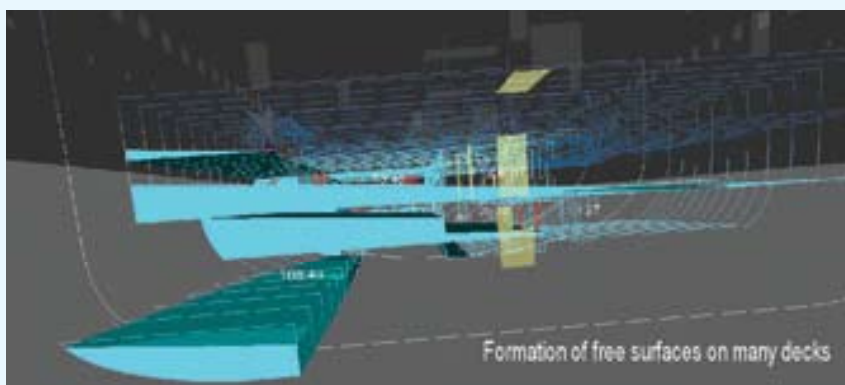


Ship safety – the focus on survivability

The need for cruise ships to operate safely requires thorough design procedures. Safety at Sea specialises in providing operators guidance for the secure running of their vessels.



The age of the mega-ship is clearly upon us, fuelling innovation and technological breakthroughs and challenging perceptions of maritime safety in an unprecedented manner. These ships will challenge the industry to ensure and maintain the excellent safety record that it currently enjoys while continuing to transport more than 90 million people every year.

In May 2000, the International Maritime Organisation (IMO) secretary general called for a critical review of the safety of large passenger ships. This prompting led the IMO MSC to adopt a new philosophy for developing safety standards for passenger ships. In this approach, modern safety expectations are expressed as a set of specific objectives and functional requirements to be met by the ship in emergency situations. This has the overarching goal to aim at no loss of human life.

As a result, the current IMO framework for passenger ships is based on the premise that 'the ship is its own best lifeboat'. With this premise in mind, ships should be designed with increased survivability so that in the event of a casualty, passengers can stay safely onboard as the ship proceeds to port. In terms of survivability, this concept implies that in all possible flooding scenarios (due to collision and grounding) the vessel must be able to stay afloat and upright for as long as necessary to either return to port, wait for assistance or allow for safe abandonment of the ship. This is an explicit safety goal, the achievement of which would lead to a significant improvement in ship survivability.

In this context, Safety at Sea Ltd has supported the development of various ongoing building projects where increased survivability – in line with the casualty threshold concept – has been one of the main targets, in addition to compliance with the new harmonised probabilistic requirements for damage stability. To this end, a direct engineering approach has been employed where numerical simulation tools and physical model tests assess the consequences of water ingress and flooding for large numbers of collision and grounding scenarios.

Safety at Sea's experience from the work carried out to date indicates that the actual level of cruise vessel survivability is shown to be significantly higher than the level implied by the current requirements. In certain cases, however, clear areas for improvement have been highlighted. Observations from simulations and model tests show that the sea state and the characteristics of potential damage are key factors in determining the rate of water ingress and the nature of the vessel's response. During the initial and stages of flooding, semi-watertight doors and windows (which may become submerged) play a significant role in ensuring that a vessel reaches the expected equilibrium stage. Consequently, the design and operation of such doors, as well as the strength of windows located just above the water line, has to be considered carefully during the design process.

The studies have also demonstrated that if a vessel does not capsize in the first few minutes after water ingress occurs, it is unlikely that the vessel will capsize at all, or it may capsize very slowly, leaving ample time for active damage control and recovery of the vessel. In such cases, the outcome of the simulations can be used to develop appropriate recommendations for decision support.

The use of direct-engineering analysis for damage survivability provides useful information to design teams that can be used to achieve significant safety improvements with minor modifications aimed at fine tuning the watertight subdivision arrangements rather than altering them. It has also allowed Safety at Sea Ltd to support operators to quantify safety explicitly, an issue which is becoming increasingly relevant for addressing innovative and alternative design challenges. www.safety-at-sea.co.uk

Safety at Sea Ltd is a consulting company of naval architects specialising in stability, design and safe operation of ships and advanced marine vehicles. The company is a commercial spin-out from the University of Strathclyde and the Ship Stability Research Centre, a world-leading centre of excellence on ship safety. www.safety-at-sea.co.uk

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