The International Regulatory Regime for Ships, IMO & Class

Regulation and enforcement in aviation, shipping and nuclear industries-
What could we learn from each other?
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Content

- Shipping
- Regulations
- Classification Societies
- New Trends
Shipping

- About 48,000 Ships in SOLAS fleet (>500gt)
- 44,000 ships in IACS members’ Class

Orderbook accumulated by type
Number of vessels as of 2007.04.01

- Tanker 30%
- Bulker 17%
- Container 18%
- Dry Cargo 12%
- LPG Carrier 3%
- LNG Carrier 2%
- Offshore 9%
- Roro 4%
- Others 5%
Ships - VLCC

Very Large Crude Carrier VLCC
Length 330 meters, Breath 60 meters
Football-field is 65 x 105 meters.
300,000 metric tonnes
350,000 m3
2.2 million barrels
40 minutes of global oil consumption
Cost: $100-$130 million

Rates: $20,000-$120,000/day
Payback time today: 2-3 years

Source: Fearnleys, SAI
Ships – Offshore Supply Vessel

Offshore Supply, Anchor Handling, Rescue

Length 80 meters, Breath 18 meters

Cost: $40 – $50 million

Rates: about $40,000/day

Payback time today: 2-3 years
Shipping: Keep global economy running

**Iron Ore Trade Flows 2006**

Finished products in Container ships, Car Carriers etc

US imports: 23.5 million/year TEU containers

Biggest Ships:
14,000 TEU Containers, 397 meters long
REGULATION
Established by UN convention in 1948

Main Instruments:

- Safety Of Life At Sea (SOLAS) – response to Titanic (1912), Adopted at IMO 1954

- The Standards of Training, Certification & Watchkeeping (STCW) Convention – IMO

- International Convention for the Prevention of Pollution from Ships; MARPOL Convention - IMO

- International Ship and Port Facility Security Code (ISPS Code) – Adopted 2002 – Under SOLAS Convention (which was amended)

International Maritime Organisation - UN

- Membership: 167 Flag States
- Consultative: 36 Intergovernmental (e.g. INTERPOL, Organization of Arab Petroleum Exporting Countries Organisations) and 65 NGOs (e.g. IACS, ICFTU, INTERTANKO, Greenpeace)
- Committers: Marine Safety Committee, Marine Environmental Protection Committee, Legal Committee, Facilitation Committee
- Sub-Committees:
  - Bulk Liquids and Gases (BLG)
  - Design and Equipment (DE)
  - Stability Load-Lines and Fishing Vessels (SLF)
  - Fire Protection (FP)
  - Communication Search and Rescue (COMSAR)
  - Flag State Implementation (FSI)
  - Dangerous goods, solid cargoes and containers (DSG)
  - Navigation (NAV)
  - Standards for Training and Watchkeeping (STW)

\[ A_0 = \sum_{i=1}^{i=t} p_i [v_i s_i] \]
Main Instrument: MARPOL

1. Adoption of the agenda
2. **Harmful aquatic organisms in ballast water (RG)**
3. **Recycling of ships (WG)**
4. **Prevention of air pollution from ships (WG)**
5. Consideration and adoption of amendments to mandatory instruments (DG)
6. Interpretations and amendments of MARPOL 73/78 and related instruments
7. Implementation of the OPRC Convention and the OPRC-HNS Protocol and relevant conference resolutions
8. **Identification and protection of Special Areas and Particularly Sensitive Sea Areas**
9. **Inadequacy of reception facilities**
10. Reports of sub-committees
11. Work of other bodies

Status of conventions

**Harmful anti-fouling systems for ships**
Promotion of implementation and enforcement of MARPOL 73/78 and related instruments

15. Follow-up to UNCED and WSSD
16. Technical co-operation programme
17. Role of the human element (WG)
18. Formal safety assessment
19. Work programme of the Committee and subsidiary bodies
20. Application of the Committees Guidelines
21. Election of the Chairman and Vice-Chairman for 2008
22. Any other business
23. Consideration of the report of the Committee
Main Instrument: SOLAS

1. Adoption of the agenda; report on credentials
2. Decisions of other IMO bodies
3. Consideration and adoption of amendments to mandatory instruments
4. Measures to enhance maritime security
5. Goal-based new ship construction standards
6. LRIT-related matters
7. Dangerous goods, solid cargoes and containers (report of the eleventh session of the Sub-Committee)
8. Fire protection (report of the fifty-first session of the Sub-Committee)
9. Ship design and equipment (report of the fiftieth session of the Sub-Committee)
10. Bulk liquids and gases (report of the eleventh session of the Sub-Committee)
11. Stability, load lines and fishing vessel safety (report of the fiftieth session of the Sub-Committee)
12. Training and watch-keeping (report of the thirty-eighth session of the Sub-Committee)
13. Radio-communications and search and rescue (report of the eleventh session of the Sub-Committee)
14. Safety of navigation (urgent matters emanating from the fifty-third session of the Sub-Committee)
15. Flag State implementation (report of the fifteenth session of the Sub-Committee)
16. Role of the human element
17. Technical assistance sub-programme in maritime safety and security
18. Capacity-building for the implementation of new measures
19. Piracy and armed robbery against ships
20. General cargo ship safety
21. Formal safety assessment
22. Implementation of instruments and related matters
23. Relations with other organizations
24. Application of the Committee’s Guidelines
25. Work programme
26. Election of Chairman and Vice-Chairman for 2008
27. Any other business
28. Consideration of the report of the Committee on its 83rd session
International

- Shipping is the first truly global business
  - great explorers (1500 hundreds)

- Ship Classification Societies Established (Lloyds Register Embryo since 1764 (Run by Underwriters) – Separate Enterprise 1834

- Two driving forces:
  - Insurers/Underwriters need for technical assessment of ships
  - Liberalisation of trade – 1849 Repeal of British Navigation Act (Ships could take cargo from third countries)

- Today’s ships may be
  - Built in one country, owner in second country, operator in third country, flagged in fourth country, classification from fifth country, insured in sixth, crew from different countries, carrying cargo between any country

- Today’s shipping is a prerequisite for globalisation – and the regulatory regime should preferable be international: ‘even playing field’
History of classification societies

- To meet the need of marine insurers: rating of the ships to be covered by hull insurance
- First class societies
  - Lloyd’s Register (1834)
  - Bureau Veritas (1828)
  - American Bureau of Shipping (1862)
  - Det Norske Veritas (1864)
Classification Societies

- International Association of Classification Societies (IACS) – Class 95% of World Fleet

Other members:
KR, RS, RINA, CCS
6,000 Surveyors
600,000 surveys/year
Classification Societies as RO

- Classification also carry out work on behalf of the Flag State – Classification Societies are Recognised Organisations (RO)
- Some Flag States delegate to a subset of IACS members
- Most Flag States delegates statutory work to IACS members
- Many Flag States delegate to organisations outside IACS
- Mandatory requirements to RO defined in SOLAS XI 1/1, resolution A.739 (18) and A.789 (19)
- Current Proposal on RO Code, specifying minimum requirements
  - General (Impartial, Integrity, Insurance, Competence, Transparency, Responsibility)
  - Management
  - Certification Process
  - Measurement, analysis and improvement (ISO 9000 stylish)
  - Quality Management System
  - A1: Required Training of Staff
  - A2: Part I: Functions (certification/Survey) covered by RO
  - A2, Part II: Auditing and Certification Scheme
The Rules published by the classification society stipulate the requirements for the assignment and maintenance of classification for seagoing ships.

Aim = to enhance the safety of the ship and those who sail on her

- Structural strength of the hull
- Safety and reliability of safety critical propulsion and steering systems
- Effectiveness of essential auxiliary systems
Class Process

Voluntary Class Notations

Core Class

Set the Standard
- DNV Standard
- IACS Unified Requirements
- Statutory Requirements

Enforce the standard
- Plan approval & CMC
- Site Survey & CMC
- SIO survey

Compliance Facilitation

Experience Transfer Loop
The **objective of class** is to ensure that classed ships have an acceptable level of **safety** and **reliability** maintained throughout the lifetime of the vessel.
- **safety** covers life, property and the environment.
- **reliability** covers all structural, mechanical and electrical failures preventing the ship performing its intended mission.
- The definition of acceptable level of **safety** and **reliability** should be provided by acceptance criteria for each area of ship design and operation.

The **scope of class** should cover all relevant areas of ship design, construction and operation and scrapping, in so far as they affect safety and reliability.

In addition to this, DNV promote improvements beyond compliance through voluntary class notations and consultancy services.
Role/scope of Class - Contribution to Profitability

Profitable Ship

Adequate Ship

Favourable Market

Regulators Objective

Shipowners Objective

Class Contribution

- Low risk of accidents
- Low risk of breakdowns, downtime
- Ability to achieve specified performance
Classification Today

- Is:
  - Main knowledge reservoir for design, construction, operation of ships
  - Main contributor to research and development
  - Provides technical support to industry, flag states and IMO

- Is Not:
  - Covering all aspects of safety
  - Class surveyors are not permanently onboard
  - Not ‘highway patrol/police’ – rather ‘vehicle licensing authority’
New Trends
Formal Safety Assessment

- FSA is intended to be a tool for rule-making at IMO:
  - To make the decision process at IMO more rational, reduce ad-hoc proposals/implementation, give less room for politics
  - To provide a proactive, holistic approach, comprising technical as well as operational aspects

<table>
<thead>
<tr>
<th>FSA - Risk Based Approach</th>
<th>Competing Approach</th>
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<tbody>
<tr>
<td>• proactive, trying to identify all conceivable hazards - <em>before</em> they lead to accidents</td>
<td>• reactive, responding to accidents</td>
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<tr>
<td>• regulations, consistent with safety objectives</td>
<td>• continuous amendment of regulations</td>
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<tr>
<td>• principle of safety equivalency</td>
<td>• prescriptive regulations</td>
</tr>
<tr>
<td>• encompasses technical, human and organisational aspects</td>
<td>• principle of technical equivalency</td>
</tr>
<tr>
<td>• cost of safety identified</td>
<td>• contains mainly technical requirements</td>
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Individual Risk & Acceptance Criteria

- Unacceptable risk
- Tolerable if ALARP
- Negligible risk
FN Criteria - model

- **Fatalities (N)**
- **Frequency of N or more fatalities (per ship year)**

- **Oil tankers**
- **Chem. tankers**
- **Oil/Chemical tankers**
- **Gas tanker**

- **ALARP**
- **Negligible**
- **Intolerable**
## Cost/Benefit Criteria

<table>
<thead>
<tr>
<th>Decision</th>
<th>Decision Maker</th>
<th>Value</th>
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<tbody>
<tr>
<td>Strengthening Bulkheads on existing Bulk Carriers</td>
<td>IACS(1)</td>
<td>&gt; 1.5 million $</td>
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<tr>
<td>Helicopter Landing Areas on Non Ro/Ro passenger ships</td>
<td>IMO(2)</td>
<td>&gt; 37 million $ (12 million $ to 73.000 million $)</td>
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<tr>
<td>3 bulkheads on car deck</td>
<td>IMO(3)</td>
<td>&lt; 5 million $</td>
</tr>
<tr>
<td>3 bulkheads on car deck</td>
<td>NMD(3)</td>
<td>&gt; 5 million $</td>
</tr>
<tr>
<td>3 bulkheads + sponsons</td>
<td>IMO (3)</td>
<td>&lt; 7.8 million $</td>
</tr>
<tr>
<td>Extended sponsons only</td>
<td>IMO(3)</td>
<td>&lt; 11.8 million $</td>
</tr>
<tr>
<td>Collision avoidance training</td>
<td>Owner(3)</td>
<td>&gt; 0.7 million $</td>
</tr>
<tr>
<td>Extra deck officer</td>
<td>IMO(3)</td>
<td>&lt; 5.5 million $</td>
</tr>
</tbody>
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Long list on: [http://www.safedor.org/resources/index.htm](http://www.safedor.org/resources/index.htm)  D.4.5.2
Cost/Benefit Criteria used in FSA

- Agreed
- Gross Cost of Averting a Fatality
  \[ \text{GCAF} = \frac{\Delta \text{Cost}}{\Delta \text{PLL}} \]
- Net Cost of Averting a Fatality
  \[ \text{NCAF} = \frac{(\Delta \text{Cost} - \Delta \text{Economic})}{\Delta \text{PLL}} \]
- For Injury and ill Health: DALY averted

- Used in studies/not debated & agreed:
  - Cost of Averting a Tonne of Oil Spill: CATS
  - 4\Delta-Model:
    - \[ \text{NCAF} = \frac{(\Delta \text{Cost} - \Delta \text{Economic} - \text{CATS} \cdot \Delta \text{Spill})}{\Delta \text{PLL}} \]
- Criteria: CAF=$3m, DALY=CAF/35, CATS=$60,000
IMO Goal Based Regulations

Tier I

Tier II

Tier III

Tier IV

Tier V

Goals

Functional Requirements

Verification of Tier IV

Class Rules, IMO Regulations

Domain Standards, Industry Norms, ISO, IEC etc.

Prescriptive

Industry

Code

Int. Guide

Convention
www.dnv.com