Impact of Watertight Door Regulations on Ship Survivability

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ABSTRACT

When demonstrating compliance with the SOLAS Chapter II-1 subdivision and damage stability requirements, it is assumed that all watertight doors are closed and the related internal watertight subdivision is 100% effective. Unfortunately, casualty history indicates that this is not always the case. Contributing to this situation are provisions in the SOLAS requirements that permit some watertight doors to remain open or be open for extended periods of time during navigation under certain conditions. This paper provides background information on the SOLAS requirements for watertight doors and discusses whether this regulatory treatment is still appropriate for passenger ships of the future.

KEYWORDS

Watertight doors; damage stability; passenger ships; SOLAS

INTRODUCTION

Inherent in the application of SOLAS Chapter II-1 subdivision and damage stability requirements is an assumption that all watertight doors will be closed in a flooding casualty and that the related internal watertight subdivision will be 100% effective. Unfortunately, casualty history indicates that this assumption is not always valid. Contributing to this situation is SOLAS regulation II-1/22.4, which is a longstanding provision that allows Administrations to permit certain watertight doors to remain open during navigation if considered absolutely necessary for the safe and effective operation of the ship's machinery or to permit passengers normally unrestricted access throughout the passenger area. Considering the substantial evolution of SOLAS passenger ship safety standards over the last two decades and the current SOLAS 2009 probabilistic damage stability regulations that provide new subdivision design flexibility, this paper questions whether regulation II-1/22.4 is still appropriate for passenger ships of the future

BACKGROUND OF SOLAS WATERTIGHT DOOR REGULATIONS

The 1960 SOLAS Convention requirement for keeping watertight doors closed only applied to passenger ships and was as follows (regulation II/13(n)): "All watertight doors shall be kept closed during navigation except when necessarily opened for the working of the ship, and shall always be ready to be immediately closed." This requirement was not changed in the 1974 SOLAS Convention and although the 1981 SOLAS amendments (resolution MSC.1(XLV)) changed the format, the requirement remained the same (regulation II-1/15.14).

Following the *Herald of Free Enterprise* casualty in 1987, several sets of SOLAS amendments were adopted. The 1989 SOLAS amendments (resolution MSC.13(57)) substantially revised the watertight door requirements in regulation II-1/15. Although the primary impact was to significantly upgrade the control system requirements for power-operated sliding watertight doors on new passenger ships (constructed on or after 1 February 1992), changes were also made to the requirements for opening watertight doors during navigation. These changes were an effort to clarify and bound the existing provision "when necessarily opened for the working of the ship". Apparently it was felt at the time that many watertight doors were being allowed to remain open under the vagueness of this provision. The new provisions in regulation II-1/15 were as follows:

"9.2 A watertight door may be opened during navigation to permit the passage of passengers or crew, or when work in the immediate vicinity of the door necessitates it being opened. The door must be immediately closed when transit through

the door is complete or when the task which necessitated it being open is finished.

9.3 Certain watertight doors may be permitted to remain open during navigation only if considered absolutely necessary; that is, being open is determined essential to the safe and effective operation of the ship's machinery or to permit passengers normally unrestricted access throughout the passenger area. Such determination shall be made by the Administration only after careful consideration of the impact on ship operations and survivability. A watertight door permitted to remain thus open shall be clearly indicated in the ship's stability information and shall always be ready to be immediately closed."

With the exception of the retroactive application of the watertight door control system requirements (to passenger ships constructed before 1 February 1992) following the *Estonia* casualty in 1994, the SOLAS watertight door requirements for passenger ships have remained the same. The SOLAS 2009 amendments separated the watertight door requirements into design (regulation II-1/13) and operational (regulation II-1/22) sections, but the requirements did not change. Therefore, the current watertight door requirements originate from the 1989 SOLAS amendments.

GUIDANCE ON WATERTIGHT DOORS PERMITTED TO REMAIN OPEN

Following the 1989 SOLAS amendments that attempted to clarify and restrict conditions when watertight doors could be opened during navigation, there has been little IMO activity with respect to watertight door requirements until recently. In 2006 the SLF Sub-Committee initiated work to establish IMO guidance on the SOLAS 2009 regulation II-1/22.4 provision "Such determination shall be made by the Administration only after careful consideration of the impact on ship operations and survivability." The SLF Sub-Committee developed the survivability related guidance and the DE Sub-Committee developed the ship operations related guidance. That joint effort resulted in the recent December 2010 MSC.1/Circ.1380 *Guidance for watertight doors on passenger ships which may be opened during navigation*.

The MSC.1/Circ.1380 guidance represents substantial compromise from the initial SLF and DE proposals and essentially requires a risk assessment but only stipulates that the minimal stability criteria need be met when operating in high risk navigation areas. As a result several countries reserved their position on MSC.1/Circ.1380, indicating the guidance is not adequate and represents a permanent degradation of the subdivision of the ship. They proposed that no watertight doors should be allowed to remain open when the ship is operating in high risk areas, and under such conditions watertight doors should be allowed to be opened for passage and closed immediately afterwards. In conditions of low risk, certain watertight doors may be allowed to remain open following satisfaction of the minimal stability criteria.

OBSERVATIONS REGARDING SOLAS REQUIREMENTS

The SOLAS 2009 passenger ship subdivision and damage stability requirements incorporate a probabilistic methodology that allows new subdivision arrangement flexible. However, the SOLAS 2009 watertight door requirements reflect a standard that was developed in 1989. The passenger ship subdivision and damage stability requirement at that time was a deterministic standard with floodable length, factor of subdivision and prescriptive main transverse watertight bulkhead requirements.

The overall SOLAS passenger ship safety standards have been significantly raised since 1989. The higher safety bar is a result of both improved technology and a reduced societal tolerance for casualties and loss of life.

PROPOSED WAY AHEAD FOR WATERTIGHT DOOR REQUIREMENTS

Given the evolution of SOLAS passenger safety standards and the SOLAS 2009 subdivision design flexibility that was not available when the watertight door requirements in regulations II-1/22.3 and II-1/22.4 were established, it is time to consider:

- deleting regulation II-1/22.4 that allows certain watertight doors to remain open during navigation

- revising regulation II-1/22.3 to further restrict when watertight doors may be opened during navigation (consider possible limits on: duration of time open; door location; number of doors open; risk of navigating area; etc.)

In this task it may be necessary to account for passenger ship size differences based on the general premise that larger ships have more arrangement flexibility, which is consistent with the legacy provision now in regulation II-1/4.3. In this context, 400 persons is an established break point and is currently used in regulation II-1/8.

With respect to personnel safety concerns of frequent passage through normally closed watertight doors, it is suggested that this risk can be reduced through future innovative designs that eliminate these arrangements.

CONCLUSIONS

Passenger ships of the future will be required to meet high safety standards. Therefore, careful consideration should be given to ensure that watertight door requirements don't impact the flooding survivability by compromising the subdivision and damage stability requirements.

DISCLAIMER

The opinions expressed in this paper are only those of the author and do not represent those of the U.S. Coast Guard