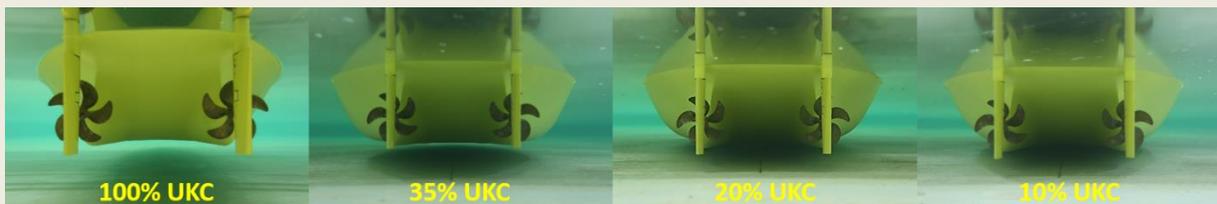


This is the 42<sup>nd</sup> [newsletter](#) of the *Knowledge Centre Manoeuvring in Shallow and Confined Water*, which aims to consolidate, extend and disseminate knowledge on the behaviour of ships in shallow and confined water. This newsletter presents an item on experimental studies that were carried out to study the performance and application potential of different controllers for ship autopilot systems.

From September to December 2019, experimental studies were carried out to study the performance and application potential of different controllers for ship autopilot systems. The tests were executed in free running mode with a combination of a software library for the ship model autopilot and a carriage control mechanism. The autopilot library is employed to make the ship model follow a [predefined course or trajectory](#). The autopilot library includes several different controllers: a proportional–integral–derivative (PID) controller, a fuzzy logic controller, Internal Model Control (IMC) and an adaptive PID controller. The towing carriage is used in a captive way to bring the ship in an initial state. When the ship model reaches the desired position and velocity, the model is released and the autopilot library fully controls the ship model, while the carriage is used only as a position tracking mechanism.



To study the effectiveness of autopilot systems, experiments have been performed with a 1/75 scale model of the Q-Flex Liquefied Natural Gas (LNG) carrier equipped with twin propeller and twin rudder. The experiments were carried out at the [Towing Tank for Manoeuvres in Confined Water](#) at Flanders Hydraulics Research. Different autopilots were investigated at different forward speeds and different Under Keel Clearances (UKCs).

The experimental results will be used to update the autopilot system of the fast time simulators. The experimental program was carried out as the validation part of Changyuan Chen's PhD project, entitled "Development of mathematical pilot models for fast-time ship manoeuvring simulation and traffic planning for harbour approach channels".



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