



K. C. LYRINTZIS  
GROUP

# Safety at Sea?

**Yes, we can certainly improve!**

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CEO  
KCL Group  
Piraeus

## Safety at Sea

- Shipping:
  - ◆... importance
  - ◆... safety
- Safety improvement:
  - ◆Can we?
  - ◆How?
- Conclusions



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# Safety at Sea

- Shipping:
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## Safety at Sea: Importance of Shipping

### How important is Shipping?

- For us who live off Shipping...  
it is most important.-



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## Safety at Sea: Importance of Shipping

### How important is Shipping?

- For us who live off Shipping...  
it is most important.
- For the rest of the world:

Thursday, September 24, 2010

Home Key Facts **Shipping and World Trade** Safety and Regulation Environmental Performance Useful Links Index

### Shipping and World Trade



- » **Overview**
- » [Different types of ship in the world merchant fleet](#)
- » [Top 20 largest shipping flags \(July 2009\)](#)
- » [Top 20 beneficial ownership countries \(January 2009\)](#)
- » [Numbers and nationality of world's seafarers](#)
- » [Number of ships \(by total and trade\)](#)
- » [Value of volume of world trade by sea](#)
- » [The low cost of transporting goods by sea](#)

**Overview**

Around 90% of world trade is carried by the international shipping industry.

Without shipping the import and export of goods on the scale necessary for the modern world would not be possible.

Seaborne trade continues to expand, bringing benefits for consumers across the world through competitive freight costs. Thanks to the growing efficiency of shipping as a mode of transport and increased economic liberalisation, the prospects for the industry's further growth continue to be strong.

There are around 50,000 merchant ships trading internationally, transporting every kind of cargo. The world fleet is registered in over 150 nations, and manned by over a million seafarers of virtually every nationality.



## Safety at Sea: Importance of Shipping

Thursday, September 23, 2010

Home Key Facts **Shipping and World Trade** Safety and Regulation Environmental Performance Useful Links Index

### Shipping and World Trade



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Around 90% of world trade is carried by the international shipping industry.

## Safety at Sea: Importance of Shipping

- Shipping is the most environmentally efficient form of transportation.



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### Sea's the future

From washing machines to Ferraris, from baked beans to petrol, all have been transported by ship.

- Over 90% of all of the world's trade is carried onboard ships.
- Shipping is the most environmentally efficient form of transportation.
- A career in the international shipping industry is both interesting and very rewarding
- The marine environment is a significant source of renewable energy



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## Safety at Sea: Safety of Shipping



*Piracy Risk*



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## Safety at Sea: Safety of Shipping



**Carreer damage**



**Arrest**



**Unemployment**



**Family misery**



**Prosecution**



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## Safety at Sea: Safety of Shipping

### How safe is Shipping?

- 'Safe' is relative:
  - ◆ Different standards in the past
- How does it compare with
  - ◆ Industry
  - ◆ Construction
  - ◆ Etc?



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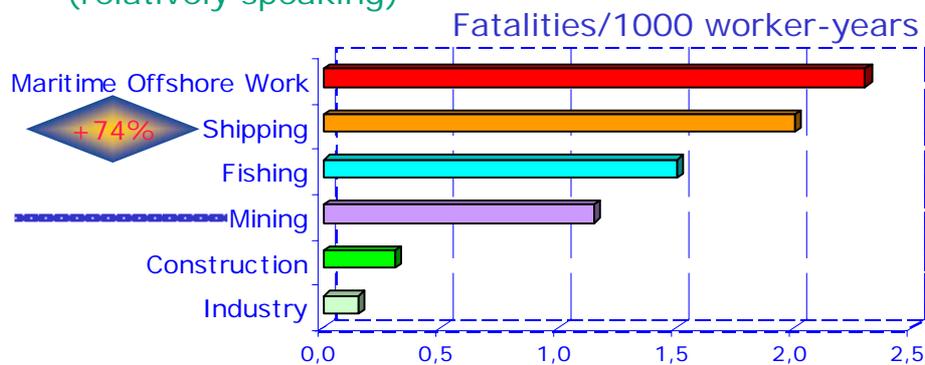


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## Safety at Sea: Safety of Shipping

### How safe is Shipping?

(relatively speaking)



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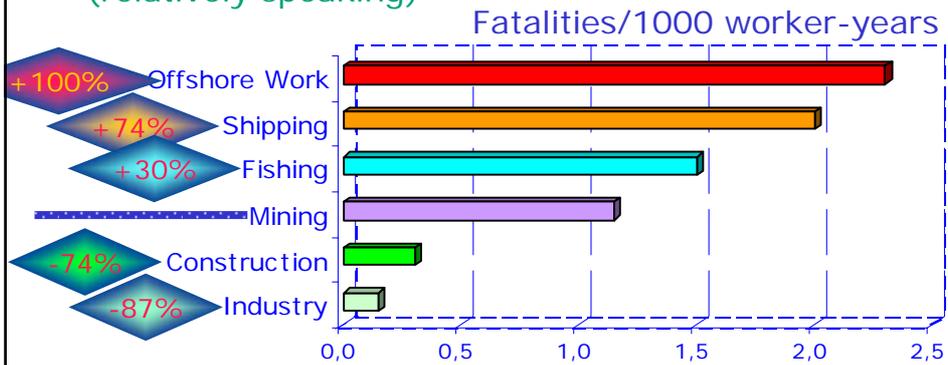
from "Maritime Transportation: Safety Management & Risk Analysis",  
Kristiansen, S., Elsevier, 2005

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## Safety at Sea: Safety of Shipping

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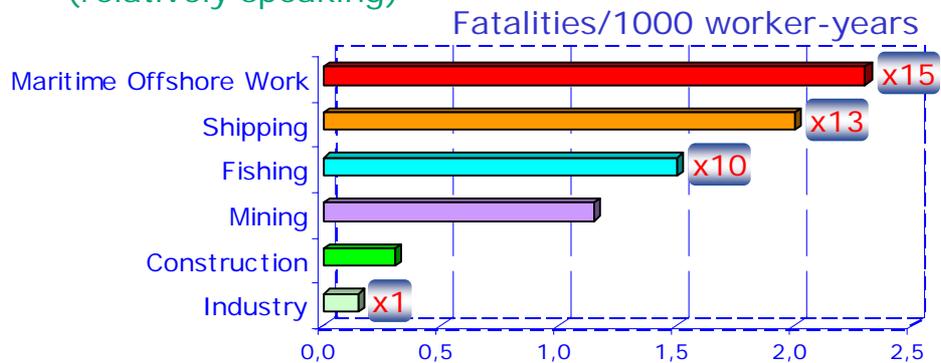


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## Safety at Sea: Safety of Shipping

### How safe is Shipping?

(relatively speaking)



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from "Maritime Transportation: Safety Management & Risk Analysis",  
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## Safety at Sea: Safety of Shipping

### So, Shipping is

- 13 times more fatal than Industry,
- 74% more fatal than Mining!



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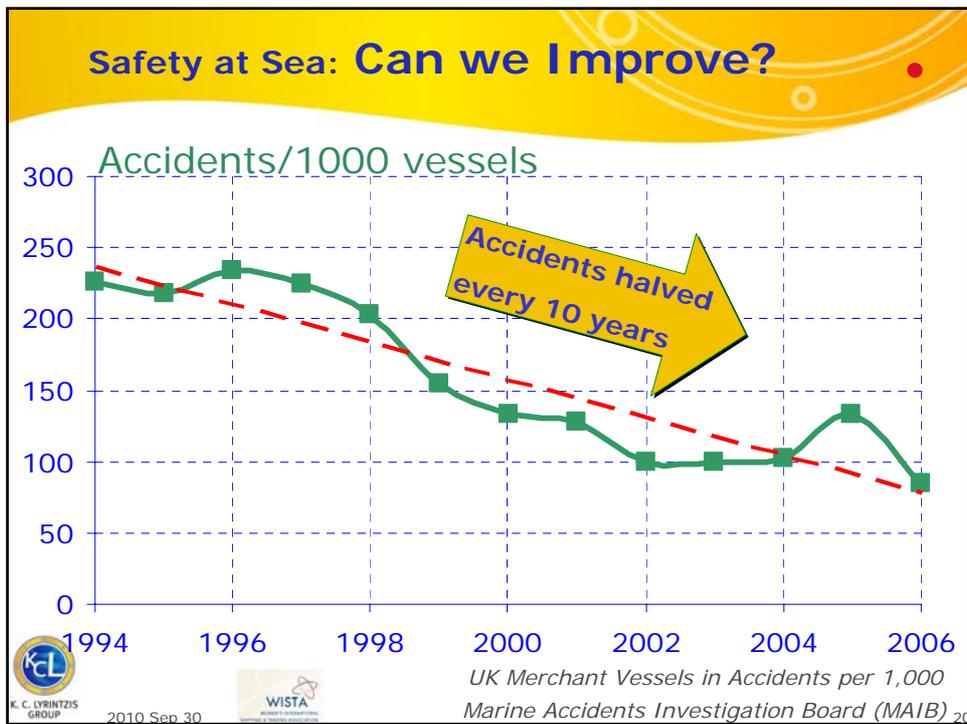
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## Safety at Sea: Can we Improve?

We have IMPROVED over time!  
(substantially)



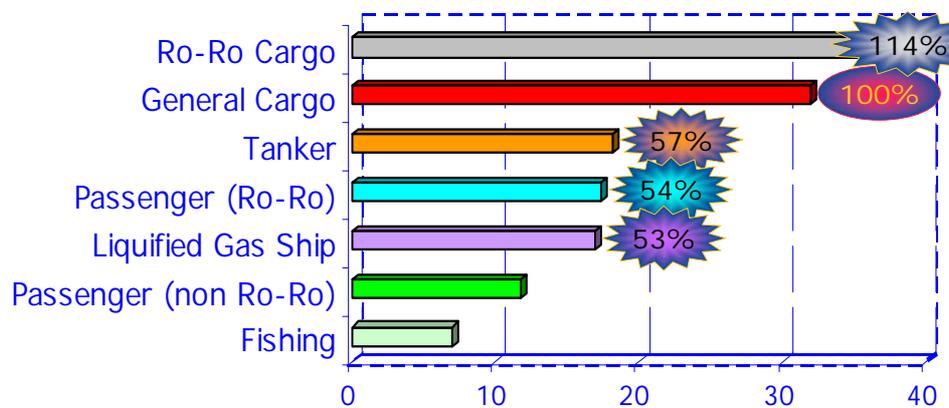
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## Safety at Sea: Can we Improve?

World Fleet Loss & Serious Accident / 1000 Ships / Year



Lloyd's Register of Shipping



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## Safety at Sea: Can we Improve?

We have IMPROVED where it matters more!  
(passengers / pollution)



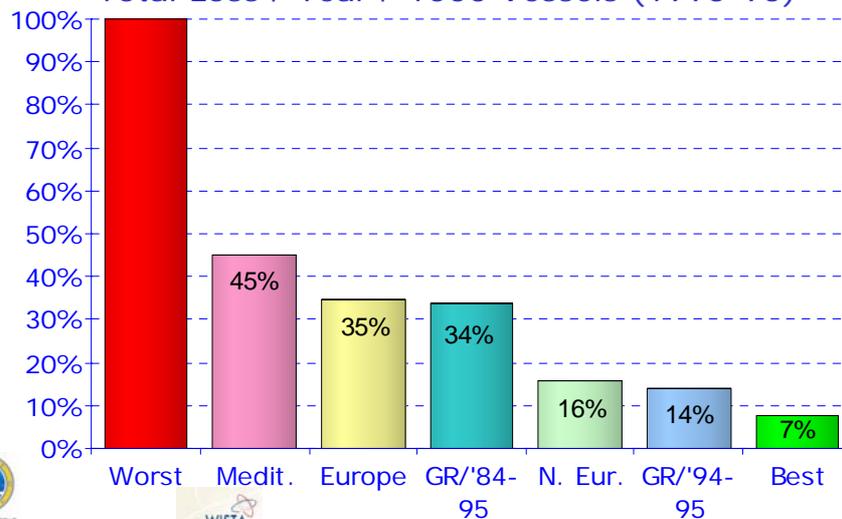
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## Safety at Sea: Can we Improve?

Total Loss / Year / 1000 Vessels (1995-95)

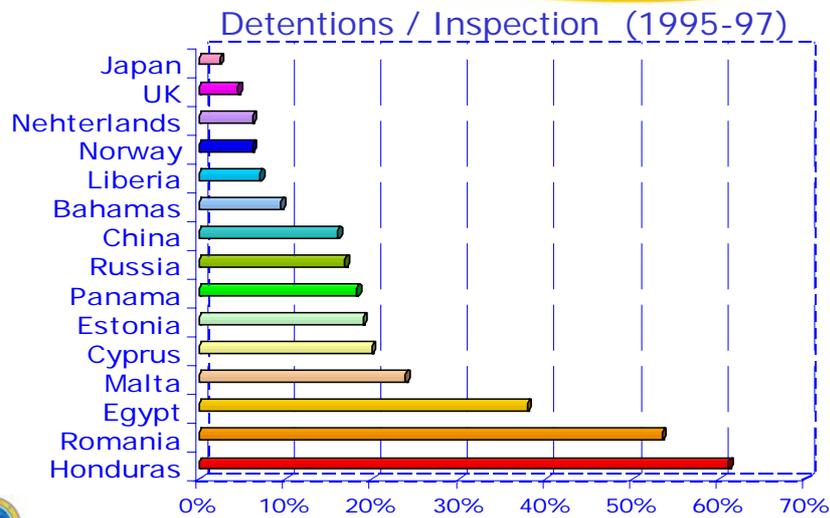


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## Safety at Sea: Can we Improve?



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from "Maritime Transportation: Safety Management & Risk Analysis",

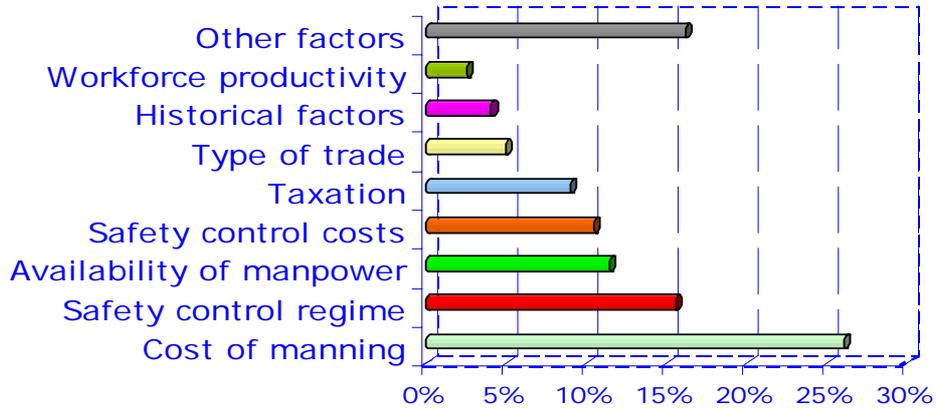


Kristiansen, S., Elsevier, 2005

## Safety at Sea: Can we Improve?

*From Questionnaire:*

### Reasons for Flagging out



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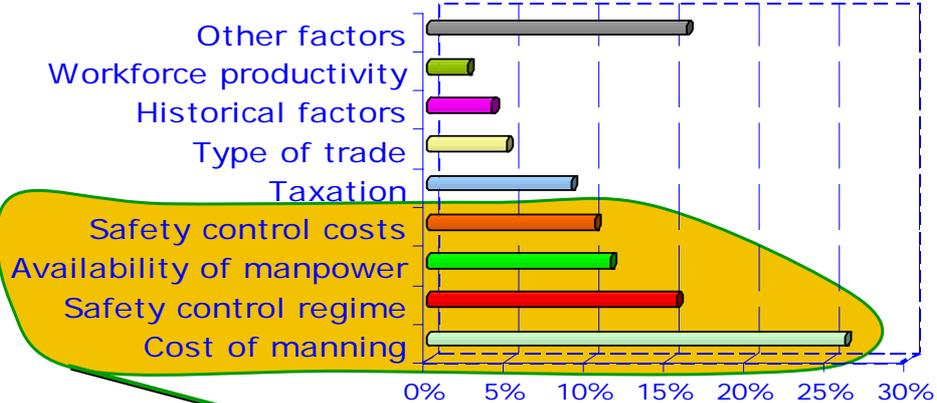


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## Safety at Sea: Can we Improve?

*From Questionnaire:*

### Reasons for Flagging out



**Safety & Manning Costs**



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## Safety at Sea: Can we Improve?

**Safety depends on conscious choices  
(owner/management decisions)**



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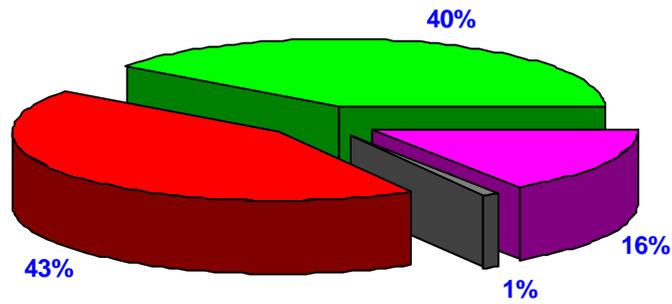


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## Safety at Sea: Can we Improve?

### Accident Causation

sample size = 71.470 - (USCG: 1991-2001)



■ Human Factor ■ Engineering Failure ■ Weather ■ Hazardous Material



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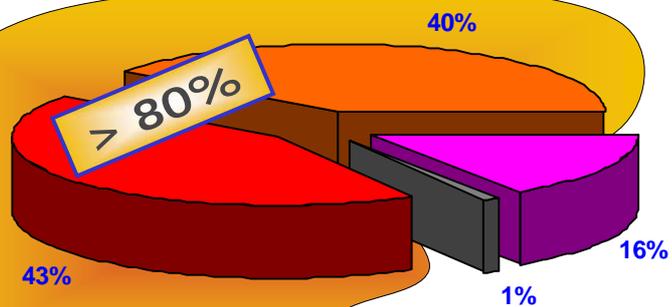


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## Safety at Sea: Can we Improve?

### Accident Causation

sample size = 71.470 - (USCG: 1991-2001)



■ Human Factor ■ Engineering Failure ■ Weather ■ Hazardous Material



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## Safety at Sea: Can we Improve?

Yes because (thankfully!) we  
cause the accidents!  
(not God)

... this includes shore  
personnel!



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## Safety at Sea

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## Safety at Sea: How to Improve?

### Safety @ Sea is in our hands:

#### ■ Root-Cause Analysis indicates:

##### ◆ 8/10 accidents r traced to errors by:

- Shore personnel
- Sea-going personnel
- Authorities
- 3<sup>rd</sup> parties

#### ■ What makes us avoid errors?



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## Safety at Sea: How to Improve?

### SHELL Model:

#### ■ Liveware (e.g. officer) **interacts** with

- ◆ Liveware (e.g. other officers)
- ◆ the **E**nvironment (e.g. sea)
- ◆ **H**ardware (e.g. the vessel)
- ◆ **S**oftware (e.g. safety procedures)



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## Safety at Sea: How to Improve?

### SHELL Model:

- Liveware (e.g. officer) interacts with
  - ◆ Liveware (e.g. other officers)
  - ◆ the Environment (e.g. sea)
  - ◆ Hardware (e.g. the vessel)
  - ◆ Software (e.g. safety procedures)

Better interaction ↗ performance  
which reduces errors  
which improves Safety



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## Safety at Sea: How to Improve?

### SHELL Model:

Liveware-Liveware interaction:

- Interrelationship within teams in
  - ◆ Bridge, or Engine-Room
  - ◆ Office

Problems



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## Safety at Sea: How to Improve?

### SHELL Model:

#### Problems

Liveware-Liveware interaction:

- Interrelationship within teams in
  - ◆ Bridge, or Engine-Room
  - ◆ Office
- Common problems:
  - ◆ Leadership problems
  - ◆ Communication errors
  - ◆ Teamwork (lack of ...)
  - ◆ Social & Cultural interactions
  - ◆ Personality & Attitude interactions



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## Safety at Sea: How to Improve?

### SHELL Model:

#### Solutions

Liveware-Liveware interaction:

- Training / Workshops / Simulator:
  - ◆ BRM & ERM
  - ◆ Leadership & Management
  - ◆ Safety Culture
  - ◆ Other soft-skill:
    - Communications,
    - Team Management,
    - etc



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## Safety at Sea: How to Improve?

### SHELL Model:

Solutions

Liveware-Liveware interaction:

- Training / Workshops / Simulator:
  - ◆ BRM & ERM
  - ◆ Leadership & Management
  - ◆ Safety Culture
  - ◆ Other soft-skill:
    - Communications,
    - Team Management,
    - etc
- HR Management & Recruitment

Quality Training only  
else waste of money & time



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## Safety at Sea: How to Improve?

### SHELL Model:

Problems

Liveware-Environment interaction:

- Interaction between
  - ◆ Human operator &
  - ◆ Internal & External Environments



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## Safety at Sea: How to Improve?

### SHELL Model:

#### Problems

Liveware-Environment interaction:

- Interaction between
  - ◆ Human operator &
  - ◆ Internal & External Environments
- Common problems:
  - ◆ Disturbed biolog. rhythm (night-shifts, etc)
  - ◆ Fatigue made worse by noise, vibration, etc
  - ◆ Stress due to demands (esp. @ ports)
  - ◆ Inadequate/unhealthy conditions
  - ◆ Negative organizational culture



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## Safety at Sea: How to Improve?

### SHELL Model:

#### Solutions

Liveware-Environment interaction:

- Improve conditions
  - ◆ Onboard (especially living quarters) &
  - ◆ at office
- Relieve pressure at port



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## Safety at Sea: How to Improve?

### SHELL Model:

#### Solutions

Liveware-Environment interaction:

- Improve conditions
  - ◆ Onboard (especially living quarters) &
  - ◆ at office
- Relieve pressure at port
- Boost personnel morale:
  - ◆ Even with low-cost gestures
  - ◆ Put them into the 'loop'
  - ◆ Show respect
  - ◆ Apply care



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## Safety at Sea: How to Improve?

### SHELL Model:

#### Problems

Liveware-Hardware interaction:

- Interaction between
  - ◆ Human operator &
  - ◆ Machine(s) & System(s)



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## Safety at Sea: How to Improve?

### SHELL Model:

Liveware-Hardware interaction:

- Interaction between
  - ◆ Human operator &
  - ◆ Machine(s) & System(s)
- Common problems:
  - ◆ Poorly designed equipment
  - ◆ Badly written manuals
  - ◆ Badly located/coded devices
  - ◆ Warning systems that fail to alert

Problems



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## Safety at Sea: How to Improve?

### SHELL Model:

Liveware-Hardware interaction:

- Do not skip proper system training
- Use 'marinized' hardware only

Solutions

*Machines must be designed to interface  
with humans, not with other machines!*



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## Safety at Sea: How to Improve?

### SHELL Model:

#### Solutions

Liveware-Hardware interaction:

- Do not skip proper system training
- Use 'marinized' hardware only
- Manuals & MSs must be written
  - ◆ In simple English
  - ◆ For simple people
  - ◆ With graphics

To be understood! Not just for the Law

*Machines must be designed to interface with humans, not with other machines!*



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## Safety at Sea: How to Improve?

### SHELL Model:

#### Problems

Liveware-Software interaction:

- Interaction between
  - ◆ Human operator &
  - ◆ Regulations, Procedures, Manuals, etc.



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## Safety at Sea: How to Improve?

### SHELL Model:

#### Problems

Liveware-Software interaction:

- Interaction between
  - ◆ Human operator &
  - ◆ Regulations, Procedures, Manuals, etc.
- **Common problems:**
  - ◆ Unsafe behaviour:
    - Violations
    - Lack of knowledge
    - Misinterpretation (checklists, etc.)
    - Lack of experience
  - ◆ Poorly designed procedures



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## Safety at Sea: How to Improve?

### SHELL Model:

#### Solutions

Liveware-Software interaction:

- Proper HR Management & Screening
- Workshops to tackle unsafe behaviour
- Frequent refresh training



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## Safety at Sea: How to Improve?

### SHELL Model:

#### Solutions

#### Liveware-Software interaction:

- Proper HR Management & Screening
- Workshops to tackle unsafe behaviour
- Frequent refresh training
- Use of simulators 2 enhance experience
- Carefully written procedures:
  - ◆ Sufficient & appropriate
  - ◆ Unambiguous checklists
  - ◆ Concise, using simple English



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## Safety at Sea: How to Improve?

Hard-ware

Environ-ment

Cause of Errors

Live-ware

Perfect Match

Soft-ware

Live-ware

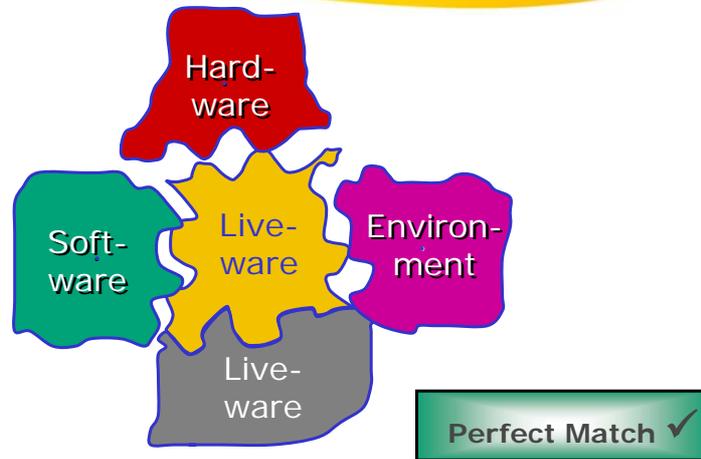
Human Performance SHELL Model

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## Safety at Sea: How to Improve?



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Human Performance SHELL Model

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## Safety at Sea: Conclusions

- We know how to be safer at sea!
- Must improve interfaces:
  - ◆ Human to human
  - ◆ Human to environment
  - ◆ Human to machines & systems
  - ◆ Human to regulations & procedures



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## Safety at Sea: Conclusions

- We know how to be safer at sea!
- Must improve interfaces:
  - ◆ Human to human
  - ◆ Human to environment
  - ◆ Human to machines & systems
  - ◆ Human to regulations & procedures
- To improve interfaces:
  - ◆ Employ the right people!
  - ◆ Invest in quality training (high RoI)
  - ◆ Do not think again about low-cost safety measures.
  - ◆ Use ISM, to its spirit, not letter!



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*Thank You for your Attention!!!*

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