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A roadmap for risk-based design and approval in the framework of GBS

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Introduction

Risk-based approaches in the shipping industry are today being used progressively more.

Three drivers are visible

- industry's need to cope with increasing and novel transport demands
- society's need to increase shipping safety, expressed by IMO's steps towards a risk-based regulatory framework incl. goal-based standards
- availability of advanced computer tools to support decision-making on ever more complex systems

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Motivation to use risk-based approaches

Implement a new and safe solution which cannot be approved today

- example: alternative design and arrangements for fire safety

Optimise an innovative solution which may or may not be approved today


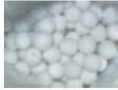
- example: probabilistic damage stability

Both activities need

- a new design approach that includes safety as objective
- a modernised regulatory framework



Chantiers de l'Atlantique

NGH Pellet

<http://www.mes.co.jp>
Conceptual Design of NGH Pellet Carrier

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Status of risk-based ship design

Risk-based ship design is being used today. Elements of it have been around for some time and several R&D-projects have advanced our toolbox.

Risk-based design relies on risk models, simulation tools and reliability data, parametric models for optimisation and risk evaluation criteria for decision-making.


SAFEDOR succeeded to apply beyond state-of-the-art risk-based design to implement eight innovative ship designs, some focussing on novel technology and others focussing on cost-effective safety and design optimisation.

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Status of risk-based ship approval

Approval of risk-based ships is currently being structured and elements such as the approval process for risk-based ships and their systems incl. risk acceptance criteria have been proposed by SAFEDOR.

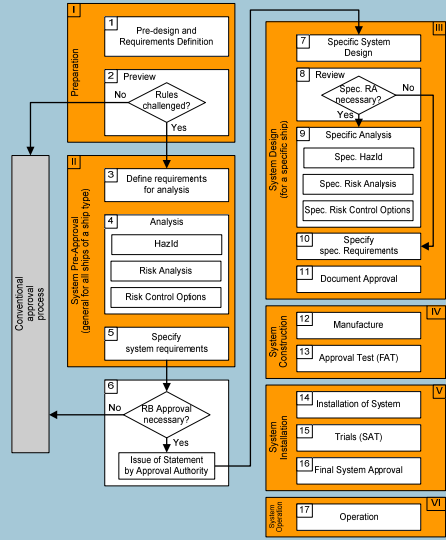
The most commonly used route to demonstrate safety compliance for risk-based ships is safety equivalence.

However, more complex risk-based ships of the future will require an advanced approach to compliance, relying on risk balance (“safety balance”), using risk evaluation criteria as reference.


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Key issues for future risk-based ship design and approval




- Practice risk-based design and approval in a uniform, transparent and predictable way**
- Harmonise risk models to ensure consistent application of risk-based design**
- Consider the accuracy of the results and provide an indication of the uncertainty**
- Establish parametric models of concept ship designs to fully exploit optimisation potential**
- Develop risk-based approval beyond safety equivalence**
- Derive risk acceptance criteria for ship function and systems**
- Ensure cost-effectiveness of risk-based design and approval with standardised solutions**
- Ensure competitiveness of inventors with balancing re-usability and protection of intellectual property**

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Status of Goal-based Standards




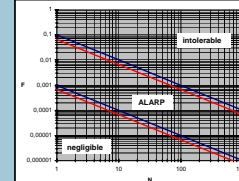

A prescriptive approach for new construction of tankers and bulkers and a risk-based approach are tackled in parallel.

At MSC82 and in the intercessional correspondence groups, both tracks of GBS are pursued with different intensity.

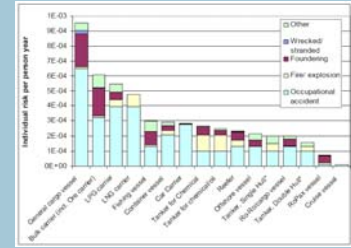
Most submissions on SLA were not discussed at all.

The safety-level approach is a holistic and risk-based method to enhance shipping safety.

Risk-based design and approval will clearly benefit from SLA being successfully implemented.

Value of risk evaluation criteria (e.g., CAF)



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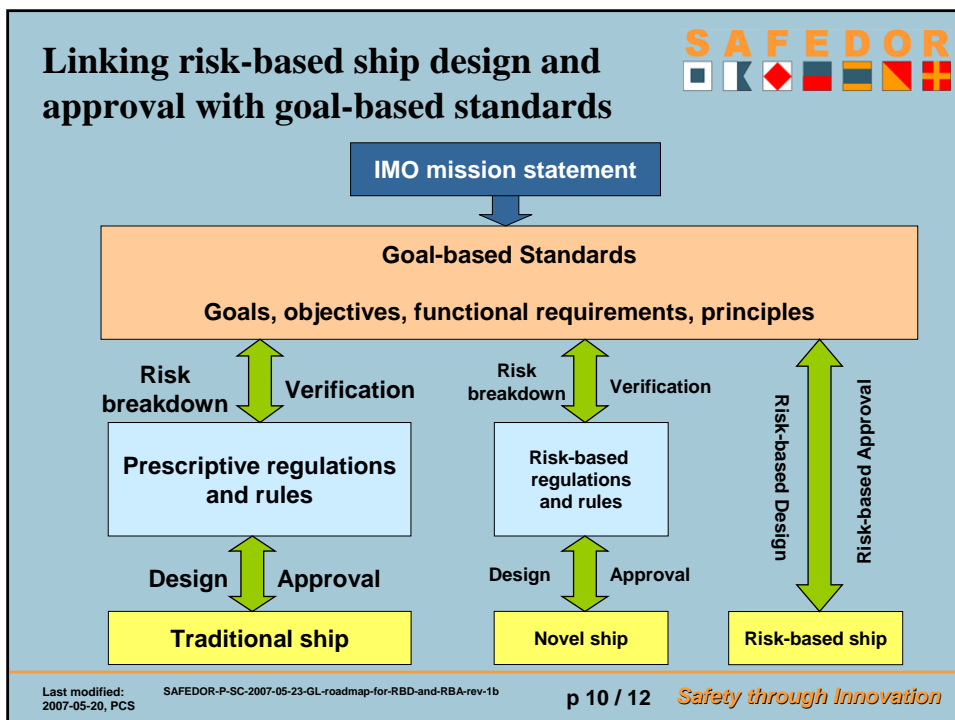
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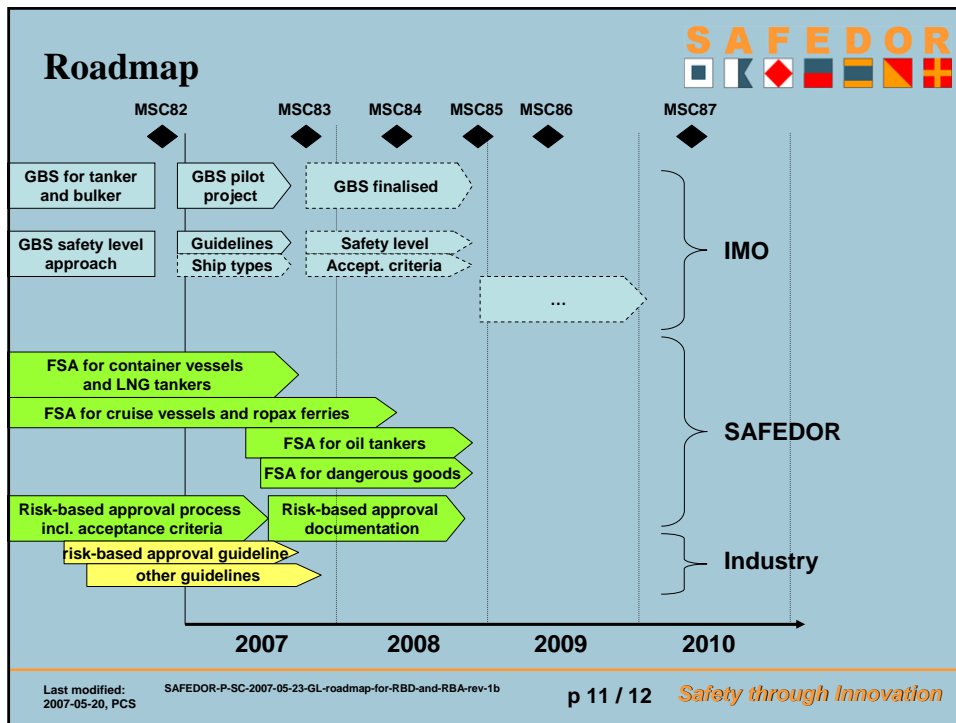
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Key issues to ensure success of SLA

- Agree on the objectives and structure of GBS based on SLA and agree on appropriate work plan
- Establish a close link to the regulatory framework
- Adhere to the ALARP principle
- Set risk evaluation criteria related to safety of human life and protection of the environment
- Compulsory use of FSA as tool when new regulations are proposed / existing substantially changed and for new work items
- Start formulating new regulations in a GBS-style

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Outlook

Risk-based ship design and approval is used today.

Some issues related to risk-based design and approval need more work.

SAFEDOR will deliver important input for GBS based on SLA

- FSA studies
- Functionality-related acceptance criteria
- Risk models
- Risk (safety) levels

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