

# **ENVIRONMENTAL RISK EVALUATION CRITERIA: Status report**

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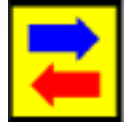
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# The need for 'proactive' regulation

- **Early stage** identification of main factors that affect safety
- Development of regulatory action to **prevent** undesirable events
- Formulation of regulation **BEFORE** event
- Formulation of regulation **AFTER** careful analysis of **all** of its implications



# [Parenthesis:

- Much of the story thus far is quite the opposite
- Many regulations have been adopted **ad hoc** in the aftermath of catastrophic accidents
- *Exxon Valdez, Estonia, Erika, Prestige,*  
and so on. ]



# The long road from reactive to proactive regulation

IMO has two basic proactive tools:

- **Formal Safety Assessment** (adopted by MSC in 2001 and by MEPC in 2002)
- **Goal Based Standards** (not yet fully in place)



# Formal Safety Assessment (FSA)

Was introduced by the IMO as

- “a rational and systematic process for accessing the risk related to maritime safety and the protection of the marine environment and for evaluating the costs and benefits of IMO’s options for reducing these risks” (FSA Guidelines in MSC circ. 1023, MEPC circ. 392)



# Risk and Risk Control Options (RCOs)



- Risk = probability X consequence
- RCO: any measure that can reduce the risk
- Basic premise: RCOs to be adopted must be “cost-effective”



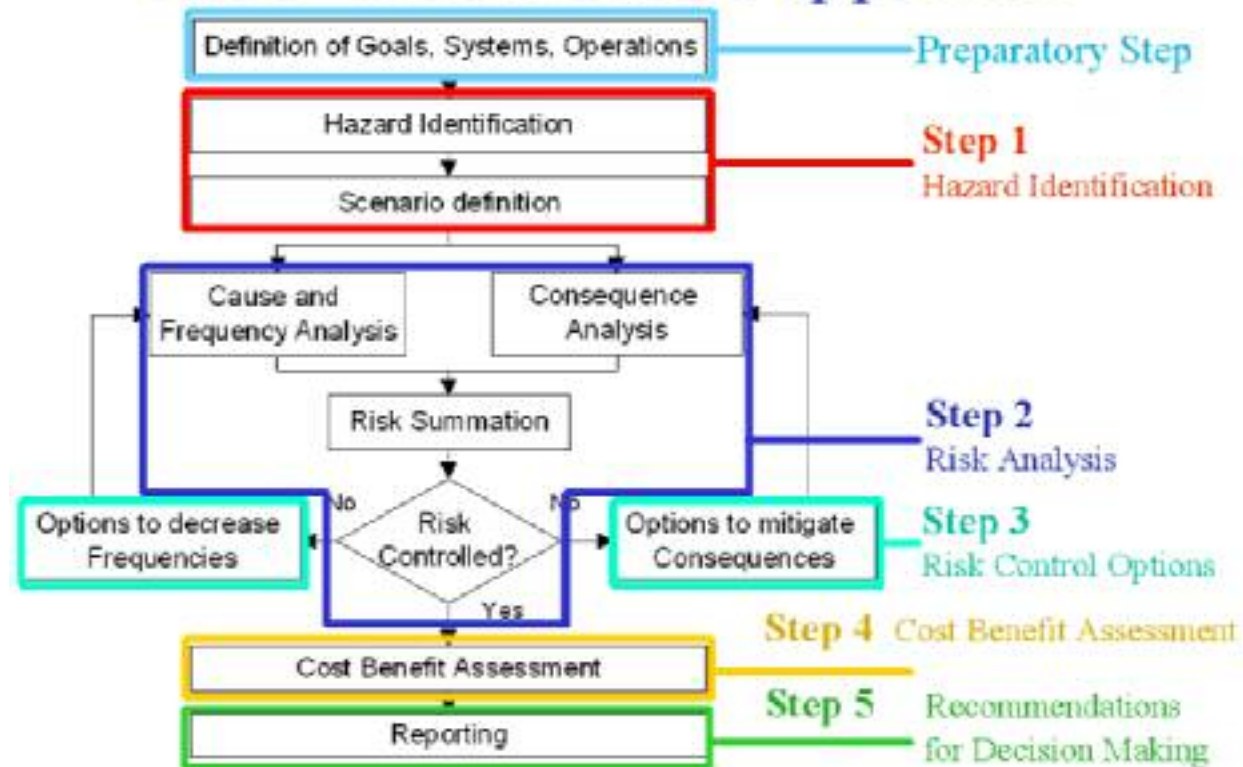
# Sample RCOs (mainly for tankers)

- Tanker double sides
- Tanker double bottoms
- Smaller tanks
- Inert gas in ballast tanks
- More steel
- Fuel tanks not close to ship hull
- Coulombi egg/ passive vacuum
- A specific design that limits discharge once it happens
- Twin screws
- ECDIS
- VTMIS
- Etc

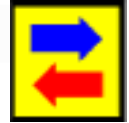


# FSA steps

## FSA - a risk based approach







# Basic topic of today's workshop

- So far FSA guidelines do not account for environmental risk
- How do we cover it?





# IMO action: MSC

- At MSC 80 (March 2005), an FSA correspondence group was tasked to amend the FSA guidelines
  - Something that was eventually accomplished (see doc. MSC 83/INF.2)
- this CG was also tasked to consider the development of ***“a risk index relevant to the protection of the marine environment”***.
- MSC 81 (May 2006) decided to submit the results of the group’s deliberations on this subject directly to MEPC



# The ball to MEPC

- Doc. MEPC 55/18 (July 2006): Outcome of MSC 81 on FSA

(among other things):

- Annex 3: [Environmental Risk Acceptance Criteria](#)



# MEPC 55 (July 2006)

- *“The Committee considered also the draft Environmental risk evaluation criteria set out in Annex 3 to document MEPC 55/18 and agreed that **the draft criteria still needed indepth consideration from the marine environment protection perspective**. Subsequently, the Chairman invited Members and international organizations to consider the draft **Environmental Risk Evaluation Criteria** during the intersessional period and submit comments thereon to MEPC 56, for further consideration prior to referring the agreed text to the MSC for appropriate action.”*



# Open Big Parenthesis

- The topic of economic valuation of the costs of oil spills, ranging from cleanup all the way to socioeconomic and natural resource damage costs, **is not new**.
- It dates to the **early 70's**, if not earlier.
- Relevant scientific work and literature is **significant and extensive**.



# Cost components (typical)

## ■ Cleanup (response) cost

- Either at sea or at the shoreline.
- Depends on response level and response strategy and tactics

## ■ Damage cost

- economic consequences to the ship owner,
- to the cargo owner,
- to fisheries,
- to tourism,
- to other industries that may be impacted negatively by the spill,
- quantifiable damages to natural resources,
- Etc

Close parenthesis



MEPC 58/18 reference to EU project SAFEDOR  
[www.safedor.org](http://www.safedor.org)

- Skjong, R., E. Vanem, Ø. Endresen (2005). "Risk Evaluation Criteria" SAFEDOR-D-4.5.2-2005-10-21-DNV; 21 October 2005.
- Criterion of "Cost to Avert one Tonne of Spilled Oil" (CATS)
- Equivalent to "Cost to Avert a Fatality" (CAF), which is used in FSA



## Cost to Avert a Fatality (CAF) criterion

- For an RCO to be cost-effective, its CAF should be  $\leq \$3$ million

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

$$NCAF = \frac{\Delta C - \Delta B}{\Delta R}$$

$\Delta R$ : reduction of fatalities





# SAFEDOR approach

FOR A SPECIFIC RCO, define:

$$\text{CATS} = \frac{\Delta(\text{per ship cost for this RCO})}{\Delta(\text{per ship oil spill volume})}$$

□ Denominator measures oil spill volume averted

■ RCO cost effective if **CATS**  $\leq$  threshold



# CATS threshold = ?

- SAFEDOR: After some analysis:

CATS threshold was computed at

**\$60,000/tonne**

# Spill cleanup cost as a function of volume

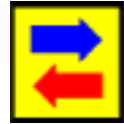


Figure 17: Average cleanup cost per tonne spilled (in 1997 US\$) based on analysis of oil spill cost data in the OSIR International Oil spill data base (38-year record of over 8,600 oil spills) [75].

# Spill cleanup cost as a function of volume

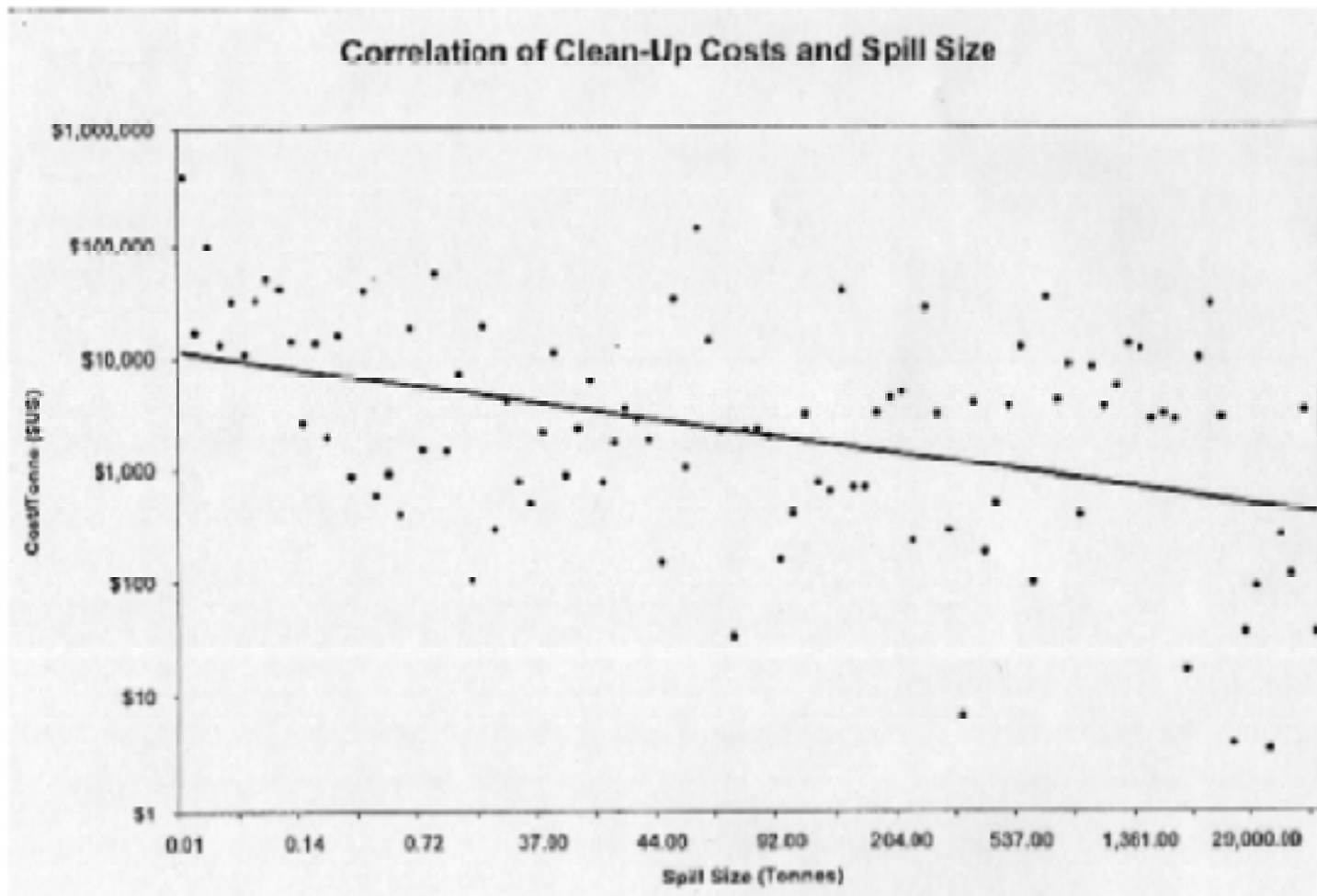


Figure 18. Correlation of per-tonne cleanup costs and spill size based on analysis of oil spill cost data in the OSIR International Oil spill data base [75].



# What \$60,000/tonne means

■ Prestige \$4.9 billion	(1,633)*
■ Braer \$6 billion	(2,000)*
■ Torrey Canyon \$8.5 billion	(2,833)*
■ Haven \$9.9 billion	(3,300)*
■ Amoco Cadiz \$16 billion	(5,333)*
■ Castillo de Bellver \$17.8 billion	(5,933)*
■ Atlantic Empress \$19.7 billion	(6,567)*

\*equivalent fatalities (assuming \$3million/fatality)

# Towards MEPC 56 (2007)



- Submission by Greece

INTERNATIONAL MARITIME ORGANIZATION



IMO

*E*

MARINE ENVIRONMENT PROTECTION  
COMMITTEE  
56th session  
Agenda item 18

MEPC 56/18/1  
4 May 2007  
Original: ENGLISH

## FORMAL SAFETY ASSESSMENT

Environmental Risk Evaluation Criteria

Submitted by Greece

### SUMMARY

*Executive summary:* This document brings to the Committee's attention some points pertaining to Environmental Risk Evaluation Criteria. This document may be useful within the process of revision of the FSA guidelines

*Action to be taken:* Paragraph 29

*Related documents:* MSC 81/18; MSC 81/WP.8; MSC 82/INF.3; MSC 82/24; MEPC 55/18; MEPC 55/23 and MEPC 56/18



# MEPC 56 (July 2007): Formation of a Correspondence Group (CG)

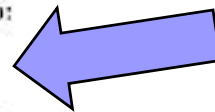
18.7 The Committee, noting that further work, including more research, was needed on the subject, agreed to establish a correspondence group, under the co-ordination of Greece<sup>\*</sup>, with the following terms of reference:

- .1 to review the draft Environmental Risk Acceptance Criteria as set out in annex 3 to document MEPC 55/18, taking into account document MEPC 56/18/1 (Greece) and the comments made in plenary with a view to finalize the Criteria; and
- .2 to submit a written report to MEPC 57.

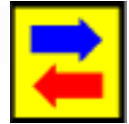
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\* Co-ordinator of the correspondence group:

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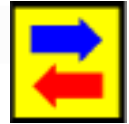
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# Approach

- Basic question: How can FSA be extended to account for environmental criteria?
  
- Terms of reference of CG limited to **oil pollution**
  - From cargo of tankers
  - From bunker spills of any ship





# CG work so far (summary)

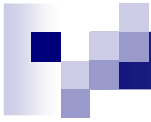
- Several rounds of submissions
- Many positions (generally divergent)
- Web site
- Two reports to MEPC:
  - To MEPC 57 (April 2008)
  - To MEPC 58 (October 2008)



# CG members (current)



- Denmark
- Finland
- France
- Germany
- Greece
- Japan
- Malaysia
- Netherlands
- New Zealand
- Norway
- Spain
- Turkey
- UK
- USA
- BIMCO
- IACS
- Intertanko
- OCIMF



# At MEPC 58 (Oct. 2008)

- Informal consultation group discussed all pending issues and reported back
  - Canada, China, Finland, Greece, Japan, Malaysia, New Zealand, Norway, Turkey, and United States. Observers: BIMCO, OCIMF and Intertanko.
- Convergence was achieved on a number of issues
- But some other issues still remain open



# Convergence areas:

- In spite of non-linearities, in Steps 3 and 4 of the FSA one can use “oil spill cost per unit volume” as a criterion
- Risk matrix or index for environmental criteria is straightforward if a volume-based approach is followed
- Same on how to combine environmental and safety criteria in Step 4.



# Still open: CATS threshold

- The group noted that it would be impossible to conclude at this time what the appropriate value of the “spill cost per unit volume” (or CATS) threshold might be.
- But a clear majority expressed the opinion that the CATS threshold should be much less than \$60,000/tonne.



# Discussion

- Japan's non linear approach (IOPCF data): average spill cost \$2,000-4,000 per tonne
- Question: what costs are included in these figures?
- Some suggested two CATS values, one for small and another for large spills



# What the CG has to do for MEPC 59

- **Recommend CATS threshold**
- Recommend how to combine environmental and safety criteria for those RCOs that effect both
- Recommend appropriate risk matrix or index for environmental criteria
- Recommend appropriate ALARP region and F-N diagram, including an appropriate value for the slope of the F-N curve
- Address the issue of collection and reporting of relevant data
- Recommend any further relevant action



# Meanwhile!

- FSA study on crude oil carriers officially submitted to MEPC 58 by Denmark
- Based on SAFEDOR analysis, including \$60k for CATS threshold
- Recommends a set of 7 RCOs for mandatory adoption, including:
  - Increased side tank widths and double bottom depths for new tankers





# FSA Expert Group (MSC)

- Will convene 1<sup>st</sup> time at MSC 86 (June)
- Will take a look at this FSA study and all other FSA studies already submitted
  - LNG carriers
  - Container vessels
  - Cruise ships
  - Ropax
  - Etc



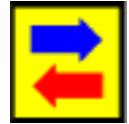
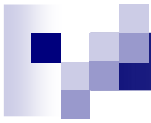
# Our CG: since October,

- Further input provided by Japan on their study
- Some comments received (from USA and Greece)
- This workshop!



# Deadlines for our CG

- For further input to CG: March 15
- To write draft report: March 31
- To submit report: April 13
  - 45 days from today!
  
- MEPC 59: July 13-17, 2009



Final outcome?





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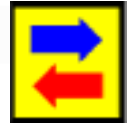
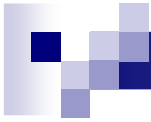
**PLEASE NOTE THAT THIS SECTION IS CURRENTLY UNDER CONSTRUCTION**

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3. Psaraftis, H.N. (2008), "[Environmental Risk Evaluation Criteria](#)", WMU Journal of Maritime Affairs, October 2008 issue (In press)
4. [MEPC 58-Report of the Correspondence Group on Environmental Risk Evaluation Criteria \(Co-ordinated by Prof. Psaraftis\)](#)
5. [Psaraftis, H.N., C.A. Kontovas \(2008\)](#), "[Ship Emissions Study](#)", National Technical University of Athens, report to Hellenic Chamber of Shipping, May
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9. [Ψαράφτης Χ.](#), [Θαλάσσια ρύπανση: Πρόληψη και καταστολή](#) , παρουσίαση στο Ευγενίδειο Ίδρυμα, ημερίδα Σχολής Ναυπηγών Μηχανολόγων Μηχανικών, στο πλαίσιο του εορτασμού των 170 ετών του ΕΜΠ, 5/12/2007.
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11. INTERNATIONAL MARITIME ORGANIZATION, [Formal Safety Assessment, Environmental Risk Evaluation Criteria](#) , Marine Environment Protection Committee, 4 May 2007
12. Kontovas, C.A., Psaraftis, H.N., Zachariadis, P., [The Two C's of the Risk-Based Approach to Goalbased](#)

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**THANK YOU!**

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