

Assistance and Control Systems to Enhance the Safety of Navigation in Inland Waterways (LAESSI)



Cargo vessel after collision with bridge

Within the project LAESSI, which is funded by the Federal Ministry for Economic Affairs and Energy (Bundesministerium für Wirtschaft und Energie, BMWi), efficient navigation assistance functionalities for the inland waterway transport will be developed. The application of these novel functionalities aims at a reduction in risk of collisions. The need for this is indicated by a number of recent accidents involving inland vessels.

The joint research initiative LAESSI is led by the company in-innovative navigation GmbH and will be pursued in a unique combination of core competences from Alberding GmbH, Fachstelle der WSV für Verkehrstechnik (Traffic Technologies Centre of German Waterway Administration) and DLR (German Aerospace Center), Institute of Communications and Navigation (Neustrelitz).

Specifically, the project focuses on the development of the following navigation assistance functionalities: bridge approach warning system, automatic guidance, mooring assistance as well as an associated conning display to precisely visualize the vessel's movements and the influences on the ship.

- The **Bridge Collision Warning** system will provide a timely alert signal to the skipper, whenever the vessel, particularly the wheelhouse or the radar mast, probably will not safely pass the bridge. A warning has to be given several hundred meters before the bridge is reached in order to ensure sufficient reaction time.
- The **Mooring Assistance** needs exact position and heading of the vessel associated to the surroundings of the vessel. The skipper will get an accurate display of the actual situation, in particular, highly accurate distances to quay walls and other vessels, in order to be supported by this information while maneuvering.
- The **Automatic Guidance System** will reduce stress on the skipper during on route navigation. Highly accurate and integrity tested positioning and heading information is the basis for this functionality, especially on narrow waterways.

- The **Conning Display** will present clearly the motion of the ship. Especially trends and changes in motion will be indicated promptly. For this purpose, not only very accurate position and heading information of the vessel is necessary, but it is also important to consider the information from the propulsion systems as well as the influence of wind and water currents.

The essential basis for all assistance functions aforementioned is the provision of reliable and comprehensive nautical information. This includes reliable position, altitude, heading and movement information about the own vessel, exact and valid electronic charts, as well as information regarding the actual situation in the navigational area (temporary restrictions at construction sites, accidents, water levels), and characteristics of the infrastructure (e.g. dimensions of the bridges and locks).

Data relevant for the assistance systems are integrated on land and sent via AIS to the vessel. In future enhanced standards for AIS communication (AIS VDES Standard) will be the basis for significant additional transmission capacity. AIS base stations are already installed along many water ways.

Exact positioning including heading and height is possible due to modern GNSS technology. Besides GPS provided by the US satellites, the Russian GLONASS satellites, the Chinese BEIDU and the European GALILEO satellite system are available. Today's GNSS sensors allow using information from any of these navigation satellite systems.

The growing AIS infrastructure ashore provides the channel for information transfer especially suited for navigational use on inland waterways. Due to ongoing developments the transmission capacity of an AIS network will remarkably increase. The project LAESSI will develop the bases to transmit information to enable high precision navigation, especially GNSS correction data, via AIS.

To realize such sophisticated navigation assistance systems on board, a concept for integrity monitoring of the GNSS data is also focus of this project. Components of the integrity concept are a land based reference network for integrity monitoring as well as monitoring and detection module on the vessel, incorporating complementary sensors, like inertial sensors to validate the signals.

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