GMDSS SIMULATOR

GM TRAINER 6.0

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1 Technical Description

1.1 General Information

The GM TRAINER 6.0 simulates the electromagnetic environment created by:

- radio stations of operator-controlled vessels;
- coastal stations;
- rescue coordination center radio stations;
- radio disturbances.

1.2 Main Characteristics

GM TRAINER 6.0 simulator incorporates the following simulated features:

- Radio wave passage using a simplified radio channel model, considering time of day, calendar season, and distance between stations;
- Offshore GMDSS A1, A2, A3 and A4 radio communications for various global navigation areas;
  - The names, call signs, identification numbers, coordinates, service types, and frequencies used by the coast stations and coast earth stations modeled in the simulator, match the parameters of real stations.
  - The simulated operational areas correspond to the real operational areas.
- Messaging between an SES Inmarsat workstation, listener and subscribers of shore-based Internet / e-mail networks, telex, and public telephone networks using a fax machine (at least 8 subscribers for each network);
- Ship-to-shore transmission of distress alerts using an Inmarsat CES listener workstation and shore-to-ship transmission in automatic mode;
- Transmitting SES Inmarsat messages with "urgency" and "security" categories using two-digit access codes to the listener workstation;
- The presence of background noise in the telephone mode;
- Ship-to-ship DSC call exchange between ship stations of listeners' workstations; automatic ship-to-shore and shore-to-ship exchange, as well as between ship stations and the instructor workstation (with the instructor involved);
- Direct printing exchange with subscribers of the telex network programmed in the simulator through the coast stations in automatic mode (at least 8 subscribers);
- Ship-to-ship radiotelephone and letterpress exchanges between ship stations of listeners' workstations; automatic ship-to-shore and shore-to- ship exchange at students' workstations, as well as between ship stations and the instructor workstation (with the instructor involved);
- Transmitting maritime safety information (IBM) via SafetyNET service, NAVTEX radio stations and on HF band frequencies in NBDP mode.

- The NAVTEX international service rules for transmitting maritime safety messages via NAVTEX coast stations are followed.

- The formats of navigational safety messages contained in the simulator database and transmitted by the simulator in automatic mode correspond to the formats of actually used texts of navigational safety messages; it is possible to record and edit these messages by the instructor.

- SafetyNET service rules implement regarding messaging for Navigation Safety in the NAVAREA / METAREA regions through the specific coordinating stations in the ocean network.

- Operation of the radar / transmitter AIS ship and rescue equipment and displaying the transmitted signals on the radar screen;

- Formation and transmitting automatic confirmations of DSC test calls in the MF / HF bands, calls in the format of automatic and semi-automatic operation in the VHF band, taking into account the simulated model of the radio channel;

- Operation of the radio equipment of the listener's workstation ship station from the onboard network and from a backup power source.

2   SimulatorStructure

The GM TRAINER 6.0 includes instructor workplace and up to 32 trainee workplaces operating under Windows 10 Pro. A typical workplace consists of one standard PC. One or two handsets used for each workplace for radiotelephony. Handsets are connected to PC via USB interface. Software and all data required for the simulator operation are stored on the instructor's PC.

The instructor workplace has a possibility of on-line monitoring of any trainee workplace. The main instructor PC can be used for this purpose.

Each workplace can be supplement with a console including the imitator of control panels of Sailor equipment: VHF SAILOR 6222, MF/HF SAILOR 6301, Alarm panel SAILOR AP 6103, two band receiver Navtex NX-700 A/B Furuno and Iridium SES LT-3100S GMDSS Satellite Communication System or Power Switchboard Sailor BP4680. The console is connected to the PC via a USB interface. The trainee can control any of these units using actual control panels or the panels simulated on the PC screen.

The software simulates the behaviour of the following devices:
- VHF RADIO STATION WITH DSC VHF, SAILOR 6222
- MF/HF RADIO STATION WITH DSC MF/HF, SAILOR 6301
- MF/HF SAILOR 6300 MF/HF Radiotelex
- INMARSAT-C SES, EGC RX with LRIT and SSAS, SAILOR 6110
- INMARSAT FleetBroadband Sailor 250

- IRIDIUM SES LT-3100S GMDSS Satellite Communication System
- INMARSAT-B SHIP EARTH STATION NERA SATURN-B (optional)
- INMARSAT-FLEET 77 SHIP EARTH STATION NERA – F77 (optional)
- TWO BAND RECEIVER NAVTEX NX-700A/B, FURUNO
- Sailor TR733 2182 kHz Watch Receiver
- COSPAS-SARSAT EPIRB Tron 60GPS, Jotron
- SART Tron SART 20, Jotron
- AIS SART TRON AIS SART
- AIS Transponder SI-70A
- Two-way VHF radio station Tron TR 30 GMDSS and Maritime VHF Radio
- VHF radio for two-way communication between vessel and aircraft, Tron TR 30 AIR, Jotron
- McMurdo Fast Find 220 PLB
- PLB AIS McMurdo S20
- GMDSS Alarm Panel Sailor AP 6103
- Radio direction finder RT-500-M (Marine)
- Power Switchboard Sailor BP4680
- Battery Charger
- Virtual Printer
- PPI of Radar/ ARPA Module JMA 5300
- GPS (Glonass) Receiver GP-170

3   Instructor Workstation

The instructor workstation is a PC-installed software that performs radio equipment and simulator control functions. Received and transmitted calls, as well as service information are sent to virtual and hardware printer.

The instructor software simulated features as following:

- RCC, ship and coast station assignment
- Assignment of working group
- Scenario editor – ability of creating and editing exercise scenarios for various cases of ship-to-ship and ship-to-shore communication
- Registration of working group
- Log module with possibility to print out and create archives
- Window for listening/ monitoring of the radiotelephone traffic including the possibilities to intervene in the radiotelephone traffic
- The possibility to introduce background noise from a list and instrument faults to trainee stations
- Ability of changing names, call signs, MMSI, telex numbers and Inmarsat mobile numbers of all emulated ship stations and coast station according to the requirement of different exercises
- Electronic chart with ships position indication and change the position, course and speed
- Ability of displaying and instantly altering trainee stations' positions on electronic chart for conducting Search and Rescue (SAR) exercise
- Full monitoring of any trainee workplace – Ability of monitoring the status of each GMDSS instrument and listening to radio traffic of each trainee station
- Connection to external printer
- Connection to active speaker to watch channels simultaneously
- Providing functions of a coast telex or phone subscriber, coast radio station and RCC operator from the log window
- Status window of all the instruments at any workplace
- Ability of logging trainee communication and action for playback and subsequent review;
- Database on the coast radio stations, NAVTEX and MSI stations and INMARSAT shore based stations plotted on the chart
- Information on the GMDSS Sea Areas on the chart
- A rough estimate of the radio waves propagation in the selected frequency band
- Evaluation and assessment module

4 Operator Workstation

The software of simulated instruments of operator workstations takes into account:

- Distance limitations
- VHF line of sight communication
- VHF, MF/HF power limitation
- MF ground wave propagation
- HF atmospheric propagation and reflection
- Inmarsat Link Test and Log ON/OFF various satellites
- EGC test

Operator workstations can be configured to operate in standalone and network modes to allow students doing individualized self-training/ self-assessment program and communication exercises for workgroup training.

Each operator workstation able to display positions of simulated ship stations, locations of coast radio/ earth stations, NAVTEX stations, GMDSS Sea Areas and Search & Rescue Regions (SRRs) on electronic chart.

Each operator workstation able to display SART signals on radar screen for training of SAR operation.

4.1 VHF Radio Station with DSC, Sailor 6222

The simulator imitation of the following principal functions:

- Turning ON/OFF and volume control
- Noise suppressing adjustment
- Selection of any out of 55 international channels

- Prompt selection of call and distress channel 16
- Function of keeping watch on two channels
- Programming and turning of the channel scanning mode
- Reduction of the station's transmitting power
- Setting of channels used in the USA
- Changing of the display illumination
- Operation in the telephony mode
- Manual and automatic input of coordinates and time
- Viewing of the own MMSI numbers
- Transmission of distress call using the <<hot>> key
- Preparation, transmission, and reception of all the types of DSC call required for the class A VHF DSC equipment
- List of stations and a facility for editing it
- Control of the channels and transmitting power of the VHF radio station
- Storage and viewing of 20 last received DSC distress calls and calls to unrelated to the distress
- Check of the modem without transmission
- Address book and a facility for editing it
- Printing out of the received DSC messages
- Setting of options in accordance with the description of the unit

By pressing HELP button the trainee can familiarize him/ herself in detail with the procedure to operate a VHF radio station. HELP system allows obtaining full information on the control of all the instruments imitated in the simulator.

4.2 MF/HF Radio Station with DSC, Sailor 6300

The simulator imitation of the following principal functions:

- Turning ON/OFF and volume control
- Manual and automatic gain adjustment
- Setting of the reception and transmission frequencies
- Setting the channel number
- Receiver frequency control with a step of 10, 100, 500 and 1000Hz
- Selection of the transmission mode
- Changing of the transmitter's output power
- Changing of a radio telephone alarm signal
- Acoustic check of the radio telephone alarm generator
- Changing of the display illumination
- Switching ON/OFF of the noise suppression
- Operation in the telephony mode, as well as in combination with the DSC and telex modem
- Manual and automatic input of coordinates and time
- Viewing of the own MMSI numbers
- Internal and external check
- Transmission of distress call using the <<hot>> key
- Preparation, transmission, and reception of all the types of DSC call required for the class A MF/HF DSC equipment
- Acoustic alarm upon the reception of distress calls, as well as calls requiring the operator's presence
- List of stations and a facility for editing it
- Keeping watch on the distress DSC frequencies
- Keeping watch on public DSC frequencies
- Storage and viewing of 20 last received DSC distress calls and calls to unrelated to the distress
- Printing out of the received messages
- Setting of options in accordance with the description of the unit

4.3   MF/HF Radiotelex Terminal Sailor 6300

The simulator imitation of the following principal functions:

- Text editor for the preparation of messages
- Operation in ARQ and FEC modes between the ships
- Calling and work with a coast radio station in ARQ mode in accordance with procedures of ITU-R Recommendation M.492
- Re-phasing of procedure in accordance with ITU-R Recommendation M.625
- Keeping watch in the mode of scanning the telex frequencies
- List of telex stations with facility for editing it
- Address book and a facility for editing it
- Printing out of the received messages
- Setting of options in accordance with the description of the unit

The simulator imitates work with the following coast radio stations: Argentina Radio, Lyngby, Halifax, Rogaland, Scheveningen, Portishead, Saint-Lys. The list can be supplement with the following coast radio stations operation in ARQ mode: Bern (telex number 3502), Lisboa (3560). When these stations are entered, these stations actual operating frequencies should be used.

The program imitate the transmission of the free channel signal by all coast radio stations listed above. You can hear this signal by tuning the MF/HF radio station to the appropriate frequencies.

### 4.4   INMARSAT-C SES with EGC Receiver Sailor 6110

The simulator imitation of the following principal functions:

- ON/OFF and input of initial data
- Manual and automatic log-in procedures to the satellite
- Manual and automatic input of coordinates
- Transmission of distress alerts by using "hot" keys
- Transmission of message with distress priority
- Ship-to-ship and ship-to-shore transmission and reception of message in the telex mode
- Sending of E-mail message
- Text editor for the preparation of messages
- Address book with editing facility
- List of stations
- Test check of the station
- Printing of messages
- Programming of the EGC receiver and reception of EGC messages
- Log of transmitted and received messages including EGC messages
- Viewing of own identifier
- Sending of position reports
- Setting of main options in accordance with the description of the unit

4.5 Ship Security Alert System (SSAS)
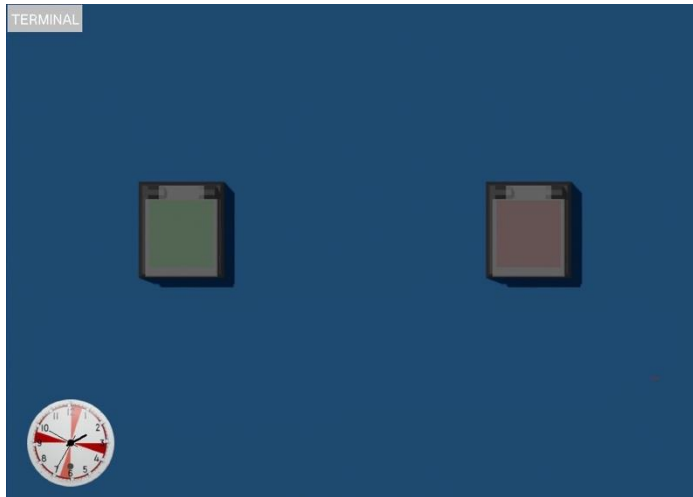
The new SOLAS resolution 6 states that the Ship Security Alert System shall provide ships with two alarm buttons, which can be activated in case of a piracy or terrorist attack. The alarm is a covert signal, which will have no sound and no flashing lights so that it is in no way obvious to any intruders on board the ship.

The simulator imitation of the following principal functions:

- Built in Inmarsat-C ship earth station
- Automatic input of coordinates
- Transmission of security alerts by using "red" key to 3 addresses
- Transmission of test message by using "Green" key to 3 addresses

4.6 Inmarsat Fleet Broadband Sailor 250

The SAILOR 250 FleetBroadband is a maritime broadband system, providing simultaneous high-speed data and voice communication via satellite through the BGAN (Broadband Global Area Network).

The software of imitator include:

- E-mail
- Phones

The SAILOR 250 FleetBroadband system includes the following main units:

- TT-3050A SAILOR 250 FleetBroadband antenna
- TT-3738A SAILOR FleetBroadband Terminal or TT-3738A-T19 SAILOR FleetBroadband 19" Rack Terminal
- TT-3670A Thrane IP Handset & Cradle, wired

4.7 IRIDIUM SES LT-3100S GMDSS Satellite Communication System

The LT-3100S GMDSS system has voice and data capabilities with 100% global coverage provided by Iridium Communications Network. The LT-3100S GMDSS system offers the following Iridium GMDSS Safety Services:

- Distress Alert & Distress Call
- Distress Alert Relay
- Maritime Safety Information (MSI)
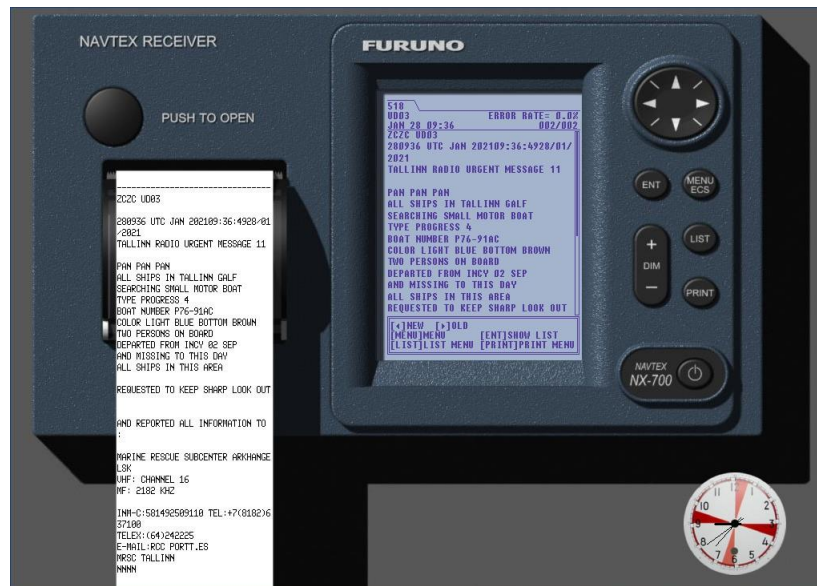- Safety calling
- Safety Messaging

The LT-3100S GMDSS system basic consists of:

- Control unit
- Antenna unit
- Handset and Cradle

4.8 Two Band Receiver NAVTEX NX-700A/B FURUNO

The simulator imitation of the following principal functions:

- ON/OFF
- Programming of the Navtex stations' reception and message types
- Test check
- Setting of options in accordance with the description of the unit
- Reception and printing of message

4.9 Sailor TR733 2182 kHz Watch Receiver

The information provided by 2182 kHz watch receiver software includes:

- STOP ALARM – button to terminate alarm signal
- SET TIME – button to time
- AUTO/ WATCH – button to select watching mode (watch or automatically)
- TEST ALARM – button to test the receiver
- ON/OFF – button to switch ON/OFF the receiver

4.10   Two-way VHF Radio station Tron TR 30

The simulator imitation of the following principal functions:

- ON/OFF
- Volume and noise suppression control
- Selection of channels
- Reduction of the transmitter's output power
- Prompt selection of call and distress channel 16 and at least one of the operating channels
- Turning on/off keyboard beep function
- Operation in the telephone mode

**4.11   Portable Two-way On-scene Radio station for the Communication with Aircraft Tron TR 30 Air**

The simulator imitation of the following principal functions:

- ON/OFF;
- Volume and noise suppression control;
- Reduction of the transmitter's output power;
- Tuning of the station to frequencies 121.5 MHz and 123.1 MHz.
- Operation in the telephone mode.

4.12 COSPAS-SARSAT EPIRB Tron 60GPS, Jotron
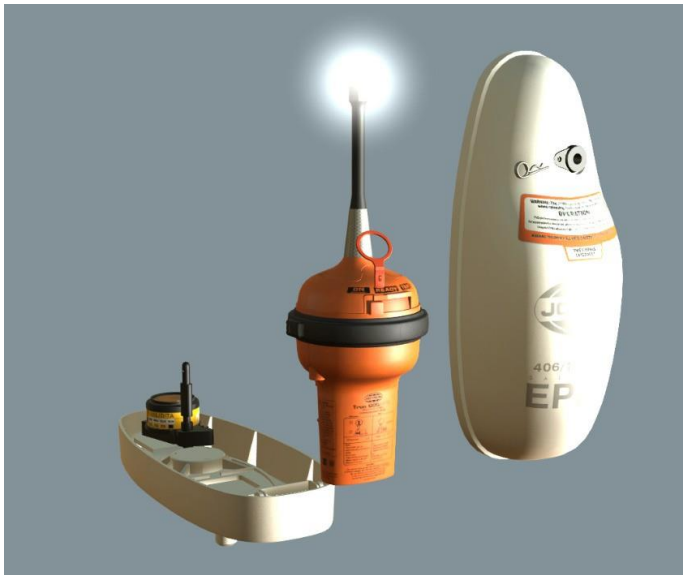
The simulator imitation of the following principal functions:

- ON/OFF switching of the buoy and initiation of the alert transmission
- Test check of the buoy

4.13 Radar Transponder Tron SART TR 20, Jotron

The simulator imitation of the following principal functions:

- ON/OFF switching of the transponder
- Test check of the transponder

4.14 AIS SART TRON AIS SART

The simulator imitation of the following principal functions:

- ON/OFF switching of the transponder
- Test check of the transponder

4.15 McMurdo Fast Find 220 PLB

The simulator imitation of the following principal functions:

- Transmits a 406 Mhz distress code message when activated
- Device testing

4.16 PLB AIS McMurdo S20

The simulator imitation of the following principal functions:

- Activating and enabling on the AIS chart plotters and onboard navigation system
- Device testing

4.17 GMDSS Alarm Panel Sailor AP 6103

The simulator imitation of the following principal functions:

- Remote initiation of distress alert transmissions via VHF, MF/HF and Inmarsat-C SES
- Visible and audible indication of incoming distress and urgency calls on VHF, MF/HF and Inmarsat-C
- Test check of the alarm panel

### 4.18 Radio Direction Finder RT-500M (Marine)

The imitator of DF-system RT-500M combines a communication direction finder and SAR (Search and Rescue) direction finder, thus allowing to bear all coastal and maritime radio stations. If equipped with an EPIRB (Emergency Position Indicating Radio Beacon), with its help person or vessels may be found quickly and safety.

The DF-system RT-500-M allows bearing of radio signals on 5 different frequency bands as well as their traditional emergency frequencies in the VHF and UHF range, the common calling up channel 16 in the maritime radio band and the widely used Cospas-Sarsat emergency signal.

4.19 Main and Reserve Switchboards Sailor   BP4680
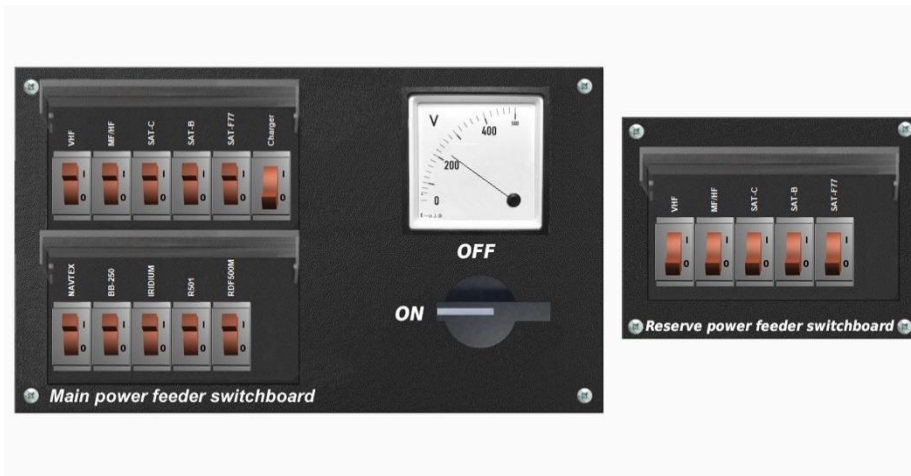
The simulator imitation of the following principal functions:

- Display of the main and reserve switchboard
- Display of the current
- Connection and disconnection from the ship network of the generator power supply of all radio equipment
- Connection and power off for each type of radio equipment
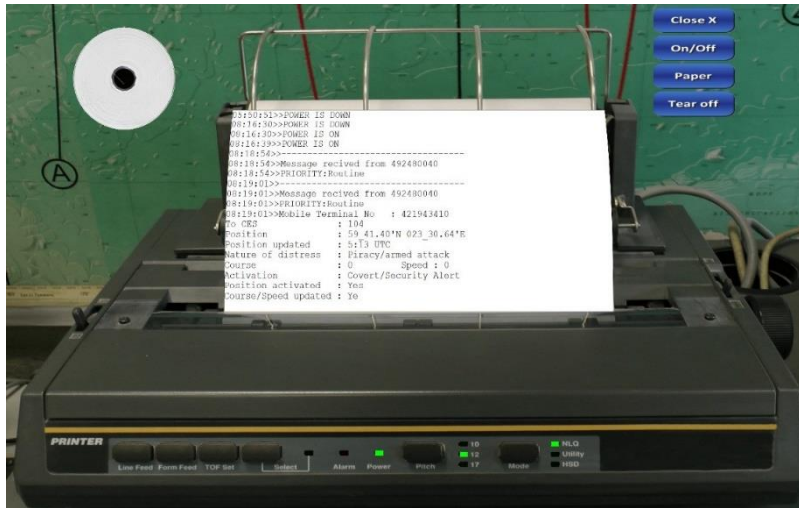
4.20 Battery Charger BP5083

The simulator imitation of the following principal functions:

- Display of the accumulator voltage
- Display of the charging and discharging current
- Visual and acoustic alarm in case of voltage drop below the permissible limit (for both, the main power supply and battery)

4.21 Virtual Printer

The simulator contain virtual printers for Radio Telex, Inmarsat-C Inmarsat-B and Inmarsat Fleet 77 SES.

4.22 Plan Position Indicator of RADAR / ARPA Module JMA 5300

The software of simulated instrument is intended for display SART signal and AIS symbol (with changeable radar range):

- Range scale: 0.125 – 96 nm
- Radar picture stabilization mode: <<Head Up>>, <<North Up>>, <<Course Up>>, <<Course Stab>>
- Motion modes: True (TM), Relative (RM)
- Displayed on the screen are: course mark on the PPI, movable marker, ERBL, VRM, up to 8 index lines, marks, range rings, automatic acquisition zones, vectors (true, relative), route (waypoints), user radar charts, ARPA symbols, UAIS symbols
- A video effects: 3 and 10 cm transmission bands, pulse length change effect, gain effects, receiver bandwidth tuning effects, sea clutter and its suppression, rain clutter and its suppression, target trails, echo stretching, scaling

4.23 GPS (GLONASS) Receiver GP-170

The software of simulated instrument is intended for imitating the satellite navigation systems:

- Switching the receiver display ON/OFF
- Display of position and other information on the ship motion
- Display mode selection as Plotter, Integrity, Navigation, Data
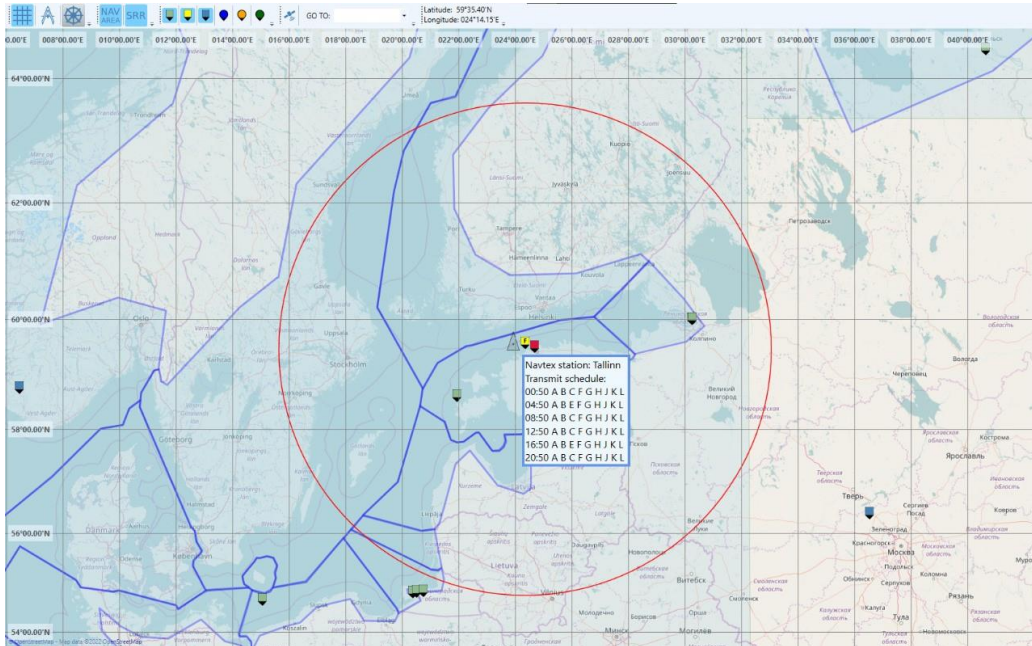
4.24   AIS Transponder SI-70A

The information provided by UAIS software includes:

- AIS SART information
- Call sign and name
- Ship position with indication of system accuracy and integrity
- Universal coordinated time (UTC) the data is fixed by the reception equipment
- The course relative to the ground
- Speed relative to the ground etc.

4.25   Electronic Chart

The software of electronic chart is intended for:

- Showing of maps for areas in which exercise are provided
- The presence of a coordinate grid
- Display of own vessel mark with speed vector
- Display of data on the movement of the vessel (coordinates, course, speed of the vessel)
- Measurement of bearing and distances
- Zooming
- Layer management (coast stations, GMDSS marine areas)

4.26 Steering Panel (Essential to Conducting SAR Operation)
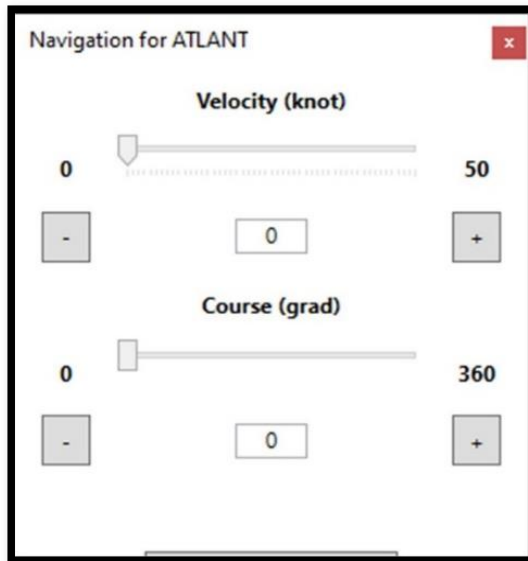
The software is intended for moving "own ship" in the navigation area and have possibility to change speed and course of vessel.

5   Dedicated Hardware

5.1   GM Trainer 6.0 GMDSS Mini Console

- VHF Panel, Sailor 6222
- MF/HF Panel, Sailor 6301
- One or two Radio Handsets with a PTT button and a cradle with a hook switch
- USB 3.0 HUB with AC 220V PSU

5.2   GM Trainer 6.0 GMDSS Middle Console

- VHF Panel, Sailor 6222
- MF/HF Panel, Sailor 6301
- IRIDIUM SES LT-3100S GMDSS Satellite Communication System or Battery Panel Sailor 4680
- Alarm Panel, Sailor 6103
- One or two Radio Handset with a PTT button and a cradle with a hook switch
- USB 3.0 HUB with AC 220V PSU

5.3   GM Trainer 6.0 GMDSS Large Console

- VHF Panel, Sailor 6222

- MF/HF Panel, Sailor 6301
- IRIDIUM SES LT-3100S GMDSS Satellite Communication System or Battery Panel SAILOR BP 5083
- Alarm Panel, Sailor 6103
- Navtex Panel Furuno NX-700
- One or two Radio Handset with a PTT button and a cradle with a hook switch
- USB 3.0 HUB with AC 220V PSU

5.4 GM Trainer 6.0 GMDSS Full Size Console

- VHF Panel, Sailor 6222
- MF/HF Panel, Sailor 6301
- IRIDIUM SES LT-3100S GMDSS Satellite Communication System
- Battery Panel SAILOR BP 5083
- Alarm Panel, Sailor 6103
- Navtex Panel Furuno NX-700
- Alarm Panel, Sailor 6103
- One or two Radio Handset with a PTT button and a cradle with a hook switch
- USB 3.0 HUB with AC 220V PSU

6   Standard PC and Monitor Requirements

OPERATOR workstation requirements:

- Motherboard: Intel based PCs on Windows OS
- CPU   : Intel Core i5 (10th generation or later)
- RAM   : 16GB or more
- GPU   : Discrete graphic card nVidia 1050 or newest
- Network : 100/1000 Base-T
- USB Port : 3 x USB2.1 or USB3.0 Ports
- HDD/ SSD   : 15 Gb of free hard disk space
- OS   : Window 10 Pro 64bits, English version
- LCD Monitor: Above 24" 1920 x 1080 FHD

INSTRUCTOR workstation requirements:

- Motherboard: Intel based PCs on Windows OS
- CPU   : Intel Core i5 (10th generation or later)
- RAM   : 8GB or more
- GPU   : Integrated graphic adapter Intel UHD Graphics 750
- Network : 100/1000 Base-T
- USB Port : 3 x USB2.1 or USB3.0 Ports
- HDD/ SSD   : 15 Gb of free hard disk space
- OS   : Window 10 Pro 64bits, English version
- LCD Monitor: Above 24" 1920 x 1080 FHD