



## SIMULATION-BASED NAVIGATIONAL SAFETY ASSESSMENT

### Navigational safety assessment

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

### Target group

Assessing navigational safety is important for various maritime stakeholders. Terminal operators and port administrations need to assess their harbor's accessibility as well as risks resulting from unsafe navigation that might affect their infra- and superstructure. This is also a

crucial issue for shipping companies, pilots and tugs. Moreover, an appropriate evaluation is also important to personnel involved in the long-term effects of navigational safety, e.g. port planners, naval architects and political decision-makers.

### Key issue

*Is it possible to safely navigate a specific vessel in a specific fairway, port or basin under specific conditions?*

A navigational safety assessment is built around this key issue. In order to thoroughly investigate it, detailed and tangible questions are developed and applied to the following areas:

### Strategic support

- How must a planned fairway, port or basin layout be designed and equipped to promote safe navigation?
- Can ships of future sizes and characteristics navigate and manoeuvre safely in a specific fairway, port or basin?

### Operational support

- How do wind, sea state, navigational aids and traffic conditions affect navigational safety in a specific fairway, port or basin?
- What is the most efficient manoeuvre strategy for safely approaching, berthing, unberthing and departing for a specific vessel in a specific fairway, port or basin?

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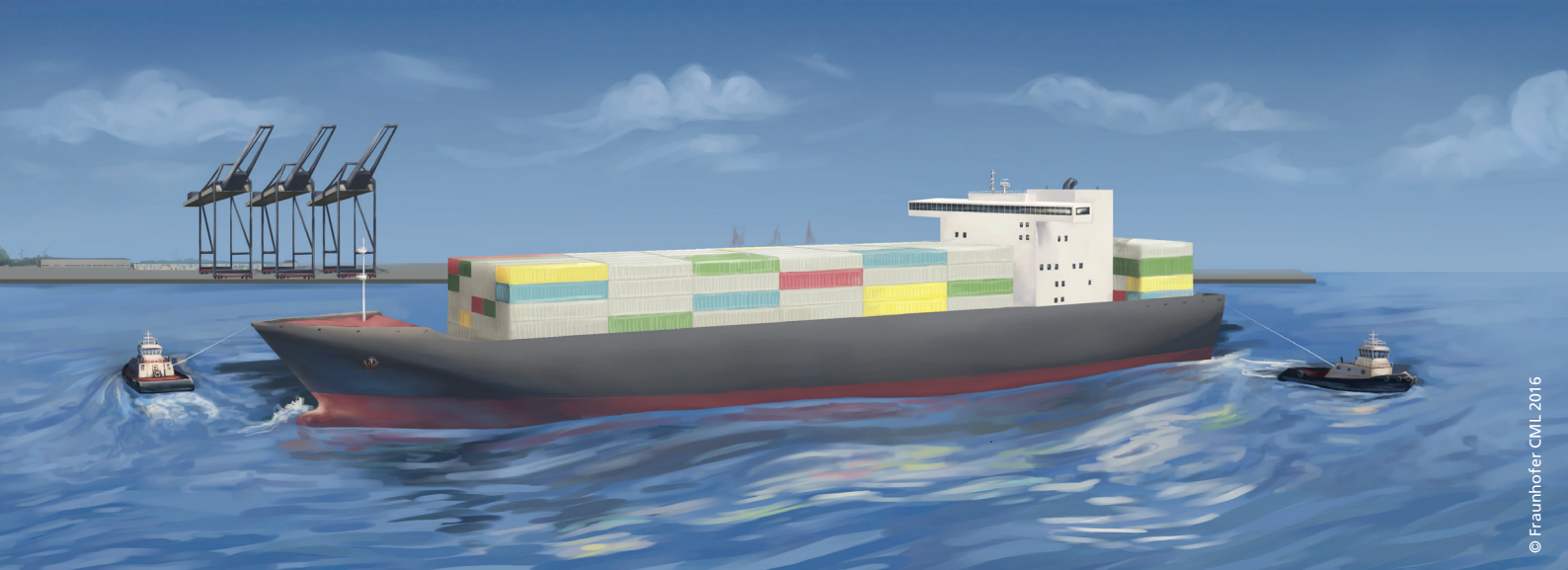
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## IMPRESSUM

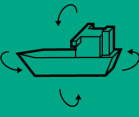



**Your need for a navigational safety assessment**




**Defining assessment scenarios**

- Workshop with customers
- General scenario description framework



**Preparing simulation environment**

- Ship modeling tool
- 2D/3D scenario environment modeling tool



**Performing real-time simulation runs**

- Experienced officers
- Ship handling simulation



**Assessing navigational safety**

- Recording functionalities
- Data evaluation tools
- Expert rating



**Your navigational safety assessment**

**Project steps for a navigational safety assessment**

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

**Defining assessment scenarios**

Together with the customer, Fraunhofer CML defines the level of detail and the focus of investigation, e.g. the specification of the simulated ship, fairway, port and basin as well as the environmental and traffic conditions under which the safety aspect shall be assessed.

**Preparing simulation environment**

According to the scenario specifications, Fraunhofer CML models the ship characteristics and the simulation environment, prepares the scenarios and develops maneuver strategies.

**Performing real-time simulation runs**

Participation of navigation experts such as pilots and masters is ensured to provide local and/ or ship knowledge for the study. All scenario runs are performed in real-time simulations and all relevant data is stored in a tailor-made data base for later in-depth analysis.

**Assessing navigational safety**

Based on the data collected, navigational safety is evaluated according to the well-established assessment approach. The defined maneuver strategies are evaluated and safety optimization options are investigated, where required. The results of the quantitative and qualitative assessment which also incorporates expert rating are described and visualized.

At all times Fraunhofer CML maintains close contact with the customer to meet the specific requirements and to elaborate a navigational safety assessment which provides a real client benefit.

**Fraunhofer CML's expertise in navigational safety assessments**

Fraunhofer CML provides two state-of-the-art ship handling simulators which are connected to a larger maritime simulator network. This infrastructure allows for real-time simulation studies and is the key enabler for a successful navigational safety assessment. Relevant hydrodynamic and environmental effects are modeled and the ship is fully controlled by experienced personnel to properly include human decision-making.

Fraunhofer CML has highly experienced and qualified staff in the fields of shipping and navigation as well as in accurate hydrodynamic modelling of ships and the creation of realistic simulation environments for ship handling simulators.

Fraunhofer CML models ships based on information from e.g. general arrangement plans, pilot cards and maneuvering characteristics displayed on wheelhouse posters. Hydrodynamic phenomena, such as squat, bank or passing-ship effect are taken into account, ensuring the model being as close to reality as possible.

Fraunhofer CML is able to rapidly generate accurate 2D models of the simulation environment from scratch or based on an import of S-57 electronic navigational charts. Additionally, Fraunhofer CML provides the possibility to build up a realistic 3D simulation environment based on 2D models.

Fraunhofer CML's state-of-the-art technological infrastructure in combination with its highly skilled staff, network of navigation experts and its scientifically sound assessment approach are the perfect preconditions for a conclusive and resilient navigational safety assessment.