PROJECT

FAROS

Human Factors in Risk-Based Ship Design Methodology

Funding: European (7th RTD Framework Programme)
Duration: Oct 2012 - Sep 2015
Status: Complete with results
Total project cost: €3,878,159
EU contribution: €2,794,934

Call for proposal: FP7-SST-2012-RTD-1
CORDIS RCN: 105337

Background & policy context:

Up to 96% of maritime accidents (collision, grounding, fire, occupational accidents) are routinely attributed to human error. However, rather than assessing the ship performance in terms of global design factors such as ship motions and noise, the human element studies have primarily focused on local design features (e.g., bridge design) that are relatively easy to fix and tune towards required effects on the crew.

From the formal point of view, the key element that has been missing and therefore preventing the integration of the human element into ship design projects is a comprehensive quantification of crew performance failure. Given the natural uncertainty of the maritime environment, such quantification must be probabilistic and therefore commensurate with safety-driven ship design methods such as the Risk-Based Design.

Objectives:

In project FAROS, the rationalised nature of the Risk-Based Design will be used to integrate the human element into the ship safety framework and deliver ship concepts (ro-pax and tanker) that are safe, economic and green.

Methodology:

The objective of FAROS will be achieved by:

1. quantitatively linking global design factors to the crew performance failure modes (fatigue, gross and fine motor skills etc.) and
2. optimising multi-disciplinary ship performance using state-of-the-art tools, methods and empirical knowledge

It is expected that the societal and personal risks on tanker and ro-pax ships can be reduced at least by 30%, provided recommended amendments to design rules are implemented and the developed ship design assessment framework, which takes into account the crew performance at sea, is used in daily ship design practice by parties relevant.

Parent Programmes:
FP7-TRANSPORT - Transport (Including Aeronautics) - Horizontal activities for implementation of the transport programme (TPT)

Institute type: Public institution
Institute name: The European Commission
Funding type: Public (EU)

Lead Organisation:

Brookes Bell Llp
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<th>EU Contribution</th>
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| Water Street Martins Building  
Liverpool  
L2 3SX  
United Kingdom | €473,324        |

**Partner Organisations:**

**Naval Architecture Progress**

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| Kolokotroni 80  
18535 Peiraias  
Greece | €207,940        |

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| SADAMA 5/7  
10111 TALLINN  
Estonia | €108,210        |

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| Praza De Europa 10 A 6B  
15707 Santiago De Compostela  
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| Philipp Mueller Strasse 14  
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| Via Ennio Quirino Visconti 8  
193 Roma  
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02150 Espoo  
Finland | €0              |
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<td>Axencia Galega De Innovacion</td>
<td>Rua Dos Feans 7 Baixo 15706 Santiago De Compostela, Spain</td>
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<td>€268,113</td>
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<td>Lloyd's Register</td>
<td>71 Fenchurch Street LONDON EC3M 4BS United Kingdom</td>
<td>€274,297</td>
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Technologies:

- Computer-aided design and engineering
- Tools for ship hull design

Development phase: Research/Invention

Key Results:

**Exploring and quantifying the link between ship design and human performance failure**

The design of a ship can adversely affect human performance, which may lead to maritime accidents. An EU initiative is looking at how ship design contributes to human error.

Some of the errors attributed to the crew, both deck officers and engineers, are the result of such global design factors (GDFs) as motion, noise, vibration and deck layout.

The EU-funded project 'Human factors in risk-based ship design methodology' (http://www.faros-project.eu/ (FAROS)) is exploring the relationship between human performance failure and the design features of a ship. Building on previous projects, the overall goal is to demonstrate how human error aboard a ship can be mitigated by its design. The project specifically focuses on early design stages such as concept design, for drastic design modifications at this stage can still be cost effective.

During the first reporting period, the work began with analysis of state-of-the-art research in the GDF influence to crew performance and human error. Findings showed that noise, vibration and ship motions affect attention management capability, while the layout of the deck and the location and accessibility of equipment influence the efficiency and safety of performing various tasks by crew.

Researchers quantified risk contributions from such casualties as crew injury and death, ship-to-ship collision, grounding, and fire that affect the entire ship and hence all people on-board. Risk models were then developed linking GDFs to human performance and errors. The models were combined to create a comprehensive risk assessment framework to be used for passenger and cargo ships in a risk-based design process.

Virtual experiments were carried out in machinery spaces (simulated in virtual reality) and on bridge simulators to determine the conditions under which the crew is most likely to fail. These conditions were then compared to corresponding design rules and guidelines, looking for relevant deficiencies and loopholes.

With a better understanding of the causal link between ship design and human performance, FAROS will offer improvements to ship design process that will lead to safer ships. These improvements will also be helpful while developing more effective safety procedures and better work and living conditions on board.
STRIA Roadmaps: Vehicle design and manufacturing
Transport mode: Water transport (sea & inland)
Transport sectors: Passenger transport, Freight transport
Geo-spatial type: Other