Guidelines for usage of Track Guidance Assistants for Inland Navigation (TGAIN)

First Edition 2026

Issued by

OCIMF
29 Queen Anne's Gate
London SW1H 9BU
United Kingdom
Telephone: +44 (0)20 7654 1200
Email: enquiries@ocimf.org

www.ocimf.org

(First edition July 2026)

OCIMF
OCIMF is a membership organisation that brings the maritime energy industry together around a shared commitment to safety. It was formed in 1970 following incidents, including Torrey Canyon in 1967, to address the need to better understand and manage maritime risk.

OCIMF's vision is: *A global marine industry that causes no harm to people or the environment.*

It promotes the safe and environmentally responsible transportation and handling of oil, petrochemicals, gas and emerging fuels, and expects the same standard in related offshore marine operations.

OCIMF is *United in purpose, to drive maritime safety in the energy sector* and works with its members and industry partners to manage today's operational hazards while helping industry prepare for emerging risks and future threats..

Contents

1 Introduction

1.1 What is Track Guidance Assistant for Inland Navigation?

Track Guidance Assistant for Inland Navigation (TGAIN) is a system that supports the boatmaster or user and reduces their workload by automatically steering a vessel along a predefined track. The track is to be displayed on a device that meets the requirements of the local authorities' Inland Electronic Chart Display and Information System (ECDIS). A TGAIN requires information from other sensors (e.g. heading, position, rate of turn) and acts via actuators on the steering of the vessel (rudder system and/or propulsion system). Sensors, actuators and Inland ECDIS equipment are not part of a TGAIN.

The use of TGAINs on board inland barges has increased significantly in recent years. It is expected that about 2,000 inland barges in Europe will soon have such a system installed and other regions are likely to follow quickly. There is currently little legislation addressing these systems and no type-approval is currently required because the systems are used as a navigation aid. Various studies have been carried out, and publications are available (see bibliography). However, it is clear within industry that numerous near-misses and incidents have occurred while TGAINs are in use.

A properly functioning TGAIN system can generally steer a vessel along a defined track more reliably than a human steering. This can help reduce steering errors associated with manual steering. The use of TGAIN may help increase the user's situational awareness by reducing the workload of the user and reducing fatigue. These systems may improve overall safety outcomes and potentially lead to reduced fuel consumption and GHG emissions due to more efficient and consistent steering inputs and by reliably following the defined track.

However, persons using a TGAIN system should also consider potential risks including, but not limited to cybersecurity, undetected GNSS interference, and collision/allision with vessels or structures along the intended track which are described further in this information paper.

1.2 Purpose and scope

This information paper provides safe practice recommendations related to performance criteria for TGAINs, and installation and implementation of TGAIN devices on board. It also describes recommended types of user training and procedures to be provided by technical operators and/or ship owners. The advice given is based on TGAIN technologies available and anticipated at the time of publishing. It does not cover artificial intelligence or augmented reality.

This information paper also considers limitations on the use of TGAIN, human factors, cybersecurity and recommended technical capabilities.

The guidance provided here focuses on managing the risks associated with the implementation, installation and operation of TGAIN systems. It is aimed at OCIMF members, technical operators and/or owners including their crew members and suppliers.

OCIMF will reassess the safe practice recommendations contained in this information paper as the use of TGAIN systems expands and matures and industry develops learnings gained from the implementation and use of TGAIN systems to identify operational best practices. When legislation related to equipment standards and the use of TGAIN systems are developed, this information paper will be reviewed. The recommendations contained in this information paper do not preclude the adoption of practices or arrangements that exceed these recommendations.

1.3 Levels of automation

The Central Commission for the Navigation of the Rhine (CCNR) has defined levels of automation in its publication, *First International Definition of Levels of Automation in Inland Navigation* (see figure 1.1). This scale runs from 0 (no automation) to 5 (full automation). The TGAINs used on board are generally categorised as level 1 (steering assistance), but can go up to level 2 if collision risk awareness is included.

	Level of automation[1]	Designation	Craft command (steering, propulsion, wheelhouse, etc.)	Monitoring of and responding to navigational environment	Fallback performance of dynamic navigation tasks
Boatmaster performs part or all of the dynamic navigation tasks	0	**No automation** The full-time performance by the boatmaster in all aspects of the dynamic navigation tasks, even when supported by warning or intervention systems	👤	👤	👤
	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 boatmaster performs all remaining aspects of the dynamic navigation tasks	👤 🚢	👤	👤
	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 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 in all dynamic navigation tasks, including collision avoidance, with the expectation that the boatmaster will be receptive to requests to intervene and will respond appropriately to system failures	🚢	👤 🚢	👤 🚢
	4	**High automation** The sustained context-specific performance and fallback performance by a navigation automation system of all dynamic navigation tasks, without expecting a boatmaster to respond to a request to intervene[2]	🚢	🚢	🚢
	5	**Autonomous = full automation** The sustained and unconditional performance and fallback performance by a navigation automation system in all dynamic navigation tasks, without expecting a boatmaster to respond to a request to intervene	🚢	🚢	🚢

Figure 1.1:
CCNR levels of automation

Key:
👤 = Boatmaster
🚢 = System

Notes to figure 1.1:

[1] Level of automation: Different levels of automation may make use of remote control but different conditions to be defined by competent authorities might apply to ensure an equivalent level of safety.

[2] "without expecting a boatmaster to a request to intervene": 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.

2 Recommendations for a TGAIN

2.1 Technical components of a TGAIN

All components should be connected to each other by hard wire and communicate via the appropriate National Marine Electronics Association (NMEA) standard 0183. Bluetooth, Wi-Fi or other wireless communication protocols are not recommended. The vessel should have at least two independent Global Navigation Satellite System (GNSS) receivers. To reduce the effects of spoofing and/or jamming, to minimise dead reckoning due to loss of signal and to help ensure the reliability of the system, the independent GNSS receivers may use different constellations of satellites (ex. BEIDOU, GALILEO, GLONASS or GPS). To mitigate the effects of signal loss when passing under bridges or other obstructions, it is recommended that one GNSS receiver is positioned on the aft end and one on the forward end of the vessel. GNSS receivers should be type approved in accordance with relevant maritime standards.

2.2 Technical design requirements

It is recommended that TGAIN equipment makers agree and adopt common display function wording for use on all types of TGAINs. All controls and indicators should be provided with symbols and/or markings in English and meet the requirements of IEC 60417: 2002 DB *Graphical symbols for use on equipment.*

All TGAINs should have a Standard Mode (S-mode) that can be activated, which should contain:

- A default display presented at the press of a button.
- A standard menu structure on this display, where all essential tasks can be operated in the same way across all manufacturers.
- A standard interface device (mouse, trackpad, joystick, etc.).

A common industry S-mode will help users become familiar more easily when encountering TGAIN systems from different makers. Touchscreens may be used for interface, but to prevent unintentional use, they should not be used to deactivate the TGAIN.

2.3 Activation, deactivation and fallback state

Due to the lack of current standards and legislation, it is recommended that TGAIN equipment makers agree and adopt common activation and de-activation sequence. Deactivation should be done in manual steering mode.

Relevant stakeholders, including vessel owners/operators, electronic navigation equipment makers and regulatory bodies should collaborate to agree on a new practice of transmitting additional information related to navigation mode (manual steering/river-pilot/TGAIN/remote operation controlled or in fallback state) via the Automatic Identification System (AIS) for display on other vessels' inland ECDIS units. Refer to *Clarifications concerning the obligation of equipment with an Inland AIS device and an Inland ECDIS device or a comparable electronic device for displaying electronic charts for inland navigation – Oct 2021* (CCNR).

While the TGAIN is activated, the user should have the ability to modify the track to follow currently in use and then designate the vessel to follow the modified track.

When a TGAIN can no longer operate for any reason, it should activate the fallback state. When required to go to a fallback state, an alarm should be activated in the wheelhouse and the system should automatically switch to manual steering mode.

2.4 Operational performance

All physical computer elements should be tested and certified in accordance with EN 60945:2002 *Maritime navigation and radiocommunication equipment and systems General requirements – Methods of testing and required test results as amended,* and a Class Type Approval Certificate should be issued and carried on board. To maintain operational performance of the TGAIN, only the necessary software should be installed on the computer and this should not interfere with any other equipment on board. It should not be possible to install or operate any other software that is not connected with the operations of the TGAIN system. See also section 9: Cybersecurity. The TGAIN should be insensitive to magnetic fields that typically occur on board the vessel, in accordance with EN 60945, as above.

2.5 Presence monitoring

Presence monitoring is the use of sensors, software or signals to track the presence of individuals in automated systems. The TGAIN should have presence monitoring to ensure a user is present any time the track control system is activated. This may take the form of a reset button or a requirement to reset after a manipulation on the ECDIS or radar. The time interval of presence monitoring should be random.

If presence is not detected, the system should first give a visual warning and if no response is received, give a second audible warning. If there is no response to the first two warnings, the general alarm should be activated. If the general alarm is not acknowledged by the user and other crew members, the system should enter a fallback state.

The interval of warnings, activating the alarm, general alarm and fallback state should be stated in the company procedures. OCIMF recommends the following time intervals/responses:

- 0-3 minutes: dormant period.
- End of dormant period: Visual warning in wheelhouse.
- 60 seconds after visual warning initiated: First audible alarm in wheelhouse.
- 60 seconds after first audible alarm initiated: General alarm activated.
- 120 seconds after general alarm activated: Recommendation that TGAIN system go into fallback state.

It should not be possible for the user to override presence monitoring when the TGAIN is activated. Please note that presence monitoring is not the same as motion detection.

2.6 Warnings and alarms

The TGAIN should be able to notify the user of necessary actions or potential problems using warnings and alarms, both visual and audible; spoken warnings and alarms are preferable.

A warning should be triggered in the following cases:

- An excessively uncertain position or heading.
- A sensor failure.
- Dead reckoning.
- Before the end of a planned track.
- Excessive changes in the measured rate of turn.
- A possible collision with an obstacle or another vessel.
- Prompting the user to respond to a signal from the presence monitoring device.

The TGAIN may warn of obstacles or other vessels. This should not be the primary means of detection; it should be in addition to traditional means of collision avoidance. If the TGAIN is equipped with a collision awareness module, the activation status should be permanently displayed (on/off). The TGAIN may also propose an alternative course.

An alarm should be triggered in the following cases:

- A complete system failure.
- A power supply malfunction or failure.
- An excessive discrepancy between the planned and actual track, which means the planned track can no longer be achieved.
- An excessive discrepancy between heading and actual track, which means the planned track can no longer be achieved.
- Malfunctions affecting the rudder position or engine control unit.
- Shortly before the end of a planned track.
- Dead reckoning exceeding a specific duration (to be defined by user).
- Excessive curvatures in the planned track, which means the planned position can no longer be achieved.
- Excessive changes in the curvature of the planned track, which means the planned position can no longer be achieved.

2.7 Classification

TGAIN hardware should be approved by the competent authority by means of a Class Type Approval Certificate. This should include approvals regarding temperature tests, humidity tests, vibration tests, electromagnetic compatibility (EMC) and enclosure standards. All physical computer elements should be tested and certified in accordance with the international norm IEC 60945 (2002) as amended, and a Class Type Approval Certificate should be issued. Documentary proof of approval should be carried on board.

The TGAIN Class Type Approval should be verified every five years or to coincide with a Class Special Survey.

3
Installation on board

3.1 Qualifications of installer

It is recommended that the TGAIN installation and individual configuration should be carried out by the manufacturer or by an approved specialist who is appropriately qualified and experienced to safely conduct the installation.

3.2 Installation

The TGAIN hardware should be class approved and compliant with the following minimum requirements, as defined by CCNR:

- Two GPS receivers – preferably one on the aft end and one at the forward end of the vessel. Extra receivers should be in place if sailing in a convoy.
- If an emergency stop switch is activated, manual steering mode should be engaged.
- The TGAIN should be protected against power surges and connected to an Uninterrupted Power Supply (UPS) backup system.
- A universal interface should be available to connect with other nautical devices, such as a voyage data recorder.
- An inland ECDIS as required by EU directive 2005/44/EC.

3.3 Sea trial

Before putting the system in service, a sea trail should be conducted and assessed by a competent authority in a safe location or one designated by local authorities. The operation of the entire steering system should be checked by means of a navigation test to confirm that a track to follow can be reliably maintained and that bends can be negotiated safely. If a rate-of-turn regulator is installed it should be checked that a predetermined course can be reliably maintained and that bends can be negotiated safely.

Any changes to or renewal of the system are subject to a new sea trial witnessed by a competent authority.

4 Testing, maintenance, calibration and certification

4.1 Testing

Full functional testing should take place during the sea trial phase of the installation process in the presence of Class approvers and conducted by the manufacturer.
The manufacturer should provide acceptable test parameters and criteria, including the performance of the TGAIN. It is advised that these parameters and criteria are standardised across all manufacturers. Testing should take place in a safe location or one designated by local authorities.

4.2 Certification

The manufacturer should provide a test performance certificate indicating the results of the test carried out during the sea trial. An installation and performance certificate for navigational radar installations, rate-of-turn indicators, inland AIS equipment, tachographs and TGAIN in inland navigation should be issued.

4.3 Calibration

The TGAIN should be calibrated during the sea trial phase of the initial installation onboard and it should be recalibrated if there are any changes to the hardware that provide inputs into the TGAIN. Any new hardware configuration is subject to manufacturer and Class approval before installation. The TGAIN should be recalibrated if there is any reduction in performance noted by the boatmaster.

The TGAIN should be calibrated periodically with a frequency determined by manufacturers. It should be calibrated in load/ballast/light ship conditions and for the following set ups and environmental conditions:

- Vessel combination type
- Current
- Shallow waters
- Winds
- Wake

4.4 Maintenance and routine testing

The manufacturer should provide a comprehensive list of the regular maintenance required including time intervals. The manufacturer should provide a means to test the alarms and connections of the TGAIN, and this test should form part of the monthly onboard checklist.

4.5 Software updates

The TGAIN software should be maintained with the latest updates installed as soon as practicable. Notification of a new update should be given by the system or the manufacturer. Notification messages should not obscure navigational information. Software updates should not be set to automatic and should not be undertaken during a voyage. All updates should be completed while the vessel is at anchor or moored alongside a dock.

5
Implementation process by owners and technical operators

The implementation of a TGAIN on inland vessels necessitates a detailed and structured approach. This process involves addressing management of change, conducting risk assessment, updating company procedures, creating work instructions for crew members, and adapting navigational audits. Effectively managing these elements enhances safety and operational efficiency.

5.1 Management of Change

The Management of Change (MoC) process is vital when introducing TGAIN on inland vessels. It is advisable to address all risks associated with the new technology, including potential training gaps and the system's limitations. Key aspects include the following:

- Identifying and assessing the impact of TGAIN on existing operations.
- Ensuring comprehensive training programmes for all crew members to handle TGAIN proficiently.
- Establishing protocols to manage the transition smoothly, minimising operational disruptions.
- Continuously monitoring and evaluating the system's performance, incorporating feedback for improvements.

5.2 Risk assessment

Conducting a thorough risk assessment is essential to identify and mitigate potential hazards associated with TGAIN. The risk assessment should include the following elements:

- Evaluating the impact of TGAIN on navigational safety and operational efficiency.
- Identifying scenarios where TGAIN might fail or provide inaccurate guidance.
- Assessing the risk of overreliance on TGAIN by crew members, which could lead to complacency.
- Developing contingency plans to address identified risks, ensuring quick and effective responses to any issues.

5.3 Company procedures

Updating company procedures is crucial for the effective implementation and use of TGAIN. These procedures should cover the following as a minimum:

- Clearly defining the areas where TGAIN can be used, considering factors such as navigational complexity and environmental conditions.
- Implementing a robust testing protocol during the first voyage to ensure the system operates as expected and to familiarise the crew with its functionality.
- Addressing the risk of crew members relying too heavily on TGAIN, which could compromise situational awareness and decision-making.
- Establishing rules and guidelines to manage the overtaking of other vessels safely, especially in narrow or congested waterways.
- Ensuring the installation of watch alarms and promoting variable time settings to enhance safety.
- Implementing protocols to ensure constant monitoring during navigation.
- Developing an emergency response scheme that includes procedures for dealing with TGAIN malfunctions or failures.
- Addressing the potential for alarm fatigue by monitoring and managing information overload.
- At regular intervals, the user should be encouraged to undertake a voyage without using the TGAIN to maintain and enhance their navigational skills.
- Using the Tanker Management and Self-Assessment (TMSA) framework as a reference for best practices in implementing and managing TGAIN.

5.4 Work instructions for the user including voyage planning

Users should be provided with detailed work instructions to ensure they understand how to integrate TGAIN into their daily operations and voyage planning. The instructions should include as a minimum:

- Regularly updating the TGAIN system to ensure optimal performance.
- Encouraging the user to analyse automatic track selections before starting the voyage.
- Ensuring the system alerts the user about areas with navigational limitations.
- Continuously monitoring water levels to verify if the selected setting is still correct.
- Identifying areas where the TGAIN can or cannot be used (see also section 7).

5.5 Navigational audits

Navigational audits should be adapted to include the evaluation of TGAIN usage when installed. These audits help ensure compliance with established procedures and identify areas for improvement. Key elements include:

- Assessing the integration and effectiveness of TGAIN in realistic scenarios.
- Evaluating crew members' proficiency in using TGAIN and adherence to update procedures.
- Identifying and addressing any issues or discrepancies in the use of TGAIN during operations. Information collected by a voyage data recorder can be used for this purpose.
- Incorporating findings into training programmes and procedural updates to enhance overall safety and efficiency.

6 Requirements for TGAIN users

TGAIN is a navigation aid that assists the user during the steering of the barge. The system should be used for its intended purpose – assisting the user so that they can pay more attention to their operating environment and anticipate future/unexpected obstacles. The user should be familiar with the system and have sufficient training and experience to use TGAIN. The user should also always be aware of the limits of TGAIN. The operating envelope of the system needs to be known by the user. It remains a navigation aid and not a replacement for the user's steering skills.

The user is accountable for the use of TGAIN. The responsible boatmaster has the authority to decide whether TGAIN is used or not, even when use of TGAIN is expected by the barge owner or technical operator.

As there are different types of TGAIN, the user needs to be trained and familiar with the system onboard the specific vessel before the system can be used.

6.1 Qualifications

The TGAIN user should hold a valid certificate of qualification (or another certificate recognised as being equivalent). If the TGAIN is used on sections that present specific risks or in reduced visibility, the user should also hold the specific authorisations required for navigation on those sections or for radar navigation.

6.2 Training

The following is advised when designing TGAIN training:

- Training should be installed on an approved simulator, e.g. for Europe: CESNI (directive EU 2017/2397).
- It should include testing the system limits and how to handle unexpected situations.
- It should be part of a generic training which includes topics such as ECDIS training, communication, user tasks during navigation, radar, handling in (potential) emergency situations (these situations can be based on lessons learned).
- Training should be repeated periodically with an interval not to exceed five years.
- Training should be followed on an independent and certified training institute.
- Certification based on generic training should be available.

6.3 Training for new tasks and responsibilities

Implementation of new systems like TGAIN can lead to new tasks for the user. Training should include the following new tasks at a minimum:

- Areas/locations where TGAIN cannot be used (operating envelope).
- Interpreting the determination of position and heading.
- Learning how to change a planned track, adjusting speed, etc.
- How to communicate with the TGAIN system.
- Anticipating crosscurrents, strong undertow, behaviour in narrow canals and their banks.
- Encountering dangerous situations in a narrow waterway.
- Responding to alarms, warnings and other malfunctions (verification, confirmation, initiating the necessary measures, e.g. quickly switching from the TGAIN to the normal rudder).
- Setting an appropriate, practicable track to follow (minimum radius, etc.).
- Communications with other traffic, VTS, locks and bridges.

6.4 Communication

The ability of newer technologies such as ECDIS/AIS and TGAINs to communicate with other vessels or traffic control centres does not replace the required VHF-communications with other vessels, VTS, locks and bridges. Other means of communication, such as sound signals, should also be used as required by regulations.

7 Operating envelope

TGAIN is a tool for enhancing safety in navigation and does not replace a competent person on the bridge. The boatmaster should always be involved in the safe navigation of the barge.

Voyage planning is essential and should include clear guidance on situations where use of TGAIN is or is not acceptable. The company should provide safety parameters that can be used as minimum requirements for the boatmaster and the user, who in turn may decide to add additional requirements or restrictions on use of TGAIN.

7.1 Areas of concern

Areas of concern need to be assessed during the voyage planning stage and need to be adjusted during the voyage if circumstances change. Conditions that affect safe navigation may include the following:

- Reliability of TGAIN equipment.
- Reliability of interfacing equipment (electronic charts, depth sounder, gyrocompass, GPS, anemometer, etc.).
- Reliability of data and external data integrity.
- Weather and environmental conditions.
- Human factors (see section 8).

7.2 Conditions that may lead to increased risk

The company should provide clear guidance on conditions that may lead to increased risk while using TGAIN. This may include the following:

- Passage of areas and obstacles that are prohibited by local legislation.
- In-port or areas where local authorities prohibit use of a TGAIN.
- Parts of waterways with restrictions, such as bridges, locks, etc.
- Low water levels on waterways.
- Operating near shallow water areas.
- Waterway currents, sailing upstream or downstream.
- Extreme high water levels.
- Adverse weather conditions.
- Narrow waterway areas.
- Congested/dense traffic areas.

- Low vessel speed (resulting in greater drift effect of wind and current).
- Communication with traffic control centres, other fairway users and operators of bridges and locks.
- Passage of areas with possible dangerous situations, for example high density of pleasure crafts, local works on the waterway, etc.
- Emergency and contingency situations, for example steering failure, engine failure, person overboard, or navigation equipment failure.

8 Human factors

It is recognised that human error is not simply a feature of individual failure, but is caused by workplace factors, equipment and task design, and organisational conditions which can lead individuals to make errors or poor decisions. This section looks at how such factors might affect the user and how to mitigate risks.

This section should be read in conjunction with *The OCIMF Human Factors Approach.*

A user involved in the navigation of a barge can easily be distracted. To maintain safe navigation, the user should have easy access to a pre-set requirement framework, provided by the company. The framework should enable the boatmaster/user to use risk mitigation measures in a consistent way, to avoid unacceptable risks during a voyage when circumstances change or unplanned events take place. The user should be provided with the tools to help them be able to easily adapt to such changes and not be distracted from the primary task of safely navigating the barge.

8.1 Voyage planning

Without TGAIN, the boatmaster or user plans their route by themselves, using their experience and knowledge shared by others to anticipate difficulties, obstructions and other aspects of the intended voyage. TGAIN systems use routes selected from or generated by external databases. This means the boatmaster does not know what criteria are used to plan the route that has been selected, so it is vital that they check and verify the route before commencing their voyage.

8.2 System automation and situational awareness

The TGAIN's automation of certain functions presents potential hazards in addition to the possible benefits. While the user may be relieved of the need to manually steer and/or adjust the speed of the vessel, they must monitor the TGAIN inputs and the response of the vessel to ensure the automation is working properly. The user's lack of engagement with the steering of the vessel can cause them to lose situational awareness and miss signals about changes in environmental conditions. If the user is not steering the vessel, they may not be aware of the degree to which wind and current are affecting the vessel's course and position. The user should make use of all available sources of information to maintain proper situational awareness.

8.3 Maintaining skills

During the voyage, the user should be able to switch back to manual steering both under normal operation and in an emergency. In such cases the user needs to know how to switch to manual and, more importantly, the fallback state, when TGAIN is enabled.

Long term use of TGAIN may lead to deterioration in the user's skills regarding how the vessel responds under manual control. The company should provide procedures that define the parameters for the safe and acceptable use of TGAIN to ensure that the users of TGAIN equipment onboard barges maintain the required ship handling skills to manually navigate the vessel. A consistent and standardised approach can help crew to be confident in applying the requirements. This in turn will enhance safe operations.

8.4 Human factor risks

Human factor risks that should be taken into account include, but are not limited to, the following:

- Complexity of systems.
- Data/information overload.
- Workload/stress factors related to workload.
- Loss of situational awareness.
- Distraction.
- Boredom.
- Fatigue/work and rest hours.
- External pressures affecting wellbeing.

8.5 Supporting the boatmaster and the user

The company should implement the following practices to help support the boatmaster/user:

- Standardised onboarding and familiarisation, and sharing best practices.
- Set requirements for generic and type-specific training, leading to certification.
- Provide clear operational parameters, such as equipment settings and alarm settings.
- Provide voyage planning format, including scenarios.
- Create reliability of data/information (i.e. water levels, bridge heights, fairway obstructions, etc.).
- Provide clarity on how to manage situational awareness and recovery.
- Navigational duty relief, handover of TGAIN setting information, and the status of interfacing equipment.
- Provide conditions and a policy to avoid distraction in the wheelhouse (*Distracted Operations Sterile Wheelhouse Policy Guidance* – AWO).

9 Cybersecurity

This section should be read in conjunction with *The Guidelines on Cybersecurity Onboard Ships.*

The company should have policies and procedures in place to protect Information Technology (IT) and Operational Technology (OT) systems on board against cyber-attacks and viruses as well as measures to detect and recover from cybersecurity incidents. A TGAIN is considered an OT system. The procedures should include the training of crew members in cybersecurity and awareness. The classification society type-approval for the equipment should include the cyber notation.

The boatmaster is the last line of defence for the digital security of the TGAIN. Only technicians' devices, e.g. laptop, should be connected to the TGAIN computer. Before connecting any technicians' device to the TGAIN computer, the boatmaster should ensure that:

- The device has up to date virus scanning software installed.
- A virus scan has been run in the last 24 hours and, if not, it is shown to be carried out before connecting to the TGAIN computer.

After the technician's work is complete, the boatmaster should ensure that a virus scan is run on the TGAIN computer.

The boatmaster should make sure that all USB devices are scanned before and after connecting to the TGAIN computer.

The manufacturer of the TGAIN should warrant that all automatic updates are free from malware and viruses before being issued.

In case of a cyber-attack, protective means should be provided to isolate the TGAIN from offsite servers. This may be referred to as a 'kill switch'.

The TGAIN should be enabled to automatically record the most important operating data when it is activated. This recording should be made in a non-volatile memory so that the malfunctioning and failure can be analysed in a verifiable manner for at least the most recent 30 days. Access to the internal configuration parameters of the TGAIN should be protected by a password.

Glossary

Alarm
An alarm is a high priority alert; a condition requiring immediate attention and action, to maintain the safe navigation and operation of the vessel.

Barge or inland vessel
Any (cargo) ship which is designed for inland and port navigation. This includes self-propelled barges and barges without propulsion operated by tugboats (pushing or towing).

Boatmaster
The officer in command of the ship. They are the owner's representative on board and holds ultimate responsibility for all actions undertaken on board, particularly the safe and efficient operation of the vessel.

Company
The owner of the vessel or any other organisation such as a technical operator who has assumed responsibility for the operation of the vessel from the owner of the vessel, including the duties and responsibilities imposed by the ISM Code.

Competent person
A person who has been adequately trained to undertake the tasks they are required to perform within their job description. For personnel in the shipping industry, they should be able to demonstrate this competency by the production of certificates recognised by the ship's administration.

Cyber-attack
Any type of offensive manoeuvre that targets IT and OT systems, computer networks and/or personal computer devices and attempts to compromise, destroy or access company and ship systems and data.

Fallback state
is a system configuration. When a specified alarm is activated, and not acknowledged, or in case of system failure, the TGAIN will manage to maintain the vessel in a static position and heading.

Fatigue
The reduction in physical or mental capability of an individual due to physical, mental or emotional exertion resulting in the reduction of their performance level.

Human factors
Human factors are the physical, psychological, and social characteristics that affect human interaction with equipment, conditions, systems, processes, other individuals, and work team(s).

International Safety Management (ISM) Code

An international standard for the safe management and operation of ships and pollution prevention. The code establishes safety management objectives and requires a Safety Management System (SMS) to be established by the company and audited and approved by the flag administration.

Information Technology (IT)

Covers the spectrum of technologies for data storing and processing, including software, hardware and communication technologies.

Management of Change (MOC)

Procedures for evaluating and managing changes to operations, procedures, equipment or personnel to ensure that all risks are identified and mitigated prior to implementing change.

Manufacturer

The entity that manufactures the shipboard equipment (in this information paper especially the TGAIN) and associated software.

Operational technology (OT)

Includes hardware and software that directly monitors/controls physical devices and processes, typically on board.

Presence monitoring

The use of sensors, software or network signals to track whether the person who is sailing the barge is active or present in the wheelhouse.

Safety Management System (SMS)

A formal, documented system required by the ISM Code and or local legislation, compliance with which should ensure that all operations and activities on board a ship are carried out in a safe manner.

Ship or vessel

For the purpose of this information paper, the term “ship” or “vessel” means a unit of any type operating in a marine environment and includes (self-propelled) barges and tugs.

Situational awareness

The understanding of what is happening around you, what others are doing and what might happen next.

Smart shipping

The highly automated sailing at sea and on inland waterways. This concerns technology on board ships and the design of the environment in which ships are located. Ships can then respond automatically to their environment through smart technology.

Track Guidance Assistant for Inland Navigation (TGAIN)

A system for automatically steering a vessel along a predefined track by providing commands to the steering gear to change the rudder angle (vessel’s heading) and sometimes the propulsion system to change the vessel’s speed.

TGAIN user (user)

A competent member of the ship's crew is appointed by the company or the boatmaster to make all decisions relating to safe navigation and has the necessary qualifications, knowledge and experience for this purpose. This information paper highlights the tasks for a user working with a TGAIN system. For the purpose of this information paper a boatmaster is also a TGAIN user.

Warning

Notification presented for precautionary reason to bring awareness of changed conditions which are not immediately hazardous, but may become so if no action is taken.

Abbreviations

AIS	Automatic Identification System
AWO	The American Waterways Operators
CCNR	Central Commission for the Navigation of the Rhine
CESNI	European Committee for Drawing up Standards in the Field of Inland Navigation
EADINS	European Association of Developers of Inland Nautical Software
ECDIS	Electronic Chart Display and Information Systems
ES-QIN	European Standard for Qualifications in Inland Navigation
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
IMO	International Maritime Organisation
MASS	Maritime Autonomous Surface Ship
NMEA	National Marine Electronics Association
TGAIN	Track Guidance Assistant for Inland Navigation
Marin	Maritime Research Institute
OT	Operational Technology
PZI	Platform Zero Incidents

Bibliography

A.1021(26) Code on alerts and Indicators 2009 (IMO)

Background to the automated navigation work at the CCNR (CCNR)

Best Practice Guidance Use of Track Guidance Assistants for Inland Navigation (PZI)

Clarifications concerning the obligation of equipment with an Inland AIS device and an Inland ECDIS device or a comparable electronic device for displaying electronic charts for inland navigation – Oct 2021 (CCNR)

Distracted Operations Sterile Wheelhouse Policy Guidance (AWO)

First International Definition of Levels of Automation in Inland Navigation (CCNR)

Recommendations on Usage of ECDIS and Preventing Incidents (OCIMF)

Smart ships (Bureau Veritas)

The Guidelines on Cyber Security Onboard Ships (OCIMF and other industry organisations)

The OCIMF Human Factors Approach (OCIMF)

Track Pilot-Automation report 35007-1-rev.1 (Marin & Rijkswaterstaat)

Recommended reading

Explanatory note related to the international definition of levels of automation in inland navigation (CCNR)

Human-Centred Autonomous Shipping (Margareta Lützhöft, Jonathan Earthy)

MASS Code, most recent version (IMO)

OCIMF
29 Queen Anne's Gate
London SW1H 9BU
United Kingdom

T +44 (0)20 7654 1200
E enquiries@ocimf.org

ocimf.org