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FORMAL SAFETY ASSESSMENT

Report of the Correspondence Group on Environmental Risk Evaluation Criteria

Submitted by Greece on behalf of the Coordinator of the Correspondence Group

SUMMARY	
Executive summary:	This document reports the outcome of the correspondence group on environmental risk evaluation criteria
Strategic direction:	12.1
High-level action:	12.1.1
Planned output:	12.1.1.1
Action to be taken:	Paragraph 94
Related documents:	MEPC 58/17, MEPC 58/17/1, MEPC 58/17/2, MEPC 58/23; MSC 83/INF.2 and MSC 85/17/3

Introduction

1 At its fifty-eighth session, the Committee recalled that MEPC 56 had noted that the one matter that needed consideration within the context of the Formal Safety Assessment Guidelines relevant to its work was the draft Environmental Risk Evaluation Criteria. MEPC 56 had also recognized the need to carry out an in-depth analysis of the proposed environmental risk evaluation criteria for the purpose of the Formal Safety Assessment (FSA) before inclusion of such criteria in the IMO FSA Guidelines (MSC/Circ.1023-MEPC/Circ.392, as consolidated in MSC 83/INF.2). MEPC 56 had therefore agreed to establish a correspondence group, under the coordination of Greece.

2 The Committee noted that progress had been made by the correspondence group in the intersessional period (between MEPC 56 and MEPC 57), but at MEPC 57 divergent views still remained on some key issues which required further analysis and discussions between members of the correspondence group, in particular: (a) on establishing an appropriate Severity Index (SI) in the Hazid step; (b) whether "costs of averting a spill (CATS)" or an alternative criterion would offer the needed decision-making quality; and (c) the acceptable boundaries of the ALARP region, slope of F-N diagram and what is the variable of the horizontal axis.

3 The Committee noted that MEPC 57 had subsequently agreed to continue with the work of the correspondence group, under the coordination of Greece. In this connection, the Committee noted that MSC 84, recognizing that there would be an outcome of MEPC 58 regarding environmental risk acceptance criteria and submissions related to the review of FSA studies, agreed to retain the item in the provisional agenda for MSC 85, and encouraged Member States and international organizations to submit, to MSC 85, proposals and comments on matters related to the review of the FSA studies and arrangements for the FSA Experts Group to be established at MSC 86.

4 MEPC 58 had before it documents MEPC 58/17 (Greece), which contained the work carried out in the intersessional period by the correspondence group, MEPC 58/17/1 (Japan), which provided information on the relation between cost of oil spills and weight of oil spilled based on an analysis of data from the IOPC Funds data, and MEPC 58/17/2 and MEPC 58/INF.2 (both by Denmark), which provided information on the FSA study on crude oil tankers carried out within research project SAFEDOR. This study recommended various Risk Control Options (RCOs) for mandatory adoption and its analysis was based on a threshold of US$60,000/tonne for CATS (the Cost to Avert One Tonne of Spilled Oil).

5 Following an intervention by the delegation of Denmark, the Committee agreed to invite the MSC to consider documents MEPC 58/17/2 and MEPC 58/INF.2 at MSC 86 when the FSA Expert Group is expected to meet in the context of the guidance on the use of human element analysing process (HEAP) and formal safety assessment (FSA) in the rule-making process of IMO (MSC/Circ.1022-MEPC/Circ.391). In this context, the Committee noted that the purpose of circulating the study at this meeting was to give experts from Member States and other interested parties as much time as possible to provide feedback on the study in preparation for MSC 86.

6 In light of the technical nature of the subject, the Committee considered, in the first instance, the establishment of a working group to progress the work but noting that no working group on the subject was envisaged by MEPC 57 as well as the concern expressed by some delegations of the lack of the necessary expertise present within their delegations to participate in such a working group, it was agreed to establish an informal consultation group under the chairmanship of Professor Harilaos Psaraftis (Greece) to enable those members of the correspondence group who were present at MEPC to have an initial exchange of views and for the group to verbally report to the Committee later in the week.

7 The group met from 7 to 8 October 2008, and was attended by delegations from Canada, China, Finland, Greece, Japan, Malaysia, New Zealand, Norway, Turkey, and United States, and by observers from BIMCO, OCIMF and INTERTANKO.

8 Document MEPC 58/23 (paragraphs 17.8-17.16) – see also annex 2 to this document – describes the deliberations of the group, which were presented verbally to the Committee by the group's Chairman. Having received the verbal report of the group, the Committee agreed to:

.1 retain this agenda item for MEPC 59; and

.2 re-establish a correspondence group under the coordination of Greece, with a view to finalizing the subject of environmental risk evaluation criteria with the following terms of reference (TOR):

.1 recommend an appropriate criterion for assessing environmental consequences in step 4 of the FSA, including an appropriate threshold

value for ascertaining if a specific Risk Control Option (RCO) is cost-effective (hereinafter referred to as TOR 1);

.2 recommend a way of combining environmental and safety criteria for those RCOs that effect both environmental and fatality risk (TOR 2);

.3 recommend an appropriate risk matrix or index for environmental criteria (TOR 3);

.4 recommend an appropriate ALARP region and F-N diagram, including an appropriate value for the slope of the F-N curve (TOR 4);

.5 address the issue of collection and reporting of relevant data (TOR 5);

.6 recommend any further relevant action (TOR 6); and

.7 submit a written report to MEPC 59 (TOR 7).

9 Following MEPC 58, the following Member States participated in the work of the correspondence group: Denmark, France, Germany, Greece, Japan, Malaysia, Netherlands, New Zealand, Norway, Spain, Turkey, United Kingdom and United States. The following non-governmental organizations also participated: BIMCO, IACS, INTERTANKO and OCIMF.

Method of work

10 Following MEPC 58, work involved three rounds of submissions. The "members-only" website already created for the work of the correspondence group for MEPC 57 and MEPC 58 was maintained, with submissions and supporting material added for the correspondence group's work for MEPC 59.

11 The Coordinator of the correspondence group first noted that some progress was already made at the informal meeting at MEPC 58 on some of the group's TOR, more specifically (see also annex 2 to this document for more details):

.1 For TOR 2, see MEPC 58/23, paragraph 17.14;

.2 For TOR 3 and TOR 4, see MEPC 58/23, paragraph 17.15; and

.3 For TOR 5, see MEPC 58/23, paragraph 17.16.

12 Given the nature of the MEPC 58 informal consultation group, discussion on the above items was still open after MEPC 58. But for the sake of being able to close the group's work by MEPC 59, the Coordinator proposed that the group does not restart from scratch, but complete discussion on these items after conclusion on TOR 1, the most important item that remained to be settled. To do so, the Coordinator proposed the following approach:

.1 Both the SAFEDOR project and the Japanese research group should provide to the group full disclosure of their analyses. Here the Coordinator borrowed what the consolidated FSA guidelines stipulate, namely, timely and open access to all supporting documents (see document MSC 83/INF.2, annex, section 9.2.1);

.2 Full disclosure should include documentation on all casualty data that were used, spill cost data, possibly broken down by categories, and all other relevant data in support of the analyses. It should also include any explanation of the analyses that is deemed necessary, including modelling or other assumptions;

3. Material provided (either in the form of databases or in any other form) will be uploaded on the group's website, which is open to members only;

.4 Members of the correspondence group will have an opportunity to comment on the material received, and also make any recommendations deemed appropriate; and

.5 Both the SAFEDOR and the Japanese research groups are invited to present their analyses at a workshop on environmental risk evaluation criteria, hosted by Laboratory of Maritime Transport of the National Technical University of Athens (NTUA) and scheduled to be held in Athens on 27 February 2009 (of which more later).

First round of submissions (MEPC 58 – February 26, 2009)

13 In response to the Coordinator's instructions, Japan provided further details of its analysis in document MEPC 58/17/1, including the IOPCF report, showing the data upon which the analysis was based.

14 There was subsequently a comment to the Japanese approach by the United States, providing several references on oil spill costs and stating that, based on these, the United States finds the values implied by Japan's analysis low and is more in favour of the value of US$60,000/tonne proposed by the project SAFEDOR.

15 Greece responded to the United States by arguing that at least the 2 of the 3 references cited cannot in any way support the US$60,000/tonne figure proposed by the project SAFEDOR as a global CATS figure.

16 The United States responded by providing additional clarifications on its position, including a relevant internal report of the US Coast Guard.

17 All first round submissions can be found in their entirety in annex 1 to this document.

The Athens workshop on environmental risk evaluation criteria (27 February 2009)

18 This was an open workshop hosted by the Laboratory for Maritime Transport of the National Technical University of Athens (NTUA) on 27 February 2009 in Athens and chaired by the Coordinator of the correspondence group. Its purpose was to:

.1 report on the state of affairs in the area, both as regards the regulatory and the scientific perspectives;

.2 identify convergent and divergent views on the subject, and issues that are currently open;

.3 identify the most promising ideas, concepts and proposals for further consideration; and

.4 support the work of IMO on the development of environmental risk evaluation criteria within the context of its Formal Safety Assessment (FSA) methodology.

All presentations of this workshop can be found at http://www.martrans.org/wsenv.htm

19 It should be clarified that this workshop was not officially connected to the work of the correspondence group, or to IMO for that matter. In fact, even though some of the participants of the workshop were members of the correspondence group, they did not attend the workshop in that capacity. But substance-wise the workshop provided a lively forum for discussion of many of the issues relevant to the work of the correspondence group. It also provided additional input to the Coordinator of this correspondence group so as to formulate proposals for which a consensus might be reached. These are in the section that follows.

The Coordinator's proposals (11 March 2009)

20 Following the Athens workshop, the Coordinator sent to the correspondence group a set of proposals on how to move with respect to each of the terms of reference of the group for MEPC 59. These proposals are listed below (paragraphs 21-26). They reflect the Coordinator's opinion on how to proceed and should not be misinterpreted as reflecting any consensus in the correspondence group. Additional background information and the rationale behind these proposals can be found in annex 2 to this document. The responses of the correspondence group to these proposals can be found in the second and third round of submissions (shown in later sections of and in annexes 3 and 4 to this document).

Proposals for MEPC 59 (TOR 1 – TOR 6)

21 TOR 1. Recommend an appropriate criterion for assessing environmental consequences in step 4 of the FSA, including an appropriate threshold value for ascertaining if a specific Risk Control Option (RCO) is cost-effective (Reference documents MEPC 58/17, MEPC 58/17/1, MEPC 58/17/2, MEPC 58/23, paragraphs 17.7-17.13).

(a) The group agrees that non-linearity between clean-up costs and oil spill volume has been documented in various studies;

(b) The group also agrees that, in spite of various documented shortcomings, in steps 3 and 4 of the FSA one could use an "oil spill cost per unit volume" criterion to assess the cost-effectiveness of risk control options (RCOs). In fact, in spite of the extensive discussion and debate on this subject since MEPC 56, the correspondence group agrees that no better and practical alternative was identified;

(c) The group notes that it would be impossible to conclude at this phase what an appropriate single value of an "oil spill cost per unit volume" (or CATS) global threshold might be;

(d) The group is of the opinion that an appropriate volume-dependent scale of CATS global thresholds would be better suited than a single threshold value;

(e) The group suggests the following as an *example* of a volume-dependent CATS global threshold scale (USD/tonne):

.1 0-10 tonnes: 50,000;
.2 10-100 tonnes: 20,000;
.3 100-1,000 tonnes: 10,000;
.4 1,000-10,000 tonnes: 5,000;
.5 above 10,000 tonnes: 3,000;

(f) The group notes that more discussion is needed to finalize this issue, including the integration of any scale within the FSA methodology. The above example's threshold values might be appropriate to be used in an interim period, in which further experience can be gained, and based on that further adjustments-refinements may be proposed.

22 TOR 2. Recommend a way of combining environmental and safety criteria for those RCOs that effect both environmental and fatality risk (Reference documents MEPC 58/17, MEPC 58/23, paragraph 17.14, MSC 85/17/3, paragraph 3, MEPC 58/17, annex, section 4):

(a) On the issue of combining environmental criteria with safety criteria, the group concurs with the approach proposed in section 4 (page 6) of the annex to document MEPC 58/17, which would be simplified further if a volume-based approach is followed;

(b) The group notes, however, that it is important to show both environmental and safety criteria in the cost-benefit analysis (CBA), so that a complete picture could be formed.

23 TOR 3. Recommend an appropriate risk matrix or index for environmental criteria (Reference documents MSC 83/INF.3, MEPC 57/17, MEPC 58/17, MEPC 58/23, paragraph 17.15).

(a) For the Frequency Matrix, use the same already used for FSA (MSC 83/INF.2):

Frequency Index			
FI	FREQUENCY	DEFINITION	F (per Ship year)
7	Frequent	Likely to occur once per month on one ship	10
5	Reasonably probable	Likely to occur once per year in a fleet of 10 ships, i.e. likely to occur a few times during the ship's life	0.1
3	Remote	Likely to occur once per year in a fleet of 1,000 ships, i.e. likely to occur in the total life of several similar ships	10^{-3}
1	Extremely remote	Likely to occur once in the lifetime (20 year) of a world fleet of 5,000 ships	10^{-5}

(b) For the Severity Matrix, use one in which the severity variable is oil spill volume. Below is an example:

Severity Index		
SI	SEVERITY	DEFINITION
1	Minor	Oil spill volume < 10 tonnes
2	Significant	Oil spill volume between 10-100 tonnes
3	Severe	Oil spill volume between 100-1,000 tonnes
4	Catastrophic	Oil spill volume between 1,000-10,000 tonnes
5	Disastrous	Oil spill volume >10,000 tonnes

(volume scales to be finalized once the scales of the CATS thresholds are finalized).

(c) On the Risk Index or Matrix, as in MSC 83/INF.2, define risk index on a log-log scale as follows: RI=FI+SI.

24 TOR 4. Recommend an appropriate ALARP region and F-N diagram, including an appropriate value for the slope of the F-N curve (Reference documents MEPC 57/17, MEPC 58/23, paragraph 17.15).

The group notes the approach of Sames and Hamann (2008)[1] (Figure 10) and agrees to defer the issue of ALARP region and F-N diagram until after the issue of the CATS thresholds is resolved.

25 TOR 5. Address the issue of collection and reporting of relevant data (Reference documents: MEPC 58/23, paragraph 17.16.)

(a) The group fully recognizes the importance of the data to be able to test and apply any agreed methodology. This especially pertains to environmental databases, as such databases are typically non-homogeneous in data coverage and quality;

(b) The group expresses the view that casualty databases used for FSA studies should be made public and contain information properly organized so as to reveal the real causes of the accidents;

(c) The group recognizes that much pertinent information on past casualties already exists in the public domain but is non-homogeneous and scattered. Such information rests with flag States, port States, classification societies, insurance underwriters, etc. The correspondence group expresses the view that assembling such information in a central and homogeneous database is a worthwhile effort and that IMO should take the lead in such an activity;

(d) The group finally notes that the information provided in the GISIS, in particular, the module on reported casualty incidents might contribute to this end, even though GISIS may still be insufficient due to the lack of reporting by Member States.

[1] Sames, P., R. Hamann, "Toward Environmental Risk Acceptance Criteria", Proceedings of the ASME 27th International Conference on Offshore Mechanics and Arctic Engineering, OMAE2008, June 2008, Estoril, Portugal.

26 TOR 6. Recommend any further relevant action.

The correspondence group requests to extend its TOR to resolve the remaining open issues.

Second round of submissions (11-19 March 2009)

27 The following members of the correspondence group responded to the Coordinator's proposals (in chronological order): IACS, OCIMF, Japan, Greece, Malaysia, the United Kingdom, Germany, the United States and Norway. The full text of these responses can be found in annex 3 to this document.

28 In this second round of submissions, the other members of the group had no reaction to the Coordinator's proposals. Even though in his memorandum to the group (annex 2 to this document) the Coordinator stated that no response would be interpreted as no objection, it is probably fairer to interpret the lack of response as neither a "no objection" nor a "no acceptance".

29 Below is a summary of the main points made by those who responded in the second round (listed by chronological order of receipt):

IACS

30 IACS agreed that a variable scale for the CATS value, based on oil spill size, may be a sensible way to proceed, even if it makes that procedure slightly more complicated. However, there may also be other possibilities, like using different values dependent on accident categories. For example, in grounding the oil spill is likely to hit the shore and therefore may potentially have a higher consequence than a spill that occurs out at sea.

31 However, IACS felt that the E(TOT), defined as the expected total oil spill cost averted due to the global application of the RCO, should actually be the expected total value of not spilling a ton of oil. This value includes the costs saved of not spilling the oil but it also includes the willingness of consuming societies to avoid oil being spilt (regardless of the cost of the spill).

32 Therefore with regard to the example scale for CATS, IACS agreed that more discussion is required, and it thinks that the different CATS should be used in some FSAs before a value, scale or formula is concluded. IACS also believed that, given the multiple references (for example those provided by the United States) that have now been presented to the correspondence group, the CATS value should be higher rather than lower. Therefore the example given in the proposal should be revised upwards.

33 IACS believes that the severity index should be compatible with the existing severity index table contained in the FSA guidelines. This implies that each severity level should have the same monetary value as those for human loss or asset damage.

OCIMF

34 OCIMF supported the views by IACS and agreed that a variable scale for the CATS value, based on oil spill volume would be the way forward. With regard to the example scale for CATS, OCIMF believes that more discussion is required and requires further analysis of data and studies. In view of this, OCIMF suggests to remove the cost of oil spill shown as example from the report.

Japan

35 Japan would basically support the draft proposal made by the Coordinator, subject to some comments.

36 On TOR 1, Japan supported the volume-dependent CATScr scale as described in TOR 1(d).

37 On TOR 1(e), Japan is of the opinion that "step-wise CATScr" as described in TOR 1(e) could be one of promising solutions for establishing reasonable CATScr. However Japan is of the opinion that it is reasonable and ideal to directly use analytical formula as CATScr. Such formula is derived in document (MEPC 58/17/1), and similar formula could be derived from Sames & Hamman (2008).

38 Japan noted that it has not yet fully discussed these two approaches. Therefore Japan is of the opinion that it might be better for the group to preserve both approaches for a while for future discussion. Alternative wordings are proposed for TOR 1(e, f).

Greece

39 Greece agreed to the Coordinator's proposals. It also thinks that using a non-linear formula, such as that used by Japan, will be more appropriate and easier to use in FSAs.

40 A problem with a step-wise function may be near the boundaries of the ranges, which does not exist if Japan's formula is used. It considered that both examples should be presented to the MEPC.

Malaysia

41 Malaysia agreed on the non-linear approach to calculate CATs.

United Kingdom

42 The United Kingdom supported the *potential* for a variable scale for the CATS value, based on oil spill size. The United Kingdom, though, agreed with IACS view of a suggested variation of values depending on accident categories. It provided a good example in which grounding would more likely affect the coast line and, therefore, have a higher consequence than a spill out at sea.

43 The United Kingdom agreed that this needs more discussion and that a volume dependent scale of CATS global threshold suggested in TOR 1(e) is an example for further basis of discussion.

44 The United Kingdom would like to ask whether the proposed approach on the analysis of environmental risk in maritime transport should not be confined to oil spill pollution. It questioned whether it should also encompass oil and bunker spills, ballast water, coatings, garbage, sewage, gas emissions and other hazardous materials emitted from vessels.

Germany

45 On TOR 1, Germany commented that the discussion in the group and in MEPC meetings showed deviating values for the specific cleaning costs. In the Japanese submission (MEPC 58/17/1), a non-linear approach was explained taking into account some parameter of influence like volume and type of oil. Following this proposal the average spill costs should be about US$4,000/tonne. A subset of 25 accidents of tankers taken from the data published by C. Grey (1999) and IOPCF (2007) shows an average value of about US$40,000. The corresponding values for all accidents (82): mean US$36,000 standard deviation 63,000. Hence, Germany supported the comment of the United States that the spill costs are significantly higher than US$4,000/tonne.

46 On TOR 1(a), regarding agreement on non-linearity, Germany did not see a need for an agreement by the group. It suggested that a more appropriate wording may be "the correspondence group considers" or "the correspondence group noted". As a minimum, a selection of the various studies should be provided. On TOR 1(e), regarding the scale suggested by the Coordinator, this proposal may be further investigated, however, Germany was not of the opinion that a consensus exists in the correspondence group with respect to these values.

47 Germany agreed with IACS' position that a number of different CATS values, scales as well as formulas are proposed and hence Germany favours an example application of the different models, for instance, using the risk model of the FSA for crude oil tankers (MEPC 58/17/2).

48 On TOR 2 and TOR 4, Germany was of the opinion that more discussion is needed before any proposal for MEPC can be formulated. On TOR 3, following the comment of IACS, the logarithmic scale should be based on the monetary value rather than the spill size.

United States

49 On TOR 1(c), the United States was of the opinion that a single point estimate is not meaningful. Given the uncertainty associated with oil spills, a range of CATS values is recommended, to be consistent with IMO's FSA ALARP concept. Since TOR 1(d) follows, recommending a range, the United States recommends deleting TOR 1(c). TOR 1(d) can then follow with a second sentence such as "The correspondence group notes that further work is needed to establish the appropriate scale of global CATS thresholds."

50 On TOR 1(e), the United States understands this is an illustrative example, but recommended the numbers be deleted. There is a danger associated with providing values as examples, as they can be misinterpreted as recommended ranges. The United States recommends instead providing ratios between spill categories, such as:

.1 0-10 tonnes: 16.666 * Baseline;
.2 10-100 tonnes: 6.666 * Baseline;
.3 100-1,000 tonnes: 3.333 * Baseline;
.4 1,000-10,000 tonnes: 1.666 * Baseline;
.5 Above 10,000 tonnes: Baseline.

51 On TOR 1(f), the United States did not agree with the statement, "*The above example's threshold values might be appropriate to be used in an interim period, …*". It recommended either striking the sentence, or providing numbers as examples that are extremely low and extremely high, to make it absolutely clear these numbers are examples only, i.e. US$1,000 for "above 10,000 tonnes" and US$5,000,000 for "0-10 tonnes".

52 On TOR 2(a), the United States conceptually agreed with combining environmental criteria with safety criteria, however, it shared the same opinion as IACS and Germany in that the specifics and method require further discussion. The United States did agree that the safety and environmental components should be preserved and presented for decision-makers.

53 On TOR 3(b), the United States was of the opinion that the Severity Index should be monetarily based, in order to capture the effect of the myriad of variables involved, such as environmental sensitivity, response capacity, etc.

Norway

54 Norway was of the opinion that this subject has not received the attention it deserves by IMO and is too important to be left to an unofficial working group (at MEPC 58) and a correspondence group, with no official working group formed.

55 Norway disagrees with many of the Coordinator's proposals, including his statement that the situation before MEPC 58 was in a deadlock. Areas of disagreement are TOR 1(e), TOR 3 and TOR 4. There is agreement on TOR 1 (b), qualified agreement on TOR 1(d,f) and apparent agreement on TOR 5.

56 Several proposed alternatives to these proposals are made, including using different values for different accident types and using various ratio tests in TOR 2.

57 In Norway's opinion the spill cost figures provided by Japan seem low and need further consideration.

Third round of submissions (23-27 March 2009)

58 Some additional comments were received after the draft version of this report was circulated, in a third round of submissions. Group members who sent comments were Greece, the Netherlands, IACS, Japan, Germany, and the United States. Below is a summary of these comments (listed in chronological order of receipt). Full details, including technical points made, can be found in annex 4 to this document.

Greece

59 Greece hopes that the issue of the variable CATS scale (which is the one critical aspect of the problem for which convergence has been achieved) is settled without delay, as several FSA studies would depend on that scale.

60 Greece does not agree with the notion of "gaining experience" with value A or scale B in an interim period, and before a definite agreement is reached on the CATS issue. If what is used in the interim period is wrong, irreversible repercussions may occur.

61 On TOR 3, Greece finds the position of IACS and Norway of different CATS values for different accident categories, as well as the position of IACS, Germany and the United States to express the Severity Index in monetary terms as impractical, and is perplexed by the fact that even though Norway had previously proposed spill volume as the severity variable, now its position is that no proposal can be made until the CATS approach has been agreed.

62 Greece believes that there is really need to converge and be constructive, following two years of deliberations. For instance, it could not see why agreement cannot be reached on the proposed Frequency Index, the same as in the safety FSA. If there is no serious objection to it, why not adopt it?

63 On the subset of 25 spills chosen by Germany, the question is how this subset was chosen and how representative the subset is for spills worldwide. Some comments on this data set and on some references cited by Germany and Norway are also made by Greece and a brief analysis on the variability of spill clean-up costs in Greece is presented.

Netherlands

64 The correspondence group should focus on a reasonable and workable value for CATS and it is not necessary to establish a value that is scientifically correct to the nearest decimal point. At MSC 86 there will probably be a working group tasked to review FSA studies that have been submitted to IMO. In this light, it would be helpful if the group could come forward with a proposal for environmental risk evaluation criteria and not prolong this discussion very much longer.

65 The Netherlands highly appreciates the proposal put forward by the Coordinator and supports this, including the table in TOR 1(e). It sees this proposal as a good compromise between the different proposals that were put forward. It also supports this to be included in the FSA guidelines with the aim to gain more practical experience in the use of this criteria. As an alternative, it can also support the formula proposed by Japan. An appropriate factor could be chosen so that the formula would correspond as far as possible with the table as proposed.

66 Based on TOR 1(f), it would also support the establishment of a drafting group to be established at the next MEPC in principle. Such a drafting group could develop an annex to the FSA guidelines with the volume-dependent CATS value as proposed and to be used as an example in FSA studies.

67 On TOR 2, the Netherlands did not see much benefit in combining environmental and safety criteria at this stage. It proposes to concentrate on the definition of environmental criteria in the first place and use environmental and safety criteria in parallel. On TOR 3, it supports the comment from IACS that the Severity Index should be compatible with the existing Severity Index table contained in the FSA guidelines.

68 On TOR 5 and 6, it can agree to the text proposed by the Coordinator, however, it also support the establishment of a drafting group (in principle), specifically to draft a proposal with respect to TOR 1.

IACS

69 On CATS by accident type, IACS agrees with Greece that the right balance between accuracy and complexity needs to be found. Indeed the IACS alternate proposal would make the

calculation slightly more complex but it can still be considered a trivial computation for a qualified engineer. Therefore the position represented by Greece is not a serious hindrance to the implementation of such a scheme.

70 On TOR 3, IACS believes that Greece has misunderstood the proposal. There would still be the volumes of oil that would be used by those using the scale to categorize the consequence. The proposal is to use the logarithmic scale on the monetary values instead of the volumes. The volumes would be defined by calculating out the appropriate volume for each monetary value.

71 IACS feels it necessary to reiterate again the view that has been expressed by a number of representatives on multiple occasions that the value we are searching for has a limited relationship to the clean-up costs of actual oil spills. The values we are searching for is the amount society is willing to pay to prevent an oil spill. This means that we have to consider the utility function associated with the risk aversion of the appropriate society to oil spills. The statement raises two questions: 1) What is the appropriate society? 2) How risk averse are they?

72 IACS also believes that ALARP is a concept that is first and foremost a legal construct. It is used to show a company has done everything reasonably in its power to avoid some negative consequence. A company must show this for all geographical areas of operation and therefore they should always use the worst case scenario.

Japan

73 Japan thinks it is important to make constructive comments or proposals to solve our difficult TOR together. Although there are different views and further discussion might be necessary for some items, Japan would like to go along with the Coordinator's conclusions in the draft report with great appreciation.

74 Japan supports Greece's comment with regard to the use of interim criteria and is of the opinion that the criteria to be used are very fundamental and an important matter which would greatly affect the decision to introduce new mandatory regulations in IMO.

75 Japan would understand the importance of gaining experiences to obtain better criteria as indicated by Germany. However, Japan would be afraid that results of any FSA studies using interim criteria could be misleading as they would be considered as a reflection of IMO's decisions even though such studies would be carried out just for gaining experiences. Therefore, Japan is of the opinion that it is important to clarify that (1) the criteria are decided before formal application, and (2) results of any FSA studies using the interim criteria are invalid.

76 On CATS by accident type, Japan shared the same views with Greece and Netherlands that "we should focus on a reasonable and workable value for CATS".

77 As for the CATS value, Japan would basically support the concept of "environmental damage" as well as "willingness to pay" as pointed out by IACS, Norway and Germany although further discussion is necessary on how much these effects would be.

78 Concerning Norway's opinion (paragraph 57), Japan would like to remind the group that all data and calculation method of the Japanese analysis had already been disclosed to the group for consideration and evaluation.

Germany

79 Germany believed that the discussion has not reached a status for a drafting group to conclude on the matter. Instead, a working group appears to be a more appropriate platform for finalizing the discussion and to conclude on relevant items.

80 Germany welcomes the comments made by Greece because they provide a good summary of the work of the group for MEPC 59. Germany provides some clarifications on these comments, including how the subset of 25 spills was chosen, whether or not inflation was taken into account in IOPCF data, and on some other technical points.

81 On the issue of oil spill clean-up costs in Greece, Germany expects that the correspondence group will welcome access to the background information, such as under which circumstances and where these accidents took place as well as what kind of oil.

United States

82 The United States wishes to reiterate that the Severity Index in TOR 3(b) should be monetarily based and encompass all aspects of the total cost of oil spill response. Also the United States does not agree that the values of TOR 1(e) should be shown.

Conclusions

83 The Coordinator thanks all the members of the correspondence group who constructively participated in the discussion on a very challenging topic during the intersessional period. The topic clearly proved more difficult than what was anticipated when MEPC 56 decided to deal with it two years ago, and the degree of difficulty has been more than demonstrated in the discussion to date.

84 MEPC 58/23, paragraph 17.2 had stated, among other things, that:

> "*... at MEPC 57 divergent views still remained on some key issues which required further analysis and discussions between members of the correspondence group, in particular:*
>
> *.1 on establishing an appropriate Severity Index (SI) in the Hazid step;*
>
> *.2 whether "costs of averting a spill (CATS)" or an alternative criterion would offer the needed decision-making quality; and*
>
> *.3 the acceptable boundaries of the ALARP region, slope of F-N diagram and what is the variable of horizontal axis.*"

85 MEPC 58 further elaborated on the key open issues by issuing a set of more specific TOR for the correspondence group. However, after MEPC 58, and in spite of various attempts to reach convergence on these open issues, no single set of recommendations can be proposed to MEPC 59 which will address all the TOR of the group and to which all of the group members subscribe to.

86 Items for which minimum (or no) disagreement exists among the correspondence group as regards the Coordinator's proposals are TOR 5, the issue of collection and reporting of relevant data, and TOR 6, the need to renew the TOR of this correspondence group beyond

MEPC 59. It should be realized however that TOR 5 is a subject of enormous depth and serious action is necessary if any further progress on it is to be made.

87 On TOR 1, a majority of correspondence group members (at least among those who responded) are in favour of a volume-dependent scale of global CATS thresholds. Some members support the Coordinator's proposed scale and some suggest that it can be further investigated. A proposed alternative is the use of Japan's non-linear formula instead of a scale, multiplied by an assurance factor.

88 However, other members disagree and some even recommended that no values be shown for the scale even as examples, as these may be misinterpreted as recommended ranges. Therefore no consensus exists on the scale itself or any proposed alternative, and on its possible interim use before an agreement is reached. More discussion is needed on all this.

89 More specifically, the item on which most of the members (again among those who responded) have agreed is TOR 1(d), the need for a volume-dependent CATS scale, as opposed to a single CATS threshold. This, in and of itself, may be the most important point of convergence within the correspondence group since its inception. It is also the one that more than any highlights the degree of difficulty of the overall problem. The fact that no agreement was reached on what the values of this scale might be is to be expected, as doing this would definitely require more discussion.

90 In the context of TOR 1, several group members noted that the CATS threshold value should cover clean-up costs, environmental costs, other compensation costs in relation to the accident and the societal need for environmental protection (risk aversion factor). Hence, according to these members, CATS threshold has a limited relation to actual spill costs. These members are of the opinion that the CATS threshold is not based on only a technical amount but contains also a political factor, the risk aversion factor.

91 On TOR 2, 3, and 4, although some group members are in agreement with the Coordinator's proposals, others disagree and no consensus has emerged. Various alternatives have been proposed.

92 There is general recognition among members of the correspondence group that more time is needed to discuss the proposals of the Coordinator and those that have been proposed as alternatives. In that sense, all these proposals may be still considered as being on the table. At least two members have suggested that the establishment of a Working Group would be beneficial, and one member suggested the establishment of a drafting group on TOR 1 (in principle).

93 An extension of the mandate of the correspondence group to MEPC 60 may conceivably resolve many of the issues that remain open. However, it is not clear to what extent the current discussion set-up in the form of a correspondence group, which was established close to two years ago, is found to have achieved progress commensurate with the seriousness of the issue, on the one hand, and the need for a timely conclusion, on the other. In that respect, any alternative avenue that the Committee would deem appropriate might be considered.

Action requested by the Committee

94 The Committee is invited to consider this document and decide as appropriate.

***

ANNEX 1

FIRST ROUND OF SUBMISSIONS (MEPC 58 – 26 February 2009)

Listed by chronological order of receipt
(receipt dates are in parentheses, text reproduced as received)

Japan (25/12/2008)

In response to the instruction made by CG chairman, Japan would like to submit a report of IOPCF data (2005) which we used as a source data of our analysis in Japanese document (MEPC 58/17/1). You could also download the same file from http://www.iopcfund.org free of charge.

As for the establishing rational CATS criteria, Japan has already submitted the relevant information (MEPC58 /17/1), where a relation between costs of oil spill (C) and oil spill weight (W) has been derived based on IOPCF data (2005).

We have derived the regression results by following steps:

1. Extract "Quantity of oil spilled" (W: weight) and "Compensation" (C: cost) from both ANNEX XX (pp.170-191) and ANNEX XXI (pp.192-198) of the IOPCF report (2005).
2. Convert currency of the costs to US$ using the exchange rate as provided in page 180 of the IOPCF report (2004).
3. Make regression analysis using all the data sets which has both C and W.
4. Derive regression curve as shown in MEPC 58/17/1.

Since IOPCF has issued the latest version of the report (2007), Japan is now in the process of updating the database by adding the IOPCF data in 2006 and 2007. Japan would like to report the updated results as soon as possible, hopefully by the WS in Greece.

ATTACHMENT: IOPCF REPORT[1]

Notes to Annexes XVIII and XIX

1 Amounts are given in national currencies. The relevant conversion rates as at 31 December 2004 are as follows:

£1 =
Algerian Dinar Din 138.415
Bahrain Dinar BD 0.728
Cameroon CFA Fr 926.52
Canadian Dollar Can$ 3.3003
Danish Krone DKr 10.5068
Estonian Kroon EEK 22.1002
Euro € 1.4125
Indonesian Rupiah Rp 17821.5
Japanese Yen ¥ 196.732
Malaysian Ringgit RM 7.2957
£1 = 1.23910 SDR or 1 SDR = £0.80704

[1] Available at: http://www.martrans.org/docs/ws2009/Annual_Report_2005.pdf

2 The following currencies were replaced by the Euro on 1 January 2002 at the following conversion rates. The equivalent values relative to the Pound Sterling, as at 31 December 2004, are also given.

€1= £1=
Finnish Markka FM 5.9457 8.3983
French Franc FFr 6.5595 9.2653
German Mark DM 1.9558 2.7626
Greek Drachma Drs 340.75 481.3094
Italian Lira LIt 1936.27 2747.9814
Spanish Peseta Pts 166.386 235.0202

3 The inclusion of claimed amounts is not to be understood as indicating that either the claim or the amount is accepted by the 1971 or 1992 Funds.

Moroccan Dirham Mor Dhr 15.819
Philippines Peso PPs 107.754
Republic of Korea Won Won 1987.48
Russian Rouble Rbls 53.2197
Singapore Dollar S$ 3.134
Swedish Krona SEK 12.7584
UAE Dirham UAE Dhs 7.0514
United States Dollar US$ 1.9199
Venezuelan Bolivar Bs 4950.05

United States (11/2/2009)

United States' response to MEPC 58/17/1, submitted by Japan

The United States appreciates the valuable contributions by Japan regarding the total spill cost, but does have some comments regarding the recommendations made in the MEPC submission. Before addressing specific aspects, two general observations are warranted. First, our experience is that a single value for a cost for averting a ton spilled is not reasonable and can provide misleading insights. Indeed, Japan points to several key variables that cause significant variation in the associated costs, including volume and type of oil. Other variables include the location of the spill, weather and response capabilities. Individually these variables can cause changes in the associated volumetric costs of one order of magnitude or greater with an even greater cumulative impact. This uncertainty is noted in Japan's submission on page 11, where it is noted "It is seen in Figure 6 that Log10W has a relatively strong correlation with Log10C *although deviation is relatively large*. [emphasis added]" As such, the U.S. typically uses a range for this volumetric cost and not a single value.

The second general point is that the cost of averting a ton spilled is comprised of a number of components, including response costs and environmental damages. In this regard, referring to the costs from Etkin (2000) is somewhat misleading, as it comprises only response costs and does not include environmental damages from oil not cleaned up.

Regarding the specific recommendations, we agree with Japan's identification of a non-linear relationship between total spill cost and total spill volume. This corresponds with our analytic experience, as well as those of the U.S. National Academy of Science[2]

[2] Valuing Ecosystem Services: Toward Better Environmental Decision-Making (2004).

However, it is our experience that the CATS value is much higher than USD 4,000/tonne for the ratio of total spill cost divided by total spill volume, and USD 2,000/tonne for a weighted average marginal cost.

For example, the following studies provided range values for CATS. All numbers are in ($2008 USD):

1. Brown and Savage, "The Economics of Double-Hulled Tankers", Maritime Policy and Management, Vol. 23, No.2, 1996. CATS values ranged from USD 14,282.52/tonne to 68,906.93/tonne,

2. ICF Kaiser Consulting Group, Soza & Company, and Marine Research Associates, 1997. The economic impacts of accidents on the marine industry. CATS values ranged from USD 50,887.17/tonne to 209,274.98/tonne, and

3. Helton and Penn, "Putting Response and Natural Resource Damage Costs in Perspective", 1999 International Oil Spill Conference, American Petroleum Institute, Washington, DC 1999. CATS values ranged from USD 68,460.87/tonne to 111,764.49/tonne.

Given this, the US is more in favour of the amount concluded by SAFEDOR of USD 60,000/tonne.

Greece (13/2/2009)

Dear Chairman, dear CG members,

Greece would like to respond to the comment of the United States, dated 11 Feb. 2009.

The US cites three rather dated papers (1996 to 1999), allegedly documenting high CATS values, and based on these papers they conclude that they are more in favour of the USD 60,000/tonne value proposed by project Safedor. This comes as a surprise to Greece, since from our own prior evaluation of two of the referenced papers, we had reached very different conclusions.

In formulating Greece's position on the CATS issue over the years, we have thoroughly reviewed (and continue to review) the relevant literature, among other sources of information. In that respect, we have already seen the two among the three cited papers, those which are in the open literature (the third is a consulting company report which we could not yet locate). It is not clear how the high values of CATS cited in these papers were computed, as these are not given explicitly in the papers. There are also some additional issues that we think are important.

The Brown and Savage paper, "The Economics of Double-Hulled Tankers", Maritime Policy and Management, Vol. 23, No. 2, 1996, for which CATS values allegedly range from USD 14,282.52/tonne to 68,906.93/tonne (we could not replicate these numbers), is a cost-benefit analysis of OPA-90, that ends with the following central conclusion:

"Double-hulls do not even show a positive net present value in the most favourable assumptions. Even if double-hulls prevent all of the spillage that occurs due to collisions and groundings, and that the damage per gallon spilled is as extensive as in the "Exxon Valdez" incident, the benefits are under half of the costs."

One issue is really, if the US believes the calculations of this paper to be correct, does the US also support its conclusions? (which essentially state that OPA-90 and MARPOL are not cost-effective).

Another issue is what this paper terms "most favourable assumptions", which are mainly worst-case figures for damages averted due to double hulls. These damages are assumed at USD 228.50 a gallon, or approximately USD 67,000/tonne in 1990 prices. But this is a value among the highest that can be found in the United States, let alone the rest of the world. How can it be used as an average global figure?

In the Helton and Penn paper, "Putting Response and Natural Resource Damage Costs in Perspective", 1999 International Oil Spill Conference, American Petroleum Institute, Washington, DC, CATS values allegedly range from USD 68,460.87/tonne to 111,764.49/tonne (2008 prices). Not only we could not replicate these numbers, but we found one spill in their sample of spills (the Mega Borg spill) that has a CATS value of about **USD 400/tonne** (1990 prices), way below what the claimed lower bound for CATS.

In fact, this paper bases its analysis on a sample of US 48 spills, ranging from 0 to 37,000 tonnes. Eight (or 17%) of these spills are pipeline, well, facility and fishing vessel spills, raising questions as to why they should be included in the sample. But even if we exclude these spills, the question is if the remaining 40 spills are a valid sample. As the authors themselves state, *"the cases were selected based on the availability of cost data, and do not reflect a statistically valid subset of spills: the database is skewed towards larger incidents with natural resource damage claims"*. It is thus clear that the selected cases, including the "Exxon Valdez" spill, which is one of the most expensive spills in the world, cannot, just by themselves, form the basis of a sound sample to estimate CATS, either in the US, or (a fortiori) the world.

Finally we could not locate the ICF Kaiser Consulting Group, Soza & Company, and Marine Research Associates, 1997 report. "The economic impacts of accidents on the marine industry."

Therefore Greece feels that at least the 2 of the 3 references cited by the US cannot in any way support the $60,000 figure proposed by project Safedor as a global CATS figure.

This is even more so given that even key members of the Safedor project team, including its project manager, **seem** to have recently adopted a different position.
In the following paper:

Sames, P. and R. Hamann, "Towards Environmental Risk Acceptance Criteria," Proceedings of the ASME 27th International Conference on Offshore Mechanics and Arctic Engineering, OMAE2008, June 2008, Estoril, Portugal,

the curve below is presented where **it seems** that for spills over 10,000 tons a value of US$6,000/ton is shown as CATS.

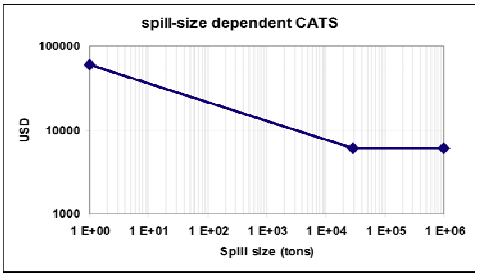

Figure 13: Cost-effectiveness criterion CATS as function of oil-spill size, based on clean-up cost variation.

The authors state that this paper does not represent the official Safedor position, but surely this is a position different from USD 60k.

We have not talked to the authors to confirm whether this is a proposed CATS or not and certainly do not intent to pre-empt them nor take any of their statements/work out of context or in isolation. In fact the authors will be presenting their paper at NTUA's workshop in Athens on February 27th, and we are looking forward to them explaining and clarifying their latest work, which will surely be relevant to our task.

Meantime, we note that whereas Japan has provided full data disclosure relevant to their work on CATS, we are still waiting from Safedor the same.

United States (26/2/2009)

(1) The United States appreciates the comments by Greece, and offers the attached report in support of our previous submittal. The attached report is an internal U.S. Coast Guard report written for informal policy development and decision-making. While this report is somewhat dated, additional data points encountered since the cutoff date for this report support an even higher CATS cost (Tank Barge Bouchard No.120 at approximately $121,000 per tonne and M/V Cosco Busan at approximately $407,000 per tonne). The United States is updating this meta-analysis and will continue to keep the Correspondence Group apprised of the insights obtained.

(2) As noted in our previous submission, in order to completely account for the benefits of avoiding spills, all consequences of a spill must be accounted for, including not just response costs, but environmental damages, lost usage and other elements. As noted in the attached, one cause for the variation between studies in estimates for total costs is that no single study included each of these cost components in developing their estimates.

(3) For the attached report, $2003 total cost numbers must be converted from $/barrel to $/tonne. This is accomplished by multiplying 7.33 bbs/tonne;

http://www.eia.doe.gov/basics/quickoil.html

This number must then be converted from $2003 USD into $2008 USD. One needs to multiply by 1.15448 using http://www.bls.gov/data/inflation_calculator.htm

* Note: references to the studies in the attached report do not necessarily constitute support by the U.S. Coast Guard for all the findings of the studies. The studies are referenced for their associated data.

(4) Given the uncertainty associated with oil spills, a range of CATS values is recommended, to be consistent with IMO's FSA ALARP region.

***

ANNEX 2

COORDINATOR'S PROPOSALS TO THE CORRESPONDENCE GROUP
(unabridged version)

MEMORANDUM

TO: MEMBERS OF THE CORRESPONDENCE GROUP (CG)
FROM: H.N. PSARAFTIS, CG COORDINATOR
DATE: 11 March 2009

CODE
Straight letters: PROPOSALS BY CG COORDINATOR FOR MEPC 59 AND OTHER OFFICIAL INFORMATION
Italics: OTHER BACKGROUND INFORMATION

This memo contains:

1. PROGRESS MADE THUS FAR, AS REGARDS FULFILLMENT OF THE TERMS OF REFERENCE OF THE CG FOR MEPC 59
2. PROPOSALS FOR REPORT TO MEPC 59
3. *OTHER BACKGROUND INFORMATION*.

IMPORTANT DISCLAIMER

The exchange within the informal consultation group formed at MEPC 58, as well as the discussion of the Feb. 27 workshop hosted by NTUA[1], both on the subject of environmental risk evaluation criteria, do not purport to be official positions, either of those CG members attending these meetings, or the IMO. However, both have been interesting from a substantive viewpoint and have provided substantial input to this CG Coordinator, together with all other received input throughout the history of this process, so as to formulate proposals for the forthcoming report to MEPC 59. These proposals are herein put to the CG for endorsement, together with some related background.

ACTIONS REQUESTED BY CG MEMBERS

Please go over this document and for each item labelled "proposal for MEPC 59" (including, as appropriate, sub-items listed) state your opinion on whether you agree, disagree, or modifications you may wish to propose, if any. Please be as specific and concise as possible. No response will be interpreted as no objection.

Deadline to respond: 18 March 2009 (end of business).

BACKGROUND

Background on events prior to MEPC 58 can be found in documents MEPC 57/17 and MEPC 58/17, among other documents.

[1] All presentations of this workshop can be found at http://www.martrans.org/wsenv.htm

The outcome of MEPC 58 on FSA is MEPC 58/23, section 17. The TOR of this CG were set as follows (MEPC 58/23, section 17.18, paragraph 2 (items 1 to 7):

.1 recommend an appropriate criterion for assessing environmental consequences in step 4 of the FSA, including an appropriate threshold value for ascertaining if a specific Risk Control Option (RCO) is cost-effective; (TOR 1);

.2 recommend a way of combining environmental and safety criteria for those RCOs that effect both environmental and fatality risk; (TOR 2);

.3 recommend an appropriate risk matrix or index for environmental criteria; (TOR 3);

.4 recommend an appropriate ALARP region and F-N diagram, including an appropriate value for the slope of the F-N curve; (TOR 4);

.5 address the issue of collection and reporting of relevant data; (TOR 5);

.6 recommend any further relevant action; (TOR 6); and

.7 submit a written report to MEPC 59 (TOR 7).

TERMS OF REFERENCE ONE BY ONE

TOR 1. Recommend an appropriate criterion for assessing environmental consequences in Step 4 of the FSA, including an appropriate threshold value for ascertaining if a specific Risk Control Option (RCO) is cost-effective.

Reference documents:
MEPC 58/17, MEPC 58/17/1, MEPC 58/17/2, MEPC 58/23, paragraphs 17.7-17.13.

Before MEPC 58 (ref: MEPC 58/17, MEPC 58/17/1, MEPC 58/17/2)

There was general divergence of views on the subject. A threshold of CATS equal to USD60,000/tonne was proposed by project Safedor and supported by some delegations. Some other delegations opposed either the approach itself, or the threshold, or both. A non-linear function between spill volume and cost (spill cost = 35,951(spill volume)$^{0.68}$) was proposed by Japan (MEPC 58/17/1). At the same time, an FSA study on crude oil tankers (MEPC 58/17/2 and MEPC 58/INF.2) was submitted by Denmark, using the USD60,000/tonne in the analysis. There was deadlock on how to proceed on this subject.*

At MEPC 58 (ref: MEPC 58/23, paragraphs 17.7-17.13)

An informal consultation group to have an initial exchange of views was established. The group did not consider the Danish submissions MEPC 58/17/2 and MEPC 58/INF.2, which were forwarded to MSC for review by the FSA Expert Group, however it noted that the one part of this FSA study that is relevant for the work on Environmental Risk Evaluation Criteria within the context of FSA guidelines is the threshold of USD60,000/tonne used as the CATS criterion in the study.

The group agreed that non-linearity between cleanup costs and oil spill volume had been documented in various studies. The group also agreed that, in spite of various documented shortcomings, in Steps 3 and 4 of the FSA one could use an "oil spill cost per unit volume" criterion to assess the cost-effectiveness of risk control options (RCOs). In fact, in spite of the extensive discussion and debate on this subject since MEPC 56, the group agreed that no better and practical alternative was identified.

There was still a divergence of views among members of the group regarding what the threshold for such a criterion might be. The CATS approach uses the above type of criterion, and has a value of USD 60,000/tonne as threshold. On the other hand, the group noted that the Japanese approach outlined in MEPC 58/17/1 which is based on IOPCF data, developed a non-linear function between spill cost and spill volume. Following a query as to what the equivalent value of "oil spill cost per unit volume" was implied by the approach outlined by Japan, the group was informed that the value was USD 4,000/tonne if one considered the ratio of total spill cost divided by total spill volume, and slightly lower than USD 2,000/tonne if an equivalent average cost was considered. The group had also discussed what types of costs were included in spill cost figures in the analysis carried out by Japan, and whether one should multiply cleanup costs by appropriate coefficients to account for environmental costs and (possibly) society's willingness to pay to prevent spills instead of incurring their cost.

After some discussion, the group noted that it would be impossible to conclude during the session what the appropriate value of the "oil spill cost per unit volume" threshold might be, although a clear majority expressed the opinion that the threshold should be much less than USD60,000/tonne. Some members of the group suggested that two values might be warranted, one for small spills and the other for large spills, but the difficulties associated with such an approach was pointed out, particularly for small spills, for which inadequate data exist.

<u>After MEPC 58</u>

Full disclosure was requested by the Coordinator of the CG, from both Japan and Safedor of their analyses. Specifically, "Full disclosure should include documentation on all casualty data that were used, spill cost data, possibly broken down by categories, and all other relevant data in support of the analyses. It should also include any explanation of the analyses that is deemed necessary, including modelling or other assumptions."

Japan responded by providing a copy of the IOPCF report, which included the full IOPCF database and some further clarifications on their analysis. No further input was received from Safedor. No further insights on what a global oil spill cost per unit volume figure might be have been obtained[2]. Comments to date were received from the United States on Japan's submission, on Greece on the US comments and from the US on some further clarifications.

[2] *However, please note that a recent independent analysis of the IOPCF data by the NTUA Laboratory for Maritime Transport estimates the ratio of 'total oil spill cost, all spills, as reported by IOPCF' divided by 'total volume of oil spilled, all spills, as reported by IOPCF' around 2,400 USD (in 2008 dollars, properly adjusted for inflation).*

At 27 February workshop

A paper by Sames and Hamann[3] suggested a variable CATS threshold approach, and a paper by Yamada updated Japan's non-linear approach (as described in MEPC 58/17/1). A paper by Meade described a cooperative damage assessment methodology for natural resources oil spill damage assessment in the United States.

In the final panel discussion, on the subject 'the way ahead', the majority of the panellists (including 5 members of the CG) were in favour of a volume-dependent scale of CATS global thresholds instead of a single threshold. This scheme is consistent with the approach of both the Sames and Hamann paper and the Yamada paper, although numerical differences between the two exist. It is also consistent with non-linearity between oil spill volume and oil spill cleanup cost.

Proposal for MEPC 59

(a) The CG agrees that non-linearity between cleanup costs and oil spill volume has been documented in various studies.

(b) The CG also agrees that, in spite of various documented shortcomings, in Steps 3 and 4 of the FSA one could use an "oil spill cost per unit volume" criterion to assess the cost-effectiveness of risk control options (RCOs). In fact, in spite of the extensive discussion and debate on this subject since MEPC 56, the CG agrees that no better and practical alternative was identified.

(c) The CG notes that it would be impossible to conclude at this phase what an appropriate single value of an "oil spill cost per unit volume" (or CATS) global threshold might be.

(d) The CG is of the opinion that an appropriate volume-dependent scale of CATS global thresholds would be better suited than a single threshold value.

(e) The CG suggests the following as an example of a volume-dependent CATS global threshold scale (USD/tonne):

- 0-10 tonnes: 50,000;
- 10-100 tonnes: 20,000;
- 100-1,000 tonnes: 10,000;
- 1,000-10,000 tonnes: 5,000;
- above 10,000 tonnes: 3,000;

(f) The CG notes that more discussion is needed to finalize this issue, including the integration of any scale within the FSA methodology. The above example's threshold values might be appropriate to be used in an interim period, in which further experience can be gained, and based on that further adjustments-refinements may be proposed.

Explanation: This scale is somewhere between the scale suggested by the Sames-Hamann paper and that suggested by the Yamada paper.

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[3] *Sames, P., R. Hamann, "Toward Environmental Risk Acceptance Criteria", Proceedings of the ASME 27th International Conference on Offshore Mechanics and Arctic Engineering, OMAE2008, June 2008, Estoril, Portugal.*

TOR 2. Recommend a way of combining environmental and safety criteria for those RCOs that effect both environmental and fatality risk.

Reference documents:
MEPC 58/17, MEPC 58/23, paragraph 17.14, MSC 85/17/3, paragraph 3, MEPC 58/17, annex, section 4.

Before MEPC 58 (ref: MEPC 58/17)

Matter open; there was only a proposal by the Coordinator of the CG, MEPC 58/17, annex, section 4 (page 6).

At MEPC 58 (ref: MEPC 58/23, para. 17.14, also MSC 85/17/3, para. 3)

The informal consultation group concurred with the approach proposed in section 4 of the annex to document MEPC 58/17, which would be simplified further if a volume-based approach were followed. The group noted, however, that it was important to show both environmental and safety criteria in the cost-benefit analysis (CBA), so that a complete picture could be formed.

The reference here is: MEPC 58/17 Annex, section 4 (page 6), and also section 5 of Psaraftis (2008)[4].

Very briefly, the proposed general scheme to combine fatality and environmental criteria is as follows. Assume an RCO that simultaneously reduces fatality and environmental risk. Then

- *The specific RCO under consideration is cost-effective globally if its cost $\Delta K < \Delta E(TOT)+VHL^{*}\Delta R$, otherwise it is not*[5].
- *Among alternative RCOs that pass this test, choose the one that achieves the highest positive difference $\{\Delta E(TOT) +VHL^{*}\Delta R -\Delta K\}$.*

where

- *ΔK is the total (per year) cost of applying this RCO globally*
- *$\Delta E(TOT)$ is the expected total oil spill cost averted due to the global application of the RCO.*
- *VHL is the value of human life (USD3 million per averted fatality)*
- *ΔR is the expected number of averted fatalities per year.*

This criterion reduces to the standard GCAF/NCAF criterion if no environmental considerations exist. Although is not immediately clear how much this scheme can be further simplified if a scale of volume-dependent CATS thresholds is used, the latter is a special case of the above general scheme.

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4 *Psaraftis, H.N., "Environmental Risk Evaluation Criteria", WMU Journal of Maritime Affairs, Vol.7, No.2, 411-430, 2008. Available at: http://www.martrans.org/documents/2008/sft/Psaraftis%20WMUJMA%20paper.pdf*

5 *This condition is if the GCAF criterion is used. For NCAF, the condition becomes $\Delta K < \Delta E(TOT)+VHL^{*}\Delta R+ \Delta B$, where ΔB is defined as in NCAF.*

At 27 February workshop

Matter identified but not discussed.

Proposal for MEPC 59

(a) On the issue of combining environmental criteria with safety criteria, the CG concurs with the approach proposed in section 4 (page 6) of the annex to document MEPC 58/17, which would be simplified further if a volume-based approach is followed.

(b) The CG notes, however, that it is important to show both environmental and safety criteria in the cost-benefit analysis (CBA), so that a complete picture could be formed.

TOR 3. Recommend an appropriate risk matrix or index for environmental criteria

Reference documents:
MSC 83/INF.3, MEPC 57/17, MEPC 58/17, MEPC 58/23, paragraph 17.15.

Before MEPC 58 (ref: MEPC 57/17, MEPC 58/17)

Several divergent proposals, no agreement.

AT MEPC 58 (ref: MEPC 58/23, paragraph 17.15)

On the issue of the proper Risk Matrix or Index (step 1 of the FSA), the informal consultation group proposed to use oil spill volume as the severity variable, with the matrix to be finalized once the issue of the CATS threshold is agreed.

At 27 February workshop

Matter identified but not discussed.

Proposal for MEPC 59

The correspondence group proposes the following:

(a) For the Frequency Matrix, use the same already used for FSA (MSC 83/INF.2):

Frequency Index			
FI	FREQUENCY	DEFINITION	F (per ship year)
7	Frequent	Likely to occur once per month on one ship	10
5	Reasonably probable	Likely to occur once per year in a fleet of 10 ships, i.e. likely to occur a few times during the ship's life	0.1
3	Remote	Likely to occur once per year in a fleet of 1,000 ships, i.e. likely to occur in the total life of several similar ships	10^{-3}
1	Extremely remote	Likely to occur once in the lifetime (20 year) of a world fleet of 5,000 ships	10^{-5}

(b) For the Severity Matrix, use one in which the severity variable is oil spill volume. Below is an example.

Severity Index		
SI	SEVERITY	DEFINITION
1	Minor	Oil spill volume < 10 tonnes
2	Significant	Oil spill volume between 10-100 tonnes
3	Severe	Oil spill volume between 100-1,000 tonnes
4	Catastrophic	Oil spill volume between 1,000-10,000 tonnes
5	Disastrous	Oil spill volume >10,000 tonnes

(volume scales to be finalized once the scales of the CATS thresholds are finalized).

(c) On the Risk Index or Matrix, as in MSC 83/INF.2, define risk index on a log-log scale as follows:

RI=FI+SI

TOR 4. Recommend an appropriate ALARP region and F-N diagram, including an appropriate value for the slope of the F-N curve.

Reference documents:
MEPC 57/17, MEPC 58/23, paragraph 17.15.

Before MEPC 58 (ref: MEPC 57/17)

Matter wide open. Not much discussion.

At MEPC 58 (ref: MEPC 58/23, paragraph 17.15)

The informal consultation group agreed to defer the issue of ALARP region and F-N diagram until after the issue of the CATS threshold is resolved.

At workshop of 27 February

The paper by Sames and Hamann made some proposals on this subject (among other things). One example is in the figure that follows:

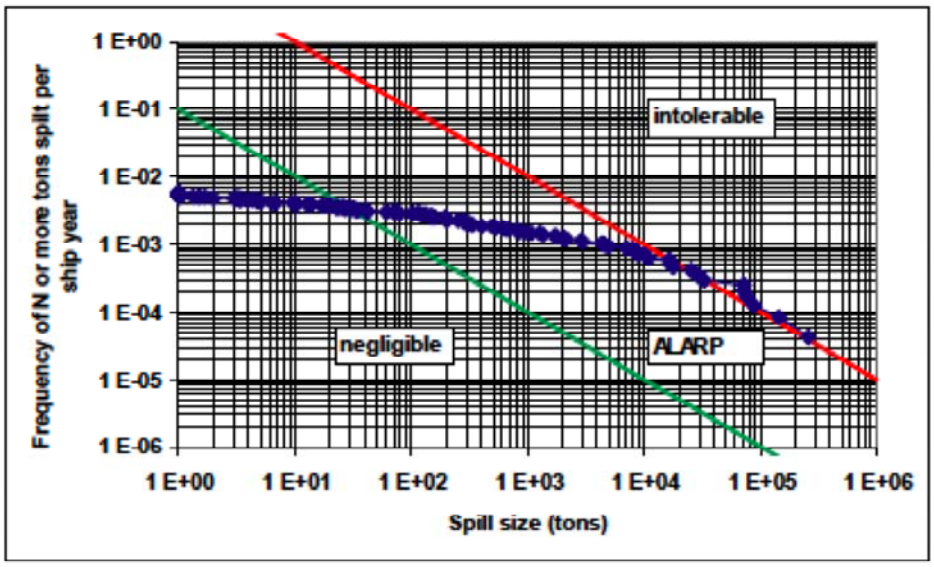


Figure 10: ALARP boundaries related to societal risk acceptance of oil spills from tankers – based on fit to historic data

At the workshop the issue was discussed but no clear recommendation emerged.

Proposal for MEPC 59

The CG notes the approach of Sames and Hamann (2008)[6] (Figure 10) and agrees to defer the issue of ALARP region and F-N diagram until after the issue of the CATS thresholds is resolved.

TOR 5. Address the issue of collection and reporting of relevant data

Reference documents:
MEPC 58/23, paragraph 17.16

Before MEPC 58

Not much discussion on the subject.

At MEPC 58 (ref: MEPC 58/23, paragraph 17.16)

The informal consultation group recognized the importance of the data to be able to test and apply any agreed methodology. Most group members expressed the view that casualty databases used for FSA studies should be made public and contain information properly organized so as to

[6] Sames, P., R. Hamann, 'Toward Environmental Risk Acceptance Criteria,' Proceedings of the ASME 27th International Conference on Offshore Mechanics and Arctic Engineering, OMAE2008, June 2008, Estoril, Portugal.

reveal the real causes of the accidents. Some members expressed the view that IMO should take the lead in such an activity. The group finally noted that the information provided in the GISIS, in particular, the module on reported casualty incidents might contribute to this end, even though GISIS may still be insufficient due to the lack of reporting by Member States.

At 27 February workshop

A paper by Zachariadis was presented and discussed. Paper addressed data and database issues as they pertain to FSA, especially the categorization of causes. Many workshop participants expressed the view that the quality of environmental databases often leaves much to be desired, and that this topic has received less attention that what it deserves.

Proposal for MEPC 59

(a) The CG fully recognizes the importance of the data to be able to test and apply any agreed methodology. This especially pertains to environmental databases, as such databases are typically non-homogeneous in data coverage and quality.

(b) The CG expresses the view that casualty databases used for FSA studies should be made public and contain information properly organized so as to reveal the real causes of the accidents.

(c) The CG recognizes that much pertinent information on past casualties already exists in the public domain but is non-homogeneous and scattered. Such information rests with flag states, port states, classification societies, insurance underwriters, etc. The CG expresses the view that assembling such information in a central and homogeneous database is a worthwhile effort and that IMO should take the lead in such an activity.

(d) The CG finally notes that the information provided in the GISIS, in particular, the module on reported casualty incidents might contribute to this end, even though GISIS may still be insufficient due to the lack of reporting by Member States.

TOR 6. Recommend any further relevant action

Proposal for MEPC 59

The CG requests to extend its TOR to resolve the remaining open issues.

TOR 7. Submit a written report to MEPC 59

To be done.

***

ANNEX 3

SECOND ROUND OF SUBMISSIONS (11-19 March 2009)

Listed by chronological order or receipt
(receipt dates are in parentheses, text reproduced as received)

IACS (13/3/2009)

Comments from IACS on the Chairman's summary of the workshop

IACS would like to make clear that in their view there was limited consensus at the workshop. IACS believes there was general consensus that the CATS value should be variable with spill size. Additionally IACS can agree there was general consensus that a number of different CATS values, scales and formulas should be used in FSAs in order to gain experience with the different options and identify the pros and cons of each option.

The workshop was unable to reach agreement on a CATS value or values, the severity index, an ALARP zone, or any other aspect.

Comments from IACS on the chairman's proposal to be included in the MEPC 59 report

IACS agrees that a variable scale for the CATS value, based on oil spill size, may be a sensible way to proceed, even if it makes that procedure slightly more complicated. However, there may also be other possibilities, like e.g. using different values dependant on accident categories. For example, in grounding the oil spill is likely to hit the shore and therefore may potential have a higher consequence than a spill that occurs out at sea,

However, IACS feels that the E(TOT), defined as the expected total oil spill cost averted due to the global application of the RCO, should actually be the value of not spilling a ton of oil. This value includes the costs saved of not spilling the oil but it also includes the willingness of consuming societies to avoid oil being spilt (regardless of the cost of the spill).

Therefore with regard to the example scale for CATS, IACS agrees that more discussion is required, and we think the different CATS should be used in some FSAs before a value, scale or formula is concluded. IACS also believes that, given the multiple references (for example those provided by the US) that have now been presented to the CG, the CATS value should be higher rather than lower. Therefore the example given in the proposal should be revised upwards.

Recommend a way of combining environmental and safety criteria for those RCOs that effect both environmental and fatality risk

IACS believes there has been insufficient discussion on this matter to conclude that the method proposed by the chairman in the Annex of MEPC 58/17 is the correct one.

Severity Index

IACS believes that the severity index should be compatible with the existing severity index table contained in the FSA guidelines. This implies that each severity level should have the same monetary value as those for human loss or asset damage.

OCIMF (16/3/2009)

OCIMF supports the views from IACS and agrees that a variable scale for the CATS value, based on oil spill volume would be the way forward. With regard to the example scale for CATS, OCIMF believes that more discussion is required and requires further analysis of data and studies. In view of this suggest to remove the cost of oil spill shown as example from the report.

Japan (16/3/2009)

First of all, Japan would like to express our gratitude to Prof. Psaraftis for his valuable contributions of organizing the FSA-WS as well as coordinating the correspondence group as a group chairman.

Japan would basically support the draft proposal made by chairman, but have some comments as follows.

As for TOR 1., Japan would like to support the volume-dependent CATScr scale as described in 1.(d).

As for 1.(e), Japan is of the opinion that "stepwise CATScr" as described in 1.(e) could be one of promising solutions for establishing reasonable CATScr. However Japan is of the opinion that it is reasonable and ideal to directly use analytical formula as CATScr. Such formula is derived in Japanese document (MEPC58/17/1), and similar formula could be derived from Sames & Hamman (2008).

Japan would like to note that we have not yet fully discussed these two approaches. Therefore Japan is of the opinion that it might be better for us to preserve these two approaches for a while for future discussion.

Considering those above, Japan would like to suggest to slightly modify 1.(e). and 1.(f) as follows.

(e) The CG suggests the following as ~~an~~ examples, of a volume-dependent CATS global threshold scale (USD/tonne).

Example 1
spill volume: CATS
0-10 tonnes: 50,000
10-100 tonnes: 20,000
100-1,000 tonnes: 10,000
1,000-10,000 tonnes: 5,000
above 10,000 tonnes: 3,000

Example 2

$$CATS = F_e \times 25441 \times W^{-0.34}$$

Fe: Coefficient to account for environmental costs etc.
W: Oil spill volume [tonnes]

(f) The CG notes that more discussion is needed to finalize this issue, including the integration of any scale within the FSA methodology. The committee is invited to consider what form and what ~~above example's~~ threshold values would ~~might~~ be appropriate to be used. Such threshold could possibly be used in an interim period, in which further experience can be gained, and based on that further adjustments refinements may be proposed.

ANNEX

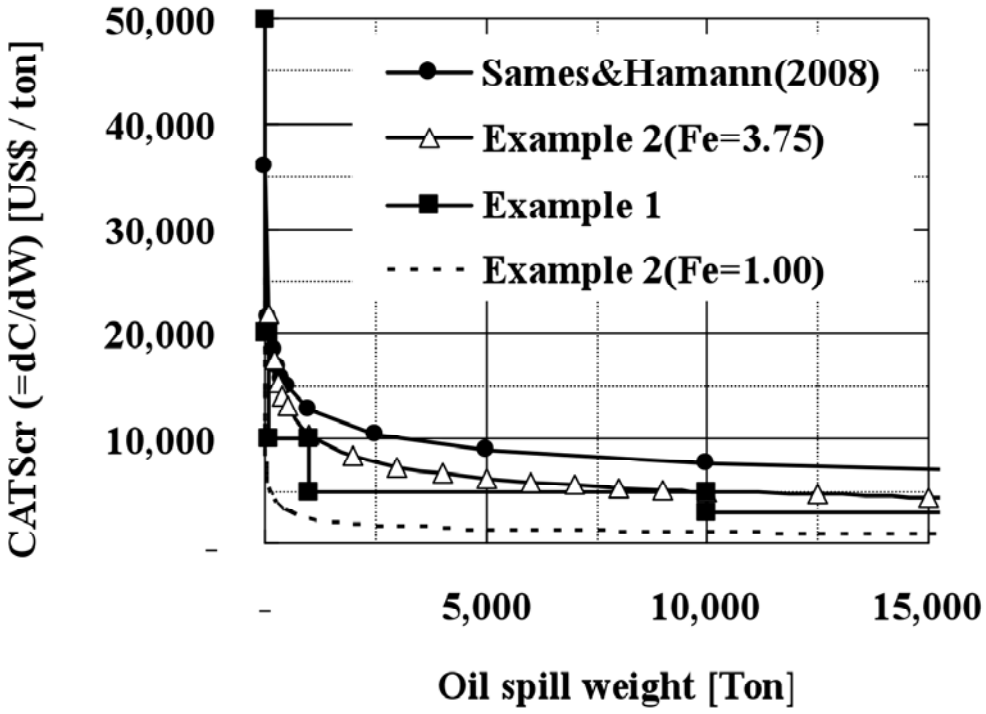


Figure1 Comparison of CATS

Greece (16/3/2009)

THE VIEW FROM GREECE IS AS FOLLOWS:
IT SEEMS ALL AGREE ON AT LEAST 2 THINGS:
1. WE NEED AT LEAST A STEP-WISE THRESHOLD FUNCTION
2. THIS IS MAINLY BECAUSE SMALL SPILLS ARE MORE EXPENSIVE PER TON.

OBVIOUSLY WE HAVE NOT AGREED ON VALUES YET.

HOWEVER, AS WE EXPRESSED IN OUR PREVIOUS MESSAGE TO THE WS PARTICIPANTS, WE ALSO THINK THAT USING A NONLINEAR FORMULA, SUCH AS THAT BY JAPAN, WILL BE MORE APPROPRIATE AND EASIER TO USE IN FSAs.

FOR ONE THING, WHATEVER STEPWISE VALUES ARE DECIDED, SAY 1-100 MT, 100-1,000 MT, 1,000-10,000 MT, ETC., THERE WILL ALWAYS BE THE PROBLEM HOW TO TREAT A HYPOTHETICAL SPILL NEAR THE STEPS, E.G., A SPILL OF 1,000 MT OR ABT 1,000 MT. WILL IT BE IN THE 100-1,000 CATS VALUE RANGE OR THE REDUCED 1,000-10,000 MT VALUE?

THIS PROBLEM IS NOT THERE IF A FORMULA IS USED.

IF THIS IS AGREED, THEN THE DISCUSSION COULD FOCUS ON WHAT IS AN APPROPRIATE MULTIPLIER (ASSURANCE FACTOR – JAPAN'S Fe) FOR THE FORMULA IN ORDER TO PRODUCE MAJORITY AGREEABLE FIGURES.

IN THAT RESPECT WE SUPPORT THE PROPOSAL BY JAPAN.
WE ALSO THINK IT IS BENEFICIAL TO INCLUDE BOTH EXAMPLES (EXAMPLE 1 STEPWISE AND EXAMPLE 2 FORMULA) FOR THE CONSIDERATION OF MEPC.

WE ALSO AGREE WITH THE PROPOSALS IN YOUR DRAFT REPORT I.E. YOUR WORDING ON COMBINING ENVIRONMENTAL AND SAFETY CRITERIA,

AGREE WITH THE PROPOSED SEVERITY INDEX, AGREE WITH COMMENTS ON ALARP AND DATA.

Malaysia (17/3/2009)

Agree that a non-linear be the way to calculate the CATs.

United Kingdom (17/3/2009)

Comments from the United Kingdom on FSA CG on EREC Memorandum (11/3/2009)

Firstly the United Kingdom would like to thank Prof. Psaraftis in his role of organizing the Formal Safety Assessment Work Shop and his continued coordination of the correspondence group. Your hard work and contribution is very much appreciated.

The United Kingdom supports the draft with the following comments:

1.(e)

The United Kingdom supports the *potential* for a variable scale for the CATS value, based on oil spill size. The United Kingdom, though, agrees with IACS view of a suggested variation of values depending on accident categories. They provide a good example in which grounding would more likely affect the coast line and, therefore, have a higher consequence than a spill out at sea.

The United Kingdom agrees this needs more discussion and that a volume dependent scale of CATS global threshold suggested in 1.(e) is an example for further basis of discussion.

The United Kingdom would like to ask whether the proposed approach on the analysis of environmental risk in maritime transport should not be confined to oil spill pollution. Should it also encompass oil and bunker spills, ballast water, coatings, garbage, sewage, gas emissions and other hazardous materials emitted from vessels?

Germany (17/3/2009)

TOR 1) recommend an appropriate criterion for assessing environmental consequences in Step 4 of the FSA, including an appropriate threshold value for ascertaining if a specific Risk Control Option (RCO) is cost-effective;

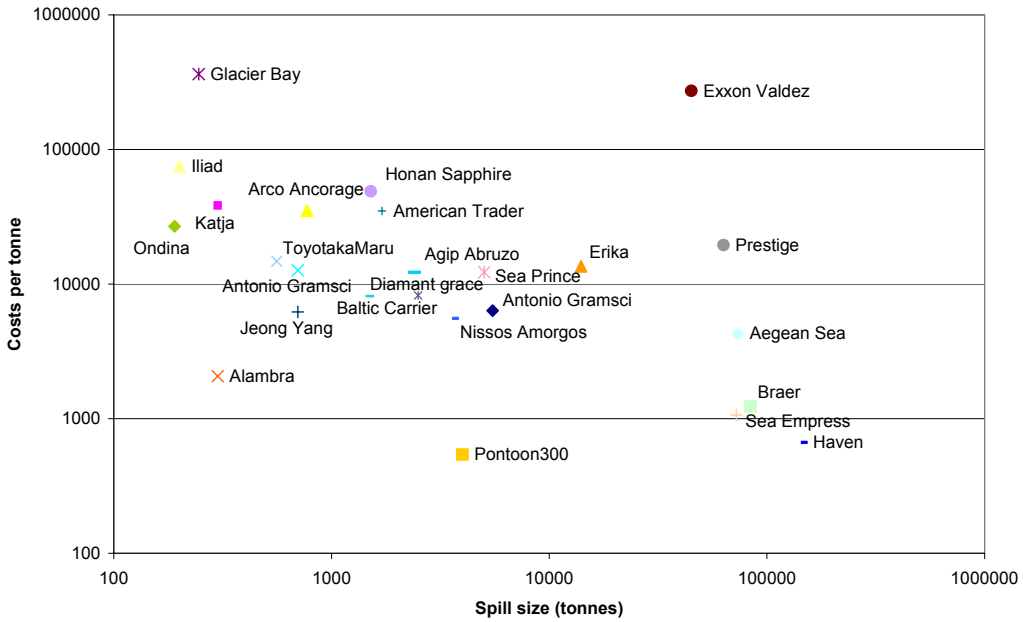
First of all Germany likes to highlight that following our understanding of the discussion until know the majority of the CG favourites CATS as defined:

$$CATS = \frac{\Delta C}{\Delta R}$$

where DC are the costs for a risk control option and DR is the risk reduction in terms of oils spill volume.

The discussion in the correspondence group and on MEPC meetings showed deviating values for the specific cleaning costs. In the Japanese submission (MEPC 58/17/1) a non linear approach was explained taking into account some parameter of influence like volume and type of oil. Following this proposal the average spill costs should be about USD4,000/tonne. A subset of 25 accidents of tankers taken from the data published by C. Grey (1999) and IOPCF (2007) shows a higher average value of about USD40,000 (see figure below). (The corresponding values for all accidents (82): mean USD36,000 std. deviation 63,000).

Hence. Germany supports the comment of the US that the spill costs are significantly higher than USD4,000 / tonne. In this context it should be noted that even for the same accidents deviating figures could be found.



This selection of accidents also demonstrates the scatter of costs (standard deviation of about USD80,000) which provides spaces for various interpretations. The reasons for this scatter were already explained in comments by several distinguished delegations. The problem seems to be that there is no natural law behind the spill costs of accidents and hence there exist no right or wrong. In this context Germany likes to bring again attention to parts of the comment of ITOPF for MEPC 57:

> *CATS is not an estimate of real-world oil spill response cost. ~~In its proper form it should be a politically negotiated agreed construct used to aid research into the specific question of regulatory impact.~~ It has no real-world meaning outside this arena.*
> *CATS does not provide "the answer". It is an aid to the political process and is best used along with other sources of information including expert opinion, data reviews, stakeholder discussions, etc. In the end, decisions made in the IMO forum are political agreements formed on the basis of consensus, rather than formulaic output. While there is nothing new about this, it should be kept in mind when debating the FSA-CATS approach.*

The CATS threshold value is a criterion to select cost efficient risk control options in the IMO process of regulation development. Hence, this threshold value should not only consider the direct spill costs but also the societal need for environmental protection. CATS should be applied to select new regulations and thus the adequacy of a value or model can only be derived from the impact on ship design and shipping.

Based on the discussion above Germany agrees with IACS position that a number of different CATS values, scales as well as formulas are proposed and hence Germany favourites an example application of the different models, for instance, using the risk model of the FSA for crude oil tankers (MEPC 58/17/2).

The formulas for a non-constant CATS value proposed until now showed relatively low correlation (R-values below 0.8) and may need further elaboration. However, Germany agrees that a non-constant scale for CATS value may be a way to proceed.

TOR 2) recommend a way of combining environmental and safety criteria for those RCOs that effect both environmental and fatality risk;

Germany is of the opinion that we need significantly more discussion before any proposal for MEPC can be formulated.

TOR 3) recommend an appropriate risk matrix or index for environmental criteria;

The discussion of the CGs showed that the majority supports the logarithmic scale already used for safety analysis in the FSA guidelines. Following the comment of IACS the logarithmic scale should be based on the monetary value rather than the spill size. This corresponds with the German proposal made for the correspondence group for MEPC 58 (ref. MEPC 58/17). The advantage of this approach is that it allows the application of different CATS formulas.

To avoid possible misinterpretations with respect to relations between fatalities and environmental pollution, e.g., "one 1,000 tonnes of oil spilt is equal to one fatality", Germany recommends to use different SI tables for human related and environmental related consequences. Furthermore, Germany supports the statement of the CO that the table should be finalized after CATS threshold is defined. In this context we like to highlight that

TOR 4) recommend an appropriate ALARP region and F-N diagram, including an appropriate value for the slope of the F-N curve;

On the workshop in Athens Germanischer Lloyd has presented different approaches to define the region of tolerable environmental risk (where risk should be made ALARP) by means of FO diagram (accumulated frequency of oil spill size):

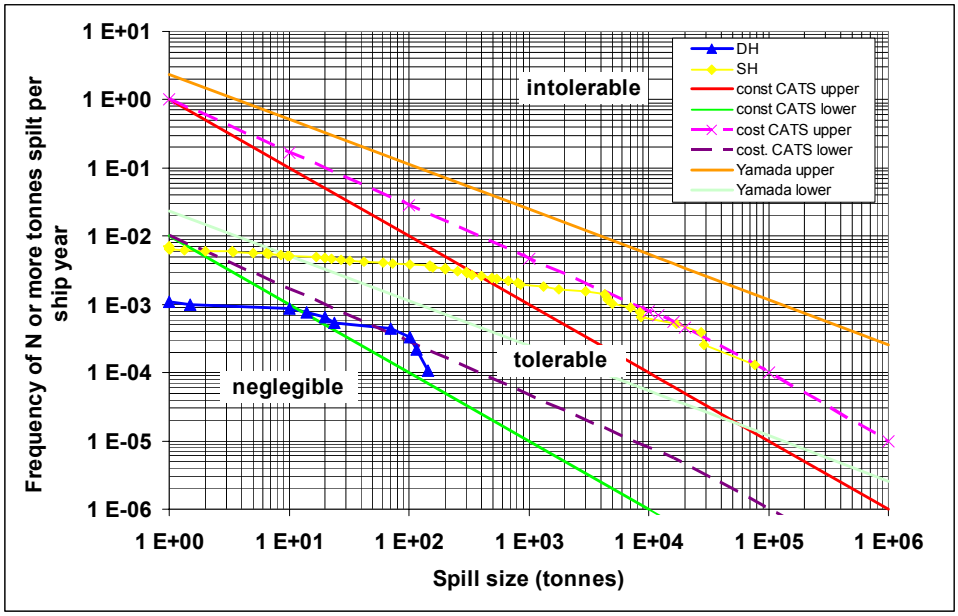
- Approach 1: It is accepted as means of transport, and associated risks are also considered acceptable.
- Approach 2: Societal acceptance of oil spills is based on the same economic value considerations as the societal acceptance of loss of life.
- Approach 2b: Approach 2 + non constant CATS.
- Approach 3: Transfer from oil transport by pipeline.

The anchor point was set on basis of the monetary relation to CAF. For constant CATS a slope of -1 was proposed based on the experiences made with the FN diagram for fatalities.

As noted by Germanischer Lloyd at the workshop in Athens these approaches were developed to initiate a discussion on this topic and do not reflect the German position.

The effect of these approaches was shown by a comparison with the historical accident data of tankers > 60,000 DWT taking into account the different hull types.

Figure below a comparison between the different proposals as well as historical risk profile is shown taking into account constant CATS of USD60,000, a spill size dependent CATS and the proposal by Japan.



The comparison shows significant deviations between the proposals. For instance, following the proposal by Japan Double Hull (DH) tankers would be in the area of negligible risk whereas the two other approaches show them in the area of tolerable risk and thus the ALARP should be applied.

Germany is of the opinion that further discussion with respect to the topics

- Is a definition of an area of tolerable environmental risk for FSA necessary
- If yes, how is this area defined (anchor points, slope).

Comments on the Memorandum[1]

In the final panel discussion, on the subject "the way ahead", the majority of the panellists (including 5 members of the CG) were in favour of a volume-dependent scale of CATS global thresholds instead of a single threshold.

Germany is of the opinion that the wording opens the possibility for misinterpretations. The workshop was outside the activities of the correspondence group. For instance, Germany has not participated in this workshop. Hence the results should be presented to the correspondence group but is should be make clear that the participants can not agree anything with respect to the correspondence group.

Paragraph Proposal for MEPC 59:

(a) The CG agrees that non-linearity between cleanup costs and oil spill volume has been documented in various studies.

Different approximations for cleanup costs have been published or proposed in the MEPC correspondence groups. As mentioned above these proposals deviate from each other.

(c) The correspondence group notes that it would be impossible to conclude at this phase what an appropriate single value of an "oil spill cost per unit volume" (or CATS) global threshold might be.

Germany agrees.

(d) The correspondence group is of the opinion that an appropriate volume-dependent scale of CATS global thresholds would be better suited than a single threshold value.

As mentioned above Germany is of the opinion that the different proposals should be applied, e.g., using the risk model of the FSA for crude oil tankers, to investigate the impact on the regulation.

(e) The CG suggests the following as an example of a volume-dependent CATS global threshold scale (USD/tonne):

- *0-10 tonnes: 50,000;*
- *10-100 tonnes: 20,000;*
- *100-1,000 tonnes: 10,000;*
- *1,000-10,000 tonnes: 5,000;*
- *above 10,000 tonnes: 3,000.*

This proposal may be further investigated, however, Germany is not of the opinion that a consensus exists in the CG with respect to these values.

At MEPC 58 (ref: MEPC 58/23, paragraph 17.14, also MSC 85/17/3, paragraph 3) The informal consultation group concurred with the approach proposed in section 4 of the annex to document MEPC 58/17, which would be simplified further if a volume based approach were followed.

[1] Note: Text in *italics* refers to excerpts from the Coordinator's memorandum (see annex 2).

The group noted, however, that it was important to show both environmental and safety criteria in the cost-benefit analysis (CBA), so that a complete picture could be formed.

The reference here is: MEPC 58/17, annex, section 4 (page 6), and also section 5 of Psaraftis (2008)4. Very briefly, the proposed general scheme to combine fatality and environmental criteria is as follows. Assume an RCO that simultaneously reduces fatality and environmental risk. Then:

- *The specific RCO under consideration is cost-effective globally if its cost $\Delta K < \Delta E(TOT)+VHL^{*}\Delta R$, otherwise it is not.*
- *Among alternative RCOs that pass this test, choose the one that achieves the highest positive difference $\{\Delta E(TOT) +VHL*\Delta R -\Delta K\}$.*

  where:
  - *ΔK is the total (per year) cost of applying this RCO globally.*
  - *$\Delta E(TOT)$ is the expected total oil spill cost averted due to the global application of the RCO.*
  - *VHL is the value of human life (USD3 million per averted fatality).*
  - *ΔR is the expected number of averted fatalities per year.*

This criterion reduces to the standard GCAF/NCAF criterion if no environmental considerations exist. Although is not immediately clear how much this scheme can be further simplified if a scale of volume-dependent CATS thresholds is used, the latter is a special case of the above general scheme.
&
Proposal for MEPC 59

(a) On the issue of combining environmental criteria with safety criteria, the CG concurs with the approach proposed in section 4 (page 6) of the annex to document MEPC 58/17, which would be simplified further if a volume-based approach is followed.

Please refer to our comment on TOR 2.

United States (18/3/2009)

Comments on the draft report from the United States

1(c). The US is of the opinion that a single point estimate is not meaningful. Given the uncertainty associated with oil spills, a range of CATS values is recommended, to be consistent with IMO's FSA ALARP concept. Since 1(d) follows, recommending a range, the United States recommends deleting 1(c). 1(d) can then follow with a second sentence such as, "The CG notes that further work is needed to establish the appropriate scale of global CATS thresholds."

1(e). The US understands this is an illustrative example, but recommends the numbers be deleted. There is a danger associated with providing example numbers, as they can be misinterpreted as recommended ranges.

The United States recommends instead providing ratios between spill categories, such as:

0-10 tonnes: 16.666 * Baseline;
10-100 tonnes: 6.666 * Baseline

100-1,000 tonnes: 3.333 * Baseline
1,000-10,000 tonnes: 1.666 * Baseline;
Above 10,000 tonnes: Baseline.

These ratios were determined using the example numbers provided.

1(f). This illustrates our concerns as noted in 1(e). The United States does not agree with the statement, "The above example's threshold values might be appropriate to be used in an interim period, …". Recommend either striking the sentence, or provide example numbers that are extremely low and extremely high, to make it absolutely clear these numbers are examples only, i.e. $ 1000 USD for "above 10,000 tonnes" and $ 5,000,000 for "0-10 tonnes".

Per the document provided in our latest submission, we found CATS ranged from $33,850USD/tonne to $812,380 USD/tonne. (These numbers have been converted from barrels to tonnes, and to $2,008 USD.) If numbers must be placed in the example in 1(e), then the baseline should be higher than the provided example of $3,000 USD.

2(a). The US conceptually agrees with combining environmental criteria with safety criteria, however, we share the same opinion as IACS and Germany in that the specifics and method require further discussion. The US does agree that the safety and environmental components should be preserved and presented for decision-makers.

3(b). The US is of the opinion that the Severity Index should be monetarily based, in order to capture the effect of the myriad of variables involved, such as environmental sensitivity, response capacity, etc. Volume is not the only parameter, as we have commented in previous submissions, and a Severity Index based solely on volume is an oversimplification and potentially significantly misleading. Environmental sensitivities can make what would be considered a minor spill, based on volume, be considered catastrophic.

3(c). This statement needs further explanation, at least denoting the acronyms used.

Norway (19/3/2009)

These are the Norwegian comments to the full report (filename unabr.pdf)

TOR 1.

Norway has to disagree with the formulation used by the chairman in describing the situation before MEPC58 as a "deadlock". In our opinion the issue has not received much attention at MEPC, and to this day there has not been an official WG discussing this subject. In our view, the subject is too important to be left to an unofficial WG (at MEPC 58) and a correspondence group. No broad overview of the topic has been presented since the initial SAFEDOR report, which has not been submitted to IMO, but referenced briefly in a CG report.

The numbers reported by Japan (MSC 58/17/1) is so low, that we suspect that there may be something wrong with the analysis itself. There have not been any authors previously proposing such low numbers (see table). The number is also mainly a cleanup costs, and no attempt is made to derive a cost of averting oil spills (which is a societal willingness to pay). When the chairman is comparing this to CATS values, this is not justified.

Authors	Cleanup	Compensation	Total	Compensation to Cleanup ratio
	2008 USD/t			
Etkin [1]	16 890	-	-	-
Shahriari and Frost [2]	8 293	-	-	-
Harper *et al.* [3]	30 987 ~ 98 123	-	-	-
Sirkar *et al.* [4]	18 688	59 411	78 099	3.18
Liu and Wirtz [5]	7 931	30 664	38 595	3.87

1. Etkin, D., S., 2000, Worldwide analysis of oil spill cleanup cost factors. Proceedings of the 23rd Arctic and Marine Oil Spill Programme Technical Seminar, Ottawa, Canada, June, pp. 161-174.
2. Shahriari, M., and Frost, A., 2008, Oil spill cleanup estimation – Developing a mathematical model for marine environment. Process Safety and Environmental Protection, **86**, pp. 189-197.
3. Harper, J., Godon, A., and Allen, A., A., 1995, Costs associated with the cleanup of marine oil spills. Proceedings of the 2005 International Oil Spill Conference, Miami Beach, Florida, USA, May, pp. 1501-1510.
4. Sirkar, J., Ameer, P., Brown, A., Goss, P., Michel, K., Nicastro, F., and Willis, W., 1997, A framework for Assessing the Environmental Performance on Tankers in Accidental Groundings and Collisions. Transactions of the Society of Naval Architects and Marine Engineers (SNAME), **105**, pp. 253-295.
5. Liu, X., and Wirtz, K., W., 2006, Total oil spill costs and compensations. Maritime Policy and Management, **33**, pp. 49-60.

The proposal of the chairman:

(a) Everyone knows that there is a non-linearity in cleanup costs, but this is not the issue. The question is if there should be a non-linearity in averting oil spill.

(b) Agreed.

(c) We are of the opinion that values proposed should be tested in application prior to a final decision, unless someone can come up with a better analysis.

(d) If different values are proposed we are more in favour of using different values for different accident types (e.g. in Grounding the oil will hit the shore, in a LOHI this is less likely), as also proposed by IACS (and used by IACS in a previous FSA).

(e) It is difficult to take this proposal seriously, until the background information and rationale is in place. The numbers are also extremely low. Last year the market value of a tonne of oil was about $1,000. Is the suggestion to let the CATS approach the market price of oil?

(f) In an interim period different numbers may be used. The FSA teams would presumably have to propos their own criteria.

TOR 2. Combined indices

In Norway's view we should extend the parameters to presenting more cost to benefit ratios. For example the existing parameters NCAF, GCAF should be presented together with the CATS criteria. Combined criteria has been used in many reports, e.g. NCAF including the effect of reduced environmental impact NCAF=(ΔC-Δ$benefit-CATS*ΔSpill)/ΔPLL.

When the recommendations are written there should be the possibility of stating things like:

- RCO is recommended based on economic considerations alone
- RCO is recommended based on safety considerations alone
- RCO is recommended based on environmental considerations alone
- RCO is recommended based on a combination of environmental and safety considerations

We disagree with the various proposals to take away the possibility of seeing the cost effectiveness, and we therefore disagree with the conclusion.

TOR 3. Severity indices

We see no merit in proposing anything until the CATS approach has been agreed, as this value should be used to derive SI.

TOR 4. FN for oil

The topic is not properly analyzed to come up with a proposal. Only proposals for tankers for oil have been presented. We would also need proposals for bunker oil.

The proposed text should reflect this.

TOR 5. Data

We agree with the wishes for the future.

Norway hopes to be able to submit some new information on the topics addressed by the correspondence group to MEPC 59.

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ANNEX 4

THIRD ROUND OF SUBMISSIONS (23-27 March 2009)
Listed by chronological order or receipt
(receipt dates are in parentheses, text reproduced as received)

These comments were received after a draft version of this report was circulated.

Greece (25/3/2009)

NOTE: WE APOLOGIZE TO OUR COLLEAGUES FOR THE LENGTH OF OUR REPLY BUT WE FELT IT WAS IMPORTANT TO PROVIDE ALL INFORMATION THAT WE HAVE COLLECTED SINCE OUR LAST INTERVENTION WHILE INVESTIGATING THE SUBJECT AND EXAMINING THE FEEDBACK OF OTHER DELEGATIONS.

Greece appreciates the effort of the Coordinator to seek areas of convergence on the TOR of the CG, and finds the draft report as accurately representing the deliberations of the group. It seems that convergence has been achieved on one of the most critical aspects of the problem, as the group agrees that a variable volume CATS scale is the best way to go. Remains to be defined what is the scale. Greece would hope that this issue is settled without delay, as several FSA studies would depend on that scale.

Greece does not agree with the notion of "gaining experience" with value A or scale B in an interim period, and before a definite agreement is reached on the CATS issue. What are the proponents of that suggesting? Keep doing environmental FSAs using $60,000 CATS or other criteria variations, see what we get and then what? Apply the recommendations (e.g. bigger double hull spaces for oil tankers) and wait 20 years to see the database results? Meantime, if the recommendation is wrong, we reduced the tanker cargo carrying capacity and thus shoot much more CO2 to the atmosphere to carry the same amount of oil.

Any "experience" gained in the "interim" period might be misinterpreted and used as the final value, and as such may lead into regulatory recommendations (such as those proposed in the tanker FSA). Also, those not liking the proposals, will always claim "this is not an approved criterion" so possibly no action will ever be taken.

The only realistic way forward in our opinion is to come up with the best possible value/scale/formula in a consensus. Otherwise environmental FSAs using their own criteria will not be accepted.

Some remarks on the positions of other correspondence group members:

The position of IACS and Norway of different CATS values for different accident categories may be theoretically correct but seems impractical. Assuming different CATS values for different spill volumes is one thing, even though that would add to the complexity of the overall analysis. But doing this also for different accident types would complicate the analysis even further, and by the same logic, one could also use different CATS values for different types of oil, different weather conditions, different spill geographical locations, and so on. We need something that is less crude than a single value of CATS, but not excessively complex.

Equally impractical, in our opinion, is the suggestion of IACS, Germany and the United States to express the Severity Index of the risk matrix in the HAZID step in monetary terms.

The index is used by the experts during HAZID to rank the severity of damage scenarios so they can rank them in importance. Experts have a good chance to estimate what would be the volume of cargo spilt if one or two tanks are ruptured or the ship breaks in two or for nearly any ship damage scenario. But if we, after struggling for two years, still cannot agree on any "average" cleanup and environmental monetary costs, while recognizing these vary greatly depending on location/type of cargo etc, how can we expect them to estimate what the cost of each spill in the damage scenario is?

But what is more difficult to understand is that after a long cycle of discussions within the CG on what the severity variable might be (spill volume or recovery time being two of the variables discussed), the proposal to use spill volume as the severity variable came up precisely because of the approach to use a volume-based approach and a cost/volume scheme. In fact this is precisely the earlier position of Norway, who had explicitly suggested spill volume as the severity variable in the risk matrix (see MEPC 57/17, annex, page 2, which we reproduce verbatim below).

Severity Index for Accidental (oil) release		
SI		
1	Minor	< 1 tonnes
2	Significant	1-10 tonnes
3	Severe	10-100 tonnes
4	Catastrophic	100-1,000 tonnes
And maybe add		
5	Disastrous	>1,000 tonnes

The above scale is identical in form to the one proposed by the Coordinator, the only difference being in the last column, which is 1/10 the values proposed by him (and he proposed it as an example subject to further discussion). Of course everybody has the right to change opinions, but we regret that Norway (which is considered a leader in FSA and the originator of CATS) now sees no merit (their expression) in proposing anything at all, until the CATS approach has been agreed!

Substance-wise, Greece believes that we really need to converge and be constructive, after two years of deliberations. **For instance, we don't see why we cannot agree on the proposed Frequency Index, the same as in the safety FSA. If there is no serious objection to it, why not adopt it?**

Germany's understanding of the discussion until now that the majority of the correspondence group favours CATS as defined by $CATS = \frac{\Delta C}{\Delta R}$ is, we feel, not entirely correct. The correspondence group did not favour any formula in a volume-based approach. The above formula is true only if a linear approach and a single threshold value are assumed. If a volume-dependent scale is used, as the consensus seems to be, a different formula has to be used, and this will not necessarily involve a ratio test. Greece has long expressed reservations on the use of ratio tests in FSA (see MSC 83/INF.2), and we should not use them as a bible in any cost-benefit analysis.

The **subset** of 25 spills chosen by Germany surely has a very high average spill cost. The question is, how was this subset chosen, and is this a representative sample of oil spills worldwide? Could someone else, by choosing a different subset produce a very low figure? We think yes.

Germany cites the Grey (1999) paper. Grey conducted an analysis of the IOPCF database using the 67 cases that were available at that time (1997). But 18 of these cases refer to **claimed** costs and not to the actual amount of money that the Fund paid later. It is therefore wiser to analyse the 2007 IOPCF report. An analysis of the latest database provides much lower figures, as one may see in Yamada (2009).

Furthermore, in Grey (1999), the total (estimated) cost per tonne of the Shinryu Maru No8 incident is 180,000 USD (1997 dollars). This is a "mishandling of oil supply" incident of just half a tonne of oil (an operational spill). The second highest cost per tonne is that of the Yeo Myung incident. According to ITOPF 2007 Annual Report, the total cost **(actual paid cost)** was Won 1,553,029,739 (in 1995 Wons) or 50,340 USD per tonne. In 2008 USD this means USD70,415/tonne. Thus, the estimate of the cost of that spill in Grey (1999) which was USD150,000/tonne in 1997 dollars is almost triple (accounting for inflation).

In the scatter diagram that Germany provides, the two highest spills in terms of per tonne spill cost are the **Glacier Bay** and **Exxon Valdez** accidents. These are not reported in the IOPCF database, and thus are not included in Grey (1999) nor in Yamada (2009). Both are US spills, which means that their costs are much higher than the world average.

Everybody knows that spills in the United States involve very high costs. But the case study presented by Norman Meade of the United States National Oceanic and Atmospheric Administration at the Athens February 27 workshop (a serious spill in an US estuary area- the Chesapeake Bay) is an example of natural resource (environmental) damages of **less than USD6,000/tonne**. It is not clear what the cleanup costs of that spill were, but the ratio of environmental to clean-up costs as suggested by Norway (between 3 and 4, to be used globally), seems very high.

Parenthetically, since we have done the research we present following more specific comments as regards Norway's references:

Etkin (2000) reports the following average cleanup costs in 1999 USD per tonne: 6.09 (Mozambique), 438.68 (Spain), 3,082.80 (UK), 25,614 (USA) and 76,589 for the region of Malaysia. An average cleanup cost for a set of highly scattered data has little statistical meaning. This paper is rather outdated (covering spills until 1997), which according to the author "are based on relatively small numbers of spills in some of the nations and regions. Cost data is not widely available in all regions and therefore, cost estimations have to be extrapolated from the limited historical data that is available."

For Shahriari and Frost (2008), Greece is unable to follow the claimed figure of USD8,293/tonne. These authors have developed a mathematical method to estimate cleanup costs based on regression analysis of 80 incidents during the period 1967-2002. The model parameters are spill quantity, oil density, distance to shore, cloudiness (used as a measure of how much sunlight reaches the oil which is the main factor that affects evaporation) and level of preparedness based on ITOPF estimations on how well different world regions cope with oil spills. The paper tries to compare the results that one can get using this model with those provided by Etkin and true costs (these provided by ITOPF).

The Sirkar *et al.* (1997) paper, which is somewhat dated, divides spill costs into natural resource damage costs, cleanup costs, third party costs, and lost product costs, and develops cost functions for each category, in order to do a cost-benefit analysis on tanker design. Note that they exclude the **Exxon Valdez** as an anomalous case and they consider the natural resource damage cost curve for large spills as speculative. Here too we are unable to reproduce Norway's average figures (which are divided into cleanup costs and compensation costs), and we suspect the analysis of this paper is valid more for the United States than the world.

Liu and Wirtz (2006) have not conducted their own analysis but cite the paper of Helton and Penn. To quote, "According to 48 cases presented in the work by Helton and Penn [29], this category cost ranges from USD147 to USD16,758 per ton and a mean value is estimated approximately USD2,058/ton." Greece has commented previously on Helton and Penn's work. This paper is also dated (spills between 1984 and 1997) and is valid for the United States spills.

Last but not least, we find the variable scale suggested by the US, in which a 'baseline' cost figure has to be determined, interesting. It is certainly compatible with the form of the scale suggested by the Coordinator.

In the next pages we present some analysis which we recently came across. It was part of a NTUA study and is based on reliable and rather comprehensive data from all recent Greek spills. This is because less than a handful of private cleanup companies are authorized to do such clean-up work in Greece, and the figures are from their records. We hope to be able to provide more details at MEPC.

Oil Spill Cleanup Cost in Greece

The results presented below were derived by an analysis focusing on the (marginal) response cost of oil spills in Greek waters; this was achieved through the development, compilation and the subsequent study of a dedicated database with records of oil spillage in Greece for the time period from 2000 to 2007. In this outline, the study was not based only on well known and/or significant oil spills, which is the *modus operandi* of most of the relative efforts presented in the international literature to date, but on all adequately documented records (i.e. 95 records) for oil pollution and respective confrontation efforts in Greek seas. Hence, the real picture of spillage response costs in Greece can be drawn in an accurate and reliable manner taking into account and analysing various aspects such as, the size of the spill, the type of spilled oil, the magnitude of impact on the shoreline, the method of the implemented oil confrontation, the activities of the area of interest, the capability (time) of reaction, the area of the broader water body (e.g., the Aegean Sea, the Gulf of Saronikos), etc.

It is therefore a fact that Greece is in position to report real costs regarding the response activities to oil pollution from ships in its waters, whereas other countries have not done the same thing in a similar, systematic way. The main advantage of this effort is that the whole spectrum of oil spillage is covered, which means that the analysis incorporates among other things small spills or operational oil pollution, in a more holistic and so indeed reliable approach. The presented procedure is by no means free of weaknesses; hence the limited number of processed records, mainly for the Ionian Sea (it is reminded that the overall number for Greece is 95 records) amplifies the fact that such issues should be always dealt with extreme caution and sometimes demands that generalizations, if any, should certainly be set under intense scrutiny, if not avoided altogether. Moreover, the elaborated costs emerged only from operations involving mechanical

means of oil confrontation; this is due to the fact that chemical dispersion is considered in Greece as the last option, hence it is practically not used in such efforts.

The results given in this communication explore the variability of response cost (€/ton, in Euros of 2007) against spill size distribution for Greek waters. In particular, the analysis of the aforementioned database gave an average value of response cost for oil spills in Greece of 8,942 €/ton (total response cost/total spill volume). However it should be made absolutely clear that potential decision making based on average values of variables that apparently have high volatility and variability should be put under exhaustive testing. In effect, the analysis for Greece showed the increased instability of the oil cleanup cost against spill size (Figure 1); a result that agrees completely with the findings from the international literature.

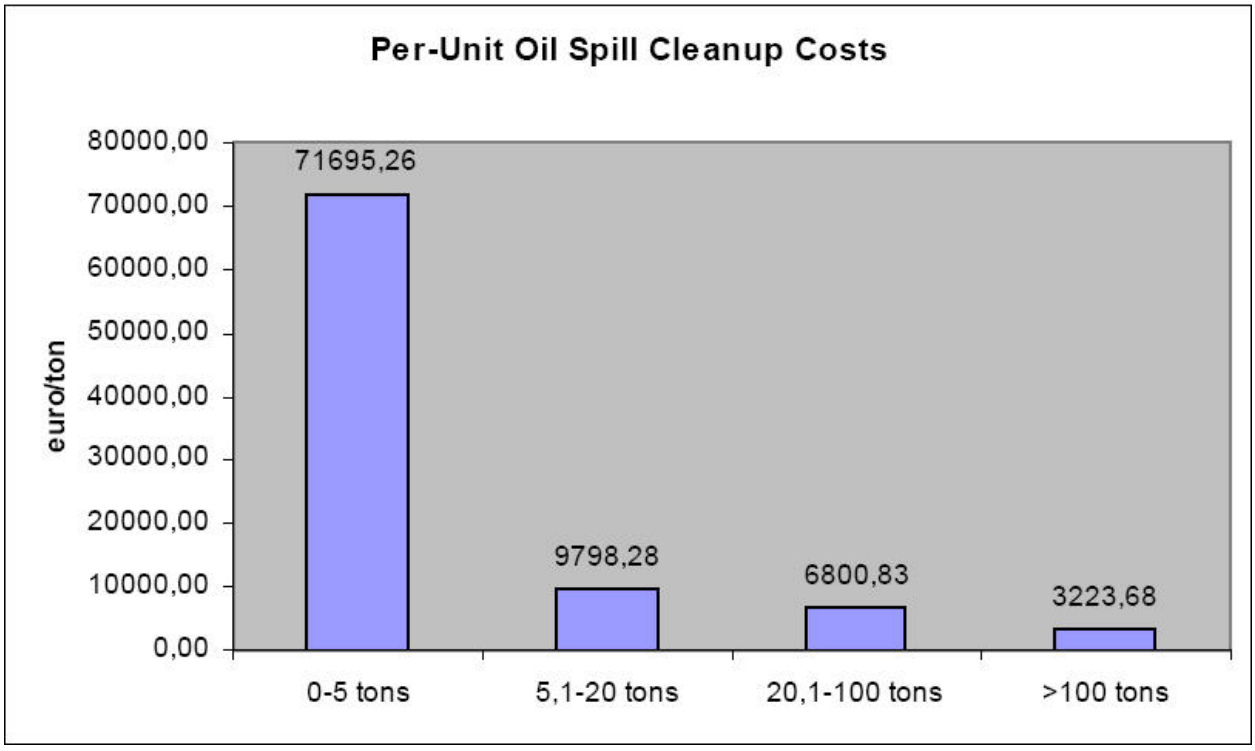

Figure 1: Oil spill response cost per spill size for Greek waters.

Figure 1 depicts a 20-fold difference for response costs (in €/ton) between 'small' and 'large' size spills, that is from 71,695 €/ton (for spills up to 5 tons) to 3,223 €/ton (for spills of more than 100 tons). The findings for the in-between size categories are also very interesting with the respective cost values "fluctuating" much more closer to the value of 'large' spills than the one of the so called 'small' spills; the response cost is 9,798 €/ton for oil slicks from 5 to 20 tons and 6,800 €/ton for spills from 20 to 100 tons. The four spill size categories were formulated according to the variation of the quantities recorded in the elaborated database.

Netherlands (27/3/2009)

Comments form the Netherlands to the draft report of the correspondence group on environmental risk evaluation criteria

First of all let me apologize for missing the deadline for the last round. However, we hope with this short paper we can still contribute.

General comments

The use of risk evaluation criteria in its context. Risk evaluation criteria in FSA's are used to determine whether a specific RCO would be recommendable from a safety or an environmental point of view (outside ALARP) or from a cost-effectiveness point of view (inside ALARP). After such an FSA, including its recommendations, is presented, or even reviewed, in IMO a decision needs to be taken on the recommendations of that study. A Sub-Committee and finally the Committees may adopt certain RCOs as recommended, however there may be other reasons just not to do that and even adopt certain RCOs that were not recommended based on the risk evaluation criteria. Obviously the adoption of a RCO will not be based on risk evaluation criteria only.

Therefore in our view the correspondence group should focus on a reasonable and workable value for CATS and it is not necessary to establish a value that is scientifically correct until after the comma.

Further we would like to point out that at MSC 86 there will probably be a working group tasked to review FSA studies that have been submitted to the IMO. In this light it would be helpful if the correspondence group could come forward with a proposal for an environmental risk evaluation criteria and not to prolong this discussion very much longer.

Comments per TOR

TOR 1
Looking at the different proposals forwarded to the correspondence group we highly appreciate the proposal put forward by the Coordinator and we support this, including the table in 21(e). We see this proposal as a good compromise between the different proposals that were put forward. We also support this to be included in the FSA guidelines with the aim to gain more practical experience with the use of this criteria. As an alternative we can also support the formula proposed by Japan. An appropriate factor could be chosen so that the formula would correspond as far as possible with the table as proposed. Based on par. 21(f) we would also support the establishment of a drafting group to be established at the next MEPC in principle. Obviously this will also depend on the number of working and drafting groups needed and priorities. Such a drafting group could develop an annex to the FSA guidelines with the volume-dependent CATS value as proposed and to be used as an example in FSA studies.

TOR 2
We do not see very much benefit in combining environmental and safety criteria at this stage. We propose to concentrate on the definition of environmental criteria in the first place and use environmental and safety criteria in parallel.

TOR 3
We support the comment from IACS that the severity index should be compatible with the existing severity index table contained in the FSA guidelines.

TOR 4
We have seen different proposals, however the Netherlands has have not reached a decisive conclusion yet.

TOR 5
We can agree to the text proposed by the Coordinator.

TOR 6
We can agree to the text by the Coordinator, however, we also support the establishment of a drafting group (in principle), specifically to write a proposal with respect to TOR 1.

IACS (27/3/2009)

IACS would like to thank the Coordinator for his hard work in compiling the report and can agree in general with the report's conclusions.

However, IACS feels that it is important to include the additional text (marked in **bold**) in the main body of the document (paragraphs 30-32) as this is crucial to our understanding of the tasks before us:

> IACS agrees that a variable scale for the CATS value, based on oil spill size, may be a sensible way to proceed, even if it makes that procedure slightly more complicated. However, there may also be other possibilities, like, e.g., using different values dependant on accident categories. For example, in grounding the oil spill is likely to hit the shore and therefore may potential have a higher consequence than a spill that occurs out at sea.
>
> **However, IACS feels that the E(TOT), defined as the expected total oil spill cost averted due to the global application of the RCO, should actually be the expected total value of not spilling a ton of oil. This value includes the costs saved of not spilling the oil but it also includes the willingness of consuming societies to avoid oil being spilt (regardless of the cost of the spill).**
>
> Therefore with regard to the example scale for CATS, IACS agrees that more discussion is required, and we think the different CATS should be used in some FSAs before a value, scale or formula is concluded. IACS also believes that, given the multiple references (for example those provided by the United States) that have now been presented to the correspondence group, the CATS value should be higher rather than lower. Therefore the example given in the proposal should be revised upwards.
>
> IACS believes that the severity index should be compatible with the existing severity index table contained in the FSA guidelines. This implies that each severity level should have the same monetary value as those for human loss or asset damage.

IACS agrees with Greece that all examples of CATS values/scales/formulae should be removed from the report to ensure that they are not mistaken as an approved CATS criteria.

CATS by Accident Type

IACS agrees with Greece that the right balance between accuracy and complexity needs to be found. Indeed the IACS alternate proposal would make the calculation slightly more complex but it can still be considered a trivial computation for a qualified engineer. Therefore the position represented by Greece is not a serious hindrance to the implementation of such a scheme.

Severity Index

IACS believes that Greece has misunderstood the proposal. There would still be the volumes of oil that would be used by those using the scale to categorize the consequence. The proposal is to use the logarithmic scale on the monetary values instead of the volumes. The volumes would be defined by calculating out the appropriate volume for each monetary value. Therefore IACS believes Greece's concerns are unfounded.

Cost benefit analysis

IACS feels that the ratio test proposed by Germany is equally valid for linear and non-linear CATS criteria and that it would certainly be one method that FSAs should use.

Cost of a spill clean-up and relevant data

IACS feels it necessary to reiterate again the view that has been expressed by a number of representatives on multiple occasions that the value we are searching for has a limited relationship to the clean up costs of actual oil spills. The values we are searching for is the amount society is willing to pay to prevent an oil spill.

This means that we have to consider the utility function associated with the risk aversion of the appropriate society to oil spills. The statement raises two questions: 1) What is the appropriate society? 2) How risk averse are they?

ALARP is a concept that is first and foremost a legal construct. It is used to show a company has done everything reasonably in its power to avoid some negative consequence. If they can demonstrate this, they can not be successfully sued or found guilty of criminal negligence. A company must show this for all geographical areas of operation and therefore they should always use the worst case scenario (i.e. the highest cost of averting the negative consequence).

We are now trying to use this construct to do the calculation on behalf of all ship owners. This is perfectly acceptable but means we too must use it by examining the most challenging cases.

Japan (27/3/2009)

First of all Japan would like to express our gratitude to the Coordinator for his great effort to seek a solution for these difficult issues. Japan thinks it is important to make constructive comments or proposals to solve our difficult TOR together. In this meaning, although there are different views and further discussion might be necessary for some of items, Japan would like to go along with the Coordinator's conclusions in the draft report with great appreciation.

Japan would like to make following comments just for clarification.

1. *Interim criteria*

Regarding the interim criteria, although Japan did not express our opposition in our previous comment, Japan supports Greece's comment with regard to the use of interim criteria. Japan is of the opinion that the criteria to be used are very fundamental and important matter which would greatly affect the decision to introduce new mandatory regulations in IMO.

Japan would understand importance of gaining experiences to obtain better criteria as indicated by Germany. However Japan would be afraid that results of any FSA studies using interim criteria would become misleading of IMO decisions although such studies is carried out just for gaining experiences.

Therefore Japan is of the opinion that it is important to clarify that:

(1) we should first decide the criteria before formal application
(2) results of any FSA studies using the interim criteria are invalid.

2. *CATS criteria*

Japan would qualitatively understand the comments from IACS and Norway with regard to using different CATS value for different accident categories. Example of grounding might be substantially related to "the location of oil spill". However Japan would rather share the opinion with Greece with regard to the impracticality of such CATS value from the practical point of view. Japan considers that balance between practicality and accuracy is important in order to put our discussion forward and to solve our TOR. Therefore Japan would share the same views with Greece and Netherlands that "we should focus on a reasonable and workable value for CATS".

As for the CATS criteria two approaches ("stepwise CATS" and "function-type CATS") are currently proposed to the correspondence group, Japan is planning to submit explanatory notes with regard to these two approaches to MEPC59.

As for the CATS value, Japan would basically support the concept of "environmental damage" as well as "willingness to pay" as pointed out by IACS, Norway and Germany although further discussion is necessary how much these effects would be.

3. *Transparency and validity of the analysis*

Japan strongly regrets to see Norway's official comment "*The number reported by Japan is so low that we suspect that there may be something wrong with the analysis itself*". Japan would like to remind that all source data and calculation method of Japanese analysis are already disclosed to the group.

Germany (27/3/2009)

Germany believes that the discussion has not reached a status for a drafting group to conclude. Instead, a working group appears to be a more appropriate platform for finalizing the discussion and to conclude on relevant items.

Germany welcomes the comments made by Greece because they provide a good summary of the work of the CG for MEPC 59.

These comments address various information and comments made in the recent discussion of the correspondence group. Please find enclosed to this email Germany's comments, some information or clarification with respect to the Greece comment.

- *Germany's understanding of the discussion until now that the majority of the CG favours CATS as defined by* $CATS = \frac{\Delta C}{\Delta R}$ *is, we feel, not entirely correct. The CG did not favour any formula in a volume-based approach. The above formula is true only if a linear approach and a single threshold value are assumed.*

In the Athens workshop Dr. Yamada explained that this formula should not be misinterpreted with the threshold value used for the cost benefit assessment. It is the formula that should be used to calculate the value that should be lower than the threshold value. And as shown in the following it can also be applied using non constant threshold values (e.g., the proposal by Japan):

$$CATS < CATS_{thr}$$
$$\frac{\Delta C}{\Delta R} < CATS_{thr}$$
$$\Delta C < \Delta R \cdot CATS_{thr}$$
$$\Delta C < (R_{original} - R_{new}) \cdot CATS_{thr}$$
$$\text{assumig that } CATS_{thr} \text{ is a function of the risk } (CATS_{thr}(R))$$
$$\Delta C < R_{original} \cdot CATS_{thr}(R) - R_{new} \cdot CATS_{thr}(R)$$

However, as we can see by the Greek comment, further discussion with respect to this issue is required to come to a solution.

- *The **subset** of 25 spills chosen by Germany surely has a very high average spill cost. The question is, how was this subset chosen.*

This subset was chosen on basis of a combination of Grey data, IOPCF data (IOPCF report 2007) and selected US data (1984 to 2000 in 1997 USD). The IOPCF data were given in different currencies and the exchange rates provided by the IOPCF report were used for the transfer into USD.

The IOPCF report contains no information whether inflation has been taken into account or not. The IOPCF report contains 107 reports between 1970 and 2001. 46 of 107 reports are accidents taking place before 1990. Only as an example, if the costs of an accident taking place 20 ago are corrected by an assumed inflation rate of 3 % the actual costs are 80 % higher.

- *... is this a representative sample of oil spills worldwide?*

Very interesting topic and Germany is convinced that the CG can spend a lot of time with this topic.

- *Shinryu Maru No 8*

Not considered by Germany in the selection of 25 accidents.

- *Yeo Myung*

Not considered by Germany in the selection of 25 accidents.

- ***Oil Spill Cleanup Cost in Greece***

Germany expects that the CG will welcome to get access to the background information, so for instance under which circumstances and where these accidents took place as well as what kind of oil.

United States (27/3/2009)

Please refer to the main body of the report.

_____