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| **Radiocommunication Study Groups** |  |
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| Annex 23 to the Working Party 5B Chairman’s Report | |
| Working Document towards a Preliminary draft NEW  report ITU-R M.[NEW\_MARNUM] | |
| Autonomous maritime radio devices | |

**Scope**

**Keywords**

**Glossary / abbreviations**

AIS: Automatic identification system

AIS-SART:Automatic identification system- search and rescue transmitters

AMRD: Autonomous maritime radio device

AtoN: Aid to navigation

DSC: Digital selective calling

EPIRB: Emergency position indicating radio beacon

GMDSS: Global maritime distress and safety system

IMO: International Maritime Organization

MID: Maritime indication digit[s]

MMSI: Maritime mobile service identities

MOB: Man overboard

**Related ITU Recommendations and Reports**

Recommendations

• [ITU-R M.493](http://www.itu.int/rec/R-REC-M.493/en): Digital selective-calling system for use in the maritime mobile service

• [ITU-R M.585-7](http://www.itu.int/rec/R-REC-M.585/en): Assignment and use of identities in the maritime mobile service

• [ITU-R M.1371](http://www.itu.int/rec/R-REC-M.1371/en): Technical characteristics for an automatic identification system using time-division multiple access in the VHF maritime mobile band

# 1 Background

This report addresses Resolution **362 (WRC-15)** which will be agenda item 1.9.1 at WRC-19.

The aim of this agenda item is to prevent unregulated operation and identification of autonomous maritime radio devices (AMRDs) to enhance safety of navigation and to ensure the integrity of the global maritime distress and safety system (GMDSS) by addressing both the spectrum and numbering needs of AMRDs.

There are more and more new AMRDs used in the maritime environment. Identifications of this kind of devices are needed. A rough survey shows that a lot of AMRDs are using maritime mobile service identities (MMSI) defined in the Recommendation ITU-R M.585-7. The random consumption of MMSI hazards the assignment and management of the numbering system, and would threaten the safety of navigation.

Recommendation ITU-R M.585-7 defines the existing numbering scheme used for automatic identification system (AIS) and digital selective calling (DSC) for both MMSI and freeform maritime identities. Numbers can be:

– uniquely allocated to a station; on board a vessel; a coast station; a group of stations; oran aid to navigation (AtoN)

– allocated to one or more devices where the leading digits indicate the type of device but the users of the devices may have no relation to each other.

Recommendation ITU-R M.585-7 defines numbering limited to certain types of device/use.

WRC-19 AI 1.9.1 considers changes to Radio Regulations to support AMRDs. This will almost certainly include novel uses of AIS not presently described in Recommendation ITU-R M.585-7. Where the changes include a new frequency allocation it may be desirable for a different form of transmitted identification to be used.

# 2 Discussion

The existing numbering system of maritime mobile service is defined in the Recommendation  
ITU-R M.585-7 with three Annexes.

Annex 1 describes formats of MMSI for ship stations, coast stations, aircrafts participating in search and rescue operations and other safety-related communications, AIS,AtoN, and crafts associated with a parent ship, summarized as following Table 1.

Table 1

The current assignment and use ofmaritime mobile service identities

|  |  |  |  |
| --- | --- | --- | --- |
| Prefix | Use for | Max capability for a single MID | Remarks |
| MID | Shipstation | 1 000 (with 000trailing)  1 000 000 (all) | Threezeroes trailing MMSIs are assigned to ships needing the internationalpublic correspondence service |
| 0 MID | Group call identities for ship station | 100 000 |  |
| 00 MID | Coast station | 10 000 |  |
| 111 MID | SAR aircraft | 1 000 |  |
| 99 MID | AIS AtoN | 10 000 |  |
| 98 MID | Craftassociated with a parent ship | 10 000 |  |

The maritime indication digit[s] (MID) denotes the administration which has jurisdiction over the station so identified.

Annex 2 describes formats of identification for other maritime devices, such as handheld VHF transceivers with DSC and global navigation satellite system, AIS-search and rescue transmitters (AIS-SART), man overboard (MOB) and emergency position indicating radio beacon (EPIRB)‑AIS, summarized as following Table 2.

Table 2

The current assignment and use ofmaritime identities used for other devices of special purposes

|  |  |  |  |
| --- | --- | --- | --- |
| Prefix | Used for | Max capability for a single MID | Remarks |
| 8 MID | VHF handheld DSC | 100 000 |  |
| 970 X4X5 | AIS-SART | 10 000 | Two digits of X4X5are the manufacturer ID. |
| 972 X4X5 | MOB | 10 000 |
| 974 X4X5 | EPIRB-AIS | 10 000 |

## 2.1 Purpose of transmitting an identification

Numbering supports machine processing of information and association with particular stations and or types of transmitter that fulfil particular roles. The finite number of identities and changes in technology have made it necessary to allow some numbers to be used in several devices [and] to have the same identity. But, unique or non-unique numbers serve different operational needs shown in Table 3 and 4.

TABLE 3

Current uniquely allocated numbers

|  |  |
| --- | --- |
| Use | Reason for unique allocation to station |
| DSC |  |
| Establishing communications with a particular station through DSC or recognised GMDSS satellite service. | Essential given the global coverage |
| SAR services use the information in the MARS database when dealing with distress alerts from vessel stations and from portable VHF radiotelephones. | Essential for operation of the MARS database |
| Enforcement action against misuse of distress alerts. | Distress alert indicates imminent danger to life and in need of assistance. There is an international obligation (SOLAS) to respond and may involve risk to others |
| Acknowledgement of distress alerts | A station that acknowledges a DSC distress alert indicates responsibility, a non-unique number in the global system could create unintended consequences and risk. |
| AIS |  |
| Automatic reporting of position of vessels and hazards (AtoN) which supports decision making for safety of navigation. | Allows simple machine processing for presentation to navigator and use in automatic estimation of closest point of approach and time of closest point of approach and for vessel traffic monitoring.  Permits simple AIS and radar target association.  Permanent AtoNs are permanently marked on navigational charts. |
| Situational awareness of aircraft and vessels deployment during SAR activities | Simplifies identification and efficient management of assets for SAR tasking and communications |
| Monitoring of vessels for security purposes | Essential for analysis |
| Investigation of maritime incidents | Uniquely identifies vessels involved and in the area. |
| Action against misuse | Action against misuse is very much simpler when a station can be uniquely identified. |

TABLE 4

Non-unique numbers – in general, these do not represent hazards to a vessel

|  |  |
| --- | --- |
| Use | Reason for non-unique allocation to station |
| DSC Communications |  |
| Distress alerts for MOB events without radiotelephony | The devices have local effect due to antenna height (a few nautical miles).  They are a distress alert for a single type of event.  They are always associated with MOB-AIS beacons for locations, the risk associated with of multiple devices with same number is considered minimal. |
| AIS |  |
| Devices to assist location of an emergency in the last few nautical miles. | AIS does not have an internationally acknowledged distress alerting function: It is for locating only in the GMDSS.  The numerical prefix identifies the type of target.  The risk associated with multiple devices with same number is considered minimal. Any asset tasked with SAR will |

## 2.2 Relationship of bridge navigational equipment to the present numbering scheme

The International Maritime Organization (IMO) performance standards and International Electrotechnical Commission test standards for bridge equipment assume that a particular number is associated with only a single source and the persistence of targets is not fully defined for graphical displays.

Where different devices provide a position report and use the same identity the way information is displayed to the user will be uncertain. Some navigation equipment supports decision making by associating radar and AIS targets; this function may be disturbed.

For AIS, it is important that anything a vessel may regard as a hazard or supports navigational safety is uniquely identified.

Graphical displays rely upon the leading digit(s) of the AIS identity to determine the displayed symbol as described in IMO Circular SN/Circ.243 Rev.1Amended Guidelines for the Presentation of Navigational-Related Symbols, Terms and Abbreviations:

• 0 are coast stations, it is likely that these appear as Aids to Navigation.

• 1-7 are assumed to be vessel targets although only 270 numbers from 100-799 are defined.

• 970, 972 and 974 indicates an Emergency Locator beacon.

• 99 indicates an Aid to Navigation.

## 2.3 Preliminary scoping

The AMRDs defined in the Resolution **362 (WRC-15)** are mostly operating with AIStechnology as described in Recommendation ITU-R M.1371, orDSC technology as described in Recommendation ITU-R M.493. At the 16th meeting of WP5B, it was recognized that the scope of study would be limited to devices that use RR Appendix **18**frequencies, and the devices such as AIS-SART, AIS-MOB and EPIRB-AIS which are defined in existing recommendations would not be included. At the 12th meeting of IMO/ITU EG, the definition of AMRD was suggested as:

“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 AMRDs are identified:

1 AMRDs that influence the safety of navigation, and

2 AMRDs that do not influence the safety of navigation.”

In the first stage of investigation, AMRDs used in one national market could also be roughly classified into two general groups by purpose of communication, deployment scenario, interested user and some of other factors.

The general group A includes towed fishing net indicator and temporary location beacon for unpowered objects such as floating ice, towed boats or small boats bearing temporary tasks in the area, which have some common natures such as:

– they are in moving status, and always moving in the merchant ship route;

– the information is broadcasted openly to unspecific users;

– they influence the safety of navigation and the sent information need to be read by moving ships.

The general group B,such as fixed aquaculture net indicators in some countries and oceanic meteorological or observation data transmitters, which have some common natures such as:

– they are deployed on a fixed platform, moving within a very small area, or rarely moving;

– the interested users are always specific;

– they do not influence the safety of navigation, and the information does not need to be read by ships.

## 2.4 Basic consideration

The discussion below takes into account the following factors:

– the existing AIS and DSC technologies used by the AMRDs;

– the existing numbering system;

– the compatibility between different numbering systems;

– the necessary transition from the existing applications to the future.

For AMRD there are four things to consider:

1 Devices that use DSC should conform to latest revision of Recommendation  
ITU-R M.493. These devices utilize Channel 70, and they should be identified with a number in accordance with the latest revision of Recommendation ITU-R M.585.   
These devices should be considered to effect safety of life and the GMDSS, since they use channels that are used by the GMDSS.

2 Devices that use AIS should conform to latest revision of Recommendation  
ITU-R M.1371. These devices utilize the AIS channels, and they should be identified with a number in accordance with the latest revision of Recommendation ITU-R M.585. These devices should be considered to effect safety of navigation and safety of life, since they share the AIS channels which are used for both safety services and are included in the GMDSS.

3 Devices that are used for maritime service and do not use DSC or AIS may use frequencies from RR Appendix **18** or some other frequencies, and the numbering scheme is TBD.

4 Devices that are not used for maritime service should not be allowed to use frequencies from RR Appendix **18**.

According to the Recommendation ITU-R M.1371-5, the user identification (User ID) of AIS should be the MMSI. The MMSI is 30 bits long, maximally containing 9 decimal digits.The 9 decimal digits would be the most significant digits limited by the existing recommendation. MMSI is also used in the address and self-identification parts by DSC as described in Recommendation ITU-R M.493as:(M, I) (D, X4) (X5, X6) (X7, X8) (X9, 0). Each pair of digits is coded in ten-bit error-detecting code, which is from 00 to 99.

The general group A of AMRDs could continue to operate in the maritime mobile service, and use the existing maritime identities but different from the MMSI defined in Annex 1 of the Recommendation ITU-R M.585-7. In this way, it is needed to consider the revision to Annex 2 of the Recommendation for allowing such general kind of devices.

On the other hand, new frequency bands and numbering scheme should be considered for the general group B of AMRDs. But it is noted that the existing technical characteristics limits the significant digits of the new identities. Considering the potential huge number of this kind of devices, if a fully expanded new numbering system is designed, the relevant Recommendations need to be revised on the data stream structure, as well as the operating frequencies.

*[Editor’s note: A new numbering scheme for Group B devices can be any format if they use a different part of the spectrum.]*

## 2.5 Preliminary plan

Considering that there are so many kinds of AMRDs made by different manufactures, and the transmission coverage is usually small, one administration proposed two options for preliminary plan of numbering scheme in the format of existing maritime identities defined in the Recommendation ITU-R M.585-7 for the AMRDs tentatively used by both general groups as following.

**Option 1:**

[**9102**]**X3X4Z5Z6Z7Z8Z9**for the use of general group A]

**9112X3X4Z5Z6Z7Z8Z9**for the tentative use of general group B during the transition period

**9102**(**12**) –the prefix of the number;

**X3X4**– indication of the individual group of the AMRDs. It could be harmonized globally, or regulated by national authorities according to national conditions. For example, 00 represents towed fishing net indicators or aquaculture net indicators, 05 represents wave-gliders or oceanic meteorological data transmitters, 10 represents floating ice indicators, etc.

**Z5Z6Z7Z8Z9**–the series number. The largest number for each reserved individual group indicators is 100 000.

**Option 2:**

[**9102**]**X3X4Y5Y6Z7Z8Z9**for the use ofgeneral group A

**9112X3X4Y5Y6Z7Z8Z9**for the tentative use of general group B during the transition period

**9102**(**12**)–the prefix of the number;

**X3X4**– indication of the individual group of the AMRDs, the same as in   
Option 1;

**Y5Y6**– identities of the manufacturers, assigned by CIRM, or reserved for national authority assignment;

**Z7Z8Z9**–the series number. The largest number for each reserved individual group indicators is 1 000.

It could be noted that both options emphasize the necessity of identifying the individual classification of the AMRDs, since this is very important to the receivers of the information. And the repeat using of the series numbers might be inevitable in both options, very similar as in use ofmaritime identities used for other devices of special purposes which is defined in Annex 2 of the Recommendation ITU-R M.585-7.

The main difference of the two options is whether to include the identities of the manufacturers in the number. That means in Option 1 all numbers must be centralized assigned and managed by the national authority. The advantages would be:

– regulate the numbering of AMRDs in a more powerful and efficient way;

– the national authority could ensure the SAR organization to get the comprehensive information if necessary in any time;

– the repeat using of the series numbers might be reduced in some way;

– give the flexibility to the authority for plan the numbering scheme according to the national conditions. For example, the authority could also plan one or two of digits to identify the nationalmanufacturers.

However, the disadvantage would be the heavier work load to the managing organization. While in Option 2 the numbers could be assigned and managed by the manufacturers, which seems to be an easier way, but obviously, the advantages of Option 1 will be lost.

The use of a temporary number allocation scheme ‘91’ for general group B devices is undesirable, manufacturers would prefer to just move to a final solution. Also the implication that general group B devices do not influence the safety of navigation as they are fixed and not moving may not be always true.

## 2.6 Further discussion

In the discussion of the numbering issue for the AMRDs, and recalling that need for the future numbering system of the future GMDSS considered during the scoping exercise of GMDSS review, some further discussions were raised without any conclusion.

– If there is a need to prepare a unique identity for every single station or equipment or device operating in maritime environment in the future? Such an extended ID has to be compatible with the existing system but may be transmitted in the second or separated message.

– Should a different format of numbering system for the new AMRDs be designed, or a harmonized format of numbering system be designed for all stations or equipment or devices operating in the maritime environment?

The view of the Joint IMO/ITU Experts Group, Document [5B/113](http://www.itu.int/md/R15-WP5B-C-0113/en), was that for dynamic navigation markers, initial guidance should be given by IMO so that ITU can take appropriate measures regarding the assignment and use of identities.

# 3 Consideration on the revision of Recommendation ITU-R M.585-7

## 3.1 Scope

According to the interim outcome of study, AMRDs are divided into two groups, respectively named as Group A which enhances the safety of navigation, and Group B which does not enhance the safety of navigation. Only the Group A would be allowed to use the frequency bands and identities in the maritime mobile service. Additional frequency bands and identification scheme needed to be developed for the Group B. It might be possible and useful to create new and independent addressing and numbering systems, depending on the implemented technology by the Group B. While, the numbering scheme of Group A should be in the scope of maritime mobile service and be described in the revised version of Recommendation ITU-R M.585.

Preliminary studies on the numbering issue showed that the prefix of “90” in 9-digits format as the identification for AMRDs Group A in the maritime mobile service seems to be feasible. If a different form of identification system for the Group B is developed and transmitted by additional frequency bands, there would be no need to have any restriction to the prefix of numbering, such as “91”, for the Group B now.

## 3.2 Indication of category

Both the preliminary numbering plan options contained 2-digits **X3X4**which were intended for indicating the category of AMRDs. By compiling and consolidating information from the PDNR.[AMRD], it was found that the existing AMRDs in the market

including Group A and Group B could basically be classified as following categories:

− MOB, Group A or Group B, depending on technologies used;

− Diver routine, Group B;

− Fishing equipment indicator for navigation hazard indication, TBD;

− Fishing equipment indicator for recovery, Group B;

− Track objects which are not a hazard to navigation, Group B;

− Mobile AtoN, Group A;

− Oceanic meteorological buoys, TBD, depending on the assessment of IMO.

Besides, there is a possible future application for an AMRD which may be termed dynamic navigation marker, but the category is still to be determined.

It seems that 1-digit for the category indication of AMRDs is enough, especially considering that only the numbering for Group A is included in the maritime mobile service identities.

## 3.3 Indication of manufacturers

The main purpose of the numbering scheme for the AMRDs is for the identification of the special objects by ships, maritime administration staffs and SAR participants, and the need to reduce the working burden of national maritime mobile service authorities. Discussions with experts from different fields including administrative organizations, shipping companies, institutions and manufacturers, led to the conclusion that it is preferable to include digits to indicate the manufacturer of a device.

## 3.4 Consideration on additional plan option for Group A AMRDs

An additional numbering plan for Group A AMRDs in the maritime mobile service identity is proposed as follows:

[**9102X3Y4Y5Z6Z7Z8Z9**

**9102** - prefix of the number;

**X3**- indication of certain category of AMRDs. The value could be proposed as listed below:

1: Fishing equipment indicator for navigation hazard indication;

[2: Mobile AtoN indicating a hazard;]

[3: Oceanic meteorological buoys;]

4: reserved for Dynamic navigation markers;

5~9 and 0: reserved for other future AMRDs.

[Note: the MOB has been assigned the identity in format of 972XXXXXX.]

**Y4Y5** -identities of the manufacturers, assigned by CIRM;

**Z6Z7Z8Z9** -the series number. The largest number for each reserved individual group indicators is 10, 000.]

# 4 Conclusion

[TBD]