PLATFORM ZERO INCIDENTS
join the journey, break the pyramid

BEST PRACTICE GUIDANCE USE OF TRACK GUIDANCE ASSISTANTS FOR INLAND NAVIGATION

Version 1,
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DISCLAIMER

The information in this document was drawn up with the highest possible accuracy. However, the Platform Zero Incidents and its participants cannot be held liable in any way for its content. Adopting measures, suggestions, warnings, etc. must therefore always be preceded by weighing up and risk assessment. Spreading this document among third parties is allowed provided that this is done in the original form.

ABOUT THE PLATFORM ZERO INCIDENTS

The Platform Zero Incidents (PZI) is an initiative of the inland shipping industry. As the name suggests, PZI aims at 0 (zero) accidents in the inland shipping industry. PZI wants to achieve this by:

- Being a Platform in which near misses and incidents are shared among its members.
- Preventing repetition of near misses/incidents by developing best practices and stimulating their use, based on research and analysis of near miss/incident (trends).
- Building lasting relationships with stakeholders.
- Raising awareness and responsibility for safety within the industry.
- Being the centre of expertise in the field of preventing safety and environmental incidents in the inland shipping industry.

This publication helps to achieve PZI's mission and vision. The document has been developed by and for inland navigation.

It can be used for various purposes, such as:

- Reference for crew members and fleet managers.
- Training of crew members.
- Input for safety meetings on board.
- Lesson material for educational institutions.
- As a basis for future discussions on this subject.
- As a basis for procedures and work instructions.

If anything is unclear or questions arise during the loading / unloading process, this should be discussed with the shore organization.

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1. INTRODUCTION

1.1. Why this document?

Autonomous sailing techniques are developing at a rapid pace in the inland shipping industry. Track guidance assistant for inland navigation (hereafter: trackpilot) is one of these techniques. The use of these types of techniques is not without risk and should be implemented with caution.

As a basic matter of principle, the deployment of a trackpilot is intended to increase general safety standards on inland waterways. The trackpilot shall not jeopardise the health and safety of shipboard personnel, not impair the craft's integrity and safety, nor interfere with any other information and navigational systems aboard the same craft, or on other craft (CESNI, 2023).

This document discusses various aspects that give substance to the responsible use of a trackpilot.

1.2. Compliance

At the time of writing this document, there are no applicable laws and regulations regarding the use of a trackpilot. However, the European Committee for Drawing up Standards in the Field of Inland Navigation (CESNI) is preparing to amend the applicable laws regarding the use of a trackpilot. When writing this BPG, use was made of the document in which the possible implications for legislation are described. This document – *Minimum requirements for the operation and technical design of track guidance assistants for inland navigation (TGAIN)* – is therefore frequently referred to in this BPG.

1.3. How to use this document

It is certainly not the intention that this document describes the only way of working, because each situation and each barge is different.

However, it can help you as an inland professional, to make the best decisions under various circumstances.

You can use the document as a reference for your safety management system, but certainly also for familiarization and/or training your crew members. In addition, you can use parts of the document during a safety meeting with your crew. It can increase safety awareness on board, thus avoiding the risk of accidents.

If you have any suggestions to further improve this document, please contact Platform Zero Incidents

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2. TRACKPILOT

This BPG discusses mitigating the risks of a trackpilot. However, it has to be clear what the actual benefits are of using a trackpilot. In addition, this chapter clarifies the place that a trackpilot has within the levels of automation, as defined by the CCNR.

2.1. Purpose of using a trackpilot

A trackpilot is a system for automatically steering a craft along a predefined track, the purpose of this system being to support the operator and reduce his workload when steering the craft (CESNI, 2023).

2.2. Trackpilots and levels of automation

A trackpilot is based on Grade 1 or 2 of the international definition of levels (see figure 1) of automation (2018-II-16, 2020-II-20, 2022-II-17), which means that the operator remains responsible at all times for the control of the craft, including track adjustment to avoid collisions (CESNI, 2023).

	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				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).
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				
	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.

Figure 1 - CCNR 2018

2.3. Risks of using a trackpilot

A trackpilot shall not jeopardise the health and safety of shipboard personnel, not impair the craft's integrity and safety, nor interfere with any other information and navigational systems aboard the same craft, or on other craft (CESNI, 2023).

Using a trackpilot is not without risks, the following aspects (not limited) are identified that could have a negative impact (e.g., collision, allision and grounding) during sailing:

- Incorrect installation, maintenance and/or replacement
- A non-compliant and/or substandard trackpilot
- Wrong dimensions of the vessel entered in a trackpilot
- Loss of signal during sailing
- Human factors, such as
    - Distraction
    - Incorrect use of a trackpilot
    - Competency
- Cybersecurity
- Ergonomics

These, and other aspects will be addressed in the following chapters of this BPG.

3. INSTALLATION, MAINTENANCE AND REPLACEMENT

When installing, maintaining or replacing a trackpilot, there must be guarantees that ensure that the technology can be used safely. This chapter describes some of these safeguards.

3.1. Installation

Installation of a trackpilot needs to be done by a specialist firm. At the time of writing this version of the BPG, there was no requirement to use approved firms to install a trackpilot, this obligation may apply in the near future.

After installation a proof of conformity needs to be issued by the supplier as an assurance that a trackpilot meets the required standards as mentioned in the CESNI document: *Minimum requirements for the operation and technical design of track guidance assistants for inland navigation (CESNI, March 20, 2023).*

Entering the ship's dimensions is crucial for the safe use of a trackpilot. In addition, the user of the ship must be alerted to changes in the dimensions of the ship, in-/excluding push barges, for example.

A trackpilot display shall be installed within the operator's extended field of vision. The control elements shall be installed within the operator's reach. Wireless remote control of a trackpilot is not permitted (CESNI, 2023).

3.2. Maintenance and replacement

Maintenance and replacement of a trackpilot needs to be done by a specialist firm and it has to meet the required standards as mentioned in the CESNI document: *Minimum requirements for the operation and technical design of track guidance assistants for inland navigation (TGAIN, March 20, 2023).*

4. QUALIFICATION, COMPETENCES, TRAINING AND FAMILIRISATION

Not only must the trackpilot technique meet safeguards, but the operator must also be qualified, competent, aware and trained. This chapter briefly describes the requirements for this.

4.1. Qualification

A trackpilot shall only be operated and monitored by the holder of a boat master's certificate or a certificate recognised as equivalent by the Regulations for Rhine Navigation Personnel.

4.2. Training

Training meets the requirements as stated in the required standards as mentioned in the CESNI document: *Minimum requirements for the operation and technical design of track guidance assistants for inland navigation (CESNI, 2023).* In this document the following items are identified as possible training topics:

- areas where a trackpilot cannot be used (see paragraph 5.3);
- interpreting the determination of position and heading;
- moving the planned track (changing direction of travel and speed);
- interpreting speed in relation to water and over the ground, environmental influences such as weather and wind;
- anticipating strong crosscurrents, strong undertow, behaviour in narrow canals and their banks;
- encounter situations in very narrow waterways;
- GNSS shadows caused by structures;
- very low engine revolutions at high speed of the craft;
- manoeuvring situations;
- responding to alarms, warnings and other malfunctions (verification, confirmation, initiating the necessary measures e.g., quickly switching from a trackpilot to the normal rudder).
- basic knowledge of cooperative devices (Inland ECDIS device [display], radar, Inland AIS device, heading sensor, rate-of-turn regulator;
- responsibility as boat master for the visual steering of the craft when using an assistance system such as a trackpilot;
- setting an appropriate, practicable track (minimum radius, etc.).

Without such training it is not allowed to use a trackpilot during sailing. Training will be given by a specialist of the specific equipment.

5. POLICIES AND PROCEDURES

The information in this chapter can be used as input for an organization's safety management system (SMS). In case the organization does not have an SMS, the information can be used to raise awareness on board when using a trackpilot.

5.1. Management of change (MoC)

Implementing techniques such as trackpilots should be subject to a robust MoC-process. This process should cover the aspects that are mentioned in this BPG.

5.2. Implementation of a trackpilot

When a trackpilot is going to be used on the ship after installation, the supplier must extensively test the system for suitability during the first voyages. In case these tests show malfunctions, a trackpilot should no longer be used. The supplier must be contacted to resolve the malfunctions. After the deviances have been resolved, the tests will be repeated until the system functions as it should.

Specific attention must be given to verification of the dimensions of the vessel entered in the trackpilot-system. In case of changing combinations in addition, the user of the ship must be alerted to changes in the dimensions of the ship, in-/excluding push barges, for example.

5.3. Navigational areas

Attention should be paid to the navigation areas where a trackpilot can/cannot be used. A trackpilot is suitable when longer distances have to be covered.

In areas where there is a lot of shipping, such as ports, a trackpilot should be de-activated. A trackpilot should also be switched off near locks, bridges and narrow fairways.

5.4. Warnings and alarms

How to handle trackpilot-warnings and -alarms need to be part of the procedures.

5.5. Familiarization

The operator must meet the necessary qualifications, see §4.1, and must be trained, see §4.2 before he/she is allowed to use trackpilot.

When the operator is new on a vessel specific attention must be paid to:

- Is the operator familiar with the policies and procedures in relation to the use of a trackpilot?
- Is the operator familiar with this type of a trackpilot?
- Is the operator familiar with this type of trackpilot in combination with the type of ECDIS-system?
- Is the operator aware of the dimensions of the vessel in relation to the use of a trackpilot?
- Is the operator aware of the settings of the trackpilot?

These topics can be part of the general familiarization process.

6. HUMAN FACTORS

Various human factors can underlie (un)safe navigation. In this chapter, some of these factors are identified and described in more detail.

6.1. Distraction, lack of focus

Distraction is one of the main hazards of using a trackpilot. A trackpilot is intended to assist and not to replace the operator. It is tempting to do other activities while using a trackpilot, such as administrative tasks. However, the operator must remain focused on navigation tasks at all times. Other than sailing activities are not allowed while using a trackpilot.

As long as the trackpilot is in active operation, supervision of the trackpilot in the wheelhouse must be ensured. A trackpilot should therefore not be used without a mechanism ensuring that the operator is present at any time (presence monitoring) (CESNI, 2023).

6.2. Other human factors

In addition to distractions, there are other human factors that pose a hazard to navigating and using a trackpilot. These factors are (not limited):

- Situational awareness
- Fatigue
- Pressure
- Capability
- Complacency

These factors will not be discussed in this BPG, reference is made to other PZI publications, such as the resilience program.

7. CYBERSECURITY

A trackpilot system needs to be resilient for cyberthreats.

The operator shall be familiar with the hazards and impact of a cyber-attack and know what action he needs to take to mitigate the risks. The operator shall also be capable of initiating the appropriate measures for safely continuing the voyage (CESNI, 2023).

Reference is made to the OCIMF-guideline *'The guidelines on cyber security onboard ships' (OCIMF, 2023)*

SOURCES

- CESNI (March 20, 2023). Minimum requirements for the operation and technical design of track guidance assistants for inland navigation (TGAIN).
- CCNR (December 18, 2018). First international definition of levels of automation in inland navigation. Ref: CC/CP (18)20
- OCIMF and others (2021). Guidelines on Cyber Security Onboard Ships. Version 4.

REVISION MATRIX

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1	First version	August 1, 2023