Safety procedure and equipment considerations on large cruise ships

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Modern cruise ships, particularly the largest of them, are effectively more part of the hotel and entertainment industry than the marine industry – yet marine safety and the practice of seamanship must still be the prime concern on board. I would argue that these vessels are now so large and so complex that there is a requirement for additional safety legislation within the cruise industry, above and beyond existing SOLAS requirements.

Owing to the difficulty and prolonged time required to get legislation approved at the IMO, flag states and even embarkation countries must be willing to enhance the basic SOLAS legislation, which is falling so far behind what should and can be done. This can of course be only a temporary solution, as it will lead to varying standards around the world. Ultimately, it points the way for a separate legislative body with enforcement powers to oversee the safety construction, safety equipment and rules of safe operation for these vessels.

But what changes should be made? This article outlines a few of the areas where change is necessary. Of course I do not expect agreement with every point, nor do I claim that I am correct in all my assumptions – but it will hopefully serve as the start of a wider discussion.

Criteria for evacuation

The IMO must consider the implications of its propagation of the ‘ship is a lifeboat’ theory. Certainly the present ‘hotel’ ships cannot be considered as such. I am sure the IMO would agree that any ship can sink given the correct circumstances – and therefore abandonment must be planned for regardless of any theory. It is, of course, true, that the better the safety equipment, the organisation, discipline and leadership on board, the more confidence the Master may have in delaying abandonment. However, to promulgate this as a general seamanship theory can only endanger those on board. We have seen too recent cases where delay in abandonment has led directly to disaster. I do not discount the possibility of designing ships that have a far better chance of acting as a lifeboat than the present generation – but it will be a long time before we see the changes in design and management attitude required.

Current evacuation guidelines

Any study of ship and equipment design must have as its prime consideration the safety of those on board and, in the final analysis, the ability to abandon the ship successfully. For this we must adopt a worse case model. Obviously a hurricane situation, while theoretically possible, cannot be imposed on companies as the standards required would be prohibitive, but a median can be assumed.

The IMO Guidelines for a Simplified Evacuation Analysis for New and Existing Passenger Ships covered by MSC Circ 1033 and its successor MSC Circ 1238 recommend a maximum allowable total passenger ship evacuation time to be in the range of 60-80 minutes, the difference in time being for the number of vertical fire zones. However, this assessment is based on the following assumptions:

5.1 The crew will immediately be at the evacuation duty stations ready to assist the passengers.

It is my experience that this never occurs, especially at night. As a benchmark, 10 minutes should be allowed for this. A small proportion of the crew will not even appear at their correct stations at all, many being stalled by the need for passenger attention or other immediate duties that only become apparent at the onset of the emergency.

5.2 Passengers follow the signage system and crew instructions (ie, route selection is not predicted by the analysis).

With emergency lighting, (not considered in the model) and possibly smoke, the signage and routeing could be obscured. As the number of passengers grows, the speed at which they are able to follow crew routeing instructions will slow down.

5.3 Smoke, heat and toxic fire products present in fire effluent are not considered to impact passenger/crew performance.

This is quite a surprising statement. The Department of Health of New York states that ‘inhaling smoke for a short time can cause immediate and acute effects’. Smoke will considerably hamper evacuation, particularly as the cruise ships do not have smoke hoods in the cabins.

5.4 Family group behaviour is not considered in the analysis.

Families, if apart, are likely to look for their family members, especially if parents are on the upper decks at the time of the alarms and their children are in their cabins several decks below. Any instructions to deter this will be ignored.

5.5 Ship motion, heel, and trim are not considered.

Any list or rolling of the ship hampers movement, especially among those not experienced onboard ship. It will particularly hamper the infirm and disabled, especially those in wheelchairs. The question remains as to how these ships intend to move wheelchair-bound passengers down several decks without lifts.

I suggest predicating evacuation timings on conditions experienced in Force 5 winds with a three to four metre sea from trough to crest, together with a five degree list and a ten degree roll giving a maximum heel of 15 degrees. These figures could be considered as average for sea conditions.
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Additional factors
It is likely that, especially at night, some proportion of passengers will be intoxicated in varying degrees. All the cruise ships have crew bars, therefore it is reasonable to assume that a small proportion of the crew will be under the influence of alcohol as well. This intoxication will considerably hamper the evacuation efforts and cause a safety concern for those passengers who are sober.

One most important issue that has not been considered in the IMO model is the wearing of lifejackets inside the ship. This will double the space required for passenger movement, again increasing the evacuation time.

I suggest that the factors I have shown will at least double the evacuation time, which would mean that none of the existing hotel ships can meet the criteria of full evacuation within 60-80 minutes.

Designing for evacuation
The design of the ships themselves is obviously a major factor in ease and efficiency of evacuation. As ships continued to grow, and the open decks got higher above the water level, so did the lifeboats. Eventually they became too high for safe evacuation and were moved back closer to sea level. Unfortunately the deck space for mustering by these boats was not designed into many ships. Passengers still muster in the public rooms on the upper decks. Then they put on their lifejackets and they are led down to the boat embarkation deck. This is not satisfactory for many reasons. Passengers on the upper decks have to go to their cabins, often below the boat deck, to fetch their lifejackets, and then return to the upper decks for muster, before going back down again to the embarkation deck. At night and with emergency lighting, it is easy for passengers to get confused and indeed lost. I doubt very much if all passengers will be at the correct boats, potentially leading to a panic for passengers to get confused and indeed lost. I doubt very much if all passengers will be at the correct boats, potentially leading to a panic situation trying to find space in other boats.

The design of these ships must be such that there is space for passengers to muster by their boats. The space should contain seating for passengers to wait for the embarkation order. This will allow mustering by the boats to be ordered as a precaution and avoid panic. Each boat must station should be supplied with a first aid pack and a defibrillator. Lifejackets can be stowed at the muster area, although we should also consider whether it is wise to wear lifejackets in enclosed lifeboats.

Stairways should be so designed to avoid blockage. It is essential that they are wide enough to allow for the movement of dense two-way traffic with systems that allow for the emergency movement of wheelchairs. At present, many stairways seem to be designed with aesthetics, rather than safety, in mind.

As these ships become larger, with more lives at risk, it becomes common sense to require double hulls. Such hulls are already required on tankers to protect the environment so surely double hulls should be required for passenger ships as well.

Safety equipment
It is essential that the standard of lifejackets be upgraded. The current standard SOLAS-compliant lifejacket has a number of flaws:

- It can injure the wearer by rising up and possibly breaking the neck.
- This could be prevented by the addition of a crotch strap, which is not currently required.
- There is no hood to prevent heat loss through the head or face mask to keep the nasal cavities clear.
- It does not give any warmth protection to the body.
- The bulkiness of these jackets doubles the space required during evacuation and mustering.

The need to change the lifejacket requirements is particularly important for cruise ships going into cold waters.

Smoke hoods are not presently required on cruise ships. However, there is a case for smoke hoods to be placed in every cabin, backed up by statements from passengers who have been forced to use damp towels to assist evacuation during a fire.

Lifeboats
According to the Life Saving Appliances (LSA) code 2010, the lifeboats are allowed to carry up to 150 persons, and a lifeboat of this size will be boarded in 10 minutes. That is a rate of 15 people per minute, or a passenger every four seconds. This is impossible, especially with enclosed lifeboats which are boarded through narrow openings.

Further, no lifeboat is currently designed for disabled persons.

We must also question whether 150 persons can get into lifeboats approved for this number. The space and weight allocations defined in the 2003 IMO Life Saving Appliance (LSA) Code [27] are too low. For many years now, most survival training schools have realised that it has not been possible to load any of the lifeboats to full capacity, even when the students were just wearing work coveralls and no lifejackets. A human factors study published in 2005 reports: ‘In 2005, a typical maritime offshore oil training class of 41 people was measured in Dartmouth, Nova Scotia (39 male, three female). Their ages ranged from 18-56 years. Over 70% of the group measured in work clothes only exceeded the 450 mm space allocation at the hips, and the shoulders were even wider. The average weight was 87 kg, 12 kg over the IMO specification.’ (Brooks, C., Kozey, J., Dewey, S. and Howard, K.)

This means that it is literally impossible to load a lifeboat to its full capacity. Where are the people who do not fit in to go?

Further, it is still legal to provide lifeboats for only 75% of the persons on board. To put this in perspective, on a ship having 8,000 persons on board, this means that 2,000 will have to rely on liferafts – which will suffer the same capacity issues as the lifeboats, to an even greater extent, as passengers will also be wearing immersion suits and lifejackets. Liferafts have been a large step forward in saving life at sea. However, relying on them as a lifeboat replacement is wrong and unsafe. Liferafts have been proven to be difficult if not impossible to board in certain conditions. In strong winds they can blow away, and elderly, infirm, disabled, children and injured persons will find them difficult to board even in good weather. On conventional merchant ships, there must be sufficient lifeboat capacity for all on board – so why does the same not apply to cruise ships where many people are unfamiliar with the sea?

Preparation
Under SOLAS, all on board – passengers and crew – are required to have warm clothing and to wear this at muster, in order that they may recognise the need to wear this for abandonment and for the ship’s crew to check that they have this. Often, passengers are not told the requirement to bring warm clothing, nor are they checked at muster for warm clothing.

Jumping from the ship
The SOLAS training manual 3.2. gives a full procedure to be followed when jumping from a ship wearing the standard lifejacket. As this is a SOLAS requirement, passengers should be instructed in this at their muster stations and by notices in cabins and on the decks. Too often, this is not the case. Most importantly, the SOLAS training manual states: ‘The recommended maximum height for jumping in the water with a lifejacket on is 4.5 metres’. As most of the open deck space on the cruise ships is now above this height, passengers should be instructed about this, and notices should be posted on decks above this height warning of the dangers. It is possible that in some cases, even Master of the cruise ship does not know of this recommendation.

Recommendations
ABANDONMENT

- Criteria for evacuation must be based on the worst case scenario, taking into account all factors of weather, heel and list, darkness, distance from the muster point to the boat embarkation position, etc.
- All ships must be prepared for the possibility of abandonment. There should be no delay in passengers being mustered by their assigned
boats and even being ordered into them to await the final decision.
- Muster stations should be by the boats with ample space for assembly and even seating arrangements for passengers to await any embarkation order. Passengers are to be supplied with their lifejackets at the muster points.

**LIFEBOATS**
- Lifeboat and liferaft spaces should be re-evaluated in line with the study carried out at Dartmouth.
- Cruise ships should carry sufficient lifeboats for ALL on board. A number of these should be specifically designed for disabled passengers. Cabins for disabled passengers should be on or next to the embarkation deck.
- Sufficient seamen should be employed to enable each lifeboat to carry three and each liferaft have one. These should not be hotel or entertainment staff.

**LIFEJACKETS**
- All lifejackets should be replaced with a type that incorporates a hood, face mask and crotch strap.
- A procedure for jumping into the water with lifejackets on should be stated and demonstrated at the muster and a notice be in each cabin. Notices should be placed on all open upper decks above 4.5 metres stating that it is dangerous to jump from these decks with lifejackets on.

**GENERAL**
- Passengers should be advised of the warm clothing requirement before joining, and warned that this will be checked at the muster.
- On cruises of over two weeks duration, all passengers should be mustered at their muster point every two weeks and then conducted from the muster point to their lifeboat. All lifeboats should be placed in the embarkation position every two weeks.
- Uniforms should reflect command responsibility, so that hotel staff cannot be confused with the officers of the ship who will be giving the command orders during any emergency.
- The consumption of alcohol should be better controlled, with age limitations strictly enforced. As all crew members will be involved in any abandonment, which could be at any time, it surely is essential that a strict no alcohol policy for all crew members be enforced.
- Cruise ships should be required to adopt double hulls exactly the same as the oil and chemical carriers, especially those going into ice waters.

The prime consideration of seamen is the safety of those on board. Our function as professionals is to consider all the problems and deal with them before the event, rather than the reactive approach currently used.

We rely on the IMO and SOLAS regulation for leadership – but when that doesn’t happen, are we to stand back and wait for the next accident and then the next? This is exactly what we are doing each time we point our finger at SOLAS and say, ‘The equipment conformed,’ ‘The design conformed’ or ‘The ship was manned according to the safe manning certificate,’ as if that can exonerate us from responsibility. We have a professional voice and I suggest that we should use it more often, to the benefit of all those at sea. 

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