



L3 MAPPS knows that a well-trained crew is a key factor in the safe and effective operation of a ship. Moreover, it contributes to a sense of professionalism which enhances both individual satisfaction and retention.

Operational tempo and budgetary constraints make it difficult to send personnel away for training courses, refreshers or re-qualification. Incorporating training sessions on board a fully operational vessel, without disrupting its mission and manning, can be an excellent compromise to the training dilemma. The L3 MAPPS comprehensive On-Board Training System (OBTS) makes this a reality.

The L3 MAPPS OBTS trains crew members aboard their vessels, using the same Integrated Platform Management System (IPMS) control consoles and interface that they use in the day-to-day operation of their ships. As detailed below, training sessions can be conducted without additional training components aboard the vessel. Personnel can train during quiet periods and still maintain a state of readiness with respect to their primary duties. This innovative approach ensures a high standard of training and qualification, and a significant reduction in operational costs because personnel remain active members of the crew even while training.

OTHER FEATURES

The OBTS provides operational training similar to that of a full-scope simulator. By using the same IPMS Human Machine Interface (HMI), control sequences and other control and monitoring software functions as are used on the operational IPMS, the L3 MAPPS concept is to train an individual or a team at his usual IPMS station using a real-time simulated environment without affecting the simultaneous IPMS control and monitoring functions of the real plant. OBTS provides a realistic training environment. Whereas in traditional training an instructor would have to abort a scenario that might endanger machinery and personnel, using an OBTS simulation allows the instructor to push the training envelope further. OBTS allows for the full range of remedial action / emergency response, and the more realistic stress that normally comes with them. Performing the training scenario in full allows the trainee to be confronted with pages and interfaces he would rarely use during regular operations. It allows the trainee to go beyond the catastrophic failure point to bring about practical, real-time and realistic feedback to his actions, as opposed to the theoretical responses associated with the conventional approach.

PROCESS

The simulation software is installed on one or several IPMS stations in the vessel and can be activated while the IPMS remains in full control of the ship. Upon selecting the OBTS function at an IPMS station, the console ceases communication with the IPMS databus, thereby isolating itself from control of the machinery. In OBTS mode, the console in training runs independent of the main IPMS network.

This provides an additional safety layer to prevent inadvertent interaction with the real plant.

Prior to entering training mode, all IPMS control and monitoring functions assigned to the student must be

transferred to another station. If problems or emergencies arise, the training session can be immediately stopped and the training console returned to its primary control mode.

A prompt return to control mode is possible due to the uninterrupted update of the IPMS control database performed in the background of all the OBTS training actions. Although all actions from the trainee are isolated from the main IPMS control databus while in training mode, the console continues to receive every database refresh message from the real plant. This constant and real-time database update allows the console to return immediately to control mode without the need to reboot or to synchronize the database.

INDIVIDUAL AND TEAM TRAINING

Individual training is available at any IPMS console. Training can also be performed in a team environment where all trainees can interact with the same simulation scenario running in an instructor station. In such a scenario, actions from one trainee will affect other trainees since they are all interacting with the same simulated environment. Any IPMS console can be designated as the instructor console, as is the case for a training console.



SIMULATION SOFTWARE

The simulation software necessary to support the OBTS functions is based on real-time plant dynamic simulation and is installed into each IPMS console with the OBTS feature. All relevant ship systems and main components, such as diesel engines, gas turbines and pumps, can be modeled using the well-proven L3 MAPPS Orchid® Modeling Environment (ME). Third-party models already developed can also be integrated or interfaced to the Orchid® ME model to optimize development time and budget. In addition to the simulation of the plant, the OBTS also requires interface with the IPMS control and monitoring sequences. These sequences typically reside in Remote Terminal Units (RTU) distributed throughout the ship. In OBTS mode, the sequences from each RTU are emulated/simulated and incorporated into the simulation software.

Integrating the actual IPMS HMI and control sequences into the OBTS ensures lower life cycle costs, as the training system always precisely matches the actual system on board. Changes to the IPMS over the life of the ship are automatically carried over to the OBTS.

INSTRUCTOR OPERATING STATION

The Instructor Operating Station (IOS) software is also installed into each IPMS console with OBTS feature, making it possible to use any station as the instructor console for team and individual training. The IOS includes the software necessary for an instructor to create a lesson plan, launch a training session, introduce faults, activate local control devices or modify the course of a scenario in real-time.

SUMMARY OF IOS FEATURES

Lesson plan controller: Without intervention from the instructor, the student would run a free-play session with the simulation model, which would ensure that the plant reacts to each action of the student. To create a situation, other than that generated simply by the student's incorrect action or response, the instructor can trigger a fault of a simulated equipment. This fault could be triggered at will by the instructor or it could be part of a lesson plan. A lesson plan is a suite of events, such as faults, signal overrides and local control, that are inserted into the simulation model to generate the situation that the instructor wishes to confront the student with.

The lesson plan controller provides the instructor with the ability to implement and edit training lesson plans. An event could be made to occur after a pre-defined time following the start of the lesson, be triggered by an operator action or the status of a plant parameter, or even a combination of these.

The lesson plan controller provides the customer with the tool to create his own training scenarios. A customer who chooses a low-cost model over a more expensive high-fidelity model can use a lesson plan to supplement the model in areas not covered by the model. A training session can be performed using a pre-coded set of events that runs on its own from the beginning to the end. It could also be modified online and in real-time by the instructor who can insert additional faults to modify a routine scenario that a trainee may have already seen. A session could also be started as a free-play activity in which the instructor could decide to interface by inserting malfunctions online. The combination of the training modes described here provides the ideal flexibility required to adapt the OBTS to each situation and schedule constraint.

Local controls: Allow the simulation and control of selected devices that are not controlled by the IPMS but that are necessary for training purposes. For example, this could allow the instructor to simulate activating a breaker or an important valve that is a manual device on the ship and that is not connected to the IPMS.

Instructor controls: Allow the instructor to initialise signals of devices that the student is not able to control from the IPMS. For example, re-initialize tank levels after a scenario.

Environmental parameters: Used to set parameters, such as ambient air temperature, humidity, pressure, wind speed and direction, wave height, seawater temperature.

Malfunctions: Generate failure of devices. This may involve pumps, heat exchangers, valves, fans, pipe breaks, motor or engine failures, and so on.

Overrides: Override a digital or analogue IPMS signal associated to a plant device.

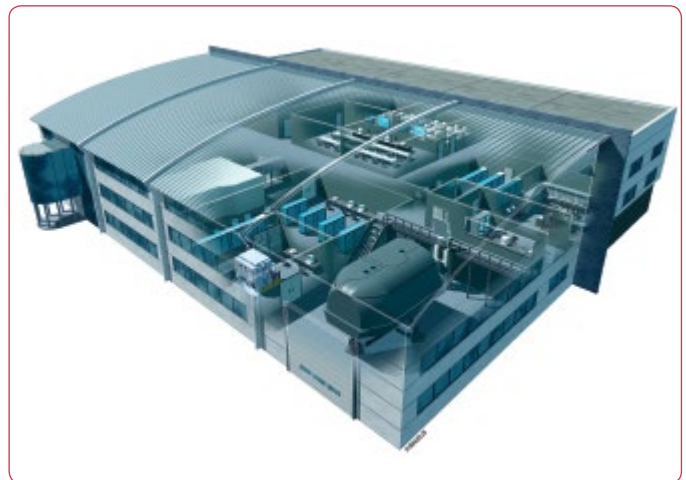
Store/Restore: Store a state of the model to the disk so that it may be retrieved at any time. Restore initializes the state of the OBTS to a previously stored state.

Event logger: Provides a historical record of the student's actions.

Scenario Manager: Allows the instructor to create a series of events, and can be performed in automatic mode or with manual inputs and modifications. Evaluation criteria can also be established for each scenario to create a complete training system with student evaluation records.

LAND-BASED TRAINER

To complement the OBTS, a land-based trainer can also be delivered to provide ashore the same type of training environment as described for the OBTS. This provides a training facility using the same tool and IPMS environment as offered on board the vessel.



Artist's rendition of the Astute Class Submarine Training Centre. L3 MAPPS, as part of the FAST Consortium is under contract to provide training services for the Astute Class Submarine for 30 years, including the provision of a turn-key training facility.



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