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Items 4 (a) and 7 of the provisional agenda

Standardization of technical and safety requirements in inland navigation: European Code for Inland Waterways (resolution No. 24, revision 6)

Automation in Inland Navigation and Smart Shipping

Proposed amendments to the European Code for Inland Waterways on the basis of the Police Regulations for the Navigation of the Rhine and definition of the levels of automation in inland navigation, 2022 edition

Note by the Secretariat

Mandate

1. This document is submitted in line with the proposed Programme Budget for 2023, part V, Regional cooperation for development, section 20, Economic Development in Europe, Programme 17, Economic Development in Europe (A/77/6 (Sect. 20), table 20.6).
2. The secretariat presents in this document:
 - Articles 8.01, 8.02, 8.05–8.08 and 8.10 of the Police Regulations for the Navigation of the Rhine, in accordance with the decision of the Working Party on the Standardization of Technical and Safety Requirements in Inland Navigation at its sixty-second session (ECE/TRANS/SC.3/WP.3/124, para. 48) (annex I).
 - The recent updates of the Police Regulations for the Navigation of the Rhine, transmitted by the Central Commission for Navigation on the Rhine (CCNR), adopted at its autumn 2022 session, which could serve as a basis for proposed amendments to the European Code for Inland Waterways (CEVNI) (annex II)
 - The definition of levels of automation in inland navigation, 2022 edition, adopted pursuant to CCNR Resolution 2022-II-17 (annex III).



Annex I

Articles 8.01, 8.02, 8.05–8.08 and 8.10 of the Police Regulations for the Navigation of the Rhine*

Article 8.01

Towing of or by a pushed convoy

1. The towing of a pushed convoy is prohibited. Notwithstanding, pushed convoys may be towed in the event of exceptional local circumstances, provided that doing so does not hinder navigation.
2. Towing by a pushed convoy is prohibited.

Notwithstanding, a pushed convoy may carry out towing operations:

When proceeding upstream, provided that its maximum dimensions do not exceed 110 m x 12 m;

When proceeding downstream, provided that its maximum dimensions do not exceed 86 m x 12 m;

And provided, in addition, that an indication to that effect is made in the inspection certificate of the pusher.

A group consisting of a pushed convoy that performs towing operations shall be considered a towed convoy within the meaning of article 1.01 (d) and the pushed convoy shall be considered a motorized vessel leading a towed convoy.

Article 8.02

Pushed convoys consisting of vessels other than pushing barges

A pushed convoy may consist of vessels other than pushing barges when this is expressly provided in the inspection certificate of the pusher and in that of the pushed vessel.

...

Article 8.05

Couplings of pushed convoys

1. The couplings of a pushed convoy must ensure the convoy's rigidity.
2. It must be possible to accomplish coupling and uncoupling simply and easily.
3. Couplings shall be kept uniformly tight by using the appropriate tools, preferably special winches.
4. For pushed convoys whose width is less than or equal to 12 m and which consist of a pusher vessel and a pushed vessel, the rigid connection between the two vessels may be replaced by a coupling system that permits guided articulation, provided that an indication to that effect is made in the inspection certificates of the vessels.

Article 8.06

Voice link on board convoys

1. When the length of a pushed convoy exceeds 110 m, there must be a two-way voice link between the wheelhouse of the pusher and the leader of the convoy.
2. In the case of pushed convoys propelled by two side-by-side pushers, a two-way voice link must be ensured between the steering positions of the two pushers.
3. In the case of side-by-side formations consisting of motorized vessels, a two-way voice link must be ensured between the steering positions of the two vessels.

* www.ccr-zkr.org/files/documents/reglementRP/rp1fr_01042023.pdf.

4. In the case of towed convoys, a two-way voice link must be ensured between the steering positions of all vessels.
5. The ship-to-ship network must not be used to provide a voice link.

Article 8.07

Movement of persons on board pushed convoys

The movement of persons on a pushed convoy must be easy and safe. In addition, convoys must be equipped with the proper protective devices for any openings between convoy units.

Article 8.08

Formation of towed convoys

1. The distance between the motorized vessel at the head of the convoy and the first towed unit must not exceed 120 m. Nevertheless, in a convoy proceeding upstream consisting of a single towed vessel whose dead weight is more than 600 t, this distance may be increased to a maximum of 200 m.
2. The distance between two towed units must not exceed 100 m.
3. The distance between two motorized vessels at the head of a towed convoy must not exceed 120 m.

...

Article 8.10

Safety on board vessels authorized to transport more than 12 passengers

The following provisions apply to vessels authorized to transport more than 12 passengers and equipped to accommodate them on board overnight:

(a) A safety plan indicating the tasks to be performed by the crew and the personnel in the event of an emergency must be kept on board the vessel. Instructions for passengers in the event of a leak, a fire or an evacuation of the vessel must also be kept on board.

The safety plan and instructions must be posted in various appropriate locations.

(b) The crew and the personnel must be familiar with the safety plan referred to in subparagraph (a) above and must be given periodic instruction in the tasks they are expected to perform.

(c) Any time passengers are on board the vessel, all obstacles must be removed from the evacuation routes. It must be possible to open easily from both sides the doors and emergency exits located on these routes.

(d) Safety instructions must be provided to passengers at the beginning of any journey lasting more than one day.

(e) During the night, as long as there are passengers on board, safety checks must be carried out every hour. Appropriate procedures should be in place for verifying the discharge of this duty.

Annex II

Recent amendments to the Police Regulations for the Navigation of the Rhine

A. Final amendment to the Police Regulations for the Navigation of the Rhine modifying article 10.01 (1) (d) on the maximum speed for downstream navigation in the Gebirge section between Bingen and St. Goar above high water mark I (resolution 2022-II-10)¹

Article 10.01 (1) (d) reads as follows:

“(d) Without prejudice to the provisions of article 6.20, the maximum speed of vessels in relation to the bank shall not exceed 20 km/h, with the exception of downstream navigation in the Gebirge section between Bingen (km point 528.50) and St. Goar (km point 556.00), where the maximum speed of vessels in relation to the bank shall not exceed 24 km/h;”

B. Final amendments to the Police Regulations for the Navigation of the Rhine – overnight ports of Boven-Rijn, Waal and Lek and the port of refuge and safety of Emmerich (summary, articles 11.01, 12.01, 14.11 and 14.12) (resolution 2022-II-11)²

1. The summary is amended as follows:

(a) After the entry for article 14.10, the entry for article 14.11 reads as follows:

“14.11 Boven Rijn, Waal and Lek overnight ports”

(b) After the entry for article 14.11, an entry for article 14.12 is added as follows:

“14.12 Emmerich port of refuge and safety”.

2. Article 11.01 (5) (adopted pursuant to resolution 2017-II-19, annex 1), reads as follows:

“5. A passenger vessel may proceed downstream of Emmerich (km point 885) only if it meets the requirements of article 13.01 (2) (b) of ES-TRIN.”³

3. Article 12.01 (3) reads as follows:

“3. The reporting requirement referred to in paragraph 1 is applicable in the following sections, as indicated by sign B.11 and an additional sign marked “Reporting requirement”:

(a) From Basel (Mittlere Rheinbrücke, km point 166.53) to Gorinchem (km point 952.50); and

(b) From Pannerden (km point 876.50) to Krimpen aan de Lek (km point 989.20).”

¹ The amendment will enter into force on 1 December 2023.

² The amendments will enter into force on 1 December 2023.

³ *Note by the secretariat:* The European standard laying down technical requirements for inland navigation vessels.

4. Article 14.11 reads as follows:

“Article 14.11

Boven-Rijn, Waal and Lek overnight ports

1. In the overnight ports of Spijk (km point 859.80), Lobith (km point 863.40), IJzendoorn (km point 907.80), Haaften (km point 936.00) and Bergambacht (km point 976.90), unless authorized by the competent authority, it is forbidden:

- (a) To load and unload vessels and, in Bergambacht, also to bunker;
- (b) To deposit goods or other objects on the bank or on a landing stage;
- (c) To degas tanks;
- (d) To embark or disembark passengers;
- (e) To enter with floating devices or installations;
- (f) To enter with vessels required to carry the marking referred to in article 3.14 (2) or (3);
- (g) To berth in public berthing areas for more than three consecutive 24-hour periods;
- (h) To berth again in the same overnight port within 12 hours of leaving the port;
- (i) To moor with the stern towards the bank;
- (j) To moor at landing stages, and in Bergambacht at the berths, with convoys longer than 135 m.

2. By way of derogation from paragraph 1 (f), vessels that are not required to carry the marking referred to in article 3.14 (2) are allowed to enter the Spijk overnight port.

3. By way of derogation from paragraph 1 (i), it is permitted to berth with the stern towards the bank at berth 10 in Spijk overnight port.

4. By way of derogation from paragraph 1 (j), it is permitted to berth convoys longer than 135 m at berth 10 in Spijk overnight port.

5. The boatmaster shall immediately inform the traffic control posts in Nijmegen (for Spijk and Lobith overnight ports), in Tiel (for IJzendoorn and Haaften overnight ports) or in Dordrecht (for Bergambacht overnight port) of the chosen berthing area in the overnight port and of the vessel’s departure from the port.

6. The competent authority may issue instructions supplementing or waiving the provisions of the present article.”

5. After article 14.11, article 14.12 is inserted, as follows:

“Article 14.12

Emmerich port of refuge and safety

1. In Emmerich port of refuge and safety (km point 851.78), unless authorized by the competent authority, it is prohibited:

- (a) To enter with floating devices or installations;
- (b) To enter with vessels required to carry the marking referred to in article 3.14 (1), (2) or (3);
- (c) To berth for more than three consecutive 24-hour periods;
- (d) To berth again within 12 hours of leaving the port;
- (e) To take up a berthing area with a barge separated from a convoy.

2. The competent authority may issue instructions supplementing or waiving the provisions of the present article.”

C. Final amendment to the Police Regulations for the Navigation of the Rhine to create a legal basis for allowing temporary derogations from the requirements for a vessel with automated crew tasks or for a remotely operated vessel (summary, article 1.26) (resolution 2022-II-12)⁴

1. The summary is amended as follows:

The following information relating to article 1.26 is added after the information relating to article 1.25:

“1.26 Derogations from these Regulations for a vessel with automated crew tasks or for a remotely operated vessel.”

2. The following article 1.26 is added after article 1.25:

“Article 1.26

Derogations from the present Regulations for a vessel with automated crew tasks or for a remotely operated vessel

1. On the basis of a recommendation drawn up by the Central Commission for Navigation on the Rhine, the competent authority may authorize, on a trial basis and for a limited period of time, derogations from the present Regulations for a vessel on which crew tasks are automated or for a vessel that is operated remotely.

2. This recommendation establishes the minimum requirements to ensure that the vessel:

- (a) Does not affect the safety and ease of navigation and
- (b) Has a level of safety equivalent to that of other vessels navigating on the Rhine.

The competent authority may include additional requirements in its authorization.

3. The competent authority shall enter the derogations referred to in paragraph 1 and the requirements referred to in paragraph 2 in the inspection certificate for the vessel concerned, or in the equivalent recognized certificate, in accordance with the Rhine Vessel Inspection Regulations.”

D. Final amendments for consistency of the references in the Police Regulations for the Navigation of the Rhine with the European Standard for River Information Services (ES-RIS 2023/1) (articles 1.01, 4.07 and 12.01) (resolution 2022-II-13)⁵

1. Article 1.01 is amended as follows:

- (a) Subparagraph (ac) (adopted pursuant to resolution 2021-I-11) reads:

“(ac) “Inland AIS device” means a device that is installed on board a vessel and is used within the meaning of part II of ES-RIS;”

- (b) Subparagraph (ai) (adopted pursuant to resolution 2021-I-11) reads:

“(ai) “ES-RIS” means the European Standard for River Information Services, in its 2023/1 edition. In order for ES-TRIN to be applicable, a member State must be one of the Rhine riparian States or Belgium.”

⁴ The amendment will enter into force on 1 December 2023.

⁵ The amendments will enter into force on 1 January 2024.

2. Article 4.07 is amended as follows:
- (a) The second sentence of paragraph 3 reads as follows:
 “The Inland ECDIS device, in information mode, shall comply with the provisions of ES-RIS part I.”
- (b) Paragraph 4 reads as follows:
 “4. At a minimum, the following data must be transmitted in accordance with the provisions of ES-RIS part II:
- (a) User identifier (Maritime Mobile Service Identity, MMSI);
- (b) Name of vessel;
- (c) Type of vessel or convoy in accordance with the provisions of ES-RIS part II;
- (d) Unique European vessel identification number (ENI), or International Maritime Organization (IMO) number for sea-going vessels that have not been given an ENI number;
- (e) Overall length of the vessel or convoy accurate to within 0.1 m;
- (f) Overall width of the vessel or convoy accurate to within 0.1 m;
- (g) Position (WGS 84);
- (h) Speed over ground;
- (i) Course;
- (j) Time of electronic position fixing device;
- (k) Navigational status as per annex 11;
- (l) Position acquisition point on the vessel accurate to within 1 m, in accordance with annex 11;
- (m) Call sign.”
- (c) Paragraph 3 (c) reads as follows:
 “(c) Type of vessel or convoy in accordance with the provisions of ES-RIS part II;”
3. Article 12.01 (1) reads as follows:
 “1. Boatmasters of the following vessels and convoys shall, prior to entering the sectors listed in paragraph 3, report electronically in accordance with the provisions of ES-RIS part IV:
- (a) Vessels carrying goods subject to AND;⁶
- (b) Tank vessels, except for supply vessels and oil separator vessels, as defined in 1.2.1 of the Regulations annexed to ADN;
- (c) Vessels carrying containers;
- (d) Vessels longer than 110 m;
- (e) Cabin vessels;
- (f) Seagoing ships;
- (g) Vessels with LNG⁷ systems on board;
- (h) Special transport as referred to in 1.21.”

⁶ Note by the secretariat: European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways.

⁷ Note by the Secretariat: liquefied natural gas.

E. Approval of amendments to the Police Regulations for the Navigation of the Rhine following the written procedure (summary, articles 1.02, 1.03, 1.08, 1.09, 4.06, 6.32, 7.08 and 11.01 and annex 13⁸) (resolution 2022-II-14)⁹

1. Article 1.02 (1) reads as follows:

“1. All vessels and other assemblies of floating material shall be placed under the authority of a person having the necessary qualifications. This person is hereinafter referred to as the boatmaster.

Boatmasters are considered to possess the necessary qualifications if they hold a valid boatmaster’s certificate under the Regulations for Rhine Navigation Personnel for the operation of the vessel concerned. Boatmasters who navigate on a section of the Rhine mentioned in article 13.03 of the Regulations for Rhine Navigation Personnel must also have the specific authorization required under this regulation.

If more than one boatmaster is prescribed for a vessel in accordance with the Regulations for Rhine Navigation Personnel, only the boatmaster in charge of the vessel is required to have the specific authorization mentioned in article 13.03 of the Regulations for Rhine Navigation Personnel.”

2. Article 1.03 (4), first sentence (concerns only the German version).
 3. Article 1.08 (3) (concerns only the German version).
 4. Article 1.09 (5) reads as follows:

“5. When under way, all high-speed vessels shall be steered by a person holding a valid boatmaster’s certificate under the Regulations for Rhine Navigation Personnel, a specific authorization for radar navigation and, where applicable, a specific authorization required for navigation on sections of the Rhine that have been identified as presenting specific risks.

A second person, also holding a boatmaster’s certificate and the necessary specific authorizations mentioned above, shall be in the wheelhouse except during berthing and casting off and in locks and their forebays.”

5. Article 4.06 (1) reads as follows:

“1. Vessels may not use radar unless:

(a) They are fitted with a radar installation and a device indicating the rate-of-turn of the vessel in accordance with article 7.06 (1) of ES-TRIN. This also applies to Inland ECDIS¹⁰ ‘equipment, which may be used for conning the vessel with overlaid radar image (navigation mode). This equipment shall be in proper working order and of a type approved for the Rhine by the competent authorities of one of the riparian States or Belgium. However, ferry boats not moving independently shall not be required to be fitted with a rate-of-turn indicator;

(b) A person holding specific authorization for navigating using radar considered valid under the Regulations for Rhine Navigation Personnel is on board; however, the radar may be used for training purposes in good visibility, even when there is no such person on board.”

6. Article 6.32 (1) reads as follows:

“1. Vessels may navigate by radar only if there is in the wheelhouse at all times a person holding a valid boatmaster’s certificate under the Regulations for Rhine Navigation Personnel, a specific authorization for navigation by radar and, where applicable, a specific authorization required for navigation on sections of the Rhine

⁸ The amendments will enter into force on 1 April 2023.

⁹ Note by the secretariat: Annex 13 is not reproduced in the present document.

¹⁰ Note by the secretariat: Electronic Chart Display and Information System for Inland Navigation.

identified as presenting specific risks, and a second person conversant with use of the radar.

However, for vessels holding an inspection certificate that indicates that the wheelhouse is designed for radar navigation by one person, the second person is not required to be in the wheelhouse at all times.”

7. Article 7.08 (2) reads as follows:

“2. The efficient watch is provided by a crew member who:

(a) For vessels referred to in paragraph 1 (a) above, holds a certificate as prescribed in article 15.02 of the Regulations for Rhine Navigation Personnel,

(b) For vessels referred to in paragraph 1 (b), holds an expert certificate as prescribed in article 14.01 of the Regulations for Rhine Navigation Personnel.”

8. Article 11.01 (3) reads as follows:

“3. A vessel more than 110 m long is authorized for navigation only if there is on board a person holding a specific authorization for radar navigation valid under the Regulations for Rhine Navigation Personnel.”

F. Final amendment to the Rhine Vessel Inspection Regulations, the Police Regulations for the Navigation of the Rhine and the Regulations for Rhine Navigation Personnel – Adaptation to take account of the updated European standard laying down technical requirements for inland navigation vessels (ES-TRIN 2023/1) (resolution 2022-II-15)¹¹

1. The Rhine Vessel Inspection Regulations are amended as follows:

Article 1.01 (25) reads as follows:

“25. “ES-TRIN” means the European standard laying down technical requirements for inland navigation vessels, in its 2023/1 edition. In order for ES-TRIN to be applicable, a member State must be one of the Rhine riparian States or Belgium.”

2. The Police Regulations for the Navigation of the Rhine are amended as follows:

Article 1.01 (ah) reads as follows:

“(ah)”ES-TRIN” means the European standard laying down technical requirements for inland navigation vessels, in its 2023/1 edition. In order for ES-TRIN to be applicable, a member State must be one of the Rhine riparian States or Belgium;”

3. The Regulations for Rhine Navigation Personnel are amended as follows:

Article 1.02 (56) reads as follows:

“56. “ES-TRIN” means the European standard laying down technical requirements for inland navigation vessels, in its 2023/1 edition. In order for ES-TRIN to be applicable, a member State must be one of the Rhine riparian States or Belgium.”

¹¹ The amendments will enter into force on 1 January 2024.



















Annex III

International definition of automation levels in inland navigation – 2022 edition (resolution 2022-II-17)

Preliminary definitions

“Level of automation”	means the level at which an automated vessel can be operated during its journey. Depending on the context, an automated vessel can implement different levels of automation.
“Navigation”	means all tasks (such as planning, steering, controlling and manoeuvring) performed to steer a vessel from one place to another on a waterway.
“Dynamic navigation tasks”	means all of the vessel’s navigational operations, such as operation of the steering gear, propulsion, anchor winches or elevating wheelhouse. The complexity of these tasks depends on the context (e.g., vessel docking may be excluded depending on the context).
“Context-specific”	means restricted navigation conditions such as navigation on specific sections of the waterway, passage through locks and vessel formations in convoy or with towing. The context includes the infrastructure relevant to the automation, e.g. the type and capacity of the radio transmission networks. The context further includes the influence of natural conditions, such as current or weather conditions, and infrastructure constraints such as water level and current height of navigable passages through bridges.
“Navigational environment”	means fixed and dynamic conditions such as profile of the waterway, water level, visibility and vessel crossing. The navigation automation system may use only part of the available information about the navigational environment (e.g. at level 1, the rate-of-turn indicators do not use information about vessel crossing). Response to the navigational environment includes radio communication with boatmasters of other vessels.
“Collision avoidance”	means the critical task of responding to surrounding conditions (other vessels, bridges, etc.).

For the purposes of this definition of automation levels, the term “boatmaster” refers to a human boatmaster.

	<i>Level of automation¹</i>	<i>Designation</i>	<i>Vessel command (manoeuvring, propulsion, wheelhouse, ...)</i>	<i>Monitoring and reacting to the navigational environment</i>	<i>Fallback performance of dynamic navigation tasks</i>
The boatmaster performs some or all of the dynamic navigation tasks	0	No automation Boatmaster performs all aspects of dynamic navigation tasks at all times, even when supported by warning or intervention systems			
	1	Steering assistance Context-specific performance by an <u>automated steering system</u> , using certain information about the navigational environment and with the expectation that the boatmaster will perform all other aspects of the dynamic navigation tasks			
	2	Partial automation Context-specific performance by an automated navigation system for <u>both steering and propulsion</u> , using certain information about the navigational environment and with the expectation that the boatmaster will perform all other aspects of the dynamic navigation tasks			
The system performs all dynamic navigation tasks	3	Conditional automation The sustained context-specific performance by an automated navigation system of all dynamic navigation tasks, <u>including collision avoidance</u> , with the expectation that the boatmaster will respond appropriately to requests to intervene and to system failures			
	4	High automation The sustained context-specific performance by a navigation automation system of all dynamic navigation tasks and fallback operation, without the expectation that the boatmaster will respond to a request to intervene ²			
	5	Autonomous = Full automation The sustained and <u>unconditional</u> performance by a navigation automation system of all dynamic navigation tasks and fallback operation, without the expectation that the boatmaster will respond to a request to intervene			

¹ Remote control can be used at different levels of automation, but different conditions, to be defined by the competent authorities, may apply in order to guarantee a level of safety equivalent to that of vessels currently in operation.

² This level introduces two distinct functionalities: the ability to operate “normally” without human intervention and exhaustive fallback operation. Two intermediate levels could be considered.

Explanatory note to the international definition of levels of automation in inland navigation, 2022 edition

1. Introduction

This explanatory note contains additional information related to the international definition of levels of automation, 2022 edition. In case of any contradiction between the explanatory note and the definition, the adopted definition should be preferred. If necessary, CCNR will update this explanatory note on the basis of experience gained.

This explanatory note does not replace or supplement any existing or future regulations.




2. Preliminary definitions

Level of automation and maximum level of automation

An automated vessel may use **different levels of automation during its voyage**. “**Maximum level of automation**” means the maximum level at which an automated vessel can be operated during its voyage. During the voyage of an automated vessel, the level of human intervention may change, so that, for the same vessel, the automated navigation system may play an important role in the control of the vessel on certain sections of the waterway, while in a different context (confined navigational conditions), the human operator will take full control of the vessel. This is the major difference between levels 4 and 5: for the latter, automation is independent of the context.

3. Table of automation levels

(a) Meaning of pictograms

<i>Pictogram</i>	<i>Meaning</i>	<i>Fallback operation</i>
	The action for which this pictogram is used is performed exclusively by the boatmaster.	The boatmaster is considered ultimately responsible and is expected to intervene.
	The individual aspects of the actions for which this pictogram is used are performed either by the boatmaster or by the system, depending on the type of action to be performed (the action may or may not be included in the operational design of the system).	The boatmaster is considered ultimately responsible and is expected to intervene.
	The action for which this pictogram is used is performed by the system.	The system is sufficiently developed to be able to intervene.

(b) Examples

<i>Levels of automation</i>	<i>Meaning</i>	<i>Examples</i>
0	No automation	
1	Steering assistance	Rate-of-turn regulator Basic track guidance assistant for inland navigation (TGAIN) used for steering assistance
2	Partial automation	Advanced system used for steering assistance and propulsion control, such as the advanced track guidance assistant for inland navigation

<i>Levels of automation</i>	<i>Meaning</i>	<i>Examples</i>
		(Advanced TGAIN). This system may have a collision avoidance warning function.
3	Conditional automation	Advanced system that includes a collision avoidance function and vessel command.
4	High automation	A vessel, on a section of canal between two successive locks (well known environment), which is entirely controlled by an automated navigation system that is not able to manage the passage through the lock by itself (requiring human intervention).
5	Autonomous = Full automation	A vessel whose automated navigation system performs all tasks (normal and fallback) during navigation on all waterways, including passage through locks.

(c) Focus on level 4, “High automation”

It is noted that level 4 “*introduces two distinct functionalities: “normal” operation capacity, without human intervention, and exhaustive fallback operation. Two intermediate levels could be considered.*”

Whereas, in levels 1, 2 and 3, the boatmaster must intervene not only on demand, but also in the case of system failure, level 4 assumes that the system is sufficiently advanced, even in context-specific situations, not only to no longer require intervention by the boatmaster in difficult situations, but also to monitor itself and react autonomously to system failures (“fail-safe” approach).

This level therefore covers two very different aspects of automation (perfect system for all unusual traffic situations and comprehensive fallback system). This could be divided into two sublevels. For the time being, this distinction is not made in the definition, mainly due to a lack of experience related to this level and developments.

4. Remote control compared to automated navigation

Remote control and monitoring of vessels is, a priori, independent of the vessel’s level of automation.

Full automation means “*the sustained and unconditional performance by an automated navigation system of all dynamic navigation tasks and implementation of fallback arrangements without the expectation that the boatmaster will respond to a request to intervene*”.

Remote control means that navigation decisions are taken by a human being or a machine not present on board the vessel. In other words, “remote control” is understood to refer to a means of performing some or all of the necessary navigational tasks (e.g., vessel command, monitoring and reacting to the navigational environment and fall-back performance of dynamic navigation tasks) from the bank or from a location other than the vessel. These remote tasks can, from a technical point of view, be performed by a human or by a machine. Thus, remote control is not in itself automation, although the two are related.

Automation and remote control are therefore two different concepts, even though they may use partly identical technologies and technical equipment. Depending on the level of automation, the automated system installed on board the vessel can make it possible to adjust

the steering or the propulsion. The action occurs by means of a command received electronically.

- The command may be given either locally or remotely.
- The command may come from either a human or a machine.

Remote control and automation therefore require identical functionalities to convert a command issued by a machine or by a human located at a distance into practical action on the steering and/or the propulsion.

There is also a link between the two concepts in the case of a malfunction. In the event that the remote control is interrupted, there should be provision to ensure that the vessel either reaches a safe location without posing a hazard to other vessels or is safely immobilized without causing undue inconvenience to other vessels. There are several ways of making this possible:

- There is a person on board the vessel who has the necessary skills to perform such a task.
- The vessel has a level of automation such that it is capable of reaching a safe location autonomously or automatically dropping anchor if communication is interrupted.

Another solution could be to have an additional and completely redundant remote control. Thus, if the primary remote control is no longer operational, another control system could be activated using alternative technical means.

In the absence of an obvious link between the remote control and automation, the diagram below indicates the need for additional conditions required to make remote control possible, depending on the level of automation. These conditions should ensure safe navigation if the level of automation on the vessel is not sufficient to guarantee safe operation in the event of a malfunction of the remote control. For example, remotely operated vessels should also be equipped to allow a boatmaster on board to take control of the vessel immediately.

Diagram: "Remote control options – Automation levels"

Note by the secretariat: Not reproduced in the present document.

5. Contact

If you have any questions or comments to improve this explanatory note, please contact the CCNR secretariat at: ccnr@ccr-zkr.org.
