



## Safety recommendation no. 170

<b>Date of the publication</b>	21.12.2021
<b>Number of the final report</b>	2016081901
<b>Safety deficit</b>	<p>In an encounter involving two steamships in the Lucerne lake basin on Lake Lucerne on 19 August 2016 at approximately 13.35, the steamship Unterwalden (DS Unterwalden) suddenly veered to the left and so collided side-on with the steamship Schiller (DS Schiller).</p> <p>The collision between the DS Unterwalden and the DS Schiller in the Lucerne lake basin was due to the fact that the rudder deflection to port could not be corrected in time when two steering commands were given almost simultaneously at two control stands. The rudder steering software was programmed to continue carrying out the first command received even after further commands had been given by another control signal transmitter.</p> <p>The following contributed to the accident:</p> <ul style="list-style-type: none"><li>• A requirements and testing process that did not describe precise specifications for the functionality and testing of the software and did not explicitly exclude undesirable states.</li><li>• The Failure Mode and Effects Analysis FMEA did not cover a steering failure, software error or operational error or their impact on operational safety in different situations.</li><li>• The lack of clear behaviours or procedures for the handover or takeover of the different control stands led to several control signal transmitters operating at the same time.</li></ul> <p>The following helped to reduce the impact: The initiation of an emergency manoeuvre (emergency stop – engines 'full back') by the crew reduced the impact of the collision.</p> <p>The following factors did not contribute to the accident, but were identified in the investigation as potential areas in which safety improvements can be made:</p> <ul style="list-style-type: none"><li>• The design of the control signal transmitters poses risks to operational safety as there are no emergency running properties in the event of conceivable defects in the switch element and insufficient protection against moisture.</li><li>• No shielded cables were used to transmit the control signals from the control signal transmitters in the control stands to the PLC in the aft peak.</li><li>• The control signals from the control signal transmitters in the three control stands are electrically connected in parallel and received via two digital inputs in the PLC. This means the control commands from the control stands cannot be separately evaluated in the PLC, pending commands cannot be prioritised and control processes cannot be seamlessly traced.</li><li>• Since computer-based control processes are not stored, they cannot be traced; if this were the case, it would be easier to understand the control processes in the event of an incident.</li></ul>

Computer-based control systems are increasingly being used on ships. There are no specific requirements for control systems used in nautical applications to meet a set of minimum requirements. For example, the need for failure detection in the event of a technical defect or a software error is not specified. Requirements for control signal transmitters or cables used, quality requirements for software or software updates and safety cases for computer-based solutions are only rudimentary in inland and maritime navigation.

<b>Safety recommendation</b>	The Federal Office of Transport FOT should be active in appropriate bodies to ensure that requirements for computer-based control systems are established in the field of inland navigation to address safety-relevant issues relating to procurement, development, testing, maintenance and operation.
<b>Addressees</b>	Bundesamt für Verkehr
<b>Stage of the implementation</b>	Implemented. The Federal Office of Transport (FOT) has given the assurance that it will work in appropriate bodies within the limits of its possibilities to ensure that requirements for computer-based control systems are established in the field of inland navigation to address safety-relevant issues relating to procurement, development, testing, maintenance and operation.
<b>Investigation report concerning the safety recommendation</b>	<u>Schlussbericht</u> <u>Vorbericht</u>