

# **GUIDE LINES**

## **TRAINING IN SHIP HANDLING AND MANOEUVRING SIMULATOR**

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# **SHIP MANOEUVRING SIMULATOR**

## **BASIC DETAILS OF THE COURSE**

### **Scope:**

This course covers the training recommended in the IMO Model Course 1.22 and fulfills the training requirement for Navigating officers at the Management Level, specified in Table A-II/2 of STCW Code 1995 concerning manoeuvring and handling a ship in various conditions and establishing good team work during Bridge Watchkeeping.

### **Objectives:**

The trainee who successfully completes this course will have gained experienced in handling ships under various conditions and will make a more effective contribution to the bridge team during ship manoeuvring in normal and emergency situations.

## **QUALIFICATION & ELIGIBILITY OF STUDENTS**

### **Entry standards:**

The trainee should be in possession of

- a. Chief Mate (F.G.) Certificate of Competency
- b. 18 months as a certified watch keeping officer

### **Required attendance:**

100% attendance is required for successful completion of the course.

### **Course intake limitations:**

The course intake shall be maximum of 8 trainees divided into two bridge teams. Depending on the facilities provided, one team would be carrying out an exercise while the other is being lectured, debriefed or planning the next exercise.

## **INFRASTRUCTURE REQUIREMENT**

### **Full Mission Ship Handling Simulator**

The Ship-Handling simulator shall be type approved by DMS on demonstrating its capability on fulfilling the required "Specification for Ship Manoeuvring Simulator"

## **COURSE DETAILS**

- a. Course duration: 5 days
- b. Course outline: As per Guide Lines

## **TRAINER QUALIFICATION**

### **Qualifications and experience:**

- a. Certificate of competency as Master of (FG), issued or recognized by the Government of Sri Lanka  
and
- b. at least 5 years service on Merchant ships of which at least two years should have been in the rank of Master  
and
- c. Should have undergone training of similar or equivalent course on a full mission ship handling simulator.

## **TRAINER REQUIREMENT**

Not less than one Master Mariners (in case where number of participants are 4 or less and not less than two Master Mariners in case the number of participants are 5 or more.

## **COURSE DURATION**

A total of 35 hours of lectures, including practical training and assessment.

## **ASSESSMENT**

Written and practical assessment would be carried out at the end of each course.

## **TEACHING AIDS**

Two sets of charts for the exercise areas used in the course.

1 set of Tide tables, List of Lights, Sailing Directions for the exercise areas in use.

These should relate to the simulator software and need not be the latest edition.

Ship Log Book – 2 sets

Passage Planning Sheets

Booklet containing Ship Maneuvering Data of the ships in use – 2 sets

Equipment Manuals for the Navigational Aids fitted on the bridge

## **RECOMMENDED TEXTBOOKS**

The Ship Handlers Guide by Capt. R. W. Rowe (N.I)

Bridge Procedures Guide by International Chamber of Shipping

International Regulations for Preventing Collisions at Sea (COLREG 1972) as amended by IMO

Perils at Sea and Salvage – A guide for Masters by ICS & ICIMF

Bridge Team Management by Capt. A. J. Swift (N.I.)

## **REFERENCE BOOK**

Collisions & their causes – Capt. Richard A. Cahill (N.I.)

Maritime Resource Management – Student workbook developed by SAS Flight Academy, Sweden.

A Guide to Collision Avoidance Rules by Cockcroft and Lameijer

Ship Manoeuvring principles and Pilotage by Paul R. Williamson

The Navigation Control Manual by A. G. Bole, W.O. Dineley & C.E.Nicholls.

## **IMO REFERENCES**

Performance Standards for Automatic Radar Plotting Aids (ARPA) – IMO Resolution A.823(19)

Performance Standards for Gyro-Compass-IMO Resolution A.424 (XI)

Performance Standards for Devices to indicate Speed and Distance – IMO Resolution A.824(19) MSC 96(72)

Performance Standards for Integrated Bridge Systems – MSC Resolution 64(67)

Performance Standards for DGPS – MSC Resolution 64 (67), 114(73)

Performance Standards for Automatic Pilots – Resolution A.342 (IX)

Performance Standards for Radar Equipment – Resolution A.477 (XII)

Performance Standards for ECDIS – Resolution A.817 (19)

## **RECOMMENDED VIDEOS**

Ship Handling – Parts 1, 2, 3	- Videotel and NMI
Ship Handling in restricted waters - ship squat and shallow water effects	- Videotel
Passage Planning	- Videotel
Bridge Watchkeeping	- Videotel
Master/ Pilot Relationship	- Videotel
Accident Prevention and Human Factor	- Videotel
Emergency Procedures	- Videotel
Bridge Team management	- The Standard P & I
No Room for Error	- UK P & I

## **SPECIFICATIONS FOR SHIP MANOEUVRING SIMULATOR**

The Simulator should conform to the requirements of STCW 95 Regulation I/12 (use of simulators), Section A – I/12 Part 1 and 2 “Perform Standards for the simulator and Simulator training Objectives” and section B – I/12, 37, 38, 39 (guidance regarding the use of simulators). It should also be capable of being used for training and demonstrating competence for Masters and Chief Mates on ship of 500 GRT or more as per STCW 95 A II/2

### **SIMULATOR SPECIFICATIONS**

- Full – Mission Simulator consisting of one or more own ship stations having a full scale mock – up of a ship’s bridge with instruments for navigation as listed below, as well as full scale display of target ships and surroundings as seen from the portholes of a wheel house.
- Equipment and consoles to be installed mounted and arranged in a ship like manner.
- A separate instructor room equipped with equipment necessary to monitor the activities in the wheel house effectively.
- Each piece of equipment installed in the simulator shall have a similar functionality to corresponding equipment used on board ships.

- If any piece of equipment does not correspond to a specific make, (the applicable IMO performance standard (functionality requirements only) for such equipment shall be followed. If such a performance standard does not exist, then the functionality of the equipment shall, as a minimum, be the same as for any recognized genuine equipment of the type, in use on board ships.
- Each piece of equipment shall resemble the behavioral characteristics e.g. accuracy, reaction time and other limitations, related to corresponding equipment in use on board ships.
- User manuals for the simulator equipment and operational controls shall be available to the learners for use during exercises.

## **SHIP TYPES AND AREAS**

- 1) The simulator shall include mathematical models of at least 10 types of own ship. The models shall resemble accurately the behavioral characteristics of an actual ship of that size, power and type, and realistically behave as per the hydrodynamic effects of wind, current and swell.
- 2) The simulator shall be able to present at least 20 different types of target ships, each equipped with a mathematical model, which accounts for motion, drift and steering angles according to forces induced by current, wind and wave.
- 3) The simulator should be able to provide at least eight international geographical visual areas for exercises which include open sea and high density traffic areas. (See section F for recommended Geographical Areas)

## **DETAILED SPECIFICATIONS**

### **Visualization**

1. At least 5 channels visualization of high resolution XGA graphics, about 170 degree horizontal field of view. In addition, the remaining 190 degree view should be able to be viewed by panning.
2. The visual screen size for each channel shall not be less than 6' x 4'. The visual system shall present all navigational marks as displayed on ECDIS and paper charts for that area.
3. The visual system shall show objects with sufficient realism (detailed enough to be recognized as in real life)

4. The visual system shall replicate movements of all Own Ships according to 6 degrees of motion freedom.
5. The simulator shall provide a realistic visual scenario by day, dusk or by night, including variable meteorological visibility, changing in time. It shall be possible to create a range of visual conditions, from clear to dense fog.
6. It shall be possible to take accurate bearings of objects seen on the screen.
7. It shall be possible to use magnified view for observations.
8. The visual system shall present at least 25 degrees of vertical field view. In addition by any method, it shall be possible to observe the ship's side and the dock during mooring operations.
9. There should be a proper correspondence between the visual picture, radar and ECDIS.
10. It shall have facility for ARPA radar overlay to ECDIS

### **Simulator Capabilities**

1. The model shall realistically simulate own ship hydrodynamics in open water conditions, including the effects of wind forces, wave forces, tidal stream and currents.
2. The model shall realistically simulate own ship hydrodynamics in restricted waterways, including shallow water and bank effects and interaction with other ships.
3. The simulator shall provide an own ship engine sound reflecting the power output.
4. The target ships shall be equipped with navigational – lights, shapes and sound signals, according to the “Rules of the Road”. The signals shall be individually controlled by the instructor and the sound signals shall be directional and fade with range.
5. The simulator shall be able to present at least 20 target ships (See STCW-95 Section A-I/12.4.3) at the same time, where the instructor shall be able to program voyage routes for each target ship individually.
6. The simulator shall be capable to providing environmental sound (e.g. wind) according to conditions simulated.
7. The simulation shall include the depth according to charts used, reflecting water level according to tidal water situation.

8. The simulator shall provide waves, variable in direction and strength.
9. It shall be possible to simulate usage of at least 4 tugs for the purpose of mooring the vessel with the capability to control the power and orientation of the tugs (push and pull)
10. It shall be possible to berth and unberth a vessel using mooring lines with the capability to control run out, have, slack, stop, let go the various mooring lines bearing in mind their breaking stress.
11. It shall be possible for Own ship to let go the bower anchors and control is pay-out as per the strain on the cable. The simulator shall have the capability to read the number of shackles out and the strain at any time.
12. It should have facility for training on search and rescue operation

### **Own Ship Control Station**

The following shall be provided as hardware panels and shall be installed, mounted and arranged in a manner that would physically resemble a ship's navigating bridge. These hardware panels should have operational resemblance to actual shipboard equipment.

1. Propulsion Controls for controlling own ships engine ahead and astern.
2. Bow-Thruster Control
3. Steering Console Stand

In addition it is recommended to have facility for joint operation with Engine Room Simulator.

There shall be provision for the following, at or near the console:

- a. Steering wheel
- b. Steering motors (at least two)
- c. Hand, auto-pilot and non-follow up steering.
- d. Compass Repeater able to depict gyro and/ or magnetic heading
- e. Gyro failure alarm
- f. Auto-pilot



The Auto-Pilot should have the following capabilities:-

- a. Weather adjustment (yawing and course control)
  - b. Rudder limit setting
  - c. Counter Rudder
  - d. Off-course alarm
  - e. Setting of constant rate of turn.
4. Engine Alarm Panel giving audible and visual alarm in case of:-
- a. Start fail
  - b. Shutdown
  - c. Slow down
  - d. Overspeed
  - e. Overload
5. Radar set with Automatic Radar Plotting Aids (ARPA) – 21” colour screen

It shall be possible to simulate both 3 cms and 10 cms radar. The radar shall be capable of being operated in the sea stabilized relative motion mode and sea and ground stabilize true motion modes (see STCW-95 Section A-I/12.4.1 and 3)

The radar simulation equipment shall be capable of generation of interference, noise, Radar/ ARPA failure, yawing, clutter, spurious echoes, blind sector, parallel index lines

The ARPA simulation equipment shall incorporate the facilities for:-

- Manual and automatic target acquisition
- Past track information
- Use of exclusion areas
- Vector/ graphic time and date display
- Trial maneuvers
- Guard Zones

6. ECDIS – 21” Colour screen

Vector charts should be available for the exercise areas. It should be possible to edit existing areas and be able to generate chart database of any area and scale if desired at the

later stage. Normal features for ECDIS system should be available including cart scaling and zooming, review, selectable layer, route planning, monitoring and radar interface.

It is recommended to have facility for weather updating and manual chart correction.

## 7. VHF Communication System

Communication between ships and port VTS shall be simulated on VHF sets which will have at least the following channels = 16, 6, 8, 9, 10, 12, 14, 75, 77, 69, 67

The following realism should be depicted

- Volume control
- Squelch
- Dual watch
- Pressel switch when speaking
- Simplex communication system.

## 8. Intercom/ Telephone

There should be a provision to communicate between Bridge and the other strategic locations like engine room, steering flat, Master, C/O, 2/O, 3/O, C/E, forward, aft, etc.

## 9. General Emergency Alarm

There shall be a facility provided for activating the General Emergency Alarm from the wheelhouse.

## 10. Chart Table with paper charts and publications

Chart Table will resemble a ship's Chart Table of minimum dimension 4'x3'. Paper charts and publications provided shall be appropriate for the areas in use.

## 11. Indicators

Each own ship station shall have atleast the following indicators:-

- a. Wind direction and speed indicator
- b. Rudder Angle Indicator
- c. Rate of Turn Indicator
- d. RPM/ Pitch Indicator

- e. Clock (Exercise time indicator)
- f. Depth indicator
- g. Doppler Speed Log

It should be capable of indicating fore/ aft and athwartship speed. Depending upon the depth, speed shall be indicated on ground or water track.

## 12. Ships Horn

To be provided on the wheelhouse console as a pushbutton.

It is recommended to have VDR, AIS and facility for activation of SSAS

### **The following equipment shall be SIMULATED:-**

It not using hardware panels, then, a colour monitor of not less than 17” size interfaced with the position and movement of own ship shall be used.

#### 1. Electronic Navigation Aids

- a. Global Position System (GPS) – Simulation of all facilities of a standard GPS receiver shall be available. This should include display of latitude, longitude, course and speed over ground by the own ship, UTC, normal navigational calculation functions such as Great Circle, Rhumb line sailing, 100 way points, alarms for X-track error, anchor drag, approaching way point, etc.

#### 2. Echo Sounder

Simulation of complete echo sounder shall be provided. Facility to change gain adjustment, change over from DBS to DBK and vice versa etc, shall be provided. Alarm for shallow water depth should be provided.

#### 3. Anchor Control capable of simulating anchoring with 2 anchors (port and stbd – Bower anchors)

- a. Means to let go and have up own ship’s anchor
- b. Indicators for amount of cable paid out, directions of cable and strain on cable.

#### 4. Sound Signal Generator

Ships whistle and fog signals: Facilities shall be available to generate fog signals manually or automatically operated by own ship(s) independently, as well as for each target separately by the instructor console. The fog signals should be interactive and the intensity and direction at own ship stations shall correspond to relative range and position of the station generating and sound signal. The fog signal generator shall be capable of generating the sound signals for the following:-

- a. Vessel making way through water
- b. Vessel making no way through water
- c. Vessel restricted in her ability to maneuver
- d. Vessel at anchor
- e. Vessel aground
- f. Vessel not under command

## 5. Navigation Lights and Shapes Display

Full set of Navigation, Christmas tree lights and shapes shall be available, which the own ship can select for display depending upon the prevailing circumstances.

### **D. Instructor**

The instructor and the assessors shall be able to:

- a. Start, halt, reset in time and place, and restart an exercise
- b. Visually observe the trainees and their actions and follow the proceeding of an exercise by any method.
- c. Change the operating environment during the running of an exercise, viz, shall be able to alter the wind (direction and force), swell (direction and height), current (direction and rate), cloud cover, state of visibility.
- d. Communicate with the trainees (i.e. simulate the outside world) by VHF on relevant communication channels and by Intercom/ Telephone (for within the ship conversations)
- e. A display (min 19" monitor) providing a global view of the criteria simulation scenario. The display plots ships tracks, target movements and also provides a tool for altering the parameters of the various ships.
- f. Be able to view the Ownship radar as set and operated by the trainee.
- g. Activate simulation of failures in real time in the following equipment:-
  - 1. Navigation lights
  - 2. Gyro compass including insertion of error
  - 3. Doppler log failure or insertion of error
  - 4. Echo sounder
  - 5. Radar
  - 6. ARPA
  - 7. GPS (including degrading of signal quality)

- 8. Autopilot
  - 9. Steering motor
  - 10. Bow thruster
  - 11. Engine
- h. It shall be possible to replay a full exercise showing the actions performed by the trainees.
  - i. Instructor shall be able to create exercises where one or more own ship stations can be interactive within the exercise or to be able to run them independently and in differing areas if so required.
  - j. For educational purposes, the instructor shall be able to create a channel by inputting depths and buoys (buoyage system A and / or B)
  - k. Instructor can on request form Own ship, engage tugs and ship mooring lines during an exercise.

**Recommended Ship Types and Sizes**

<b>Type</b>	<b>Displacement (tones)</b>
1. Bulk Carrier (Handy size)	About 30,000
2. Bulk Carrier (Panamax size)	About 60,000
3. Container Ship	About 30,000
4. Container Ship	About 70,000
5. Container Ship	About 100,000
6. Coaster	Under 10,000
7. RO-RO/ Car Carrier	About 15,000
8. Tanker	About 85,000
9. Super tanker	Over 150,000
10. VLCC	Over 250,000

Note:

- a The above is suggested list for general guidance
- b Among the Own Ship Types, there should be vessels equipped with bow thruster and some with Controllable pitch Propeller

### **Recommended Geographical Areas:-**

1. Dover Straits
2. Singapore Straits
3. Malacca Straits
4. Gibraltar Straits
5. Approaches to New York
6. Approaches to Rotterdam
7. North Sea
8. Sydney Harbour.
9. Singapore Harbour
10. Open Sea