Brookes Bell Group

faros

SEVENTH FRAMEWORK PROGRAMME

FAROS

Human Factors in Risk-based Ship Design Methodology

Overview

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Outline

- Background
- Objectives
- Project structure
- Overall project impact

Background

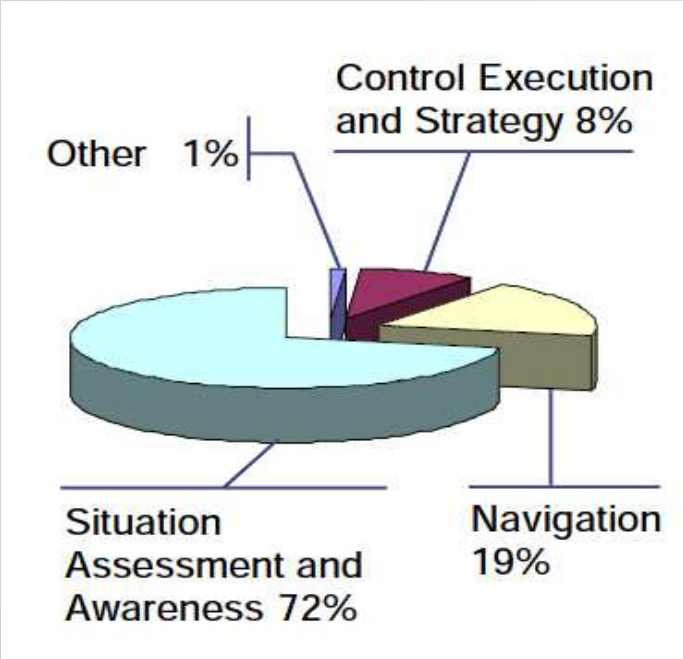
- The 21st century shipping industry faces new challenges, e.g.
  - 25 years ago the average cargo ship was manned with 40-50 crew members
  - Today just 22 seafarers on a Very Large Crude Carrier (VLCC)
- Technology has moved on
- But, reduction of failures in technology revealed the underlying level of influence of human error in accident causation

Background

- 673 passenger and seafarer injuries and fatalities (5 years average, United States Coast Guard)
- 82% of occupational death accidents are due to **human error,** while moving about ship, carrying out maintenance work and other ordinary tasks (MAIB)
- Up to 96% of maritime accidents (collision, grounding, fire, etc.) are routinely attributed to **human error** (USCG)

Background

Types of human error



(United States Coast Guard)

- **Societal risk** (multiple injuries/fatalities in one go)
- **Personal risk** (injury/fatality due occupational accidents)
- **Economic risk** (loss of property/revenue)

Expectations

“Vision, principles and goals" for the human element (resolution A.947(23), 2004)

- **VISION:** to significantly enhance maritime safety and the quality of the marine environment by addressing human element issues to improve performance
- **PRINCIPLES:**
  - (f) **crew performance is a function of** individual capabilities, management policies, cultural factors, experience, training, job skills, **work environment** and countless other factors;
  - (h) consideration of **human element matters should aim at decreasing** the possibility of **human error** as far as possible

SST.2012.4.1-1. Human element factors in shipping safety (2011)

…

Multi-disciplinary, human centred design optimisation, including:

- Framework for integrating human factors in ship design projects
- Tools and methodologies for integrating human factors in ship design projects and optimisation

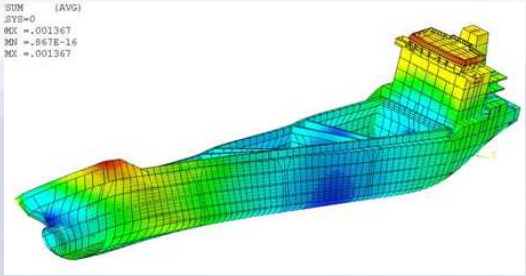
…

FAROS Concept

Integrate **Human Element** into **Risk-Based Design Framework** and deliver ship concepts (ropax and tanker) that are safe, economic and green

Objectives | Closing gaps

Ship motions



Vibration & noise

Deck layouts, means of access…

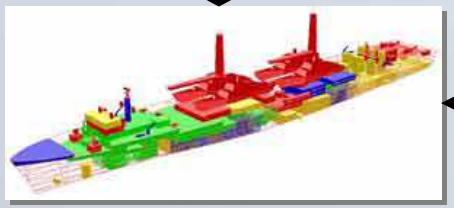
Crew performance failure
- Fatigue
- Stress
- Motion induced sickness
- …

Personal risk models
- Health deterioration
- Injuries
- Death

Societal risk models
- Collision
- Grounding
- Fire

Objectives | Holistic design

Design requirements



Parameterised baseline ship concepts (ropax & tanker)

Design exploration & optimisation

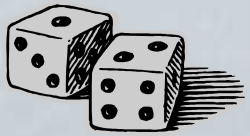
Innovative ship concepts (ropax & tanker)

with optimised:

- Hull shape
- Machinery configuration
- Watertight subdivision
- Deck layouts

Life-cycle economic models (eg NPV)

Environmental impact model (eg EEDI)



Enhanced risk models

- Societal risk
- Personal risk

Objectives | Notifying IMO

- Submission of Information Paper on
  - Developed risk models, **highlighting links** between crew performance failure, ship design and physical environment
  - **Design recommendations** towards ship design improvements that mitigate risk

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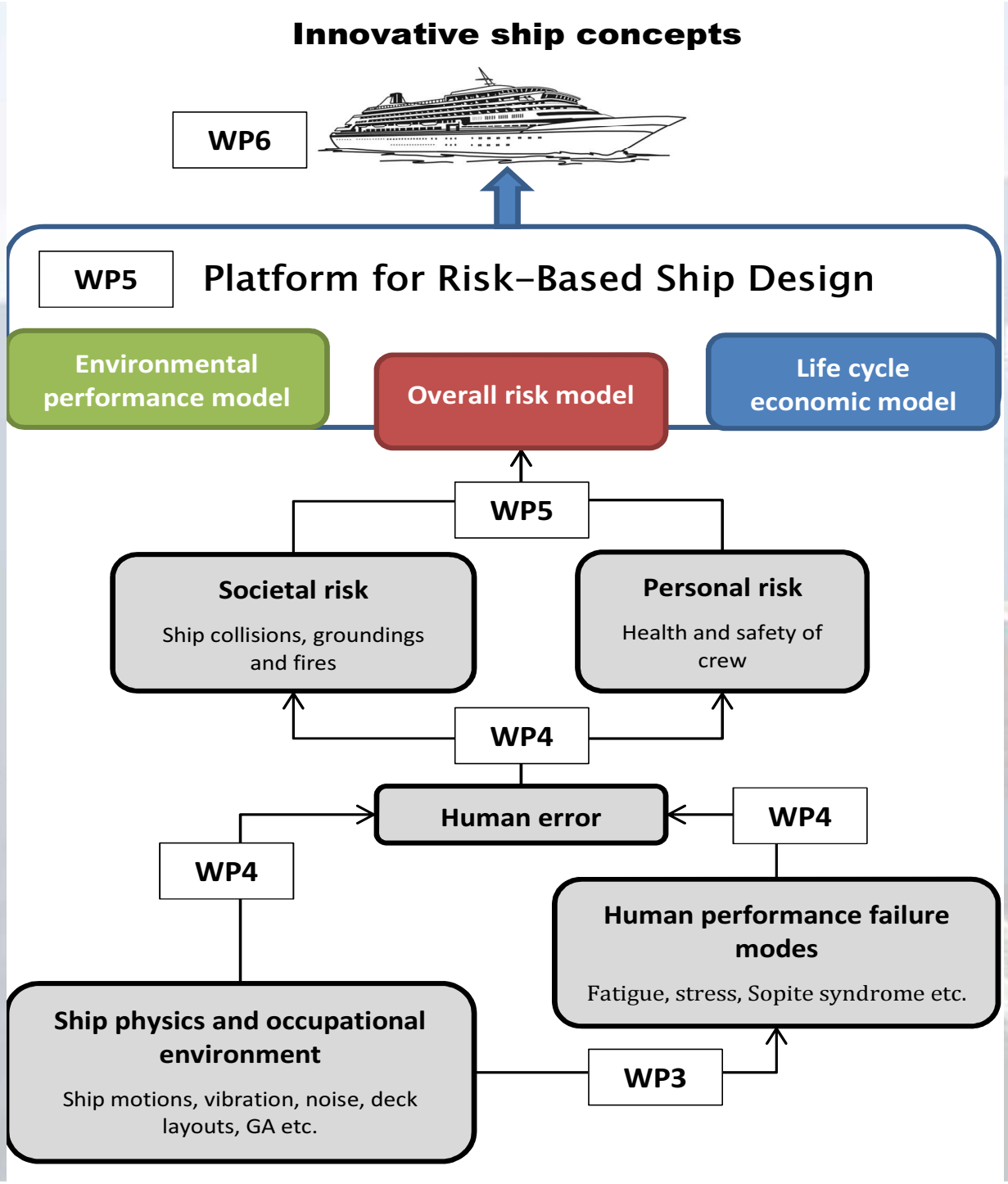
Project structure



Arrows indicate the links addressed by project work-packages

Overall project impact

- Reduction of personal risk
- Reduction of societal risk
- Improve comfort: a better place to live and work
- New ship design ideas
- New research prospects