

PILOTAGE ADVISORY COMMITTEE

Proposed Ship Simulation System
for Training and Assessment by the Hong Kong Pilots Association

Purpose

Members are invited to refer to the Annex for perusal of a paper concerning the captioned matter. This paper will be presented by Capt. Steven Lam, Senior Pilot of the Hong Kong Pilots Association.

Marine Department
August 2021

Proposed Ship Simulation System
for Training and Assessment by the Hong Kong Pilots Association

Purpose

The purpose of this paper is to seek members' support on the Hong Kong Pilots Association (HKPA)'s proposal to set up a Full Mission Ship Simulation System (FMSS) for training and assessment purpose in order to comply with the pilot's licensing and assessment requirement.

Background

2. Simulators can generate a controlled environment which is similar to the real situation at large without practical exposure to any risks of life and property during training. HKPA adopted pilotage simulation training since the inception of simulation service provided at the Marine Department Training Centre (MDTC) in 2003. Although there is no stipulated requirement in the Pilotage Ordinance, Cap. 84, it has always been HKPA's in-house requirement for pilots to undertake simulation training prior to their advancement in each class.

3. In collaboration with MDTC, the pilots of HKPA conducted various types of simulation for training, evaluation, research studies etc. The proven records of pilotage simulation training for HKPA induced the achievement of safer management, upskill of ship handling and knowledge sharing amongst the HKPA's pilots. In addition, it also provides a platform for port development involving HKPA and other interested parties in tandem with the benefits of stakeholders.

4. In June 2016, the use of ship simulator for training and assessment was incorporated in MD's pilotage training requirement by the Pilotage Advisory Committee (PAC). Together with the newly implemented demarcation of Class II pilots and the refresher simulation training for senior pilots, the requirement for ship simulation sessions has been greatly increased in the past several years, let alone the number of simulation works required by the private consultation

sector and certain other government agencies.

5. As a result of the limited time slots allowable at MDTC, at present the simulation training for the pilots is at a “training for assessment” status rather than “training for practical needs and professional technique”. Certainly this is not ideal. In order to provide more training and practicing opportunities for the Apprentice pilots and Class II pilots, the proposal of establishing a FMSS will enable HKPA to implement their training plan with more flexibility.

6. The Proposal will allow better time management and scheduling to meet pilot’s advancement in terms of training and assessment requirement, also use for reproducing accident scenarios from which the pilot concerned as well as all other pilots will be benefited by revisiting the incident. Allowance could be made for simulation trials on new ship types and pilotage operations, reviewing and fine tuning the berthing guidelines, as well as providing an alternative venue for the private consultation sector to answer their simulation needs.

The Proposal

7. There are no universal regulations to govern the technical specifications of each simulator but IMO has set out certain “Performance Standard” within the scopes of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978 (STCW). To evaluate the achievement of performance standards, in general, Classification Societies will undertake the accreditation process of ship simulator manufactured by the vendor. For an example, the DNV-GL for the sake of clarification dictates a comprehensive check list for the concerned parties who may operate a simulator within the STCW regime.

8. The most important functions of the FMSS for HKPA is to simulate a realistic environment coupling with complicated meteorological, hydrographic conditions and all conditions of waterways. It should also provide powerful tools to mimic the complexity of manoeuvring characteristics and three-dimensional (3D) view similar to the reality. To serve the highest quality of training and assessment for the Hong Kong pilots, it is also capable of simulating a total shipboard bridge operation situation, including the capability for advanced manoeuvring in restricted waterways.

9. HKPA will be fully responsible for all costs of installation including the management of simulation facilities thereafter. In collaboration with the governing authority, HKPA will establish the relevant technical details and appropriate library of ship models and landscapes which are adapted to the challenging demand of Port of Hong Kong.

10. Moreover, HKPA will have its own ability to update the newest trend of various ships types and landscapes for any future port development in Hong Kong. It would become one of the effective arenas to promoting the port safety and enhancing the many risk assessments related to port development.

11. Technical Aspects of the proposed FMSS is at Annex I & II.

Schedule

12. With Members' support, HKPA will kick out the implementation plan by three phases:-

Phase I:	Planning and Tendering	- 2 months
Phase II:	Installation and Test run	- 3 months
Phase III:	Operation and Training for Trainers	- 2 months

Way Forward

13. A team of dedicated HKPA coaches will be formed for conducting simulation training. Prior simulation instructor training will be provided to the team to ensure their familiarity of the simulation system as well as competency as a simulator instructor. During the initial stage of conducting simulation exercise, MD and PAC Members will be invited to monitor the progress and to offer their valuable comments to ensure future simulation training and assessment are acceptable to MD in terms of quality and professionalism.

Advice Sought

14. Members' comments and endorsement are sought on the proposal to set up a Full Mission Ship Simulation System (FMSS) for training and assessment purpose in order to comply with the pilot's licensing and assessment requirement as outlined above.

Presentation

15. This paper will be presented by Capt. Steven Lam, Senior Pilot of HKPA.

Hong Kong Pilots Association
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Proposed Configuration of HKPA Simulation Centre

With reference to the “DNV-GL Standard of Maritime Simulator Systems”, Class A (NAV) used by the Marine Department Training Centre (MDTC) – a Full Mission Ship Simulator (FMSS) is proposed by HKPA to serve for highest quality of training and assessment of their pilots.

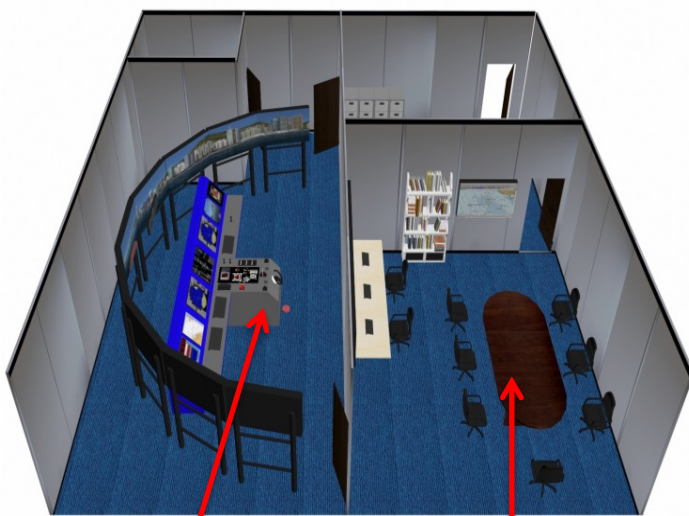


Figure 1

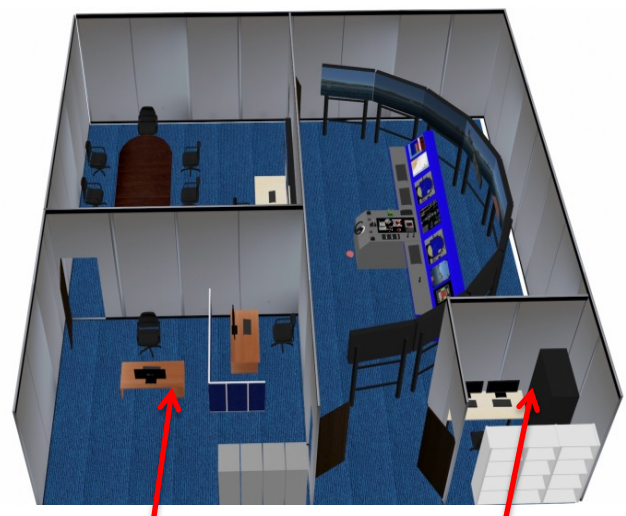


Figure 2

The installed simulator will be a type approved FMSS which complies with STCW requirements, layout of the proposed HKPA Simulation Centre is shown in Figure 1 & 2 above:-

Remarks :

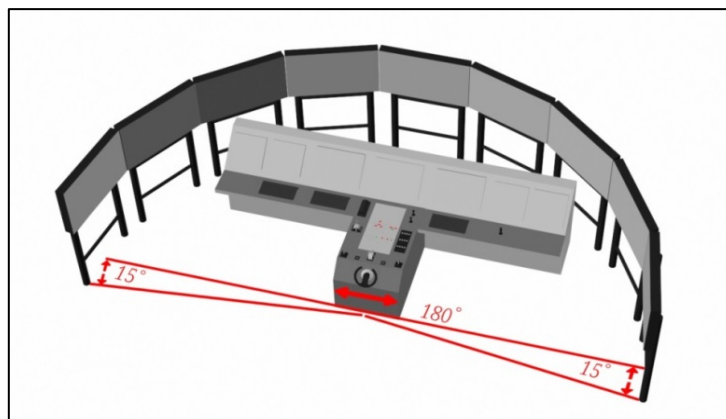
- 1 Simulator Room
- 2 Multi-function Room
- 3 General Office
- 4 Server Room

The Full Mission Ship Simulator System (FMSS)

I. Displaying System

The simulator is equipped with a wider horizontal field-of-view (HOV) that is essential to obtain an immersive, life-like experience under a restricted simulation environment. To accomplish the quality of virtual environment to be sighted by the trainee's eyes, the simulator will adopt a 210° HOV at the least to mimic the real environment as far as practical.

The System has a built-in 3D engine which can handle tons of sophisticated calculations of 3D parameters to induce real-time rendering process. The real-time rendering is the masterpiece of FMSS which converts the 3D models into realistic images with high resolution 1920 x 1080 pixels format running on the animation pipeline.



210° Horizontal Field of View

Nine 55" state-of-the-art LED monitors are erected to display the animation frames as shown in [Figure 3](#).

Figure 3

II. Audio System

The FMSS equips with professional surround sound system and sound generation application as shown in [Figure 4](#). It can stimulate all sounds (e.g engine, whistle signal, wind and sea etc.) experienced on ship's bridge. The stimulated surround sound technology can increase the depth of immersion for simulation training.

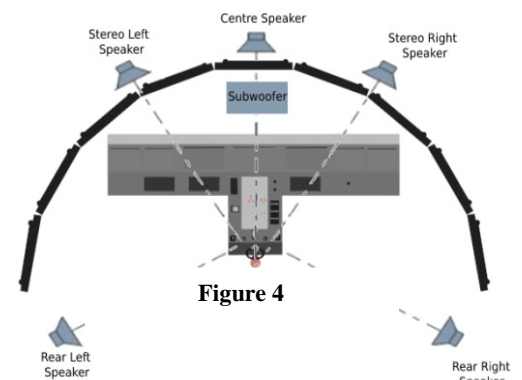

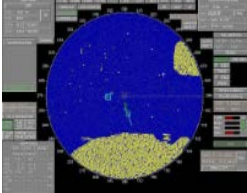


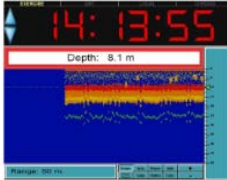





Figure 4

III. Bridge Consoles System

The System will be equipped with a “Pilot plug” and a Bluetooth transmitter to enhance its training adaptability and flexibility. The consoles consist of various Sub-units to perform a variety of functions which are similar to the navigation/communication devices installed on board ship:-

No.	Sub-unit		
i.	<p><u>Simulated Conning Unit</u></p> <p>The Unit displays information relating to navigation and the environment, such as data of engine, steering gear, ship’s speed, depth of water etc.</p>	 <p style="text-align: center;">Figure 5</p>	
ii.	<p><u>Simulated Navigation Unit</u></p> <p>This provides navigation information required for safe passage. Those devices could be interoperable by the standard protocol. It includes :-</p> <ul style="list-style-type: none"> - RADAR/APRA; ECDIS, AIS, GPS & Echo-sounder etc. 	 <p style="text-align: center;">Figure 6</p>	 <p style="text-align: center;">Figure 7</p>
		 <p style="text-align: center;">Figure 8</p>	 <p style="text-align: center;">Figure 9</p>
iii.	<p><u>Simulated Internal Communication Unit</u></p> <p>An internal communication system is installed for the communication between the bridge simulator and the instructor station.</p>	 <p style="text-align: center;">Figure 10</p>	 <p style="text-align: center;">Figure 11</p>
iv.	<p><u>Simulated Multi-function Manoeuvring Unit</u></p> <p>It mimics real manoeuvring characteristics of ship models under different form/status of rudder, propeller and propulsion modes.</p>		

IV. Instructor Station

The instructor station located in the multi-function room is one of the main integral parts of the simulation system, it features with control and monitoring devices to govern every process and stages of simulation training. The station is capable of managing all complex simulation activities as follows:-

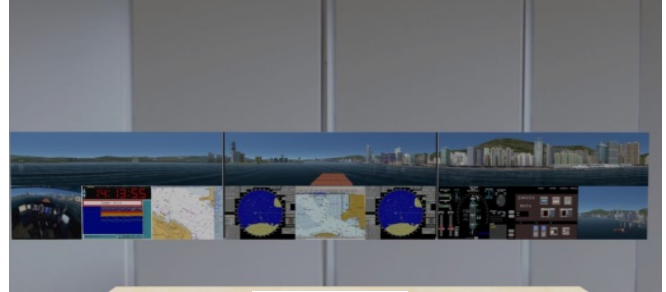


Figure 13

- i. to create/edit the simulation scenarios under various meteorological and hydrographic conditions. (e.g. poor visibility)
- ii. to provide platform for the interaction with trainees with due regard to the traffic activities, Rules of the Road, radio-communication and emergency response;
- iii. to monitor the system integrity and the reliability of data presentation on each Sub-unit;
- iv. to provide tools for monitoring and recording all video/audio signals and voice communication during the simulation run. A drone view is also provided for overseeing the exercise area in details.



Figure 14

V Briefing/Debriefing Station

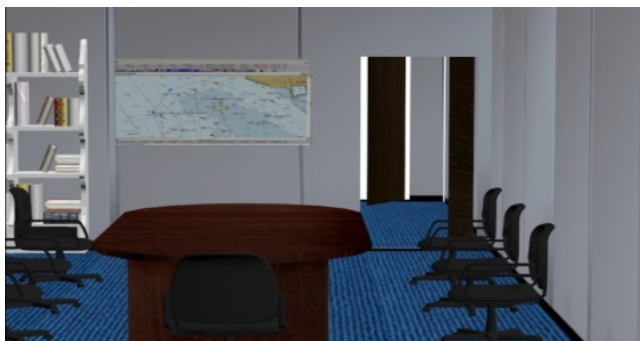


Figure 15

A combined briefing/debriefing station is also located in the multi - function room, it can perform briefing session before simulation run and process scenario analysis by retrieving

data records in the form of video and/or simulation trajectory performed by the trainees together with all related data.

VI Exercise Area

The port of Hong Kong is the main exercise area for the simulation training, details of 3D environment including landscape and port facilities will be built in a large extent. With reference to the Berthing Guidelines, it is expected that the 3D berths and waterways nearby can be available for the simulation training programme after commissioning of the FMSS.

VII Own/Target Ship Model

Bridge models used for training will be tailor-made to tie in with the class of pilots. All bridge models will be tested by the experienced coach pilots/trainers to ensure the realism of manoeuvring characteristics. To create complex traffic situation, at least **30** target ship models will be provided including different type of oceangoing ships and local vessels accordingly.

VIII Tug Management Tool

Tug management is one of the critical training issues for pilotage training, the FMSS provides an efficient tug management tool for manipulating tug forces/lines by the instructor. It can simulate tug movement and the aggregate effect on bridge model performance in respect of speed, turning ability and stopping distance during a ship's passage, berthing/unberthing operation.

Ends