 Input paper: [[1]](#footnote-1) VTS39-9.2.5

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

**□** ARM **□** ENG **□** PAP **x** Input

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

Agenda item [[2]](#footnote-2) 9

Technical Domain / Task Number 2 9.2

Author(s) / Submitter(s) Peter Eade

Making V.128 suitable for its readership

# Summary

Vissim does not support the current draft of V.128 Edition 4 that has been submitted for approval at VTS39 as Input Paper VTS39-9.2.1. Vissim has concerns that this paper, if published, may have the following consequences:

1. Possible commercial, contractual and legal problems between systems integrators and equipment suppliers
2. Misunderstood by VTS Authorities (its intended readership)
3. Damage to IALA’s reputation

The current draft does not naturally connect with other IALA VTS Committee documents and as such does not assist VTS Authorities with the implementation of a VTS System that is aligned with all of IALA’s recommendations. In fact, this draft seems to completely ignore other Committee documents and takes the view that a VTS System is simply a set of, mainly, hardware components. It then describes such components to a level of technical detail that most VTS Authorities will neither understand nor need.

In an attempt to provide a constructive alternative, I have invested some time to propose a new structure that I believe would avoid all of the above issues. It is currently in a skeleton form with some initial material to give a flavour of the direction I think that this document should adopt. The aim has been to link V.128 much more closely with the types of VTS service (INS, TOS and NAS). It seems logical that when defining a system that will support a particular type of service, there should be clear traceability of how the system components map with the requirements of each type of service. Given more time, this is the focus that I believe should be central to the new edition of IALA Recommendation V.128.

Please note: While the attached document is presented as an alternative approach, other possible document structures should be debated by the committee before a new structure is selected.

## Purpose of the document

This input paper is provided to demonstrate to the Committee that the excessively technical approach adopted by Input Paper VTS39-9.2.1 is not the only way that V.128 can be structured. The new structure aims to show that a more integrated approach with other IALA documents, could lead to an improved document that will be more appropriate and user friendly for its intended readership.

## Related documents

The related documents are:

1. Input Papers 9.2.1 and 9.2.2
2. Input Paper 3.1.4

# Background

I originally wrote to the Technical coordinator of IALA in May 2013, expressing concern that V.128 was developing into a document that would be too technical for its intended readership. The draft document is now into its fifth year of editing, including two inter-sessional meetings, and still cannot be defined as user friendly or fit for purpose.

The recent inter-sessional meeting (January 15) only reviewed Section 1 and previously submitted comments. Vissim still has concerns about the content of many sections of the document.

# Discussion

IALA members have invested a lot of time and effort in producing recommendations that will assist VTS Authorities and bring improved understanding of how VTS Services should be provided. It is therefore inconsistent with IALA’s approach for an important document such as V.128 to take a fundamentally different approach and not show how the VTS System should be designed around the types of services that a VTS Authority could provide.

As an intergovernmental organisation, IALA documents should be completely neutral of any commercial interest. However, when a Recommendation includes so much technical information, it begins to risk becoming a specification. The question then has to be asked as to whether such technical information favours any particular supplier. This is a risk for IALA.

# References

1. Annex A – V.128 Edition 4 (new) - See below

# Action requested of the Committee

The Committee is requested to:

1. Not approve Input Paper 9.2.1
2. Recommend that Working Group 2 produce a new structure for V.128 that aligns with other IALA documentation
3. Allocate additional time to the development of V.128 based on a new structure
4. Consider whether the current leadership of Working Group 2 should be changed so that the new approach can be led more appropriately.
5. V.128 Edition 4 (New)

Document Revisions

International Association of Marine Aids to Navigation and Lighthouse Authorities

***AISM***Association Internationale de Signalisation Maritime ***IALA***

10, rue des Gaudines

78100 Saint Germain en Laye, France

Telephone: +33 1 34 51 70 01 Fax: +33 1 34 51 82 05

e-mail: [contact@iala-aism.org](mailto:iala-aism@wanadoo.fr) Internet: [www.iala-aism.org](http://www.iala-aism.org)

**IALA Recommendation**

**V-128**

**On**

**Operational and Technical Performance Requirements for VTS Equipment**

**Edition 4 (new)**

**Xxxxxxx 201X**

**Edition 4 / October 2015**

Revisions to the IALA Document are to be noted in the table prior to the issue of a revised document.

|  |  |  |
| --- | --- | --- |
| **Date** | **Page / Section Revised** | **Requirement for Revision** |
| Edition 1.1  June 2005 | Addition of Annex 6 – Hydrological and Meteorological equipment | Annexes added as they are completed to ensure all aspects of VTS equipment are covered. |
| Edition 2.0  December 2005 | Restructured to include operational performance requirements.  Annex 2 amended to reflect new annex on operational performance requirements.  Annex 6 renamed to Annex 5  Annex 1,3,4,6 added | Annexes added as they are completed to ensure all aspects of VTS operations and equipment are covered. |
| Edition 3.0  June 2007 | Editorial changes to correct errors in paragraph numbering, cross references etc.  Structure of annexes harmonised, part of Annex 2 moved to new IALA Guideline (Establishment of Radar Services)  Clarification of text, few sentences in annex 1 and 2. | Inconsistence in cross references, table of contents etc. in edition 2.0  Varying structure of individual annexes  Users of the document provided ideas to clarification of text on some subjects. |
| Edition 4.0  Xxxxxxxxx 201X | Complete document rewritten and updated.  Sections 6,7,9-13 added  Also reformatted according to latest IALA template (now only one single annex). | Include additional, new and emerging technology.  Make the document more user friendly, apply Plain English, improve consistency, remove duplications and include additional considerations for ports and inland waterways. |
|  |  |  |
|  |  |  |

IALA Recommendation on Operational and Technical Performance Requirements for VTS Equipment

(Recommendation V-128)

THE COUNCIL:

**RECALLING** the function of IALA with respect to Safety of Navigation, the efficiency of maritime transport and the protection of the environment;

**NOTING** that Chapter V (12) of the International Convention for the Safety of Life at Sea 1974 (SOLAS 74 as amended) requires Contracting Governments planning or implementing VTS wherever possible to follow the guidelines adopted by the Organization by Resolution A. 857(20);

**NOTING ALSO** that that IMO Resolution A.857(20), Annex section 2.2.2recommends that in planning and establishing a VTS, the Contracting Government or Governments or the competent authority should *inter-alia* establish appropriate standards for shore and offshore-based equipment;

**NOTING FURTHER** that thatNational Members provide shore infrastructure to support the aim of IMO to improve the safety of navigation and the protection of the environment;

**RECOGNISING** that IALA fosters the safe, economic and efficient movement of vessels through improvement and harmonisation of aids to navigation, including vessel traffic services, worldwide;

**RECOGNISING ALSO** that harmonisation of vessel traffic services would be enhanced by the introduction of international technical performance requirements for VTS;

**ADOPTS** the Operational and Technical Performance Requirements for VTS as set out in the annex of this recommendation; and,

**RECOMMENDS** that Competent Authorities providing Vessel Traffic Services take into consideration the appropriate Operational and Technical Performance Requirements contained in this recommendation when establishing appropriate standards for shore and offshore-based VTS equipment.

**RECOMMENDS ALSO** that the VTS authorities consider this recommendation in conjunction with the standards set by the Competent Authority when implementing or operating VTS equipment.

**RECOMMENDS FURTHER** thatVTS training organisations consider this recommendation when planning personnel training.

Table of Contents

[Document Revisions 3](#_Toc414034378)

[Table of Contents 6](#_Toc414034379)

[Abbreviations 8](#_Toc414034380)

[1 Introduction 9](#_Toc414034381)

[1.1 Modern Technology Environment 9](#_Toc414034382)

[1.2 Changes in the VTS Technology Landscape 9](#_Toc414034383)

[1.3 Document Structure 9](#_Toc414034384)

[2 Core Operational Requirements 11](#_Toc414034385)

[2.1 Information Service (INS) 11](#_Toc414034386)

[2.1.1 INS Functions 11](#_Toc414034387)

[2.2 Traffic Organisation Service (TOS) 11](#_Toc414034388)

[2.2.1 TOS Functions 12](#_Toc414034389)

[2.3 Navigational Assistance Service (NAS) 12](#_Toc414034390)

[2.3.1 NAS Functions 12](#_Toc414034391)

[3 Core Technical Performance Requirements 13](#_Toc414034392)

[3.1 INS Technical Requirements 13](#_Toc414034393)

[3.1.1 Traffic Image Compilation 13](#_Toc414034394)

[3.1.2 Communication Services 14](#_Toc414034395)

[3.1.3 Meteorological Information gathering 15](#_Toc414034396)

[3.1.4 Hydrological Information gathering 15](#_Toc414034397)

[3.1.5 Prevailing routing information and restrictions to manoeuvrability 15](#_Toc414034398)

[3.1.6 Status of Navigational Aids 15](#_Toc414034399)

[3.1.7 Relevant Port information 15](#_Toc414034400)

[3.2 TOS Technical Requirements 15](#_Toc414034401)

[3.2.1 Vessel Movement Scheduling / Separation / Prioritisation 15](#_Toc414034402)

[3.2.2 Sailing Plans 15](#_Toc414034403)

[3.2.3 Pilotage 15](#_Toc414034404)

[3.2.4 Special procedures for managing Hazardous Cargo carrying vessels 15](#_Toc414034405)

[3.2.5 Management of berths / anchorages 15](#_Toc414034406)

[3.2.6 Ship Reporting System 15](#_Toc414034407)

[3.2.7 Fairways and Speed Limits 15](#_Toc414034408)

[3.2.8 Re-routing of traffic around special events or works. 15](#_Toc414034409)

[3.2.9 Enforcement action 15](#_Toc414034410)

[3.3 NAS Additional Technical Requirements 15](#_Toc414034411)

[3.3.1 Grounding warnings 15](#_Toc414034412)

[3.3.2 Collision warning 15](#_Toc414034413)

[3.3.3 Advice where on board equipment has failed 15](#_Toc414034414)

[4 Detecting and Tracking targets within the VTS Area 16](#_Toc414034415)

[4.1 Automatic Identification System 16](#_Toc414034416)

[4.2 Radar 16](#_Toc414034417)

[4.3 Electro-Optics and CCTV 16](#_Toc414034418)

[5 Ensuring Effective Communication 17](#_Toc414034419)

[5.1 Maritime VHF Communication 17](#_Toc414034420)

[5.2 Other forms of Radio Communication 17](#_Toc414034421)

[5.3 Satellite & Mobile Telephones 17](#_Toc414034422)

[6 Environmental Monitoring and Protection 18](#_Toc414034423)

[6.1 Environment Monitoring 18](#_Toc414034424)

[6.2 Environmental Protection 18](#_Toc414034425)

[7 Presentation of Information to the Operator 19](#_Toc414034426)

[8 Cooperation with other VTS Authorities / other agencies 20](#_Toc414034427)

[9 Through life support 21](#_Toc414034428)

[9.1 Commercial off the Shelf Equipment 21](#_Toc414034429)

[9.2 Software Support 21](#_Toc414034430)

[9.3 Hardware Support 21](#_Toc414034431)

[9.4 Mid life upgrade 21](#_Toc414034432)

Abbreviations

# Introduction

The main purpose of this Recommendation is to assist the VTS Authority in the definition, specification, and through life management of a VTS system. The document addresses the relationship between the Operational Requirements and VTS system performance (Technical) requirements and how these reflect into a system design for an effective VTS solution.

## Modern Technology Environment

In the 1980’s and much of the 1990’s, VTS Systems were custom designed bespoke products that used technology that was not used within society in general. However, in the age of the Internet and cloud computing, the situation is very different. In the 1980’s and 90’s the technology used within most VTS systems was still applicable 10 years after it was originally purchased. In the current environment, the latest mobile phone often has more advanced technology than a VTS system purchased only a few years earlier.

In addition, it must be remembered that when the Estonia sank in the Baltic in 1994, coverage of the incident was limited. When the Costa Concordia sank in the Mediterranean in 2012, the situation on board was filmed by many of the surviving passengers using their mobile phones. It is clear that future maritime incidents will also have evidence collected by many independent sources and that such information will be quickly and widely circulated through social media and the Internet. It is therefore essential that VTS Authorities recognise this step change in the use of technology and ensure that their VTS system is effective in collecting an accurate record of all actions taken so that any incident can be fully justified based upon high quality recorded data.

IALA document V119 highlights the fact that a VTS is a considerable investment and this remains a true statement. However, as mentioned above it must be remembered that in current times any incident may be recorded by multiple independent individuals and therefore the need for a VTS Authority to have a reliable record of activity within its area of responsibility should now be considered within the formal risk assessment as the political consequences of not having information to back up its actions during an incident could be disastrous.

## Changes in the VTS Technology Landscape

In the 1980’s and 90s, the primary sensor of a VTS system was described as being its Radar. In the 21st Century that is not necessarily still as true as it was at that time. During this time AIS has been introduced as a mandatory fit for all SOLAS and Passenger carrying vessels and these are normally the vessels of greatest interest to a VTS Authority. As AIS also provides identification information, whereas Radar does not, it is now appropriate to consider AIS as the primary source of information for a VTS system with radar providing a supporting capability to detect non-AIS vessels or in the case of a failure of the on board transponder equipment.

Communication remains the core function of a VTS System and remains the only technology that has barely changed since the 1980’s and 90s. However, DSC has been introduced on VHF Channel 70 and eNav functionality may result in part of the maritime VHF band migrating to digital technology by the start of the next decade, perhaps earlier.

## Document Structure

As has been mentioned above, there have been many changes that have affected VTS technology over the last 10 – 20 years and as such this document needs to change to reflect more accurately the way in which technology is applied for a VTS system. The earlier editions of V128 have referred to VTS systems using the terms Basic, Standard and Advanced. However, these terms have frequently been applied incorrectly to systems as a whole when they mainly refer to configurations of the radar technology. As mentioned above, Radar is no longer the principle sensor of a VTS system and therefore focusing terminology relating to the system as a whole on a single sensor no longer seems appropriate. Therefore in this Edition 4 of V128, the terms Basic, Standard and Advanced have therefore been dropped.

This edition of V128 will aim to focus the types of VTS System on the types of Vessel Traffic Service as defined in IALA guideline 1089 (Provision of Vessel Traffic Services). These are the Information Service (INS), Traffic Organisation Service (TOS) and Navigation Assistance Service (NAS). This will more accurately align VTS Systems with the operational requirements of VTS Authorities and will provide a more coherent and logical approach to the definition of Technical Requirements for a VTS System procurement.

The document addresses the Operation and Technical Requirements using the following structure:

* Core Operational requirements;
* Core Technical Performance Requirements
* Detecting and Tracking targets within the VTS Area
* Environmental Monitoring and Protection
* Presentation of Information to the Operator
* Cooperation with other VTS Authorities / other agencies
* Through life support

The core operational Requirements identified in section 2 will be traced through to technical requirements in section 3. This will aid VTS Authorities to translate their own Operational Requirements into technical requirements that can be used to select the necessary components for a VTS system that meets their needs.

Sections 2 and 3 therefore form the main backbone of this recommendation. However, to assist VTS Authorities further, sections 4 – 7 provide further information about some of the common technology that comprises a VTS system. This includes technology for the detection and tracking of targets (for example: AIS, Radar and EO (CCTV)), for ensuring effective communication with Vessels at Sea and for monitoring the environment within the VTS area. Section 7 provides some basic information about the presentation of information for operator interaction but this section will simply focus on the main features and functionality that a VTS Operator may use. Due to rapid changes in technology, this section will not reference any specific hardware platform so that continued product development by system suppliers can offer new and exciting features for the benefit of VTS Operators and Authorities. Section 8 provides details about the way VTS systems could be interconnected so that information can be shared between VTS Authorities. For the first time, this edition of V.128 will also address the issue of the Through Life upkeep and support of VTS systems as it is important that any modern system is properly supported with appropriate software upgrades and technology updates in order to ensure it keeps pace with the latest developments in technology.

# Core Operational Requirements

This section of V128 will draw information from the IALA Guideline 1089 (Provision of Vessel Traffic Services). As the principle IALA document that provides clarity about the operation issues regarding each type of Vessel Traffic Service, Guideline 1089 provides details of the operational issues of each type of Vessel Traffic Service. These factors will be assessed in this section and transformed into Technical requirements in Section 3.

IALA Recommendation V119 provides details of the process that should be employed to ascertain the key local issues for each VTS implementation and advises on a risk assessment and cost benefit analysis to fully justify the decision to proceed.

IALA Recommendation V127 provides details on the Operational procedures for VTS. Whilst this document does not define actual procedures, it provides recommendations for the content of the procedures that each VTS Authority would implement. As such, these procedural guidelines will be matched to Operational Requirements to ensure that they are translated into appropriate Technical Requirements as would be required from a VTS System that has been designed to support the appropriate type of Vessel Traffic Service.

## Information Service (INS)

IALA Guideline 1089 describes an Information Service as the fundamental service provided by a VTS and indicates that this is provided by all VTS. However, it also refers to the Information Service as being the means of relaying information from the VTS sensors or a Traffic Image to vessels at sea. An Information Service is therefore provided in situations where professional navigational or management advice will not be required. All decision making is understood to be taken on board the vessel with the assistance of Information provided by the VTS.

### INS Functions

The functional capability required for implementing an INS VTS is as follows:

1. Traffic Image compilation
2. Communication Services
3. Meteorological Information gathering
4. Hydrological Information gathering
5. Prevailing routing information and restrictions to manoeuvrability
6. Status of Navigational Aids
7. Relevant Port information

## Traffic Organisation Service (TOS)

A Traffic Organisational Service is declared by a VTS Authority when there is a need to organise or manage the vessel traffic within the VTS Area to avoid the development of dangerous situations. A TOS is often applied in areas of high traffic density or where movements of vessels may affect other traffic flows.

### TOS Functions

The functional capability required for the implementation of a TOS includes all INS functions listed above and the following in addition:

1. Vessel Movement Scheduling / Separation / Prioritisation
2. Sailing Plans
3. Pilotage
4. Special procedures for managing Hazardous Cargo carrying vessels
5. Management of berths / anchorages
6. Ship Reporting System
7. Fairways and Speed Limits
8. Re-routing of traffic around special events or works.
9. Enforcement action

## Navigational Assistance Service (NAS)

Navigational Assistance is a service that may be requested by a Vessel and is provided by the VTS in addition to either its INS or its TOS Service. It may also be initiated by the VTS if a vessel is observed to be in need of such assistance in order to navigate to the nearest place of safety.

It is important to note that a NAS service is a temporary upgrade in the provision of the normal Vessel Traffic Service in order to assist a vessel at a time when it may be experiencing difficulties or is observed to be inexperienced with regard to the normal navigational issues of the VTS area.

### NAS Functions

The functional capability required for the implementation of a NAS includes:

1. Grounding warnings
2. Collision warning
3. Advice where on board equipment has failed

# Core Technical Performance Requirements

IMO Resolution A.857 states that “a VTS should at all times be capable of generating a comprehensive overview of the traffic in its service area.” This indicates that all VTS systems should be capable of generating a Traffic Image relating to the VTS Area. In addition, all VTS implementations are required to provide the INS functions as a minimum requirement and therefore Communication, Meteorological, Hydrographical and other local information services are included as core components of VTS systems.

From the lists of functions derived from IALA Recommendation 1089 as shown in section 2 above it can be seen that the TOS functions mainly relate to an enhanced functional capability. The sensor and basic monitoring capability is similar for both INS and TOS and for INS + NAS and TOS + NAS. Therefore the key differentiator for VTS systems will be based on the functional capability required by the VTS Authority. This section is therefore sub-divided as follows:

1. INS Technical Requirements
2. TOS Technical Requirements
3. NAS Additional Technical Requirements

## INS Technical Requirements

As briefly mentioned above, the INS requirements are the foundation components of a VTS and it is the INS Core Operational Requirements that leads to the definition of technical requirements for the physical equipment that will be used to construct the VTS System. The core requirements are each addressed within the sub-sections below.

### Traffic Image Compilation

As referenced above, IMO Resolution A.857 states that “a VTS should at all times be capable of generating a comprehensive overview of the traffic in its service area.” The traffic in its VTS area will include SOLAS Vessels, Passenger carrying vessels, Fishing Vessels, Leisure Vessels and unknown vessels. In terms of AIS, these can be categorised as Class A Vessels, Class B vessels and Unknown Vessels.

The presentation of this data will form the basis of the Traffic Display. In many cases, a VTS Authority may be only interested in the AIS Class A equipped Vessels and therefore the VTS could be established as an AIS only VTS. However, it must be remembered that in the modern “connected” society, almost everyone who has a mobile phone can become an instant journalist uploading videos, images and tweets to the Internet that are then re-transmitted many times. Should an incident occur within the VTS Area, it is highly recommended that the VTS Authority should deploy Radar to ensure that non AIS vessels are also detected and tracked and included within the main Traffic Display. Therefore, the core technical requirements for Traffic Image Compilation include:

1. AIS Identification and Tracking
2. Radar Detection and Tracking
3. Electro-optic / CCTV Detection, Recognition and Identification
4. Traffic Image presentation
5. Traffic Image recording
6. INS display software functionality

The Detection and Tracking of targets is further analysed with Section 4 and the presentation of the Traffic Image is further described in Section 7.

### Communication Services

Communication is the only absolutely essential component of a VTS System. Without the ability to communicate Traffic Image information to vessels at sea, the VTS Authority cannot provide a service to incoming or departing vessels. It is therefore essential that good communication coverage is planned and implemented for the whole of the VTS Area. It should be noted that this includes both voice and data communication services. eNavigation may enable data communication with vessels for the sharing of VTS Information Services and therefore the radio communication architecture should be designed to accommodate all forms of communication services.

VHF Communication is the main form of voice communication with and between maritime vessels. Whilst a section of the maritime VHF band may be converted for digital use from 2017 onwards, the remaining section of the maritime band is one of the few remaining radio services that uses analogue technology. It is therefore inefficient in its use of the bandwidth in the VHF section of the frequency spectrum and VTS Authorities should therefore use the available channels sparingly.

The analogue, broadcast, nature of the VHF maritime band has resulted in misunderstandings between VTS Operators and watch-keeping personnel on board ships. It is strongly recommended that where VTS Operators need to communicate with a specific vessel, the call should be initiated by addressing the MMSI number of the vessel instead of using a Channel 16 broadcast.

VHF Communication is Horizon limited in range and therefore where the VTS Area extends beyond the horizon, other forms of communication service are necessary. This could include MF/HF Radio, Satellite Communication Services and mobile phone services. A vessel that is within Coastal waters but out of VHF range, may be contacted by mobile phone if it is within an area of coastal GSM coverage.

Therefore, the core technical requirements for Traffic Image Compilation include:

1. VHF Communication coverage,
2. MF / HF Communication Coverage,
3. Satellite & Mobile Phone Coverage.

Further details on these services is provided in Section 5 of this document.

### Meteorological Information gathering

### Hydrological Information gathering

### Prevailing routing information and restrictions to manoeuvrability

### Status of Navigational Aids

### Relevant Port information

## TOS Technical Requirements

### Vessel Movement Scheduling / Separation / Prioritisation

### Sailing Plans

### Pilotage

### Special procedures for managing Hazardous Cargo carrying vessels

### Management of berths / anchorages

### Ship Reporting System

### Fairways and Speed Limits

### Re-routing of traffic around special events or works.

### Enforcement action

## NAS Additional Technical Requirements

### Grounding warnings

### Collision warning

### Advice where on board equipment has failed

# Detecting and Tracking targets within the VTS Area

Detecting and tracking targets within the VTS area is a core part of the Traffic Image compilation function of VTS systems. However, traffic image compilation is a function that will be based on different issues for each VTS Authority and the selected sensors for traffic compilation do not determine the level of capability of the VTS. Each VTS Authority should therefore assess its traffic image needs based upon the actual circumstances that exist within its VTS Area.

As has been mentioned above, Radar is no longer the primary sensor for VTS systems even though it has an important role. Since its introduction, AIS has proven to be reliable and has therefore taken over as the primary source of information. However, the issues that VTS Authorities must address relate to the consequences of the failure of the on board AIS Transponder (even if it is a rare event). If the AIS Transponder were to fail on board a SOLAS or Passenger carrying vessel at the most critical point on its approach or departure, how much time would be available before the vessel would pass a point of no return? These questions should be addressed as part of the risk analysis that is undertaken when planning a VTS (part of the process defined in IALA Recommendation V119).

Like Air Traffic Control, Vessel Traffic Services are now highly dependent on the use of on board transponders and, as eNavigation begins to be introduced, the level of data exchange between the VTS Centre and Vessels at Sea is likely to increase. As VTS Operators become more accustomed to reliable data exchange, there can be a tendency to assume that it will always be available. However, a VTS System must be designed to ensure safe navigation at all times and the design should be based upon a graceful degradation approach so that a failure of one part does not take the entire system offline.

Radar is the backup to the normal VTS data exchange. Where the direct data exchange with a vessel is not available or fails for whatever reason, radar provides a service that is entirely under the control of the VTS Authority. In such situations, the VTS Authority should then consider which type of radar sensor is most appropriate for their needs. If no other traffic is likely to be nearby, then almost any type of radar will suit the VTS Authority’s needs, however, if the high risk areas include high traffic density then the VTS Authority should ensure that the resolution of the radar is appropriate to enable it to effectively manage the situation.

## Automatic Identification System

## Radar

## Electro-Optics and CCTV

# Ensuring Effective Communication

Communication is very important to a VTS Authority and errors in communication are frequently identified as the cause of maritime accidents. The ability to communicate and exchange information with vessels at sea is a core function of a Vessel Traffic Service (See section 3.1.2). Therefore understanding the geographic coverage, which types of communication to use and when to use them are key aspects of the VTS System Design and for VTS Operator training.

VTS Operator workload is often quoted as an issue for many VTS Authorities and the communications components of a VTS system can make a big difference to that workload. If the communications system provides good quality audio and is straightforward and easy to use, then the VTS Operator will benefit. If the communications components are of poor reception quality, complex to use and ensuring communication with the right vessel proves difficult, then the VTS Operator workload will increase which may have a detrimental effect on the operational performance of the VTS centre. Therefore good quality and easy to use communication services should be considered as an essential element of a VTS System.

## Maritime VHF Communication

## Other forms of Radio Communication

## Satellite & Mobile Telephones

# Environmental Monitoring and Protection

Understanding the Environmental conditions throughout the VTS Area is an important aspect of a VTS System as providing advice about how the weather or the tide may affect navigation is a key role of the VTS.

## Environment Monitoring

## Environmental Protection

# Presentation of Information to the Operator

# Cooperation with other VTS Authorities / other agencies

# Through life support

## Commercial off the Shelf Equipment

## Software Support

## Hardware Support

## Mid life upgrade

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