

ITUEvents

ITU World Radiocommunication Seminar 2018

**3-7 December 2018
Geneva, Switzerland**

www.itu.int/go/ITU-R/WRS-18



**Modern Maritime
Communications**

**By Germán Medici
BR/TSD/TPR**

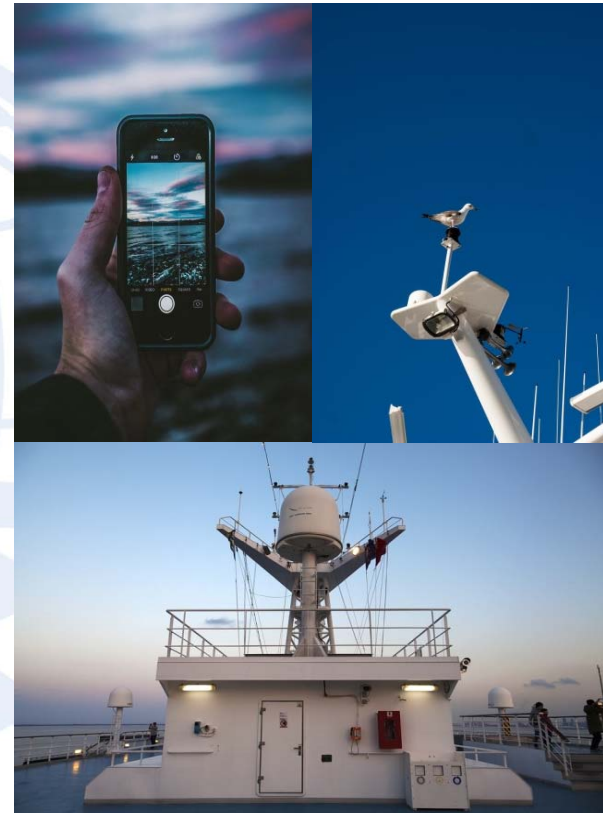
**ITU HQ Geneva,
3 December, 2018**



Overview of presentation

1. **Commercial & Welfare communications**
2. **Safety and Security communications**
3. **Onboard communications**
4. **Navigation and tracking**
5. **Future & ongoing discussions**

Questions...



Commercial & Welfare communications

The range of possibilities is very diverse from Terrestrial, mobile Telephony or High Frequency to satellite communications



The key point is cost-effectiveness and reliability

- Cellular networks during coastal navigation;
- Satellite communications;
- High Frequency voice, point to point, through coast stations or even Email through HF-internet;
- Combination (hybrid) solutions e.g. on board passenger ships, VSAT (Ka or Ku band), GEO or polar orbit satellite providers combined with small cellular dedicated networks on board.
- These cellular networks offer voice or data connectivity and onboard services, such as SMS with information for passengers, regarding events timetables, etc.

Safety and Security

| Summary of SOLAS CONVENTION requirement | |
|--|--|
| Requirement | how to comply? |
| <p>Chapter IV - GMDSS Equipment According to the Operations Area (A1-A2-A3-A4) and type of activity (passenger, cargo, tank, etc.) (Solas Convention, Chapter IV, Part C)</p> | <p>VHF RT and DSC MF RT and DSC HF RT and DSC</p> <p>Satellite (Inmarsat)</p> <p>EPIRB</p> <p>Maritime Safety Information (MSI) NAVTEX / EGC</p> |
| <p>Chapter III - Life-saving appliances and arrangements (Solas Convention, Chapter III, Part B)</p> | <p>VHF portable devices Water-Proof</p> <p>Radar or AIS Transponder (SART or AIS SART)</p> |
| <p>Chapter IV - Safety of Navigation Systems (Solas Convention, Chapter IV)</p> | <p>Identification and tracking (short and long range)</p> <p>AIS</p> <p>LRIT</p> |
| <p>Chapter XI - Ship Security Alert Systems Is not part of the GMDSS</p> | <p>SASS devices, i.e. Inmarsat, Cospas-Sarsat</p> |

Appendix 15 to the Radio Regulations (RR)- GMDSS frequencies

Safety and Security

- The Global Maritime Distress and Safety System (GMDSS), was implemented from 1992-1999 and introduced Digital Selective Calling (DSC) for automated watch-keeping and alerting on HF, MF and VHF frequencies)

Reference: Recommendations [ITU-R M.493](#) and [M.541](#)

*What is Digital
Selective Calling (DSC)
How does it Work?*



What is a Maritime Mobile Service Identity?

Ships: MIDXXXXXX

Group of Ships: 0MIDXXXXX

Coast Station: 00MIDXXXX

Recommendation ITU-R M.585 "Assignment and use of identities in the maritime mobile service"

- Maritime Mobile Service Identity (MMSI) number is programmed into VHF/MF/HF DSC equipment by the radio commissioning technician at first installation.
- In case of changing equipment from one ship to another, it is necessary to reprogram the new MMSI. In the same way that ships change MMSI.

GMDSS is in a modernization process

Safety and Security

GMDSS functional requirements also include: transmit and receive maritime safety information (MSI)

NAVTEX 518 kHz (Int) 490 and 4 209.5 kHz (Nat) or EGC Enhanced group Call-MSI via Satellite i.e. Inmarsat C



Other mandatory safety and security-related systems:

Collision avoidance and tracking

- AIS Automatic Identification System, AIS uses VHF frequencies; Recommendation ITU-R M.1371 provides navigation and communications information;
- LRIT Long Range Identification and Tracking is a ship tracking and monitoring system.

Location/homing

- Radar Transponder for locating (9 GHz); EPIRB-AIS (121,5 MHz and AIS).

Distress alerting/locating

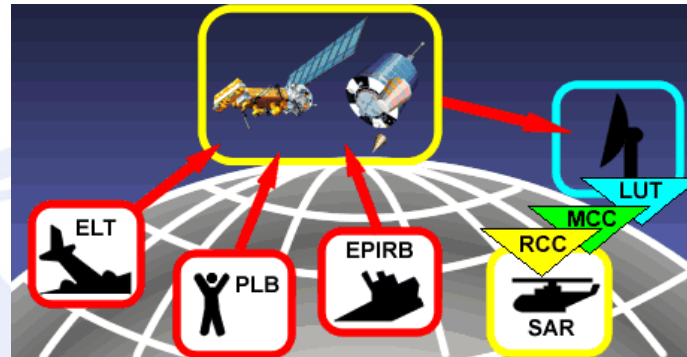
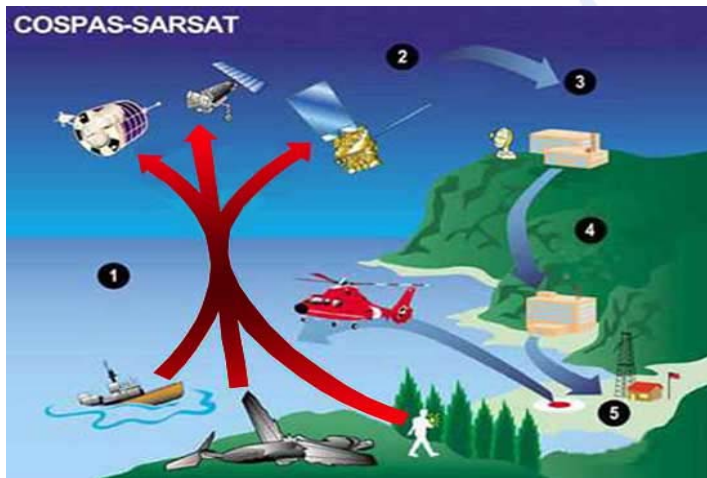
- 406 MHz EPIRB (Cospas-Sarsat Programme).

Security, anti piracy

- SSAS Ship Security Alerting System, a mandatory commercial ship anti-piracy alerting facility. SSAS is not part of the GMDSS communication requirements.

Safety and Security

COSPAS SARSAT



The Cospas-Sarsat System includes two types of satellite:

- satellites in low-altitude Earth LEOSAR System;
- satellites in geostationary Earth orbit GEOSAR System.

What is an EPIRB? How does it Work?

Future:

- The future Cospas-Sarsat System will include new types of satellite in the medium-altitude Earth orbit (MEO) which will form the MEOSAR System. (19) Galileo, (2) GLONASS and (19) GPS (S Band).
- A new service called "Return Link Service" (RLS) is going to be implemented. This system will allow 406 MHz Beacons to receive an acknowledgement from the Mission Control Centre (MCC).
- A further feature of RLS will allow the Rescue Coordination Centres to send an acknowledgement to the beacon once rescue activities have begun.
- Second Generation Beacon SGB.

Onboard communications

May be considered as communications on board the vessel, those used by the crew in manoeuvres or coordination of Deck-Bridge; Bow-Stern, etc. They may also be used during onboard emergencies such as firefighting.

Provision No. 5.287 (WRC-15) of ITU-RR allows the use of the frequencies bands 457.5125-457.5875 MHz and 467.5125-467.5875 MHz by the maritime mobile service being limited to onboard communication stations. It could be implemented in both analogue and digital modulation, on 25 kHz, 12.5 kHz or 6.25 kHz channel bandwidth ([Rec. ITU-R M. 1174](#)).

The use of these frequency bands in territorial waters is subject to the national regulations of the concerned administration.



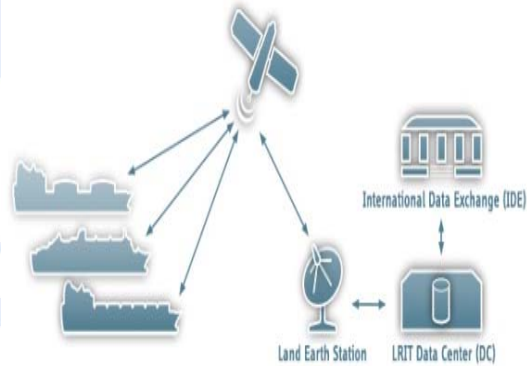
Navigation and tracking

- Positioning/locating applications, for navigational purposes (Global Navigation Satellite System GNSS) such as GPS, GLONASS, BeiDou and Galileo.



- Tracking applications
Tracking of vessels, containers, valuable cargo, etc. Normally using hybrid solutions such as 2G/ 3G and Satellite.
In the future hybrid small radio stations using 5G (cloud services) and Satellite systems will provide robust solutions.

- situational awareness purposes
AIS & LRIT
(Long Range Identification and tracking)



Primary purpose: AIS Collision avoidance;
LRIT Monitoring and Security (1000 nautical miles)
Report every 6 hours (minimum)

Navigation and tracking

AIS “Aids to Navigation” (AtoN), freq. AIS1 and AIS2 (App 18) of the RR.
These provide identification marks on land and sea to guide shipping.



Real: The AIS transceiver is installed on the “Aids to Navigation”.

Synthetic: The “Aids to Navigation” does not have AIS installed and the AIS message is transmitted by an AIS land-based station.



Virtual: The physical “Aids to Navigation” does not exist. However, to mark the hazard, an AIS message is transmitted by a land based AIS station and materializes as a mark on the AIS screen of a vessel.

RACONs (Radar Beacons), are transponders which transmit a marine radar signal and are used to improve the detection of certain objects such as beacons or lighthouses in any weather conditions (9 GHz Radar)

Navigation and tracking

“E-navigation is the harmonized collection, integration, exchange, presentation and analysis of marine information on board and ashore by electronic means to enhance berth to berth navigation and related services for safety and security at sea and protection of the marine environment.”

ITU’s ongoing work in this area: Technical characteristics for a VHF data exchange system in the VHF maritime mobile band and assessment of shore-based electronic navigation (eNAV) infrastructure and new draft Standards for data exchange in the VHF maritime mobile band (156-174 MHz)

[Recommendation ITU-R M.2092](#) and [Report ITU-R M.2122](#)

- The concept is based on the interconnection of ships and shore facilities by communication links, including high speed broad band data links, to ensure safe navigation particularly in coastal and high traffic areas;
- To provide the mariner on board the ship and the Coastal state with high speed data to update information, such as updating of computerized bridge displays in real time;
- The system will allow vessels to be always on, connected to maritime electronic highways, particularly during passages through more sensitive high traffic coastal passages and vessel traffic schemes (VTS).

Navigation and tracking

Future VHF Data Exchange System VDES, with terrestrial and satellite components

| VHF data exchange system VDES | | | |
|----------------------------------|--------------------------------|-----|-----|
| Terrestrial component VDE-TER | Satellite component VDE-SAT | AIS | ASM |

The VHF Data Exchange System (VDES) has the potential to provide many forms of data to ships, such as Maritime Safety Information (MSI), hydrographic and environmental data, piracy and security reporting, updating and monitoring of onboard systems (i.e. engine and cargo monitoring systems).

Possibility to provide a broadband communication system with up to 300 kbps data transfer. It is based on the already very successful Automatic Identification System (AIS) and may provide mariners worldwide with an effective low cost digital communications system

Based on the above, it may support the future eNAV concept

Decisions regarding a satellite component of the VDEs will be considered at WRC-19. There were several proposals discussed during the study cycle WRC-15/WRC-19.

Navigation and tracking

Navigational Data for the broadcasting of maritime safety and security related information (NAVDAT)

- Broadcast of digital files from coast to ships;
- Sequential transmission: like NAVTEX (Also possible on Single Frequency Network SFN);
- Broadcast modes:
 - General for all ships
 - Selective: by geographical area, by group of ships, for a specific ship;
- Reference: Recommendation [ITU-R M.2010 / 2058](#) and [Report ITU-R M.2201](#);
- The WRC-12 allocated the MF frequency of 500 kHz with a 10 kHz radio frequency (RF) channel for the exclusive use of NAVDAT;
- However, any frequency in the maritime frequency band 479-526.5 kHz could be used after validation by the administrations concerned in the future.

Possible additional frequencies:

4 226 kHz

6 337.5 kHz

8 443 kHz

12 663.5 kHz

16 909.5 kHz

22 450.5 kHz

Future & ongoing discussions

WRC-19

Agenda Item 1.8 (two issues) (Chapter 5, [Doc CPM19-2/1](#))

- The global maritime distress and safety system (GMDSS) modernization;
This will consider the modernization of the GMDSS after IMO has concluded its work on this topic. Therefore, It may be carried forward to WRC-23. However, two methods have been proposed for discussion at the WRC-19 :
 - No changes to the RR or
 - To include frequencies (MF/HF) for NAVDAT.
- The introduction of additional satellite systems into the GMDSS
 - Iridium/HIBLEO 2 – Has been recognized by IMO- Resolution MSC.451(99)
“Maritime Safety committee (MSC) Recognizes the maritime mobile satellite services provided by the Iridium Safety voice, Short-Burst data and enhanced group calling services, for use in the GMDSS”; (May 2018)
Several methods to be discussed, were presented to reflect in the RR the frequencies used by a non-GSO GMDSS satellite system;
 - Thuraya- indicated that it may be interested to participate (as a regional provider).

Future & ongoing discussions

Agenda Item 1.9.1 (Chapter 5, [Doc CPM19-2/1](#)):

- To determine the spectrum needs and technical and operational characteristics of autonomous maritime radio devices (AMRD) operating in the frequency band 156-162.05 MHz; to ensure that no undue constraints are placed on the GMDSS and AIS systems.

“An Autonomous maritime radio device (AMRD) is a mobile station; operating at sea and transmitting independently of a ship station or a coast station”.

Two groups of AMRD are identified:

Group A AMRD that enhances the safety of navigation,(AIS or DSC freq.)

Group B AMRD that does not enhance the safety of navigation

Agenda Item 1.9.2 (Chapter 5, [Doc CPM19-2/1](#)) :

- Regulatory provisions and spectrum allocations to the maritime mobile-satellite service to enable the satellite component of the VHF Data Exchange System (VDE-SAT) and enhanced maritime radiocommunication, to be completed.

Two methods have been proposed for discussion:

- No changes to the RR;
- Several methods based basically on 2 different frequency plan allocations.

Thank you



**Please remember to visit
the WRS-18 Exhibition
located at the entrance of the
ITU Montbrillant building**