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Results from the in-depth study on human-machine interface in relation to accidents in inland navigation

Hardly any uniformity in the wheelhouses, location of control elements not according to the ergonomic standards and a false sense of security of information from the automated tools. These are the three most important findings from Intergo's research, commissioned by the IWT Platform, into the human-machine interface in the wheelhouse in relation to accidents in inland navigation. IVR and the Ministry of Infrastructure and Water Management (IenW) were also involved in the study.

Due to an increasing number of accidents and damage claims in the inland shipping industry, Phase 1 of the study into human factors in relation to the accidents started in 2020. The conclusion was reached that human factors account for about 70-80% of all incidents. Following this study, the above IWT partners have commissioned the research agency Intergo to conduct a Phase 2 of the study for more in-depth examination. An additional motivation for the study was expressed by Paul Goris, president of the IWT Platform: ***"The Inland Waterway Transport sector is on the eve of a major transition in terms of sustainability and digitalisation. This requires further development of standards and certain safety requirements."***

Phase 2 consists of two separate studies:

- **Phase 2a**, emphasising *the human-machine interface in the wheelhouse and its design, also in light of the current and future levels of automation and information provision.*

- **Phase 2b**, *emphasising the organisational aspects as plausible root causes of accidents, namely communication, fatigue and stress, specific waterway or situations, and qualification of crew members.*

Intergo has now delivered the report following examination of Phase 2a that presents three factors related to an inadequate Human-System-Integration: wheelhouse design, human-machine interface (HMI), and current and future levels of automation. The results are based on the international questionnaire for skippers and the inland shipping industry, followed by vessel visits with interviews and observations.

Results

An important observation collected from the study is that there is little to no uniformity inside the wheelhouses regarding controls and displays at the position of a helmsman. In the past, the helmsman stood at the same helm for years and was therefore familiar with the respective wheelhouse and its operating systems. However, with currently growing shift patterns and personnel changes on inland vessels, they increasingly come into contact with different wheelhouses and other (auxiliary) equipment. This shift may introduce a risk of human error when operating another vessel, especially in unforeseen circumstances. During on-board visits, it was noticed that a location of primary controls (i.e. rudder, engine, VHF radio) and primary displays (i.e. radar, ECDIS) is not according to the ergonomic standards. Reachability, visibility, and legibility are often compromised, leading to (potential) errors and musculoskeletal disorders. The same vessel visits also revealed that sometimes the availability and/or reliability of information from automated tools is unclear to the skipper and that it may create a false sense of safety. On the other hand, certain automated information still requires a proper interpretation and action by the skipper.

Recommendations

The **first recommendation** from the Intergo report is to update and improve the available wheelhouse and HMI design guidelines. A user- and task-based approach should be followed, and guidelines should anticipate the developments in automation. The guidelines must be attractive for the industry to follow. The **second recommendation** is to develop a vision on minimum required availability, reliability, usability, and integration of information and automation at the helmsman's position. Both recommendations may be combined. The research has been summarised in a technical leaflet that concisely presents its most important aspects.

Next steps

The question of human factors root causes is not only about the technical standards and regulations, but also about the qualifications and skills of crew members, and the way how everything is organised on-board vessels. It is crucial that the recommendations from study Phase 2a and Phase 2b are followed up in an integrated manner. To put these recommendations into practice, Intergo recommends developing a roadmap that will involve all relevant stakeholders.

Lijdia Pater, secretary of the IWT Platform, says: **"It is an important subject, both for the safety on-board of inland vessels, but also for the image of inland navigation as a safe mode of transport. We want to use the results of this study to make a useful and substantial contribution to further discussions, but above all we want to contribute to reducing or preventing accidents in inland navigation."**

The results of the study's Phase 2a can be retrieved via the following links:

- Report Phase 2a – click here
- Report Phase 2a Annex – click here

Note to the press. For more information, you can contact:

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