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FORMAL SAFETY ASSESSMENT

Consideration on the Development of Environmental FSA Guidelines

Submitted by Japan

SUMMARY

Executive summary:	This document summarizes the current status of the development of environmental FSA guidelines, contains a proposal for the methodology of assessing cost-effectiveness of multiple RCOs when applied in combination, and presents Japan's view on the review of an FSA study on crude oil tankers
Strategic direction:	12.1
High-level action:	12.1.1
Planned output:	12.1.1.1
Action to be taken:	Paragraph 10
Related documents:	MEPC 59/17/1, MEPC 60/WP.11 and MEPC 60/22

Introduction

1 The Committee has had extensive discussions on the development of environmental FSA guidelines relating to oil spills from ships. In this document, Japan summarizes the current progress of the development of the guidelines in order to have clear understanding on remaining tasks. Japan also proposes a methodology of assessing cost-effectiveness of multiple RCOs when applied in combination, taking into account interdependency of multiple RCOs. Lastly, Japan presents its view on the review of an FSA study on crude oil tankers.

Current status of the development of the environmental FSA guidelines

2 With regard to safety FSA, every FSA study on safety requirement should be conducted based on the existing FSA guidelines, "Guidelines for formal safety assessment (FSA) for use in the IMO rule-making process" (MSC/Circ.1023-MEPC/Circ.392, as amended). According to the guidelines, a study should be considered through five steps, each of which has important criteria such as Frequency Index and ALARP region.

3 In the case of environmental FSA on oil spill accidents, the same five steps should be used, but criteria to be used in each step are different from those used in the safety FSA guidelines. Thus, to date, the Committee has focused its discussion on how to establish key criteria in each step. The current status of the development of the environmental FSA guidelines is described in paragraph 3.1 to 3.5; it should be noted that discussions on most of the steps (not only step 4 but also step 1 and step 2) have as yet not been concluded; it should be also taken into account that each step is closely related; and, no FSA case studies on oil spill accidents can be conducted before finalization of these criteria.

.1 Step 1 is the identification of hazard. In this step, hazards are identified and listed, and associated scenarios are ranked. The ranking is undertaken by using Risk Index (RI), which consists of two important indices: severity index (SI) and frequency index (FI). Only high ranked scenarios can move forward to step 2. In other words, scenarios to be analysed in step 2 cannot be determined unless both criteria of SI and FI are established. Regarding FI, the Committee, at its sixtieth session, endorsed the Working Group's view on using the FI already in use for the safety FSA methodology (MEPC 60/22, paragraph 17.8.5). As to SI, the Committee was informed that the Working Group agreed that the exact detail of the SI could not be finalized until the CATs function is resolved (MEPC 60/WP.11, paragraph 31).

.2 Step 2 is the risk analysis. The purpose of this step is to investigate in detail the causes and consequences of the more important scenarios identified in step 1. In this step, the risk level of a scenario is categorized into three levels in the diagram of Frequency and Tons of oil spilled by accident (F-T diagram):

.1 *Intolerable*: the risk level cannot be justified except in extraordinary circumstance;
.2 *Negligible*: the risk level has been made so small that no further precaution is necessary; and,
.3 *As low as reasonably practicable (ALARP)*: the risk level falling between the above two States.

Only a case in which the risk level falls into either ALARP or Intolerable region is it to be considered in step 3. In other words, step 3 cannot be conducted unless the appropriate ALARP region and the F-T diagram are established and risk levels of scenarios are identified. In this regard, the Committee was informed of the Working Group's conclusion that it might be premature to take this issue forward until such time that the CATS function is resolved (MEPC 60/WP.11, paragraph 32-35).

.3 Step 3 concerns Risk control options (RCOs). The purpose of step 3 is to propose effective and practicable RCOs. As described in paragraph 3.2, RCOs are proposed only for risks considered to be in either in the ALARP or the Intolerable regions. Therefore, the risk analysis in step 2 is indispensable for step 3.

.4 Step 4 is the cost benefit assessment. The purpose of step 4 is to identify and compare benefits and costs associated with the implementation of each RCO identified and defined in step 3. The CATs threshold is the key criterion for comparison of cost and benefit. The Committee has not come to the conclusion yet although some developments were made at MEPC 60.

.5 Step 5 is recommendations for decision-making. The purpose of step 5 is to define recommendations which should be presented to the relevant decision makers in an auditable and traceable manner. This step is conducted after every previous step is implemented appropriately.

Step	Purpose	Required criteria	Current status of development
Step 1	to identify a list of hazards and associated scenarios prioritized by risk level specific to the problem under review	-Frequency Index (FI) -Severity Index (SI)	FI: finished SI: to be considered after finalizing CATS criteria
Step 2	to investigate in detail the causes and consequences of the more important scenarios identified in step 1	ALARP region (F-T diagram)	ALARP region: to be considered after finalizing CATS criteria
Step 3	to propose effective and practicable RCOs (Risk Control Options) regarding historical risks and identified risks (from steps 1 and 2)	—	—
Step 4	to identify and compare benefits and costs associated with the implementation of each RCO identified and defined in step 3*	CATS (Cost of Averting a Ton of Oil Split) threshold	CATS threshold: to be developed
Step 5	to define recommendations which should be presented to the relevant decision makers in an auditable and traceable manner	—	—

* It is essential to develop a methodology for assessing benefits and costs of RCOs when they are applied simultaneously so as to achieve the accurate and reliable assessments (paragraph 5 to 6).

Figure 1: Required criteria and their development status in each step of environmental FSA

4 It is urgent to conclude on the issues mentioned in paragraph 3.1 to 3.5 so as to conduct FSA studies on oil spill accidents. Japan would like to continue placing its utmost efforts for earlier finalization of the environmental FSA guidelines.

Assessment of cost-effectiveness of multiple RCOs when applied in combination

5 Careful consideration should be given in step 4 (cost benefit assessment) when multiple risk control options (RCOs) are considered to be applied simultaneously. Paragraph 7.2.3 of the existing FSA guidelines provides instruction on evaluation of RCO interdependencies. However, the instruction is conceptual, and it is unclear how re-evaluation should be conducted. Japan believes that the clear indication on the methodology for assessing cost-effectiveness of multiple RCOs should be provided in the environmental FSA guidelines in order to avoid incorrect assessment and to choose truly cost-effective RCOs.

Proposal for a methodology of assessing cost-effectiveness of multiple RCOs

6 Japan proposes that assessment of cost-effectiveness of multiple RCOs should be conducted as follows. Also, Japan suggests that this issue should also be considered in the review of safety FSA guidelines which has been being discussed in MSC.

.1 Order of RCOs: determine the RCO to be applied firstly among the RCOs which are considered to be cost-effective in step 4. Then, the subsequent order of RCO applications should be decided (RCO 1, RCO 2, RCO 3, …).

.2 Reassessment of RCO 2: RCO 2 should be reassessed from step 1 to step 4. In this process, the event tree should be re-constructed, taking into account the changed risk levels because of RCO 1.

.3. Reassessment of other RCOs: other RCOs (RCO 3, RCO 4, …) should be reassessed in a similar manner if ROC 2 is justified as a result of reassessment as described in paragraph 6.2.

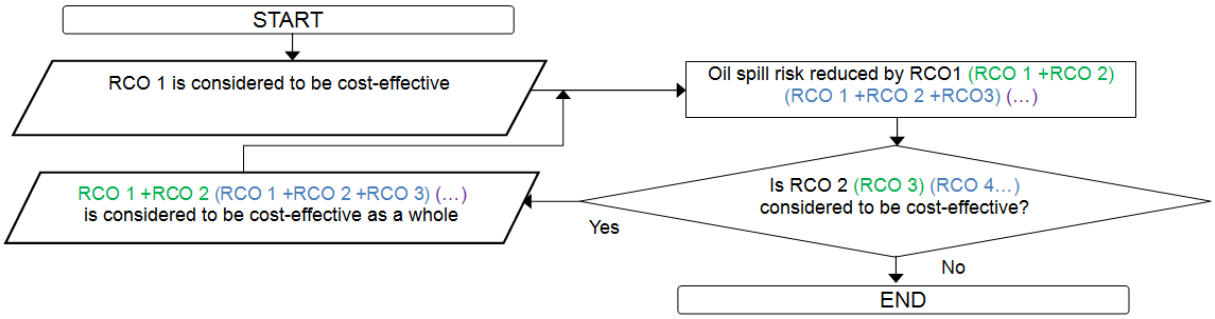

Figure 2. Flow chart of recursive FSA to assess cost-effectiveness of multiple RCOs

Method to use the non-linear cost function in FSA studies

7 At MEPC 59, Japan proposed the method of establishing CATS based on the non-linear concept (MEPC 59/17/1). At the last session, a majority of the members of the expert group agreed that a non-linear function is more justifiable by the available data (MEPC 60/WP.11, paragraph 17). However, as regards the integration of a non-linear cost function within the FSA methodology, there was the concern that the review process may be more complicated and less transparent (MEPC 60/WP.11, paragraph 23). To address the concern expressed, Japan would like to make it clear that the risk with a volume-dependent CATS (CATS[W]) is simple and easy to calculate because a CATS value is obtained by simple calculation based on a CATS function when the oil spill volume is given. Once a CATS value is obtained, it can be dealt in the same manner as a constant CATS threshold. Furthermore, in general, an event tree is developed by using Excel during an FSA study, and the oil spill volume, W, is given by the event tree. Thus, a non-linear CATS is no more onerous and complicated than a constant CATS.

Review of tanker FSA at FSA GoE

8 An FSA study on crude oil tankers had been submitted to MEPC 58 (MEPC 58/17/2 and MEPC 58/INF.2). At the last session, there was a proposal to refer the FSA study on crude oil tankers to the FSA expert group to be established at MSC 87, with the view that the group could review the methodology and data related to all steps other than step 4

(cost benefit assessment). Other delegations expressed the view that it is premature to take forward the evaluation of the FSA study because a number of key steps cannot be finalized. After extensive discussions, the Committee agreed to adhere to its early decision, which was to defer consideration of the study until the environmental risk criteria are finalized (MEPC 60/22, paragraph 17.9 to 17.14).

9 As described in paragraph 3, most of the criteria to conduct the environmental FSA steps (step 1, step 2 and step 4) have not been finalized yet. Taking this situation into account, it is technically impossible to review the FSA study on crude oil tankers with regard to oil spill aspects in the FSA expert group. Thus, Japan is of the view that the agreement at the last session should be retained until the work on the environmental FSA study is finalized.

Action requested of the Committee

10 The Committee is invited to take note of the information, as appropriate, and in particular to:

.1 note information on the current status of the development of the environmental FSA guidelines (paragraphs 3, 4 and 7);

.2 consider the proposal for methodology of assessing cost-effectiveness of multiple RCOs (paragraph 6);

.3 inform the MSC of the results of the discussion on the above proposal, for consideration in the review of safety FSA guidelines, if deemed appropriate (paragraph 6);

.4 note information on method to use the non-linear cost function in FSA studies (paragraph 7); and

.5 consider the comments on the FSA study on an oil tankers (paragraph 9).