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SIMULATION-BASED NAVIGATIONAL SAFETY ASSESSMENT

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Navigational safety assessment

Navigational safety assessment entails the investigation and evaluation of the risk of collision or grounding of a vessel in specific circumstances, e.g., poor weather or congested traffic situations. Using real-time simulation methods facilitates the assessment of risk without posing a threat to humans and assets.

Target group

Assessing navigational safety is important for several stakeholders. Port-side stakeholders, like terminal operators or port administrations, need to assess risks resulting from unsafe navigation that affect their infra- and superstructure. Furthermore, ship-owners, tugs and pilots, are instinctively interested in this topic. Moreover, an appropriate evaluation is also important to personnel involved in the long-term effects of navigational safety, e.g., port planners, ship designers and politicians.

Key issue

In principle, navigational safety assessments answer one key question: is it possible to safely navigate a specific vessel in a specific basin, port or fairway in specific conditions? More detailed questions can then be based on this general question. These apply to the following areas:

Strategic support

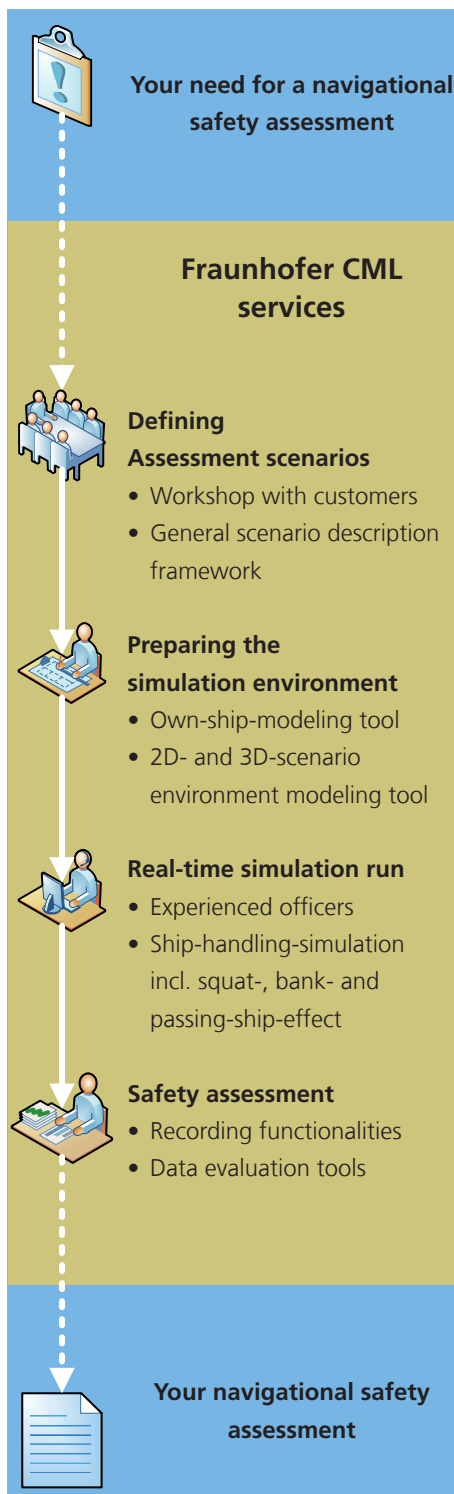
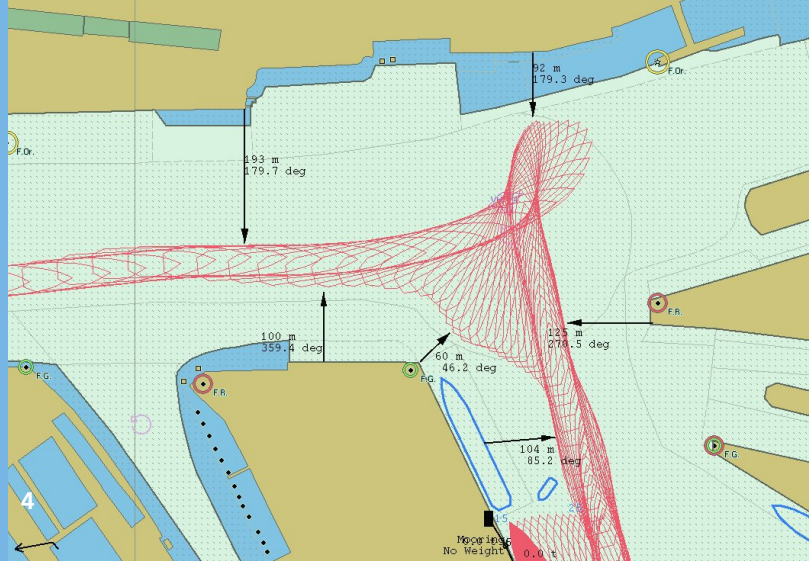
- How must a planned basin, port or fairway layout be designed to allow safe navigation?
- Can future ships navigate and maneuver safely in a specific basin, port or fairway?

Operational support

- How do wind, weather and traffic conditions affect navigational safety in a specific port or fairway?
- What is the fastest maneuver strategy that can be used to berth and release a vessel safely?

"Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions." (COLREG §6)

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Project steps of a navigational safety assessment

A navigational safety assessment is conducted in four consecutive project steps:

- **Defining Assessment Scenarios**

Together with its customer, Fraunhofer CML defines the level of detail and the object of investigation, e.g., the specification of the simulated vessel (also known as the own-ship) as well as the environmental, weather and traffic conditions in which the safety aspect shall be evaluated.

- **Preparing the Simulation Environment**

Based on the scenario specifications, Fraunhofer CML models the own-ship characteristics and the simulation environment, prepares the scenarios and develops maneuver strategies.

- **Real-time Simulation Run**

Real-time simulation runs are performed for all scenarios by experienced personnel and all relevant data is recorded. If desired, external stakeholders, e.g., pilots, may participate.

- **Safety Assessment**

Based on the data collected, navigational safety is evaluated and the results are visualized. The defined maneuver strategies are assessed and safety optimization options are investigated if required.

Fraunhofer CML maintains close contact with its customer at all times.

Fraunhofer CML's expertise in navigational safety assessments

Fraunhofer CML provides a state-of-the-art ship-handling simulator that facilitates real-time simulation studies of ship movements under different conditions. Relevant hydrodynamic and weather effects are modeled and the own-ship can be fully controlled by experienced personnel during the simulation runs to allow for human behavior.

Fraunhofer CML's key competences include its experience in accurate modeling of own-ships and its ability to generate realistic simulation environments.

Fraunhofer CML models own-ships based on information in the general arrangement plan, the pilot card and the maneuvering characteristics displayed on the wheelhouse poster. Special hydrodynamic effects, like the squat effect or the bank effect, are taken into account, ensuring that the model is close to reality.

Fraunhofer CML can rapidly generate an accurate 2D model of the simulation environment from scratch or based on an import of S-57 nautical charts. If required, Fraunhofer CML can develop the 2D model into a realistic 3D simulation environment.

3 *International Maritime Organization: International Regulations for Preventing Collisions at Sea.*

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