PLATINA3

IWT policy platform

- JOBS & SKILLS -

Report on required content and options to establish training and refresher classes for automated vessel operation D3.4

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Executive Summary

This document is **taking stock of the current situation of refresher classes in European inland navigation in general and more specifically of refresher classes for more automated vessel operation in inland navigation in Europe.** This exercise on more automated vessel operation, in line with PLATINA3[1] deliverable D3.3 and based on the sector consultation during the first Platina3 stage event is focussing on remote controlled and remotely assisted vessel operation. Even though remote vessel operation and remote assistance are not automatically linked to automation, **stakeholders including decision makers in the some of the largest companies in the sector are currently investing in remote vessel operation and start to train their personnel in the domain of cooperation between remote control center and crew on board remotely assisted or remotely controlled vessels.**

For reasons of clarity, automation is looked at on the basis of the internationally accepted levels of automation in IWT introduced by the Central Commission for the Navigation of the Rhine (CCNR). Even if remote controlled vessel operation is not necessarily automated vessel operation, remote controlled vessel operation is in the focus of this report due to practical relevance of new competences of remote vessel operators and personnel on board remotely controlled or remotely assisted vessels as described in deliverable 3.3 and currently discussed in CESNI, i.e. on a level of automation 2 and 3 which is the most common practice when looking at the most comprehensive overview of pilot projects on automation as permanently updated on the CCNR website.[2]

The present report compares the situation in the sector of inland navigation transport (IWT) with other modes of transport that are often more advanced in terms of mandatory or voluntary refresher classes in general and more precisely in more automated transport operation. This overview leads to the assumption that IWT could fall behind other modes of transport in terms of attractiveness for newcomers to the transport sector who wish to be part of a lifelong learning environment and attractive job opportunities that provide for upskilling where need be.

Some concrete subjects for updating of CESNI standards for competence are then looked at with regard to modern technology for more automated vessel operation. As the competence standards have just been introduced in early 2022, this report focuses more on new competences for more automated vessel operation that have been identified in Platina3 deliverable 3.3 (Report on competences to operate on board systems allowing for automation of inland navigation vessels) submitted on 31 August 2022.

Based on these general findings, this document is proposing a general scheme for refresher classes for **two key target groups of deck crew members operating more automated vessels, who are:**

- **experienced crew members already sailing on board IWT vessels since a long time**
- **crew members who have recently joined the IWT sector, on operational level (OL, i.e. boatman, able boatman and helmsman) and management level (ML, i.e. boatmaster)**

This document provides as well a brief outlook on modern training methods and techniques. Legislators will have to decide if the proposed options for such training will be established and what preconditions will have to be considered. This will largely depend on the judgement of CESNI Member States, in the respective police regulations, if vessels will be allowed to sail without a person holding a certificate of qualification as a boatmaster onboard and if so, if the person onboard a remotely operated or remotely assisted vessels can be an able boatman with specific additional competence (and qualifications such as a radio operator's certificate, which is only required by persons holding a certificate of qualification of helmsman or as a boatmaster).

[1] PLATINA3 1st Stage Event, the "Budapest sessions" on 7 & 8 April 2021. Programme and presentations available on https://platina3.eu/event/budapest/

[2] https://automation.ccr-zkr.org lists 37 pilot projects (state 6 October 2022) in a four language (DE, EN, FR, NL) overview of projects mostly coming from CCNR Member States (BE, CH, DE, FR, NL), Scandinavian countries (FI, NO, SE) and the UK.

List of abbreviations

AIS	Automatic Identification System
CBTA	Competency Based Training and Assessment
CCNR	Central Commission for Navigation of the Rhine
CESNI	European Committee for the Elaboration of Standards In the field of Inland Navigation
EASA	European Aviation Safety Agency
EBT	Evidence-Based Training
EBU	European Barge Union
ECDIS	Electronic chart display and information system
EDINNA	Education in inland navigation
ES-QIN	European Standard for Qualifications in Inland Navigation
ESO	European Skippers' Organisation
ES-TRIN	European Standard laying down Technical Requirements for Inland Navigation vessels
ETF	European Transport Workers' Federation
EU	European Union
GDPR	General Data Protection Regulation
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IMO	International Maritime Organization
IWT	Inland Waterway Transport
RCC	Remote Control Center
RIS	River Information Services
RPN	Regulations for Rhine Navigation Personnel
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
TFEU	Treaty on the Functioning of the European Union
TGAIN	Track Guidance Assistant systems for Inland Navigation

1. Introduction

Inland Waterway Transport (IWT) is recognized as an environment friendly and safe mode of transport, and one of the most appropriate means of transportation in the pursuit of a sustainable development strategy.[3] But like every other mode of transport, continuous technological change forces inland navigation personnel to adapt their competence (knowledge and skills) throughout their career.

This need is reflected in the stronger role for vocational training enshrined in the Lisbon treaty[4]. For the specific needs of the sector, the communication from the Commission NAIADES III: Boosting future-proof European inland waterway transport from 2021[5] calls for more attractive and sustainable jobs in IWT. According to the Commission, "*the current and future workforce needs to be equipped with the right skills to deal with the green and digital transitions, cyber-security, synchromodality and the automation of vessels and infrastructure. Policies for lifelong learning need to be developed so that new technology can be introduced in a smooth and safe manner*."[6]

For several years now, stakeholders like ETF[7] and EDINNA have stressed the need of refresher classes or periodic training in IWT, highlighting that such training is already mandatory in other modes of transport.

At the beginning of 2020, the **European Commission** clearly stated in its Communication presented by President von der Leyen "A strong social Europe for just transitions"[8], that new technologies will lead to new job opportunities and allow for more flexible work arrangements. At the same time, the European Commission also wanted to make sure that new jobs are quality jobs, and that people are equipped with the right skills to take them up.

A few months later, a Communication from the Commission[9] "**Sustainable and Smart Mobility Strategy** – putting European transport on track for the future" stated on its point 95 the following:

> "*Changes in the sector, in particular those relating to automation and digitalisation, are creating many new challenges. Jobs in the transport sector, especially low- and medium skilled jobs, may be at risk due to automation and moves towards greater sustainability. At the same time, the ongoing digital transformation presents new opportunities, such as an improved working environment and quality jobs that could become more attractive for women and young people. Therefore, a credible path is needed for the just transition for transport workers. The Commission will issue recommendations for the transition to automation and digitalisation and on means to mitigate their impact on the transport workforce*."

The **European Pillar of Social Rights Action Plan** (May 2021) outlines concrete actions to further implement the principles of the European Pillar of Social Rights as a joint effort by the Members States and the EU, with an active involvement of social partners and civil society. One of the headline targets to be achieved in 2030 is that at least 60% of all adults should participate in training every year.

[3] IWT is one of the most CO2-efficient modes of transport (per tons of goods carried) along with rail. See STREAM: Study on Transport Emissions of All Modes, CE Delft, October 2009, https://cedelft.eu/publications/stream-study-on-transport-emissions-of-all-modes/

[4] Treaty on the Functioning of the European Union, 2007, Article 166.

[5] COM (2021) 324 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions NAIADES III: Boosting future-proof European inland waterway transport, 24 June 2021.

[6] Ibid, p. 12.

[7] See i.a. ETF problem analysis for CESNI work programme 2022-2024.

[8] "*A strong social Europe for just transitions*" Communication of the European Commission presented by President von der Leyen on 14 January 2020 to EP, Council, ESC and CoR (COM (2020) 14 final).

[9] Communication from the Commission to the European Parliament, the Council, the European economic and social Committee and the committee of the regions, "*Sustainable and Smart Mobility Strategy – putting European transport on track for the future*", SWD (2020) 331 final.

With the European Pillar of Social Rights Action Plan[10], the Commission has set out concrete initiatives to deliver concrete results envisaged by the European Pillar of Social Rights. In chapter one, which deals with equal opportunities and access to the labor market the action plan states on education, training and life-long learning that everyone has the right to quality and inclusive education, training and life-long learning in order to maintain and acquire skills that enable them to participate fully in society and manage successfully transitions in the labor market.

NAIADES 3 highlights that new standards in terms of competence and examination for digital and eco-efficient skills are needed, to keep skilled crew members fit for the future.

Parallel to EU policy, the concept has already been raised at a regional level in 2018 by **the Mannheim Declaration.**[11] The Central Commission for the Navigation of the Rhine (CCNR) has been tasked by Transport Ministers of Belgium, Germany, France, the Netherlands and Switzerland in the Mannheim declaration to provide for up-to-date manning requirements that provide for more flexibility and to enhance the attractiveness of the sector also with a view to the demographic development.

Finally, the **Sectoral Social Dialogue Committee (SSDC)[12] recognized the importance of refresher classes.** Social partners of the IWT sector meet on a regular basis within the framework of the Sectoral Social Dialogue Committee.[13] At the SSDC meeting in January 2022, the Work Programme for 2022-2023 has been presented.[14] The Work Programme is a reflection of major topics and challenges that social partners would like to discuss at the European level during the upcoming months and years. Consultation with DG MOVE and DG Employment, Social Affairs and Inclusion will also play an important role in this process.

Eleven subjects are included in this work programme, including automation. For this subject, the objective is to "*raise awareness on and support life-long learning and explore Periodic Training schemes*". The expected result is planned as follow: "*Social partners will contribute to a skilled workforce by supporting life-long learning and explore and develop instruments to stimulate refreshment and upskilling*". The draft standards for competence of competence elaborated as Platina3 deliverable D3.3 and the present draft report are items social partners wished to discuss at the SSDC meeting on 21 October 2022 too.

Competence-based approach introduced for professional qualifications in IWT introduced in 2022

IWT education and training is currently undergoing a major transition of passing from a former mainly experience-oriented system of obtaining qualifications towards a new competence-based system based on European standards for competence, examination and use of simulators, based on Directive (EU) 2017/2397[15] and the new CCNR Regulations for Rhine Navigation Personnel (RPN)[16] which both refer to the CESNI standards of ES-QIN 2019.

The new set of competence requirements for all deck crew members became applicable on 18 January 2022 and is built up on seven sections applicable both for OL and ML deck crew members.

[10] https://ec.europa.eu/info/strategy/priorities-2019-2024/economy-works-people/jobs-growth-and-investment/european-pillar-social-rights_en

[11] Mannheim Declaration "150 years of the Mannheim Act – the driving force behind dynamic Rhine and inland navigation" Congress of the Central Commission for the Navigation of the Rhine on 17 October 2018.

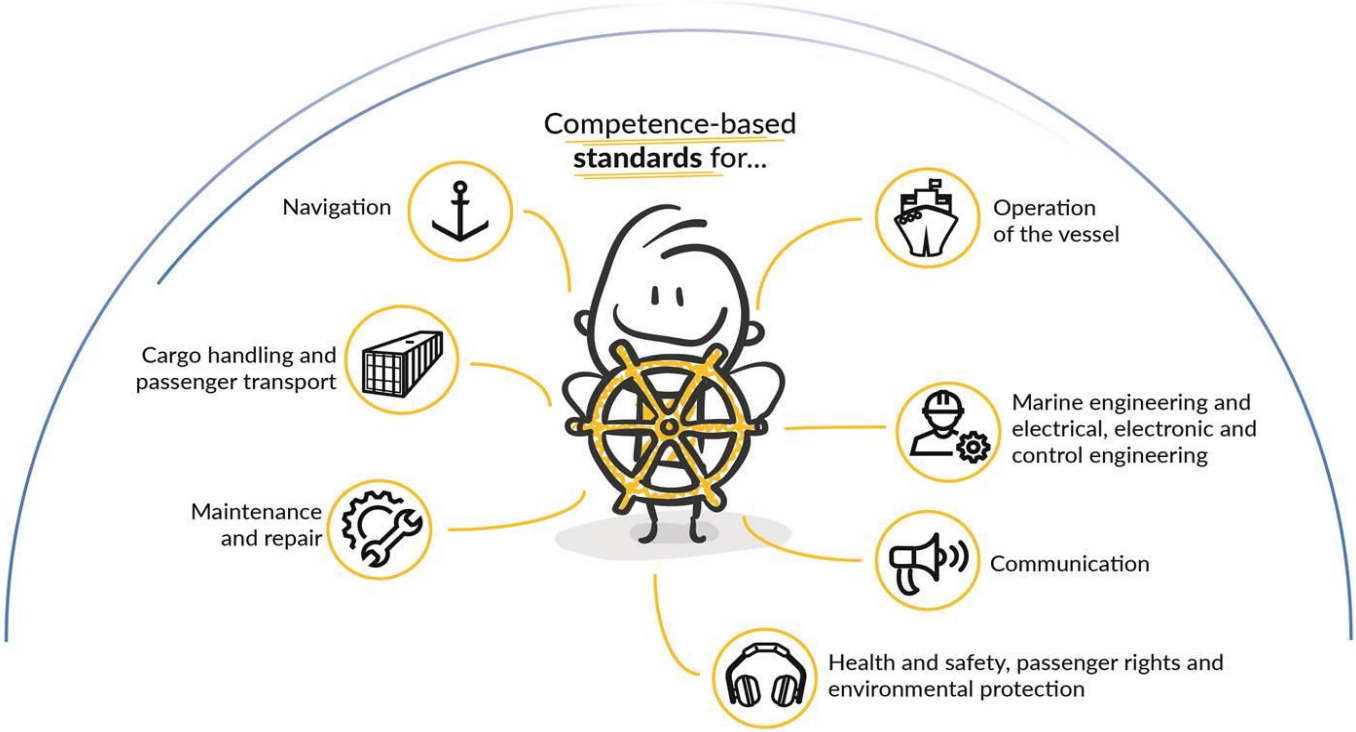
[12] See European IWT Platform, Social partners present the Work Programme 2022-2023 of the SSDC, January 2022, https://www.inlandwaterwaytransport.eu/social-partners-present-the-work-programme-2022-2023-ssdc/

[13] European Commission, presentation of the Sectoral social dialogue - Inland waterways https://ec.europa.eu/social/main.jsp?catId=480&langId=en&intPageId=1840

[14] SSDC Inland Waterways 29 September 2021, https://circabc.europa.eu/sd/a/ec051dbf-753e-4417-b46d-b4bdd1cc37c4/IWT-20210929-WG-min.pdf

[15] Directive (EU) 2017/2397 of the European Parliament and of the Council of 12 December 2017 on the recognition of professional qualifications in inland navigation and repealing Council Directives 91/672/EEC and 96/50/EC, OJ L 345 27.12.2017

[16] CCNR, Regulations for Rhine Navigation Personnel (RPN), January 2022 as revised by CCNR resolution in the autumn plenary meeting 2022, see https//ccr-zkr.org



The implementation of the new legal framework[17], requesting new curricula, new methods and content of examinations and even new simulators is based on the common interest of the CESNI Member States (ministries of transport and/or education), administrations working on new exams or on the approval of new training programmes and on various side effects related to the documentation of new qualification to implement the comprehensive system of CESNI standards for competence, practical examination, approval of simulators used in examination (included in the ES-QIN) and CESNI standards facilitating the implementation of the competence based approach that are not referred to explicitly in Directive (EU) 2017/2397 and the new RPN (and this not included in the ES-QIN). The latter cover standards on model exams for OL and ML and standards for theoretical exams. Alike, new lesson material and elements for quality assessment in the new legal framework absorbed a lot of the resources of exam commissions and training institutes active in CESNI Members States who received valuable support through the EU funded COMPETING project.[18] Consequently, refresher classes were not in the focus of IWT stakeholders. Also, legislators first put full attention to the implementation of the "new era" of IWT education and training.[19]

In this context, it is important to highlight that CESNI Member States and social partners strongly supported the creation of up-to-date competence standards that entered into force in 2022 and ensured that the most recent technical equipment used for more digital and more automated vessel operation has been taken into account in ES-QIN chapter I, parts 1 and 2 (competence for OL and ML). More precisely, experts included competence on inland automatic ship identification system (AIS)[20], inland electronic chart display and information system (ECDIS)[21] and

[17] Monitored on the dedicated COM website on the social dimension of IWT available at https://transport.ec.europa.eu/transport-modes/inland-waterways/social-dimension_en.

[18] Reference to the COMPETING project, more specifically WPs 1 and 4, see https://www.iwt-competencies.eu/.

[19] Term used in the CCNR press release on the adoption of Directive (EU) 2017/2397, https://ccr-zkr.org/files/documents/cpresse/cp20171208en.pdf.

[20] See ES-QIN 2019 Chapter 1 Standards of competence for the operational level for navigation (1.1.11, p.4; 6.1.1, p. 14), and also Chapter 2 Standards of competence for the management level (1.1.6 p.32).

[21] See ES-QIN 2019 Chapter 1 Standards of competence for the operational level for navigation (1.1.11, p.4), and also Chapter 2 Standards of competence for the management level (1.1.5; 1.1.6 p.32).

River Information Services (RIS)[22] in a broader sense, even though these devices have not or still are not mandatory on all connected waterways in CESNI Member States. Based on ES-QIN, no refresher classes are needed for the operation of these systems and tools.

CESNI Member States also tasked themselves to constantly keep the competence standards up to date with a view to more automated vessel operation.

Support for refresher classes has not been on employers' side, more precisely when it comes to mandatory refresher classes. ESO and EBU state that the sector has a strong own interest and a long tradition of catching up with the most recent technological development without a need to follow mandatory refresher classes, due to its structure of family businesses that operate as responsible entrepreneurs in a market of fierce competition[23]. In this context, stakeholders from employers' organisations highlight findings on a use of computer-based technology that have been collected on the basis of vessels sailing in Germany[24], where fleets with a rather high level of modern digital equipment on board, such as the Dutch, Swiss and Flemish fleet and fleets with a rather lower level of modern digital equipment on board, such as the Polish or Czech fleet, sail on the same waterways in the CESNI Member State with the highest volume of IWT transhipment. EBU and ESO see their findings confirmed by a technologically smooth introduction and general acceptance of inland AIS by boatmasters as reported by the CCNR online enquiry with more than 1,000 participants on the introduction of inland AIS and electronic chart display systems on the river Rhine carried out in 2016[25].

Technical systems such as Inland AIS, ECDIS (electronic chart display and information system), devices for calculating bridge clearance heights or integrated systems for automatic track guidance support the boatmaster or person at helm in important navigation decisions. Overall, according to the German Federal Office for Goods Transport, around 93 percent of the surveyed companies in dry cargo shipping and all surveyed companies in tanker shipping use at least one of these digital navigation aids. In passenger shipping, these devices are used by around 81 percent of the companies surveyed. Especially in poor visibility, these technical systems can provide valuable information to the ship's command and thus make an important contribution to making navigation on inland waterways safer.[26]

Computers, smartphones, laptops, and tablets are also frequently used on inland vessels. Around 88 percent of the inland navigation companies surveyed, including all tanker companies, equip their vessels with at least one of these pieces of hardware. Comparatively less widespread are programmes for electronic data transmission, which can help to avoid multiple reporting by inland navigation operators to the competent authorities and their partners in the multimodal transport chain. It is true that around 88 percent of the companies surveyed in tanker shipping use such programmes. In dry goods and passenger shipping, however, around 58 percent and around 36 per cent of the companies surveyed do so.[27]

However, enforcement bodies and public authorities of CCNR Member States identified room for improvement in some areas of the actual and possible future use of AIS and electronic chart display (ECDIS) systems by boatmasters,

[22] See ES-QIN 2019 Chapter 1 Standards of competence for the operational level for navigation (6.1.2 p.14), and also Chapter 2 Standards of competence for the management level (1.1.6 p.32; 1.3.4 p.35).

[23] Statement of Andrea Beckschäfer, spokesperson of the IWT platform's committee for social affairs, commenting the draft CESNI work programme 2022-2024

[24] BAG report on equipment rate of IWT fleet with digital instruments in Germany 2018, https://www.bag.bund.de/SharedDocs/Downloads/DE/Marktbeobachtung/Sonderberichte/Digitalisierung_Binnenschifffahrt.pdf?__blob=publicationFile&v=1

[25] Published as annex to CCNR autumn plenary resolutions on 7 December 2017, https://www.ccr-zkr.org/files/documents/ris/enq_Ais_e.pdf

[26] Bundesamt für Güterverkehr, Viele Binnenschiffer setzen digitale Navigationshilfen an Bord ein, https://www.bag.bund.de/SharedDocs/Pressemitteilungen/DE/2018/2018_9_5.html

[27] Ibid.

improving the current use and setting preconditions for more automated vessel operation (see below for the "AIS case")[28].

Another example was the accident analysis of the Dutch Safety Board (OVV) of the grounding of the Nova Cura[29]. The purpose was to draw lessons from the accident regardless of individual responsibility under civil law. The analysis made clear that the time has come to increase awareness of risks and limitations related to the use of ECDIS and to provide better support to crew members in the wheelhouse in voyage planning and safe navigation.

More recently, conclusions drawn in the stage 2b Intergo report (February 2022) could serve as an argument against secure market acceptance in this respect "the availability of electronic equipment in the steering hut can give a false feeling of safety".

Aging work force

Stakeholders from social partners and CESNI Member States refer to the demographic challenges that IWT is facing due to the phenomenon of the high average age of IWT navigation personnel is, most particularly of boatmasters. Many of them will leave the sector in the next five to ten years.

According to the Eurostat Structural Business Statistics, the total number of persons employed in the transport of goods and passengers on inland waterways in Europe amounted to approximately 48,000 in 2020.[30] The age of the employees is an important characteristic of the IWT workforce, as the aging seems to be a great challenge for the labour market of today and tomorrow. In Germany, around 25% is over 55 years old[31] and in France, in 2016, around 24 % is over 50 years old.[32]

According to the CCNR thematic report on the European inland navigation sector labour market, detailed long run data for Belgium show that ageing is particularly a problem within the group of self-employed barge owner-operators, although also within the group of employees. This higher degree of ageing amongst the self-employed begs additional explanations, which were found during expert interviews amongst banks. They point to a combination of social, economic and cultural influencing factors.[33]

Trade union representatives highlight that it is not only because of the attractiveness of the sector, but also due to the aging workforce that refresher classes are key to enable the IWT personnel to keep up with the demands of tomorrow.[34]

All stakeholders agree that

a) a high percentage of IWT will still be working in the sector with new elements of automation developing at high speed and

b) new-comers entering the sector do not go beyond ES-QIN 2019 competence when it comes to more automated vessel operation as the number of highly or let alone fully automated vessels, where new workforce could be trained (in addition to the training required by ES-QIN), is marginal.

[28] For overview of recommendations, see https://unece.org/fileadmin/DAM/trans/doc/2018/sc3wp3/5.2_CCNR_AIS_presentation.pdf

[29] Digital navigation: old skills in new technology, 20 april 2016, Onderzoeksraad voor Veiligheid, https://www.onderzoeksraad.nl/en/page/4871/digitaal-navigeren-oude-vaardigheden-in-nieuwe-techniek-20-april-2016

[30] EUROSTAT, https://ec.europa.eu/eurostat/web/transport/data/database, 8 February 2021

[31] German Federal Employment Agency, 2020. This data relates only to employees, not to the self-employed.

[32] CCNR Thematic Report - Labour Market, 2021. It can be noticed that IWW freight transport has a slightly above average share of employees of 60 years of age or older, particularly regarding persons working on board vessels. This implies that a relatively high share of employees will retire in the forthcoming years compared to other sectors, unless they continue to work after reaching retirement age, a phenomenon that is relatively common for persons working on board inland navigation vessels.

[33] CCNR, Thematic Report: The European Inland Navigation Sector Labour Market, February 2021 p.9, https://inland-navigation-market.org/wp-content/uploads/2021/02/Thematic-report_EN_web_BD.pdf
See also L'Antenne, "Navigation fluviale: un marché du travail mouvant en Europe », 16 March 2021 https://www.lantenne.com/Navigation-fluviale-un-marche-du-travail-mouvant-en-Europe_a55622.html

[34] See CESNI/QP (21) 42, 23 April 2021, Communication from ETF, CESNI Work Programme 2022-2024.

(Mis)communication

Following phase 1 of the study on human factors root causes of accidents in inland navigation, a conclusion was reached that human factors account for about 70-80% of these accidents. The European inland shipping industry organizations, united in the European IWT Platform, have commissioned research agency Intergo to conduct a phase 2 of the study for more in-depth examination. IVR was also involved in the study. Following the publication of the phase 2a report earlier in November 2021, the results and recommendations of the phase 2b have been published in February 2022.

The report that Intergo delivered covered phase 2b. It is an in-depth study of four main factors that relate to the root cause of organizational aspects.

The questionnaire conducted showed that the vast majority of respondents – 96%, believe that inadequate or poor-quality **communication** with other waterway users is an important cause of waterway accidents. As learnt in the course of conducting the entire study, there can be a number of various communication issues between vessels, e.g. limited use of standard communication protocols and phraseology, plus limited command of a shared common language, which is related to the increasing internationalization of personnel. All those, together with a high adoption of automation, can contribute to a false sense of safety resulting in (potential) errors and accidents.

The first recommendation from the Intergo report is to update and improve protocols and guidelines on VHF communication in inland navigation, including incorporating a shift to one shared nautical language across the IWT ecosystem. The second recommendation is to develop an integral vision on life-long personal development for crew members especially on management/entrepreneurship and non-technical skills. Apprentices should be supervised more while sailing and more practice should be integrated in training programmes. The results of the study may feed into CESNI work on accidents which is a transversal task for all permanent working group of CESNI. The CESNI working group on professional qualification that may wish to look into competence to use modern communication tools, taking into account concrete findings whether crew members are relaying too much on technical support because of insufficient knowledge on the options and limitations to make use of the (e.g. ECDIS charts, TGAINs etc.).

1.1. Definition: What is automation?

Automation implies a fundamental change for inland navigation and will affect almost all aspects of inland navigation. It is also a challenge, as it involves the safe coexistence of automated vessels and “conventional” vessels and as it will have to be adapted to the existing physical infrastructure. Therefore, CCNR chose a global approach, taking account of legal, ethical and social aspects.[35]

During its plenary session in December 2018, CCNR adopted the first international definition of levels of automation in inland navigation. This definition allows a clear understanding of all levels of automated navigation, subsequently enabling an assessment of the need to take regulatory measures, based on a common understanding.

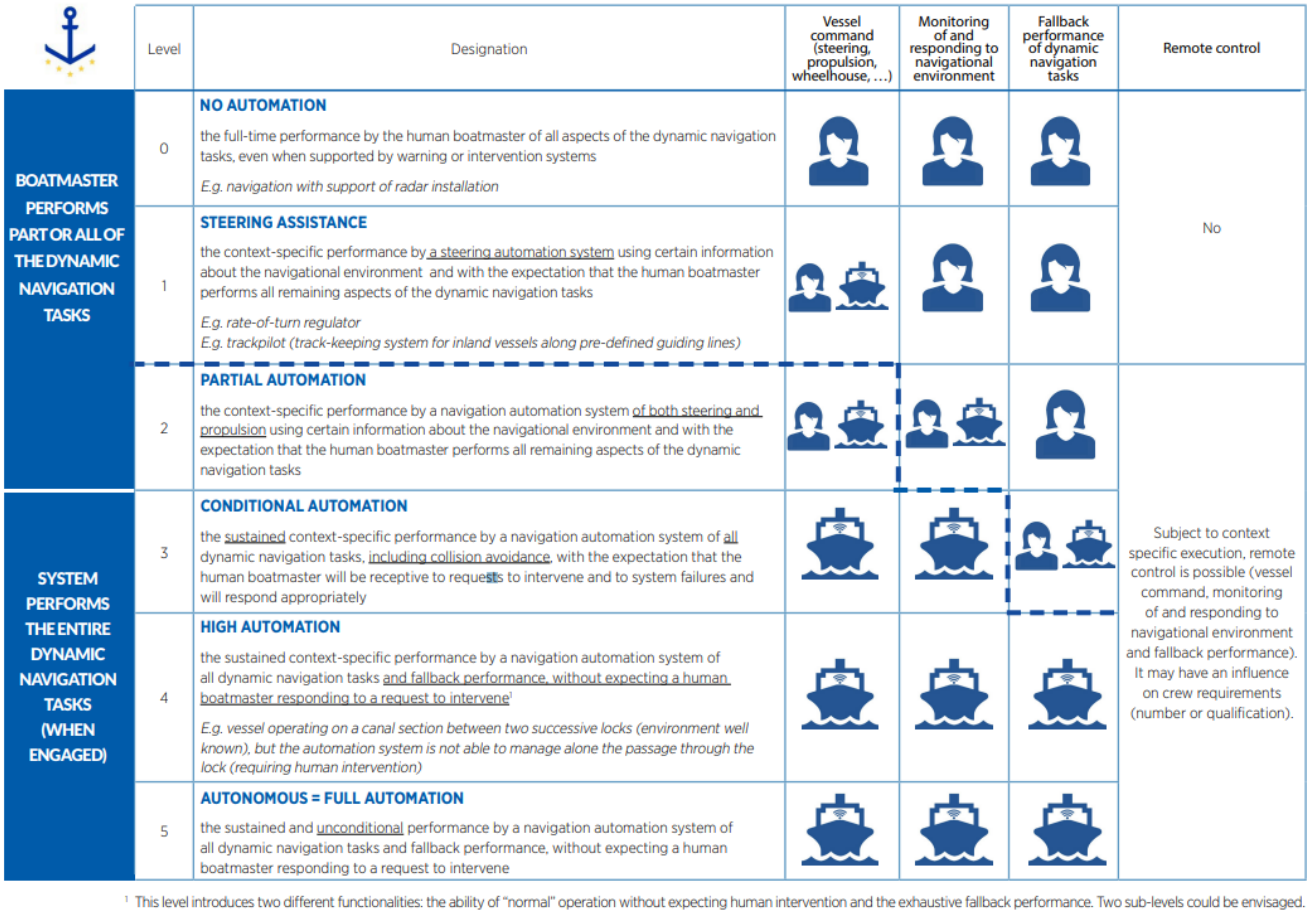
These different levels of automation offer a good starting point for the prioritisation of work. It is important to note that in the short term, CCNR considers it necessary to work on minimum requirements and/or recommendations for inland navigation guidance aids corresponding to level 2 of the definition as described in the table below. In parallel with the automation itself, CCNR is also working on the requirements for remote control center operator rooms and other framework conditions for operating an automated vessel from a central facility for remote control[36]and monitoring of vessels.[37]

This definitions of levels of automation in inland navigation are currently discussed in CCNR, which will is planning to revise in its plenary meeting on 8 December 2022propose new developments.

[35] CCNR press release, Summary of the CCNR’s vision to support the harmonised development of automated navigation, 17 November 2021, https://ccr-zkr.org/files/documents/cpresse/cp20211117en.pdf

[36] Remote control meaning equipped to supervise & control vessel functions in a remote way.

[37] Same as 35



	Level	Designation	Vessel command (steering, propulsion, wheelhouse, …)	Monitoring of and responding to navigational environment	Fallback performance of dynamic navigation tasks	Remote control
BOATMASTER PERFORMS PART OR ALL OF THE DYNAMIC NAVIGATION TASKS	0	**NO AUTOMATION** the full-time performance by the human boatmaster of all aspects of the dynamic navigation tasks, even when supported by warning or intervention systems *E.g. navigation with support of radar installation*				No
	1	**STEERING ASSISTANCE** the context-specific performance by a steering automation system using certain information about the navigational environment and with the expectation that the human boatmaster performs all remaining aspects of the dynamic navigation tasks *E.g. rate-of-turn regulator* *E.g. trackpilot (track-keeping system for inland vessels along pre-defined guiding lines)*				
	2	**PARTIAL AUTOMATION** the context-specific performance by a navigation automation system of both steering and propulsion using certain information about the navigational environment and with the expectation that the human boatmaster performs all remaining aspects of the dynamic navigation tasks				
SYSTEM PERFORMS THE ENTIRE DYNAMIC NAVIGATION TASKS (WHEN ENGAGED)	3	**CONDITIONAL AUTOMATION** the sustained context-specific performance by a navigation automation system of all dynamic navigation tasks, including collision avoidance, with the expectation that the human boatmaster will be receptive to requests to intervene and to system failures and will respond appropriately				Subject to context specific execution, remote control is possible (vessel command, monitoring of and responding to navigational environment and fallback performance). It may have an influence on crew requirements (number or qualification).
	4	**HIGH AUTOMATION** the sustained context-specific performance by a navigation automation system of all dynamic navigation tasks and fallback performance, without expecting a human boatmaster responding to a request to intervene[1] *E.g. vessel operating on a canal section between two successive locks (environment well known), but the automation system is not able to manage alone the passage through the lock (requiring human intervention)*				
	5	**AUTONOMOUS = FULL AUTOMATION** the sustained and unconditional performance by a navigation automation system of all dynamic navigation tasks and fallback performance, without expecting a human boatmaster responding to a request to intervene				

[1] This level introduces two different functionalities: the ability of "normal" operation without expecting human intervention and the exhaustive fallback performance. Two sub-levels could be envisaged.

1.2. Growing need for refresher classes

Many stakeholders regret that in the inland navigation sector, unlike in other transport sectors, there is no compulsory periodic training scheme, in order to address the future needs of vocational training and identify specific topics that enable crew members to act responsibly with regard to the use of resources and to handle relevant technologies that allow for the reduction of energy consumption. Trade unions, training institutes but also employers' organisations stress the need for vocational training to **keep up with skills that are demanded to operate a fleet that is undergoing energy transition and experiencing significant changes in technical and digital equipment on board.**

Moreover, insurance companies began to require refresher classes for the crew. It seems that some of them are currently using the "malus-bonus" system, which penalize companies with employees without special training. During the PLATINA3 5th Stage event[38], it has been mentioned that several insurance companies are said to be starting to implement this kind of malus-bonus system, for safety and security reasons.

Social partners voice growing concerns that IW may fall behind, compared to other modes of transport, not only with a view to the substantial demographic challenge, but also with a view to a skilled work force that can cope with the technologies from tomorrow. The employers' organisations tend to disagree, however, if such refresher classes should be mandatory, whereas the Trade Unions very much support compulsory periodic training schemes for IWT to be set up. The ETF (European Transport Workers' Federation) advocates the development of an

[38] PLATINA3 5th Stage event, on 19 & 20 October 2022. Programme and presentations available on https://platina3.eu/event/budapest-2022/

overarching framework on compulsory periodic training schemes whereby they can be assessed at regular interval to ensure the courses remain close to the day-to-day-challenges to tackle.

2. Short reminder: Refresher classes in other modes of transport

In terms of qualified work force who is prepared to carry out tasks for modern and more automated vessel operation, IWT may fall behind, if refresher classes were mandatory in other modes of transport whereas they are not in IWT.

2.1. Aviation

At international level, the International Civil Aviation Organization (ICAO) is responsible for setting minimum aviation safety standards, but these are not binding and so compliance is mainly dependent on the States parties' goodwill. The common civil aviation safety rules are based on the standards and recommendations adopted by the ICAO but are often more stringent.

The creation of a European internal market in aviation has meant that all passengers should benefit from the same, high level of safety wherever they fly in the Union. National rules have thus given way to common binding rules at EU level. In the same way, national regulatory authorities have been replaced by an EU-level mechanism linking national civil aviation authorities, the European Commission and the **European Aviation Safety Agency** (EASA). According to the EASA regulation, "*each flight crew member shall be periodically checked to demonstrate competence in carrying out normal, abnormal and emergency procedures*".[39]

Desk study from the aviation sector indicates that in aviation education & training emphasis has moved to non-technical skills. This was driven by enhancement of systems onboard. This could be a valuable insight for the IWT sector which is confronted with a similar trend in electronical systems on-board.

Aviation is one of the most regulated industries in the world. Pilots are among the very few professionals that are required to do repeated training as well as complete regular and rigorous examinations to maintain the existing skills and develop new ones. However, it is important to note that not only the management level, but the entire crew is subject to mandatory periodically trainings.

Aviation training evolved from skills-based training in the '30s to task-based training most of the 20th century and introduced CBTA (Competency Based Training and Assessment) in the 21st century. In 2020 the aviation industry moved to CBTA.[40]

Task Based Training	**Competency Based Training & Assessment**
Focus on technical skills	Focus on technical and non-technical skills (competencies)
Measured by deviation from technical limits	Measured by observing & comparing behaviours with a behavioural standard
Output and analysis of deficient performance	Root cause analysis of deficient performance

[39] Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council, OJ L 296, 25.10.2012.

[40] AIRBUS, "Competency Based Training, the pilot training (R)evolution", Flight operation & Training symposium, Montreal May 2018, https://www.youtube.com/watch?v=zss7IVOHnQk

See also IATA, Competency-Based Training and Assessment (CBTA) Expansion within the Aviation System, White paper, 2021, https://www.iata.org/contentassets/c0f61fc821dc4f62bb6441d7abedb076/cbta-expansion-within-the-aviation-system.pdf

Retroactive, master a known inventory of tasks	Pro-active master a set of competencies to prepare for the unforeseen

The pilot competences

The International Air Transport Association (IATA) recommends following the latest ICAO provisions for competency-based training and assessment. Approved training organizations should use 9 pilot competencies (8 pilot competencies as proposed by ICAO and the competency "Application of Knowledge" as proposed by EASA for EBT (Evidence-Based Training).

The 9 pilot competences are:

PC 0 Application of Knowledge
PC 1 Application of Procedures and Compliance with Regulations
PC 2 Communication
PC 3 Airplane Flight Path Management, automation
PC 4 Airplane Flight Path Management, manual control
PC 5 Leadership and Teamwork
PC 6 Problem Solving and Decision Making
PC 7 Situation Awareness and Management of Information
PC 8 Workload Management

Distinguished between technical and non-technical, the pilot competencies are:

Technical Competencies	**Non-Technical Competencies**
APK – Application of Procedures and Compliance with Regulations	COM – Communication
FPA -Flight Path Management, Automation	LTW – Leadership & Teamwork
FPM – Flight Path Management, Manual Control	PSD – Problem solving & Decision making
KNO – Application of Knowledge	SAW – Situation Awareness & Management of Information
	WLM – Workload management

Recommendations to mitigate the consequences of automation dependency[41]

Concerns over the human factor have led to focus and reliance on automation. As a consequence, a lack of practice might occur and potentially a degradation of pilot skills for manual flight control.

Therefore, following recommendations have been listed:

- **Up to date skills are essential for confidence and competence**
- **Standards and guidance should evolve to ensure training programs align with technological advancements.**
- **Further study of issues surrounding automation, including assessing the degree to which over reliance on automation may be occurring.**

[41] ICAO, Pilot Training Improvements to Address Automation Dependency, Working paper, A40-WP/296, 08.02.2019.

- **Variation in approach between states in regulation and guidance adds extra complexity and forms potential risk**
- **Multilateral cooperation for certification**

At the national and regional levels, States may benefit from bilateral or multilateral cooperation, to identify automation dependency hazards and mitigate related operational safety risks.

Prevention of automation paralysis

It needs to be acknowledged and second to address individual differences in information processing and decision making both under routine and non-routine situations.[42] Adapt automation to cater to the needs, limitations and capabilities of different pilots regardless of their experience and varied training standards. "The pilot doesn't need to understand the full complexity of the aircraft, the pilot just has to know how to react if a system fails".

2.2. Droning

Droning is related to aviation but is a little different mode of transport. For defence purposes both droning and remote piloting have been around for a long time. Only since the beginning of the century drones became mainstream for the wider public and commercial purposes.

In 2019 the European Commission established common European regulation on drones to ensure drone operations across Europe are safe and secure.[43] These common rules, in force since 2020, help drone operators, whether professional or recreational, to have a clear understanding of what is allowed or not. At the same time, it enables them to operate across borders.

The EU roles on droning make an absolute distinguishment between the operator (registered as responsible for the drone) and the (remote) pilot who most have undergone appropriate training and licensing.

Competences distinguished by training institutes are: accuracy, analytical skills, courage, innovation, independency, result orientation and autonomy. This emphasis is in line with the trend in aviation towards more non-technical competences relevant in training programmes.

2.3. Rail

The so-called Rail Directive 2007/59/ on the certification of train drivers operating locomotives and trains on the railway system in the Community[44] states in its article 23.8: 8. "A process of continuous training shall be set up in order to ensure that staff competences are maintained, in accordance with point 2(e) of Annex III to Directive 2004/49/EC." The point 2 of this directive 2004/49/EC (Railway Safety Directive)[45] states as follow:

"2. Basic elements of the safety management system

The basic elements of the safety management system are: (…)

(d) procedures and methods for carrying out risk evaluation and implementing risk control measures whenever a change of the operating conditions or new material imposes new risks on the infrastructure or on operations;

[42] Geoffrey Thomas, Steve Creedy, "Pilot training, skill levels and automation come under intense scrutiny", Airline ratings, March 18, 2019, https://www.airlineratings.com/news/pilot-training-skill-levels-and-automation-come-intense-scrutiny/

[43] Commission Delegated Regulation 2019/945 of 12 March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, OJ L 152, 11.6.2019 and Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft, OJ L 152, 11.6.2019

[44] Directive 2007/59/EC of the European Parliament and of the Council of 23 October 2007 on the certification of train drivers operating locomotives and trains on the railway system in the Community, OJ L 315 3.12.2007

[45] Directive 2004/49/EC of the European Parliament and of the Council of 29 April 2004 on safety on the Community's railways and amending Council Directive 95/18/EC on the licensing of railway undertakings and Directive 2001/14/EC on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certification, OJ L 164, 30.4.2004

(e) provision of programmes for training of staff and systems to ensure that the staff's competence is maintained, and tasks carried out accordingly."

However, this regulation could progress in the following months. A call for evidence "digitalization as a driver" has been launched in January 2022 by the Commission for a proposal of a new regulation[46] The EU's transport policy includes a harmonised certification scheme for train drivers that allows them, on the basis of certain minimum requirements, to easily transfer between EU countries and/or railway companies. Following an evaluation, this initiative seeks to improve the scheme by ensuring that it:

- is future-proof
- keeps pace with technological progress & increased demand for international journeys
- makes the train-driving profession more diverse & attractive to young people.

Public consultation started in the first quarter 2022, and Commission adoption is planned for the fourth quarter 2022.

2.4. Road

For the road sector, directive 2003/59/EC of the European Parliament and of the Council of 15 July 2003 on the initial qualification and periodic training of drivers of certain road vehicles for the carriage of goods or passengers47 states in its article 3.1. "The activity of driving as defined in Article 1 shall be subject to a compulsory initial qualification and compulsory periodic training. To this end Member States shall provide for:

(a) a system of initial qualification (…)

(b) a system of periodic training

In accordance with section 4 of Annex I, periodic training involves compulsory course attendance. It shall be certified by a CPC as provided for in Article 8(1)"

With regard to the section 4 of this Annex I, "Compulsory periodic training", it provides in its article 3(1)(b) that "compulsory periodic training courses must be organised by an approved training centre. Their duration must be of 35 hours every five years, given in periods of at least seven hours. Such periodic training may be provided, in part, on top of-the-range simulators".

It is also important to note that the Annex I of the Directive on the initial qualification and periodic training of drivers now explicitly includes a new mandatory objective for initial training (point 1.3) which reads: "ability to optimize fuel consumption: optimisation of fuel consumption by applying know-how as regards points 1.1 and 1.2, importance of anticipating traffic flow, appropriate distance to other vehicles and use of the vehicle's momentum, steady speed, smooth driving style and appropriate tyre pressure, and familiarity with intelligent transport systems that improve driving efficiency and assist in route planning".

2.5. Maritime

In the maritime sector, directive 94/58/EC of 22 November 1994[48] on the minimum level of training of seafarers gave the 1978 STCW Convention[49] the full force of EU law.

The convention underwent significant revisions in 1995, and again in 2010, entailing corresponding revisions to the EU directive, the most recent version of which is Directive 2012/35/EU of 21 November 2012. It outlines the rules on training and competency standards for seafarer certification, as well as regulated specialist training. The

[46] Train drivers – improved EU certification scheme, see better regulation website and Ares (2022)179060 - 11/01/2022.

[47] Directive 2003/59/EC of the European Parliament and of the Council of 15 July 2003 on the initial qualification and periodic training of drivers of certain road vehicles for the carriage of goods or passengers, amending Council Regulation (EEC) No 3820/85 and Council Directive 91/439/EEC and repealing Council Directive 76/914/EEC, OJ L 226, 10.9.2003.

[48] http://data.europa.eu/eli/dir/1994/58/oj

attention: Consolidated text: Directive 2001/25/EC of the European Parliament and of the Council of 4 April 2001 on the minimum level of training of seafarers http://data.europa.eu/eli/dir/2001/25/2007-10-20

[49] IMO, International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW).

directive also deals with Member States' requirements for seafarer training, communication between crew members, and the verification of crew members' certificates (port State control). It also includes stronger measures to combat fraudulent certification, higher standards for physical aptitude and updated safety training.

Article 12 provides the applicable regulation regarding the revalidation of certificates as follow:

1. Every master, officer and radio operator holding a certificate issued or recognised under any chapter of Annex I other than Chapter VI who is serving at sea or intends to return to sea after a period ashore shall, in order to continue to qualify for seagoing service, be required at intervals not exceeding **five years**:

   (a)to meet the standards of medical fitness prescribed by Article 11; and

   (b) to establish continued professional competence in accordance with section A-I/11 of the STCW Code

2. Every master, officer and radio operator shall, for continuing seagoing service on board ships for which special training requirements have been internationally agreed upon, successfully complete approved relevant training.

3. Each Member State shall compare the standards of competence which are required of candidates for certificates issued before 1 February 2002 with those specified for the appropriate certificate in Part A of the STCW Code, and shall determine the need to require the holders of such certificates to undergo appropriate refresher and updating training or assessment.

   Refresher and updating courses shall be approved and include changes in relevant national and international regulations concerning the safety of life at sea and the protection of the marine environment and take account of any updating of the standard of competency concerned.

4. Each Member State shall, in consultation with those concerned, formulate or promote the formulation of a structure of refresher and updating courses as provided for in section A-I/11 of the STCW Code.

5. For the purpose of updating the knowledge of masters, officers and radio operators, each Member State shall ensure that the texts of recent changes in national and international regulations concerning the safety of life at sea and the protection of the marine environment are made available to ships entitled to fly its flag.

Ad 3. For example the Basic Training (STCW) Refresher is for all who already have an Basic STCW certificate and must take the compulsory refresher course (once every 5 years). The training consists of refreshing the Personal Survival Techniques, Elementary First Aid, Personal Safety and Social Responsibilities, and Fire Prevention and Fire Fighting module. Until January 1, 2017, seafarers may provide evidence of having maintained the minimum of competence in basic training by documenting 12 months of service within the last 5 years. After January 1, 2017, seafarers must provide evidence of maintaining the standards of competence in basic training every 5 years.

Also in relation to Part B of the STCW, there are refresher courses. They are not mandatory, though based on the requirements of the shipping line, or insurance companies, seafarers may be required to take the refreshers courses.

Ad 5. The comparison with Dynamic Positioning (DP) certificates may be relevant. There are several model courses. DP basic and advanced. After five years, a DP certificate needs to be renewed. For a renewal or revalidation of an existing certificate, 150 DP sea time days are required. If sufficient days are not obtained, a revalidation course (kind of refresher course) can be taken to extend the current certificate for another five years (if attending for the first time). Potentially a similar model could be in place for RCCO.

For decades, refresher classes have always been part of the debate for all the other modes of transport. This overview of the current regulation of refresher classes in aviation, drones, rails, road and maritime sectors highlights that qualified work force will be prepared to carry out tasks for modern and more automated operations.

Except for the droning sector regulation, which is relatively new, a system of periodic training is provided for each mode of transport.

In terms of qualified work force who is prepared to carry out tasks for modern and more automated vessel operation, IWT may fall behind, if refresher classes were mandatory in other modes of transport whereas they are not in IWT, if IWT does not seize the opportunities that exist in non-mandatory refresher classes.

3. Content of refresher classes in IWT

3.1. Existing mandatory refresher classes

According to Annex II of Directive (EU) 2017/2397[50], which is taking up content that already existed in the Regulations for Rhine Navigation Personnel (RPN)[51], refresher classes after five years are only needed to refresh the two expert qualifications, whereas the Directive applies to deck crew members, liquefied natural gas experts and passenger navigation experts on the following types of craft on any Union inland waterway. There is no specified content for the refresher classes, which, for some experts, may even be replaced by navigation time on certain vessels instead of following a refresher class.

This is the case for the minimum requirements for the certification of a passenger navigation expert. Directive (EU) 2017/2397 states that every applicant for the renewal of a Union certificate of qualification as a passenger navigation expert shall pass a new administrative exam or complete a new approved training programme every five years[52]. The same situation applies for the certification as LNG expert. Every applicant for the renewal of a Union certificate of qualification as LNG expert shall have accumulated at least 180 days during the previous five years or at least 90 days during the previous year aboard a craft using LNG as fuel.[53]

The RPN specified the content of refresher classes for passenger navigation experts as well. According to article 5.04, the passenger navigation expert must attend a refresher course organised or recognised by the competent authority before expiry of a 5-year period from his successful participation in the basic training. The second paragraph of this article detailed this course, providing that the refresher course "shall address the common risks (for example preventing panic, firefighting) in a dangerous situation and, as far as possible, include information on new developments in passenger safety. During the refresher course, the active participation of the trainee will be ensured by means of exercises and tests". The RPN provides also that the passenger navigation expert must attend a new refresher course before expiry of a 5-year period from his attendance of the previous refresher course.

RPN will be reviewed and will be aligned with the Directive (EU) 2017/2397. However, for all other qualifications, be it on operational level or management level, no refresher classes are mandatory.

3.2. Concrete needs for refresher classes

Cybersecurity

Recently, STC has hosted a yearly conference about today's port innovations. On the 1st of June 2022, maritime companies, port innovators, cybersecurity experts and high-end tech developers took the stage and showed how they apply the technological innovation and what profits this can convey. They explained how safety is increased, efficiency and cost savings are achieved, and a competitive advantage can be gained. Applications for VR and AR were demonstrated; its potential for business and education & training was underlined. For inspirational purpose an after movie was made of this conference (Smart Vision 2022).[54]

The number and the complexity of navigational and information equipment on inland navigation vessels have increased considerably over the last century, and the cybersecurity needs a specific approach. Inland navigation is highly exposed to cyber threats and because of the international traffic structure, focused very much on the Rhine corridor, a regulatory process cannot be national.

Therefore, on 5 September 2019, the first international workshop on cybersecurity in inland navigation was held in the Rhineland city of Bonn, under the auspices of the CCNR and in partnership with the German Federal Ministry

[50] Directive (EU) 2017/2397 of the European Parliament and of the Council of 12 December 2017 on the recognition of professional qualifications in inland navigation and repealing Council Directives 91/672/EEC and 96/50/EC, OJ L 345 27.12.2017

[51] See Chapters 4 and 5, CCNR, Regulations for Rhine Navigation Personnel (RPN), op. cit.

[52] Directive (EU) 2017/2397, Annex I, art. 4. This new approved training programme in accordance with Article 17(2) of this same Directive.

[53] Directive (EU) 2017/2397, Annex I, art. 4.2 or meet the standards of competence for LNG experts set out in Annex II

[54] STC Group, Smart Vision 2022 – "Port safety and technology", 7 June 2020, https://www.youtube.com/watch?v=fgwwoBM5kOs

of Transport and Digital Infrastructure (BMVI, today: BMDV) and the World Association for Waterborne Transport Infrastructure (PIANC).[55] CCNR has also decided to set up a dedicated working Group to enable the exchange of information between Member States and to strengthen the resilience of the Rhine Corridor to cyber threats.[56] Cybersecurity has also been included in the draft standard for entrepreneurial skills that was agreed by CESNI/QP in May 2022 in Berlin and that will be submitted for examination to CESNI in October 2022.

In parallel, the PIANC published the "*Awareness Paper on Cybersecurity in Inland Navigation*" in 2019.[57] The pursued objective is to raise awareness for cybersecurity in inland navigation among practitioners in the management of inland waterways, ports, as well as shipping companies.

According to this paper, the shipping industry association BIMCO identified two categories of attack: targeted (with an aim in mind specific to the operator attacked, like infiltrating the supply chain or denial of service) and untargeted (e.g. as part of the general spread of a computer virus).[58]

As almost all information technology is susceptible to cyberattack, there is already a number of mitigation strategies in common with other industries, that could be useful to the inland water transport sector. As mentioned by the PIANC paper, these measures must begin with ensuring adequate procedures are in place systematically and professionally to assess the system, the risk to the system and to put in place mitigation procedures including e.g. that staff are continuously and appropriately trained. Also, other generally applicable mitigation measures include:

Ensuring IT industry-standard security countermeasures are in place, such as:

- access control systems (e.g. secure logins, limiting administrator rights to those who need them) and controlling physical third-party access to critical machines;
- ensuring VPNs, anti-virus software and firewalls are installed and up-to-date;
- developing typical contingency plans, such as data and software recovery capabilities to ensure services recovery and continuation of operations.[59]

Finally, this paper gave some recommendation regarding a possible future training: "*Inadequate training and a lack of awareness around cybersecurity both on-board and onshore elevates the likelihood of incidents caused by human error. This requires establishing a comprehensive training and awareness programme, conducting threat and risk assessments, and performing vulnerability assessments of individual ships to ascertain main vulnerabilities since installations and the connection of systems vary from ship to ship.*

*The Task Group 204 concluded that "****an appropriate training of all crew members is highly desirable and can rely on electronic training methods. The training might help to develop a minimum knowledge for all crew members, even if the training programme would differentiate between the management and operational level. The same conclusions apply for onshore operators***."

Platina3 deliverable D3.3 includes reflections on additional competences as required for handling cyber-attacks and assuring cyber security, such as additional knowledge of RCC cyber security protocols and system for the remotely operated or remotely supported vessel as well as additional ability to explain the strengths and vulnerabilities of the remotely operated or remotely supported vessel's systems regarding the prevention of cyber-attacks (built-in protection).

Secondly, additional knowledge is recommended of the safety systems in the RCC and on board of the remotely operated or remotely supported vessel, as well as the ability to interpret safety related information received from the remotely operated or remotely supported vessel, including video streams to verify the vessel's operational safety.

[55]Workshop on cybersecurity in inland navigation, 5 September 2019. Press release, programme and presentations are available in https://www.ccr-zkr.org/13020152-en.html

[56] This working group should begin to work in 2022.

[57] InCom TG 204: Awareness Paper on Cybersecurity in Inland Navigation (2019), https://www.pianc.org/publications/inland-navigation-commission/tg204

[58] Ibid., p. 6.

[59] Ibid., pp. 9-10.

For “conventional vessels”, i.e. outside the context of RCC, legislators could continue work on the development of standards for refresher classes, but has first targeted the societal responsibility for preventing cyberattacks and mitigating their impact focusing on digital skills, e.g. for entrepreneurs that have been tabled by CESNI/QP in May 2022. If adopted in second reading by CESNI in 2023, the above-mentioned elements could be used in training programmes and examination for entrepreneurs as a good practice. CESNI could also be the place to discuss and evaluate familiarisation programmes for crew members that go hand in hand with the necessary update of digital competences, related to cyber risks and the use of modern equipment on board.

As part of the COMPETING consortium ProDanube Management has yielded a concise analysis of the current role and status of cybersecurity in the ongoing digitalisation process of inland waterway transport (IWT). The deliverable generated by PDM proposes to consider the maritime sector as an example of good practice where cybersecurity awareness training has become mandatory by 1 January 2022. Given that no consistent research work on cybersecurity in IWT, let alone harmonised teaching materials on this very important issue have been published up to this date, this deliverable aims to propose important topics that should be taken up by IWT training institutes in the development of future teaching materials.

Based on extensive desk research activities, this document touches upon various important aspects. In a first step, it tries to provide a commonly accepted definition of cybersecurity – what is cybersecurity, and which are its most important characteristics? The second chapter deals with the status of cybersecurity in IWT as well as with the ongoing activities in this field. Another important topic is the governance of cybersecurity in the European Union. Chapter 3 therefore proposes a policy analysis of the legislation that regulates cybersecurity at EU level. Equally important, the role and activities of ENISA – the European Union Agency for Cybersecurity – are described. The document concludes with a brief analysis of the status of the European Digital Identity and its expected impact on the digital world.

Safe and efficient use of existing technologies: the case of Inland AIS

To improve the safe navigation of the Rhine and in an effort to provide skippers with additional information, CCNR introduced mandatory installation of Inland AIS, as well as Inland ECDIS devices or comparable electronic chart display devices with effect from 1 December 2014.[60] Two years later, the CCNR decided to conduct an online survey to find out about the various stakeholders’ experiences and to give the individuals affected by these requirements the ability to suggest improvements of their own. According to this survey, first data regarding the instruction in the use of Inland AIS have been presented. Some installation firms stated quite clearly that “*they are not providing a training course, but rather **instruction allowing the users to familiarise themselves with the system**. This can be either in the form of a manual or a dialogue.”*[61]

An important finding of the evaluation of the AIS survey was that boatmasters sometimes lack awareness of the difference of sailing with information mode or navigation mode and do not have a correct perception of what AIS and ECDIS combination may be used for in both cases. Experts found that automatic transfer of data on the status could have negative effects on the boatmaster’s perception of the used status. Whereas requirements from police regulations are clear with respect to the reliable use of navigation mode[62], increased use of automated navigation may require extra training and familiarisation of boatmasters of adopting the immediate navigation status for vessel operation in the concrete environment[63] when it comes to interaction with other traffic in distances of some 1,000 metres. The training could especially deal with priority of actions to be taken in accident situation when e.g. giving acoustic signals (like “stay away”) seems more important than adopting navigation / information status.

[60] See Clarifications concerning the obligation of equipment with an Inland AIS and an Inland ECDIS device or a comparable electronic chart display device, March 2017, https://www.ccr-zkr.org/files/documents/ris/brochureAIS_en.pdf

[61] CCNR, “Inland AIS devices and electronic chart display systems on the river Rhine”, Annex to protocol 2017-II-18, 7 December 2018.

[62] See e.g. Art. 4.07 Rhine police regulation (RPNR) in combination with Annex 11 RPNR.

[63] See actualisations according to numbers 0, 1, 5 and 6 of Annex 11 RPNR.

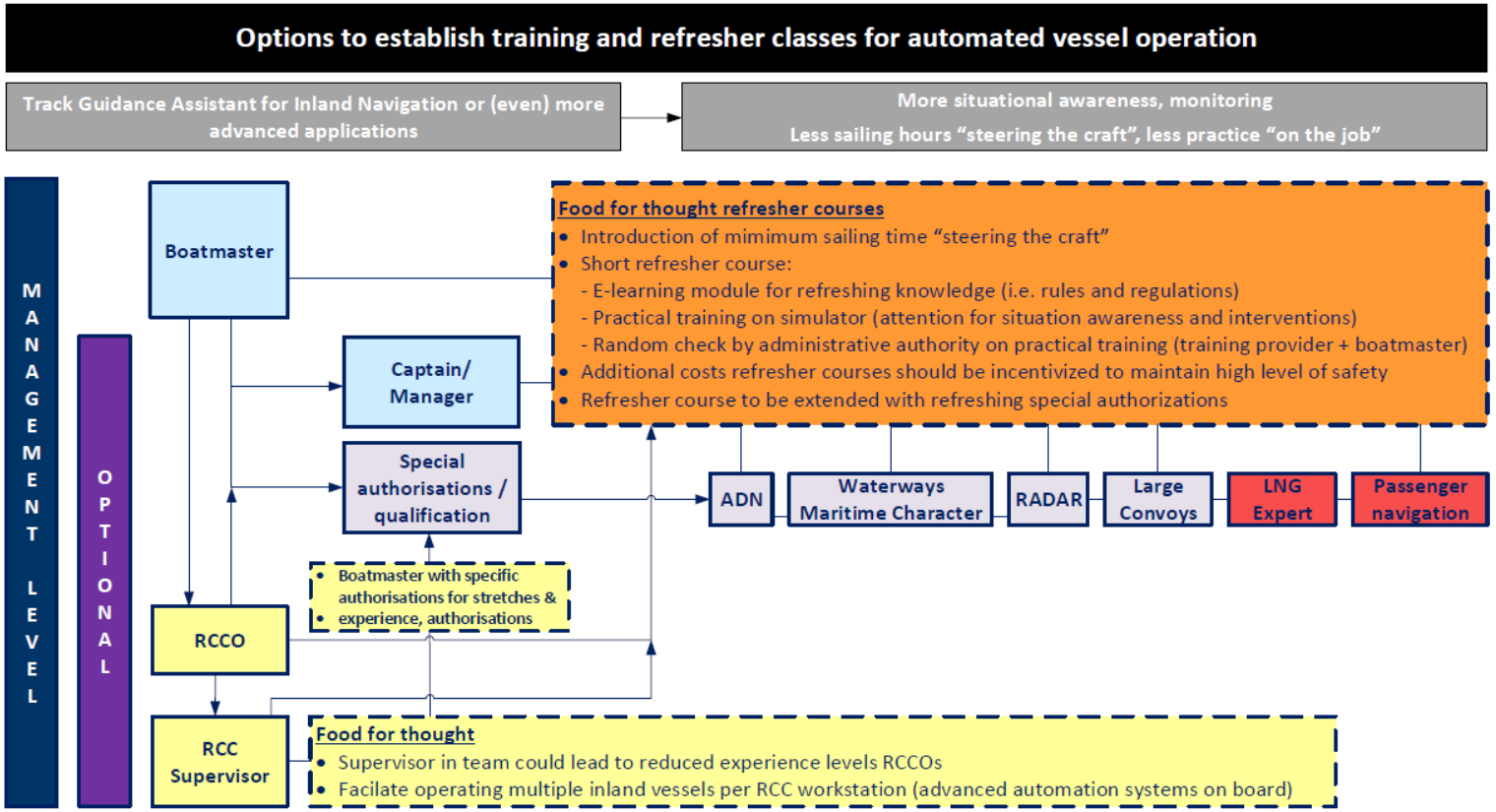
Track guidance assistant for inland navigation (TGAIN)

TGAIN are used on level 2 (simple TGAIN like autopilot) and level 3 (more sophisticated TGAIN) of automation. On 6 October 2021, an ad hoc working group (led by the CCNR and including partners from CESNI Member States TGAIN met for a “hearing” with external partners (manufacturers, installation firms and users) to discuss minimum requirements for TGAIN and proper training. During the meeting, minimum requirements to be complied with by the operator TGAIN have been proposed. Experts found that there is no need for specific training in dedicated refresher classes, as the manufacturers' instructions are sufficient and should be explained in the specific onboard environment of the vessel where the TGAIN is installed. Experts found that initial and continuous training based on ES-QIN provides for sufficiently qualified boatmasters who know the option for TGAIN use. Sector representatives using TGAIN explained that the manufacturers gave them a short training, and such familiarisation was necessary to create good understanding for the concrete use cases. The ad hoc working group stressed that operators need to understand the device, in order to react properly in case of any kind of system failure. However, experts from CCNR Member States and other interested CESNI Member States such as Austria found that the need of a mandatory extra training has not been shown. This conclusion is awaiting validation by experts in CCNR. The analysis of experts can however be supported by the fact that, when working on ES-QIN standards for practical examination of boatmasters, government experts from CESNI Member States agreed that TGAIN may be used in examination, but that the failure of the device has to be mastered by the applicant as well.

On 27 September 2022 the temporary working group on TGAIN came up with a proposal for minimum requirements for the use and technical requirements for TGAIN for IWT. In parallel, first feedback on the chapter on TGAINS in Platina3 deliverable 3.3 showed that it could be considered to include the TGAIN more prominently in the training of future boatmasters, because TGAIN will have a growing market share and other boatmaters should also know some basics about TGAINs. Focusing on the work programme of CESNI (see task QP-7) minimum requirements are still to be drafted with respect to schooling and upskilling boatmasters. It is proposed that nautical experience and basic skills should not be getting lost due to frequent use of TGAIN. Refresher courses on TGAINs could be carried out in a full mission vessel handling simulator as described in ES-QIN.

Intermediate result:

Options for refreshers in relation to automation, focussing on TGAINs or higher levels of automation and RCC operations could be set up as follows:



Certificate of Qualification

Education and Training for qualification and/or navigation time

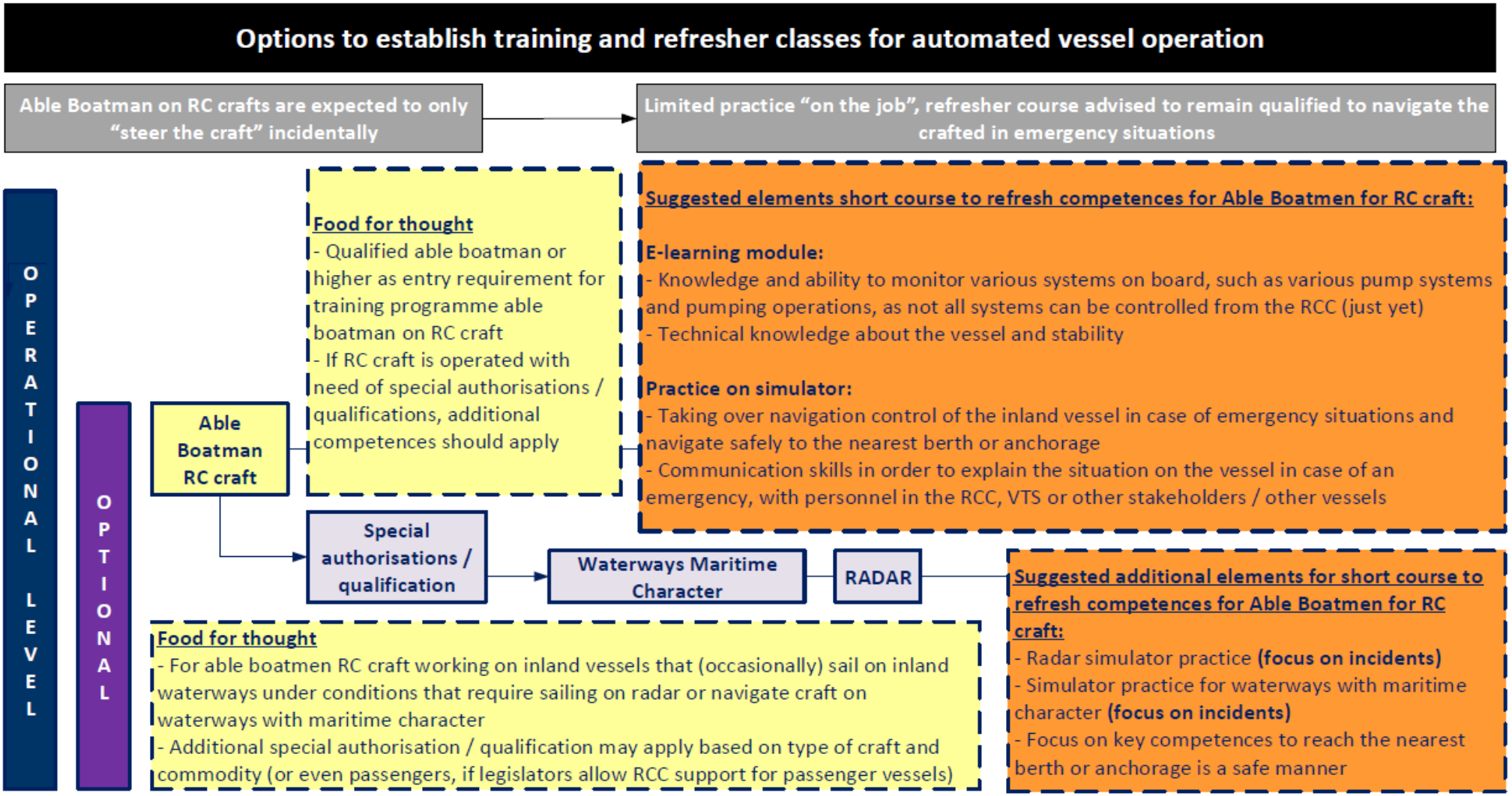
Optional special authorisations / qualifications

Options to establish refresher classes

Suggested competence framework included in Platina 3 – D3.3

Requirements for renewal included in Directive EU/2017/2397

Minimum (entry) requirements according to Directive (EU) 2017/ 2397 not included in framework


Options to establish training and refresher classes for automated vessel operation
Able Boatman on RC crafts are expected to only "steer the craft" incidentally
Limited practice "on the job", refresher course advised to remain qualified to navigate the crafted in emergency situations
OPERATIONAL LEVEL
OPTIONAL
Able Boatman RC craft
Food for thought
- Qualified able boatman or higher as entry requirement for training programme able boatman on RC craft
- If RC craft is operated with need of special authorisations / qualifications, additional competences should apply
Suggested elements short course to refresh competences for Able Boatmen for RC craft:
E-learning module:
- Knowledge and ability to monitor various systems on board, such as various pump systems and pumping operations, as not all systems can be controlled from the RCC (just yet)
- Technical knowledge about the vessel and stability
Practice on simulator:
- Taking over navigation control of the inland vessel in case of emergency situations and navigate safely to the nearest berth or anchorage
- Communication skills in order to explain the situation on the vessel in case of an emergency, with personnel in the RCC, VTS or other stakeholders / other vessels
Special authorisations / qualification
Waterways Maritime Character
RADAR
Food for thought
- For able boatmen RC craft working on inland vessels that (occasionally) sail on inland waterways under conditions that require sailing on radar or navigate craft on waterways with maritime character
- Additional special authorisation / qualification may apply based on type of craft and commodity (or even passengers, if legislators allow RCC support for passenger vessels)
Suggested additional elements for short course to refresh competences for Able Boatmen for RC craft:
- Radar simulator practice (focus on incidents)
- Simulator practice for waterways with maritime character (focus on incidents)
- Focus on key competences to reach the nearest berth or anchorage is a safe manner

Remote Control Center

Input received during the Sector consultation event on 14 December 2021 participants from all over Europe were asked to express their opinion for personnel working in remote control centers. A majority of the participants said/voted that the crew should have the same qualifications, but with additional requirements related to the specific conditions in remote control centers[64].

- Quick reminder of competence for Remote control operator and crew members working on board RCC supported or assisted vessels
- Maritime

ABS doc Autonomous vessels (February 2022) The identified potential gaps and themes are as follows:

1. Meaning of the terms master, crew or responsible person
2. Remote control station/center
3. Remote operator as a crew member
4. Provisions containing manual operations, alarms to the wheelhouse
5. Provisions requiring actions by personnel (fire, spillage, cargo management, onboard maintenance, etc.)
6. Certificates and manuals on board
7. Connectivity, cybersecurity
8. Watchkeeping

[64] CESNI/QP/Crew (21) 114, 21 February 2022, Input received during the sector consultation event on 14 December 2021, https://www.cesni.eu/wp-content/uploads/2022/03/cesniqp21_114en_crew_corr.pdf

4. Possible future methodology

Permanent improvement of the performances of the existing training equipment as well as on the introduction of modern training techniques based on virtual reality are in the experts focus. This improvement aims also to increase the quality of online training courses to which we adapted the courses face to face due to the pandemic situation. All the education and training institutions in the sector faced the same situation, and all have to use suitable e-learning tools for the online education and training in a harmonized way. There is a need at European level for a standard on the functionalities of e-learning platforms used in education and training of crew members on board inland navigation vessels.

In the COMPETING[65] project an e-learning platform (INeS) has been developed for IWT education and training institutions, which will be further developed under the follow up project of COMPETING (1System4IWT). The newly built repository in INeS stands on the shoulders of previous projects on the technical basis. Additionally technical adaptation appeared to be necessary in the COMPETING project in order to have it running on up-to-date components serving the new requirements. Conceptional process development for the platform had to take place.

Within COMPETING it was necessary to setup the e-learning platform in a new way in order to enable different user experiences for registered users with additional functionality and the possibility to provide publicly available learning content. Self-evaluation (quizzes) has been composed for every competence and interactive learning modules for several topics. User groups and administration processes were setup to support training and networking between project partners institutions and external training participants.

INeS[66] as a platform has been hosted for many years by viaDonau; since last summer it has been transferred to EDINNA.

In parallel training institutes have to look into the future to the ongoing educational harmonized processes developed as a response to the new kind of jobs required for a changing sector due to the technological development. New training programmes that consider the innovative technological aspects are of outmost importance, and this means that education and training institutes must strengthening their capacity to adapt more efficiently to this huge challenge in the sector.

4.1. Increased use of simulators

Currently, ES-QIN part III, chapter 1 defines technical and functional requirements for approved vessel handling and radar simulators used in practical examination of boatmasters. Simulators complying with these standards can also be used in training. Under current legislation, their use in training does not replace experience gained through navigation time, but provides for familiarisation of applicants with equipment that is not mandatory in IWT vessel operation according to ES-TRIN, such as the one-person-radar wheelhouse environment as well as inland AIS and ECDIS. The increased use of simulators is widely supported by CESNI Member States. More specifically, CESNI is currently working on **standards for eco-efficient navigation** which, according to findings of the PROMINENT project, could lead to a decrease of fuel consumption on board existing vessels of more than 10 per cent, are not yet harmonized at European level and easily accessible for training institutes. CESNI/QP has tabled draft standards for eco-efficient navigation (CESNI/QP (21) 5 rev. 2) that can be used on voluntary basis or as part of “Green award” programmes[67], and include the use of modern simulators. It could be reflected in CESNI, if the use of simulators may be viewed as an element of experience for future experts for remote control operation. Such simulator use would in this case have to be added to the navigation time and competence at ML that is currently required for

[65] See https://www.iwt-competencies.eu/

[66] See http://ines-danube.info/ilias.php?baseClass=ilrepositorygui&reloadpublic=1&cmd=frameset&ref_id=1

[67] Incentive programme to reduce harbour fees that can become relevant in terms of access to ports like Rotterdam in 2025 onwards, see https://www.greenaward.org/inland-shipping/

boatmasters. At a more general level, CESNI may wish to consider examining if the use of simulators can replace navigation time for certain qualifications, including certain specific authorisations (e.g. LNG expert).

4.2. Revised entrepreneurial skills as discussed by CESNI

Apart from more appropriate competence to deal with cyber security as mentioned above, the CESNI work programme in its task QP-2 foresees the drafting of general standards of competence for entrepreneurs carrying goods or passengers by inland waterway transport.

With view of a possible revision of the entrepreneurial competences required to access the market under Council Directive of 9 November 1987 on access to the occupation of carrier of goods by waterway in national and international transport and on the mutual recognition of diplomas, certificates and other evidence of formal qualification for this occupation (87/540/EEC)[68], the Secretariat provided an overview of the current legal basis and approaches to modernize entrepreneurial competences.[69] On the basis of these elements, the Secretariat also provided in the same document a first draft of essential competence requirements which could be used as a basis if a competence-based approach was to be adopted for entrepreneurs.

Experts found that a competence-based approach could indeed be well placed to address the significant variety in terms of implementation of the Directive that has been identified as a preliminary finding in the ongoing fitness check of Directive 87/540/EEC.

Experts also agreed that the exercise of creating a competence table on the basis of the essential competence requirements as it has been carried out for other professional qualifications for deck crew members seems to be a logical next step after having formulated the essential competence requirements on the basis of the Annex of Directive 87/540/EEC. Some experts highlighted that this exercise should not lead to additional burden for entrepreneurs with regard to the listed competences.

With a view to entrepreneurs who are active in the transport of passengers, experts have tasked the Secretariat to add existing legal obligations only that have been introduced by competence standards as laid down in ES-QIN persons on board passenger vessels who might be working for the entrepreneur. Experts felt that specific attention should be given to the person who is entrepreneur, when more than one employer are active onboard and in situations where the vessel operator is not the vessel owner.

Based on this expert's feedback during the CESNI/QP meeting on 20 May 2021, the Secretariat drafted a concrete list of competences including a detailed list of knowledges and skills for entrepreneurs carrying goods or passengers by inland waterway transport.[70] After revision in September 2022, CESNI/QP experts submitted a draft competence standard for transport of goods only. The takes modern technologies providing for more automated vessel operation into account and thus goes beyond competence required for crew members. This is why the draft can be expected to contribute to a revision of training programmes for entrepreneurs and examination, using more advanced technologies and referring to more automated vessel operation.

[68] Council Directive 87/540/EEC of 9 November 1987 on access to the occupation of carrier of goods by waterway in national and international transport and on the mutual recognition of diplomas, certificates and other evidence of formal qualifications for this occupation, OJ L 322, 12.11.1987.
[69] See CESNI/QP (21) 33.
[70] See CESNI/QP (21) 60 rev. 2.

4.3. Outlook on new learning methods

Augmented Reality

ETF and STC organized, on 9 November 2021, a meeting in which they presented remote coaching and skills training using AR with focus on

- CAPABILITIES – Remote Mentor – IoT Data Visualization – Digital Workflow;
- APPLICATIONS – Provide expert knowledge remotely – Performance, diagnostics, predictive data & historic trends – Increased productivity & error reduction;

and, in the field of head mounted tablets, on

- CAPABILITIES – Voice recognition – Image & video capture – Video playback – Document navigation
- APPLICATIONS – Share knowledge – Capture processes – Perform remote inspections – Document issues – Reduce paper – Faster training.

The participants presented the following perspectives:

- Using AR is learning by doing, it is possible to embrace new developments and new skills step by step,
- Collaboration of clusters – worldwide you can bring together and share knowledge.
- Digitalisation, vessels, ports and industry interact.

Teachers found that depending on the level of students you have more instruction to give, take them step by step into use.

Young people are more familiar with AR. Do you use these techniques only in class or on board the vessel? Both is possible, but teachers also feel that it is important to provide for ambient noise and use quality use headphones.

Finally, teachers felt that one will have to look for mix of training methods, students should also develop socially. In the year behind us, COVID was less possible. The pilot discussed here was therefore under special circumstances.

New training methods can also be blended learning, lessons in classes, e-learning, VR

General

Questions from experts are:

- What knowledge of a specific vessel is needed to sail it? Need experience with sailing — and/or experience on simulators — remote control center, how do these different learning opportunities relate to each other?
- Can we develop attractive learning modules at accredited maritime training institutes? Using new techniques such as e-learning and Augmented Reality. The completion of a training with a certificate also gives status to the training.

The above-mentioned event was a dissemination event of the RELAR project (REmote Learning and examination based on AR, co-funded by Erasmus+).

For the purpose of understanding the possibilities of the AR tool from RealWear (HMT-1), under observation in the RELAR project, two presentations can be studied that were given at a 'Train the Expert' virtual event regarding the HMT-1 (with the courtesy of Thomas Kogias, University of the Aegean).

1 - HMT-1, A Thorough Introduction: https://rebrand.ly/relar-tte-hmt1-intro

2 - HMT-1, Setup - Control - Management: https://rebrand.ly/relar-tte-hmt1-setup-control-manage

This first experience leads to the assumption that with a view to learning methods, IWT is also at the eve of a new era, that may go hand in hand with a new culture of lifelong learning.

In the joint recommendations of the European social partners on promoting social partnership in employee training published in 2018[71], the following recommendations have been proposed:

- Employee training can contribute towards creating a good working environment, which ensures employees' well-being in their work, motivates them, and enables them to progress in their career and earnings. In turn, employers benefit from the enhanced motivation and productivity of their workforce and overall businesses performance. This means that there is a shared interest and a shared responsibility of employers and employees to contribute to upskilling and reskilling, leading to successful enterprises and an appropriately skilled workforce
- Social dialogue and collective agreements, in particular at the sectoral level, play an important role in the governance of training systems and in creating training opportunities and improving the relevance and provision of employee training. This includes social partners working together to foster transition and career paths between sectors. The establishment of training funds has occurred in several Member States and can play an important role.
- The changes and transitions in the labour market require effective upskilling and reskilling, according to identified needs, and defined by labour market intelligence tools and social partner involvement at all appropriate levels, so as to respond to the existing and future skills demand identified by employers and trade unions across sectors and occupations.

[71] German Economic Institute, Promoting Social Partnership in Employee Training, 2018, https://www.etuc.org/sites/default/files/publication/file/2018-06/Employee%20training_Final%20report.pdf

5. Conclusion

Today, IWT workforce is faced with three main challenges: the energy transition, the digital transition and the lack of skilled work force.

The European Commission recognized all the importance to make more attractive and sustainable jobs in IWT and will work to help Member States to take relevant measures to counter the lack of qualified personnel in the sector.[72] However, if the lack of specialized training in IWT in general is obvious for the IWT stakeholders, this is even more so in automation.

Following the overview of use cases in this deliverable (AIS, entrepreneurial skills, cybersecurity, TGAIN, other modern equipment), it seems clear that a mandatory refresher class is not needed at this time: personnel of IWT vessels could update their competences on these new technologies by familiarisation.

However, for other new technologies of systems of automation it should be mandatory. This is the case of RCC, for which specific qualification earned by a specialized training should be provided.

This deliverable aims to provide the basis for discussions on how to go about crew in relation to automation. First the discussion needs to focus on what the crew on board should do on a remotely operated vessel. Then the qualifications can be established and after that the training and refresher courses can be developed.

Regarding the implementation, several options have been identified:

- CESNI Standards in ES-QIN that are mandatory under EU or CCNR law
- CESNI Standards that are not mandatory such as on Eco navigation.

As sketched in Platina3 deliverable 3.1[73], CESNI is also tasked to work on competence standards, standards for practical examination and, if need be, on simulator approval, for qualifications such as “remote control operator” that may go beyond the new legal framework established by the list of specific authorisations in Art. 6 of Directive (EU) 2017/2397/ Chapter 13 or the new RPN, if new specific authorisations are needed due to the imperative of safety or in the interest to protect the environment. Establish new trainings and refresher classes for automated vessel operation also raises the question of the methodology. Regarding the road sector, Directive 2018/645/EU calls to make best use of e-learning and simulators where possible. In the IWT sector, the use of simulators has been modernized in Europe by ES-QIN 2018 and has become more and more frequent due to the installation of new simulators in several CESNI Member States (such as Germany, the Netherlands, Belgium, France, Romania). The simulators market also changed and grew over the past ten years, and today, smaller companies are also part of it. Therefore, the use of simulators for training seems to belong to modern training. However, can a simulator replace on board experience? Will the trainee develop the same knowledges and skills on a simulator, like he/she could obtain on board? These elements could be reflected on by legislators. For structuring such thoughts, a scheme meant to summarise thoughts on options for refreshers in relation to automation, focussing on TGAINs or higher levels of automation and RCC operations (see paragraph 1.2).

[72] Naiades III, op. cit.

[73] See pages 21 and 22 for report on CESNI/QP meeting in May 2022.

Annex: source list

Legal sources

CESNI, European Standard for Qualifications in Inland Navigation (ES-QIN), edition 2019 (including ES-QIN 2018), https://www.cesni.eu/wp-content/uploads/2020/03/ES-QIN_2019_en.pdf

CCNR, Regulations for Rhine Navigation Personnel (RPN), January 2022, https://www.ccr-zkr.org/13020500-fr.html

COM (2021) 324 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions NAIADES III: Boosting future-proof European inland waterway transport, 24 June 2021

Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council, OJ L 296, 25.10.2012

Communication from the Commission to the European Parliament, the Council, the European economic and social Committee and the committee of the regions, "Sustainable and Smart Mobility Strategy – putting European transport on track for the future", SWD (2020) 331 final

Communication of the European Commission presented by President von der Leyen on 14 January 2020 to EP, Council, ESC and CoR “A strong social Europe for just transitions” (COM (2020) 14 final)

Council Directive 87/540/EEC of 9 November 1987 on access to the occupation of carrier of goods by waterway in national and international transport and on the mutual recognition of diplomas, certificates and other evidence of formal qualifications for this occupation, OJ L 322, 12.11.1987

Directive (EU) 2017/2397 of the European Parliament and of the Council of 12 December 2017 on the recognition of professional qualifications in inland navigation and repealing Council Directives 91/672/EEC and 96/50/EC, OJ L 345 27.12.2017

Directive 2003/59/EC of the European Parliament and of the Council of 15 July 2003 on the initial qualification and periodic training of drivers of certain road vehicles for the carriage of goods or passengers, amending Council Regulation (EEC) No 3820/85 and Council Directive 91/439/EEC and repealing Council Directive 76/914/EEC, OJ L 226, 10.9

Directive 2004/49/EC of the European Parliament and of the Council of 29 April 2004 on safety on the Community’s railways and amending Council Directive 95/18/EC on the licensing of railway undertakings and Directive 2001/14/EC on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certification, OJ L 164, 30.4.2004

Directive 2007/59/EC of the European Parliament and of the Council of 23 October 2007 on the certification of train drivers operating locomotives and trains on the railway system in the Community, OJ L 315 3.12.2007, p. 51

European Union. Consolidated Version of the Treaty on the Functioning of the European Union. Luxembourg: Publications Office of the European Union, 2019

Mannheim Declaration “150 years of the Mannheim Act – the driving force behind dynamic Rhine and inland navigation” Congress of the Central Commission for the Navigation of the Rhine on 17 October 2018, https://www.zkr-kongress2018.org/files/Mannheimer_Erklaerung_en.pdf

Studies and reports

STREAM: Study on Transport Emissions of All Modes, CE Delft, October 2009, https://cedelft.eu/publications/stream-study-on-transport-emissions-of-all-modes/

CCNR Thematic Report - Labour Market, 2021, https://inland-navigation-market.org/wp-content/uploads/2021/02/Thematic-report_EN_web_BD.pdf

EUROSTAT, https://ec.europa.eu/eurostat/web/transport/data/database, 8 February 2021

CCNR press release, Summary of the CCNR’s vision to support the harmonised development of automated navigation 17 November 2021, https://ccr-zkr.org/files/documents/cpresse/cp20211117en.pdf

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