Input paper: VTS53-6.3.4

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

**□** ARM **□** ENG **□** PAP **X** Input

**□** ENAV **X** VTS **□** Information

Agenda item 6

Technical Domain / Task Number …………………………………

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Suggestion about formulating “Functional Requirements and Technical Performance Requirements for Bridge Area VTS”

# SUMMARY

With the continuous construction of bridges across rivers and bays (canyons) all over the world, the possibillities of ship collision accidents is increasing. Each accident will bring serious consequences such as bridge structure damage, ship damage, casualties, public psychological impact and major economic losses. According to the relevant investigation and analysis of The Permanent International Association of Navigation Congresses(PIANC), 70% of the bridge collision accidents are caused by human factors, which means that through the establishment of an effective prevention system, accidents can be significantly reduced.

Many bridges use VTS system to prevent bridge collision accidents. However, the functional requirements, performance requirements and installation guidence of the VTS in the bridge area are different from those of the existing VTS. Therefore, it is recommended to formulate guidelines and put forward relevant suggestions on the functional requirements and technical means of the VTS in the bridge area.

This proposal further discusses the necessity and main contents of formulating the guideline of "Functional Requirements and Technical Performance Requirements for Bridge Area VTS”.

## Purpose of the document

* To discuss the importance and content of formulating the guideline of "Functional Requirements and Technical Performance Requirements for Bridge Area VTS”
* Promoting the incorporation of this task into the IALA VTS 2024-2027 work plan.

# BACKGROUND

* The prevention of ship-bridge collisions is a subject involving many aspects. The conventional practice is to use necessary devices and facilities such as protective shell or anti-collision pier during the designing and construction process of the bridge to minimize the loss caused by ship-bridge collision. However, it can’t avoid the accidents of ships-bridge accidents from happening. The use of VTS system to control the information and activities of ships in the bridge area can effectively avoid the occurrence of ship collision accidents.
* However, the VTS in the bridge area needs to consider the special needs such as the snarrow water in the bridge area, the high requirements for real-time tracking, the need to get the ship height data, and the limited installation space of the equipment provided by the bridge body.
* Comparing to the VTS requirements in the bridge area, the existing VTS specifications have the following shortcomes: Low functional pertinence, not suitable for radar performance (multiple reflections), and lack of ultra-high detection sensors.
* Therefore, it is necessary to put forward targeted requirements for the special functional requirements, performance considerations, target monitoring means, equipment technology selection, etc. of the VTS in the bridge area.

# discussion

## NECESSITY

* Most of the radars recommended in G1111 guideline are pulse transmitting radars, and intermittent transmission is adopted to avoid the interference caused by insufficient isolation of receiving and transmitting, which leads to the detection blind area in the short range.
* The radar recommended in G1111 guideline is the waveguide crack radar antenna, which is harsh on the installation conditions of space, load and other equipment. The installation in the bridge area needs to set up a separate station or platform.
* There are no requirements for ship height detection and technical means in the VTS guide, so it is impossible to master the ship height.
* The technical means proposed in the existing VTS technical guide, especially radar, video monitoring and other equipment, cannot better meet the VTS functional requirements in the bridge area. With the development of radar technology, video processing and deep learning technology, new technologies should be introduced to meet the functional requirements of VTS system in bridge area and promote the development of VTS technology.

## CONTENT

* Determine a basic framework of Bridge VTS system functional requirements, which can be divided into basic functions and optional functions; From the two aspects of the risk that ships are prone to cross the bridge, the basic functions include yaw collision pier early warning and super-high collision bridge deck early warning. The optional functions include proposed from the navigation management measures in the water area of the bridge area, such as speed limit, no anchoring, etc;
* Determining the performance requirements (or factors to be considered) of the VTS in the bridge area, the requirements for the water area covered by the VTS in the bridge area, the ship speed tracking requirements, the ship height detection accuracy requirements, and the installation requirements;
* Suggestions for VTS technology selection in the bridge area: if phased array radar or continuous wave radar is adopted, the transmitting and receiving can be carried out at the same time, which is conducive to short-range target detection. Moreover, Doppler technology is adopted, with high moving target detection accuracy, which is suitable for the target monitoring and control application scenario with high requirements for short-range and speed accuracy in the water area of the bridge area. Laser superelevation detection, video processing and deep learning algorithm are used for superelevation detection

# Action requested of the Committee

Requests the Committee:

Consider the contents of this proposal and list it as a new task.