Lifeboat safety solutions

A unified industry approach

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Lifeboats using on-load release systems cause an unacceptably high number of accidents. Many different would-be solutions have been proposed, not least in the pages of Seaways.

Now the industry has come together in an attempt to solve the problem once and for all. The Industry Lifeboat Group has prepared a definitive document to the Design and Equipment Sub-committee of the IMO. Among other points, it argues for the fitting of a fall preventer device (FPD) to every lifeboat in the period before IMO ensures that safe lifeboat release mechanisms are universally fitted.

Over the last 20 years, too many seafarers have been killed or injured as a result of accidents with lifeboats using on-load release systems. As recently as January this year, two crew members were killed when a lifeboat 'inadvertently' fell from a ship in the Baltic. There are no comprehensive global statistics available, but industry studies and accident investigations over the past decade show an unacceptably high number of accidents and have identified common causative factors.

There have been many seminars, articles and letters in maritime publications, including *Seaways*, on the causes of accidents with lifeboats, with many of them proposing solutions (see pp 26-27, for example). Additionally, P&I clubs regularly alert their members to the problems. Yet seafarers are still being killed and injured due to accidents during lifeboat drills and this has led to a widespread loss of confidence in lifeboat launching among seafarers. The situation is not helped in that there are more than 70 different designs of on-load release systems fitted to ships in service – and some of these are copies of type-approved designs, but manufactured using inferior materials. It causes problems for crew members when each vessel they join may have a different system from their previous vessel, and even sister ships may have different launching systems.

In a bid to solve the problem once and for all, an Industry Lifeboat Group (ILG) comprising representatives of a wide range of interests and associations (including The Nautical Institute), under the chairmanship of the International Chamber of Shipping, has had several meetings with a view to presenting a definitive document to the IMO. The outcome is 'Measures to Prevent Accidents with Lifeboats', a draft document to be presented to the 51st Session of the Design and Equipment Sub-committee (DE51) at the IMO (18–22 February 2008). In addition to design requirements for safe lifeboat release mechanisms, the ILG proposes that every lifeboat be fitted with a fall preventer device (FPD) in the interim period before appropriate IMO measures have been introduced to ensure that only safe lifeboat release mechanisms are fitted to ships' lifeboats.

Background

There have been a number of major research projects into lifeboat accidents including:

- In 1994, a study by the Oil Companies International Marine Forum (OCIMF) and in 2000, a joint industry study by OCIMF, INTERTANKO and the Society of International Gas Tankers and Terminal Operators (SIGTTO).
- In 2001, the Marine Accident Investigation Branch (MAIB) published a review of lifeboat and launching systems accidents covering a 10-year period from 1991.
- In 2005, the Marine and Coastguard Agency (MCA) commissioned Burnett Corlett – Three Quays Ltd – to carry out a study into the safety of lifeboats and their launching systems (MCA Research Project 555).
- Trevor Ross, Marine Operations Manager at NOC (National Oceanography Centre) Southampton, MSc thesis 2005: 'Ships' lifeboats: Analysis of accident cause and effect and its relationship to seafarers' hazard perception'.
- The Nautical Institute has also collected data on lifeboat accidents and their causes, including a New Zealand Branch survey in 2005, with ongoing accident and near-miss reports in the MARS database, and input from the Institute's Sea Going Correspondence Group (SGCG).

Project findings

1. The joint industry study produced a comprehensive report demonstrating that most accidents occurred during routine drills and maintenance activities at the human/mechanical interface, with the majority of personnel being injured or killed within the boat. Equipment failure was reported to be the most common cause of accidents, within which quick release mechanism failure was identified as the most frequent cause. Design failure, lack of maintenance, a failure to follow correct procedures and lack of proper training were all considered to be major contributory factors leading to such casualties.

2. The MAIB review identified on-load release hooks as the most common cause of fatal accidents: in 11 accidents reported over the decade, seven people were killed and 10 injured. A common feature of these accidents was the involuntary release of one or more hooks. Where one hook is released, the shock effect often causes the other end to tear off and the lifeboat to fall

IMO circulars

IMO MSC Circular 1205 (MSC.1205) Guidelines to encourage development of user-friendly operation and maintenance manuals for lifeboat systems – manuals which should be easy to understand and preferably be in a single document. MSC.1205 places greater emphasis on the use of a simplified common technical vocabulary and illustrations explaining the safe use of lifeboat systems. It also includes an example of an operation and maintenance manual for a lifeboat system.

IMO MSC Circular 1206 (MSC.1206) places responsibility for carrying out lifeboat maintenance with ship operators. It differentiates between manufacturer-defined routine maintenance that can be performed by the ship's crew as part of the weekly and monthly inspections and all other servicing and repair, which should be conducted by the equipment manufacturers or their authorised representatives.

■ See also www.msc1206.com

into the water. The review recommended that the IMO undertake a study on the present value, need and desirability of lifeboats. If this should conclude that lifeboat launching systems are indeed necessary, it should give consideration to formulating the requirements for safe lifeboat launching systems in merchant ships. Such requirements would seek to introduce integrated systems which:

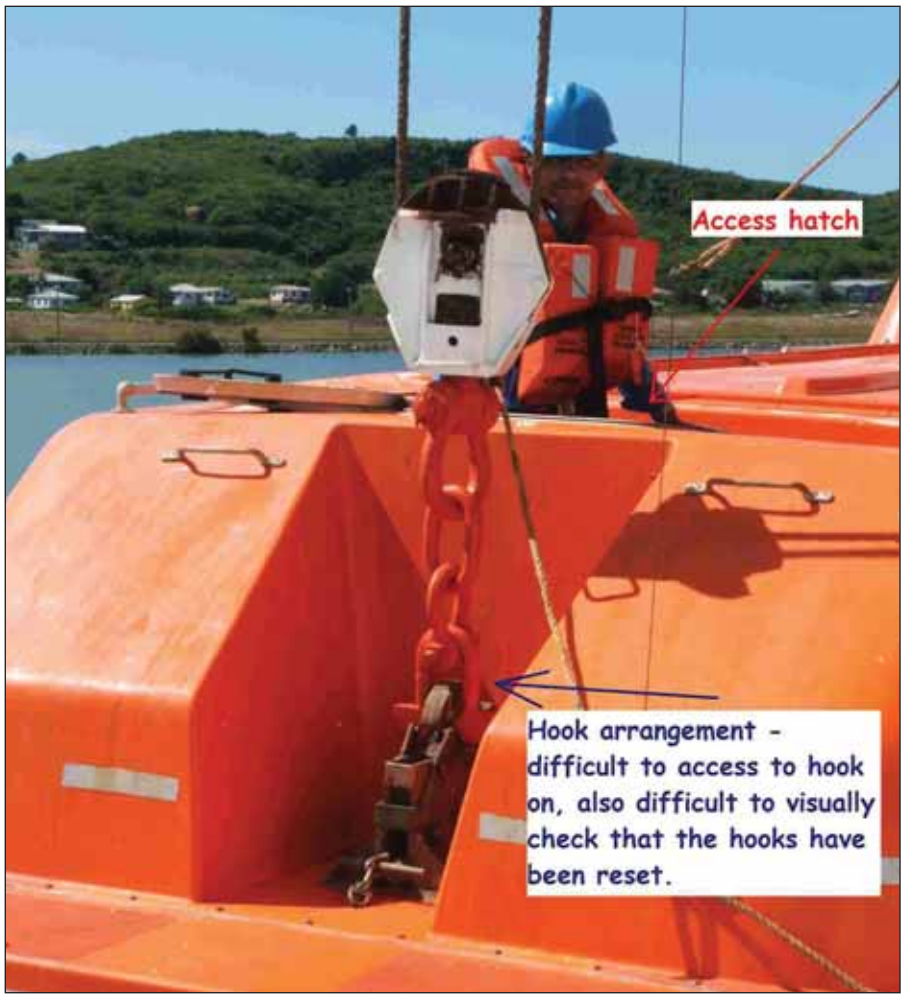
- have common operating procedures independent of the manufacturer;
- can be readily understood by non-technical persons;
- will reliably perform their tasks, which include lowering and deployment for training purposes; and
- will perform safely under the control of operators with minimum experience and training.

It recommended that such a study be undertaken as a matter of urgency.

3. The primary objective of the MCA 555 study was to make proposals for measures to improve the performance of lifeboats and contribute to the prevention of accidents.

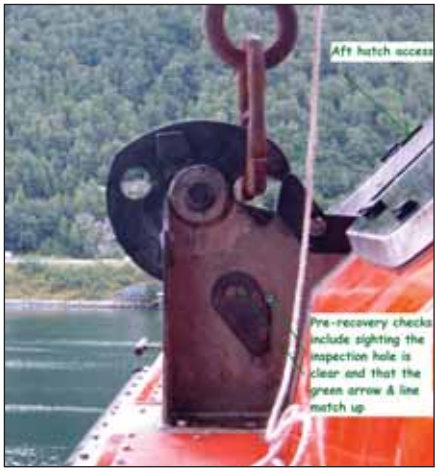
Recommendations from previous studies sought improvements in maintenance and training, and urged design improvements by manufacturers. Nevertheless accidents continued to occur, prompting action by the IMO to issue circulars (including MSC.1205 and MSC.1206 – see box) regarding equipment servicing and maintenance, crew training and safety management during lifeboat drills.

The MCA 555 study found that many existing on-load release hooks, while satisfying the current regulations, may be inherently unsafe and therefore not fit for purpose. Specifically, they have a tendency to open under the effect of the lifeboat's own weight and need to be held closed by the operating mechanism. As a result, there is no defence against defects or faults in the operating mechanism, or errors by the crew, or incorrect resetting of the hook after being released. Furthermore, the study concluded that the solution lay, not in training or



▲ These pictures show difficulties in hook access and visual checking

▲ Forward hook access



▲ aft hatch access

maintenance, but in radical redesign of the hook types involved. It also concluded that improved maintenance, while desirable, was unlikely to be a sufficiently effective risk reduction measure because of the harsh operating environment and dwindling levels of skilled resource on board a ship.

The study recommendations included:

- All on-load release hooks should be designed and constructed to be stable, ie self-closing, when supporting the weight of the lifeboat;
- An interim measure of by-passing on-load release hooks during drills should be considered.

4. In his thesis, Trevor Ross found that lifeboat accidents are often caused by a combination of factors, primarily failures in maintenance, design and training. The difficulty in establishing the primary cause meant that accidents due to design may be more common than is officially acknowledged, as these may be wrongly attributed to failures in other areas. However, after removing the variances, he found that the causes of accidents were almost equally divided among training, maintenance and design.

Analysing the feedback from seafarers, it was evident that the overall feeling towards lifeboats was a positive one. The majority of responses demonstrated faith in the safety and reliability of the equipment. However it is worth noting that several of the questionnaires from seafarers contained notes to the effect that their positive responses were given based on using a lifeboat in calm waters only. In any sort of a seaway they considered lifeboat operations to be too dangerous to undertake in any but an emergency situation.

5. Nautical Institute studies, and observations from the Sea-Going Correspondence Group (SGCG), drew attention to the complexities of the mechanisms, particularly hydrostatic interlocks. One ship's safety officer said: 'Most crew regard them as having something "clever" inside that they can't see; they have to take our word for it that they will work. The lack of permissible onboard maintenance requiring shoreside contractors to be on the vessel for the annual inspections also add to this theory.' The President of the Institute, Captain Nicholas Cooper FNI, stated: 'All the lifeboats I have encountered over the past 15 years have suffered from the same major design fault, which is the over-complicated releasing gear, compounded by confusing on-load/off-load instructions and procedures.'

Other comments from the SGCG included:

- Poor visibility through plastic windows, which after six months from new become 'frosted', making approach much more difficult.
- Access to the hook locations are poor and often do not allow much movement for personnel to reach for the hooks.
- The quality of the manuals and instructions. Common problems include manuals which are overly complex and cannot be understood without specific training, lack important maintenance information or are not available in the working language of the ship. One correspondent noted that, on his vessel, there were six different manuals covering the operations of the lifeboats (see MSC 1205 box).
- The release systems must be standardised (no more than two or three types nominated by IMO), more reliable and made simpler to operate and maintain. Even with the best of training and briefings, the operation and the correct resetting of the on-load release is easily misunderstood.
- It all depends on knowing if the on-load release system is secured or not.
- Training should not be neglected even if it is to be carried out without any people in the boat. IMO's solution to the problem is to take people out of the boats; however, this should not be used by equipment manufacturers as a signal that they need not work to improve the safety and uniformity of the launching gear.
- Even in the best sea conditions, on a high freeboard ship like a large container or vehicle carrier, the lifeboat swings alarmingly. The impacts on the ship's hull are bound to damage the boat at some time and worse, the shocks may actually cause the on-load release to operate.

Functionality of lifeboats

Last year, a seminar, Lifeboat Safety and the Future, organised by The Honourable Company of Master Mariners (HCMM), in conjunction with The Nautical Institute and Institute of Marine Engineering, Science and Technology (IMarEST), concluded that there was a lack of simple instructions and manuals in the right language, lack of effective training and training aids, and a lack of research and statistics into accidents with lifeboats.

At a recent Functionality of Lifeboats workshop, Captain Rodger MacDonald FNI, Secretary General of the International Federation Shipmasters' Association (IFSMA) opined that davit-launched lifeboats have not significantly changed since the time of the *Titanic*. The fundamental principle of suspending the boat on hooks and falls, of swinging the boat outboard, and of lowering it to the water on running tackle is still the practice today. Other elements of ships' operations have been radically redesigned (such as cargo-handling methods), but changes in lifeboat launching arrangements have been typified by regulation-driven advancement (for example on-load release systems).

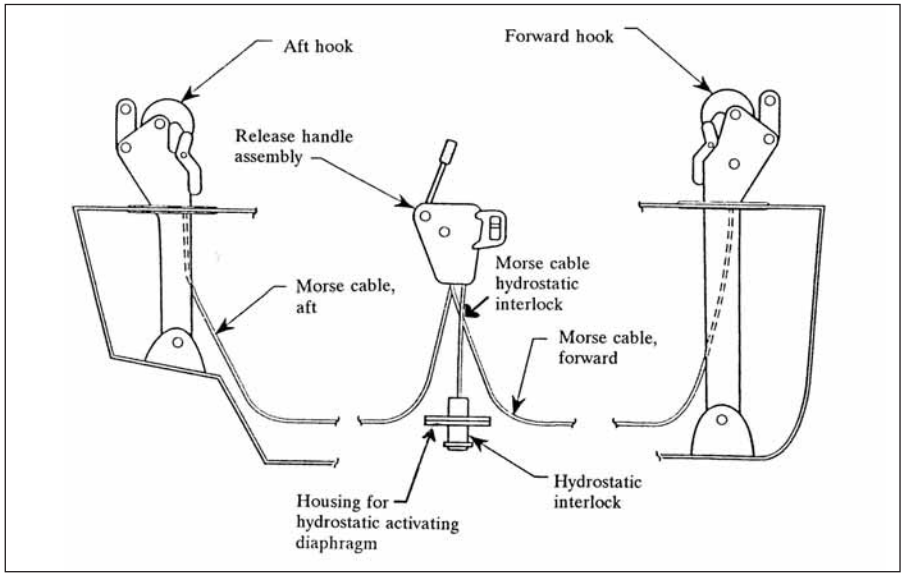
These successive regulatory developments, apparently implemented without any fundamental design reappraisal, may have led to lifeboat systems being unnecessarily complex and thereby contributing to risk.

Single point failure

The MCA 555 review concluded that, as a generality, on-load release hooks are typically unstable. Any fault or problem in the operating mechanism, or any error in its use, leads almost inevitably to release of the hook. As such, on-load release systems could be said to be prone to single-point failure, whereby a single failure in the system could cause it to fail, resulting in an accident. Such systems cannot be considered robust in safety terms, since they are not tolerant of defects, failures or human errors. More than one type of fault or failure in the release system can lead to hook opening and hence a lifeboat accident. Typically, therefore, on-load release systems could be said to be prone to multiple single point failure modes.

Viewed from this perspective, and considering the large number of lifeboat drills carried out aboard ships as required by regulations, it is perhaps remarkable that there are not more lifeboat accidents. The record of accidents would appear to demonstrate that, in general, considerable care is taken by shipowners and ships' crews to maintain and service lifeboat launching equipment properly and to conduct lifeboat drills carefully, despite the rather unforgiving nature of the marine and shipboard environment.

The MCA 555 study surmised that the design of an inherently safe on-load release hook appeared not only practicable, but was essential for preventing lifeboat accidents, given the inevitability of human error and equipment degradation in the marine environment. Most release systems now being made by manufacturers have addressed some of the



▲ On-load generic release arrangement

problems, with several companies having produced a 'fail to safe' system.

With regard to ships in service, consideration needs to be given to retrospective fitting of safe on-load release systems. A key concern is that retrofitting (like-for-like replacement) should be entirely practicable. A schedule of implementation dates, taking account of a ship's age and the timescale needed for development, approval and production of new hook designs, should be agreed at IMO. In the meantime, until the present 'unstable' release systems are replaced, measures should be implemented to prevent accidents.

ILG submission to DE51

The document submitted to DE51 addresses these conclusions and incorporates the views of the participating representatives in the ILG, including those of the SGCG. This document provides initial proposals about design requirements for lifeboat release mechanisms that are safe in operation and in the event of a mechanical or operational failure, will remain closed until the lifeboat is either afloat or is secured in an otherwise safe condition.

The ILG considers that fall preventer devices (FPD) should have a role to play in the interim period before appropriate IMO measures have been introduced to ensure that only safe lifeboat release mechanisms are fitted to ships' lifeboats.

■ **1.** A number of design characteristics for a safe lifeboat release mechanism have been identified that the ILG consider would contribute to improved lifeboat safety, including:

a. Universal standardised design and operability;

b. Lifeboat vendor to be responsible for supply of hook connecting link and associated connection to davits;

c. Fail to safe – stable and self closing/resetting;

d. Durable corrosion resistant construction materials;

e. Safe operation not reliant on the maintenance of critical manufacturing tolerances;

f. To release only at a safe height (on or immediately above the water);

g. Durable sealed hydrostatic interlocks without the need for seals/diaphragms to be replaced on an annual basis;

h. Safe operation in exposed marine environment in high and low ambient temperatures when wearing personal protection equipment (PPE) including gloves;

i. Standardised operational and control mechanism;

j. Good access to, and visibility of all controls and safety locks;

k. Release control to be distinctly and unambiguously marked;

l. Release mechanism status to be clearly visible from deck of ship and from within lifeboat;

m. Operation of on-load release to require multiple separate actions;

n. Sealed, maintenance-free, stainless steel, control and release cables;

o. Release cables to be free of residual load when release mechanism connected;

p. Lifeboat cannot be hoisted if release mechanism and lifting falls/wires are not correctly reset or attached;

q. Intuitive operation and re-attachment;

r. Facility to untwist rotated wires/falls under load;

s. Operation of all components in all light conditions;

t. Unambiguous photo-luminescent signage at point of operation;

u. Training and maintenance manuals should be to a high standard of standardised format and structure;

v. Routine maintenance requirements to be minimal and limited to greasing;

w. Survey and load test cycle within existing five year survey cycle of ship.

The use of FPD such as synthetic safety strops or release mechanism 'locking pins' (with a similar functionality to the harbour pins provided for securing davits) could be strongly supported by the Sub-Committee. Guidance concerning the use of such FPD should be very carefully considered to avoid introducing additional risks that could compound the dangers associated with the premature opening of release mechanisms. FPD may be used to stop lifeboats dropping in the event that the release mechanism fails or operates when the lifeboat is housed in the davit, suspended or otherwise not floating.

■ **2.** Guidance regarding the use of FPD should include requirements that:

a. Design and operation and installation of the FPD should be approved by class;

b. Operation of the FPD should not impede the correct operation of the release mechanism;

c. Correct fitting of the FPD to be readily visible from the deck of the ship and from within lifeboat;

d. Release of the FPD should be easily and quickly achieved from within the lifeboat when it is floating. If release of the FPD requires opening of lifeboat hatches this should be readily achievable as a single person operation at location of each device from within the craft;

e. Safe operation in exposed marine environment in high and low ambient temperatures when wearing PPE including gloves;

f. Connection of FPD to be unambiguous and with design of components ensuring that only intended components can be connected to each other;

g. FPD devices should make use of standardised colour coded components;

h. Where FPD utilises strops, wire/fabric components including attachment points, to be tested to required loads. Slack strops to be avoided to prevent shock loading; and

i. For there to be clear and unambiguous signs indicating FPDs need to be fitted.

The ILG recognise that FPD may

▲ Hook with FPD fitted

require seafarers to work outside the protection provided by the totally enclosed lifeboat and during emergencies involving fire or the release of chemicals. It is further recognised that FPD might introduce new hazards; nevertheless the ILG believe the hazards of using lifeboats without FPD are greater than the hazards posed in such emergency situations.

■ **It is to be hoped that the DE Sub-committee recommends these proposals to the Maritime Safety Committee.**

■ The Nautical Institute is dedicated to continually improving lifeboat safety as a result of member feedback, therefore all feedback, either on hooks or other aspects, is welcomed.

In the meantime, all readers are urged to make best use of this information when conducting a risk assessment for all lifeboat drills and maintenance.

■ The Nautical Institute will be publishing further articles on the outcome of this IMO initiative and will provide further guidance on fall preventer devices (FPDs).