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Input paper for the following Committee(s): check as appropriate Purpose of paper:

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Agenda item [[2]](#footnote-3) G1008《remote control and monitoring of marine aids to navigation》

Technical Domain / Task Number 2 ………5.1.1…………………

Author(s) / Submitter(s) CHINA MSA

The communication methods of RCM and its advantages and disadvantages

# Summary

In order to let IALA members have a clearer understanding of several communication methods of AtoN’s RCM, this proposal mainly conducts comparative analysis from the aspects of signal stability, coverage, energy consumption, communication delay, communication cost, network security, etc., and proposes pros and cons of different methods.

## Purpose of the document

This proposal compares the advantages and disadvantages of various RCM communication methods from the aspects of signal stability, energy consumption and communication costs, so as to provide a useful reference for the revision of the IALA Guideline 1008 on Remote control and monitoring of marine aids to navigation, and it is also the first time for IALA members to use the RCMS or replace the existing RCMS to help.

## Related documents

IALA Guideline 1008 on Remote control and monitoring of marine aids to navigation

# Background

With the rapid development of communication technology, the communication methods of RCM also tend to be diversified. At present, the mainstream applications include public network RCM, AIS RCM and satellite RCM systems. This proposal compares and analyzes several key indicators, hoping to provide help for IALA members to choose the RCM system.

# Discussion

This proposal mainly compares and analyzes the public network RCM, AIS RCM, and satellite RCM in the form of a matrix table, hoping to provide help for the revision of the IALA Guideline 1008 on Remote control and monitoring of marine aids to navigation and the selection of RCMS by IALA members.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Public network RCM | AIS RCM | Satellite RCM |
| Signal stability | The signal stability is relatively good within the coverage area, which meets the needs of RCMS. | AIS has been used for many years, and the signal stability is good, which meets the needs of RCMS, and pays attention to the problem of signal interference. | Satellite communication technology is already very mature, and the signal stability is high. For example, China has more than 7,800 AtoNs using Beidou satellite RCM, and the signal stability is good, meeting the needs of RCM. |
| coverage | Considering the limited coverage of the public network, the signal is stable within the coverage area, but when there are many AtoNs in an area that are far away from the base station and the AtoNs cannot receive signals from the base station, the public network RCM are not applicable in that area. (Generally within 15 nautical miles from the base station) | AIS RCM coverage is slightly larger than the public network RCM range, which can basically meet the needs of RCM. (Generally within 33 nautical miles from the base station) | Relying on satellite communication can realize all-regional communication, and realize RCM of all AtoNs. For example, China's Beidou Communication has completed three generations of construction, and can now achieve global positioning and communication. |
| communication delay | Communication delays within seconds. | Communication delays within seconds. | The data is counted for 1 second to 5 seconds. In fact, the RCMS does not need real-time communication, because real-time communication will be a huge burden in terms of communication cost and power consumption. According to the demand, real-time communication is not required. In practice, make a reasonable launch period to expect a good result. Therefore, with the advancement of modern communication technology, a few seconds of communication delay will not affect the performance of RCM. |
| Energy consumption | Slightly smaller than satellite RCM. | Slightly smaller than satellite RCM. | Since the signal needs to be transmitted to the satellite, the energy consumption is relatively large. When using solar panels, if the light in the area is not ideal all the year round, it is not recommended to use solar panels. Combining communication costs and energy consumption, choose an appropriate transmission cycle to ensure RCM in place. |
| Cost-effective | When AtoNs in the area are all within the Internet coverage, it is cost-effective to choose Internet RCM. The cost of communication is lower than that of satellite communication, and the technology and application are relatively mature. | This involves the cost of the construction of the AIS base station, because the policies of each country are different. For example, in China, AIS communication base stations are constructed and maintained by the MSA, so AIS communication does not incur costs. | Although the cost of satellite communication has been reduced a lot in recent years, satellite communication can be used on a large scale, but relatively speaking, the cost of satellite communication is still higher than the cost of Internet communication. At the same time, it also involves the cost of lamps that can receive satellite signals. |
| cyber security | There is a risk of being stolen and modified during the transmission of measurement and control data through the public network | In the process of AIS AtoN transmitting data to AIS base station, there is a risk of data theft, and AIS AtoN is easy to be disguised by illegal base stations. | Compared with the above communication methods, it is more secure. |
| environmental protection | The RCMS combined with solar panels and plastic buoys will contribute in terms of cost and reduction of ships. After the reasonable application of the RCMS, the cruise of the ship can be greatly reduced, the failure or deviation of AtoN can be found in time, and the timely repair can be ensured, thereby ensuring the stable performance of the AtoN. | The RCMS combined with solar panels and plastic buoys will contribute in terms of cost and reduction of ships. After the reasonable application of the RCMS, the cruise of the ship can be greatly reduced, the failure or deviation of AtoN can be found in time, and the timely repair can be ensured, thereby ensuring the stable performance of the AtoN. | The RCMS combined with solar panels and plastic buoys will contribute in terms of cost and reduction of ships. After the reasonable application of the RCMS, the cruise of the ship can be greatly reduced, the failure or deviation of AtoN can be found in time, and the timely repair can be ensured, thereby ensuring the stable performance of the AtoN. |
| future possibilities | Due to the small coverage of the public network, it is less likely to seek further development in the future. | In the future, AIS base stations can be used to share navigation aid data with ships (including autonomous ships). | First, in the future, AtoN’s data can be shared with ships (including autonomous ships) through satellites. The second is to use the satellite timing system to carry out the development of the same frequency and flashing of the AtoNs and the channel. |

# References

[1] IALA Guideline 1008 on Remote control and monitoring of marine aids to navigation

# Request for action by the committee

The committee is invited to note the information and take action as appropriate.

1. Input document number, to be assigned by the Committee Secretary [↑](#footnote-ref-2)
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