules and Assembly resolutions, for example, are available on CD and information may be found on the IMO web site at <http://www.imo.org>.

■ Training and the 1995 STCW-F Convention

The standards of competence that have to be met by fishing vessel personnel are defined in the Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel Convention, 1995. It sets out the education and training required to achieve those standards. Regulation II/2 sets out as follows:

Chapter II

Regulation 2

“Mandatory minimum requirements for certification of officers in charge of a navigational watch on fishing vessels of 24 metres in length and over operating in unlimited waters

- 1 Every officer in charge of a navigational watch on a fishing vessel of 24 metres in length and over operating in unlimited waters shall hold an appropriate certificate.
- 2 Every candidate for certification shall:
 - .1 be not less than 18 years of age;
 - .2 satisfy the Party as to medical fitness, particularly regarding eyesight and hearing;
 - .3 have approved seagoing service of not less than two years in the deck department on fishing vessels of not less than 12 metres in length. However, the Administration may allow the substitution of the seagoing service by a period of special training not exceeding one year, provided that the period of the special training programme shall be at least equivalent in value to the period of the required seagoing service it substitutes or by a period of approved seagoing service evidenced by an approved record book covered by the 1978 STCW Convention.
 - .4 have passed an appropriate examination or examinations for the assessment of competency to the satisfaction of the Party. Such examination or examinations shall include the material set out in the appendix to this regulation. A candidate for examination who holds a valid certificate of competency issued in accordance with the provisions of the 1978 STCW Convention need not be re-examined in those subjects listed in the appendix which were passed at a higher or equivalent level for the issue of the Convention certificate; and
 - .5 meet the applicable requirements of regulation 6, as appropriate for performing designated radio duties in accordance with the Radio Regulations.”

The course is organized under the three functions at the operational level of responsibility. Specifically, this course covers the minimum standard of competence for officers in charge of a navigational watch on fishing vessels of 24 metres in length and over operating in unlimited waters.

For ease of reference, the course material is organized in three separate functions, namely:

- Function 1: Navigation
- Function 2: Catch handling and stowage
- Function 3: Controlling the operation of the fishing vessel and care for persons on board

Each function is addressed in three parts: Part A, Part B and Part C.

Part A provides the framework for the course with its aims and objectives and notes on the suggested teaching facilities and equipment. A list of useful teaching aids, IMO references and textbooks is also included.

Part B provides an outline of lectures, demonstrations and exercises for the course. No detailed timetable is suggested. From the teaching and learning point of view, it is more important that the trainee achieves the minimum standard of competence defined in the FAO/ILO/IMO Document for Guidance on Training and Certification of Fishing Vessel Personnel than that a strict timetable is followed. Depending on their experience and ability, some students will naturally take longer to become proficient in some topics than in others. Also included in this section are guidance notes and additional explanations.

A separate IMO model course addresses Assessment of Competence. This course explains the use of various methods for demonstrating competence and criteria for evaluating competence. The FAO/ILO/IMO Document for Guidance on Training and Certification of Fishing Vessel Personnel provides tables of competency units and functional skill components that could be used to assess the competence of engineer officers serving on board fishing vessels.

Part C gives the Detailed Teaching Syllabus. This is based on the theoretical and practical knowledge specified in the FAO/ILO/IMO Document for Guidance on Training and Certification of Fishing Vessel Personnel. It is written as a series of learning objectives, in other words what the trainee is expected to be able to do as a result of the teaching and training. Each of the objectives is expanded to define a required performance of knowledge, understanding and proficiency. IMO references, textbook references and suggested teaching aids are included to assist the teacher in designing lessons.

■ Responsibilities of Administrations

Administrations should ensure that training courses delivered by colleges and academies are such as to ensure officers completing training meet the standards of competence required by the STCW-F 1995 Convention regulation II/2, paragraph 2.

Function 1: Navigation

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1.4 Magnetic and gyro-compasses	
1.5 Meteorology and oceanography	
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1.7 Emergency procedures	
1.8 English language	
1.9 Communications	
1.10 Search and rescue	
1.11 Fishing vessel power plants	

Function 1: Navigation

Part A1: Course Framework

■ Objective

The syllabus covers the requirements of the 1995 STCW-F Convention chapter II, regulation 2, and provides the details of the knowledge required to support the training outcomes related to the functional element of navigation.

This section provides the background knowledge to support the tasks, duties and responsibilities in:

- determining position and conducting navigation
- using compasses and determining compass errors
- operating and using radar
- obtaining and applying meteorological information
- establishing watchkeeping arrangements and procedures
- manoeuvring and handling a vessel in all conditions
- response to navigational emergencies

■ Teaching aids (A)

- A1 Instructor Guidance (Part B1 of this course)
- A2 Catalogue of British Admiralty charts and other hydrographic publications
- A3 British Admiralty Notices to mariners
- A4 Charts
- A5 Deviation Table
- A6 British Admiralty List of Lights
- A7 National List of Lights and Buoyage System
- A8 British Admiralty Tide Table of the area concerned
- A9 National Tide Table
- A10 Tidal stream atlas
- A11 British Admiralty 'Pilot' book for the area concerned
- A12 National sailing direction
- A13 Star Finder and Identifier HO 2101-D
- A14 Nautical Almanac
- A15 IALA Maritime Buoyage System
- A16 Ocean plotting sheet
- A17 Distance table
- A18 Ship's Log-book
- A19 Nautical table (Norie's, Burton's or others)
- A20 Star Chart
- A21 Pre-computed altitude and azimuth tables (e.g. HO229)
- A22 Pocket calculator
- A23 GPS receiver

V1 IMO – Safe secure and efficient shipping on clean oceans (IMO Code No. VOIOM)

V3 Know the current rules (Code No. 328)
V4 Bridge watchkeeping (Code No. 497)
V5 Passage planning (Code No. 496)
V6 Search and rescue: co-ordination (Code No. 574)
V7 Man overboard (Code No. 644)
V8 Theory of mooring (Code No. 615)

■ IMO references (R)

- | | |
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| R1 | <i>International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (STCW-F), 1995 (IMO Sales No. I915E)</i> |
| R2 | <i>FAO/ILO/IMO Document for Guidance on Training and Certification of Fishing Vessel Personnel, 2001 (IMO Sales No. IA948E)</i> |
| R3 | <i>Torremolinos Protocol and Torremolinos International Convention for the Safety of Fishing Vessels, 1993 (IMO Sales No. I793E)</i> |
| R4 | <i>International Convention for the Safety of Life at Sea (SOLAS), as amended (IMO Sales No. ID110E).</i> |
| R5 | Assembly resolution A.382(X) – Magnetic compasses: carriage and performance standards |
| R6 | Assembly resolution A.424(XI) – Performance standards for gyro-compasses |
| R7 | Assembly resolution A.574(14) – Recommendation on general requirements for electronic navigational aids |
| R8 | <i>Radar Navigation, Radar Plotting and use of ARPA, Radar navigation – Operational level (Model course 1.07) (1999 edition), TA107E</i> |

Details of distributors of IMO publications that maintain a permanent stock of all IMO publications may be found on the IMO web site at <http://www.imo.org>

■ Textbooks (T)

- T1 *Admiralty Manual of Navigation. Vol 1.* London, HMSO 1997, 1st impression (ISBN 0-11460-3-68-8)
- T2 Bole, A.G. and Dineley, W.O. and Nicholls, C.E. *The Navigation Control Manual 2nd ed.* Oxford. Heinemann Professional, 1992 (ISBN 0-7506-0542-1)
- T3 Danton, G. *The Theory and Practice of Seamanship.* 11th ed. London, Routledge, 1996 (ISBN 0-4151-5372-7)
- T4 Frost, A. *Practical Navigation for Second Mates.* 6th ed. Glasgow, Brown, Son & Ferguson, 1985 (ISBN 0-8517-4397-8)
- T5 Frost, A. *The Principles and Practice of Navigation.* 3rd ed. Glasgow, Brown, Son & Ferguson, 1988 (ISBN 0-8517-4542-3)
- T6 Gylden, S. *The Use of Constant Rate Turns* OUT OF PRINT 1998
- T7 Hensen, H. *Tug Use In Port*, Nautical Institute (ISBN 1-8700-7739-3)
- T8 Hooyer, H.H. *The Behaviour and Handling of Ships.* Cornell Maritime Press (ISBN 0-7870-33306-2)
- T9 International Chamber of Shipping, *Bridge Procedures Guide*, 3rd ed. 1998
- T10 Kemp, J.1. and Young, P. *Notes on Compass Work.* End ed. London, Stanford Maritime, 1972; reprinted 1987 (ISBN 0-5400-0362-X)
- T11 MacElvrey, D.H. *Shiphandling for the Mariner.* 3rd ed. Centreville (Maryland, US), Cornell Maritime Press, 1995. (ISBN 0-8703-3464-6)
- T12 *Maritime Meteorology*, End Ed. 1997. Thomas Reed Publications (ISBN 0-9012-8167-0)
- T13 Merrifield, F.G. *Ship Magnetism and The Magnetic Compass*, Pergamon Press
- T14 Meteorological Office, *Marine Observer's Handbook.* 11th ed. (Met.0.887). London, HMSO, 1995 (ISBN 0-1140-0367-X)
- T15 Meteorological Office, *Meteorology for Mariners,* 3rd ed. 8th impression. London, HMSO, 1978 (ISBN 0-1140-0311-4)
- T16 Rowe, R.W. *The Shiphandler's Guide.* The Nautical Institute, 1996. (ISBN 1-870077-35-0)
- T17 Tetley, L. and Calcutt, D. *Electronic Aids to Navigation: Position Fixing 2nd ed.* 1986 London, Edward Arnold, 1991 (ISBN 0-3405-4380-9)
- T18 *The Mariner's Handbook.* (NP 100). 6th ed. Taunton (UK), Hydrographer of the Navy, 1989
- T19 *IMO Standard Marine Communications Phrases (SMCP)* (including CD: pronunciation guide) (2002 edition) English IA987E
- T20 Taylor, D.A. *Introduction to Marine Engineering.* End ed. London, Butterworth, 1990. (ISBN 0-4080-5700-8)
- T21 Daniel H. MacElrevey, Daniel E. MacElrevey & Earl R. McMillin, *Shiphandling for the Mariner*, Cornell Maritime Press, 2004. (ISBN 870335588)
- T22 Maurice Cornish & E. Ives, *Maritime Meteorology*, Thomas Reed Publications, 2002. (ISBN 901281670)
- T23 W. Burger, *Radar Observer's Handbook for Merchant Navy Officers* (Glasgow, Brown, Son and Ferguson, 1983) (ISBN 0-85174-443-5)
- T24 R. Lownsborough and D. Calcutt, *Electronic Aids to Navigation: Radar and ARPA* (London, Edward Arnold, 1993) (ISBN 0-340-59258-3)

- T25 Christopher Emms & S. Gossif, *An Instruction to Coastal Navigation: A Seaman's Guide*, Morgans Technical Books Ltd., 1985. (ISBN 948254025)
- T26 W.H. Perry, *Fishermen's Handbook*, Fishing News Books Ltd., 1987. (ISBN 852381433)

Textbooks may be available from the following:

Blackwell Publishing Ltd. 9600 Garsington Road Oxford OX4 2DQ UK, Tel. +44 1865 776868, Fax +44 1865 714591

Fishing News Books Ltd. Osney Mead, Oxford OX2 OEL, UK

Warsash Nautical Bookshop, 6 Dibles Road, Warsash, Southampton S031 9HZ, UK.
Tel: 44 1489 572 384 Fax: 44 1489 885756 E-mail: orders@nauticalbooks.co.uk
URL: www.nauticalbooks.co.uk

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Function 1: Navigation

Part B1: Course Outline and Guidance Notes

■ Timetable

No formal example of a timetable is included in this model course.

Development of a detailed timetable depends on the level of skills of the trainees entering the course and the amount of work on basic principles that may be required.

Lecturers must develop their own timetable to suit the course intake, also taking into account:

- the level of skills of trainees at entry
- the numbers to be trained
- the number of instructors

and normal practices at the training establishment.

Preparation and planning constitute important factors which make a major contribution to the effective presentation of any course of instruction.

■ Lectures

As far as possible, lectures should be presented within a familiar context and should make use of practical examples. They should be well illustrated with diagrams, photographs and charts where appropriate, and be related to matter learned during seagoing time.

An effective manner of presentation is to develop a technique of giving information and then reinforcing it. For example, first tell the trainees briefly what you are going to present to them; then cover the topic in detail; and, finally, summarize what you have told them. The use of an overhead projector or a beam projector and the distribution of copies of the transparencies as trainees handouts contribute to the learning process.

■ Course outline

The tables that follow list the competencies and areas of knowledge, understanding and proficiency, together with the estimated total hours required for lectures and practical exercises. Teaching staff should note that timings are suggestions only and should be adapted to suit individual groups of trainees depending on their experience, ability, equipment and staff available for training.

Functional skill components	Total hours for each topic	Total hours for each subject area of required performance
COMPETENCE:		
1.1 Navigation and position determination		
1.1.1 APPLY CELESTIAL BODY OBSERVATION FOR POSITION FIXING AND NAVIGATION		
.1 Use a sextant	5	45
.2 Complete sight reduction	15	
.3 Obtain and plot position lines	25	
1.1.2 USE TERRESTRIAL OBSERVATION FOR POSITION FIXING AND COASTAL NAVIGATION		
.1 Define basic theories or knowledge for terrestrial observation	20	90
.2 Identify navigational hazard	5	
.3 Use navigational aids, clearing marks and transit bearings to safely navigate hazards	15	
.4 Read and interpret marine charts	10	
.5 Obtain and plot position line to determine vessel's position	15	
.6 Apply dead reckoning procedures to determine vessel's position	10	
.7 Use notices to mariners and other publications to assess accuracy of positions	5	
.8 Exercise chartwork	10	
1.1.3 USE ELECTRONIC NAVIGATIONAL AIDS FOR POSITION FIXING AND NAVIGATION		
.1 Operate electronic navigational aids	20	40
.2 Determine vessel's position with electronic aids	20	
COMPETENCE:		
1.2 Watchkeeping		
1.2.1 APPLY INTERNATIONAL REGULATIONS FOR PREVENTING COLLISIONS AT SEA TO FISHING VESSEL OPERATION		
.1 Apply steering and sailing rules	20	30
.2 Apply light and shape regulations	5	
.3 Apply sound and light signal requirements	5	
1.2.2 PRINCIPLES TO BE OBSERVED IN KEEPING A NAVIGATIONAL WATCH		
.1 Navigational watch	4	10
.2 Maintain a navigational watch	5	
.3 Maintain an anchor watch	1	

Functional skill components	Total hours for each topic	Total hours for each subject area of required performance
COMPETENCE:		
1.3 Radar navigation <i>See IMO Model Course No. 1.07 for guidance</i>		29.5
1.3.1 OPERATE RADAR		
.1 Identify factors affecting performance and accuracy	7	
.2 Set up radar and maintain displays	5.5	
.3 Detect misrepresentation of information, false echoes, sea return etc.	1	
.4 Establish the range and bearing of a radar target	3	
.5 Identify critical echoes	2	18.5
1.3.2 USE RADAR FOR COLLISION AVOIDANCE		
.1 Establish the course and speed of other ships	5.5	
.2 Determine the time and distance of closet approach of crossing, meeting, or overtaking ships	2	
.3 Detect course and speed changes of other ships	1	
.4 Identify the effect of changes in own vessel's course or speed or both	1	
.5 Apply the International regulations for Preventing Collisions at Sea	1.5	11
COMPETENCE:		
1.4 Magnetic and gyro-compasses		
1.4.1 DETERMINE AND APPLY COMPASS ERRORS USING TERRESTRIAL OBSERVATION	20	
.1 The magnetism of the earth and the ship's deviation	10	
.2 Magnetic compass	10	
.3 Gyro-compass	5	
.4 Automatic pilot		45
1.4.2 DETERMINE AND APPLY COMPASS ERRORS USING CELESTIAL OBSERVATION	1	
.1 Determine and apply compass errors using terrestrial observation	14	
.2 Determine and apply compass errors using celestial observation		15
COMPETENCE:		
1.5 Meteorology and oceanography		
1.5.1 OBTAIN AND APPLY METEOROLOGICAL INFORMATION		
.1 Identify weather conditions liable to endanger the vessel	10	
.2 Use shipborne meteorological instruments	10	
.3 Identify the characteristics of various weather systems	10	30
1.5.2 OBTAIN AND APPLY OCEANOGRAPHIC INFORMATION		
.1 Use appropriate navigational publication on tides and currents	10	
.2 Calculate the times and heights of the high and low water and estimate the direction and rate of tidal streams	5	15

Functional skill components	Total hours for each topic	Total hours for each subject area of required performance
COMPETENCE:		
1.6 Fishing vessel manoeuvring and handling		
1.6.1 IDENTIFY TECHNIQUES FOR MANOEUVRING AND HANDLING FISHING VESSELS IN ALL CONDITIONS		
.1 Identify requirements for berthing, unberthing and manoeuvring alongside other vessel at sea	5	
.2 Identify requirements for manoeuvring during fishing operations	3	
.3 Identify the effects of wind, tide and current on ship handling	3	
.4 Identify requirements for manoeuvring in shallow waters	3	
.5 Identify major considerations for managing a fishing vessel in heavy weather	3	
.6 Identify requirements for rescuing persons and assisting vessels in distress	3	
.7 Identify requirements for towing and being towed	3	
.8 Identify vessel handling requirements for man-overboard procedures	2	
.9 Identify, where applicable, practical measures to be taken when navigating in ice or conditions of ice accretion	5	30
COMPETENCE:		
1.7 Emergency procedures		
1.7.1 RESPOND TO EMERGENCY SITUATIONS INVOLVING FISHING VESSEL PERSONNEL		
.1 Follow emergency procedures specified in the vessel's contingency plans	5	
.2 Identify relevant emergency situation duties and responsibilities	3	
.3 Identify appropriate action to be taken following a fire or collision	3	
.4 Indicate procedures to be followed in abandoning the fishing vessel	3	
.5 Indicate action to be taken in rescuing persons	3	
.6 Identify man-overboard procedures	3	20
1.7.2 RESPOND TO FISHING VESSEL EMERGENCY SITUATIONS		
.1 Specify precautions to be taken when beaching a vessel	3	
.2 Identify actions to be taken prior to, and after, grounding	4	
.3 Specify action to be taken when the gear becomes fast to the ground or other obstructions	3	
.4 Follow procedures for floating a grounded vessel, with and without assistance	3	
.5 Indicate action to be taken following a collision	3	
.6 Follow procedures for the temporary plugging of leaks	4	
.7 Prepare contingency plans for the protection and safety of fishing vessel personnel in emergencies	3	
.8 Identify procedures for limiting damage and salvaging the vessel following a fire or explosion	5	
.9 Specify abandoning ship procedures	3	
.10 Identify emergency steering arrangements	3	34

Functional skill components	Total hours for each topic	Total hours for each subject area of required performance
1.7.3 PROVIDE ASSISTANCE IN EMERGENCY SITUATIONS .1 Follow recommended procedures for rescuing persons from a ship in distress or from a wreck .2 Follow recommended man-overboard procedures .3 Apply procedures for towing and being towed	3 3 3	9
COMPETENCE: 1.8 English language 1.8.1 APPLY ENGLISH LANGUAGE TO FISHING VESSEL OPERATIONS .1 Interpret English language charts and nautical publications .2 Interpret English language meteorological information and safety message .3 Communicate with other ships and coast stations .4 Interpret and use relevant sections of IMO standard marine communication phrases as appropriate		
COMPETENCE: 1.9 Communications <i>See IMO Model Course No. 1.26 for guidance</i> 1.9.1 IDENTIFY GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) AND RADIOCOMMUNICATIONS REQUIREMENTS .1 Principles and basic factors for GMDSS use .2 Navigational and meteorological warning systems and select the appropriate communication services .3 The adverse effects of misuse of communication equipment 1.9.2 PROVIDE GMDSS AND RADIOCOMMUNICATIONS SERVICES .1 Operate radiocommunications equipment .2 Provide radio service in an emergency .3 Apply search and rescue radiocommunications procedures .4 Use vessel reporting systems .5 Apply radio medical services procedures .6 Apply measures to protect personnel from radiation hazards 1.9.3 MAKE VISUAL SIGNALS .1 Use the International Code of Signals .2 Transmit and receive signals by Morse light		10
COMPETENCE: 1.10 Search and rescue <i>See IMO Model Course No. 1.08 for guidance</i>		6
COMPETENCE: 1.11 Fishing vessel power plants 1.11.1 OPERATE AND MAINTAIN FISHING VESSEL POWER PLANTS .1 Identify operating principles of marine power plants in fishing vessels	5	
Total for Function 1: Navigation		393

Teaching staff should note that the hours for lectures and exercises are suggestions only as regards sequence and length of time allocated to each objective. These factors may be adapted by lecturers to suit individual groups of trainees depending on their experience, ability, equipment and staff available for teaching.

Guidance Notes

The following notes are intended to highlight the main objectives or training outcomes of each part of the function. The notes also contain some material on topics which are not adequately covered in the quoted references.

This function covers the theoretical knowledge, understanding and proficiency for the safe navigation of a fishing vessel in coastal waters and in the open ocean.

■ Function 1: Navigation

On completion of training for this function, the officer will possess a thorough understanding and capability in navigation. This together with knowledge gained in other areas, will enable the officer to carry out passages independently in a proper and safe manner and to be able to solve those problems that may arise during a fishing voyage.

The officer will be able to fix positions and analyse in a practical way the quality of the fix, make great circle calculations, read tide tables and predict times and heights of tides at different ports worldwide.

In voyage planning the officer will be able to:

- use appropriate means of navigation in coastal waters
- make use of publications and other information sources for safe voyage in coastal waters
- use pilot charts, Ocean Passages for the World and other publications to select a safe and economic 'best' route.

Officers will be able to demonstrate a thorough knowledge of the International Regulations for Preventing Collisions at Sea (COLREG 1972). They will be able to apply them correctly in all situations as officer in charge of a navigational watch of a vessel.

Officers will be able to arrange and monitor the keeping of a safe navigational watch at sea to and from the fishing ground, an effective anchor watch and a deck watch in port taking account of the standards regarding watchkeeping in the STCW-F 1995 Convention chapter IV. They will have knowledge of all modern navigational aids, enabling them to navigate safely in all parts of the world. They will have specific knowledge of operating principles, limitations, sources of error, detection of misrepresentation of information and methods of correction to obtain accurate position fixing. Officers will appreciate the danger of exclusive reliance on information gained from instruments and the necessity for calibration and frequent checking of the instruments.

On completion of the function, officers will be able to demonstrate a thorough knowledge of the theory of magnetism as applied to the earth's field and magnetic conditions aboard the vessel. They will understand the reasons for the change of compass deviation with time and position and the need for routine checking of the ship's deviation. They will also be able to produce and analyse a deviation table, make a tentative adjustment of the vessel's compass and understand the further adjustments to make in the light of deviations experienced.

Officers will have a knowledge and understanding of gyro-compass errors and will be able to evaluate possible errors and appreciate the limitations of the instrument.

On completion of the function, officers will:

- possess a general understanding of the elements and processes which determine the weather;
- be able to draw conclusions on the basis of observations made on board and from information available;
- be able to utilize information from weather and wave charts; and
- have a basic knowledge of the elements of oceanography.

This knowledge will enable the trainee to take into account climatic conditions, the weather prognosis, ocean currents and information on the presence of ice for the safe operation of the fishing vessel.

The officer will understand and interpret a synoptic chart, predict area weather, have a knowledge of the characteristics of various weather systems and ocean current systems and be able to use all appropriate navigational publications.

Officers will also be aware of all of the factors affecting the manoeuvring and handling of vessels. They will be able to plan berthing or anchoring procedures, taking account of prevailing conditions of wind and tide and their own vessel's characteristics. They will, after having gained seagoing experience or training on a ship-handling simulator, also be able to handle a vessel so as to minimize the risk of damage or stranding resulting from heavy weather. Officers will be aware of the dangers to be encountered when navigating in ice or conditions of ice accumulation on board and the precautions to take for the safety of the vessel and crew.

Officers will know the procedures to use in VHF communications and be able to use radiotelephones, particularly with respect to distress, urgency, safety and navigational messages. They will also know the procedures for emergency distress signals by radiotelegraphy, as prescribed in the Radio Regulations, and will be able to send a distress call by using an automatic keying device and the emergency transmitter.

The radio communications requirements of the 77/93 Torremolinos International Convention and Protocol, and the procedures for distress, urgency, safety and navigational messages in accordance with chapter IX of the Radio Regulations will be known.

COMPETENCE

1.1 Navigation and position determination

175 hours

First of all, the officers should be well acquainted with publications which supply appropriate information for voyage planning. Intelligent use of the information, together with professional ability and watchfulness, leads to a successful voyage. Proper safe working procedures are very important and should be stressed. Instructors will find (T24) a valuable source of reference.

1.1.1 APPLY CELESTIAL BODY OBSERVATION FOR POSITION FIXING AND NAVIGATION

45 hours

Use a sextant

The trainee should first practise measuring the altitude of the sun, reading a sextant and applying index error. Secondly, the trainee should do exercises in correcting a sextant.

Regarding altitude corrections, it is optional whether the Nautical Almanac or an appropriate nautical table is used. It is recommended that the trainee does sufficient simple exercises in altitude corrections to master such problems thoroughly.

At low altitudes the correction for refraction is significant. The trainee should understand this effect and be able to explain it.

Complete sight reduction

The main objective of this subject area is that the trainee shall gain knowledge and ability in position fixing by using stars and planets.

To compute the altitude of the celestial body, three methods are available:

- the cosine formula and a pocket calculator
- the haversine formula and logarithmic tables
- pre-computed altitude and azimuth tables.

Which of these is chosen is optional. After having introduced these methods, it is recommended to select one of them and specialize in that particular method. These days, with universal access to inexpensive pocket calculators, the first method may be preferable.

Obtain and plot position lines

The Marcq St. Hilaire's method of position fixing is universal and can be utilized for any celestial body in any direction, the body in the meridian included. It is recommended that position fixing using celestial bodies that are out of the meridian is restricted to this method.

Fixing positions might be carried out as geometrical problems, preferably on an ocean plotting sheet or the navigation chart used (if scale permits).

Composite exercises, including various observation methods, dead reckoning and great-circle sailing, should be a part of the learning process.

The examination of trainees in celestial navigation should be mainly limited to their demonstrating the ability to explain the most common definitions and, in a written examination, to the ability to carry out the calculations related to the various observations.

1.1.2 USE TERRESTRIAL OBSERVATION FOR POSITION FIXING AND COASTAL NAVIGATION

90 hours

Navigational hazards, navigational aids, clearing marks and transit bearings

This subject area is primarily concerned with reading information from charts. It is essential for a nautical officer to understand fully the signs and symbols on charts, with special emphasis on buoys and beacons. Thus, the trainee should be familiar with the IALA Maritime Buoyage System.

It takes some time to become familiar with a chart, its huge amount of information, use and limitations. Therefore, it is important to give the trainees time for chart exercises, including, if possible, some aboard a training vessel.

Assess accuracy of position fixes

This subject area is intended to give the trainee sufficient knowledge and ability in:

- 1) chart projections, with the emphasis on those appropriate to navigational use;
- 2) sailing calculations, using the Mercator formula;
- 3) simple analysis of errors that may occur in position fixing.

The latter is a very important task. As far as mathematical knowledge permits, statistical methods may be used. A more practical approach to the problem may in most cases be more fruitful. The trainees' ability to make critical judgments and to adopt a critical attitude should be encouraged. In particular, the understanding of possible errors, limitations of accuracy and the need for repeated observations should be stressed.

Calculation of the course, distance and intermediate positions should be practised by working a sufficient number of exercises. The choice of formulae and the method of calculation are optional. In the case of a pocket calculator being chosen, which these days is a natural choice, use of the cosine formula for the distance and of the cotangent formula for the course is convenient. The cotangent formula cannot be used close to the equator, where the great-circle method is of little or no benefit. Except for this restriction, the formulae can be used in any position.

Despite great-circle sailing having the advantage over Mercator sailing for a shorter distance, the method has certain disadvantages. In some cases, use of the method may lead to latitude which is too high, and composite sailing has to be used. Discussion of routes and the analysis of the optimum track may start in this subject area and continue in the subject area of voyage planning.

1.1.3 USE ELECTRONIC NAVIGATIONAL AIDS FOR POSITION FIXING AND NAVIGATION

40 hours

Basic principles of hyperbolic navigation

This subject area is an introduction to the general theory of hyperbolic position lines. The topic should not be given a mathematical approach, but a basic understanding of the nature of hyperbolic position lines is important. Graphic representation should be used.

Demonstration should be given of how the position lines diverge as distance from the foci (stations) increases, how intersection between position lines varies and how these facts influence the accuracy.

Loran-C system

The main points in this subject area should be the practical use of the instrument, position fixing using Loran-C, coverage area, possible errors and accuracy. The trainee should be able to explain how various external factors may effect accuracy of position data.

Satellite navigation systems

GPS is the primary satellite system, although reference should be made to GLONASS and other systems.

COMPETENCE

1.2 Watchkeeping

40 hours

1.2.1 APPLY INTERNATIONAL REGULATIONS FOR PREVENTING COLLISIONS AT SEA TO FISHING VESSEL OPERATION

30 hours

This section will be dealt with mainly by question-and-answer sessions, using teaching aids such as models or magnetic boards. Trainees are already expected to be thoroughly familiar with COLREG 1972 and their application, so these sessions will be for purposes of revision and consolidation. Where the level of knowledge of COLREGs is found to be insufficient, additional information would have to be provided. The response “call the skipper”, of course, should no longer be available to them as a first response.

The attention of trainees should be drawn to collision examples of cases and court judgments, where possible, when discussing their answers and the actions they propose.

When dealing with manoeuvring in traffic separation schemes, particular attention should be drawn to the proper use of inshore traffic zones where they exist. Exercises should involve planning passages during which it would be necessary to join or to leave lanes, including cases which involve crossing the other lane.

Some attention should be paid to the posting of look-outs, the proper use of sound signals, the actions to take on hearing the fog signal of another vessel and other matters which do not lend themselves to simulation.

1.2.2 PRINCIPLES TO BE OBSERVED IN KEEPING A NAVIGATIONAL WATCH 10 hours**Navigational watch**

This should be based on the requirements set out in the appropriate regulations of the STCW-F 1995 Convention, chapter IV.

In most cases, a failure to keep an adequate navigational watch caused or contributed to the accident. These should be used to emphasize the importance of following the guidance given. Particular attention should be drawn to the recommendation to fix the ship's position by more than one method whenever possible. The tendency to rely entirely on radar fixes in coastal waters should be discouraged.

COMPETENCE**1.3 Radar navigation** 29.5 hours**1.3.1 OPERATE RADAR** 18.5 hours**1.3.2 USE RADAR FOR COLLISION AVOIDANCE** 11 hours

Trainees should be conversant with the application of COLREGS to avoid collisions or close encounters and means of avoiding collisions.

COMPETENCE**1.4 Magnetic and gyro-compasses** 60 hours

The compass can be checked by transit bearing, bearing to a distant object or azimuth of a celestial body. Checking by means of the amplitude method is the simplest and therefore the most common way of compass checking using celestial bodies. The comparison of compasses, for instance of gyro-compasses against magnetic compasses, should be a normal checking procedure. The importance of frequent checks should be stressed.

1.4.1 DETERMINE AND APPLY COMPASS ERRORS USING TERRESTRIAL OBSERVATION 45 hours

Although the magnetic compass is mainly used only as a stand-by for the gyro-compass, its errors should be regularly checked and recorded. Readjustment should be carried out when necessary, to ensure that a reliable and predictable instrument is available in the event of failure of the gyro-compass.

1.4.2 DETERMINE AND APPLY COMPASS ERRORS USING CELESTIAL OBSERVATION 15 hours

The errors should be treated non-mathematically. The various errors may be referred to the performance standards for gyro-compasses to give trainees an indication of the limits of the accuracy that can be expected.

COMPETENCE

1.5 Meteorology and oceanography 45 hours

1.5.1 OBTAIN AND APPLY METEOROLOGICAL INFORMATION 30 hours

Identify weather conditions liable to endanger the vessel

The wind and pressure system over the oceans

The trainee should have a basic knowledge of the general global pressure distribution and wind circulation, including the doldrums, trade winds, monsoon areas and seasons, winds of the temperate zone and the more important local winds. There are good world climatic charts in The Mariner's Handbook (T18) in addition to those in the textbooks.

Tropical revolving storms

The instructor should make use of drawings of the structure of a tropical storm, graphical representations of temperature, pressure and wind speed, satellite pictures and charts showing actual storm tracks.

Trainees should be fully conversant with the means of avoiding tropical storms, where to find details of radio storm warnings, and the information which should be transmitted if the skipper has good reason to believe that a tropical storm is developing or exists in his neighbourhood.

Apply available meteorological information

If a facsimile receiver is available, receiving and interpreting the weather chart of the day should be part of the training process.

The planetary system of wind and pressure

Reference should be made to the way in which the stability of the atmosphere determines the type of cloud, the height at which it forms and its thickness. The stability of the different air masses and how it is modified as they move should be related to the weather associated with them.

A qualitative treatment of the various forces which give rise to surface winds is intended.

Climatology

Trainees should have a general idea of the climate of the oceans and the seasonal change to be expected. The Mariner's Handbook (T18) contains world climatic charts.

Weather forecasting

On occasions, the observations taken do not agree with the forecasts or prognostic charts as the result of a system having a speed or direction of movement different from that expected.

Trainees should be able to use their observations and knowledge of the weather expected in different parts of the system to revise the original forecast.

If a facsimile receiver is available, receiving and interpreting the weather chart of the day should be part of the training process.

1.5.2 OBTAIN AND APPLY OCEANOGRAPHIC INFORMATION

15 hours

Use appropriate navigational publications on tide and currents

Trainees should possess sufficient knowledge of ocean currents and sources of information on currents to enable them to select an optimal route for a fishing voyage and season.

Calculate the times and heights of high and low water and estimate the direction rate of the tidal stream

The variation of water levels can be interpreted as being made up of two components, i.e. the astronomic component (tide) and the meteorological component. The tide is predicted to a reasonable accuracy for different ports around the world. The meteorological component cannot be predicted, at least not for longer periods than normal weather prediction. This latter component is added to, or subtracted from, the predicted height. It is therefore important to emphasize that the predicted height of the tide is not an accurate value.

COMPETENCE

1.6 Fishing vessel manoeuvring and handling

30 hours

1.6.1 IDENTIFY TECHNIQUES FOR MANOEUVRING AND HANDLING FISHING VESSELS IN ALL CONDITIONS

30 hours

Berthing, unberthing and anchoring

Trainees should demonstrate, with the use of aids such as models on a large table, how to berth and unberth at given port facilities, under various conditions of wind and current, detailing the helm and engine orders, anchors, mooring lines and instructions to tugs that they would use. The class should be asked to evaluate and criticize the actions taken and suggest alternative methods where applicable (V5).

Exercises in anchoring are particularly suitable for practice with a training vessel where one is available. Trainees should be required to produce a plan for anchoring in a given position and then carry out the plan, acting as a bridge team. Their roles in the bridge team would be rotated in subsequent exercises. Mention should be made of the importance of checking, lateral as well as fore-and-aft, movement of the fishing vessel when anchoring near very large ships.

Manoeuvring a vessel in shallow water

Squat is not easily measured, so the information supplied to a vessel consists of estimated values. The actual squat experienced may differ somewhat from those values in the prevailing circumstances.

In any case, since squat is proportional to the square of the speed, a reduction in speed effectively reduces the resulting sinkage and change of trim. See reference (T21)

Vessel handling in restricted waters

The approximate mean squat can be calculated by using formulae. Trainees should be reminded that values obtained from formula or from squat diagrams are theoretical and that the actual squat and trim of the their vessels may differ somewhat.

Managing and handling of fishing vessels in heavy weather

Full use should be made of trainees' personal experiences when covering this section. When dealing with methods of keeping a disabled vessel out of a sea trough and lessening lee drift, trainees should be restricted to using materials which are available aboard their vessels (V6, V8).

Manoeuvring the vessel during fishing operations

Many accidents occur when shooting and hauling the fishing gear and deckhands should stand clear of running ropes or warps so that the vessel's motion does not throw them onto the ropes or warps. They should keep clear of outrunning gear of all types, and should not stand on parts of the gear lying on deck when the remaining part is still in the water. The working deck is a dangerous environment, particularly in adverse weather conditions. During shooting and hauling any fishing gear, crew whose presence is not necessary for the operation should keep clear of the operating area.

Fasteners (obstructions to gear on the sea-bed) are a source of danger on deck until the last section of gear is on board. The tension in the warps to clear fasteners should be from as low a point and as near to the vessel side or stern as possible. Great strains can occur in unexpected places when heaving on taut warps or by the motion of the vessel. Fasteners which result in the gear being parted at one end and the entire load being hauled from one warp present dangerous situations.

Identify precautions to be taken in manoeuvring for launching boats or liferafts in bad weather

A vessel stopped in high wind will probably lie with the wind approximately abeam and will drift quite rapidly to leeward. Survival craft, particularly liferafts, will experience difficulty in getting clear of the lee side and will probably be dependent on a motor lifeboat or rescue boat to tow them clear.

On the weather side, conditions will be much rougher and it will be difficult to hold craft alongside for boarding. Streaming a sea-anchor will slow the drift of survival craft sufficiently to allow the vessel to drift away from them.

Identify vessel handling requirements associated with taking on board survivors from lifeboats or liferafts

General maritime considerations for survivors in the water: the rescuing vessel may find it necessary to rig scramble nets, launch lifeboats, launch liferafts, have crew members suitably equipped to enter the water to assist survivors and be prepared to provide initial medical treatment.

General maritime considerations for a fire or extremely heavy weather, or where it is impossible for the rescue vessel to come alongside, then a lifeboat or liferaft may be towed to a closer position.

General maritime considerations in heavy weather:

- the use of oil for reducing the effect of the sea:
 - experience has shown that vegetable oils and animal oils, including fish oils, are most suitable for quelling waves
 - lubricating oils may be used
 - fuel oil should not be used, except as a last resort, as it is harmful to persons in the water
 - a lubricating oil is less harmful, and tests have shown that 200 litres discharged slowly through a rubber hose with an outlet just above the sea, while the vessel proceeds at slow speed, can effectively quell a sea area of some 5,000 square metres; and
 - a vessel with a low freeboard may be better suited to effect rescue.

A boarding station may be rigged by mooring a liferaft alongside:

- it is particularly useful when lifeboats are used;
- survivors can be quickly unloaded into the boarding station; and
- releasing the boat for another trip.

The direction of approach to the distressed craft (or survivors) will depend upon circumstances:

- some emergencies, such as a vessel on fire, may have to be approached from windward and others, such as liferafts, from leeward.
- the two key factors are:
 - whether a lee-side protection is necessary during the rescue operation; and
 - the comparative rates of drift of the distressed craft and the rescuing vessel.

If time permits, assess the relative rates of drift:

- this precaution may prevent serious mishaps during the rescue operations; and
- in general, survivors in the water are best approached from the leeward side.

If practicable, arrange for injured personnel requiring the attention of a medical officer to be transferred to a vessel carrying one.

Where applicable, practical measures to be taken when navigating in ice or conditions of ice accretion on board the vessel

The Mariner's Handbook (T18) contains a full treatment of ice conditions, well illustrated with photographs.

Trainees should be able to know where information on ice reports can be found and understand the terms and descriptions used in them. The Marine Observer's Handbook (T14) contain the Ice Nomenclature drawn up by the World Meteorological Organization.

Trainees should also be able to recognize the conditions which may give rise to severe accumulation of ice on the vessel.

Navigate at an appropriate speed to avoid damage caused by own vessel's bow or stern wave

When sailing in severe following or quartering seas, a vessel is likely to encounter various kinds of dangerous phenomena, which may lead to capsizing.

The sensitivity of a vessel to dangerous phenomena will depend on the actual stability parameters, hull geometry, vessel size and vessel speed.

Guidance for avoiding dangerous situations in following and quartering seas provides advice on safe and unsafe combinations of vessel speed and course relative to waves, in a simplified form of a polar diagram.

The watchkeeping officer should pay careful attention that the vessel maintains a good state of stability and does not carelessly navigate in severe following and quartering seas.

Procedures for transferring fish at sea to factory ships or other vessels

A vessel at anchor will pivot around her stern to a degree depending on wind, tide and swell. A vessel in an anchorage which is not sheltered from wind and/or swell, or one in open waters, will certainly be moving in a figure of eight motion either large or small.

Fishing vessels which are called upon to go alongside a vessel at anchor should exercise the utmost degree of caution and skill before doing so. The first task before going alongside the anchored vessel, after having decided that it is safe to do so, is to establish communication by VHF and maintain it throughout the operation.

The approach run to the anchored vessel should not be made at a fine angle from the stern, nor should it be made with very much headway. As the bow of the approaching vessel nears the stern of the anchored vessel, even in a calm sea, interaction between the vessels will be set up, depending on the way of the approaching vessel. The displacement effect at the bow will put pressure on the stern of the anchored vessel and push it away. The vessel at anchor will pivot at an angle across the approaching vessel's bows and a collision will probably

occur. If contact is made at the forepart of the anchored vessel, both vessels will sheer away forward and a second contact will take place between the quarters.

It is far better to approach an anchored vessel on her beam at a suitable distance and pass breast ropes across. By doing so the vessels may be brought together under the control of the breast ropes and by winch. If the anchored vessel takes a sheer when the two vessels are abeam, it can be corrected by the use of helm and engines. The vessel about to moor must also take action to avoid impact and if necessary steam away altogether.

Once having moored alongside an anchored vessel it is of primary importance to be sure that the vessels are well fendered. It will also be seen that any two vessels are unlikely to have the same characteristics insofar as draught, length, beam and stability conditions. Consequently, in any sea, swell, or wind, the vessels will have different roll and pitch periods, and they will range differently. In moderate to good conditions, good fendering may be adequate to prevent damage, but the prudent skipper will have the vessel ready at all times so that he is ready to cast off in the event of worsening wind, sea, or swell and so avoid damage to his vessel.

Procedures for refuelling at sea

A fishing vessel intending to take fuel on board at sea should be adequately equipped and the skipper and crew properly trained. In like manner, a vessel intending to transfer fuel at sea to another vessel should be adequately equipped and the skipper and crew properly trained. Both vessels should be provided with an appropriate checklist in relation to the safe transfer of fuel at sea.

To the extent practical, the transfer of fuel should be carried out in calm weather and preferably in a sheltered position.

The passing of the flexible pipe from one vessel to another is a hazardous operation and should be supervised by a competent person on board both vessels. Furthermore, the persons manning the lifting gear should be in attendance at all times during the transfer of fuel operation. Similarly, experienced personnel should continuously man the relevant valves on the supply vessel ready to act quickly in the event of an emergency.

On completion and when pumps are stopped, but with the deck connection valves open, the mid section of the flexible pipe should be raised to drain as much fuel as possible from the pipe. Thereafter, with the save-all still in place, valves may be closed and the pipe flange on the fuelled vessel disconnected, the blank flange refitted and the pipe retrieved by the fuel supply vessel.

COMPETENCE

1.7 Emergency procedures

63 hours

1.7.1 RESPOND TO EMERGENCY SITUATIONS INVOLVING FISHING VESSEL PERSONNEL

Follow emergency procedures specified in the vessel's contingency plan

Given a brief description of a vessel and a crew list, trainees should be able to divide the crew into appropriate emergency teams and draw up the muster list and emergency instructions. Instructions should cover general emergency and fire stations separately.

Plans for dealing with fires in specific areas should be considered. Actual plans would depend upon the construction and arrangement of a particular vessel, but principles such as containment of a fire, escape routes, access for fire fighters and the medium to be used can be dealt with. Trainees should be reminded that these plans should be put into practice by performing drills at sea and that a different location for the fire should be chosen at each practice. It may be found that the plans need revising in the light of experience gained during drills.

Similarly, boat drills should sometimes be organized on the assumption that certain survival craft have been destroyed or are not usable for some reason.

The vessel safety committee should be involved in the organization of emergency drills and the evaluation of the plans in the light of those drills. Representatives can bring any difficulties or deficiencies to the attention of the committee and suggest solutions to the problem. The committee can increase awareness of the actions required from crew members through their representations.

The control centre for the command team in port should normally be at main deck level, at a location suitable for liaison with shore authorities. It should have a shore telephone connection and have emergency equipment and information stored there ready for use.

Means of limiting damage and salvaging the ship following a fire or explosion

No definite procedures can be laid down as each occurrence will be unique. Trainees should consider the measures which could be taken in a variety of situations, using materials to be found aboard the vessel.

It is important to keep observation on damaged areas and temporary repairs, to ensure that there is immediate warning of a worsening situation.

Procedure for abandoning ship

A vessel should not be abandoned prematurely. It is generally safer to remain aboard a wreck, to await the arrival of assistance, for as long as possible. This is particularly true in severe weather conditions, when abandoning a vessel is very hazardous and the condition

of the crew will deteriorate rapidly in survival craft. Also, in those conditions, craft are likely to become widely dispersed, making rescue more difficult.

When the condition of the vessel is such that sinking or breaking up is inevitable, the vessel should be abandoned in time to get clear of her before she sinks or before wreckage makes the launching of survival craft dangerous. In the event of fire or explosion or the release of toxic fumes it may be essential to get clear of the vessel as quickly as possible.

Consideration should be given to the method of passing the 'abandon ship' signal. It should be distinctive, so that it is not confused with other signals or instructions which may be given in an emergency. The instruction to abandon ship may have to be given by word of mouth if other communication systems have broken down.

The duties of the emergency party should include provision for the shutting down of any machinery, as required.

Man-overboard procedures

The standard full-speed man-overboard manoeuvres, such as the Williamson turn, are not possible in very heavy weather. Turning at speed into a heavy sea and swell could cause serious damage to the ship. The turn should be made in the safest way possible in the conditions and the vessel manoeuvred into a position to windward of the person in the water. The vessel will quickly drift down to him. A few fit crew members, wearing immersion suits, lifejackets and lifelines, should be standing by to help the person on board. Use may also be made of the line-throwing apparatus, with a buoyant head, to drift a line to the person in the water. It is essential to keep the person in sight throughout the operation, and this is difficult in a heavy sea and swell, so any crew not otherwise occupied in the rescue should be posted as look-outs.

When a person is reported to the skipper as missing, it may reasonably be assumed that efforts have already been made to find him. A final call on the public address system should be made and if there is no response the vessel should be turned into its wake and a search along the reciprocal course made. At the same time, a thorough search of the vessel should be organized and the time at which the missing person was last seen should be established. The track should be searched back to the position where it is known the person was still on board. An urgency call requesting other vessels in the vicinity to keep a look-out for the person should be made.

1.7.2 RESPOND TO FISHING VESSEL EMERGENCY SITUATIONS

34 hours

Precautions to be taken when beaching a vessel

Although a gently shelving beach of sand or gravel is ideal, in many cases the urgency of the operation will dictate that the nearest beach is used regardless of the nature of the bottom. Similarly, the state of the tide can seldom be chosen.

A loss of stability similar to that experienced on taking the blocks in dry-dock will occur. If the vessel has a large trim or the slope of the bottom is large, a heavy list may develop as the tide falls. The vessel will list similarly when one end lifts again on the rising tide. Transfer of ballast of flooding a compartment may be necessary to prevent the list becoming excessive.

Beaching with the vessel parallel to the beach may avoid that problem; the vessel will settle with a list to the slope of the beach. If a boat is used to transfer non-essential crew members ashore, the broad side on position will provide a lee from onshore waves and surf for the boatwork.

On the other hand, a vessel end-on to the beach with ground tackle laid out to keep the stern in place would be better able to withstand heavy onshore weather and would be easier to haul off eventually.

Actions to be taken prior to, and after, grounding

When planning an attempt at refloating, consideration should be given to the extent of damage, the height of tide, the assistance available and whether the vessel can be lightened by discharging fishing gears or catch. Soundings, taken from a boat, will give an indication of the most favourable direction in which to try to move the vessel during refloating.

The release or probable release of oil or other harmful substances should be reported at once to the nearest coast radio station. Where a serious threat of pollution exists, the coastal State involved may intervene in the salvage operations.

Action to be taken following a collision

The duties of the skipper following a collision are set out in Article 8 of the International Convention for the Unification of Certain Rules of Law with respect to Collision between Vessels, Brussels, 1910.

“After a collision, the master of each of the vessels in collision is bound, so far as he can do so without serious danger to his vessel, her crew and her passengers, to render assistance to the other vessel, her crew and her passengers.

He is likewise bound so far as possible to make known to the other vessel the name of his vessel and the port to which she belongs, and also the names of the ports from which she comes and to which she is bound.

A breach of the above provisions does not of itself impose any liability on the owner of a vessel.”

There may also be national requirements regarding the recording and notification of collision accidents. In any case, full details of the collision, engine and helm orders prior to impact, estimates of the heading and speed at the time of impact and the angle of contact with the other vessel should be entered in the log-book for future reference. The trace from the course recorder should be appended to the log-book.

Even a small hole in the shell plating below the waterline will admit water faster than the capacity of bilge pumps to deal with it. A rapid assessment is needed of the tonnage of water in the space, the lost buoyancy and change of trim and the effect of these factors on stability. Cross-flooding may be needed to reduce the list in certain vessels, if only to aid abandonment.

The release or probable release of oil or other harmful substances should be reported to the nearest coast radio station at the first opportunity.

Means of limiting damage and salving the vessel following a fire or explosion

No definite procedures can be laid down as each occurrence will be unique. Trainees should consider the measures which could be taken in a variety of situations, using materials to be found aboard vessel.

It is important to keep observation on damaged areas and temporary repairs, to ensure that there is immediate warning of a worsening situation.

Procedure for abandoning vessel

A vessel should not be abandoned prematurely. It is generally safer to remain aboard a wreck, to await the arrival of assistance, for as long as possible. This is particularly true in severe weather conditions, when abandoning ship is very hazardous and the condition of the crew will deteriorate rapidly in survival craft. Also, in those conditions, craft are likely to become widely dispersed, making rescue more difficult.

When the condition of the vessel is such that sinking or breaking up is inevitable, the vessel should be abandoned in time to get clear of her before she sinks or before wreckage makes the launching of survival craft dangerous. In the event of fire or explosion or of the release of toxic fumes it may be essential to get clear of the vessel as quickly as possible.

Consideration should be given to the method of passing the 'abandon ship' signal. It should be distinctive, so that it is not confused with other signals or instructions which may be given in an emergency. The instruction to abandon a vessel may have to be given by word of mouth if other communication systems have broken down.

The duties of the emergency party should include provision for the shutting down of any machinery, as required.

Use of auxiliary steering gear and the rigging and use of jury steering arrangements

The textbook gives examples of jury steering arrangements which have been produced with considerable ingenuity on the part of vessels' officers concerned. Trainees should be restricted to using material which would be available aboard vessel when answering questions on jury steering arrangements or jury rudders.

1.7.3 PROVIDE ASSISTANCE IN EMERGENCY SITUATIONS

9 hours

Rescue of persons from a vessel in distress or from a wreck

Unless the situation is critical, conditions should be assessed carefully and a plan prepared before initiating. Unless the situation is critical, conditions should be assessed carefully and a plan prepared before initiating rescue action. If the survivors are in no immediate danger and existing conditions make rescue hazardous, consider waiting until conditions have improved or until daylight. Try to establish communications with the survivors to obtain information about their condition and to inform them of the intended method of rescue.

Direct transfer of survivors from a wreck to the vessel requires nearly calm conditions and, normally, rescue boats or motor lifeboats will be used.

It is unlikely that the disabled vessel or wreck will be drifting at the same rate as the rescue vessel so, if time permits, it is a good idea to try to get an estimate of their relative drift rates before launching the boats. At the same time, the rescue vessel should reconnoître the area around the wreck to see if there are any obstructions which might hamper the boat.

During the launching of boats, lifelines, lifebuoys, ladders and nets should be ready in case somebody falls overboard or a boat overturns.

Going alongside a wreck may be difficult. On the lee side the approach may be obstructed by wreckage, and if the wreck is drifting quickly the boat will have difficulty getting away from the side. Sea conditions may make it impossible to approach from the weather side and, since the wreck will probably drift faster than the boat, it will be difficult to remain close enough to transfer survivors. An approach from the weather side is the only possibility when the wreck is on fire or releasing toxic fumes, in which case survivors may have to jump into the water to be picked up by the boats.

If weather conditions make the use of boats too hazardous, and it is not possible to wait for conditions to moderate, a liferaft on a stout line may be towed or floated to the wreck or may be hauled out to the wreck after making connection by line-throwing apparatus. The painter fitted to the liferaft is not heavy enough to be used in this manner.

At the rescue vessel, preparations for the transfer of survivors include the provision of a boat rope, nets, ladders, lines and crew standing by to assist. The use of a liferaft alongside as a landing stage releases the boat quickly if it is necessary to make several journeys. Survivors who have been in the sea or survival craft for some time may be suffering from cold, fatigue and sea-sickness and be unable to do much to help themselves.

Apply procedures for towing and being towed

Towing for the purpose of saving life is always permitted. For example, towing a disabled vessel away from a lee shore may be the safest way of saving the crew in some circumstances.

The towing wires used by salvage tugs are much longer than the towing wires carried by fishing vessels, which do not have sufficient weight on their own to provide a catenary to absorb shock loadings. To provide the extra weight it is usual to shackle the towing wire to the anchor cable of the towed vessel and to walk back the cable sufficiently to keep the towing wire submerged throughout the towing operation.

When starting to tow, the weight should be taken up gradually, the speed being slowly increased until towing speed is reached. Care should be taken to avoid jerking the tow wire on first taking the weight. The towing speed is adjusted so that the tow wire remains submerged. If the tow wire shows signs of clearing the water and straightening, the engine revolutions should be reduced until a catenary has been restored.

A method of slipping the tow in an emergency (such as the foundering of the towed vessel, for example) should be reduced and known to all of the watchkeepers.

Disconnecting the tow, particularly in confined waters at a port approach, can be a critical operation and should be planned and agreed between the two vessels. Speed will have to be reduced gradually over a long distance. As the depth of water decreases, the towed vessel should shorten the tow by heaving in cable, to prevent the tow line fouling on the bottom. Harbour tugs should be arranged to assist with manoeuvring during disconnection and to take the tow into a berth. Alternatively, both vessels may be brought to anchor before disconnecting.

COMPETENCE

1.8 English language

1.8.1 APPLY ENGLISH LANGUAGE TO FISHING VESSEL OPERATIONS

The requirements for English language knowledge are specified in the STCW-F 1995 Convention, chapter II, which states that English language, both written and spoken is necessary for the exchange of communication relevant to the safety of life at sea.

IMO Model Course 3.17 – Maritime English, is based on a clearly defined entry standard in general English, deals with maritime terminology and the use of English for the purposes of using charts and other nautical publications and understanding meteorological information.

The course also includes the vocabulary needed to make use of and understand manufacturers' technical manuals and specifications to converse with technical shore staff concerning vessel and machinery repairs.

This should be an intensive stand-alone course and its duration will depend to a great extent on the current proficiency and aptitude of course entrants. A pre-course appraisal by a qualified English teacher will be necessary to ascertain the level of entrants.

A test should be designed to fit in to this section to point towards the English course to be done separately within the training institution, as part of the credit to award the certificate of competency.

1.8.2 STANDARD MARINE COMMUNICATION PHRASES

In addition to the above IMO model course on maritime English, the IMO Standard Marine Communication Phrases for communications with other vessels or coast stations concerning vessel's safety and operation should also be incorporated.

COMPETENCE

1.9 Communications

27 hours

The competence requirements for knowledge and understanding of communications skills should cover those areas referred in section 16 of the Appendix to Regulation II/1 of the STCW-F Convention.

See also Model Course 1.26 for guidance.

COMPETENCE

1.10 Search and rescue

6 hours

Instructors should note that the International Aeronautical and Maritime Search and Rescue Manual, published jointly by IMO and the International Civil Aviation Organization (ICAO) in three volumes, provides guidelines for a common approach to organizing and providing SAR services. The International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual was published in 2007. A revised SAR Convention, which entered into force on 1 January 2000, clarifies the responsibilities of Governments and puts greater emphasis on the regional approach and co-ordination between maritime and aeronautical SAR operations.

Volume III, Mobile Facilities, is intended to be carried aboard rescue units, aircraft and vessels to help with performance of a search, rescue or on-scene co-ordination function, and with aspects of SAR that pertain to their own emergencies.

COMPETENCE

1.11 Fishing vessel power plants

5 hours

1.11.1 OPERATE AND MAINTAIN FISHING VESSEL POWER PLANTS

5 hours

Operating principles of marine power plants in fishing vessels

Diesel engines

The principles of the working of 2-stroke and 4-stroke diesels should be covered, together with their essential services such as fuel, lubricating and cooling systems. Details of particular makes of engines are not required. Trainees should be aware of the procedures for preparing the engine for use and the change over from full sea speed to manoeuvring, with the likely times involved. They should also know what is involved in starting and controlling the engine.

The rules regarding the capacity of the starting air reservoir are laid down by the classification societies.

Propeller and propeller shaft

The bridge control for controllable-pitch propellers is usually arranged to give about 60 to 70 % of engine full speed when set for zero pitch. Movement of the lever forward or aft initially affects the pitch only. Full pitch is usually reached by moving the control lever through half of its travel, further movement increasing the engine revolutions. There may also be a means of adjusting the maximum pitch available. The engine and CPP can be controlled from the machinery control room and facilities may be provided for overriding all remote controls. Standing orders should indicate the procedure for informing the bridge if this has to be done.

Before starting the main engines, the propeller operation control-oil pumps should be running and a check made that control is possible from all control positions. During starting, control will be from the machinery control room. The propeller should be set for zero thrust and a

check made that it is all clear to start the propeller turning. After starting, control is transferred to the bridge.

Before letting go or weighing anchor, the officer of the watch should check which position has control and that it is effective, by making a small movement of the pitch control and observing the result. Before entering harbour or restricted waters, a check should be made on the control of engine speed and propeller pitch while still at sea and adequate room is available.

Throughout this section, instructors should keep in mind that officers should be able to explain the principles of operating and maintaining marine power plants. In this context, officers should be familiar with the correct and commonly used engineering terminology. The officer must have sufficient knowledge to be able to understand and manage the issues – he or she, therefore, does not need to have detailed engineering knowledge. It is important that they understand the consequences of any malfunction and the actions to restore proper operations, or avoid problems if the machinery operation cannot be restored.

Wheelhouse control

Technical details are not required. Trainees should be able to draw block diagrams of the systems, showing the information paths between the various components. The requirements for indicators and alarms in the wheelhouse are set out in Torremolinos regulations.

Function 1: Navigation

Part C1: Detailed Teaching Syllabus

■ Introduction

The detailed teaching syllabus is presented as a series of learning objectives. The objective, therefore, describes what the trainee must do to demonstrate that the specified knowledge or skill has been transferred.

Thus each training outcome is supported by a number of related performance elements in which the trainee is required to be proficient. The teaching syllabus shows the required performance expected of the trainee in the tables that follow.

In order to assist the instructor, references are shown to indicate IMO references and publications, textbooks and teaching aids that instructors may wish to use in preparing and presenting their lessons.

The material listed in the course framework has been used to structure the detailed teaching syllabus; in particular:

- Teaching aids (indicated by A)
- IMO references (indicated by R) and
- Textbooks (indicated by T)

will provide valuable information to instructors.

■ Explanation of information contained in the syllabus tables

The information on each table is systematically organized in the following way. The line at the head of the table describes the **FUNCTION** with which the training is concerned. It describes related activities which make up a professional discipline or traditional departmental responsibility on board.

In this Model Course there are three functions:

- Navigation
- Catch handling and stowage
- Controlling the operation of the fishing vessel and Care for persons on board

The header of the first column denotes the **COMPETENCE** concerned. Each function comprises a number of competences. For example, the Function 1, Navigation, comprises a total of eleven **COMPETENCES**. Each competence is uniquely and consistently numbered in this model course.

The first is **Navigation and position determination**, It is numbered 1.1, that is the first competence in Function 1. The term competence should be understood as the application

of knowledge, understanding, proficiency, skills, and experience for an individual to perform a task, duty or responsibility on board in a safe, efficient and timely manner.

Shown next is the required **TRAINING OUTCOME**. The training outcomes are the areas of functional skill components in which the trainee must be able to demonstrate knowledge and understanding. Each COMPETENCE comprises a number of training outcomes. For example, the competence **Navigation and position determination** comprises a total of ten training outcomes. The first is in **VOYAGE PLANNING AND NAVIGATION FOR ALL CONDITIONS**. Each training outcome is uniquely and consistently numbered in this model course. That concerned with Voyage Planning and Navigation for all Conditions is uniquely numbered 1.1.1.

Finally, each training outcome embodies a variable number of required performances – as evidence of competence. The instruction, training and foaming should lead to the trainee meeting the specified required performance. For the training outcome Voyage Planning and Navigation for all Conditions, there are two areas of performance. These are:

1.1.1.1 Use sextant

1.1.1.2 Complete sight reduction

and so on.

Following each numbered area of required performance there is a list of activities that the trainee should complete and, which collectively specify the standard of competence that the trainee must meet. These are for the guidance of teachers and instructors in designing lessons, lectures, tests and exercises for use in the teaching process. For example, under the topic 1.1.1.2 – Complete Sight Reduction, to meet the required performance the trainee should be able to:

- define the apparent solar day and state the relationship between LHA (sun) and LAT
- define the sidereal day and state that it is a fixed time interval

and so on.

IMO references (R) are listed in the column to the right hand side – Teaching aids (A), videos (V) and textbooks (T) relevant to the training outcome and required performances are placed immediately following the **TRAINING OUTCOME** title.

It is not intended that lessons are organized to follow the sequence of required performances listed in the tables. The syllabus tables are organized to match with the competence in the FAO/ILO/IMO Document for Guidance for Training and Certification of Fishing Vessel Personnel, chapter 7, section 2 and 3. Lessons and teaching should follow college practices. It is not necessary, for example, for celestial navigation to be studied before tides. It is necessary, however, to ensure that all the relevant elements are covered and that teaching is effective to allow trainees to meet the standard of the required performance and demonstrate their competence.

COMPETENCE 1.1 Navigation and position determination	IMO Reference
TRAINING OUTCOMES: <i>Demonstrate a knowledge and understanding of:</i> 1.1.1 CELESTIAL BODY OBSERVATION FOR POSITION FIXING AND NAVIGATION 1.1.2 TERRESTRIAL OBSERVATION FOR POSITION FIXING AND COASTAL NAVIGATION 1.1.3 ELECTRONIC NAVIGATIONAL AIDS FOR POSITION FIXING AND NAVIGATION	Paragraphs 2, 3 and 6 of appendix of regulation II/2 in STCW-F

COMPETENCE 1.1 Navigation and position determination	IMO Reference
<i>Required performance:</i>	
1.1.1 CELESTIAL BODY OBSERVATION FOR POSITION FIXING AND NAVIGATION Textbooks: T1, T3, T4, T25 Teaching aids: A1, A13, A20 1.1 Use sextant (5 hours) – define ‘sextant altitude’ – demonstrate how to read a sextant – show how to correct a sextant into which has been introduced one or more of error of perpendicularity, side error or index error – demonstrate how to find the index error of the sextant by the horizon – demonstrate how to find the index error of the sextant by the sun and stars – use the sextant for taking vertical and horizontal angles – describe the purpose of altitude correction – define ‘visible’, ‘sensible’ and ‘rational’ horizons – define ‘observed altitude’ and ‘true altitude’ – define ‘dip’, ‘refraction’, ‘semi-diameter’ and ‘parallax’ and explain their causes – apply index error – apply the corrections for the items listed in the above objectives and explain the factors determining their magnitude – illustrate the effect of terrestrial refraction on the dip and distance of the sea horizon – correct an altitude using tables in the Nautical Almanac, including reference to critical tables, interpolation tables and low-altitude correction tables – obtain the true zenith distance from the true altitude of the body 1.2 Complete sight reduction (15 hours) – define the apparent solar day and state the relationship between LHA (sun) and LAT – define the sidereal day and state that it is a fixed time interval – explain the reasons for the sun’s irregular rate of change of SHA and hence the necessity to adopt the astronomical mean sun for timekeeping purposes – define the equation of time (ET) and its components – determine the ET from the almanac and its sign of application – define GMT, LMT and longitude – define zone times and standard times – explain how to alter the ship’s time during a passage with increasing or decreasing longitude – demonstrate the use of time signals – calculate the error of a chronometer or watch – describe the information contained in general in the Nautical Almanac and in detail in the daily pages – use the tables of corrections and incremental corrections in the Nautical Almanac – find the LHA of a body, given the date, GMT and longitude of the observer – explain the importance of the First Point of Aries – find the LHA of Aries, given the date, GMT and longitude of the observer – explain what is meant by the sidereal hour angle of a star and obtain it from the Nautical Almanac	R1, R2

COMPETENCE 1.1 Navigation and position determination	IMO Reference
<i>Required performance:</i>	
– derive the LHA of a star from the LHA of Aries and the SHA of the star – use the information in the Nautical Almanac to obtain the LMT of the meridian passage of a body to the nearest minute and interpolate for the observer's longitude when necessary – apply the true zenith distance of a body when it is on the observer's meridian to the declination of the body, to obtain the observer's latitude – apply these correctly when the declination and latitude have the same names – apply these correctly when the declination and latitude have different names – state the relationship between the altitude of the elevated pole and the latitude of the observer – explain what is meant by a circumpolar star, and the terms upper and lower transit – find the value of the polar distance of the body, using its declination – apply the polar distance to the true altitude of a body at a lower transit to find the altitude of the elevated pole and the latitude – calculate the direction of the position line and the latitude of the observer by meridian altitude – identify certain major stellar constellations and navigational stars describe their movement relative to Polaris and the movement of Polaris with change of latitude – identify Polaris – identify some major constellations – describe the motion of the stars about Polaris – describe the relationship between the altitude of Polaris and the observer's latitude – deduce from the above objective that the true altitude of Polaris can be used to find the latitude of the observer – obtain the corrections -1°, $+a_0$, $+a_1$, $+a_2$, from Pole Star tables in the Nautical Almanac and apply them to the altitude of Polaris to find the latitude of the observer – find the true azimuth of Polaris from the tables and the direction of the position line	
1.3 Obtain and plot position lines (25 hours) – combine the equinoctial and horizon system of co-ordinates to determine the centre and radius of a position circle and its direction in the vicinity of a selected position – apply the principle of a method of enabling the navigator to draw a small part of the position circle in his vicinity to at a practical problem – determine the direction of a position line through an observer and a position through which it passes – define and evaluate the co-latitude, polar distance and zenith distance and use them as the sides of the PZX triangle – solve the PZX triangle to find the calculated zenith distance of the body when it is out of the meridian – apply this calculated zenith distance to the true zenith distance of the body to find the intercept and the intercept terminal points through which to draw the position line (Marcq St. Hilaire method) – determine the true azimuth of the body from tables and hence determine the direction of the position line – find the position of the observer at the time of the final observation, given two or more position lines with the courses and distances run between the observations	

COMPETENCE 1.1 Navigation and position determination	IMO Reference
<i>Required performance:</i>	
1.1.2 TERRESTRIAL OBSERVATION FOR POSITION FIXING AND COASTAL NAVIGATION Textbooks: T1, T2, T4, T5, T25 Teaching aids: A1, A4, A5, A6, A7, A9, A10, A12, A14, A15, A18, A24 2.1 Define basic theories and knowledge for terrestrial observation (20 hours) – define ‘great circle’, ‘small circle’, ‘spherical angle’, ‘spherical triangle’, ‘poles of a great circle’ – define ‘earth’s poles’, ‘equator’ and ‘meridians’ – define ‘latitude’ and ‘parallels of latitude’, ‘prime meridian’ and ‘longitude’ – define ‘difference of latitude’ and ‘difference of longitude’ – describe the earth as an ellipsoid. – define ‘compression’, and state its value – define ‘international nautical mile’, ‘cable’ and ‘knot’ – demonstrate basic knowledge of chart projections – define ‘natural scale’ of a chart – state the requirements of a chart appropriate for marine navigation – identify the Mercator chart as a mathematical projection and understand the principles of its construction. Describe the properties of the chart and the degree to which it meets navigational requirements and also its limitations – demonstrate the use of a chart catalogue – demonstrate the correcting of charts according to Notices to Mariners – describe the rotation of the earth about its axis – define directions on the earth’s surface – describe the direction indicated by the gyro-compass – describe the direction indicated by the magnetic compass – describe the direction of the ship’s head on a gyro-compass (gyro course) – describe the direction of the ship’s head in a magnetic compass (compass course) – state the approximate polar and equatorial circumferences of the earth – demonstrate how to measure the distance between two positions on a Mecator chart – define a position – plot a position on the chart from simultaneous cross bearing and from bearing and distance off – define ‘dead reckoning position (DR)’, ‘estimated position’ and ‘fixed position’ – define ‘departure’ and state the relationship to difference of longitude – define ‘true course’ and ‘rhumb line’ – derive the plane sailing formulae – explain the relationship between departure and difference of longitude in cases involving a change of latitude, by using mean latitude – understand the meaning of, and can derive, mean latitude	R1, R2

COMPETENCE 1.1 Navigation and position determination	IMO Reference
<i>Required performance:</i>	
2.2 Identify navigational hazards (5 hours) – recognize and demonstrate the use of the Nautical chart symbols and abbreviations on a chart – identify the characteristics of navigational hazards 2.3 Use navigational aids, clearing marks and transit bearings to safely navigate hazards (15 hours) – identify the characteristics and range of lights – explain the principles and rules of the International Association of Lighthouse Authorities (IALA) Maritime Buoyage System, Systems “A” and “B” – calculate the distance of sighting lights and dipping distances – explain the danger of placing implicit reliance upon floating navigational aids – explain the danger of approaching navigational aids too closely – recognize coastlines, coast and radar-responsive targets – recognize suitable passages, approaches and anchorages in clear weather and thick weather, using radar-responsive targets – demonstrate simple passage planning and execution – explain the use of clearing marks and horizontal and vertical danger angles 2.4 Read and interpret marine charts (10 hours) – demonstrate basic knowledge of chart projections – define ‘natural scale’ of a chart – state the requirements of a chart appropriate for marine navigation – identify the Mercator chart as a mathematical projection and understand the principles of its construction – describe the properties of the chart and the degree to which it meets navigational requirements and also its limitations – demonstrate the use of a chart catalogue – demonstrate the correcting of charts according to Notices to mariners – explain that ECDIS and other electronic chart systems meeting IMO performance standards may substitute for traditional charts – state that familiarization with the ship’s particular electronic chart equipment and controls is required 2.5 Obtain and plot position line to determine ship’s position (15 hours) – define a position – give the radar distance off a charted object and plot its position circle on a chart – plot a position on the chart from simultaneous cross bearing and from bearing and distance off – plot position line – straight line, circle, hyperbola	

COMPETENCE 1.1 Navigation and position determination	IMO Reference
<i>Required performance:</i>	
– find position line by bearing, horizontal angle, vertical sextant angle, transit line and radio aids – determine a position by a combination of bearing, distance and the methods in the above object – determine a position by simultaneous bearings of two objects – find the distance that the ship will pass off a given point when abeam – construct a position line to clear a navigational danger by a given distance	
2.6 Apply dead reckoning procedures to determine ship's position (10 hours) – define 'dead reckoning position (DR)', 'estimated position' and 'fixed position' – plot a dead reckoning position of the chart – plot an estimated position on the chart	
2.7 Use Notices to mariners and other publications to assess accuracy of position fixes (5 hours) – demonstrate the correcting of charts using information from Notices to mariners – explain that ECDIS and other electronic chart systems meeting IMO performance standards may substitute for traditional charts – explain why a navigation problem should be solved by using a Mercator sailing in preference to plane sailing because of the distance involved – explain how errors may occur in position fixing, and explain how to minimize the probability of errors – demonstrate how erroneous position lines influence the positions	
2.8 Exercise chartwork (10 hours) – define 'course' and 'distance' – lay off true course between two positions – find the distance between two positions – calculate the speed between two positions – define 'set', 'rate', 'drift' and 'leeway' due to wind – define 'ship's speed', 'effective speed', 'course and distance made good', 'applied leeway' – find the course and distance made good with a tidal stream or current – find the course to steer, allowing for tidal stream or current – find the set and rate of tidal stream or current from charts or tables – explain the term 'running fix' and use the method to plot a position – find positions by running fix in a tidal stream or current – calculate the actual set and rate of tidal stream or current from DR and fixed positions	

COMPETENCE 1.1 Navigation and position determination	IMO Reference
<i>Required performance:</i>	
1.1.3 ELECTRONIC NAVIGATIONAL AIDS FOR POSITION FIXING AND NAVIGATION Textbooks: T1, T3, T5, T17, T24, T25 Teaching aids: A1, A18, A23, A24, A25, A27, A28 3.1 Operate electronic navigational aids (20 hours) – describe the principles of time difference used in the Loran–C system – show how ambiguity occurs when two radio stations are transmitting signals simultaneously – describe the pulsing system and cycle matching used in the Loran–C system – explain the possibility of sky wave interference – state the approximate accuracy and explain how it varies – explain a coverage diagram for a Loran–C chain – state the limitations of the system and the reason for frequent checking – state the areas of the world covered by the Loran–C navigation system – describe the basic principles of the Global Positioning System (GPS) – describe the configuration of satellite orbits and the periods of the satellite vehicles (SVs) – describe the system configuration – state the frequencies that are used – describe the C/A & P codes – describe how the basic line measurement is obtained – describe the Dilution of Precision (DOP) – state the various errors of GPS – describe the reason for selective availability and the effect it has on the accuracy of a fix – describe differential GPS – state the accuracy obtainable with GPS and how the accuracy can be downgraded – explain WGS 84 – explain why a fix obtained from the GPS receiver cannot be plotted direct onto a navigational chart – explain datum shifts – state that at least four SVs at a usable elevation should be visible to the receiving antenna at any point on the earth's surface at any time – describe the basic concept of an integrated navigation system, i.e. data input, processing and presentation – describe a system of: – partial integration – total integration	R1, R2, R7