INTERNATIONAL MARITIME ORGANIZATION

E

SUB-COMMITTEE ON FIRE PROTECTION
54th session
Agenda item 9

FP 54/INF.6
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ENGLISH ONLY

RECOMMENDATION ON EVACUATION ANALYSES FOR NEW AND EXISTING PASSENGER SHIPS

Summary of the discussions of the correspondence group

Submitted by Germany

SUMMARY	
Executive summary:	This document lists the submissions of the correspondence group members
Strategic direction:	5.1
High-level action:	5.1.1
Planned output:	5.1.1.1
Action to be taken:	Paragraph 3
Related document:	FP 54/9

Background

1 Since a lot of fundamental arguments were brought forward within the discussion of the Correspondence Group on Recommendation on Evacuation Analyses for New and Existing Passenger Ships, the complete submissions are listed in annex 1 to this document, and could be used as a basis for further discussions on this matter.

Participants in the correspondence group

2 Delegates from the following Member Governments participated in the group:

FRANCE
GERMANY
JAPAN
SWEDEN
UNITED STATES

and an observer from the following non-governmental organization:

CRUISE LINES INTERNATIONAL ASSOCIATION (CLIA)

Action requested of the Sub-Committee

3 The Sub-Committee is invited to note of the outcome of the discussion and take action as deemed appropriate.

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ANNEX 1

SUMMARY OF THE DISCUSSIONS OF THE CORRESPONDENCE GROUP

1 MANDATORY REQUIREMENT

1.1 France

1.1.1 France agrees with the Japanese interpretation of the terms of reference (TOR) 1: "discuss a mandatory application of the requirement for evacuation analysis to new passenger ships other than ro-ro passenger ships, and if appropriate, prepare draft amendments to the requirement".

1.1.2 Referring to question 1 Japan's comments on TOR 1, we would indeed be interested in the validation of MSC.1/Circ.1238. We are especially interested in the robustness of the advanced models, meaning the independence of the results towards the user, the software, etc. In that respect, if MSC.1/Circ.1238 was to be made mandatory for all passenger ships, France would like to enhance paragraph 18 of annex 3, quantitative verification with reliable experimental data, and make mandatory the quantitative verification of the model to be used.

1.1.3 If the evacuation analysis is made mandatory for all passenger ships it would have to be added to existing regulations concerning evacuation, i.e. it would not be an option, and therefore the aim would be to increase the safety of the evacuation of persons on board new passenger ships other than Ro-Pax.

1.1.4 Not having had an important accident challenging the assembly phase recently, it is difficult to assess the necessity to make an evacuation analysis for these passenger ships mandatory. Therefore, once the validation of the models has been demonstrated, in agreement with Japan, France suggests that the safety benefit be assessed, as well as the cost/burden of such a requirement in order to answer TOR 1. This could be done as a first step using the Guidelines for Formal Safety Assessment.

1.1.5 France would like to draw attention to the fact that although the advanced analyses are quicker/easier today than in the past, they are highly dependent on the design and arrangements. Therefore, the analysis "early in the design" might set the design and arrangements. However, from the designers' point of view there is a need for flexibility during the design phase, particularly for cruise ships. This constraint is very difficult to assess in terms of cost, but it is known from experience how difficult it is to deal with. In the same way, the approval and the survey of ships that have undergone such an analysis are not straightforward. France would like to open the discussion on these factors.

1.1.6 Additionally, France acknowledges that the current MSC.1/Circ.1238 is not fully adapted to procedures on cruise ships. A distinction between cruise ships and Ro-Pax should be made, and the circular should be revised in order to take into account the specificities of procedures on cruise ships (see our comments on TOR 2).

1.1.7 Finally, we think that such a new MSC.1/Circ.1238, or an amended version of this circular, should be recommended in the SOLAS Convention, as the current MSC.1/Circ.1238 is up to now dedicated to Ro-Pax. Moreover, specifically referring to the Japanese comments on the mandatory application of the requirement for evacuation analysis, in SOLAS regulation II-2/13.7.4, and/or the application of the Guidelines (MSC.1/Circ.1238), we have no objection to clarifying in SOLAS regulation II-2/13.7.4 that the application of these Guidelines is mandatory for the evacuation analysis of ro-ro passenger ships.

1.1.8 France supports comments made by Japan, CLIA and the United States, and reiterates its position for a non-mandatory application of evacuation analysis for all passenger ships (except as already required by SOLAS for ro-ro passenger ships).

1.1.9 With regard to comment 4 from CLIA:

.1 France understands the concern expressed by CLIA, but thinks that simulation tools – as far as we know – are not adequate/designed to consider correctly disabled persons yet;

.2 moreover, those persons will be given specific attention during a real evacuation such as for example:

.1 dedicated crew members to assist them; and

.2 use of different evacuation routes (lifts) when in wheelchair, separated from those used by valid persons;

.3 therefore, we do not think that disabled people could be decisive in the global flow of passengers and that they could influence the global results of the simulations;

.4 it has also to be mentioned that MSC.1/Circ.1238 considers the case of persons with mobility impairment, specifying in table 3.1 the percentage of mobility impaired persons (10% including persons older than 50) and in tables 3.4 and 3.5 the displacement speeds lower than for other persons. Is it not sufficient to treat the case of persons not in wheelchairs?; and

.5 to conclude, France does not feel that a better consideration of people with disabilities during evacuation simulations would make better the global results of the calculations and, therefore, is not in favour to develop that item more deeply.

1.1.10 With respect to some comments expressed by Japan and CLIA (Validation of MSC.1/Circ.1238 – confidence in the current state of the art), it seems that the results that come from the EC funded SAFEGUARD project could be very interesting and give some answers. Is it possible for our correspondence group to wait for the end of SAFEGUARD project to answer that question?

1.2 Germany

1.2.1 Germany is of the opinion that the experience gained on evacuation analyses would enable the mandatory application of the Guideline to passenger ships.

1.2.2 CLIA states that spaces are not well defined at an early stage of design. It has been shown that the general arrangement and dimensions of corridors, as they are available at the early design stage, where analyses are made, is sufficient to provide reliable results.

1.2.3 The exact time frame of the Guideline is criticized for being arbitrary. This accounts for almost every threshold, but they have to be defined somehow, until better information leads to new thresholds. However, the method defined in MSC.1/Circ.1238 is statistical, so 5% of the calculated durations already exceeds the significant duration. Thus the threshold eventually is not as absolute as it looks like.

1.2.4 Disabled persons and crew assisting the evacuation are already taken into account by the current Guidelines (page 35 (English version), table 3.4). The simulation of crew members assigned to assist disabled persons will make the evacuation simulation more complex and intransparent.

1.2.5 Germany agrees with CLIA's statement, that analyses should be made mandatory for new ships to increase efficiency and identify problem areas.

1.2.6 Germany agrees with France, that the robustness of the software towards the user could be a problem. However, the simulation is defined by the General Arrangement plan and the methods described in MSC.1/Circ.1238. Any additional interpretation, or assumption, exceeding the recommendations of MSC.1/Circ.1238, have to be proved in detail by the Authorities.

1.2.7 Germany welcomes the proposal of France, to enhance paragraph 18 of annex 3 to the Guidelines with reliable experimental data.

1.2.8 We would like to avoid a "disaster driven" development of safety guidelines. So far, applying the Guideline to passenger ships in general has lead to improvements of evacuation plans, thus reducing significant congestions and increasing the efficiency. Thus, Germany encourages the mandatory application of the Guidelines for passenger ships of a certain size (to be defined).

1.2.9 It would be in everybody's favour to determine a reliable duration for the absolute evacuation duration. Unfortunately, it has been shown that nobody is willing to pay for the number of full scale evacuation trials which would be necessary to gather enough information in order to determine a statistically reliable threshold. However, experience shows that the current thresholds have never been a problem for actual designs.

1.2.10 Germany agrees with the statement, that the emphasis of the analysis should be the detection of problematic areas and thus to improve evacuation performance.

1.2.11 Germany supports to make MSC.1/Circ.1238 mandatory for all passenger ships constructed on or after [1 July 2010] exceeding a certain size.

1.2.12 Germany proposes the following amendments to SOLAS regulation II-2/13:

.1 3.2.7 (Evacuation analysis), with reference to MSC.1/Circ.1238; and

.2 escape routes shall be evaluated by an evacuation analysis early in the design process. The analysis shall be used to identify and eliminate, as far as practicable, congestion which may develop during an abandonment, due to normal movement of passengers and crew along escape routes, including the possibility that crew may need to move along these routes in a direction opposite the movement of passengers. In addition, the analysis shall be used to demonstrate that escape arrangements are sufficiently flexible to provide for the possibility that certain escape routes, assembly stations, embarkation stations or survival craft may not be available as a result of a casualty.

1.2.13 Reasons supporting our view:

.1 since the advanced analysis came into effect, it was widely used by the German industry and partners throughout Europe. The analyses carried out have never shown any problem with regard to the calculated duration of the evacuation,

instead problematic areas leading to significant congestions where discovered and this has consequently led to changes in the design. Thus, applying the analysis was beneficial for the safety of every vessel;

.2 the important parameters of simulation models (e.g., density-flow-relations) are of common scientific knowledge and simulating evacuation processes is the most accurate way to analyse the process. The advanced method has been applied for about eight years, which is proof its reliability. It had been applied to nearly all passenger ship newbuildings, not only ro-ro ships, since coming into force;

.3 within Germany (and Europe as well), the Guidelines were used for RoPax ships (as stipulated) and voluntarily used for newbuildings of cruise ships. The results were considered beneficial for the safety and until now it is almost common practice to apply evacuation analyses for new built or converted passenger ships; and

.4 in our eyes, the definition of a boundary for a mandatory application for passenger ships other than RoPax ferries should be taken from the Safe Return to Port concept, meaning 3 or more MVZs and longer than 120 m.

1.3 Japan

1.3.1 Taking this opportunity, we would like to clarify the meaning of this TOR to make an efficient discussion.

1.3.2 First of all, the following two issues should not be confused:

.1 mandatory application of the requirement for evacuation analysis; and

.2 mandatory application of the Guidelines (MSC.1/Circ.1238).

1.3.3 We are of the opinion that the mandatory application of requirement for evacuation analysis should be considered. The existing requirement for evacuation analysis is SOLAS regulation II-2/13.7.4.

"7.4 *Evacuation analysis*

Escape routes shall be evaluated by an evacuation analysis early in the design process. The analysis shall be used to identify and eliminate, as far as practicable, congestion which may develop during an abandonment, due to normal movement of passengers and crew along escape routes, including the possibility that crew may need to move along these routes in a direction opposite the movement of passengers. In addition, the analysis shall be used to demonstrate that escape arrangements are sufficiently flexible to provide for the possibility that certain escape routes, assembly stations, embarkation stations or survival craft may not be available as a result of a casualty."

1.3.4 MSC.1/Circ.1238 is just a footnote (recommendation) to the heading of this requirement. Thus, we consider that the mandatory application of the requirement for evacuation analysis should be discussed because it is clear that the mandatory application of the Guidelines is not necessary.

1.3.5 It should further be noted that the word "all passenger ships" means new and existing passenger ships in accordance with the definition in SOLAS chapter II-2. At present, evacuation analysis is required for ro-ro passenger ships early in the design process. Then, we consider that the mandatory application of the requirement for evacuation analysis to the existing passenger ships is not necessary, taking into account the original purpose of the requirement for evacuation analysis.

1.3.6 Thus, we propose to amend/interpret the TOR 1 as follows: discuss a mandatory application of the requirement for evacuation analysis to new passenger ships other than ro-ro passenger ships, and if appropriate, prepare draft amendments to the requirement.

1.3.7 We believe that the above interpretation of the TOR 1 is consistent to the proposed point of discussion in the document FP 53/9, in paragraphs 4 to 6.

1.3.8 Then, we would like to propose the following course of discussion on the mandatory application of the requirements for evacuation analysis:

.1 taking into account the discussion on the evacuation analysis at FP 51, discuss whether the experience on the evacuation analysis is enough or not and whether the Guidelines (MSC.1/Circ.1238), which is important for the uniform implementation of the requirement for evacuation analysis, has been fully validated or not;

.2 if the answer to the above question is YES, discuss whether the requirement for evacuation analysis should apply to new passenger ships other than ro-ro passenger ships or not, taking into account the effectiveness of the evacuation analysis on improvement of safety and the cost/burden of the evacuation analysis;

.3 if the answer to the above question is YES, discuss the limitation of the application, based on ship size or number of certified persons on board, taking into account that the evacuation analysis is more effective for bigger passenger ships rather than for smaller passenger ships, in general; and

.4 if the scope of the mandatory application is agreed, in principle, prepare the draft amendment to the requirement for evacuation analysis for further discussion at FP 54.

1.4 United States

1.4.1 SOLAS regulation II-2/13.7.4 requires that escape routes on all passenger ships shall be evaluated by an evacuation analysis early in the design stage to identify and eliminate areas of congestion in the ship's means of escape.

1.4.2 The United States supports the use of MSC.1/Circ.1238 for this purpose, but does not support the mandatory application of the total calculated evacuation times in paragraph 3.5.2 of the annexes. Mandatory performance limits might be incorporated at a later stage; however, we believe that more experience is needed, including full scale evacuation trials, before this is established.

1.4.3 Paragraph 4 of MSC.1/Circ.1238 requires corrective actions to be taken if the total calculated evacuation time is greater than 60 min for ships with no more than three main vertical zones, or greater than 80 min if the ship has more than three main vertical zones. It is not clear to

us that these time limits will provide a true margin of safety in all cases. We believe that it is more important that the evacuation analysis should be used to identify relative differences in the evacuation times of each area.

1.4.4 In our experience, we have seen cases where the analysis identified areas that required significantly longer evacuation times than the remainder of the ship, but were still within the prescribed total evacuation times. In these cases, we found that minor modifications could be made to passageway arrangements or door locations to greatly reduce the evacuation time for these areas, resulting in a higher level of safety for the passengers. Because this was done at an early stage in the design, it had little impact on the construction of the ship. These improvements would not have been made if the overall evacuation time limit was applied as the measure of performance.

1.4.5 As discussed in TOR 2, the possible addition of new evacuation scenarios for safe return to port is to be considered. We support this in general; however, because we will not know what changes to MSC.1/Circ.1238 may result until after the discussions are finalized, we believe this to be another reason for not making MSC.1/Circ.1238 mandatory at this stage.

1.4.6 We generally support the comments submitted by Japan and CLIA, and reiterate our previous comment that in any case, requirements for total evacuation time should not be made mandatory.

1.5 CLIA

1.5.1 CLIA remains concerned that the two tasks agreed to at the Maritime Safety Committee for these Guidelines to be made mandatory have not come to pass. First, verification of the evacuation analysis programmes, that is, the various programmes from the various institutions and contractors should be given the same ship design drawings and initial distribution and the analysis run by each. The results should be in basic agreement so that we are in agreement that each of these programmes is acceptable in providing the same basis for acceptance (i.e. there will be no forum shopping for one programme over another based on the results). Second, that the programmes be validated, that is, that evacuation scenarios on well documented events with well known initial distribution should be run and the results compared against the actual results of the scenario. We are of the view that this has not been done and that the results of these two exercises are needed for confidence in the current state of the art.

1.5.2 Also, we are concerned with what is meant by “mandatory application”. There are essentially four concerns here:

.1 from the beginning, this was to be done at an early stage of design to demonstrate that there are no bottlenecks or other points of overcrowding and was not intended to model reality. At the early stage of design, many of the spaces are not well defined as to their use and thus the exact distribution may not be fully known for the cases desired. This does however give a good indication of flow and bottlenecks. Accordingly, this may not be accurate in meeting the time frame indicated;

.2 the second point has to do with the 80 min time frame indicated. This was arrived at upon compromise long ago when the “large” passenger vessel initiative was still in development. While the rules have been amended to indicate safe areas, design basis fires, and take home capability, none of these were agreed as the evacuation analysis was being developed. In our view, an exact time frame of 80 min for the evacuation to muster stations may or may not be the correct figure to use. Accordingly, we are concerned with a mandatory application at an

early stage of design that would hold the results to this "hard" number rather than the goal of assuring no bottlenecks and efficient flow of persons in an emergency. If the results of one of the analysis runs indicates that this goal is not met by, say, 10 s, does this mean that the ship has to be redesigned? If there is an obvious bottleneck, then yes but if not and the test results miss the mark by very little, with no basic indicator of why, then what is the response?;

.3 third, in a mandatory application while trying to apply some of the more recent suggestions, it appears that the view is to try to model reality versus flow and drive the scenarios to the point of the catastrophic event that overwhelms the ship. We view this modelling or testing to destruction as being pointless. It was not and should not be the intent of the analysis to drive the evacuation analysis to failure through events beyond the design basis scenario or to model immediate implementation of catastrophic events that in reality take time to develop – time that would be utilized in early movement of passengers and crew (more on this in the general comments below); and

.4 finally, we are concerned at the efforts to model persons who are disabled, persons who are inebriated, persons who are elderly and, etc., but there is still, to my knowledge, no equivalent modelling of the crew members stationed in corridors or as stairway guides, or the positive effect of having teams of crew members assigned to assist the disabled or those standing by to assist if someone is injured, etc. It is not reasonable in our view to model the things that extend the evacuation without equal weight given to those things that shorten the evacuation. Thus, evacuation should not attempt to replicate reality but again, should be a tool to identify bottlenecks and other areas where evacuation may be hindered in some manner.

1.5.3 In CLIA's view, requiring an evacuation analysis of existing cruise ships is pointless. If you are operating a ship, with regular Passenger Musters and day to day operations, you already know where your bottleneck points are and have done something about them (i.e. guides) as you have to deal with the problem regularly. This is not the case for ferries, where there is no muster and the passengers change, often several times a day. We do not object to the analysis being made mandatory for new vessels subject to acceptable consideration and answers to the above points.

1.5.4 The crux of this matter in our view is still the one we brought up years ago when we were still ICCL. That is, is this intended mandatory evacuation analysis some strict test that must be passed, or is it a guide to efficiency. If the former, we remain concerned about these new day/evening cases with the counter flow as the proponents want to model counterflow and other factors to drive the time up (as discussed above) but still want to load large safety factors on top.

1.5.5 CLIA is of the view that such evacuation analysis can be made mandatory for the purpose of being a guide to efficiency and for identifying problem areas. Anything beyond that is not realistic.

2 AMEND SCENARIOS

2.1 France

2.1.1 France would rather alter the existing scenarios rather than add new ones:

.1 case 1 scenario should not be altered or suppressed;

.2 case 2 scenario could possibly be altered appropriately to be inline with the actual procedure of the ship (including the retrieving of life vests in the cabins for example); and

.3 cases 3 and 4 could be altered and harmonised with SRTP concepts which are quite similar.

2.1.2 In any case, France would like to discuss:

.1 the need for an analysis of the travel of passengers from their assembly stations to their embarkation stations in advanced analyses (annex 2);

.2 the reality of the overlap of the assembly phase (1.25T or A+1.25T) and the abandonment phase (E+L);

.3 the different procedures of abandonment; and

.4 the status of safety doors during evacuation.

Note: The definition of "scenario" is not clear in the question and in document FP 53/9. In document FP 53/9, "a new scenario" cover 2*n cases, where 2 stands for the night and day cases (see paragraph 12) and n is the number of MVZs ("each MVZ should be examined" see paragraph 11) what increases the amount of work. In order to clarify, we would like to invite Germany and Sweden to provide an example of the new scenario analysis/analyses as a basis of discussion.

2.1.3 France thinks that following clarifications could be used to amend scenarios as currently given within MSC.1/Circ.1238 for passenger ships having emergency procedure which includes the retrieving of life vests in the cabin.

2.1.4 ***Case 1 (Primary simulation – Night case)***

.1 most of the passengers are in the staterooms so no question regarding their lifejacket;

.2 as soon the assembly signal is emitted and the response time elapsed, passengers and crew members move towards the assembly decks using the main staircase of the fire zone in which their stateroom is located. Fire doors of the main fire bulkheads should be considered as closed. The imposition of the use of the main staircase would create the missing link between assembly simulations and the FSS Code, chapter 13 (Arrangement of means of escape);

.3 once the assembly decks are reached, some persons – those having their stateroom allocated to an assembly station in another fire zone – continue to move to reach their allocated assembly station. Tables giving allocation of staterooms to assembly stations should be attached to the simulation report;

.4 simulation ends when all persons have reached their allocated assembly stations; and

.5 the night case assembly time is then defined by the time period starting from the emission of the assembly order to the moment for which the last person enters its assembly station (plus a given safety factor).

2.1.5 ***Case 2 (Primary simulation – Day case)***

France agrees with comments from the United States, recommending that the analysis for case 2 should be revised to follow the specific evacuation procedures used onboard the ship. Proposal for revision of case 2 is given hereunder:

.1 the day simulation to perform would be the one for which people travel from where they are in the ship when the assembly order is emitted (any place) to their staterooms where they get their lifejacket;

.2 fire doors of main fire bulkheads are opened, people can move freely throughout the ship;

.3 from that point (persons in the staterooms) and except the response time which in fact should be a preparation time needed to wear the lifejackets and take some warm clothes, the rest of the simulation is the same than for the night case;

.4 it could be suggested to limit the day case simulation to the simulation of the above travels of persons; and

.5 calculation of the complete assembly time in day situation would need to be revised, in particular to define how to connect night simulation results and results obtained from the above simulations (anywhere in the ship to the cabins). That could be one of the items to discuss and solve by our correspondence group.

2.1.6 ***Case 3 (Secondary simulation – Assembly/One staircase lost)***

Same simulation than for case 1, but with the main staircase having the largest capacity lost due to fire. Status of the fire doors should be revised, to allow a good functioning of the simulations.

2.1.7 ***Case 4 (Secondary simulation – Assembly/One assembly station lost)***

Same simulation than for case 1 but with the assembly station having the largest capacity lost due to fire. Status of the fire doors and allocation of cabins to assembly stations to revise to allow a good functioning of the simulations.

2.1.8 Cases 3 and 4 being emergency situations, France considers that they should not be included in the determination of the travel time "T". Hence, paragraph 5.4 of the appendix of MSC.1/Circ.1238, annex 2 should be revised consequently;

2.1.9 ***Abandonment simulations***

.1 sometimes, simulations are requested or needed (in case of alternative design assessment, for example) for the abandonment phase (from assembly stations to the lifeboats) in addition to the assembly simulations. France's opinion is that a methodology for the assessment of the embarkation time should be included in the revised MSC circular. This would be facultative and would be applicable for any passenger ship;

.2 abandonment cases, similarly to assembly cases, should be defined such as, for example:

.1 primary case: all assembly stations available;

.2 secondary case: one assembly station unavailable; and

.3 the objectives here would be:

.1 to obtain an abandon time closer from reality than simply using the 30 min SOLAS criteria;

.2 to "validate" the design of the ship in comparison with the 30 min criteria; and

.3 to identify and qualify the more efficient abandonment procedure which could be implement on board (number of persons per evacuating group, sequencing of the groups, etc.); and

.4 to have a complete abandonment analysis, performed with a same tool (evacuation study consistent in its whole duration).

2.2 Germany

2.2.1 The proposal to analyse the phase when passengers move to their cabins is comprehensible, however, in our opinion it is questionable, how this could be properly defined in an official guideline. It remains unclear, which routes passengers would use to move towards their cabins. Concerning the primary and secondary egress routes, this is clearly definable, but here, there are no official routes to follow.

2.2.2 Germany agrees upon the statement, that the Guidelines should not represent a catastrophic event.

2.2.3 We are not sure, if evacuating one MVZ into a neighbouring zone is pointless. For cabin-only areas, this may be the case, however, if public areas conglomerate in one MVZ, it might get problematic to quickly evacuate it.

2.2.4 We agree upon the statement, that case 1 is reasonable and should not be altered.

2.2.5 As responded to Japan, it remains unclear to us, how a day case scenario on a cruise vessel could be properly defined in an official guideline. Maybe it would be helpful to exclude case 2 for passenger ships other then RoPax ferries for the moment.

2.2.6 We agree upon the statement, that case 3 and 4 in their current definition are not helping to improve safety and, therefore, should be altered.

2.2.7 It would be beneficial, if the Guidelines would leave to the applicants more freedom to take the different ways of assembling and embarking the passengers into account (if available). After all, different ship operators apply different concepts.

2.2.8 Applying MSC.1/Circ.1238, cases 3 and 4, never delivered information leading to significant and unquestionable improvements of the evacuation concept. Thus we believe that these two cases should be altered as follows:

Instead of blocking parts of staircases, the MVZ leading to the longest evacuation duration in cases 1 and 2 should be evacuated through the secondary means of escape, thus through the neighbouring MVZ.

2.2.9 Experience has shown that the embarkation process (leading the passengers from the assembly stations to the LSA) often seams to be a bigger problem then the assembly process. Germany would therefore like to introduce a new case, to analyse this procedure. It could roughly be defined by:

.1 100% of passengers capacity and 50% of the crew should be initially positioned on the assembly stations, as defined by the evacuation plan;

.2 according to the assumptions made in the evacuation plans, all persons should proceed to the assigned LSA;

.3 if detailed information about the process is available, the real procedure should be emulated. Otherwise, a given response time distribution (to be defined) should be used; and

.4 after a statistical analysis, a significant embarkation duration is determined in the same way as for cases 1 and 2.

2.2.10 In view of SRTP, it would also be relevant to analyse the standard evacuation cases from safe areas with significant MVZs blocked (referring to SOLAS regulation II-2/21 5.1.4).

2.3 Japan

2.3.1 Regarding introduction of the additional scenarios in document FP 53/9, we would like to invite the coordinator to clarify/propose the possible criteria for judgement in “alternative day case scenario” specified in paragraphs 7 to 9 in that document. For consideration of these scenarios, the following sequence should also be considered:

.1 fire outbreaks;

.2 passengers go back to their cabin and prepare for the abandon ship order; and

.3 passengers start to abandon ship after getting the order in their cabin.

2.3.2 In such a situation, the evacuation analysis for night case is applicable for the step (3).

2.3.3 Regarding new scenarios specified in paragraphs 10 to 16, we do not have enough experience to comment. If possible, we would like to invite members of the correspondence group to provide the results of evacuation analysis using such scenarios.

2.3.4 We could neither develop new scenario nor propose amendments to the scenarios in MSC.1/Circ.1238 at this stage, though we do not oppose to the addition of new scenarios and amendments to the existing scenarios.

2.4 United States

2.4.1 The United States supports considering additional evacuation scenarios to support the safe return to port concept. One element of this is to consider the loss of one MVZ and the movement of passengers to safe areas. This will require further discussion of the approach to be taken for this scenario, mainly, how will the passengers be evacuated, and which of the "normal" escape routes remain functional, or at what point will they become unavailable. It is difficult to envisage how this calculation would be performed if all of the internal escape routes are assumed unavailable.

2.4.2 We do not believe that the addition of new scenarios is necessary based on the group discussions so far. The existing day and night scenarios address travel from all decks within an MVZ to the assembly stations. We expect that under the safe return to port scenario, the passengers will initially be directed to the assembly stations to allow a count to be taken. Following this, the passengers will be directed to safe areas for the return to port voyage. In this stage of the evacuation, there could be numerous safe areas available in the unaffected parts of the ship, and we expect that the passengers would likely be directed to these locations in smaller groups. Since the evacuation analysis to the assembly stations has already looked at the movement of a much larger number of passengers to fewer destinations, congestion would seem to be less of a concern.

2.4.3 However, we can see the merit of further discussing three specific scenarios to see if they are already being considered by evacuation modelling, or if these situations need to be analysed as part of the safe return to port concept:

.1 if the fire affects a major assembly station, a large number of passengers will initially need to be directed to an alternate location. Does MSC.1/Circ.1238 consider this possibility?;

.2 if the casualty threshold is exceeded, internal escape routes in the entire MVZ affected could be assumed unavailable, requiring the passengers to travel only through on-deck areas. Is it realistic to consider that the entire MVZ will be unavailable for internal transit?; and

.3 on very small ships, could it be necessary to consider the capacity of evacuation routes to the safe areas if there are only a limited number of safe areas?

2.4.4 We welcome the member's opinions on whether these scenarios should be discussed further.

2.4.5 As explained in document FP 52/19/1 (paragraphs 7 and 8) existing case 2 assumes that the passengers in the public spaces will travel directly to the assembly stations. However, if the life vests are stored in the passenger cabins, it would be necessary for the analysis to consider that the passengers first return to their cabins. We recommend that the analysis for case 2 should be revised to follow the specific evacuation procedures used on board the ship.

2.5 CLIA

2.5.1 CLIA does not see the point of the analysis that requires the time to evacuate a zone to the one next door. Since the alleyways are big enough to take everybody to the stairtower, they must be big enough to take half the occupants in each direction. As we understand the explanation,

it is to get the time to arrive in a Safe Area which is defined as a place outside the effected zone with food, water, etc., this in reality means anywhere outside the affected zone. It is not a "citadel" concept, as this was rejected early in the discussions regarding the safe area concept.

2.5.2 Moving from one fire zone into the next should not be a difficult operation based on current rules.

2.5.3 While we have some sympathy for the time to evacuate to adjacent zones and thence to the Muster Stations, we would need however, to be careful that this does not lead us down the path of oversized Muster Stations, just in case a neighbouring zone needs to evacuate.

2.5.4 We are of the view that the catastrophic event that overwhelms the ship should not be modelled. This would take us back to testing to destruction which was never the intent. There are simply too many imponderables and one can not model reality - especially early in the design stage.

3 LIFE SAFETY CRITERIA

3.1 France

3.1.1 Referring to document FP 53/9/1, and TOR 3, we would like to recognize that some MSC.1/Circ.1238 parameters are used/invoked in fire and flooding engineering studies, when they use evacuation analysis. Nevertheless, France understands that the MSC.1/Circ.1238 first aim is to check the "evacuability" of a ship in a standard way rather than simulating actual emergency situations. France agrees with the Japanese comments and would like to have the paragraph (annex 1, Preamble, paragraph 1.1) mentioned in the beginning of both annexes 1 and 2 to the Guidelines. Having a methodology of coupling smoke and heat development simulations (or heel and trim development simulations) with an advanced evacuation analysis tool should be aside from the current guideline methods. Moreover, we think that these life safety criteria problems of fire safety should be discussed in the framework of MSC/Circ.1002 directly. Consequently, we think that there is no necessity to define uniform life safety criteria for evacuation routes in the MSC.1/Circ.1238.

3.1.2 France reiterates its comments made for round 1: no life safety criteria should be included in evacuation simulations.

3.1.3 Regarding the proposal from the United States, France supports the Japanese proposal to amend MSC/Circ.1002.

3.2 Germany

No comments.

3.3 Japan

3.3.1 We consider that it is not necessary to establish uniform life safety criteria at this stage, and it should be discussed under a separate agenda item, as necessary.

3.3.2 Annex 1 to MSC.1/Circ.1238 starts with the following sentences:

.1 "The following information is provided for consideration by, and guidance to, the users of these Guidelines:

.2 To ensure uniformity of application, typical benchmark scenarios and relevant data are specified in the Guidelines. Therefore, the aim of the analysis is to assess the performance of the ship with regard to the benchmark scenarios rather than simulating an actual emergency."

3.3.3 In recent years in academic societies, some researchers have proposed new numerical methods consisting of evacuation analysis and smoke movement simulation, including fire modelling, to evaluate safety of structures against fire. Such methods may be effective to evaluate alternative design of passenger ships, based on the Guidelines on alternative design and arrangements for fire safety (MSC/Circ.1002). However, the purpose of the requirement for evacuation analysis (SOLAS regulation II-2/13.7.4) and the Guidelines for the evacuation analysis (MSC.1/Circ.1238) are quite different from the comprehensive analysis of fire safety, including smoke movement simulation, while evacuation analysis could be a part of the evaluation of fire safety.

3.3.4 The following is the comment on the draft MSC/Circ.1002, paragraph 3.1 proposed by the United States under TOR 3.

3.3.5 Life safety criteria have already been included in the "established approach", in general, taking into account models for respective engineering analyses.

3.3.6 In this context, care should be taken not to replace the life safety criteria in the "established approach" for the reason of consistency in the respective approach.

3.3.7 Thus, it may be inappropriate to determine the acceptable limits for human exposure irrespective of the established approaches. Such limits may be determined in relation to the models for the analyses.

3.3.8 On the other hand, as proposed by the United States, acceptable limits for human exposure may be necessary in some cases.

3.3.9 Proposal: Instead of developing a new MSC circular, it may be appropriate to add the following text at the end of paragraph 6.3.1 in the annex to MSC/Circ.1002:

.1 "The following values, determined at 2 m above the deck surface, may be used as the as the acceptable limits for human exposure in areas where passengers and crew may be present, as necessary:

.2 Maximum temperature: 60°C;

.3 Maximum heat flux: 2.5 kW/m^2;

.4 Minimum visibility: 10 m; and

.5 Maximum CO concentration: 1400 ppm".

3.3.10 Japan would like to invite the correspondence group to consider the above proposal.

3.4 United States

3.4.1 The United States proposed the establishment of life safety criteria in document FP 53/9/1. We believe that a separate guideline should be prepared for this purpose since the life safety criteria could also be used with MSC/Circ.1002. The life safety criteria should not be incorporated in the amended MSC.1/Circ.1238.

3.4.2 Since the correspondence group consists of world-recognized experts on this subject, we recommend that it is the appropriate venue to discuss the issue.

3.4.3 SOLAS new regulation II-2/21 requires that the ship shall be able to return to port with the passengers relocated to safe areas. The additional evacuation scenario to be discussed in TOR 2 will be used to evaluate the ship design to eliminate congestion in the alternate evacuation routes to the safe areas. We do not currently have an agreed methodology for performing this evaluation. It may be acceptable to consider the use of evacuation routes within the fire–affected MVZ, if it can be demonstrated that these areas remain habitable after a fire. In addition, regulation II-2/21.5.1.3 requires that ventilation design shall reduce the risk that smoke and hot gases could affect the use of the safe areas. By defining what the safe limits of smoke, carbon monoxide and reduction in visibility are, a method will be created to allow designers and Administrations to confirm compliance with this regulation.

3.4.4 The response to circular 1 shows that the group has agreed that life safety criteria should not be included in MSC.1/Circ.1238. We support this decision, but would like to continue the discussion on this subject. Since our TORs includes consideration of guidelines that could be useful for fire modelling carried out in conjunction with MSC/Circ.1002 (FP 53/23, paragraph 9.5.3), we have prepared a separate guideline for this purpose, and propose that if agreed, that it be included as an annex in the correspondence group report (see annex 2).

3.5 CLIA

As implied above, we are not convinced that the document from the United States is relevant to the actual evacuation analysis. The evacuation analysis works by immediately blocking a corridor, it does not allow you to keep it open for a period or have reduced usage for a period while toxicity builds. To do this would make the modelling even more complex. Toxicity and fire progression are interesting, but if the corridor or passage is considered blocked immediately, then it is not relevant. They are really looking at human survivability times, but in talking to the delegates from the United States, we are not convinced that any of us fully understand their intent *vis-à-vis* evacuation modelling. If one were to do this, then the impact of extraction ventilation would also have to be modelled much more clearly.

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ANNEX 2

DRAFT MSC CIRCULAR

GUIDELINES ON ESTABLISHING LIFE SAFETY CRITERIA FOR PASSENGER HABITABILITY

1 The Committee, at its [eighty-seventh session (12 to 21 May 2010)], having recognized the need for guidelines on establishing life safety criteria for use in defining the conditions under which passengers can be expected to safely occupy or travel through areas that may be affected by fire, approved Guidelines on establishing life safety criteria for passenger habitability.

2 Member Governments are invited to apply the annexed guidelines on or after [*date of approval*] and bring them to the attention of ship designers, equipment manufacturers, ship owners, and other parties concerned.

ANNEX

GUIDELINES ON ESTABLISHING LIFE SAFETY CRITERIA FOR PASSENGER HABITABILITY

General

1 The functional requirements for SOLAS regulation II-2/13 state that safe escape routes shall be provided and further, that the escape routes shall be maintained in a safe condition. SOLAS regulation II-2/3.51 defines "safe areas in the context of a casualty" as areas that can safely accommodate all persons onboard.

2 Escape routes and safe areas located outside the main vertical zone, in which a fire has occurred, may be considered to satisfy these functional standards. Another acceptable approach is to use an engineering analysis in accordance with MSC/Circ.1002 to analyse the level of fire safety provided for areas that do not meet this criterion, for example, areas within the same main vertical zone but located on other decks.

3 The purpose of these Guidelines is to quantitatively define performance criteria to establish the habitability of evacuation routes and safe areas if this alternate approach is used.

Minimum life safety criteria

4 The following values, determined at 2 m above the deck surface, are recommended as the acceptable limits for human exposure in areas where passengers and crew may be present:

Maximum temperature	60ºC
Maximum heat flux	2.5 kW/m^2
Minimum visibility	10 m
Maximum CO concentration	1400 ppm