

The Issues of Maritime Radiocommunication on the WRC-19

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ABSTRACT: The article presents maritime radio communication issues being the subject of the World Radiocommunication Conference (WRC) meeting in 2019, including issues related to the modernization of Global Maritime Distress and Safety System (GMDSS). The preparation process for WRC-19 have been presented. The discussed issues were described from the substantive side as well. Finally, the position of IMO in relation to the maritime issues have been discussed. Some aspects of the World Radiocommunication Conference meeting in 2023 (WRC-23) were also presented.

1 INTRODUCTION

The main goal of the WRCs (World Radiocommunication Conferences), convened every 3-4 years, is to analyze and make decisions about the worldwide use of radio frequencies to meet the global, changing demand for radio spectrum. This demand is enforced by the rapid development of the broadly understood information and communication technology sector - ICT (Information and Communication Technology).

WRCs decisions update the Radio Regulations (RR), issues by the International Telecommunication Union (ITU), regulating the global use of the radio spectrum [ITU, 2016].

These regulations are of great importance for the maritime community and especially for the unconditional operation of the Global Maritime Distress and Safety System - GMDSS, the proper operation of marine navigation devices (radars, satellite navigation, Automatic Identification System - AIS, etc.), as well as the use of radio frequencies for

public communications (business and crew's communications).

The decisions taken by the WRC in 2019 and 2023 will be of particular importance for the successful completion of the two International Maritime Organization (IMO) projects: the GMDSS modernization project and, associated with the first, the e-navigation project [Korcz K. 2015].

2 WORLD RADIOCOMMUNICATION CONFERENCES

The World radiocommunication conferences (WRCs) are held every three to four years. It is the job of WRC to review, and, if necessary, revise the Radio Regulations, the international treaty governing the use of the radio-frequency spectrum and the geostationary-satellite and non-geostationary-satellite orbits. Revisions are made on the basis of an agenda determined by the ITU Council, which takes into

account recommendations made by previous world radiocommunication conferences.

The general scope of the agenda of world radiocommunication conferences is established four to six years in advance, with the final agenda set by the ITU Council two years before the conference, with the concurrence of a majority of Member States.

Under the terms of the ITU Constitution, a WRC can:

- revise the Radio Regulations and any associated Frequency assignment and allotment Plans;
- address any radiocommunication matter of worldwide character;
- instruct the Radio Regulations Board and the Radiocommunication Bureau, and review their activities;
- determine Questions for study by the Radiocommunication Assembly and its Study Groups in preparation for future Radiocommunication Conferences.

On the basis of contributions from administrations, the Radiocommunication Study Groups, and other sources (according to Article 19 of the Convention, Geneva, 1992) concerning the regulatory, technical, operational and procedural matters to be considered by World and Regional Radiocommunication Conferences, the ITU Conference Preparatory Meeting (CPM) shall prepare a consolidated report to be used in support of the work of such conferences.

3 RADIO REGULATIONS

The Radio Regulations contains the complete texts as adopted by the World Radiocommunication Conference (Geneva, 1995) (WRC-95) and subsequently revised and adopted by World Radiocommunication Conferences, including all Appendices, Resolutions, Recommendations and ITU-R Recommendations incorporated by reference.

The last edition of 2016 of the Radio Regulations, contains the complete texts of the Radio Regulations as adopted by the WRC-95, subsequently revised and approved by the WRC-97, WRC-2000, WRC-03, WRC-07, WRC-12 and WRC-15 [ITU, 2016].

The Radio Regulations consists of four volumes (Figure 1):

- 1 Articles;
- 2 Appendices;
- 3 Resolutions – Recommendations; and
- 4 ITU-R Recommendations incorporated by reference.



Figure 1. The Radio Regulations [ITU, 2016]

The first volume contains the following examples of issues:

- Terminology and technical characteristics;
- Frequencies;
- Interferences;
- Provisions for services and stations;
- Distress and safety Communications;
- Maritime services.

The second volume contains the following examples of appendices:

- APPENDIX 1 (REV.WRC-12) Classification of emissions and necessary bandwidths;
- APPENDIX 2 (REV.WRC-03) Table of transmitter frequency tolerances;
- APPENDIX 3 (REV.WRC-12) Maximum permitted power levels for unwanted emissions in the spurious domain;
- APPENDIX 15 (REV.WRC-15) Frequencies for distress and safety communications for the Global Maritime Distress and Safety System (GMDSS);
- APPENDIX 16 (REV.WRC-07) Documents with which stations on board ships and aircraft shall be provided.

The third volume contains the following examples of resolutions and recommendations:

- RESOLUTION 1 Notification of frequency assignments;
- RESOLUTION 205 (Rev.WRC-15) Protection of the systems operating in the mobile-satellite service in the frequency band 406-406.1 MHz;
- RESOLUTION 339 (Rev.WRC-07) Coordination of NAVTEX services;
- RESOLUTION 809 (WRC-15) Agenda for the 2019 World Radiocommunication Conference;
- RESOLUTION 810 (WRC-15) Preliminary agenda for the 2023 World Radiocommunication Conference;
- RECOMMENDATION 316 (Rev.Mob-87) Use of ship earth stations within harbours and other waters under national jurisdiction.

The last fourth volume of the Radio Regulations contains the following examples of ITU-R Recommendations incorporated by reference:

- Rec. ITU-R M.476-5 Direct-printing telegraph equipment in the maritime mobile service;
- Rec. ITU-R M.489-2 Technical characteristics of VHF radiotelephone equipment operating in the maritime mobile service in channels spaced by 25 kHz;

- Rec. ITU-R M.492-6 Operational procedures for the use of direct-printing telegraph equipment in the maritime mobile service;
- Rec. ITU-R M.1171-0 Radiotelephony procedures in the maritime mobile service.

4 THE PREPARATORY PROCESS FOR WRC-19

In the global preparatory work for WRC-19 participates ITU and, at the same time, regional organizations gathering the radiocommunication administrations of the countries in the region, international organizations interested in WRC issues, eg. the International Maritime Organization (IMO) in matters related to maritime affairs, as well as radiocommunication administrations of the Member States.

The global preparatory process for WRC-19, including the timing of this work, is shown in Figure 2 [ITU, 2015, Res. 809].

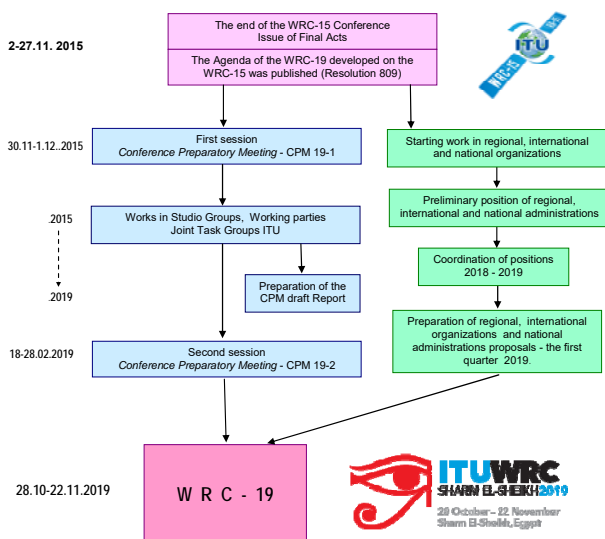


Figure 2. The global preparatory process for WRC-19

The preparatory process within the ITU includes the work of the Conference Preparatory Meeting (CPM), Working Parties (WPs), Study Groups (SGs) and Join Task Groups (JTGs).

The first session of the Conference Preparatory Meeting for WRC-19 (CPM 19-1) took place shortly after the end of WRC-12 (30.11-1.12..2015). Its task was to initiate a whole series of complex works and arrangements for proper preparation for the WRC-19 meeting. The main issues discussed during the CPM 19-1 meeting concerned:

- preparing proposals for the content and structure of the project of CPM report on WRC-19;
- organization of preparatory studies based on the agenda of issues approved on WRC-15;
- preparation of the second session of CPM 19-2.

A proposal was also prepared for issues to be discussed in the relevant items of the WRC-19 agenda. These issues, together with a list of topics and tasks, are the basis for the separation of work between the relevant ITU Study Groups.

The organization of work and the list of priority tasks of the appointed Special Committee (SC) were also adopted.

Figure 3 presents the most important regional organizations preparing their positions for particular items of the agenda of the WRC-19.

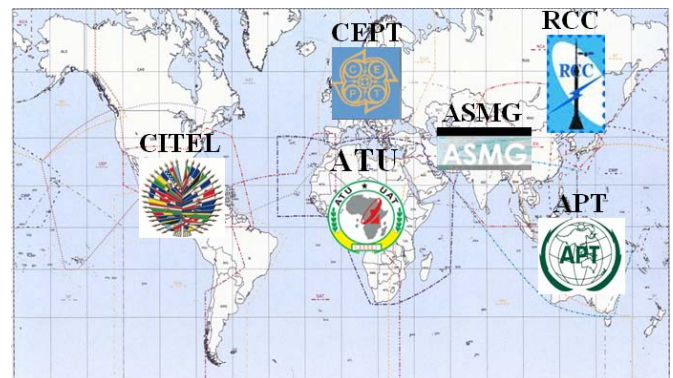


Figure 3. Regional organizations involved in preparations for the WRC-19

The most important regional organizations taking part in the preparatory work for WRC-15 are (Figure 3):

- CEPT - European Conference of Postal and Telecommunications Administrations,
- CITELE - Inter-American Telecommunication Commission,
- ATU - African Telecommunications Union,
- APT - Asia – Pacific Telecommunity,
- RCC - Regional Commonwealth in the field of Communications,
- ASMG - Arab Spectrum Management Group.

Each regional organization develops a meeting plan where it discusses and establishes its point of view regarding the respective agenda items of the WRC-19, taking into account the positions of other regional and international organizations. At meetings of regional organizations, individual administrations of countries in a given region report their proposals to ensure that their own interests are met. Representatives of other regional or international organizations also participate as observers in the works and meetings of regional organizations. As a result of such procedure, a joint, agreed position is elaborated, which on behalf of its members will be brought to the WRC-19 forum.

The degree of participation of international organizations interested in radiocommunication issues depends on the scope of its operation. The International Maritime Organization (IMO), due to its area of activity, is interested in issues related to maritime radiolocation and, discussed in the article, the issues of maritime radiocommunication and strictly speaking the GMDSS issues. The position of the IMO, in terms of agenda items on "maritime" issues, is developed mainly by the Sub-Committee on Navigation, Communications and Search and Rescue (NCSR), at its annual sessions.

5 WRC-19 AGENDA ITEMS FOR THE MARITIME RADIOCOMMUNICATION

Among the 16 items on the provisional agenda of the WRC-19, the most important, directly related to maritime radiocommunication, include agenda items **1.8, 1.9.1, 1.9.2** and **10**.

- Agenda item **1.8**
to consider possible regulatory actions to support Global Maritime Distress Safety Systems (GMDSS) modernization and to support the introduction of additional satellite systems into the GMDSS, in accordance with Resolution 359 (Rev.WRC-15);
In Resolution **359** (Rev.WRC-15) on *Consideration of regulatory provisions for updating and modernization of the Global Maritime Distress and Safety System*, the World Radiocommunication Conference (Geneva, 2015), invites ITU-R to conduct studies, taking into consideration the activities of IMO, as well as information and requirements provided by IMO, in order to determine the regulatory provisions to support GMDSS modernization and invites the 2019 World Radiocommunication Conference to consider the result of ITU Radiocommunication Sector (ITU-R) studies and take necessary actions, as appropriate, to support GMDSS modernization.
- Agenda item **1.9.1**
regulatory actions within the frequency band 156-162.05 MHz for autonomous maritime radio devices to protect the GMDSS and automatic identifications system (AIS), in accordance with Resolution **362** (WRC-15);
In Resolution **362** (WRC-15) on *Autonomous maritime radio devices operating in the frequency band 156-162.05 MHz*, the World Radiocommunication Conference (Geneva, 2015), invites ITU-R to conduct the necessary studies in time for WRC-19 to determine the spectrum needs and technical and operational characteristics of autonomous maritime radio devices operating in the frequency band 156-162.05 MHz and invites the 2019 World Radiocommunication Conference to consider the results of ITU-R studies and take appropriate action.
- Agenda item **1.9.2**
modifications of the Radio Regulations, including new spectrum allocations to the maritime mobile-satellite service (Earth-to-space and space-to-Earth), preferably within the frequency bands 156.0125-157.4375 MHz and 160.6125-162.0375 MHz of appendix **18**, to enable a new VHF data exchange system (VDES) satellite component, while ensuring that this component will not degrade the current terrestrial VDES components, applications specific messages (ASM) and AIS operations and not impose any additional constraints on existing services in these and adjacent frequency bands as stated in recognizing d) and e) of Resolution **360** (Rev.WRC-15);
In Resolution **360** (Rev.WRC-15) on *Consideration of regulatory provisions and spectrum allocations to the maritime mobile-satellite service to enable the satellite component of the VHF Data Exchange System and enhanced maritime radiocommunication*, the World Radiocommunication Conference (Geneva, 2015), invites ITU-R to conduct, as a matter of urgency, and in time for WRC-19, sharing and compatibility

studies between VDES satellite components and incumbent services in the same and adjacent frequency bands specified in recognizing d) and e) to determine potential regulatory actions, including spectrum allocations to the Maritime Mobile Satellite Service - MMSS (Earth-to-space and space-to-Earth) for VDES applications, and invites the 2019 World Radiocommunication Conference to consider, based on the results of ITU-R studies, appropriate modifications of the Radio Regulations.

- Agenda item **10**
to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, in accordance with article 7 of the Convention;

6 IMO POSITION ON THE MARITIME RADIOCOMMUNICATION

6.1 Agenda item 1.8

The issue is divided into two parts [IMO, 2019]:

A - concerns the modernization of GMDSS, e.g. the NAVDAT system and the frequency review for the modernized GMDSS;

B - concerns new satellite operators for GMDSS.

6.1.1 Issue A

IMO is in the process of GMDSS modernization. The modernization plan of the GMDSS has been endorsed by Sub-Committee on Navigation, Communications and Search and Rescue - NCSR 4 and approved by Maritime Safety Committee - MSC 98. Some new technologies are introduced for consideration in the modernization plan of the GMDSS, such as MF/HF NAVDAT [Korcz K. 2017]. Meanwhile, ITU is continuing the study on NAVDAT, including revisions to ITU-R recommendations, as well as spectrum and regulatory issues, under this agenda item 1.8.

6.1.2 NAVDAT system

Navigational Data (NAVDAT) is the radio system, for use in the maritime mobile service, operating in the MF (500 kHz) and HF bands for digital broadcasting of maritime safety and security related information from shore-to-ship [ITU-R, 2012; ITU-R, 2014].

The NAVDAT system uses a time-slot allocation similar to the NAVTEX system which could be coordinated by IMO in the same manner.

That system can also work on Single Frequency Network (SFN). In this case transmitters are frequency synchronized and the transmit data must be the same for all transmitter.

The NAVDAT digital system offers a broadcast transmission of any kind of message from shore-to-ships with possibility of encryption.

Any broadcasting message should be provided by a secure and controlled source.

Message types broadcast can include, but are not limited to, the following:

- - safety of navigation;
- - security;
- - piracy;
- - search and rescue;
- - meteorological messages;
- - piloting or harbour messages;
- - vessel traffic system files transfer.

These messages are broadcasted for the attention of all ships, a group of ships or in a specific navigation area. These messages can be addressed to one ship, using the maritime mobile service identity (MMSI) as well.

The NAVDAT system is organized upon five vectors performing the following functions [ITU-R, 2012]:

- 1 System of information and management (SIM):
 - collects and controls all kinds of information;
 - creates message files to be transmitted;
 - creates transmitting programme according to message files priority and need of repetition.
- 2 Shore network:
 - assures the transportation of the message files from sources to the transmitters.
- 3 Shore transmitter:
 - receives the message files from SIM;
 - translates message files to orthogonal frequency division multiplexing (OFDM) signal;
 - transmits RF signal to the antenna for broadcast to ships.
- 4 Transmission channel:
 - transports the RF signal.
- 5 Ship receiver:
 - demodulates the RF OFDM signal;
 - reconstructs the message files;
 - sorts and makes the message files available for the dedicated equipment according to the message files applications.

Figure 4 shows the diagram of the MF NAVDAT broadcast chain [Korc K., 2017].

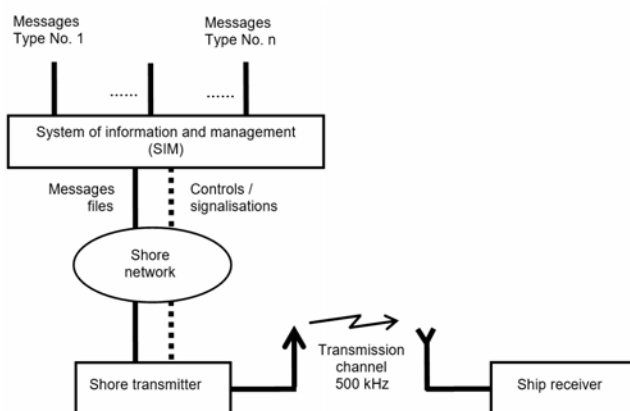


Figure 4. The diagram of the MF NAVDAT broadcast chain

The SIM term includes:

- all the sources that deliver file messages (e.g. meteorological office, safety and security organizations, etc.);

- the file multiplexer which is an application running on a server;
- the file multiplexer manager;
- the shore transmitter manager.

All the sources are connected to the file multiplexer through a network.

The shore network can use a broadband link, a low data rate link or a local file sharing.

A coastal transmitting station consists of this minimum configuration:

- one local server connected to a protected access;
- one OFDM modulator;
- one RF amplifier;
- one transmit antenna with matching unit;
- one GNSS receiver or atomic clock for synchronization;
- one monitoring receiver with its antenna.

A typical NAVDAT digital receiver is composed of several basic blocks:

- reception antenna and GNSS antenna;
- RF front end;
- demodulator;
- file demultiplexer;
- controller;
- power supply.

NAVDAT MF ship receiver performance specifications has been showed on Table 1 [ITU-R, 2012].

Table 1. Performance specifications of NAVDAT MF ship receiver

Frequency band	495 to 505 kHz
Adjacent channel protection	> 40 dB @ 5 kHz
Noise factor	< 20 dB
Usable sensitivity for BER = 10 ⁻⁴ after error correction	< -100 dBm
Dynamic	> 80 dB
Minimal usable RF field (with adapted receiving antenna)	25 dB(μV/m)

The system uses Orthogonal Frequency-Division Multiplexing (OFDM) which is a modulation technology for digital transmissions.

In the 10 kHz channel bandwidth with RF propagation, the raw data rate available for the data stream (DS) is typically around 25 kbit/s with 16-QAM signal.

With respect to the GMDSS Modernization Plan [IMO, 2016]:

- SOLAS chapter IV should be revised to allow ships to use NAVDAT service in addition to or in place of NAVTEX in places where NAVDAT is available;
- when the NAVDAT concept is sufficiently developed, IMO and ITU should develop the necessary technical recommendations and performance standards for international NAVDAT service. This work should be closely followed by the development of IMO, IHO, ITU, WMO and IEC standards as appropriate, for shipborne NAVDAT and/or combined NAVTEX/NAVDAT equipment;

- the need for a NAVDAT coordination scheme needs to be considered taking account that it should retain the existing NAVTEX service areas, but other aspects may not be compatible with the existing NAVTEX coordination scheme (allocation of transmission times, duration etc.).

6.1.3 Issue B

At MSC 98 the Committee adopted resolution MSC.434(98) on *Performance standards for a ship earth station for use in the GMDSS* and approved amendments to SOLAS chapter IV, enabling, when adopted at MSC 99, the introduction of additional GMDSS mobile satellite service providers. This followed the IMSO report to NCSR 4 noting the suggested timeline provided by Iridium for completing the technical and operational assessment of Iridium in 2018. At MSC 99 the Committee adopted resolution MSC.451(99), *Statement Of Recognition of Maritime Mobile Satellite Services Provided by Iridium Satellite LLC*. MSC 99 also adopted resolution MSC.436(99) on *Amendments to the International Convention for the Safety of Life at Sea*, including amendments through chapter IV to replace references to "Inmarsat" with the term "recognized mobile satellite service". The change reflects the ability of recognized providers of mobile satellite services to meet the GMDSS carriage requirements effective 1 January 2020.

Considering the above discussion IMO invites ITU to [IMO, 2019]:

- 1 when considering issue A, consider frequency allocations for NAVDAT which IMO supports but without committing the Organization regarding future requirements on the use of NAVDAT;
- 2 when considering issue B to take regulatory measures to ensure full protection and availability of the frequency bands to be used by recognized GMDSS satellite service providers for the provision of GMDSS services by 1 January 2020; and
- 3 resolve any issues under Resolution 359 (Rev.WRC-15), in relation to the future operation of newly recognized GMDSS satellite service providers.

6.2 Agenda item 1.9.1

There are some types of autonomous maritime radio devices using automatic identification system (AIS) technology or digital selective calling (DSC) technology, or transmitting synthetic voice messages, or with a combination of those technologies, which have been developed for, and are operating in, the maritime environment, and their number is expected to increase. Some of these devices do not enhance the safety of navigation or serve the purpose of communication between coast stations and ship stations, or between ship stations, or between associated on-board communication stations, or survival craft stations and emergency position-indicating radio (EPIRB) beacon stations, but occupying the spectrum and identities of the maritime mobile service. There is a need to categorize and regulate the usage of autonomous maritime radio devices. ITU at its seventeenth Working Party (WP)

5B session adopted the preliminary draft definition of AMRD developed at the twelfth IMO Joint Experts Group meeting and finalized the definition at its eighteenth WP 5B session in May 2017. The categorization of AMRD and relevant information are contained in the draft new recommendation ITUR M.[AMRD].

Having regard to the above the IMO position is following [IMO, 2019]:

- 1 the integrity of AIS and the Global Maritime Distress and Safety System (GMDSS) should be protected;
- 2 autonomous maritime radio devices which enhance the safety of navigation should be regulated for the use of frequencies and identities of the maritime mobile service; and
- 3 for autonomous maritime radio devices which do not enhance the safety of navigation, regulation of the use of frequencies, and technical and operational characteristics, should benefit both the user of devices as well as maritime safety. A new numbering scheme which is different from those in the existing maritime mobile service should be considered as well.

6.3 Agenda item 1.9.2

6.3.1 VHF Data Exchange System

The VHF Data Exchange System (VDES) was developed by International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) to address emerging indications of overload of the AIS VHF Data Link (VDL) and simultaneously enabling a wider seamless data exchange for the maritime community. The initial concept of VDES includes the function of the Automatic Identification System (AIS), Applications Specific Messages (ASM), VDE terrestrial component and VDE satellite component. The VDES is one of the potential elements of e-navigation. VDES is capable of exchanging ASM, facilitating numerous applications for safety and security of navigation, protection of marine environment, efficiency of shipping and others. VDES will prospectively have a significant beneficial impact on the maritime information services including Aids to Navigation (AtN) and Vessel Traffic Service (VTS) in the future. It can potentially provide local MSI.

The VDES concept includes a satellite component. This system component might be suitable to be used for the transmission of MSI information in remote areas [ITU-R, 2015].

Insufficient study on sharing and compatibility between the VDE satellite component and incumbent services in the same and adjacent frequency bands was the cause that the spectrum issue could not be resolved at World Radiocommunication Conference in 2015 (WRC-15). As a consequence, VDES is still not a complete functional system as a whole. Consequential to WRC-15, the ITU standard for VDES, Recommendation ITU-R M.2092-0, was approved [ITU, 2016]. A remaining outstanding issue is the approval of the satellite component for the VDE channels which is targeted for approval at WRC-19.

According to IALA Guideline 1117 "VDES Overview", the following potential VDES use cases are identified:

- Search and rescue communications;
- Maritime Safety Information;
- Ship Reporting;
- Vessel Traffic Services;
- Charts and Publications;
- Route Exchange; and
- Logistics.

VDES satellite component would offer additional communications in polar regions and other remote areas for the above use cases. These use cases are all cross referenced to Maritime Service Portfolios identified in IMO e-navigation Strategic Implementation Plan (SIM) and possibly also to modernization of GMDSS in future.

The study of the candidate frequency bands 156.0125-157.4375 MHz and 160.6125-162.0375 MHz would mainly concern the relationship with the existing services primarily allocated for the land mobile service and maritime mobile service, and with the services within lower adjacent frequency band from 154 MHz to 156 MHz and for the higher adjacent frequency band from 162 MHz to 164 MHz.

Taking into account the above, the IMO's position in the issue is as follows [IMO, 2019]:

- 1 Recognizing that the VDES satellite component should not bring any harmful interference:
 - modifications should not be required to existing AIS equipment on board existing vessels;
 - the integrity of the GMDSS should be protected;
 - an identification of the frequencies for the VDES satellite component should protect the integrity of the original operational purpose of AIS on the existing AIS frequencies;
- 2 IMO supports the availability of VDES including both terrestrial and satellite components.

6.4 Agenda item 10

Resolution **810** (WRC-15) containing the preliminary agenda for WRC-23, lists as item 2.1, to consider possible spectrum needs and regulatory actions to support Global Maritime Distress and Safety System (GMDSS) modernization and the implementation of e-navigation, in accordance with Resolution **361** (WRC-15) [ITU, 2015, Res. 810].

As a consequence of GMDSS modernization, the SOLAS Convention will be revised, which is preliminarily planned to be finalized by June 2022 and to enter into force in 2024.

MSC- 99 has received an application to recognize an existing mobile satellite system as part of the GMDSS and instructed the NCSR Sub-Committee to undertake the technical and operational evaluation.

Considering the above, IMO's position is to retain agenda item 2.1 of resolution 810 (WRC-15) containing the preliminary agenda for WRC-23, to consider possible spectrum needs and regulatory actions to support Global Maritime Distress and Safety System (GMDSS) modernization and the implementation of e-navigation, in accordance with Resolution **361** (WRC-15), which may need to be amended.

7 CONCLUSIONS

The future of the GMDSS Modernization Plan [IMO, 2016] is closely connected with the development of the e-navigation project and the detailed role of the radiocommunication in this process. Without a doubt a data communication network will be one of the most important parts of the e-navigation [Korc K., 2015].

In the Author's opinion the most important actions required at this stage of work on the GMDSS modernization are decisions taken on the upcoming World Radiocommunication Conference taking place in 2019 (WRC-19) and future World Radiocommunication Conference in 2023 (WRC-23).

The main issue in the work on GMDSS modernization is prepare a good changes in the SOLAS Convention and appropriate changes in the Radio Regulation.

It should be noted that it is very important that the work on changes in Radio Regulation be correlated with the work of the IMO on the modernization of the GMDSS system. The Table 2 reflects the IMO action plan on modernization of the GMDSS system.

Taking into account the above work, the Work Plan for the revision and development of legal instruments, performance standards and guidance material has to be adopted as well.

During this work it is necessary first to identify real user needs and secondly to realize that the modernization of the maritime radiocommunication should not be driven only by technical requirements. In addition, it is necessary to ensure that man-machine-interface and the human element will be taken into account including the training of the personnel. The lessons learnt from the original development and operation of GMDSS should be taken into account as well.

Table 2. Coordinated Plan of Work for the IMO Modernization Project

Year	Year Deliverable
2019	Second draft of the revision of SOLAS and related instruments; Approved revision of the Criteria for the provision of mobile-satellite communication services in GMDSS;
2020	Final draft revision of SOLAS and related instruments; Draft performance standards for NAVDAT;
2021	Approved SOLAS amendments and related instruments; Approved performance standards for NAVDAT;
2022	Adopted SOLAS amendments (and related instruments, as appropriate);
2023	-
2024	SOLAS revisions in force.

Furthermore, the continuous and open process is needed to ensure it remains modern and fully responsive to changes in requirements and evolutions of technology and it will meet the expected e-navigation requirements. To ensure it, a mechanism

for continuous evolution of the maritime radiocommunication (GMDSS) in a systematic way should be created as well.

In this approach to development of the GMDSS it is very important that the integrity of GMDSS must not be jeopardized.

And finally it should be noted that a key to the success of the modernization process of the GMDSS and e-navigation project is not only that the work is completed on time, but also that it has the flexibility to implement changes ahead of schedule.

REFERENCES

- International Telecommunication Union (ITU). Radio Regulations (RR), Geneva, 2015.
- International Telecommunication Union (ITU). RESOLUTION 809 (WRC-15). Agenda for the 2019 World Radio-communication Conference, 2015.
- International Telecommunication Union (ITU). RESOLUTION 810 (WRC-15). Preliminary agenda for the 2023 World Radiocommunication Conference, 2015.
- International Maritime Organization (IMO), Sub-Committee on Navigation, Communications and Search and Rescue - NCSR 4. Report to the MSC, London, 2016.
- International Maritime Organization (IMO), Sub-Committee on Navigation, Communications and Search and Rescue - NCSR 6. Report to the MSC, London, 2019.
- Korcz K.: Concepts of the GMDSS Modernization. [in:] A. Weintrit (ed.): Information, Communication and Environment. Marine Navigation and Safety of Sea Transportation. CRC Press, A Balkema Book, Taylor and Francis Group, Boca Raton – London – New York – Leiden 2015, pp.75-82.
- Korcz K.: Some aspects of the Modernization Plan for the GMDSS. *TransNav, the International Journal on Marine Navigation and Safety of Sea Transportation*, Vol. 11, No. 1, doi:10.12716/1001.11.01.20, pp. 167-174, 2017.
- Radiocommunication Sector of ITU (ITU-R). Recommendation ITU-R M.2010 on Characteristics of a digital system, named Navigational Data for broadcasting maritime safety and security related information from shore-to-ship in the 500 kHz band, Geneva, 2012.
- Radiocommunication Sector of ITU (ITU-R). Recommendation ITU-R M.2058-0 on Characteristics of a digital system, named navigational data for broadcasting maritime safety and security related information from shore-to-ship in the maritime HF frequency band, Geneva, 2014.
- Radiocommunication Sector of ITU (ITU-R). Recommendation ITU-R M.2092-0 on Technical characteristics for a VHF data exchange system in the VHF maritime mobile band, Geneva, 2015.