

# Non-GMDSS communication systems (AIS, SSAS, LRIT)

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# Automatic Identification System (AIS)

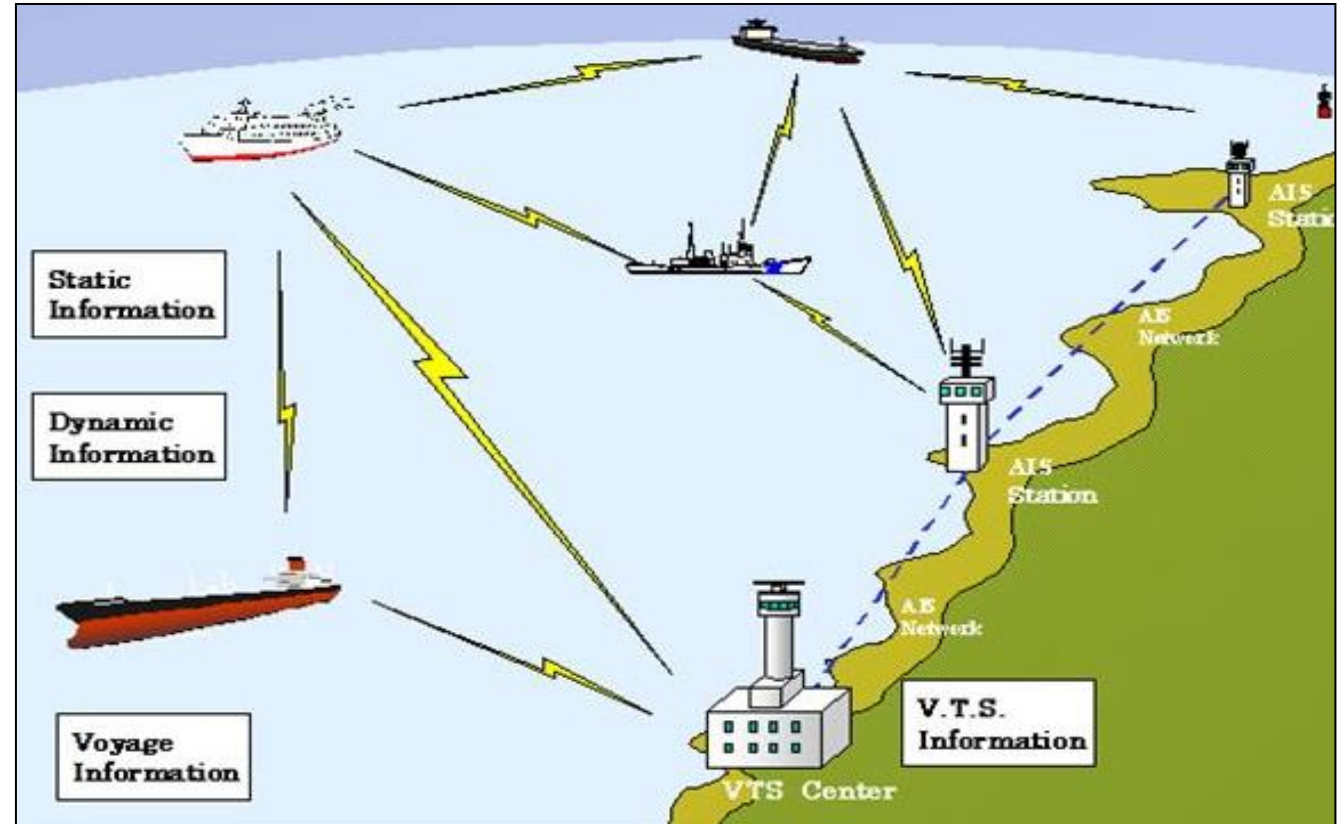
# AIS (Automatic Identification System)

**AIS is a short-range tracking system used on ships and by shore stations.**

Shipborne AIS :

- transmits ship's own data to other ships and vessel traffic service (VTS) stations; and
- receives and makes available data of other ships and VTS stations and other AIS stations, such as AIS-SARTs, AIS-ATON, etc.

AIS uses VHF radio.



# AIS ( Automatic Identification System) (cont.) – Data autonomously sent by ship

## Static Information – sent every 6 minutes and or on request :

- MMSI number
- Name and Call Sign
- IMO number
- Length and Beam
- Type of ship
- Location of position fixing antenna

## Dynamic Information - Intervals depends on speed and course alteration (from 2 s to 3 min) :

- Ship's position with accuracy indication
- Position Time stamp (in UTC)
- Course Over Ground (COG)
- Speed over ground (SOG)
- Heading
- Navigation status - *manually entered by OOW*
- Rate of turn (when available)

## Voyage related information – manually entered - sent every 6 minutes and or on request :

- Ship's draught
- Hazardous cargo (type)
- Destination and ETA
- Route plan (waypoints) – at the discretion of the master

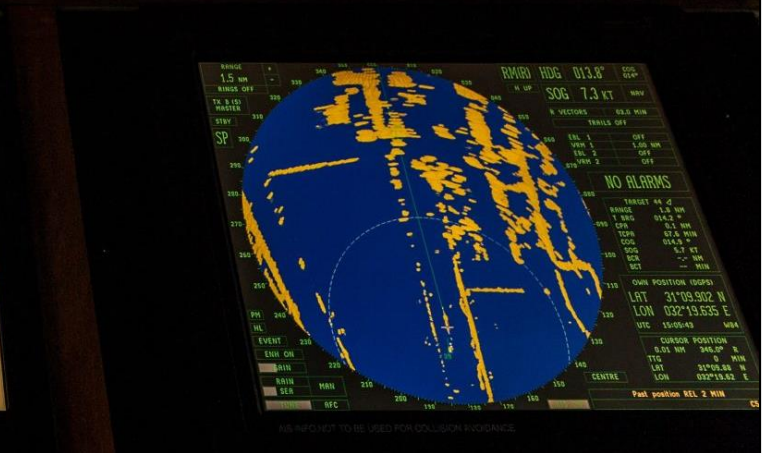
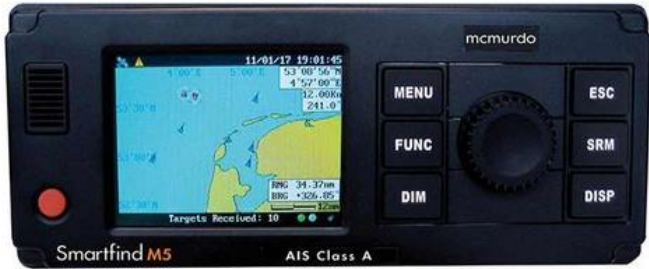
## Safety related – manually entered – sent automatically as required :

- Short safety related message addressed either a specific addressee or broadcast to all ships and shore stations / but not recognised for SAR purposes



# AIS ( Automatic Identification System) (cont.) – Display of information

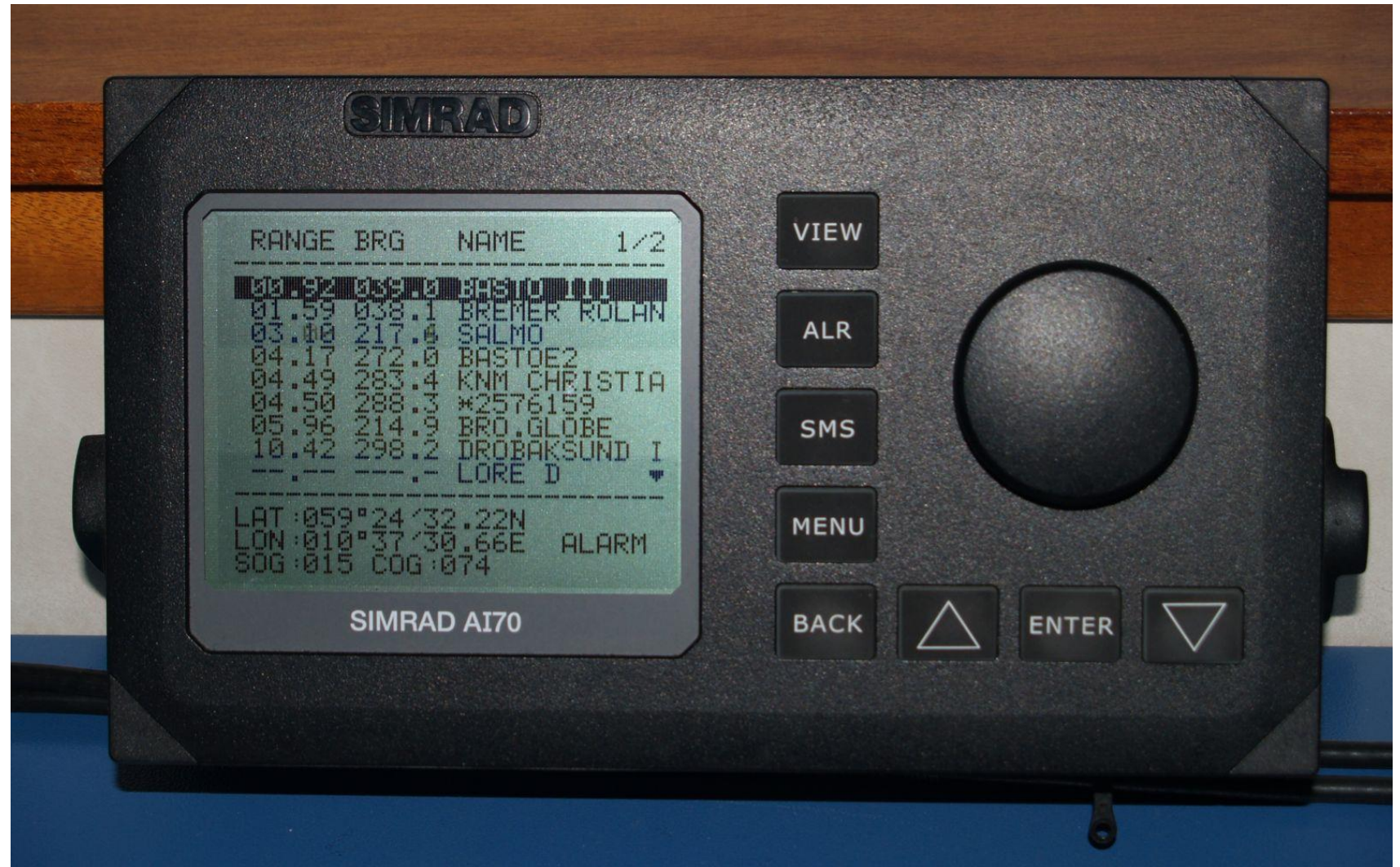
The information can be displayed on the unit itself or devices such as Electronic Chart Display and Information Systems (ECDIS), Electronic Chart Systems (ECS), Portable Pilot Units (PPU), and radars.



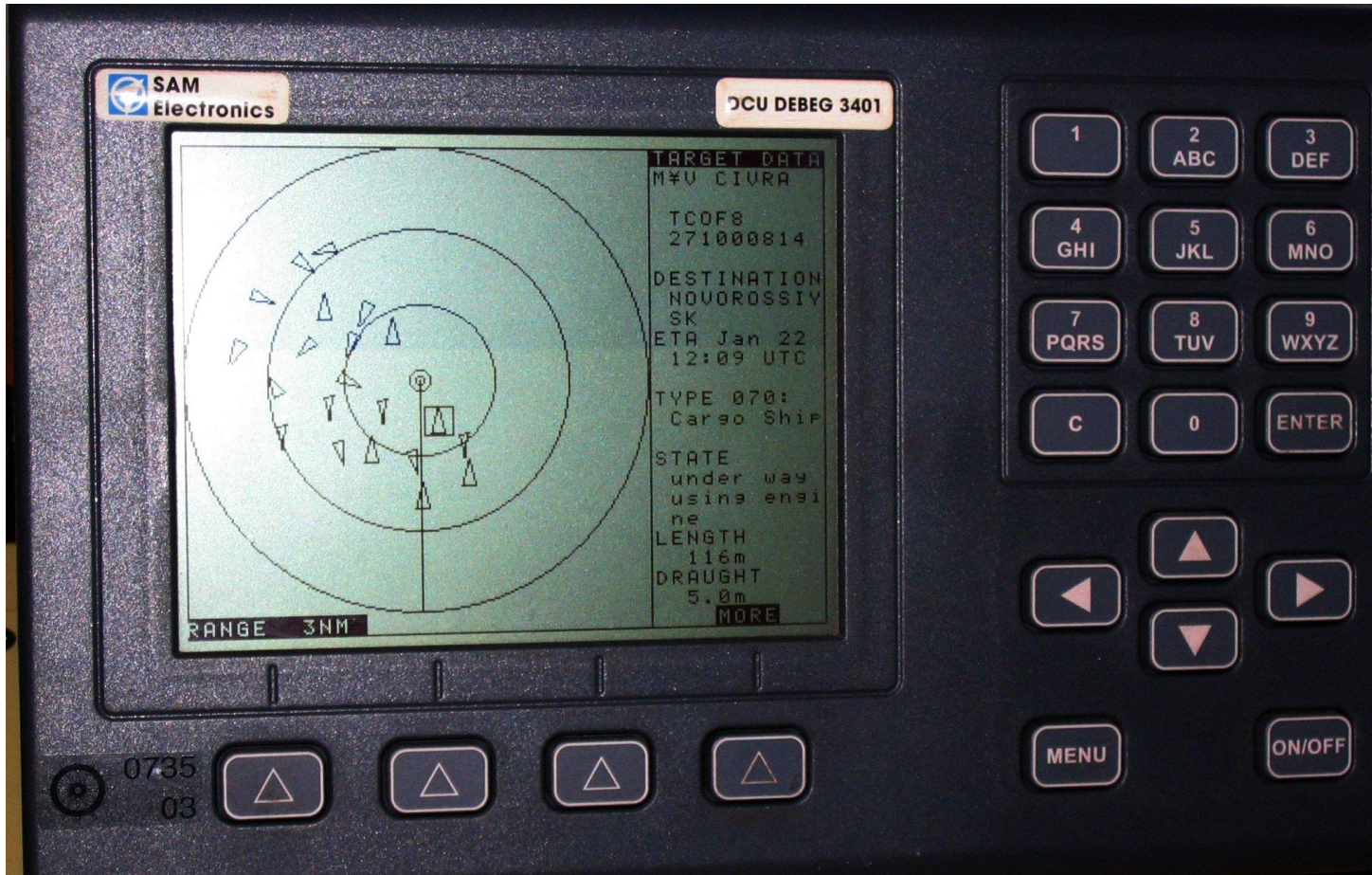
## AIS ( Automatic Identification System) (cont.) – Display of information

A vessel's text-only AIS display, listing :

- nearby vessels' range,
- bearings,
- and names



# AIS ( Automatic Identification System) (cont.) – Display of information

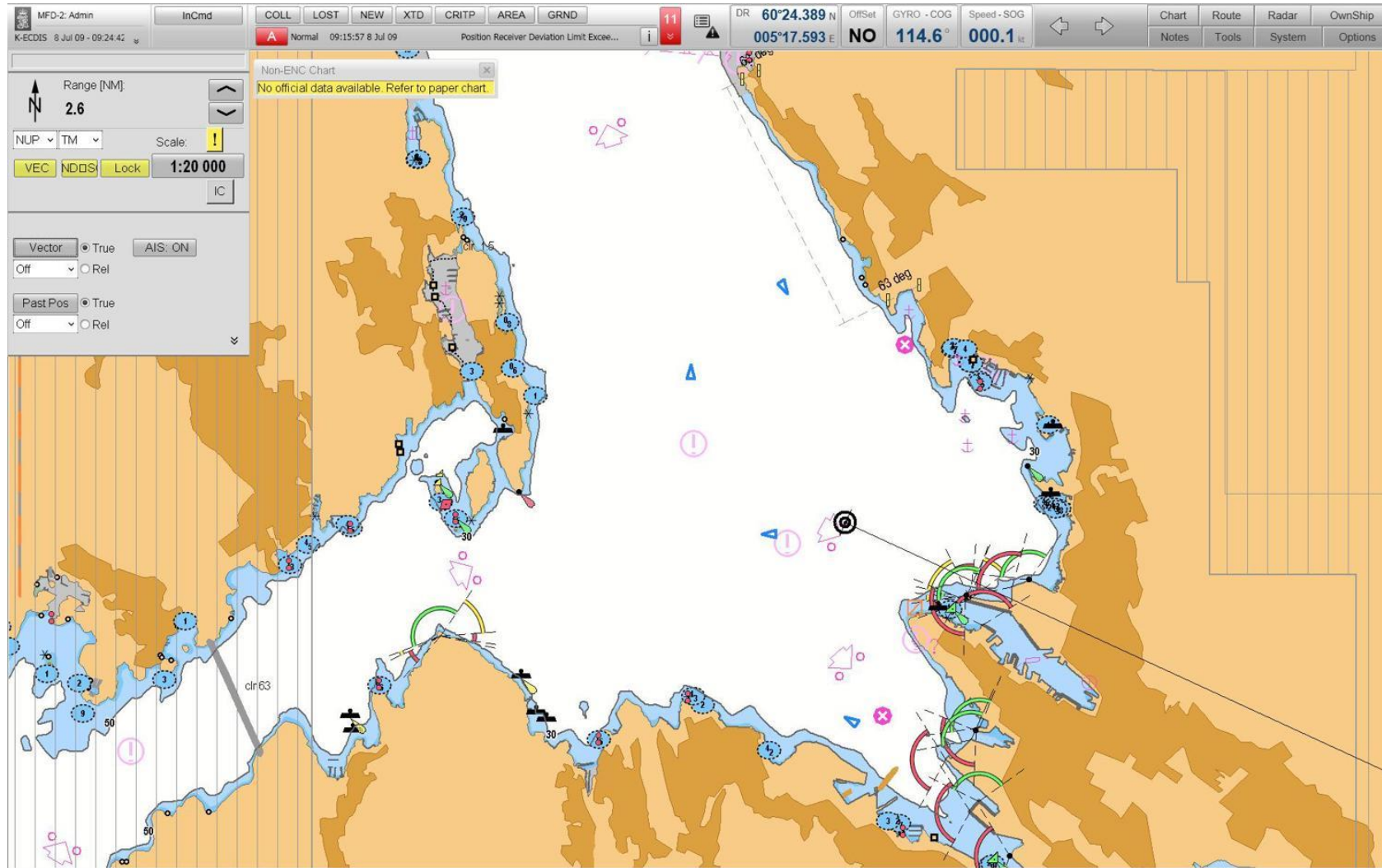


An AIS-equipped system on board a ship presenting the bearing and distance of nearby vessels in a radar-like display format.





# AIS ( Automatic Identification System) (cont.) – Display of information



AIS interfaced with ECDIS

## AIS ( Automatic Identification System) - Purpose

- help identify ships,
- assist in target tracking,
- assist in search and rescue operation,
- simplify information exchange (e.g. reduce verbal mandatory ship reporting) and
- provide additional information to assist situation awareness.

**AIS improves the quality of the information available to the Officer of the Watch  
at a shore surveillance station**



**or on board a ship as an aid to collision avoidance**



# AIS ( Automatic Identification System) – Carriage requirements



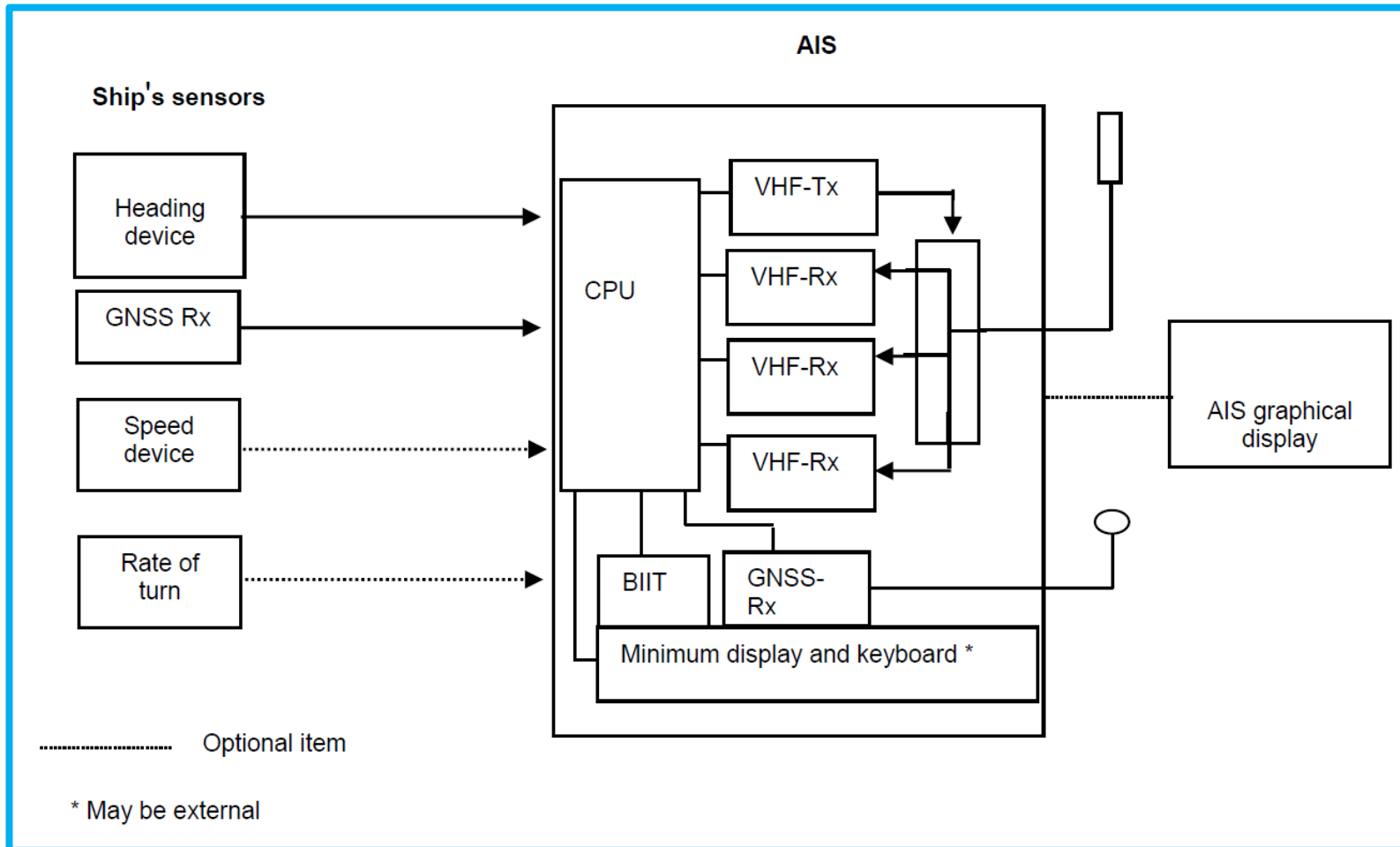
SOLAS Chapter V – Safety of Navigation - Regulation 19 made AIS compulsory for :

- All ships of 300 gross tonnage and upwards engaged on international voyages.
- Cargo ships of 500 gross tonnage and upwards not engaged on international voyages.
- Passenger ships irrespective of size.

National regulations may extend to other ships the obligation to carry an AIS.



# AIS ( Automatic Identification System) – AIS components



- one VHF transmitter,
- two VHF TDMA receivers,
- one VHF DSC receiver, and
- a standard marine electronic communications link to shipboard display and sensor systems.

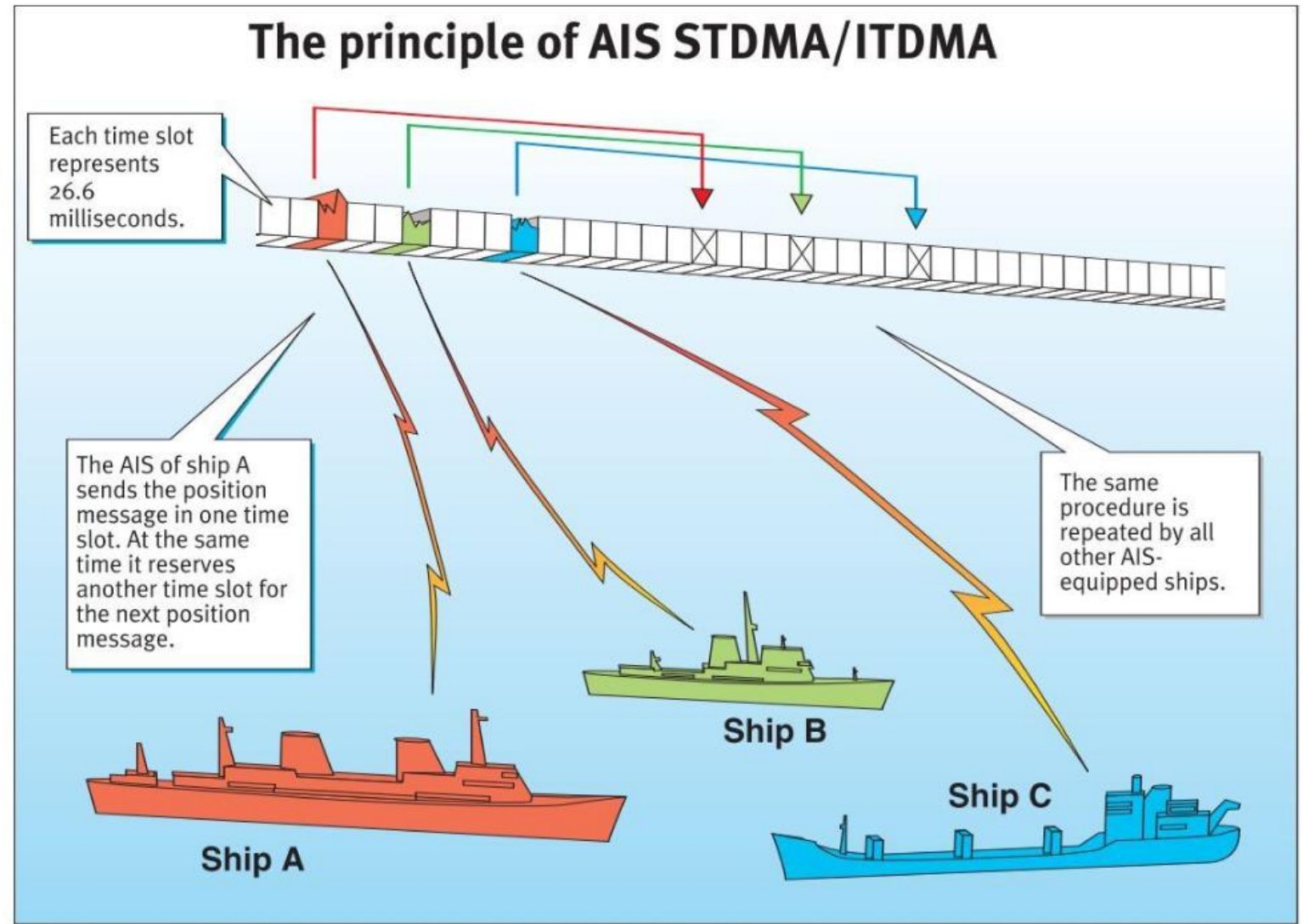
# AIS ( Automatic Identification System) – frequencies used and principle

AIS operates principally on **two dedicated frequencies or VHF channels:**

AIS 1: Works on 161.975 MHz- Channel 87B (Simplex, for the ship to ship)

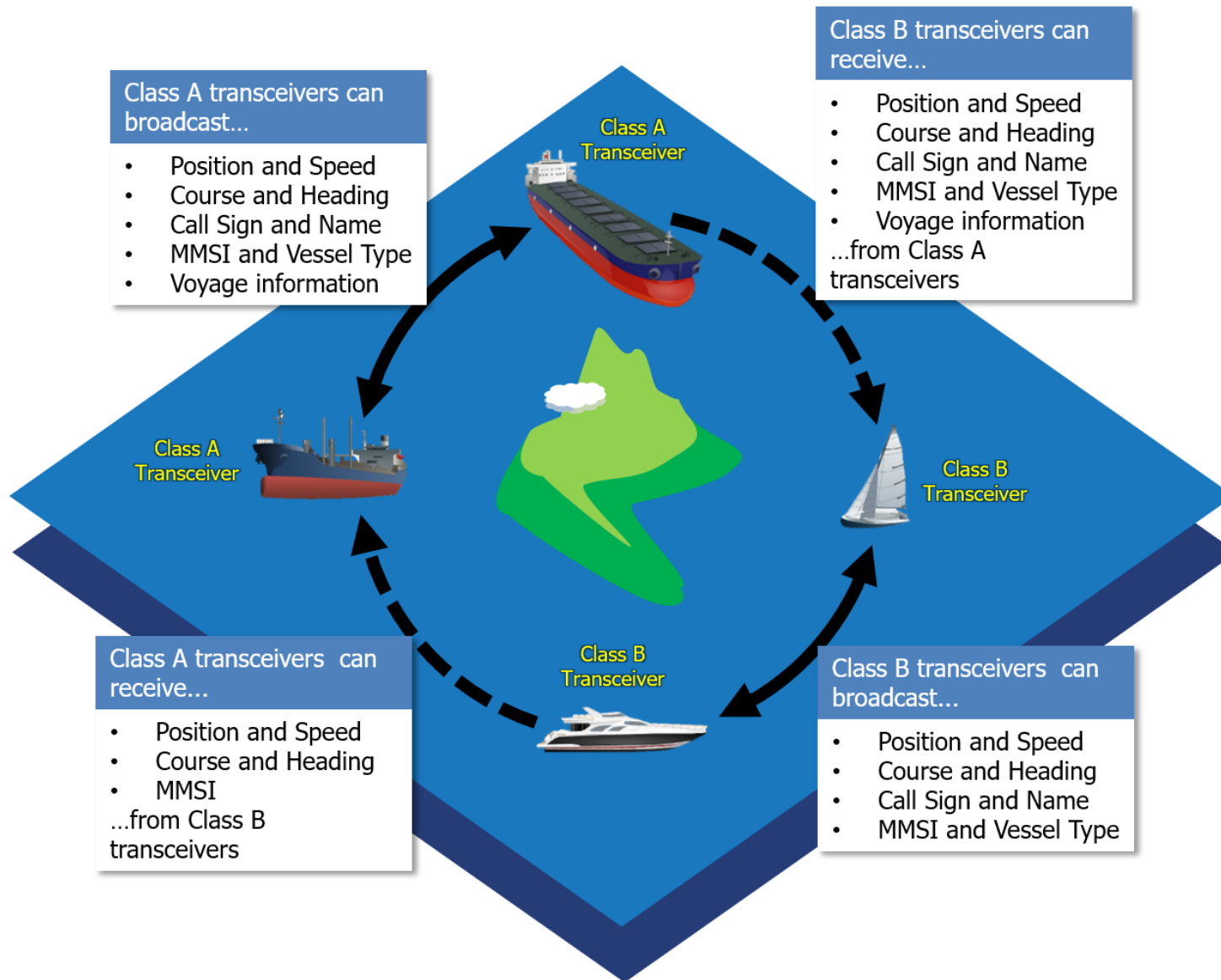
AIS 2: 162.025 MHz- Channel 88B (Duplex for the ship to shore)

It uses **Self Organizing Time Division Multiple Access (STDMA) technology** to meet the high broadcast rate. This frequency limits the line of sight, which is about 40 miles.



Ships with a self organizing broadcast AIS onboard will see each other as soon as they are in radio range.

# AIS ( Automatic Identification System) – Two types : A and B



Only Class A AIS meets all IMO performance standards

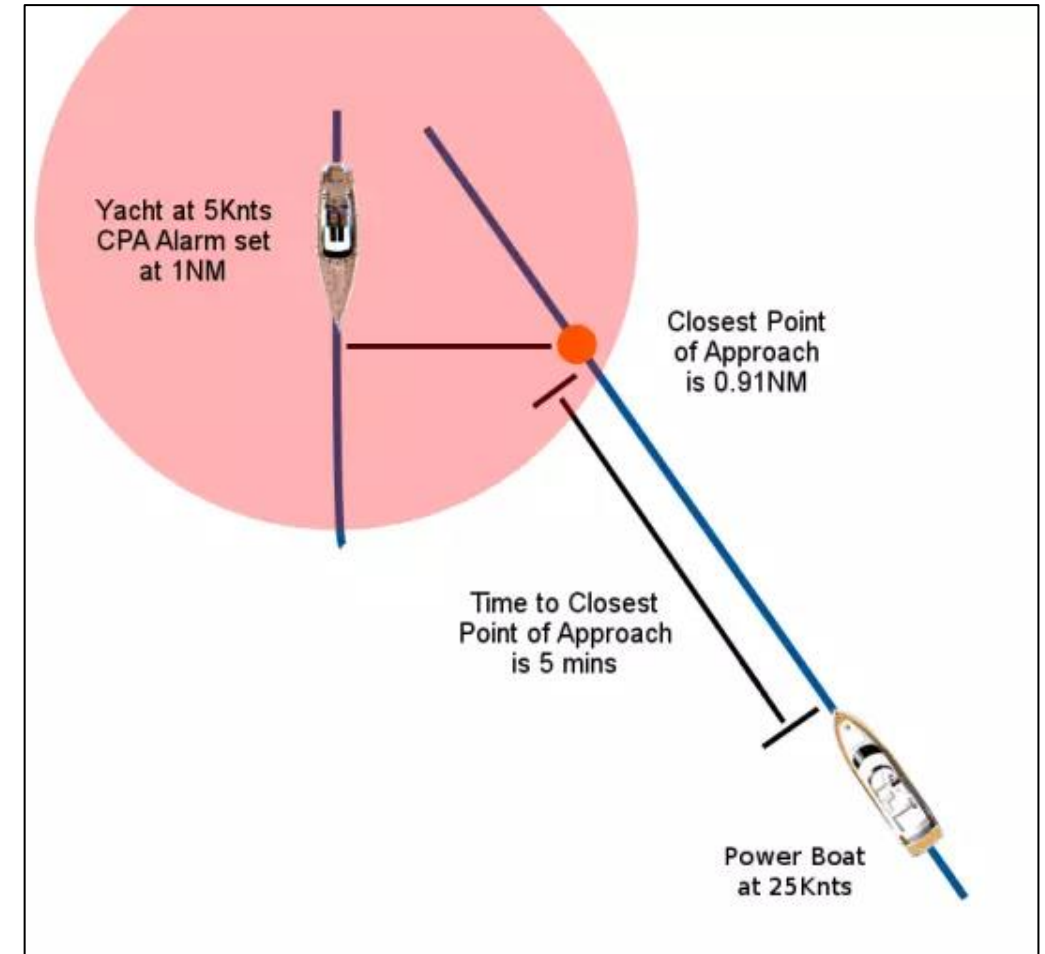
Class B devices is a simplified version that may be carried on ships which are not subject to the SOLAS carriage requirements

A third type of AIS system, “receive-only”, can be used by small boat (pleasure craft) operators who wish to benefit from a low cost alternative to Class B AIS transponders. They have limited capabilities

### Safety of navigation

- Originally developed as a collision avoidance tool to enable commercial vessels to 'see' each other more clearly in all conditions. For example, AIS allows fast and automatic calculation of the **Closest Point of Approach (CPA)** and **Time to Closest Point of Approach (TCPA)** from the target vessel's positional information.
- Combined with a shore station, this system also offers port authorities and maritime safety bodies the ability to **manage maritime traffic** and reduce the hazards of marine navigation.

AIS (Automatic Identification System) is the mariner's most significant development in navigation safety since the introduction of radar.



### **Maritime security**

- Authorities can identify specific vessels and their activity.
- When AIS data is fused with existing radar systems, authorities are able to differentiate between vessels more easily.
- AIS data can be automatically processed to detect abnormal behaviours
- AIS improves maritime domain awareness and allows for heightened security and control



## AIS ( Automatic Identification System) (cont.) – Operation of AIS on board

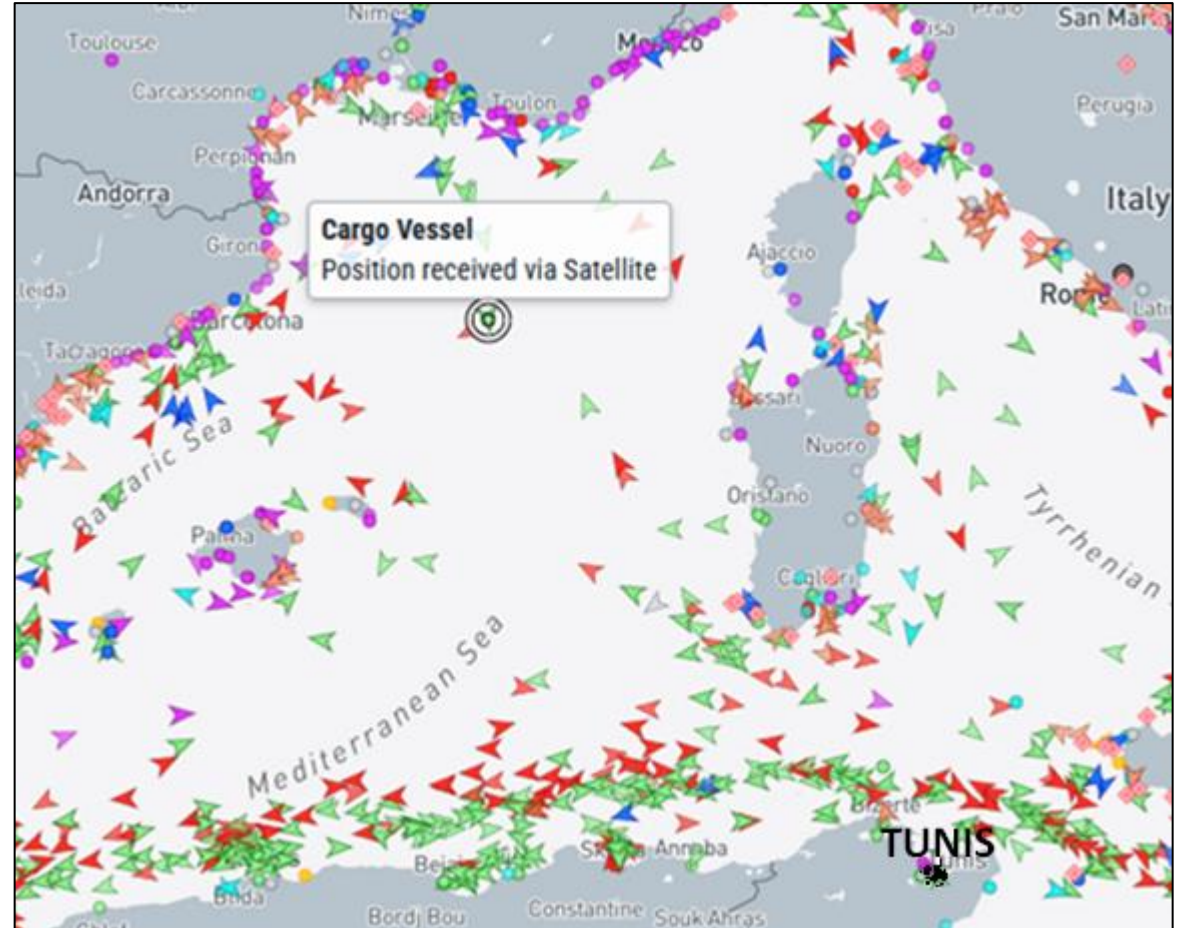
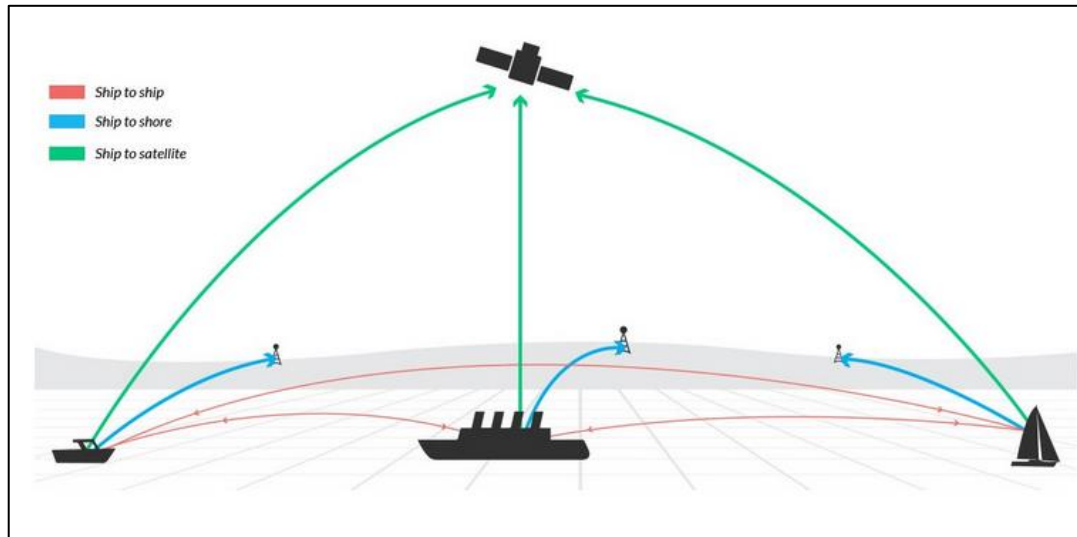
The AIS must be switched on at all times unless the Master decides that it should be turned off for security purposes.



In ports AIS operation is in accordance with port requirements.

# AIS (Automatic Identification System) – AIS signal also received by satellites

Over the last few years, the capacity of low-medium orbit satellites equipped with AIS transponders have increased significantly, contributing to the increased availability of data and global monitoring of ship traffic.





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ASSEMBLY  
29th session  
Agenda item 10

A 29/Res.1106  
14 December 2015  
Original: ENGLISH

**Resolution A.1106(29)**

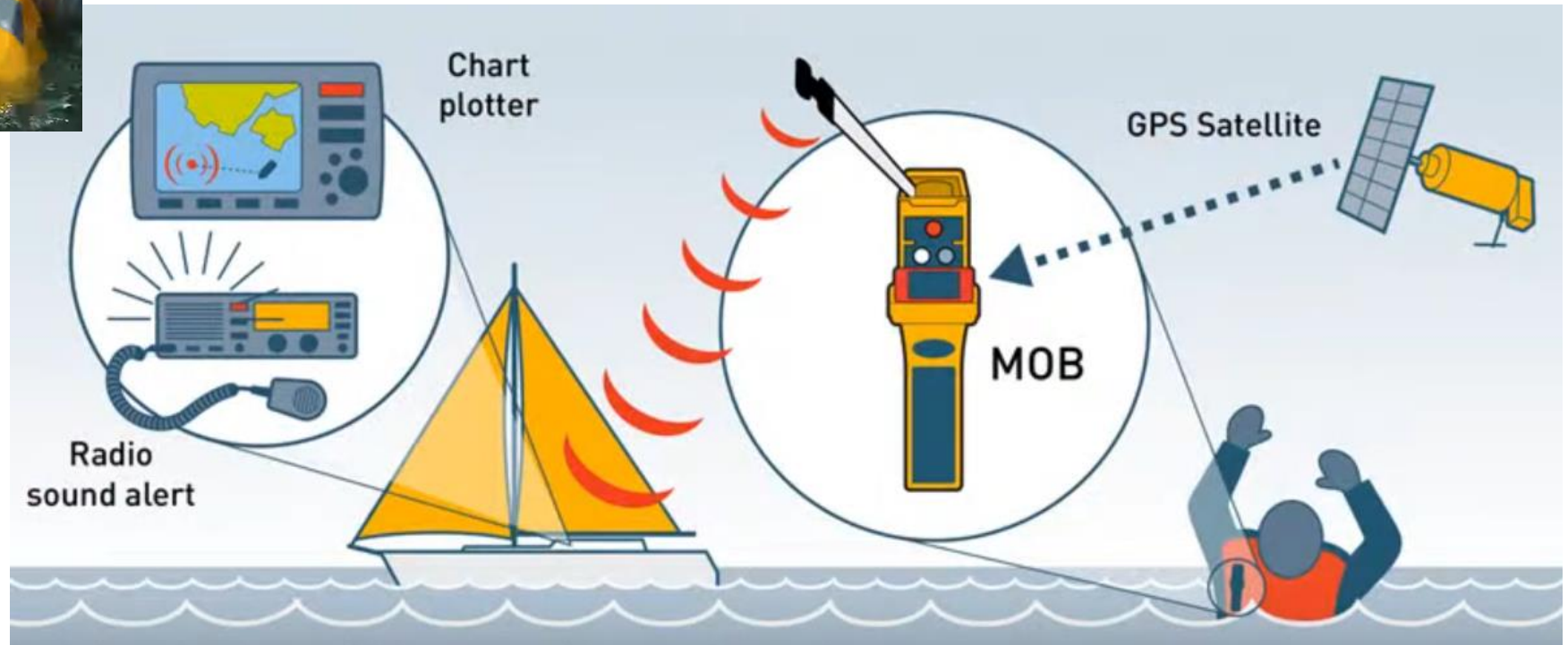
**Adopted on 2 December 2015  
(Agenda item 10)**

**REVISED GUIDELINES FOR THE ONBOARD OPERATIONAL USE OF  
SHIPBORNE AUTOMATIC IDENTIFICATION SYSTEMS (AIS)**

# AIS (Automatic Identification System) – Manoverboard locating device



Need to be programmed in advance with MMSI Nr of the vessel



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# **SSAS (Ship Security Alert System)**

# SSAS (Ship Safety Alert System) - Intro

In 2002 a new chapter XI-2 *Special measures to enhance maritime security* was added to SOLAS.

Regulation 6 requires ships to be fitted with SSAS for the purpose of of transmitting a security alert to the shore **to indicate to a competent authority that the security of the ship is under threat or has been compromised**

Chapter XI-2	
Special measures to enhance maritime security	
1	Definitions
2	Application
3	Obligations of Contracting Governments with respect to security
4	Requirements for Companies and ships
5	Specific responsibility of Companies
6	Ship security alert system
7	Threats to ships
8	Master's discretion for ship safety and security
9	Control and compliance measures
10	Requirements for port facilities
11	Alternative security agreements
12	Equivalent security arrangements
13	Communication of information

# SSAS (Ship Safety Alert System) - Intro

In the case of attempted piracy or terrorism, the ship's SSAS can be activated.

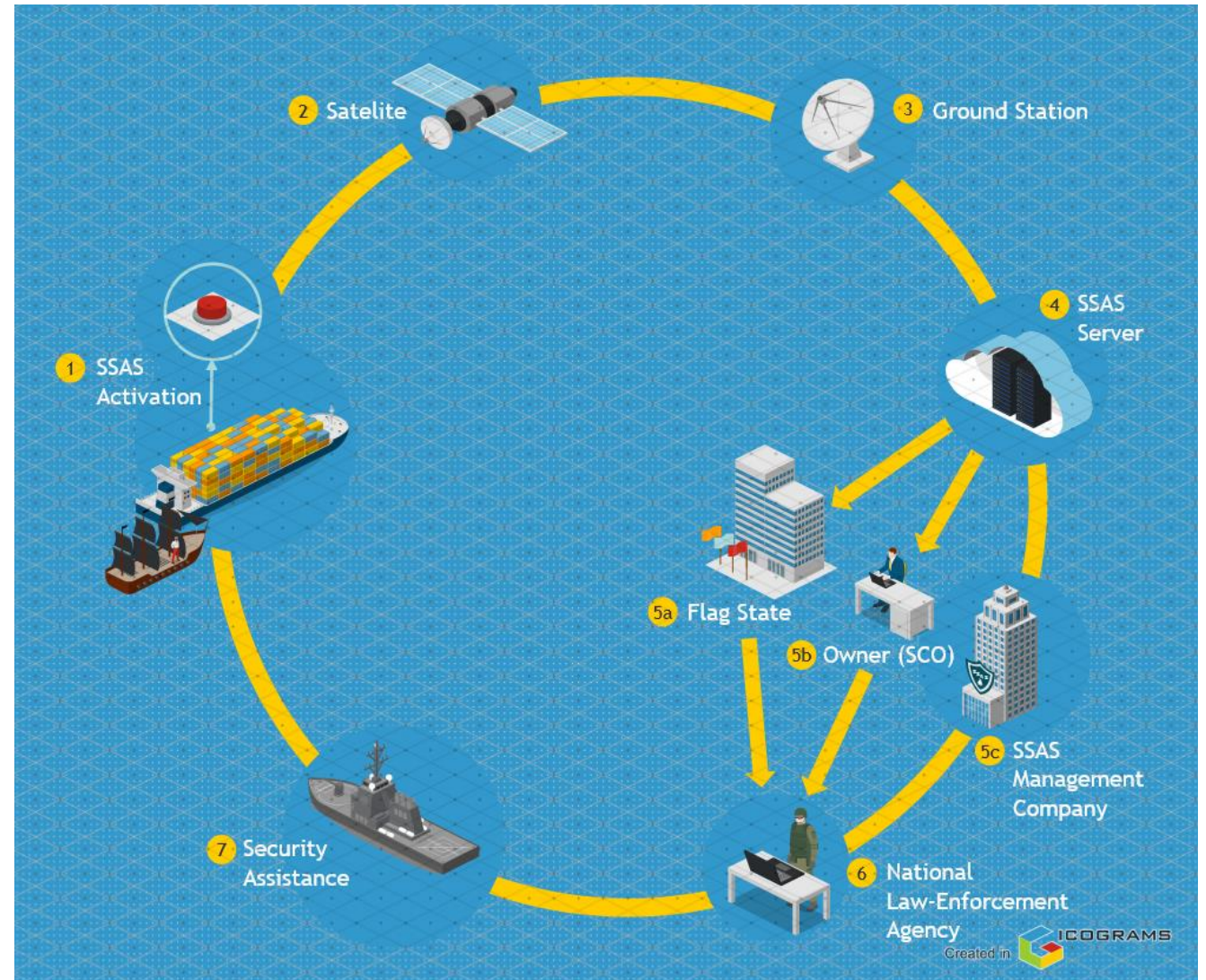
A message is automatically sent via satellite connection to predefined recipients : competent authority, ship's company...

Transmission includes the ship identity and current position associated with date and time, course and speed.

As required by its Administration, the competent authority receiving the alert notifies the:

- Authority responsible for maritime security within its Administration
- The Coastal State in whose vicinity the ship is presently operating, or
- Other Contracting Governments.

The ship gets help from security forces



## SSAS (Ship Safety Alert System) - Activation

When activated, SSAS shall :

- initiate and transmit a ship-to-shore security alert to a competent authority designed by the Administration
- not alert other ships
- not raise an alarm on board ship
- continue the ship security alert until deactivated and/or reset.

SSAS activation doesn't impair functionality of GMDSS





# SSAS (Ship Safety Alert System) – Carriage requirements for SOLAS vessels

Cargo ships of 500 gross tonnage and upwards engaged in international voyages



Mobile offshore drilling units



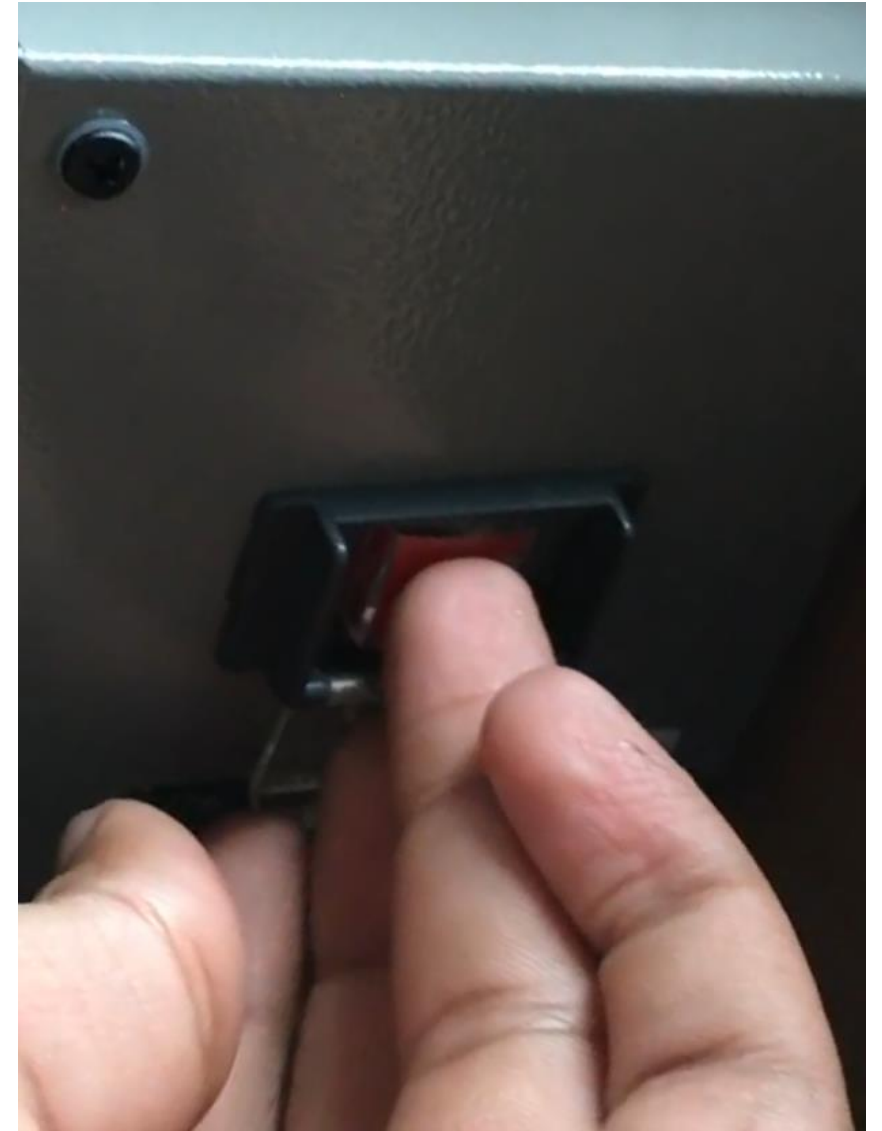
Passenger ships irrespective of size ships engaged in international voyages



## SSAS (Ship Safety Alert System) – Activation points



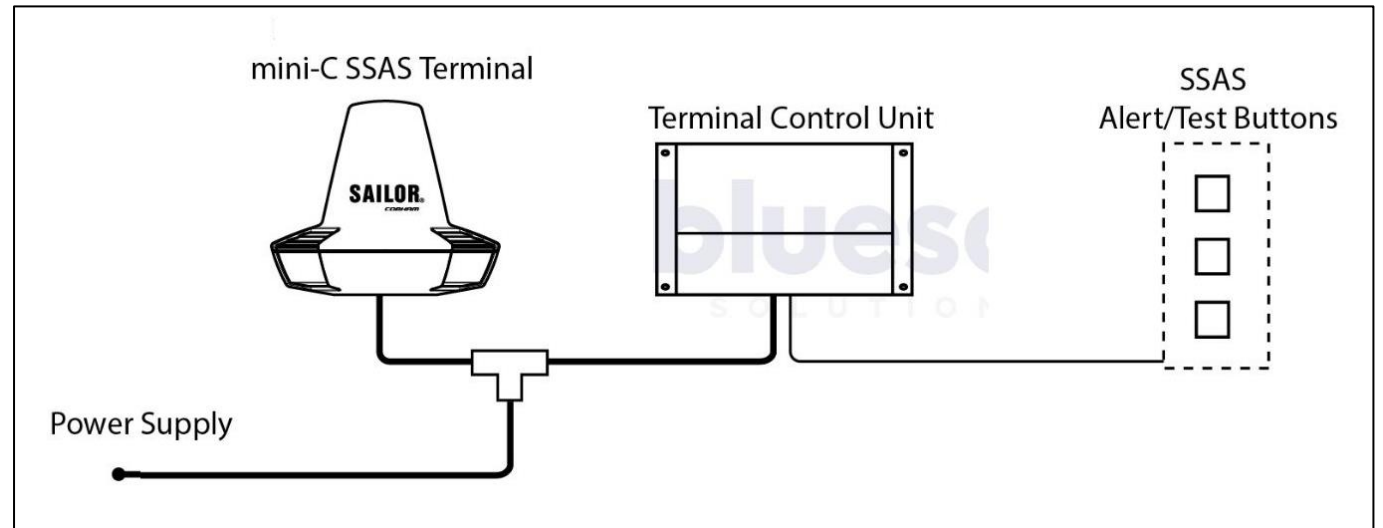
- At the navigation bridge and in at least one other location
- Designed so as to prevent the inadvertent initiation of the ship security alert.
- The location of activation points is given in the ship security plan confidential



## SSAS (Ship Safety Alert System) - Installation

SSAS may utilise the GMDSS radio installation, other radio systems provided for general communications or dedicated radio systems.

*Example of a stand-alone Ship Security Alert System using Inmarsat mini-C*



Note : Ship security alert systems are capable of being tested by ship's crew

Performance standards are set out in IMO Resolution MSC.147(77)

**RESOLUTION MSC.147(77)**  
**(adopted on 29 May 2003)**

**ADOPTION OF THE REVISED PERFORMANCE STANDARDS  
FOR A SHIP SECURITY ALERT SYSTEM**

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO resolution A.886(21), by which the Assembly resolved that the functions of adopting performance standards for radio and navigational equipment, as well as amendments thereto, shall be performed by the Maritime Safety Committee on behalf of the Organization,

RECALLING FURTHER the provisions of the new chapter XI-2 of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, and the requirements of regulation XI-2/5, that all ships shall be provided with a ship security alert system,



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# LRIT (Long Range Identification and Tracking)

## LRIT (Long Range Identification and Tracking)

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The LRIT system was **set up under the auspices of the IMO** and has been in force since 1 July 2009.

It aims to provide a global system for the identification and tracking of ships.

Initial purpose of LRIT system was to **enhance security of shipping**.

LRIT provides ship identity and current location information **in sufficient time for a government to evaluate the security risk** posed by a ship off its coast and **to respond** if necessary.

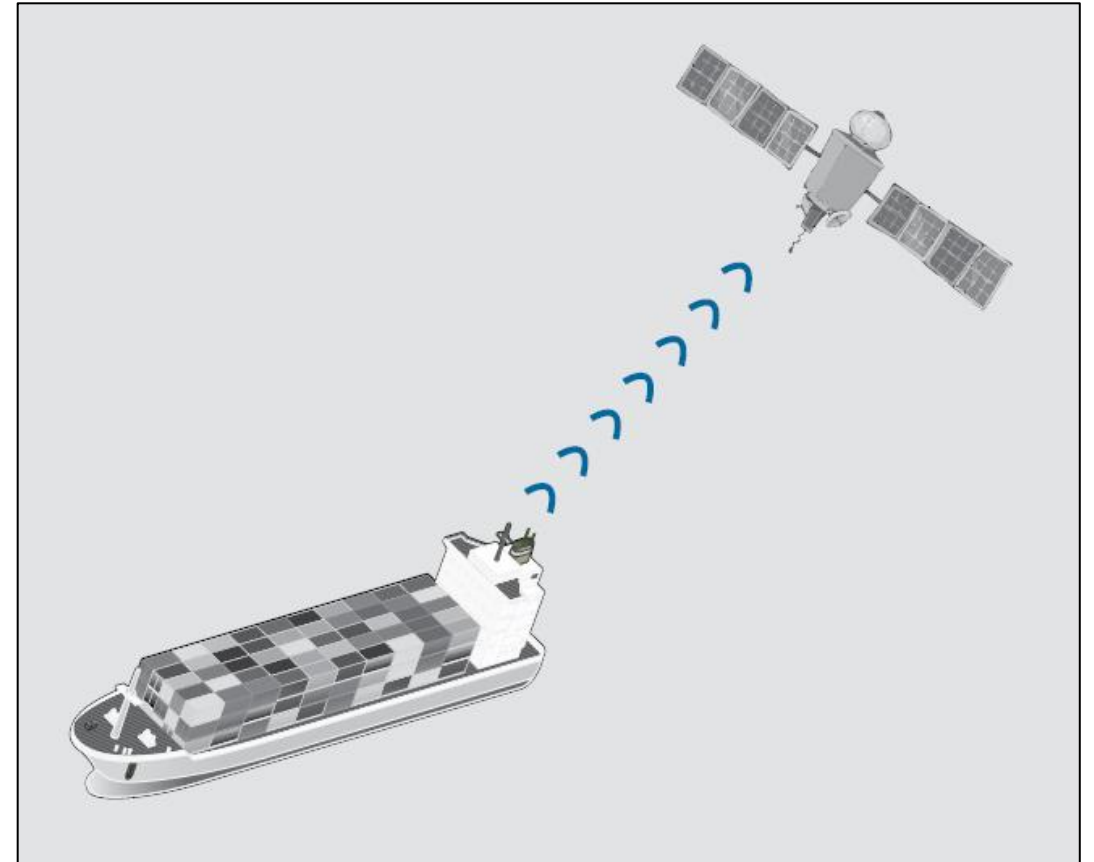
The scope of LRIT has since been **extended to include search and rescue (SAR), safety, and protection of the marine environment**. Accurate information on the location of a ship in distress, as well as ships in the vicinity that could lend assistance, can reduce response time, supporting timely rescue and possibly minimising pollution along a coastline.

## LRIT (Long Range Identification and Tracking) – Transmission from ship

Ships are fitted with a transmitting equipment .

Shipborne LRIT equipment transmits automatically, every 6 hours, to a LRIT Data centre:

- The identity of the ship.
- The position of the ship (latitude & longitude).
- The date and time of the position provided.



Notes :  
Intervals of transmission can be remotely configured (15 min. minimum).  
Capability to transmit information following receipt of polling command

- **Routine LRIT transmission**  
**Within 15 min** of the time it is transmitted by the ship.
  
- **On-demand LRIT information :**  
**Within 30 min** of the time the LRIT Data User requested the information.



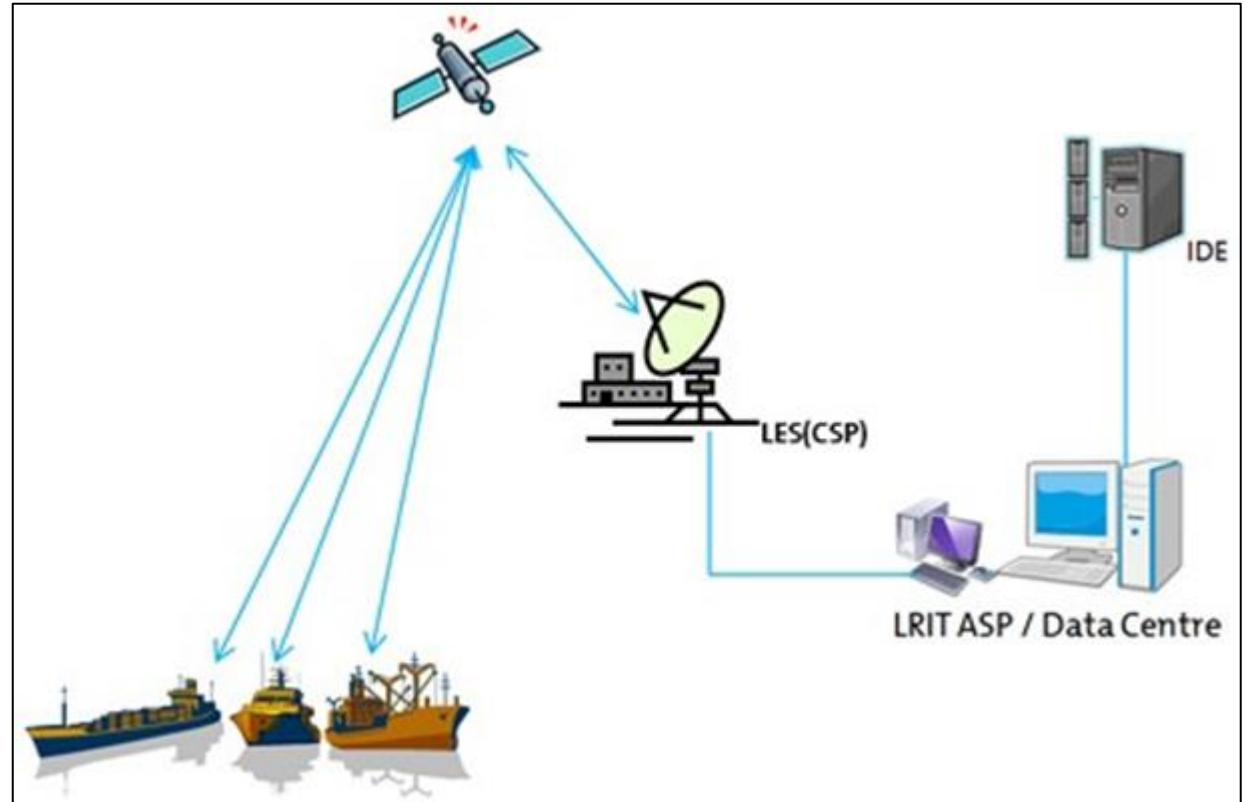
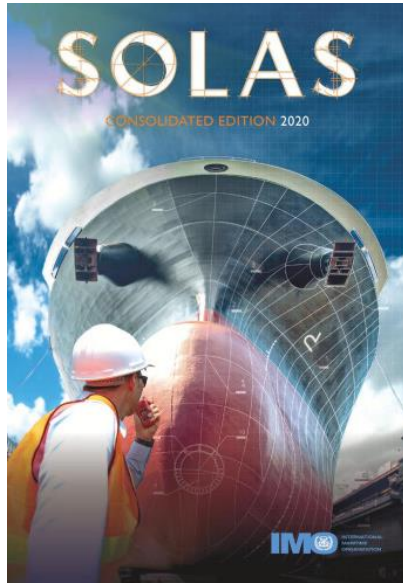


# LRIT (Long Range Identification and Tracking)

Unlike AIS, access to information is provided only for SOLAS contracting governments under certain conditions.

LRIT information is stored and available for those users entitled to access it.

Statutory requirements are given in Regulation V/19-1 of the 1974 SOLAS Convention.



# LRIT (Long Range Identification and Tracking) – LRIT users and application

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LRIT users include the following:

- **Flag States** may request information on the location of their vessels around the world
- **Coastal States** may request information on ships up to 1 000 nautical miles from their coasts irrespective of their flag
- **Port States** may request information on those ships that have declared one of their ports as destination, irrespective of their location or flag
- **Search and rescue authorities.**

LRIT Applies to:

- **Passenger ships**, including high speed passenger craft.
- **Cargo ships**, including high speed craft, of 300 gross tonnage and upwards.
- **Mobile offshore drilling units**

Note : LRIT doesn't apply to ships operating exclusively in A1 GMDSS area and are fitted with AIS

# LRIT (Long Range Identification and Tracking) – How LRIT works

**LRIT shipborne equipment** transmits position information to the Communication Service Provider.

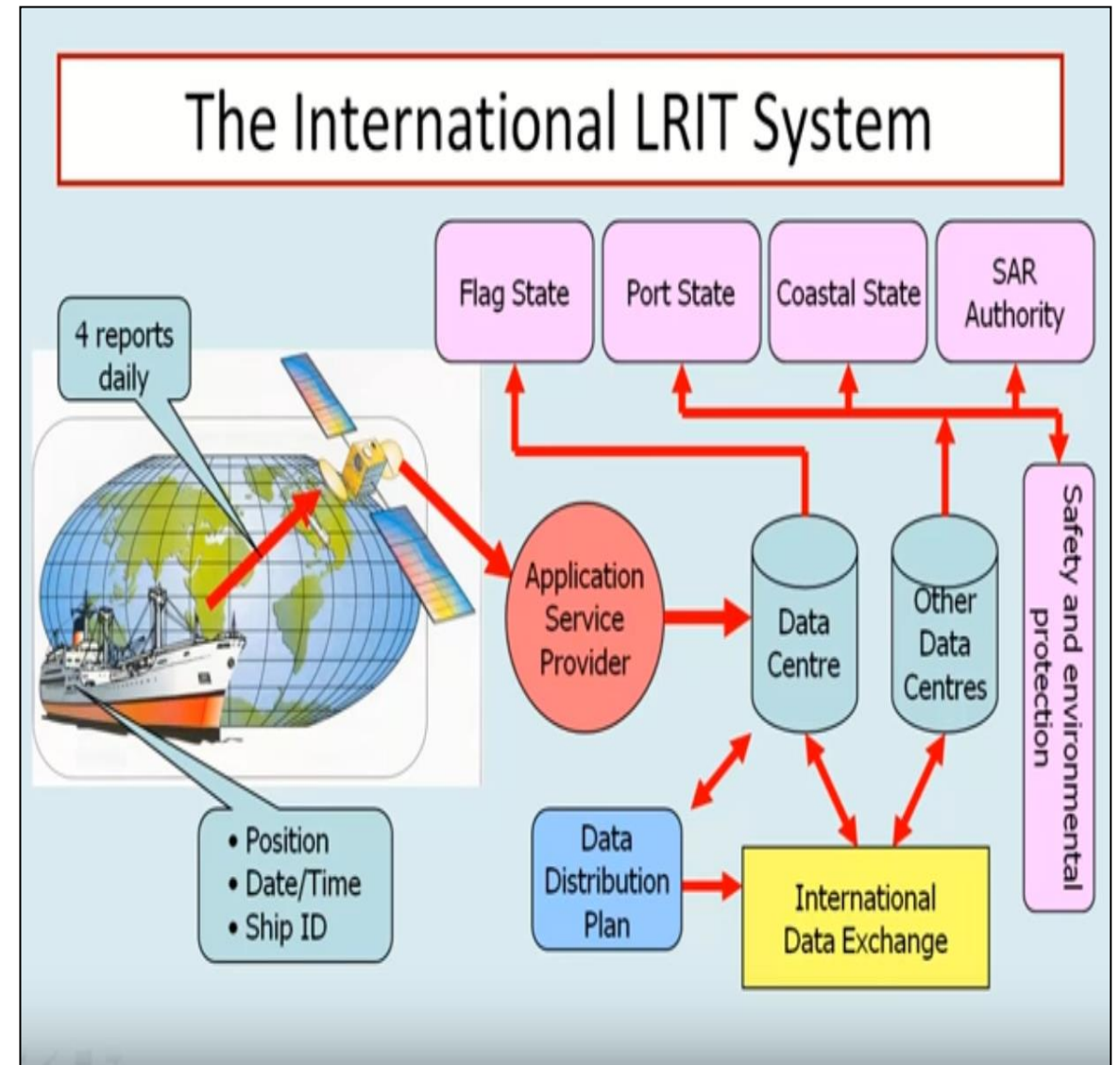
**Communication Service Providers (CSP)** provide the communication infrastructure and services to ensure the end-to-end secure transfer of the LRIT message between the ship and ASP.

**Application Service Providers (ASP)** provide a communication protocol interface and add information to the LRIT message between the CSP and the LRIT Data Centre.

**LRIT Data Centre** collects and provides LRIT information to its users according to the Data Distribution Plan.

**LRIT Data Distribution Plan (DDP)** defines rules and access rights (i.e. which users can receive what LRIT information). The DDP server is managed by IMO and is populated by SOLAS Contracting Governments, following IMO technical specifications.

**International LRIT Data Exchange (IDE)** routes LRIT information between LRIT Data Centres according to the DDP.

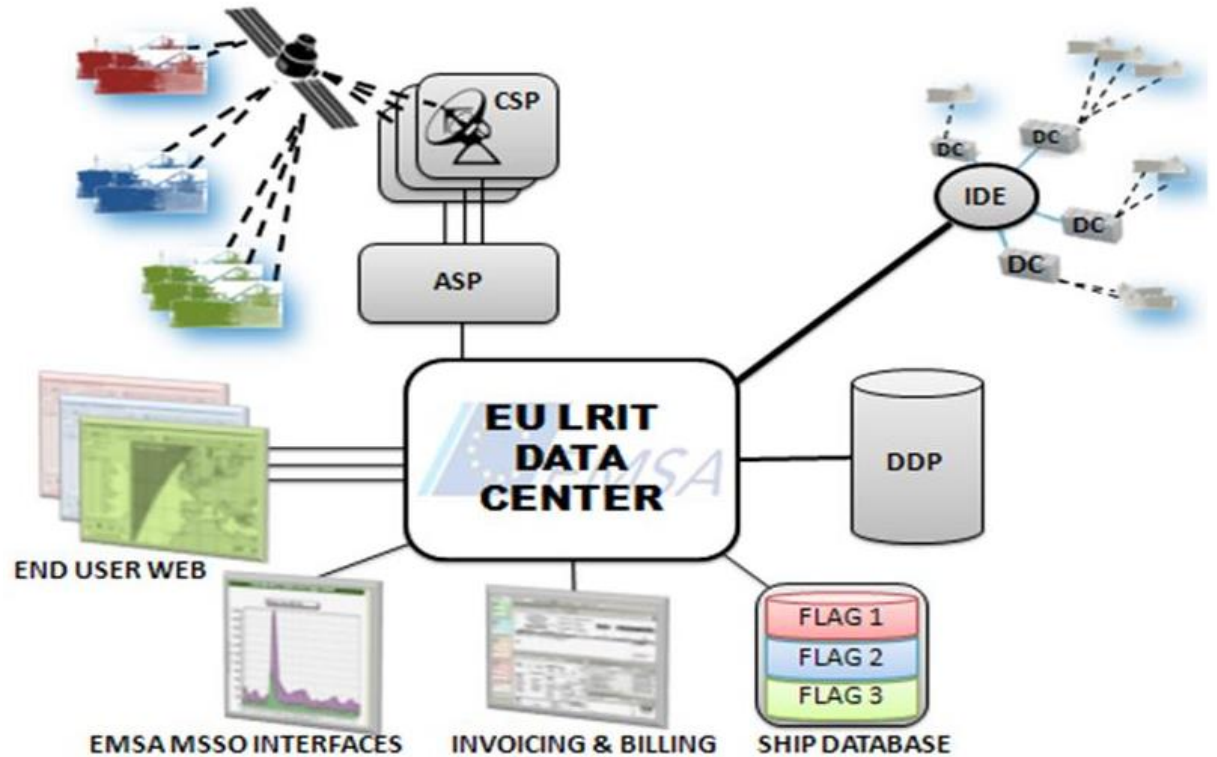


## LRIT (Long Range Identification and Tracking) – Three types of LRIT Data Centres

**National LRIT Data Centre** : May be established by a Contracting Government.

**Regional or a Cooperative LRIT Data Centres** may be established by a group of Contracting Governments

**International LRIT Data Centre** is established and coordinated by the MSC Committee for Contracting Governments not participating in a National, Regional or Cooperative LRIT Data Centre.



EMSA is in charge of the EU LRIT Cooperative Data Centre

- Ensure that a minimum of four position messages per ship per day (one every six hours) are sent by ships flying their flag.
- Select a LRIT Data Centre
- Provide the selected LRIT Data Centre, a list of the ships flying its flag, which are required to transmit LRIT information (Name + IMO number + Call sign + Maritime Mobile Service Identity)



Under the following circumstances:

- When international agreements, rules or standards provide for the **protection of navigational information**.
- In exceptional circumstances and for the shortest duration possible where the operation is **considered by the Master to compromise the safety or security of the ship**. In such a case the Master shall inform the Administration.
- When a ship is **undergoing repairs, modifications or conversions in dry-dock or in port** or is laid up for a long period.

Regulation V/19-1 of the 1974 SOLAS Convention

Resolution MSC 263(84) – REVISED PERFORMANCE STANDARDS AND FUNCTIONAL REQUIREMENTS FOR THE LONG-RANGE IDENTIFICATION AND TRACKING OF SHIPS

MSC1/Circ 1307 – GUIDANCE ON THE SURVEY AND CERTIFICATION OF COMPLIANCE OF SHIPS WITH THE REQUIREMENT TO TRANSMIT LRIT INFORMATION

MSC1/Circ 1298 - GUIDANCE ON THE IMPLEMENTATION OF THE LRIT SYSTEM



Thank you for your  
attention