Training Circular No. 1 of 2002

No.3-TR(24)/2001 **Dated: January 24, 2002**

Sub: Specifications for Ship Maneuvering Simulator

Sir,

I am directed to forward herewith the **Guidelines/Specification** to be followed for giving approval for Ship Maneuvering Simulator.

Sd/-
(Naresh Salecha)
Sr. Dy. Director General of Shipping

SPECIFICATIONS FOR SHIP MANEUVERING 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 "Performance 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 ships of 500 GRT or more as per STCW 95 A-II/2.

SIMULATORS 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 wheelhouse 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 that 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 five 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 10 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 also high density traffic areas.

DETAILED SPECIFICATIONS

A. Visualization

1. At least 3 channels visualization of high resolution XGA graphics, about 120 degree horizontal field of view. In addition, the remaining 240 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 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 dense fog to clear.

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.

B. Simulator Capabilities

1. The model shall realistically simulate own ship hydrodynamics in open water conditions, including the effects of wind forces, wave foreces, 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 "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 of 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 runout, heave, slack, stop, let go the various mooring lines bearing in mind their breaking stress.

C 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 ship's engine ahead and astern.

2. Bow-Thruster Control

3. Steering Console Stand

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 :-

i) Weather adjustment (yawing and course control)

ii) Rudder limit setting

iii) Counter Rudder

iv) Off-course alarm

v) Setting of constant rate of turn.

4. Engine Alarm Panel giving audible and visual alarm in case of :-

(a) Start fail

(b) Shut down

(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 stabilized relative motion mode and sea and ground stabilized 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-scale and data display

Trial manoeuvres

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

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, 13, 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. Chartable with paper charts and publications 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 push button.

The following equipment shall be SIMULATED :- If 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 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 depth and depth alarm should be provided.

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

(a) Means to let go and heave up own ship's anchor

(b) Indicators for amount of cable paid out, direction of cable and strain on cable.

4. Sound Signal Generator Ship's whistle and fog signals : Facilities shall be available to generate fog signals manually or automatically operated by own ships independently, as well as for each target separately by the Instructor's 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 the 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 manoeuvre
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 ownship can select for display depending upon the prevailing circumstances.

D. Instructor

The instructor and the assessor shall be able to :

a. Start, halt, reset in time and place, and restart an exercise
b. Visually follow the proceedings 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 learners (i.e. simulate the outside world) by VHF on relevant communication channels 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 ship's tracks, targets movements and also provides a tool for altering the parameters of the various ships.
f. Activate simulation of failures in real time in the following equipment :-

i) Navigation lights
ii) Gyro compass including insertion of error
iii) Doppler log failure or insertion of error
iv) Echo sounder
v) Radar
vi) ARPA
vii) GPS (including degrading of signal quality)
viii) Autopilot
ix) Steering motor
x) Bow thruster

xi) Engine

g. It shall be possible to replay a full exercise showing the actions performed by the learners.

h. 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 differing areas if so required.

i. For educational purposes, the instructor shall be able to create a channel by inputing depths and buoys. (buoyage system A and /or B).

j. Instructor can on request from Own ship, engage tugs and ship mooring lines during an exercise.