Experience with implementation of LQI at the international Maritime Organization

LQI DTU 2012.08.22

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MANAGING RISK

IMO – International Maritime Organization

IMO – the International Maritime Organization – is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships.
Located in London

Use of use Risk Analysis for justifying Regulations (1995)

INTERNATIONAL MARITIME ORGANIZATION

IMO

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MARITIME SAFETY COMMITTEE
83rd session
Agenda item 21

MSC 83/INF.2
14 May 2007
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FORMAL SAFETY ASSESSMENT

Consolidated text of the Guidelines for Formal Safety Assessment (FSA) for use in the IMO rule-making process (MSC/Circ.1023–MEPC/Circ.392)

Background

- Representing Norway in the International Maritime Organization since 1995
- IMO is a UN organisation:
  - Globally accepted criteria for shipping
- Work with introducing risk assessment as basis for the decision making process
  - Formal Safety Assessment
  - Risk based rules & regulations
- Not initially intended to be used for individual design
- Opening for use in individual ship design
  - Referred to as risk based design
  - SAFEDOR project prepared a book ‘Risk Based Ship Design’, Springer (2009) (Also available in Chinese)
  - SAFEDOR ‘Guidelines for approval of Risk Based Ship design’, Submitted by Denmark, MSC86/5/3 (2009) – Currently developed to an IMO Guideline

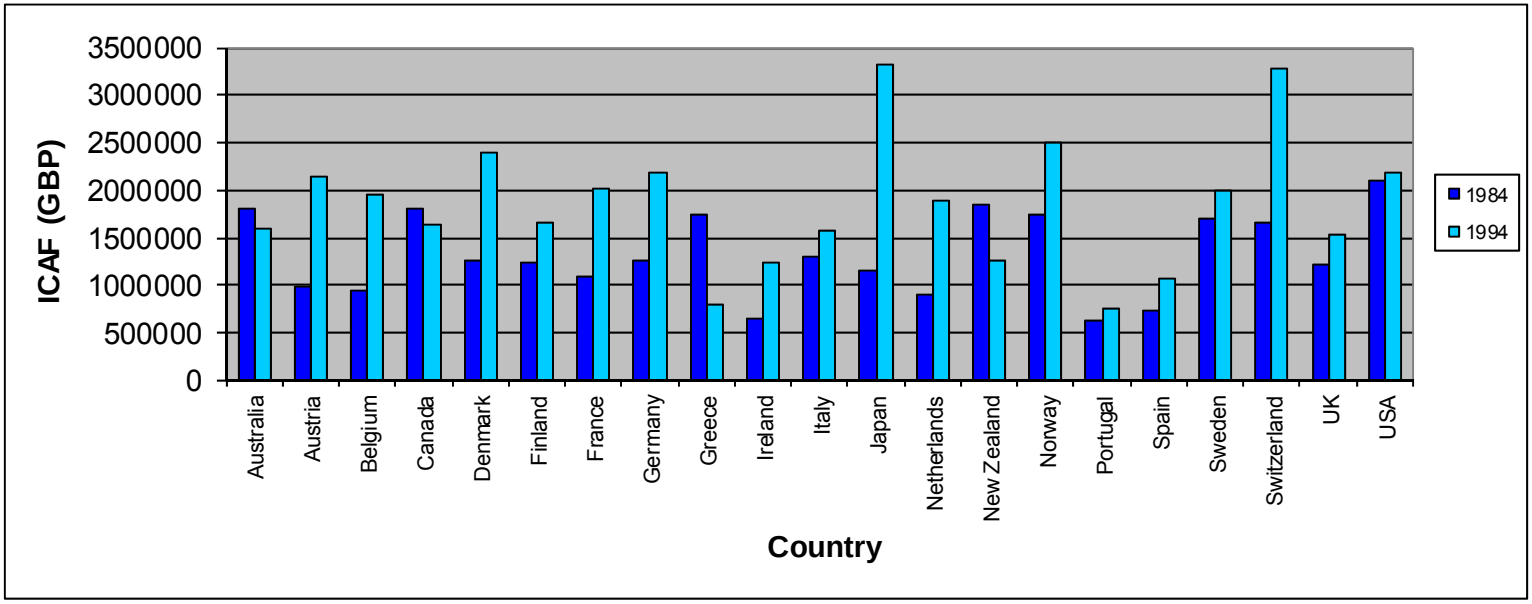
The first FSA – Helicopter Landing area on Cruise ships

- Recommendation originally for RoPax – panel of experts/Post Estonia
- Made applicable also to Cruise Ships by IMO/MSC
- DNV carried out an FSA (1997)
- Conclusion:
- The Committee noted that the cost-effectiveness of a helicopter landing area, in terms of the cost of implementation divided by the expected number of additional lives saved (i.e. ICAF, the implied cost of averting a fatality) is US$37 million and that, acknowledging the uncertainties in the evaluation of both risk benefit and cost, the group agreed that the ICAF may range from about US$12 to 73,000 million.
- The regulation was repealed
- The current terminology:
- GCAF = ΔC/ΔPLL, NCAF = (ΔC-Δ$Benefit)/ΔPLL
- Net and Gross Cost of Averting a Fatality.

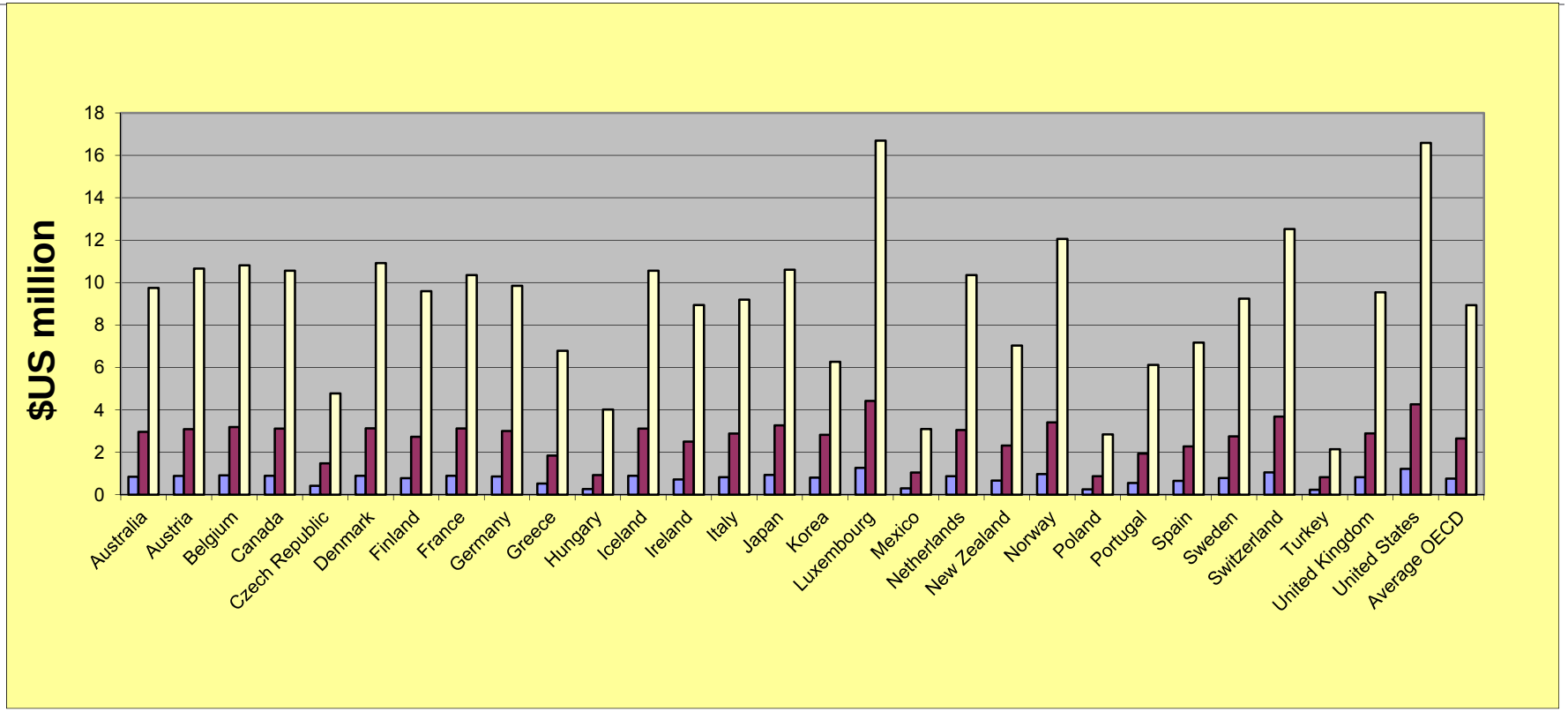
Papers on LQI

- Skjong, R and KO Ronold (1998) '*Societal Indicators and Risk Acceptance'*, Offshore Mechanics and Arctic Engineering Conference, OMAE 1998
- SKJONG, R AND K RONOLD (2002) '*SO MUCH FOR SAFETY*.' OMAE-2002-28451, OSLO, JUNE 2002.
- Skjong, R and K Ronold (2004) 'Criteria for cost effectiveness of safety measures', Journal of offshore mechanics and arctic engineering. J. Offshore Mech. Arct. Eng. / Volume 126 / Issue 1 129 (6 pages)
- General about risk acceptance, where also LQI referenced
  - Norway (2000) 'FORMAL SAFETY ASSESSMENT, Decision parameters including risk acceptance criteria', MSC72/16
  - International Association of Classification Societies (IACS) (2004) 'FORMAL SAFETY ASSESSMENT, Risk evaluation, MSC78/19/2
  - Rolf Skjong, Erik Vanem and Øyvind Endresen 'Risk Evaluation Criteria, http://www.safedor.org/resources (30.000 downloads in a 2 years period)
  - LQI included in the IACS Training course on Formal Safety Assessment since 1998

1998 paper

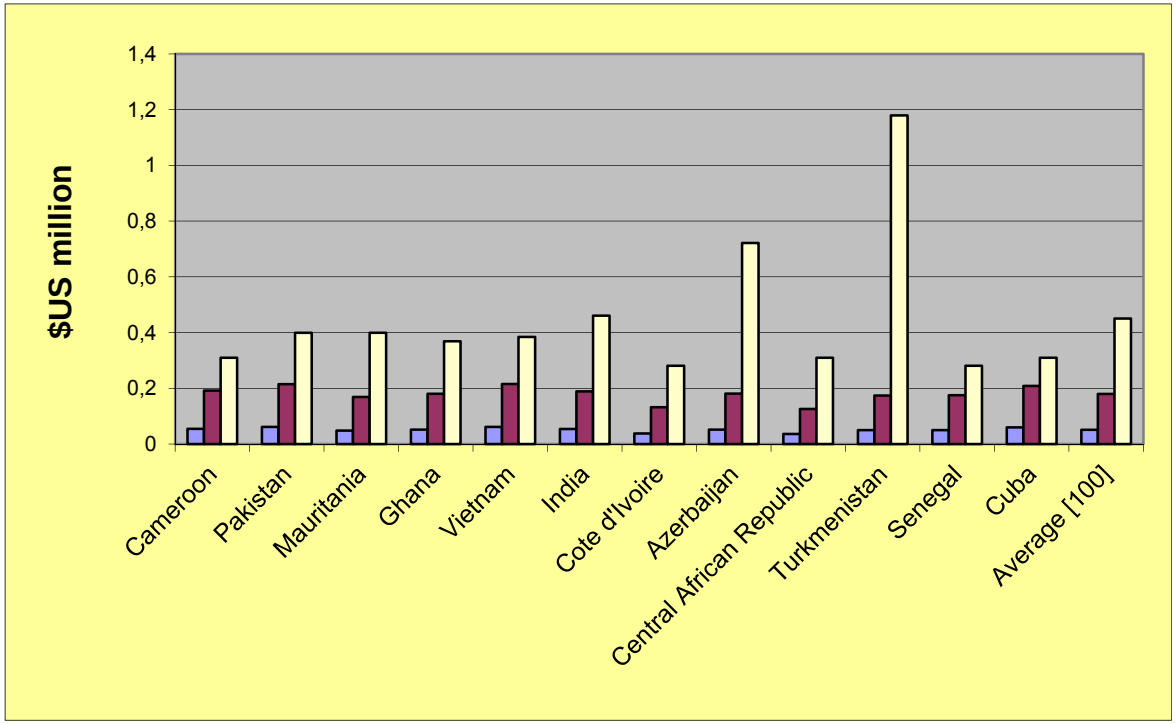


2002 paper



The net cost of averting fatality criteria for OECD member countries. The blue (left) columns would be defendable by purely economic considerations, the red (middle) columns represent the societal value (derived from the societal indicators), the yellow (right) columns represent the limit where no regulation should be implemented as individuals would use the resources better on life saving. The OECD average numbers are $ 0.76 million, $ 2.65 million and $ 8.93 million. The factor differences are 3.50 and 3.33.

Problematic to set global standards



Optimum safety in OECD countries may be ‘net killers’ in developing countries.

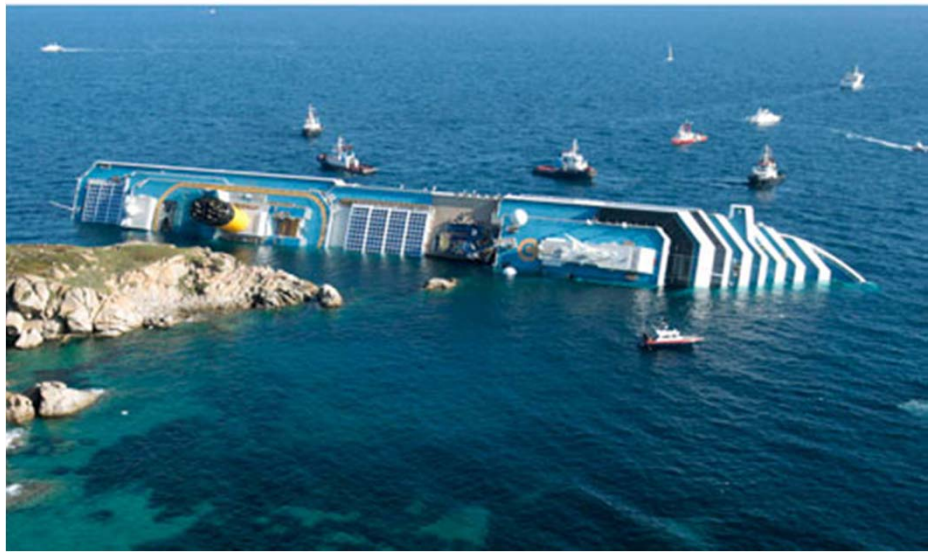
Motivation

- Development of a comprehensive FSAs covering all aspects of ship safety, security and environmental protection, looking into all possible risk control option is a massive task
  - In practice impossible to finance and run such projects
- Need methods that can demonstrate cost effective risk control option and implement them.
- Solution in Norway (2000) document
  - Demonstrated that most ship are in the ALARP area – allowing for use of cost/benefit analysis
  - Propose criteria for cost effectiveness evaluation
    - Based on willingness to pay – previous decisions by IMO
    - Based on willingness to pay – previous decisions by other stakeholder
    - Based on willingness to pay – in national regulations
    - Based on LQI – OECD average (sine 95% of goods transported are between OECD countries –in 2000)
    - **All methods gave similar results**
    - For ill-health an injuries: QALY criterion: e/2 CAF
  - All later studies have used a $3m criterion

LQI As referenced in the IMO FSA Guidelines

- LQI (Life Quality Index): The index for expressing the social, health, environment and economic dimensions of the quality of life at working conditions. The LQI can be used to comment on key issues that affect people and contribute to the public debate about how to improve the quality of life in our communities
- 3.2 The proposed values for NCAF and GCAF in Table 2 have been derived by considering societal indicators (refer to document MSC 72/16, UNDP 1990, Lind 1996). They are provided for illustrative purposes only. The specific values selected as appropriate and used in an FSA study should be explicitly defined. These criteria given in Table 2 are not static, but should be updated every year according to the average risk free rate of return (approximately 5%) or by use of the formula based on LQI (Nathwani et al. (1996), Skjong and Ronold (1998, 2002), Rackwitz (2002 a,b).

2012 Update: GOALDS Project



- It is noted that the $3million is in reality derived from 1998 statistics for OECD member countries. If adjusted for US inflation rates until 2010, this figure should be updated to $4.14 million (2010). If adjusted for a 5% risk free rate of return the figure should be $5,39million (2010), and if a full update based on LQI for OECD member countries is carried out the result is $7,45million.

Update

- In practice the updating should be done regularly/annually by a secretariat
- This require a defined procedure and defined statistics
- G – Good statistics, changes a few percentages annually
- E – Good Statistics, changes a few percentages annually
- W – No good available statistics, changes very slowly

Conclusions

- Because resources are limited criteria are necessary
- LQI is currently the best idea available to set safety criteria
- Applicable for policy decision in all areas (industry, transport, health sector)
  - Not to be applied in emergency situations
- Consistent with use of cost effectiveness analysis
- Similar criteria are available for environmental issues (CO_2, NO_x, SO_2, etc.)

Safeguarding life, property and the environment

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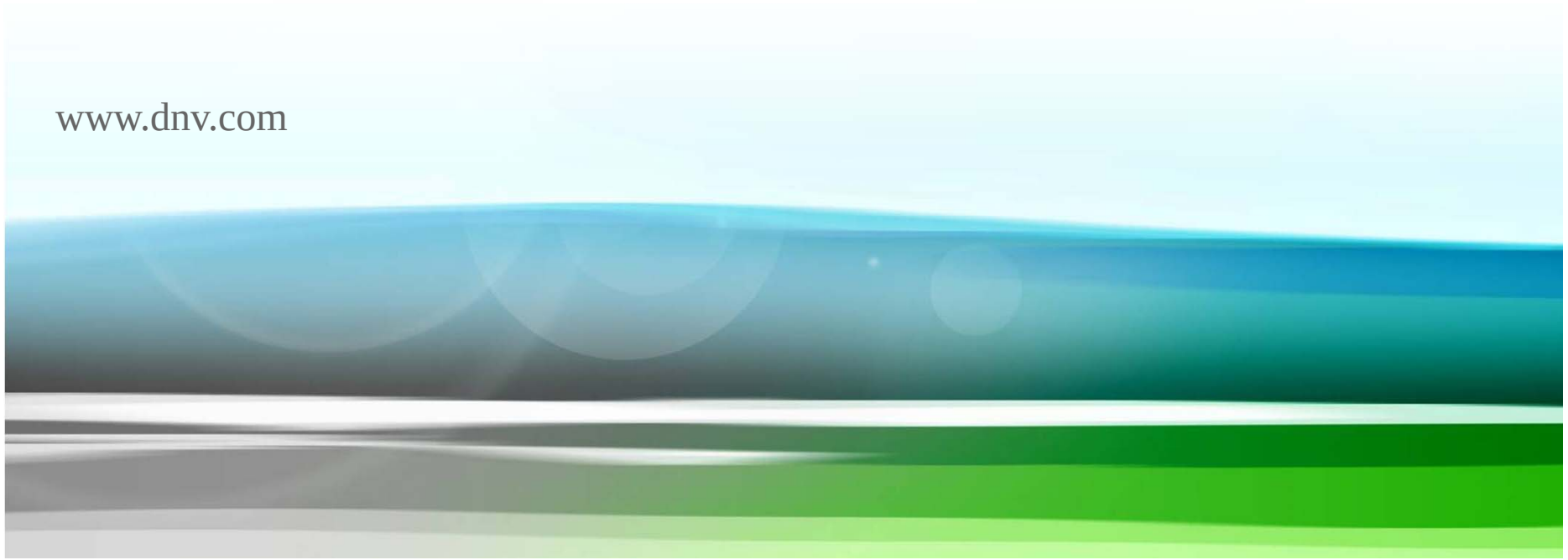

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