



# VTS MANUAL

## EDITION 6



**IALA**





# VESSEL TRAFFIC SERVICES MANUAL

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# FOREWORD

This sixth edition of the IALA VTS Manual has been prepared by the VTS Committee. It updates the guidance and advice provided in previous editions to assist authorities considering the implementation of new Vessel Traffic Services or the upgrading of an existing service.

The VTS Committee, formed in 1981, has evolved in recent years. Its membership now represents most of the world's leading national maritime authorities whose delegates are widely experienced mariners and VTS professionals. The VTS Committee is also supported through participation from relevant international sister organizations. This ensures that the Committee is able to speak with international authority on VTS matters and, importantly, to develop new procedures to meet the emerging needs for modern traffic management and to enhance maritime safety.

The VTS Manual is intended to be a general source of reference on VTS policy to meet the needs of the profession and those responsible for managing its activities. It also provides a pointer to the more detailed material that any VTS professional may seek.

IALA welcomes feedback about its publications. Readers are invited to send comments or suggestions, which will be taken into account when considering the publication of the next edition.



# ACKNOWLEDGEMENT

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Captain Paul Owen.

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## CHAPTER 1. INTRODUCTION

### 0101 Purpose of the Manual

This is the sixth edition of the IALA VTS Manual, which is acknowledged by the VTS community as being the most comprehensive guide to Vessel Traffic Services (VTS) as well as a point of reference for further detailed study.

The content is aimed at a wide readership to encompass all who are in any way involved with the policy for provision, operation and effectiveness of VTS, including those with management responsibility at national level and those who deliver services to the mariner.

### 0102 Development of VTS - A Brief History

The movement of goods by sea has supported world commerce for centuries, giving rise to a need for ships to navigate safely and efficiently. To this end, authorities throughout the world have provided aids to navigation in and around their coastal waters. The earliest aids to navigation were shore-side beacons and lights, followed by the introduction of buoys. Over the years, these aids have been steadily improved upon with greater visibility and range and the addition of audible signals.

Not long after World War II, it became clear that short range, audio-visual aids to navigation were insufficient to enable the full utilisation of port facilities in all conditions of visibility and increasing traffic density. Adverse weather and congestion resulted in delays of vessel traffic movement, which in turn created serious disruption to port operations with consequences for other modes of transport.

A consensus emerged among maritime experts that traffic monitoring using shore-based radar combined with communications could be applied to enhance safety and efficiency in port areas and their approaches. The first radar based Port Control station was established in Douglas, Isle of Man, in 1948.

Later the same year, the port of Liverpool established a radar site and similar trials took place in Rotterdam. In the 1950s, a number of shore-based radar sites were established around the world as well as in European ports, including the approaches to the port of Amsterdam in 1952 and the entire Rotterdam port area in 1956.

Although these early systems were intended to minimise traffic delays and increase the efficiency of traffic flow in general, attention was also given to the number of shipping accidents and the ways in which these might be reduced. Studies were carried out to see what effect that these rudimentary vessel traffic services were having on reducing the number of accidents in port areas using radar surveillance. The studies concluded that, in addition to increasing the operational hours, thereby providing better utilisation of a port's capacity, the number of accidents was also being reduced.

In the 1960s and 1970s major shipping disasters, including Torrey Canyon, Metula and Amoco Cadiz, made the public keenly aware of the environmental damage that a shipping accident could cause. The ensuing public outcry for protection of the marine environment brought substantial pressure on authorities to implement measures to enhance the safety of shipping. The concern that such disasters might happen in port approaches and port areas further expanded the use of radar surveillance and the management of vessel traffic.



Figure 1

Harbour control by radar - Douglas harbour installation by Cossor Ltd

In these early days of radar-aided traffic management, the view on how to proceed further was hotly debated among the various port authorities, including pilots and shipmasters. The exercise of regulatory management over shipping from ashore was a new phenomenon and it soon became apparent that some form of international harmonisation of these emerging vessel traffic services was needed.

In 1968 the Inter-Governmental Maritime Consultative Organization (IMCO) examined the Recommendation A.158 - 'Port Advisory Services', adopted by the Maritime Safety Committee, which recommended to governments that they consider setting up such services in ports and their approaches, that warrant it by the importance and nature of their traffic, particularly in oil terminals and ports where noxious or hazardous cargoes are loaded and unloaded. This Recommendation also instructed masters that an early indication of the expected time of arrival to the appropriate authorities would also contribute to safety, due regard being given to the actual conditions and the existing local arrangements.

In 1985 the International Maritime Organization (IMO) adopted Resolution, A.578(14) - 'Guidelines for Vessel Traffic Services'. In general these guidelines described the operational procedures and planning for VTS. The Guidelines did not address liability or responsibility, which needed to be considered by the authority establishing a VTS, nor did they create new rights to enact legislation on the requirements for shipping. With respect to personnel, the Guidelines did not specifically address recruitment, qualifications and training of VTS operators.

The requirements for VTS were considered by IALA and a follow-up study was undertaken jointly with the International Maritime Pilots' Association (IMPA) and the International Association of Ports and Harbors (IAPH). The original IMO Resolution on VTS was revised and updated with the adoption in 1997 of IMO Assembly Resolution A.857(20) - 'Guidelines for Vessel Traffic Services', which is the currently internationally recognised source policy document for VTS.

The development of modern technology was very important for the technical concept of VTS. The concept developed from a simple radar and voice radio system, with the aim of enhancing navigation in poor visibility, to a modern system using multiple sensors with the objectives of enhancing safety of navigation, improving the efficiency of maritime traffic and protecting the marine environment.

The realities of modern shipping, with larger and less manoeuvrable ships, traffic congestion in ports and waterways, hazardous cargoes and the potential for environmental damage, demanded that sophisticated measures be taken to reduce risks. Establishing Vessel Traffic Services was and still is a significant response to that demand. When established, implemented and operated within the context of international laws, conventions and

maritime practices and, with the co-operation of vessel operators, a VTS can contribute substantially to the safety and efficiency of maritime traffic, protection of the environment as well as security within the port area.

As a result of the improvements in efficiency, safety and the reduction of potential environmental pollution experienced by authorities using a VTS, together with the rapid developments in computer technology, the number of VTS type operations has increased considerably and there are now well over 500 of these services operating worldwide. In some countries VTS centres have also been established for vessels operating in inland waters with similar overall objectives that apply to the coastal and offshore systems.

As Vessel Traffic Services increased in number throughout the world, the operating concepts have led to VTS being established to cover coastal waters, ports or harbours, rivers and inland waterways. Vessel traffic can be regulated passively by the utilisation of Traffic Separation Schemes (TSS), or actively by interaction with the VTS centre from which operations are being managed, or both.

### 0103 Consultative Bodies and VTS

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IALA attaches great importance to its association with other maritime consultative bodies that participate in the work of the VTS Committee and who have played a key role in the development of guidance and the contents of this publication. These consultative bodies include the following international organizations:

- ✓ International Maritime Pilots' Association (IMPA);
- ✓ International Harbour Masters' Association (IHMA);
- ✓ International Federation of Shipmasters' Associations (IFSMA);
- ✓ International Association of Ports and Harbors (IAPH); and
- ✓ The Nautical Institute (NI)

#### Definitions and Abbreviations

A list of definitions and a glossary of abbreviations/ acronyms of the terms commonly used in connection with VTS can be found at ANNEX D.





## CHAPTER 2. LEGAL FRAMEWORK AND GUIDELINES FOR VTS

### 0201 Introduction

The successful organization and provision of Vessel Traffic Services generates a self-evident need for international agreement as to how shipping from various flag-states can successfully and harmoniously interact. At the same time, there is also a need for domestic national and regional law to reflect universally accepted objectives in relation to the ports that such shipping uses.

There is the requirement, therefore, to have a clear and unambiguous link from the global concept, characterised in Lord Donaldson's report to the UK Government in 1993 - 'Safer Ships, Cleaner Seas' - to the local bye-law requirements that might govern the actions of a single VTS Operator in a small local port. Generally, the mariner wishes to be part of a regime where the regulatory requirements and procedures for all ports are consistent, the only principal difference between ports being location.

It is the purpose of this chapter to demonstrate the link between internationally agreed conventions and the successful provision of VTS at a local level as part of an effective safety management system.

### 0202 The United Nations and International Law

Several major developments in international law have occurred under the auspices of the United Nations. These range from the development in the 1970-80s of the Law of the Sea to, more recently, the negotiation and adoption of several key international treaties in such areas as international environmental law, international economic law, the legal measures to counter international terrorism, and the creation of new international entities.

### 0203 United Nations Convention on the Law Of the Sea

The United Nations Convention on the Law of the Sea (UNCLOS) was adopted in 1982. UNCLOS lays down a comprehensive regime of law and order in the world's oceans and seas; establishing rules governing all uses of the oceans and their resources. It embodies in one instrument traditional rules for the uses of the oceans and introduces new legal concepts and addresses new concerns. The sovereignty of a coastal State extends, beyond its land territory and internal waters and, in the case of an archipelagic State, its archipelagic waters, to an adjacent belt of sea, described as the territorial sea. The sovereignty over the territorial sea is exercised subject to this Convention and to other rules of international law.

As a result, coastal States can claim jurisdiction over internal waters, territorial seas, contiguous zones, archipelagic waters, exclusive economic zones (EEZs) and the continental shelf. However,

the extent of the jurisdiction that can be claimed is different for each of the waters, seas and zones. When a VTS is being considered, care should be taken to establish the extent of jurisdiction that can be applied to the VTS area and its sub-areas or sectors, noting that participation is not mandatory outside of territorial waters.

With regard to the authority that may be given to a VTS, a State retains the right to control its territorial waters and all vessels that are subject to the jurisdiction of the State. Therefore, the authority to establish and operate VTS in a region is clearly established, including the right to mandate participation in a VTS scheme and to regulate a vessel's movements. Within territorial waters, a coastal State may exercise its authority subject to the right of innocent passage. Beyond territorial waters, a State's authority with regard to VTS is substantially reduced.

In straits used for international navigation, a VTS Authority cannot restrict or impede the innocent passage of vessels. In these instances a State should endeavour to enter into agreements with neighbouring States, or other maritime nations, to agree standards of conduct for vessels operating in these waters. These standards may include provisions for voluntary participation in a VTS or the requirements of an internationally agreed Ship Reporting System.

(Note: The full text of UNCLOS is currently available at [www.un.org/Depts/los/index.htm](http://www.un.org/Depts/los/index.htm).)

The Division for Ocean Affairs and the Law of the Sea (DOALOS) of the Office of Legal Affairs of the United Nations serves as the secretariat of the Convention on the Law Of the Sea and provides information, advice and assistance to States with a view to providing a better understanding of the Convention and the related Agreements, their wider acceptance, uniform and consistent application and effective implementation. The Division monitors all developments relating to the Convention, the law of the sea and ocean affairs, and reports annually to the General Assembly of the United Nations.

Although the International Maritime Organization (IMO) is explicitly mentioned in only one of the articles of UNCLOS (article 2 of Annex VIII), several provisions in the Convention refer to the 'competent international organization' to adopt international shipping rules and standards in matters concerning maritime safety, efficiency of navigation and the prevention of marine pollution from vessels and by dumping. In such cases, the expression 'competent international organization', when used in the singular in UNCLOS, applies exclusively to IMO, bearing in mind its global mandate as a specialised agency of the United Nations.

### 0204 International Maritime Organization (IMO)

It has always been recognized that the best way of improving safety at sea is by developing

international regulations that are followed by all shipping nations and from the mid-19th century onwards a number of such treaties were adopted. Several countries proposed that a permanent international body should be established to promote maritime safety more effectively, but it was not until the establishment of the United Nations itself that these hopes were realized. In 1948 an international conference in Geneva adopted a convention formally establishing IMO (the original name was the Inter-Governmental Maritime Consultative Organization, or IMCO, but the name was changed in 1982 to IMO). The IMO Convention entered into force in 1958 and the new Organization met for the first time the following year.

The purposes of the Organization, as summarized by Article 1(a) of the Convention, are 'to provide machinery for cooperation among Governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade; to encourage and facilitate the general adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation and prevention and control of marine pollution from ships'. The Organization is also empowered to deal with administrative and legal matters related to these purposes.

## 0205 IMO - Mandate

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IMO's first task was to adopt a new version of the International Convention for the Safety of Life at Sea (SOLAS), the most important of all treaties dealing with maritime safety. This was achieved in 1960 and IMO then turned its attention to such matters as the facilitation of international maritime traffic, load lines and the carriage of dangerous goods, while the system of measuring the tonnage of ships was revised.

But although safety was and remains IMO's most important responsibility, a new problem began to emerge - pollution. The growth in the amount of oil being transported by sea and in the size of oil tankers was of particular concern and the Torrey Canyon disaster of 1967, in which 120,000 tonnes of oil was spilled, demonstrated the scale of the problem.

During the next few years IMO introduced a series of measures designed to prevent tanker accidents and to minimize their consequences. It also tackled the environmental threat caused by routine operations such as the cleaning of oil cargo tanks and the disposal of engine room wastes - in tonnage terms a bigger menace than accidental pollution.

The most important of all these measures was the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78). It covers not only accidental and operational oil pollution but also pollution by chemicals, goods in

packaged form, sewage, garbage and air pollution.

IMO was also given the task of establishing a system for providing compensation to those who had suffered financially as a result of pollution. Two treaties were adopted, in 1969 and 1971, which enabled victims of oil pollution to obtain compensation much more simply and quickly than had been possible before. Both treaties were amended in 1992, and again in 2000, to increase the limits of compensation payable to victims of pollution. A number of other legal conventions have been developed since, most of which concern liability and compensation issues.

Also in the 1970s a global search and rescue system was initiated, with the establishment of the International Mobile Satellite Organization (IMSO), which has greatly improved the provision of radio and other messages to ships.

The Global Maritime Distress and Safety System (GMDSS) was adopted in 1988 and began to be phased in from 1992. In February 1999, the GMDSS became fully operational, so that now a ship that is in distress anywhere in the world can be virtually guaranteed assistance, even if the ship's crew do not have time to radio for help, as the message will be transmitted automatically.

Two initiatives relate to the human element in shipping. On 1 July 1998 the International Safety Management Code entered into force and became applicable to all ships and mobile offshore drilling units of 500 gross tonnage and above from 1 July 2002.

In July 2004 a comprehensive security regime for international shipping, including the International Ship and Port Facility Security (ISPS) Code became mandatory under SOLAS.

In 2005, IMO adopted amendments to the Convention for the Suppression of Unlawful Acts (SUA) Against the Safety of Maritime Navigation, 1988 and its related Protocol (the 2005 SUA Protocols), which amongst other things, introduced the right of a State to board a ship flying the flag of another State when the requesting State has reasonable grounds to suspect that the ship or a person on board the ship is, has been, or is about to be involved in, the commission of an offence under the Convention.

As IMO instruments have entered into force and been implemented, developments in technology and/or lessons learned from accidents have led to changes and amendments being adopted. The focus on implementation continues, with the technical co-operation programme a key strand of IMO's work.

Key issues on the IMO agenda in 2016 included:

- ✓ protection of the marine environment by the introduction of the Ballast Water Management Convention amongst other measures;
- ✓ addressing the reduction of greenhouse gas



emissions from ships and thereby ensuring IMO's contribution to the climate change issue;

- ✓ keeping the safety of life at sea and the human element, especially the seafarer, at the heart of IMO's work; and
- ✓ protecting maritime radio frequencies.

IMO's mission statement, as stated in Resolution A.1060(28) - 'Strategic Plan for the Organization', covers the six year period 2014 to 2019:

'The mission of the International Maritime Organization (IMO) as a United Nations specialized agency is to promote safe, secure, environmentally sound, efficient and sustainable shipping through cooperation. This will be accomplished by adopting the highest practicable standards of maritime safety and security, efficiency of navigation and prevention and control of pollution from ships, as well as through consideration of the related legal matters and effective implementation of IMO's instruments with a view to their universal and uniform application.'

## 0206 Member States, NGOs and IGOs

IMO currently has 171 Member States and three Associate Members. In 2014 there were 76 international Non-Governmental Organizations (NGO) in consultative status with IMO, of which IALA have been one such organization since 1961. Non-governmental international organizations that have the capability to make a substantial contribution to the work of IMO may be granted consultative status by the Council with the approval of the Assembly.

IMO may enter into agreements of co-operation with other Inter-Governmental Organizations (IGO) on matters of common interest with a view to ensuring maximum co-ordination in respect of such matters. In 2014 there were 64 inter-governmental organizations that have signed agreements of co-operation with IMO.

All Members may participate at meetings of IMO bodies in charge of the elaboration and adoption of recommendations containing safety and anti-pollution rules and standards. These rules and standards are normally adopted by consensus; and

All States, irrespective of whether or not they are Members of IMO or the United Nations, are invited to participate at IMO conferences for the adoption of new IMO conventions.

## 0207 Structure of IMO

The Organization consists of an Assembly, a Council and five main Committees: the Maritime Safety Committee; the Marine Environment Protection Committee; the Legal Committee; the Technical Co-operation Committee and the Facilitation Committee and a number of Sub-Committees support the work of the main technical committees.

The Assembly is the highest Governing Body of the Organization. It consists of all Member States and it meets once every two years in regular sessions, but may also meet in an extraordinary session if necessary. The Assembly is responsible for approving the work programme, voting the budget and determining the financial arrangements of the Organization. The Assembly also elects the Council.

The Maritime Safety Committee (MSC) is the highest technical body of the Organization. It consists of all Member States. The functions of the Maritime Safety Committee are to 'consider any matter within the scope of the Organization concerned with aids to navigation, construction and equipment of vessels, manning from a safety standpoint, rules for the prevention of collisions, handling of dangerous cargoes, maritime safety procedures and requirements, hydrographic information, log-books and navigational records, marine casualty investigations, salvage and rescue and any other matters directly affecting maritime safety'.

The MSC is also required to provide machinery for performing any duties assigned to it by the IMO Convention or any duty within its scope of work that may be assigned to it by or under any international instrument and accepted by the Organization. It also has the responsibility for considering and submitting recommendations and guidelines on safety for possible adoption by the Assembly. The expanded MSC adopts amendments to conventions such as SOLAS and includes all Member States as well as those countries that are Party to conventions such as SOLAS even if they are not IMO Member States.

## 0208 IMO Conventions

There are many Conventions concerned with maritime safety, marine pollution and liability and compensation. There is one directly related to VTS, namely the SOLAS Convention (Chapter V Regulation 12).

### 0208.1 Safety Of Life At Sea (SOLAS) Convention

This Convention in its successive forms is generally regarded as the most important of all international treaties concerning the safety of merchant ships. The first version was adopted in 1914, in response to the Titanic disaster, the second in 1929, the third in 1948 and the fourth in 1960. The 1974 version includes the tacit acceptance procedure - which provides that an amendment shall enter into force on a specified date unless, before that date, objections to the amendment are received from an agreed number of Parties. As a result the 1974 Convention has been updated and amended on numerous occasions. The Convention in force today is sometimes referred to as SOLAS, 1974, as amended.

### 0208.2 SOLAS Chapter V - Safety of Navigation

Chapter V identifies certain navigation safety services that should be provided by Contracting

Governments and sets out provisions of an operational nature applicable in general to all ships on all voyages. This is in contrast to the Convention as a whole, which only applies to certain classes of ship engaged on international voyages.

### 0208.3 SOLAS Chapter V - Regulation 12 - VTS

Regulation 12, which came into force in July 2002, contains five paragraphs. These can be viewed at ANNEX B.

## 0209 IMO Resolutions and Codes

Besides Conventions, IMO has also issued a series of Resolutions and Codes, including guidelines on navigation issues and performance standards for ship borne navigational and radio communications equipment. Some are simply Recommendations - though such is their wide acceptance that they effectively mark international policy - while others are referred to by relevant Regulations of specific Conventions, thereby giving them the same weight as the Convention Regulations themselves.

### 0209.1 Safety of Navigation & Maritime Security

The events of 11 September 2001 sent shock waves that were to have a global impact, not least in the maritime community. At the IMO Diplomatic Conference in December 2002, amendments to SOLAS Chapter XI were adopted. The new Chapter XI-2 introduced regulations under the heading - 'Special Measures to Enhance Maritime Security', as well as the International Code for the Security of Ships and Port Facilities (ISPS Code).

The ISPS Code is a comprehensive set of measures to enhance the security of ships and port facilities as well as the security of passengers and crews and has two parts, one mandatory and one recommendatory. In essence, the Code takes the approach that ensuring the security of ships and port facilities is a risk management activity and that, to determine what security measures are appropriate, an assessment of the risks must be made in each particular case. The purpose of the Code is to provide a standardised, consistent framework for evaluating risk, enabling Governments to offset changes in threat with changes in vulnerability for ships and port facilities through determination of appropriate security levels and corresponding security measures.

The ISPS Code indirectly affects a VTS centre, which is generally part of a port's infrastructure. Port facilities, to which Chapter XI-2 applies, are required to develop and maintain a port facility security plan on the basis of a port facility security assessment. These facilities are also required to designate port facility security officers who, together with appropriate port facility security personnel, are required to undergo training in maritime security in accordance with the guidance given in Part B of the ISPS Code. They are also required to conduct drills and exercises with respect to the port facility security plan.

### 0209.2 Places of Refuge and Maritime Assistance Services

In November 2003, the IMO Assembly adopted two Resolutions addressing the issue of places of refuge for ships in distress - an important step in assisting those involved in incidents that may lead to the need for a place of refuge to make the right decisions at the right time.

IMO Resolution A.949(23) - 'Guidelines On Places Of Refuge For Ships In Need Of Assistance', is intended for use when a ship is in need of assistance but the safety of life is not involved. Where the safety of life is involved, the provisions of the SAR Convention should continue to be followed. (Amendment proposed by INTERTANKO and others)

The guidelines recognize that, when a ship has suffered an incident, the best way of preventing damage or pollution from its progressive deterioration is to transfer its cargo and bunkers, and to repair the casualty. Such an operation is best carried out in a place of refuge. However, to bring such a ship into a place of refuge near a coast may endanger the coastal State, both economically and from the environmental point of view, and local authorities and populations may strongly object to the operation.

IMO Resolution A.950(23) - 'Maritime Assistance Services' (MAS), recommends that all coastal States should establish a MAS. The principal purposes would be to receive the various reports, consultations and notifications required in a number of IMO instruments; monitoring a ship's situation if such a report indicates that an incident may give rise to a situation whereby the ship may be in need of assistance; serving as the point of contact if the ship's situation is not a distress situation but nevertheless requires exchanges of information between the ship and the coastal State, and for serving as the point of contact between those involved in a marine salvage operation undertaken by private facilities if the coastal State considers that it should monitor all phases of the operation.

The need to review the issues surrounding the need for places of refuge was included in a list of measures aimed at enhancing safety and minimizing the risk of oil pollution, drawn up in December 2000 in response to the oil tanker Erika incident of December 1999. The November 2002 sinking of the oil tanker Prestige further highlighted the issue.

International law recognizes the right of States to regulate entry into their ports (UNCLOS, Article 2, refers to the sovereignty of a coastal State over its land territory, internal waters, archipelagic waters and the territorial sea). The right of a foreign ship to stop and anchor in cases of force majeure or distress is explicitly referred to by UNCLOS in the case of navigation in the territorial sea (Article 18(2)), Straits used for international navigation (Article 39.1(c)) and in archipelagic waters (Article 54).





The right of a foreign ship to enter a port or internal waters of another State in situations of force majeure or distress is not regulated by UNCLOS, although this constitutes an internationally accepted practice, at least in order to preserve human life. This, however, does not preclude the adoption of rules or guidelines complementing the provisions of UNCLOS.

### **0209.3 Standards for Training Certification and Watchkeeping (STCW)**

The 1978 STCW Convention was the first to establish basic requirements on training, certification and watchkeeping for seafarers on an international level. Previously the standards of training, certification and watchkeeping of officers and ratings were established by individual governments, usually without reference to practices in other countries. As a result standards and procedures varied widely, even though shipping is the most international of all industries. The Convention prescribes minimum standards relating to training, certification and watchkeeping for seafarers which countries are obliged to meet or exceed.

On 1<sup>st</sup> February 1997, the 1995 amendments to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978 entered into force. They greatly improved seafarer standards and, for the first time, gave IMO itself powers to check Government actions with Parties required to submit information to IMO regarding their compliance with the Convention.

These amendments, adopted by the 1995 Conference, represented a major revision of the Convention, in response to a recognized need to bring the Convention up to date and to respond to critics who pointed out the many vague phrases, such as 'to the satisfaction of the administration', which resulted in different interpretations being made.

The 1995 Conference was of particular importance for VTS, with the adoption of Resolution 10. The Conference invited the International Maritime Organization to consider developing provisions covering the training and certification of maritime pilots, VTSOs and maritime personnel employed on mobile offshore units for inclusion in the 1978 STCW Convention or in such other instrument or instruments as may be appropriate.

The Manila amendments to the STCW Convention and Code were adopted on 25<sup>th</sup> June 2010, marking a major revision of the STCW Convention and Code. The 2010 amendments came into force on 1<sup>st</sup> January 2012 under the tacit acceptance procedure and are aimed at bringing the Convention and Code up to date with developments since they were initially adopted and to enable them to address issues that are anticipated to emerge in the foreseeable future.

The amendments also drew attention to the use of the SMCP (Standard Marine Communication Phrases) together with VTS procedures.

Partly in response to STCW 1995 and partly in response to demands from its membership, IALA developed a training regime (V-103) for VTSOs to match the format and requirements of those established for mariners in STCW 1995. This training regime was initially approved by IMO in MSC Circ.952, which was superseded in 2002 by MSC Circ.1065 - 'IALA Standards For Training And Certification Of Vessel Traffic Service (VTS) Personnel' (See ANNEX C). This approval by IMO of the IALA standard of training was recognised as a significant milestone for the VTS world in general and for VTSOs in particular.

### **0209.4 Marine Pollution - Particularly Sensitive Sea Areas (PSSA)**

A Particularly Sensitive Sea Area (PSSA) is an area that needs special protection through action by IMO because of its significance for recognised ecological or socio-economic or scientific reasons and which may be vulnerable to damage by international maritime activities.

Guidelines on designating a Particularly Sensitive Sea Area (PSSA) are contained in IMO Resolution A.982(24) - 'Revised Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas (PSSAs)'. These guidelines include criteria to allow areas to be designated a PSSA if they fulfil a number of criteria, including: ecological criteria, such as unique or rare ecosystem, diversity of the ecosystem or vulnerability to degradation by natural events or human activities; social, cultural and economic criteria, such as significance of the area for recreation or tourism; and scientific and educational criteria, such as biological research or historical value. The provisions of the United Nations Convention on the Law of the Sea (UNCLOS) are also relevant.

When an area is approved as being a particularly sensitive sea area, specific measures can be used to control the maritime activities in that area, such as routing measures, strict application of MARPOL discharge and equipment requirements for ships, such as oil tankers and installation of VTS.

A PSSA can be protected by ships routing measures - such as an area to be avoided: an area within defined limits in which either navigation is particularly hazardous or it is exceptionally important to avoid casualties and which should be avoided by all ships, or by certain classes of ships.

Wetlands of international importance are covered by the Convention on Wetlands (Ramsar), which is an intergovernmental treaty that embodies the commitments of its member countries to maintain the ecological character of their Wetlands of International Importance and to plan for the 'wise use', or sustainable use, of all of the wetlands in their territories. (CHAPTER 4, section 0406 provides further explanation on this Convention.)

## 0210 Enforcement

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The enforcement of IMO conventions depends upon the Governments of Member States. Contracting Governments enforce the provisions of IMO conventions as far as their own ships are concerned and also set the penalties for infringements, where these are applicable. They may also have certain limited powers in respect of the ships of other Governments.

In some conventions, certificates are required to be carried on board ship to show that they have been inspected and have met the required standards. These certificates are normally accepted as proof by authorities from other States that the vessel concerned has reached the required standard. Should an offence occur within the jurisdiction of another State, however, that State can either cause proceedings to be taken in accordance with its own law or give details of the offence to the flag State so that the latter can take the appropriate action.

Under the terms of the 1969 International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, Contracting States are empowered to act against ships of other countries that have been involved in an accident or have been damaged on the high seas if there is a grave risk of oil pollution occurring as a result. The way in which these powers may be used are very carefully defined, and in most conventions the flag State is primarily responsible for enforcing conventions as far as its own ships and their personnel are concerned.

In 1973 The Conference adopted the Protocol relating to Intervention on the High Seas in Cases of Marine Pollution by Substances other than Oil. This extended the regime of the 1969 Intervention Convention to substances which are either listed in the Annex to the Protocol or which have characteristics substantially similar to those substances. Various amendments have been made to this Protocol in line with a revision of the list of substances other than oil. The latest amendment came into force in June 2004.

## 0211 National Legislation

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Contracting States to international conventions are Sovereign States that undertake, as part of the accession and ratification process to each convention or protocol, to enact appropriate national legislation to give effect to the provisions that have been agreed. Such enactments will, where appropriate, include provisions for enforcement and sanctions for infringements.

Whilst it is for governments to determine how best to enact international agreements within the framework of national legislation, it is evident that some broad similarities emerge in the way that States undertake this responsibility. Most governments find it necessary in the maritime context to rely on two broad bodies of primary legislation; one concerned with its flag shipping,

the other with its geographical jurisdictions. These can be summarised as:

- ✓ Marine, Shipping, Merchant Shipping Laws or Acts; and
- ✓ Harbour, Port, Docks Laws or Acts.

With regard to the second category, which is normally of a national character with uniform applicability to all port undertakings, it may be accompanied by local legislation that has applicability only to the port to which it refers.

Some typical examples of national legislation in connection with VTS are given at Annex G where a table provides a synopsis of some of the various methods used by States to implement international obligations.

## 0212 Port State Control

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Under the provisions of the IMO Conventions (see section 0208 for a summary), a flag state is responsible for promulgating laws and regulations to give the effect to applicable conventions, ensuring that a ship is fit for service. In some cases it is difficult for the flag State to exercise the necessary degree of continuous control over their ships, because they may not frequently visit the flag State. This can be partly overcome by the delegation of these tasks to the Port State that the ships visit.

Port State Control procedures have been established by IMO and promulgated in IMO Resolution A.787(19) - 'Procedures for Port State Control', together with amendments, in IMO Resolution A.882(21). These documents are intended to provide basic guidance on conduct of port State control inspections and afford consistency in the conduct of these inspections, the recognition of deficiencies of a ship, its equipment, or its crew, and the application of control procedures.

## 0213 European Union (EU)

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Although the European Parliament is the only directly-elected body of the European Union, it is the Commission who presents, explains and defends its legislative proposals to the parliamentary committees, and must take account of the changes called for by Parliament.

Under EU Directive 2002/59/EC - 'Establishing a Community Vessel Traffic Monitoring and Information System' (as amended by EU Directive 2009/17/EC), the EU established a Vessel Traffic Monitoring and Information System along the coasts of Member States. The purpose of the Directive is to establish, within the sea areas subject to the jurisdiction of Member States of the European Community, a system that will enhance the safety and efficiency of maritime traffic.

The Directive seeks to improve the response by authorities to incidents, accidents or potentially



dangerous situations at sea, including search and rescue operations, and contributing to a better prevention and detection of pollution by ships. Member States shall monitor and take all necessary and appropriate measures to ensure that the masters, operators or agents of ships, as well as shippers or owners of dangerous or polluting cargoes carried on board such ships, comply with the notification requirements set out in the Directive. It establishes SafeSeaNet as the reporting system between Member States and imposes reporting obligations on Member States and port authorities.

Directive 2009/16 EC - 'on Port State Control' introduces more robust regulations on the inspection of shipping and includes obligations that may involve port authorities on arrival notifications. Directive 2010/65/EU - 'on reporting formalities for ships arriving in and/or departing from ports of the Member States', specifies arrangements to simplify and harmonise the administrative procedures applied to maritime transport by making the electronic transmission of information a standard procedure and by rationalising reporting formalities to be in place no later than 1 June 2015. Dependent on how much a VTS is involved in the broader activities of port management and notifications, both these directives could have an impact on VTS processes.

## 0214 National Legislative Measures

Examples of national legislative measures are given below and summary tables are at Annex E.

### 0214.1 Australia

Australia has implemented its obligations under SOLAS in the Navigation Act 2012 and Marine Order 64 (Vessel Traffic Services) 2013 (Marine Order 64) which establishes the Australian Maritime Safety Authority (AMSA) as the competent authority for VTS in Australia.

Marine Order 64 is the regulation that provides for VTS for Australia. In particular, Marine Order 64 sets out the arrangements for AMSA to regulate:

- ✓ VTS Authorities, including authorisation, certification and auditing
- ✓ VTS training organisations, including accreditation, approval of model courses and auditing
- ✓ Masters of vessels to provide reports required by VTS authorities and to comply with their instructions

A copy of Marine Order 64 is available at <http://www.comlaw.gov.au/Details/F2013L01545>

### 0214.2 Canada

The Canadian Coast Guard's Marine Communications and Traffic Services Program (MCTS) fulfills, through the provision of marine

communications and traffic management services, the obligations of the Minister of Fisheries and Oceans for coast guard services relating to the safe, economical and efficient movement of ships in Canadian waters, as charged by section 41(1)(a) of the Oceans Act.

MCTS guiding legislation includes Part 5 of the Canada Shipping Act, 2001, which empowers the Minister of Fisheries and Oceans to designate persons as marine communications and traffic services officers for the purpose of vessel traffic services (VTS). CSA 2001 empowers MCTS Officers to give direction to a vessel to leave or refrain from entering a VTS Zone or an area of a VTS Zone for safe and efficient navigation and environmental protection purposes or to proceed to or to remain in any location of it. Such vessels must obtain a clearance prior to entering, leaving or proceeding with a VTS Zone, and be able to maintain direct communication with a MCTS officer when proceeding within a VTS Zone. The VTS Regulations amplify the statutory provisions of CSA Part 5 section 126 by requiring vessels of a prescribed class to report by radio at certain times and with certain information.

### 0214.3 China, Hong Kong

The Shipping and Port Control Ordinance, chapter 313 of the Laws of Hong Kong is the principal legislative instrument for marine and port control affairs in the Special Administrative Region.

The requirement for vessels to participate in VTS is stipulated in subsidiary legislation; the Shipping and Port Control Regulations. These regulations include the requirement for vessels to:

- ✓ provide Pre-Arrival Notification not less than 24 hours before the intended entry into Hong Kong waters;
- ✓ carry radio equipment that is capable of operating on the HK VTS working VHF channels;
- ✓ report their arrival, departure and movements in Hong Kong waters to the VTS centre; and
- ✓ report any anomalies to the VTS centre.

The Regulations empower the authorised officer in the VTS centre to issue directions to shipping under specified conditions.

### 0214.4 Italy

The Italian Coast Guard ("*Corpo delle Capitanerie di Porto*") is the National Competent Authority on:

- ✓ VTS/VTMIS (vessel traffic monitoring, control, management and VTS Authority);
- ✓ SAR (Italian Maritime Rescue Coordination Centre);
- ✓ PSC and FSC;
- ✓ maritime security;
- ✓ marine fishery control & monitoring;

- ✓ national and international NAVTEX service (promulgation of maritime safety information).
- ✓ It is also involved in the following matters:
- ✓ investigations of marine incidents/accidents;
- ✓ marine environmental protection;
- ✓ harbour master;
- ✓ conservation and management of flag Register of Ships;
- ✓ seamen data-bases.

#### 0214.5 The Netherlands

The primary legislation stems from the Scheepvaartverkeerswet, the national Shipping Traffic Act of 1988 and its subsequent amendments. This is complemented and enhanced by various Statute Orders and Ministerial Decrees. At local level competent authorities are empowered to and, required to, establish Harbour Bye-laws for each port or local area; provisions for the regulation of VTS are included in this legislation. The policy on VTS is kept permanently under revision.

#### 0214.6 Turkey

The national regulation on the establishing and operating Vessel Traffic Services came into force in 2007. It includes:

- ✓ authorizations and responsibilities of the Competent and VTS Authorities;
- ✓ operational and technical principles;
- ✓ qualification, training and certification of VTS Operators and Supervisors; and
- ✓ other functions of VTS.

In accordance with this national regulation, Directorate General of Coastal Safety has been appointed as VTS Authority for four VTSs in Turkey; Turkish Strait VTS, Izmit VTS, Izmir VTS and Mersin VTS.

Each VTS has its own operating procedures that prepared based on the national regulation on VTS and other related national and international legislation. In addition to this the Maritime Traffic Regulations for the Turkish Straits which is promulgated in 1998 is one of the most important regulations for the operations of the Turkish Strait VTS.

#### 0214.7 United Kingdom

The Vessel Traffic Monitoring and Reporting Regulations 2004 is the Statutory Notice by which the National Competent Authority for VTS, the Maritime and Coastguard Agency (MCA), regulates VTS. These instructions, which are the United Kingdom implementation of the European Parliament and Council Directive 2002/59/EC (as amended by 2009/17/EC), are published also by the UK Hydrographic Office.

The Harbours Act of 1964, Section 20, provides for harbour authorities to establish 'control

of movement' orders for securing, so far as is practicable, the safe and uninterrupted movement of ships in their respective harbours and the approaches thereto. A 'control of movement' order may contain provision for a number of matters including the body or bodies by whom the scheme established by the order is to be administered (e.g. the relevant harbour's VTS service) and the person specified (usually the Harbour Master) to give directions to ships within the harbour and within its approaches to which the scheme relates, for securing that they move only at specified times and to or from specified places, through specified areas, along specified routes or through specified channels, and so on.

In addition to the Harbours Act, most UK ports have supplemental legislation specific to the individual port authority. For example, the Port of London Act, 1968, provides for the making of 'general directions' for navigation of vessels in the Thames and also for the Harbour Master to give 'special directions' to any specific vessels. Ports such as London, therefore, have published General Directions for Navigation that require the mandatory reporting of vessels to the ports' VTS and for vessels to be regulated in accordance with directions given from the VTS. The 'Duty Port Controller' in the Port of London Authority Thames Navigation Service has the full delegated responsibility of the 'Harbour Master.'

Harbour Authorities have Specific Duties and Powers to establish VTS to mitigate risk, enhance vessel safety and to protect the environment. To be recognised as a VTS, the service must conform to IMO and national standards and operated by personnel trained to the appropriate standard. The VTS must be designated as such by the MCA in its capacity as the National Competent Authority for VTS.

Vessels that enter a harbour authority's VTS area (operated in accordance with the IMO guidelines) must comply with the rules of that service.





## CHAPTER 3. IALA

### 0301 Introduction

IALA has been associated with the development of VTS for nearly 50 years, having first discussed the use of shore-based radar installations and VHF radiotelephone communications as a means of providing improved navigational facilities for shipping. IALA followed the developments of VTS and, recognising that these were uncoordinated and differed from country to country, considered that there needed to be a forum at which similar problems could be discussed and experiences could be shared. Consequently, in 1980, IALA established a VTS Committee to undertake these tasks. Since then the VTS Committee has grown steadily and has developed into the foremost forum on Vessel Traffic Services in the world.

### 0302 Background History

In 1889, at the International Exposition in Paris, the main attraction was the newly built Eiffel Tower. However, the exhibition included a Conference on Maritime Works, organized by the French Lighthouse Authority, which dealt with maritime structures, coastal lights, buoys and maritime signals. This resulted in the creation of a French ministerial decree "*Congrès International des Travaux Maritimes*" giving structure to a number of Conferences held on the subject during World Exhibitions since 1851, which gave birth to a Permanent Commission of the Congresses of Maritime Works.

After the merging of the Commission with the Inland Navigation Congresses, forming the Permanent International Association of Navigation Congresses (PIANC), marine aids to navigation were one of the subjects dealt with at PIANC congresses, until 1926.



Figure 2 The Founders of IALA  
L to R: Paul Pétry (France), P.J.G. van Diggelen (The Netherlands), Sir Gerald Curteis (England), Gerhard Wiedemann (Germany)

At that time the need arose for separate Conferences. The first International Lighthouse Conference was convened in 1929 in London, followed by another five until 1955.

In 1956 a constitution was drafted to create IALA. On 1<sup>st</sup> July 1957 the constitution was adopted thus setting into motion a chain of events that has since had repercussions throughout the maritime world. This seemingly simple and singular event has touched anyone that must fix their position, determine a safe course to steer or avoid unseen dangers at sea.

### 0303 The Name

The International Association of Marine Aids to Navigation and Lighthouse Authorities, hereinafter referred to as 'IALA', formerly called the International Association of Lighthouse Authorities / Association Internationale de Signalisation Maritime, is a Non-Governmental Organization (NGO). The term 'Marine Aids to Navigation' referred to in the present Constitution should be understood to be a device, system or service, external to vessels, designed and operated to enhance safe and efficient navigation of individual vessels and/or vessel traffic.

### 0304 Aim

The aim of IALA is to foster the safe, economic and efficient movement of vessels, through improvement and harmonisation of aids to navigation worldwide and other appropriate means, for the benefit of the maritime community and the protection of the environment. IALA is secular and non-political. IALA brings together services and organizations concerned with the provision or maintenance of marine aids to navigation and allied activities, at sea and on inland waterways.

The aim of IALA is mainly achieved by developing international co-operation between its members, collecting and circulating information and facilitating mutual exchange of information, and formulating and publishing appropriate standards, recommendations and guidelines, manuals, model courses and other appropriate documentation.

### 0305 World-Wide Academy (WWA)

In January 2012 IALA established the World-Wide Academy (The Academy), the vehicle by which IALA delivers training and capacity building. The Academy is an integral part of IALA, independently funded.

The Academy works closely with IMO and other key Organizations, such as IHO, to develop capacity building in a co-ordinated manner as part of the United Nations "Delivering as One" initiative. The Academy establishes and manages systematic aids to navigation capacity building to enable national authorities of developing States in target regions

to meet their obligations under the UNCLOS and SOLAS Conventions.

The Academy is there to promote the work of the IALA Committees and assist in the development of IALA Recommendations and associated model courses on aids to navigation training, including VTS. The Academy facilitates the accreditation process and the delivery of VTS and aids to navigation training in accordance with IALA Recommendations and associated model courses.

### 0306 Strategy

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The IALA Strategy established 14 priorities with a view to achieve two main goals:

- ✓ ensure that Aids to Navigation systems and related services, including e-Navigation, Vessel Traffic Services and emerging technologies are harmonized through international co-operation and the provision of standards; and
- ✓ that all coastal states have contributed to an efficient global network of Aids to Navigation and services for the safety of navigation, through capacity building and the sharing of expertise.

### 0307 Governance

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IALA places considerable emphasis on strong governance arrangements. The following details the groups and functions established as governing and executive bodies of IALA:

- ✓ IALA Assembly: The IALA Assembly and Council provide strong oversight and direction of the Organization's governance arrangements. The General Assembly elects 21 of the 24 national members forming the IALA Council and approves IALA Standards, proposed strategy and amendments to the IALA Constitution;
- ✓ IALA Council: The IALA Council approves the annual budgets, financial statements and IALA Recommendations and Guidelines, as well as other publications as appropriate. The Council also sets the rates for contributions each year and authorizes any major purchases or bank loans;
- ✓ Finance and Audit Committee: The IALA Finance and Audit Committee (FAC) is elected from among Council members and operates under the direction of the IALA Council. It is responsible for reviewing and overseeing the financial aspects of IALA.

### 0308 Membership

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IALA comprises the following types of membership:

- ✓ National membership may be applied for by a National Authority of any country, or any part of that country, legally responsible for the

provision, maintenance or operation of marine aids to navigation within that country, or any part of that country (hereinafter referred to as National Authority);

- ✓ Associate membership may be applied for by any other service, organization or scientific agency that is concerned with aids to navigation or related matters; and
- ✓ Industrial membership may be applied for by manufacturers and distributors of marine aids to navigation equipment for sale, or organizations providing marine aids to navigation services or technical advice under contract.
- ✓ Honorary membership may be conferred for life by the IALA Council to any individual who is considered to have made an important contribution to the work of IALA.

In 2015 IALA comprised a membership of 79 national members, 124 industrial members, 55 associate members and 44 personal honorary members. The headquarters is in St. Germain-en-Laye, on the outskirts of Paris, France.

### 0309 Committees

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The IALA Committees are the 'heartbeat' of IALA and are established by the IALA Council to study issues such as management, operations, engineering and training associated with topics like VTS, radio aids, visual aids, and their associated technologies, support services and other relevant matters, with the aim to prepare Standards, Recommendations, Guidelines and other documents for IALA members and submissions to other organizations.

The Committees meet regularly, normally twice each year, at the IALA Headquarters. The work programmes for the Committees generally cover a four year period, from one IALA Conference to the next.

In 2016 there are four Committees:

- ✓ Aids to Navigation Requirements and Management (ARM) Committee - dealing with requirements for aids to navigation systems, management of aids to navigation, marine spatial planning and risk management;
- ✓ e-Navigation (ENAV) Committee - dealing with data modelling and message systems, e-Navigation communications, shore technical infrastructure, e-Navigation test beds and maritime service portfolios;
- ✓ Aid to Navigation Engineering and Sustainability (ENG) dealing with light and vision physics, Aid to Navigation design and maintenance, global capacity building and training, civil engineering and environment including heritage; and
- ✓ Vessel Traffic Services (VTS) Committee.

## 0310 VTS Committee

The Vessel Traffic Services (VTS) Committee deals with all aspects of VTS, including the expanding role of vessel monitoring for maritime safety, environmental protection and security.

VTS itself has been in existence in various forms since 1948, as a radar and voice communications system. A series of accidents around the world caused authorities to look at VTS as a means to monitor traffic. Despite scepticism in several quarters interest in VTS grew and the responsibility to establish and operate these services often fell to lighthouse authorities. Over the years several symposia were held in different parts of the world and it was soon realised that the growth of VTS had reached a point where it warranted a separate technical committee to address its many ramifications. Thus it was that in 1981 IALA created the VTS Committee to study the influence of VTS on lighthouse services' activities, collect information on existing and planned VTS as well as studying the harmonisation of operational procedures.

The current VTS Committee comprises national members, affiliated organizations and industrial members meeting every six months, usually at IALA headquarters, where it is well attended. The representation by members is spread globally and, more recently, regionally resulting in a diverse mix of experience drawn from many parts of the world. Equally diverse is the individual experience of members, many of whom are in possession of current Master Mariner, Pilot or VTS qualifications and are engaged daily in the management or operation of VTS or act as national co-ordinators. This diversity is an important asset to ensure that IALA remains at the centre of VTS developments and speaks with the authority and experience of its membership.

A primary objective of the VTS Committee is the provision of sound and timely guidance and advice to those involved in VTS matters. Given the complexity of modern, multi-discipline systems and management, it rarely does this in isolation, consulting frequently with other committees,

notably the ANM Committee, the e-NAV Committee, allied organizations and the IMO.

The formal posts on the VTS Committee include a Chairman, Vice Chairman, and a Secretary, the latter being drawn from the headquarters staff. The Committee's work programme is decided on a 4-yearly basis, to match the policy guidelines set by the IALA Council, but new items are constantly being added to meet changes in the maritime environment and the demands of members. A key product of the Committee's work is the publication of the IALA VTS Manual, usually every four years.

Work items are normally allocated, where this is appropriate, to working groups (WG) within the VTS Committee that have the following broad remits:

- ✓ VTS Operations;
- ✓ VTS Technology; and
- ✓ VTS Training.

The outputs of all the WGs are considered in plenary session with the entire VTS Committee before any recommendations, guidelines or documents are submitted to the Secretariat for approval by Council.

## 0311 VTS Policy

IALA maintains very strong links with IMO and is recognised as a Non Governmental Organization (NGO) with consultative status. It is represented on numerous standing bodies and is in close touch with developments and trends that affect the maritime environment. A consequence of these links, together with the wide range of experience of its membership and the quality of its published material, is that IALA is acknowledged as an authority in its field. It is thus able to offer advice and guidance to the maritime community and to influence developments associated with aids to navigation and VTS where the interests of the mariner can best be served.

The principle policy and regulatory document for VTS is IMO Resolution A.857(20) - 'Guidelines for Vessel Traffic Services', adopted on 27 November 1997. This Resolution, like its predecessor, IMO



Figure 3

IALA VTS Committee - March 2016

Resolution A.578(14) adopted by IMO in 1985, was drafted by the VTS Committee at IALA and is kept under frequent review to ensure that it continues fully to meet the needs of the profession.



Figure 4

Logo for VTS2016

### 0312 Conferences, Symposiums and Exhibitions

IALA holds general aids to navigation Conferences and Symposiums at four yearly intervals, thus organizing major events every second year.

An IALA Conference is an event that has, as its principal objective, the exchange of information relating to all types of marine Aids to Navigation, including VTS and e-Navigation. It is open to all IALA members and other International Organizations and Associations, Aids to Navigation Authorities, VTS Authorities and official bodies as agreed by the Host country National Member and the Council.

Papers, presentations and discussions address a wide range of marine aids to navigation issues, including VTS. The work of IALA over the previous four years is also presented. All members are invited to submit papers for discussion.

IALA generally holds the General Assembly in conjunction with their Conference.

An IALA Symposium is an event held to consider and discuss a set of contributions on specific subject(s) relating to marine Aids to Navigation.

IALA Symposiums are held on the subject of Vessel Traffic Services.

The Industrial Members' Committee generally organises an Industrial Exhibition in conjunction with Symposiums and Conferences.

VTS Symposiums are forums where delegates can discuss current challenges and opportunities both in VTS and Domain Awareness. Amongst the general themes for Symposiums are, VTS from a global perspective, focusing on areas such as recent technological advancement, professional competencies, e-Navigation, legal aspects and VTS in the Arctic region - all contemporary and global themes. There is the ability to exchange views with world-class experts in the field of VTS and associated topics, both inside and outside the technical sessions.

### 0313 Publications related to VTS

IALA has established a hierarchy of VTS related documents that it publishes and periodically reviews (see ANNEX F). These authoritative and reliable documents and publications are the cornerstone of IALA's work and are available to the VTS and maritime professions worldwide as being the most up-to-date advice and guidance. The documentation takes the form of IALA Recommendations, Guidelines and Manuals as well as Model Courses for training VTS personnel. The documentation hierarchy is as follows:

- 1 IALA Recommendations: These documents represent the highest level of documentation (equivalent to a 'standard' in an intergovernmental organization). Recommendations provide direction to IALA members on uniform procedures and processes that will facilitate IALA objectives. IALA recommendations contain information on how to plan, operate and manage Aids to Navigation. Recommendations may reference relevant international standards and IALA Guidelines.
- 2 IALA Guidelines: These documents provide detailed information on an aspect of a specific subject, indicating options, best practices and suggestions for implementation. IALA Guidelines relate to planning, operating and managing Aids to Navigation.
- 3 IALA Manuals: These documents provide members, non-members and training institutions with an overall view of a large subject area - for example the NAVGUIDE and the IALA VTS Manual. Whilst aimed at introducing a subject to a widely varied audience, reference is also made to IALA Guidelines and IALA Recommendations, as well as other related international documents, as an indicator of further study.





## CHAPTER 4. FUNCTIONS OF VTS

*'Vessel Traffic Services (VTS) contribute to the safety of life at sea, safety and efficiency of navigation, the protection of the marine environment, the adjacent shore area, worksites, and offshore installations from possible adverse effects of maritime traffic' - SOLAS V-12.*

### 0401 Introduction

At its simplest, the main objectives of a VTS are to:

- ✓ aid the mariner in the safe and efficient use of navigable waterways;
- ✓ afford unhindered access to pursue commercial and leisure activities, subject to any restrictions that may exist; and
- ✓ contribute to keeping the seas and adjacent environment free from pollution.

Experience shows that, in general, these ideals are subject to potentially greater and more intense risks in coastal waters particularly at shipping congestion points and at the interface with ports and estuaries. The benefits derived from VTS can be of considerable value and, when properly implemented, outweigh the costs of provision.

IMO recognises the importance and value of VTS as a vital tool in the management of a number of potentially high risk geographic areas and for the protection of the environment.

Contracting Governments undertake to arrange for the establishment of VTS where, in their opinion, the volume of traffic or the degree of risk justifies such services (SOLAS V - Regulation 12). When planning and implementing VTS Contracting Governments shall, whenever practical, follow IMO Guidelines on VTS (IMO Resolution A.857(20)) and endeavour to secure participation in and compliance with, the provisions of VTS by ships entitled to fly their flag.

### 0402 Type of VTS

*A clear distinction may need to be made between a Port or Harbour VTS and a Coastal VTS. A Port VTS is mainly concerned with vessel traffic to and from a port or harbour or harbours, while a Coastal VTS is mainly concerned with vessel traffic passing through the area. A VTS could also be a combination of both types.*

*IMO Resolution A.857(20)*

#### 0402.1 Port / Harbour VTS

In order to ensure safety and efficiency, the movement of vessels within port areas may

demand specific traffic management which not only minimizes incidents but also promotes economic results. The coordination of a number of different port services may be required. A port/harbour VTS should help prevent unnecessary delays and reduce the number of close quarter situations between vessels that may jeopardize the ports integrity.

Port VTS around the world ensure the economic profitability of ports, the safety of human life and the protection of the marine environment.

The techniques used in port VTS may be different from a coastal VTS, because the navigation is in itself different. In port areas both the separation between vessels and the required under-keel clearances may be reduced. These two factors directly affect the navigation of vessels and therefore port VTS procedures.

A port/harbour VTS may promulgate port entry requirements and may issue instructions. Examples of such requirements/instructions are:

- ✓ Clearances for entering/exiting VTS areas.
- ✓ The obligation of taking pilot.
- ✓ The obligation of taking tugs.
- ✓ Maximum speed in the area.
- ✓ Separation distance between vessels.
- ✓ Assignments of anchor positions.
- ✓ Overtaking permissions in narrow channel.

These functions are normally rendered under a traffic organization service (TOS). In a port area, VTS should also provide a navigation assistance service (NAS), where vessels are assisted in complex navigational situations.

#### 0402.2 Coastal VTS

A coastal VTS should assist the safe and expeditious passage of shipping through coastal waters. It may also be involved in providing assistance to vessels before embarkation or disembarkation of a pilot.

The types of service provided by a coastal VTS will depend on its legal basis but is likely to include more than just an information service. IALA has provided further guidance on this where the VTS area covers an international strait or extends beyond territorial waters in Guideline 1071 - Establishment of a Vessel Traffic Service beyond Territorial Seas.

#### 0402.3 VTS in Inland Waters

The purpose of VTS in inland waters is to improve the safety and efficiency of navigation, safety of life and the protection of the environment and/or the adjoining waterway banks, nearby residents and enterprises from possible adverse effects of vessel traffic.

Inland waters are rivers, lakes or other stretches of water, whether linked to the sea or landlocked,

which by natural or man-made features are suitable for navigation.

A part of the objectives of a VTS in inland waters may include the support of efficient transport and the collection of data and information that, as a consequence, may be required.

The benefits of implementing a VTS in inland waters are that it allows identification and monitoring of vessels, the strategic, tactical and operational planning of vessel movements, managing traffic by allocation of space, as well as the provision of navigational information and assistance.

A VTS in inland waters may provide an information service (INS), a navigational assistance service (NAS) and a traffic organisation service (TOS).

Further information may be found in IALA Recommendation V-120, - 'Vessel Traffic Services in Inland Waters'.

#### 0403 Functions of a VTS

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VTS functions - can be subdivided into internal and external functions. Internal functions are the preparatory activities that have to be performed to enable a VTS to operate. These include data collection, data evaluation and decision-making. External functions are activities executed with the purpose of influencing the traffic characteristics. They relate to the primary traffic management functions of rule-making, allocation of space, routine control of vessels and manoeuvres to avoid collisions, as well as to other management functions such as enforcement, remedial and ancillary activities.

Amongst the most important functions that a VTS may carry out are those related to, contributing to and thereby enhancing:

- ✓ Safety of life at sea;
- ✓ Safety of navigation;
- ✓ Search and Rescue;
- ✓ Efficiency of vessel traffic movement;
- ✓ Protection of the marine environment;
- ✓ Supporting maritime security;
- ✓ Supporting law enforcement; and
- ✓ Protection of adjacent communities and infrastructure.

The benefits of implementing a VTS are that it allows identification and monitoring of vessels, strategic planning of vessel movements and provision of navigational information and assistance. It can also assist in prevention of pollution and co-ordination of pollution/emergency response. The efficiency of a VTS will depend on the reliability and continuity of communications and on the ability to provide accurate and unambiguous

information. The quality of accident prevention measures will depend on the ability to detect developing dangerous situations and on the provision of timely warnings of such dangers.

The precise functions of any VTS will depend upon the particular circumstances in the VTS area and the volume and character of maritime traffic. A port VTS will often have different objectives and functions to that of a coastal VTS, which is addressed in more detail in CHAPTER 5 - Provision and Types of Service in a VTS. When a VTS is established, the existence of the VTS and the functions carried out, will need to be promulgated to all relevant stakeholders.

#### 0404 Safety of Life at Sea and Safety of Vessel Traffic

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Incidents involving vessels can lead not only to material damage and injuries, but also to loss of life. VTS endeavours to prevent incidents resulting from vessel traffic movements, thereby contributing not only to the improvement of vessel traffic safety but also to the improvement of safety of life at sea and protection of the environment.

By being proactive, a VTS can contribute to:

- ✓ Preventing incidents from developing;
- ✓ Preventing incidents from developing into accidents;
- ✓ Preventing accidents from developing into disasters; and
- ✓ Mitigating the consequences of incidents, accidents and disasters.

Unlike other aids to navigation, VTS, being active, has the capability to interact and influence the decision-making process on board the vessel.

For example, VTS might detect the development of close-quarter situations between vessels or vessels standing into danger, and can thus alert such vessels accordingly and, in some cases, instructing them to take certain avoiding action, providing that any instructions or advice issued by the VTS is result-orientated only. As the majority of maritime accidents can be attributed to human factors, it is clear that the involvement of a VTS, and interaction with it, can provide a significant additional safeguard.

Although safety of life should be a primary reason for implementing VTS, the needs of other VTS functions often provide more persuasive arguments for its establishment. However, the beneficial effects of VTS on the expected (or even actual) number or size of vessel traffic accidents and casualties will often be difficult to determine. The preferred way to assess the effect of VTS on vessel traffic safety is by determining the risk reduction, which can be achieved by VTS. IALA has developed a risk management toolbox of concepts and tools



for risk assessment and evaluation of various risk mitigating measures, for further information see Section 0408.

If an incident has occurred or is likely to occur, VTS can be used to support other incident mitigation operations. In the context of vessel traffic safety, VTS might support, for example Maritime Assistance Services (IMO Resolution A.950(23)), Places of Refuge (IMO Resolution A.949(23)), Search and Rescue (SAR), fire fighting, pollution response and salvage operations. In some VTS centres such operations are carried out under the supervision of the VTS and/or Competent Authority.

#### 0405 Efficiency of Vessel Traffic

VTS can improve the efficiency of vessel traffic in two ways through:

- ✓ Reducing accidents; and
- ✓ Increasing the utilisation of the infrastructure (waterways, locks, ports etc.).

Prevention of an accident directly leads to an improvement in the efficiency of vessel traffic. An accident causes delays, not only for the vessels involved but also for other vessels in the vicinity. Serious accidents can lead to lengthy delays, especially when the movement of vessels is being restricted and possibly being re-routed, or in extreme cases when the VTS has to close the navigable waterways to vessel traffic.

An infrastructure will have a certain capacity, both in the size and the number of the vessels that can be accommodated. A VTS can safely increase the capacity by enabling:

- ✓ Larger vessels to use the infrastructure (e.g. larger draught, beam, length, air draught);
- ✓ Longer use of the infrastructure (e.g. tidal windows, continued operation under adverse conditions); and
- ✓ More use of the infrastructure (e.g. higher traffic density, higher speed).

The resulting improvement for the vessels concerned in carrying capacity and reduction in delays increases the efficiency of these vessels. At the same time this increases the utilisation of the infrastructure, which may either eliminate delays or reduce the need for costly investments in the expansion of this infrastructure. These economic benefits are more directly noticeable to the stakeholders concerned and are easier to determine than the benefits of VTS for safety of navigation. Methods to determine these economic benefits are addressed in CHAPTER 7 – Determining the Need for VTS.

#### 0406 Protection of the Environment

In many societies, communities and areas, the protection of the environment is considered the

highest priority. Pollution can cause substantial economic damage, in particular to those activities dependant on a clean environment, such as tourism, recreation and fisheries. Generally, oil or other toxic liquid pollution is the biggest concern but accidental emissions of polluting gasses can also cause environmental pollution.

Protection of the environment is often a substantial driving force for determining the need for VTS. It may even result in a VTS being implemented in an area with relatively low traffic volumes and limited risk to vessel safety if relatively large quantities of polluting cargoes are transported through areas that are considered to be environmentally sensitive.

In addition to the explicit formal recognition of the contribution of VTS in SOLAS, there is an implicit recognition of the contribution VTS can deliver to the protection of the environment in UNCLOS. VTS is one of the four possible 'associated protective measures' specifically mentioned in IMO Resolution A.982(24) - 'Revised Guidelines for the Identification And Designation of Particularly Sensitive Sea Areas', for the establishment of 'Particularly Sensitive Sea Areas' (PSSA).

At regional level, there is a formal recognition of the contribution VTS can offer to the protection of the environment. In the EU, the Directive for the establishment of a community vessel traffic monitoring and information system 2002/59/EC (as amended) specifically mentions VTS as one of the components of this EU-wide system to protect the environment.

MARPOL 73/78 defines certain sea areas as 'special areas' in which, for technical reasons relating to their oceanographical and ecological condition and to their sea traffic, the adoption of special mandatory methods for the prevention of sea pollution is required. Under the Convention, these special areas are provided with a higher level of protection than other areas of the sea.

A Particularly Sensitive Sea Area (PSSA) is an area that needs special protection through action by IMO because of its significance for recognised ecological or socio-economic or scientific reasons and which may be vulnerable to damage by international maritime activities. The criteria for the identification of particularly sensitive sea areas and the criteria for the designation of special areas are not mutually exclusive. In many cases a Particularly Sensitive Sea Area may be identified within a Special Area and vice versa.

**The Ramsar Convention on Wetlands** is an intergovernmental treaty adopted in 1971, is the first global intergovernmental treaty on the conservation and sustainable use of natural resources. The Convention entered into force in 1975 and by 2011, had 160 Contracting Parties, or member States. Though the central Ramsar message is the need for the sustainable use of all wetlands, the 'flagship' of the Convention is the 'List of Wetlands of International Importance' (the 'Ramsar List').

In 2011 this listed more than 1,830 wetlands for special protection as 'Ramsar Sites', covering 170 million hectares (1.7 million square kilometres), larger than the surface area of France, Germany, and Switzerland combined. Many of these sites are in coastal zones and estuaries adjacent to shipping and port activities.

Apart from preventative actions to avoid incidents and mitigation actions, when incidents have occurred, VTS can provide support as well as contribute to the identification of sources of illegal spills. With the information available in the VTS on vessel movements in the VTS area, sources of pollution in or nearby the VTS area may be more easily identified and proven. The very presence of a VTS can often act as a deterrent to vessels illegally discharging pollutants.

As environmentally sensitive areas are often at sea outside port areas, it might sometimes be desirable to have the VTS coverage extend into international waters or straits for the protection of these sea areas. It should be realised that VTS participation by vessels can only be made voluntary in international waters or straits. However, mandatory participation in VTS in international waters or straits may be achieved by establishing a mandatory Ship Reporting System or Ship Routeing measures that have been adopted by IMO.

As with the safety of vessel traffic, measuring the effect of VTS on protection of the environment is not easy. The impact of VTS on the size and number of accidents is difficult to determine, as is the impact of VTS on the reduction of pollution, which could possibly result from such accidents. This requires a thorough risk analysis, which needs availability and access to data on traffic, circumstances and environmental sensitivity.

#### **0407 Protection of the Adjacent Communities and Infrastructure**

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In certain ports, narrow straits and inland waterways, vessels sail in close proximity to populated areas, industrial activities and their associated infrastructure. Generally, accidents involving spills or emissions of hazardous chemicals in fluid or gaseous form are the biggest concern, but deaths, injuries and damage can be caused by vessels colliding with habited areas on waterfronts. The additional impact of a chain reaction in oil or chemical plants on a waterfront initiated by an accident with a vessel needs to be considered.

A VTS may help prevent such accidents occurring or developing into disasters. It can also be used by the emergency services in the event of marine associated emergencies, which necessitate the co-ordination of all activities within the area concerned.

#### **0408 Risk Assessment**

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Assessing the effectiveness of a VTS in managing the safety of vessel traffic, protecting

the environment, reducing the number of accidents and lessening the risk to the adjacent communities and infrastructure is a complex process. This requires a thorough risk analysis and, thus, availability and access to data on traffic, circumstances and sensitivity of the adjacent communities and infrastructure.

The current tools / concepts are:

- ✓ IWRAP (IALA Waterway Risk Assessment Programme); and
- ✓ PAWSA (Ports and Waterways Safety Assessment)
- ✓ Simulation

IWRAP is useful for estimating the frequency of unwanted incidents, such as collisions and groundings. It is a quantitative concept, based on the analysis of objective data such as AIS data and bathymetry information. IWRAP was developed during the 1990s by IALA working with the Canadian Coast Guard, the Technical Universities of Denmark and Wismar. IWRAP Mk2 was released in 2009 with additional contribution from the University of Helsinki. It continues to be developed, with new features being added as experience is gained in its use. It is a quantitative tool and a basic version is available to anyone willing to join the IWRAP data exchange programme. A commercial version, which allows the automatic importation of AIS data, is also available.

PAWSA was originally developed for the United States Coast Guard and is a qualitative model, requiring an experienced facilitator to run each PAWSA workshop. The PAWSA concept is based on a structured approach to interviewing 20-30 different stakeholders on their knowledge and beliefs with regard to the risks and effectiveness of possible mitigating measures in a given waterway.

Experience is showing that a combination of PAWSA and IWRAP Mk2 can produce a better result than either model on its own.

Interest in simulation for the study of risk management is increasing and greater use of simulators as a risk management tool can be expected.

IWRAP Mk2, PAWSA and simulation are considered to comprise the IALA Risk Management Toolbox and IALA holds at least one Risk Management Toolbox training seminar each year.

Further information on the use of these tools and the seminars can be obtained from IALA and via the IALA website.

Risk assessment forms part of the Needs analysis process which is covered in more detail in CHAPTER 7 - Determining the Need for VTS.



#### 0409 Efficiency of Related Activities

In ports there are many activities related to shipping, known as ‘allied services’, such as:

Pilotage	Towage
Bunkering	Line handling
Repairs	Chandlery
Immigration	Inspections
Cargo/passenger transfer	Customs
Cargo (onward) transport	Cargo treatment/processing
Security	Agents

All of these allied services may benefit from correct and timely information about actual and expected vessel positions, movements, destinations and times of arrival. This enables the allied services to enhance their own efficiency through improved planning and better utilisation of resources, which should lead to a reduction in the cost base.

Ports seek improvement in information gathering and dissemination to offer a better service to the shipping community and as a means to gain a competitive advantage over other ports. Improved information exchange with interested stakeholders, including other VTS centres, forms part of the management of vessel traffic.

By virtue of the various services it provides, VTS has a significant amount of relevant information. In this respect the contribution that can be offered by supplying this information to stakeholders involved in cargo transfer and onward transport (by road, rail, inland waters and sea) is of increasing importance. It improves the optimisation of the overall logistical chain for intermodal transport from producer to consumer.

The transfer of information concerning cargo, position, movement, destination and ETA is a key part of the interconnectivity within this chain. Whilst the cargo is still on-board, information concerning the whereabouts and intentions of involved vessel may be an acceptable substitute for more detailed cargo information.

Making information accessible to other VTS users and allied services, offers direct benefits to the port and transport community. This, in itself, can be a significant driving force for implementing VTS, in particular for authorities trying to improve the competitive position of their port. However, special attention needs to be given to the sensitivity and access to such data. Legal restrictions and societal sensitivities may have to be considered in the protection of potentially commercially sensitive information. Unlawful misuse of this information by individuals and organizations is of increasing concern and conflicts may occur when the VTS is not the only source of vessel related information.

#### 0410 Supporting Maritime Security

As a result of terrorist and piracy attacks and the increased threat from such activities, security is a

high priority for the maritime community. Together with the aviation industry, maritime transport is one of the forerunners in improving the security of transport. IMO has addressed maritime security by the adoption of the International Ship and Port Facility Security (ISPS) code.

#### International Ship and Port Facility Security (ISPS)

Code requires each Contracting Government to conduct port facility security assessments. Security assessments have three essential components. The first step is to identify and evaluate important assets and infrastructures that are critical to the port facility as well as those areas or structures that, if damaged, could cause significant loss of life or damage to the port facility’s economy or environment. The assessment must then identify the actual threats to those critical assets and infrastructure in order to prioritise security measures. Finally, the assessment must address vulnerability of the port facility by identifying its weaknesses in physical security, structural integrity, protection systems, procedural policies, communications systems, transportation infrastructure, utilities, and other areas within a port facility that may be a likely target. Once this assessment has been completed, Contracting Government can accurately evaluate risk.

#### 0411 Security in the VTS Environment

There are three distinct aspects associated with security in the VTS environment.

Firstly, there is the need to ensure that the operation of a VTS is not exposed to, or susceptible to, the risk of terrorist attack. This situation should apply to all VTS operations, not least because of the general duty of care that a VTS Authority should exercise in relation to client shipping. Under ISPS there are a number of minimum functional security requirements for ships and port facilities. For port facilities, the requirements include:

- ✓ Port facility security plans;
- ✓ Port facility security officers;
- ✓ Certain security equipment;
- ✓ Monitoring and controlling access;
- ✓ Monitoring the activities of people and cargo; and
- ✓ Ensuring security communications are readily available.

Secondly, there is the potential for VTS to obtain information that may aid or assist security agencies in counter-terrorist activities. However, this situation will normally only apply when a VTS Authority enters into specific agreement with national authorities.

Thirdly, although VTS is not by definition a security-related system, the integrity of VTS data and systems must be protected and security assessments should be considered. It is necessary to prevent unwanted



and unauthorised access to the VTS system, i.e. connection to external systems, such as the internet, should be established through a robust firewall. Whilst it may often be desirable to make some VTS information public, the firewall should prevent any opportunity for unauthorised access to be gained into the system or to the data it holds.

Protection against terrorist action in the maritime domain requires, among many things, a complete image of vessel traffic in areas of concern with information on the intentions and cargoes of those vessels as well as vigilant monitoring of this vessel traffic. This information could also be of use to support actions against smuggling of goods and illegal immigration.

A VTS centre maintains a vessel traffic image of almost all vessels in the VTS area and possibly in adjacent waters. The VTS has trained VTS Operators (VTSO) monitoring this traffic in real-time. A VTS has the potential to contribute to State security, although such involvement is a national consideration. The limitations of VTS should, however, be recognised and these include radar detection capability, particularly of small craft, and the training of VTSOs in the recognition of potential security threats and their ability to respond to them.

Port facilities which have to comply with the requirements of SOLAS Chapter XI-2 and part A of the ISPS Code - 'mandatory requirements', are required to designate a Port Facility Security Officer (PFSO), who has the responsibility to co-ordinate appropriate actions when a ship encounters difficulties with respect to maritime security. The use of a vessel traffic image display may facilitate this work and enhance port security.

## 0412 Trends

The following trends have emerged in maritime operations and management:

### Standards

- ✓ Environmental standards will continue to acquire ever-higher stringency and priority;
- ✓ Professional competence of marine personnel will continue to vary, notwithstanding the adoption of international standards;
- ✓ The pursuit of common standards will continue, particularly on a regional basis;
- ✓ Comprehensive and effective risk assessment will increasingly become the basis for the safe management of navigation; and
- ✓ The development of the IMO e-navigation concept may lead to further development of new services (Maritime Service Portfolios) with a need for further worldwide harmonization.
- ✓ The growing focus on Safety Awareness and Safety Culture may lead to a need for training on those aspects.

## 0412.1 User Requirements

- ✓ Commercial pressures will demand ever more rapid and reliable transport and cargo handling schedules, while reducing costs and improving quality of service;
- ✓ The need for more comprehensive wide-area traffic information will lead to an increase in the volume of information being exchanged mainly digitally between ships and shore organizations;
- ✓ Predicted restrictions on waterspace for vessel traffic, specifically in areas of high traffic density and those areas where alternative utilization of this space is expected, may lead to an increasing need for management of vessel traffic from shore;
- ✓ Coastal waters and inland waterways will be increasingly used for recreational and other purposes.
- ✓ Inland and short sea shipping will become increasingly attractive from an environmental perspective as methods of transport of goods and passengers; and
- ✓ Co-ordination of port services will become increasingly important in the interests of safety, security, protection of the environment and improved economic performance, particularly where such services may be obtained from external sources.

## 0412.2 Technology

- ✓ Ship design and technology will continue to evolve, particularly in the areas of information processing and communication; and
- ✓ Advances in technology will necessitate an expanding requirement for capital expenditure and trained personnel. This will offer opportunities for increased efficiencies and the potential for the delivery of additional services.

## 0412.3 Security and Allied Services

- ✓ Heightened international security concerns will have an impact on maritime trade and transport processes. These same concerns are already leading to a requirement to track commercial shipping at long range;
- ✓ The use of formal and more effective systems to manage safety and security at sea and in port will increase; and
- ✓ The need for protection of data and information against intended/unintended access is increasing (cyber security).

## 0413 Consequential impact on VTS

These overall maritime trends are likely to lead to the following consequences for VTS:

- ✓ VTS will play a central role in gathering and disseminating information for safety, security, environmental protection and economic



performance purposes;

- ✓ Automated systems for the effective management and validation of transferred data between ships, VTS centres and VTS networks will be increasingly required;
- ✓ Exchange of information between VTS systems will lead to the formation of VTS networks;
- ✓ VTS information will increasingly be used by various allied services in the global tracking of vessels;
- ✓ The need for quality assurance to international standards for VTS systems, including equipment, personnel, and operating procedures, will increase;
- ✓ The need to assure and certify the competency of VTS Operators and VTS Supervisors in order to reduce any exposure to increased liability will add to the scope and priority of such training. This should be achieved through the establishment of a Revalidation Process as prescribed in IALA Model Course V-103/5;
- ✓ The need to manage recreational and other small craft traffic by VTS and by other means in order to ensure the safety of navigation in areas where commercial and high-density recreational traffic co-exist, will increase;
- ✓ As the quality and accuracy of vessel tracking improves, the potential for greater control of vessel traffic may be used more widely as a mechanism for reducing risk; and
- ✓ The regulated control of traffic by VTS centres may bring a greater exposure to liability.







## CHAPTER 5. PROVISION AND TYPES OF SERVICE IN A VTS

### 0501 Introduction

In many waterways vessels can operate independently under any conditions of traffic and weather. In such circumstances there is no need for a VTS since vessels operate safely and unaided. However, there are many waterways where vessels rely on interaction with shore authorities to conduct their movements safely and efficiently and where a VTS may be required. The purpose of this chapter is to set out the options available to a Competent Authority for the provision of a VTS.

Vessel Traffic Services (VTS) is a service implemented by a Competent Authority, designed to improve the safety and efficiency of vessel traffic and to protect the environment. The service should have the capability to interact with the traffic and to respond to traffic situations developing in the VTS area.

*'The Competent Authority is the Authority made responsible, in whole or in part, by the Government for the safety, including environmental safety, and efficiency of vessel traffic and the protection of the environment!'*  
IMO Resolution A.857(20)

### 0502 Prerequisites

The prerequisites for Vessel Traffic Services (VTS) are:

#### 0502.1 Vessel Traffic Services

- ✓ Authorised by the Competent Authority;
- ✓ Staffed by V-103 certificated personnel;
- ✓ Interacts with traffic;
- ✓ Responds to traffic situations; and
- ✓ Equipped to provide INS/NAS/TOS as appropriate.

### 0503 Provision and Declaration of Services

The responsibility for determining the types of service provided by the VTS to mitigate identified hazards, lies with the Competent/VTS Authority who is accountable for the standards set. This includes the resources, staffing levels, training and qualifications.

An Information Service (INS) is the basic type of service. It should be declared formally and provided as a service by all VTS. When a VTS Authority organises and manages traffic within its VTS Area as part of its function, then it would normally also declare the provision of a Traffic Organization Service (TOS).

While VHF should be the primary means of communicating information, any available means

within the maritime mobile service may be used when providing any of the services.

Normally a VTS Authority would be expected to respond to situations where a vessel was observed, or otherwise deemed, by the VTS to be in need of navigational assistance, using appropriate procedures. It would also be expected to respond to requests from a vessel that is in need of navigational assistance in situations such as an equipment failure or incapacitation of a key member of the bridge team; this may be limited to getting the vessel to the nearest place of safety.

It therefore follows that, normally, a VTS Authority should declare a Navigational Assistance Service (NAS) in addition to an INS or TOS and that VTS personnel should be trained appropriately. Where the delivery of NAS is subject to special conditions or additional capabilities/requirements relating to a specific VTS Area, these should be clearly promulgated in the appropriate publications.

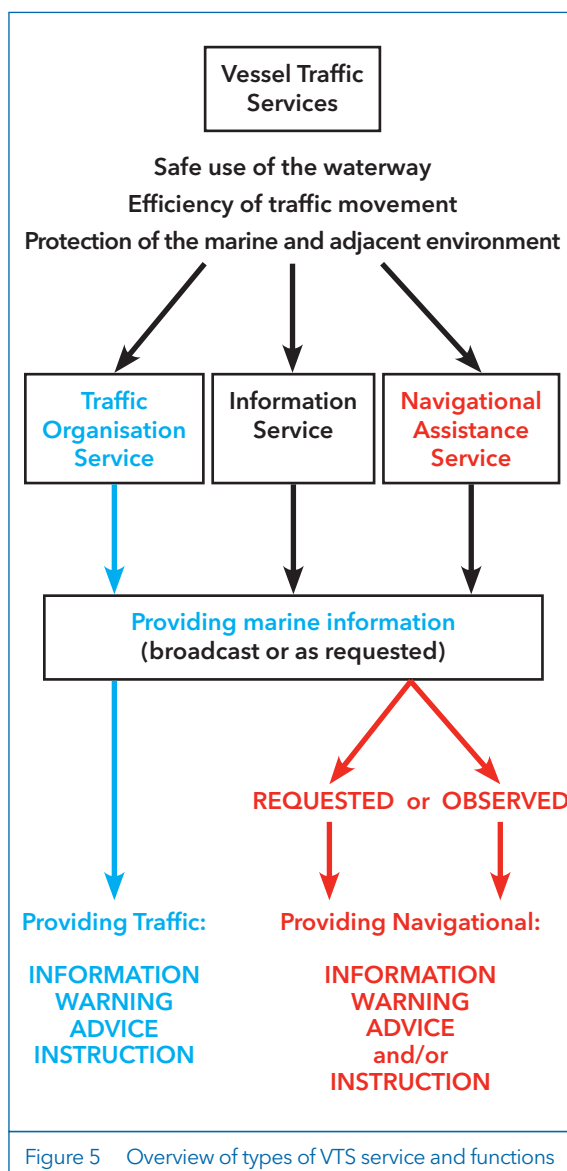


Figure 5 Overview of types of VTS service and functions

## 0504 Types of service within a VTS (INS/TOS/NAS)

### 0504.1 Information Service (INS)

#### A. General

An Information Service provides relevant information at appropriate times and on request for the promulgated VTS area.

An Information Service involves maintaining a traffic image and allows interaction with traffic and response to developing traffic situations. An Information Service should provide essential and timely information to assist the on board decision-making process, which may include but is not limited to:

- ✓ The position, identity, intention and destination of vessels;
- ✓ Amendments and changes in promulgated information concerning the VTS area such as boundaries, procedures, radio frequencies, reporting points;
- ✓ The mandatory reporting of vessel traffic movements;
- ✓ Meteorological and hydrological conditions, notices to mariners, status of aids to navigation;
- ✓ Manoeuvrability limitations of vessels in the VTS area that may impose restrictions on the navigation of other vessels, or any other potential hindrances: or
- ✓ Any information concerning the safe navigation of the vessel.

More detailed examples of different types of information that may be provided by the VTS operating an Information Service will be found in IALA Guideline 1089 on Provision of Vessel Traffic Services (INS, TOS & NAS)

#### B. Provision of an Information Service

An Information Service should be provided when:

- ✓ broadcasting information at fixed times and intervals, as promulgated in the appropriate navigational publications;
- ✓ deemed necessary by the VTS; or
- ✓ the vessel has requested information.

If a VTS is tasked with providing a maritime safety information service (MSI), guidance on this type of information is found in IMO Resolution A.706(17), as amended, - World-wide navigational warning service.

### 0504.2 Traffic Organisation Service (TOS)

#### A. General

A Traffic Organization Service (TOS) is a service to prevent the development of dangerous maritime traffic situations and to provide for the safe and efficient movement of vessel traffic within the

declared VTS area. It concerns the operational management of traffic and the planning of vessel movements and is particularly relevant in times of high traffic density or when vessel movements may affect the traffic flow.

A Traffic Organization Service may be provided in part, or all, of the declared VTS area.

#### B. Provision of a Traffic Organization Service

A Traffic Organization Service should be provided when the VTS is authorized to provide services, such as when:

- ✓ vessel movements need to be planned or prioritised to prevent congestion or dangerous situations;
- ✓ special transports or vessels with hazardous or polluting cargo may affect the flow of other traffic and need to be organised;
- ✓ an operating system of traffic clearances or sailing plans, or both, has been established;
- ✓ the allocation of space needs to be organised;
- ✓ mandatory reporting of movements in the VTS area has been established;
- ✓ special routes should be followed;
- ✓ speed limits should be observed;
- ✓ the VTS observes a developing situation and deems it necessary to interact and coordinate vessel traffic;
- ✓ nautical activities (e.g. sailing regattas) or marine works in-progress (such as dredging or submarine cable-laying) may interfere with the flow of vessel movement.

A Traffic Organization Service should be responsible for separating traffic in the interest of safety. This separation could be defined in space, time and/or distance.

Enforcement may also be carried out within a Traffic Organization Service where the VTS should monitor adherence to applicable rules and regulations and to take appropriate action where required and within the authority of the VTS.

### 0504.3 Navigational Assistance Service (NAS)

#### A. General

A Navigational Assistance Service is a service that provides essential and timely navigational information to assist in the on board navigational decision-making process and to monitor its effects. It may also involve the provision of navigational advice and/or instruction.

The Navigational Assistance Service is especially important in difficult navigational or meteorological circumstances or in case of defects or deficiencies.

A Navigational Assistance Service is an important supplement to the provision of other navigational services, such as pilotage. Navigational Assistance Service may be provided at the request of a



vessel, irrespective of whether a pilot is on board, or when a navigational situation is observed and intervention by the VTS is deemed necessary.

Navigational Assistance Service requires positive identification and continuous communication throughout the process. If possible and if time permits, checks should normally be made prior to commencement of the provision of Navigational Assistance Service to assess the capability of the vessel to respond to the guidance given. An example of a checklist for provision of NAS is found in ANNEX B of IALA Guideline 1089, which should be modified as required for local requirements.

VTS operators should be appropriately trained and ready to deliver Navigational Assistance Service when a situation that compromises navigational safety occurs.

#### B. Provision of a Navigational Assistance Service

It is recommended that a Navigational Assistance Service:

- 1 Is provided to an individual vessel, at the request of the vessel or when deemed necessary by the VTS, to assist the decision-making process on board the vessel concerned. This service consists of navigational matters relating to a specific vessel and may include information, warning, advice and instruction subject to the authority of the VTS.
- 2 Has a start and end time.

It is important that information to assist the on board decision-making is provided in a timely manner. It should be conducted in a clear and concise manner in order to maximise on board understanding and to eliminate the chance of misinterpretation and to minimize the risk of unwanted consequences.

Examples of developing situations where a Navigational Assistance Service may be provided:

- ✓ Risk of grounding;
- ✓ Vessel deviating from the VTS sailing/passage plan;
- ✓ Vessel unsure of its position or unable to determine its position;
- ✓ Vessel unsure of the route to its destination;
- ✓ Assistance to a vessel to an anchoring position;
- ✓ Vessel defects or deficiencies, such as navigation or manoeuvring equipment failure;
- ✓ Severe meteorological conditions (e.g. low visibility, strong winds);
- ✓ Risk of collision between vessels;
- ✓ Risk of collision with a fixed or floating object;
- ✓ Assistance to a vessel to support the unexpected incapacity of a key member of the bridge team.

#### C. When should a Navigational Assistance Service be provided?

Navigational Assistance Service should be provided when:

- ✓ observed / deemed necessary by the VTS;
  - ✓ the vessel has requested the service.
- .1 Observed / deemed necessary by the VTS

This may occur when the VTS observes a developing situation (e.g. a vessel approaching shallow waters) and deems it necessary to interact with the bridge team.

When the VTS observes a developing situation (e.g. a vessel deviating from a recommended route) and deems it necessary to intervene, it is likely that, under such circumstances, the immediate priority will be placed on providing the necessary assistance before attempting to formally negotiate the commencement of navigational assistance. However, once the immediate situation has been resolved, the continuation or completion of the service should be subsequently clarified and the use of the checklist considered.

- .2 On request by a vessel

This may occur on request by a vessel in circumstances such as equipment failure or navigational unfamiliarity. Individual circumstances will dictate the degree of preparation that can be undertaken prior to commencing the Navigational Assistance Service on request. If possible, preparations should include an assessment of the capability of the vessel to undertake the passage safely and/or the risks involved if for any reason the VTS is not able to provide navigational assistance.

The provision of navigational assistance does not absolve the master from the responsibility for the safety of the vessel; furthermore, the master should be made aware of any limitations that may affect the service provided. The VTS operator should also be aware of the specific responsibilities for collision avoidance that apply to the vessel.

If possible and if time permits, checks should normally be made prior to commencement of the provision of navigational assistance to assess the capability of the vessel to respond to the guidance given. An example checklist for provision of NAS can be found in ANNEX B of IALA Guideline 1089, which should be modified as required for local requirements.

#### D. Methods of communicating NAS

In providing a Navigational Assistance Service it is important that the interaction from a VTS centre to assist the on-board decision-making is conducted in a timely manner, is unambiguous and clearly understood by both parties and not open to interpretation.

Messages relating to Navigational Assistance Service should always be addressed by name to the vessel participating in the service so that there is no doubt to whom the content of the message is directed.

Consideration should be given regarding the VHF radio frequency on which the Navigational Assistance Service should be provided depending on individual and local circumstances. An assessment should be made of the benefits of conducting the assistance on a discrete frequency so that interference from other users can be avoided, or the use of a common working frequency such that other users are aware of the likely actions of the vessel participating in the Navigational Assistance Service. Other options may be available if the participating vessel is able to monitor two or more frequencies.

#### E. Message Markers within NAS

Although any message marker may be used when providing a Navigational Assistance Service, INSTRUCTION as a message marker should only be provided when the VTS Operator has been given the authority to use it within the Navigational Assistance Service.

It is recommended as best practice that message markers are always used when delivering Navigational Assistance Service irrespective of the language ability of the recipient. Navigational Assistance Service is often provided when a degree of stress or urgency exists and the use



Figure 6 VTS Centre - Tuapse, Russia

of message markers can help to ensure that the purpose of each part of the message is clear and unambiguous.

Message Markers are further described in CHAPTER 18 - VTS Operational Procedures.

For more details on the provision of VTS, see IALA Guideline 1089 Provision of Vessel Traffic Services (INS, TOS & NAS).

## 0505 Promulgation of Services and Related Information

The services offered to the mariner by a VTS should be promulgated to vessels in internationally recognised marine publications. This should include details of the VTS, its capabilities, rules, regulations, requirements, radio frequencies and procedures. The information promulgated should be verified, or updated, at least annually. VTS areas should also be clearly defined on navigational charts. Further information on the promulgation of VTS information can be found in CHAPTER 14 - Promulgation of VTS Information.

## 0506 Allied and Other Services

### 0506.1 Introduction

Allied Services are services actively involved in the safe and efficient passage of the vessel through the VTS area.

Other Services refer to services other than the allied services, which MAY use VTS data to more effectively undertake their work (e.g. ensuring local security or preventing illegal imports).

The role of VTS is well established and its services are well positioned in the maritime domain. VTS information may be needed to support other services such as maritime security or environmental agencies, with which the VTS Authority may not have had previous interaction. The possible stakeholders who may wish or need to co-operate with the VTS Authority need to be identified. IALA Guideline 1102 VTS Interaction with Allied or Other Services has a broad perspective, to help VTS Authorities in their interaction with other services, outside the VTS area and examples of possible stakeholders can be found at ANNEX A to this Guideline.

### 0506.2 Possible Interaction with Allied and Other Services

It should be taken into account, that interaction between VTS and allied or other services - inside or outside the maritime domain - could be necessary to sustain those services. In such a case, an arrangement between the VTS Authority and the provider(s) of those services should be in place.

In some cases, when considered necessary, support from VTS may extend outside the VTS area. This could result from national, regional or international arrangements.



Some examples of interaction between VTS and allied and other services are:

- ✓ Security
- ✓ Safety and protection of the marine environment
- ✓ Efficiency of maritime traffic
- ✓ Search and Rescue

#### **0507 Certification and Audit of Vessel Traffic Services**

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Appropriate and adequate operational and administrative procedures of the VTS should be in place. The Competent Authority should ensure that the operational and administration procedures used by a VTS Authority are appropriate for the declared services through certification and continual improvements. Certification can be achieved by an appropriate auditing and accreditation process. IALA Guideline 1101 Auditing and Assessing VTS provides guidance for auditing and assessing a VTS and the subsequent on-going assessment and evaluation to ensure conformity with international obligations and is a framework to assist authorities to meet their requirements for the establishment and operation of VTS in a consistent manner.

Useful guidance may also be found in IALA Guideline 1115 on Preparing for an IMO IALA Member State Audit Scheme (IMSAS).

For further details on audits and quality management systems (QMS), see CHAPTER 19 – Quality Management in VTS.





## CHAPTER 6. PRINCIPLES OF MANAGING VESSEL TRAFFIC

### 0601 Introduction

This chapter discusses the principles of managing vessel traffic that an authority may wish to implement in order to enhance safety and efficiency of vessel traffic in a port, waterway or coastal waters. These principles may be enacted in conjunction with the various types of service discussed in the previous chapter and with nautical service providers where necessary. However, before implementing any measure, the authority should evaluate the local conditions and, in addition, the authority should evaluate the arrangements concerned between shipping interests and terminals, where appropriate.

The evaluation should include a review of the geography, meteorology, hydrology and environmental issues of the port or regional area; an assessment of the types and numbers of vessels operating within it; consideration of port business interests; a review of waterspace management techniques, and conclude with an evaluation of the types of service and how they can contribute to safety and efficiency of marine traffic operating within the area. The primary issues are outlined below and may need to be taken into account in determining whether a VTS is required to enhance safety and efficiency of marine traffic, a process that is described more fully in CHAPTER 7 - Determining the need for VTS.

### 0602 Geography, Meteorology, Hydrology and Environmental Issues

The geography, meteorology, hydrology and topography of the local or regional area will

determine the way in which traffic operates within the area, the type of traffic that can safely use the area and how it may be managed.

#### 0602.1 Geography

This involves an assessment of the waterspace available for navigation, identification of the fairways or channels and how they might be marked. Consideration should also be given to the proximity of isolated dangers and the quality/availability of primary and alternative methods of positioning and navigation. Guidance on assessing the criteria for safe shipping movements has been published by the Permanent International Association of Navigation Congresses (PIANC) and includes a discussion of the risks associated with, and the relationship between factors such as vessel draught, Under Keel Clearance (UKC) and channel width. The control and management of UKC is a key risk management and safety feature. Its calculation includes an allowance for factors such as: vessel construction, water density, squat, wave and swell allowance and bottom type.

#### 0602.2 Meteorology

Factors such as the speed and direction of the prevailing wind, direction and height of the waves, visibility and the formation of ice may impact on the assessment of the safe operating patterns in a particular area, fairway or channel and the types of vessels that may be permitted to operate within the area.

#### 0602.3 Hydrology

The establishment of safe operating areas, fairways and channels should take into account



Figure 7

Traffic in Port of Rotterdam, The Netherlands

the hydrology of the area. This will include factors such as the stability of the seabed, the accuracy of surveys, tidal ranges, tidal streams, prevailing currents and swell.

#### 0602.4 Environmental Issues

There are areas where the risk of, or consequences of an incident would be such that extra safety provisions, over that normally applied, may be appropriate. These areas must be identified so that the VTS can accommodate them.

There is an increasing awareness of the impact of emissions from vessels either when alongside, when manoeuvring, or in coastal waters. VTS and pilots may have a role in monitoring adherence to regulations and specific operational procedures may apply

### 0603 Vessel Types and Traffic Density

The geography, meteorology and hydrological considerations above should be closely linked with an assessment of the types of vessels, their size and manoeuvrability, traffic density, traffic patterns and the trade being conducted in the area. The inter-relationship between the environmental factors and the vessel size is self-evident but special consideration may need to be given to the type of vessels and the cargoes being carried, particularly where these incur additional risk.

International guidance provides options for some high-risk ships, and national legislation may dictate the need for additional restrictions in the management of certain cargoes. For example, the Society of International Gas Tanker and Terminal Operators (SIGTTO) document 'LNG Operations in Port Areas' gives guidance about the factors that need consideration when establishing the size of domain that should be used with liquefied gas shipping when in a narrow channel. Such guidance relies on the output obtained from a relevant risk-assessment.

### 0604 Business Interests

Ports must operate in an efficient manner to meet the needs of the users but this must be done without impinging on the safety of operations and protection of the environment. Recreational activities, issues associated with oil and gas production and military operations may take place within the area to be covered by Vessel Traffic Services. A good working relationship needs to be established and maintained with other users of the area and allied services. The authority must make due allowance for any potential conflict between safety, business interests and other activities of service providers in the port and pre-empt such conflicts before they arise.

### 0605 Waterspace Management

Having established the available waterspace and the type of vessels that will be operating within

the area, a number of techniques are available to manage traffic. These include:

**Channel and Fairway Dimensions** - Safety of navigation may be enhanced by establishing a deep-water channel within a buoyed fairway that would permit shallower draught vessels to navigate safely outside of the deep-water channel, whilst remaining within the buoyed fairway.

**Traffic Separation Schemes** - TSS may be established to organise traffic where traffic patterns and traffic flows indicate that this may be desirable. TSS may be established by national authorities within their territorial sea but those in international waters must be adopted by IMO. Guidance for establishing a TSS is contained in the IMO Publication - 'General Provisions on Ships' Routing'.

**Two-Way Traffic** - Within a channel, normal two-way traffic flows may be permitted. This may involve granting approval for overtaking and for encounters involving vessels carrying hazardous cargoes. Further consideration should be given to additional restrictions involving overtaking and encounters at pinch points such as bends in the channel.

**One-Way Traffic** - Risk assessment may indicate the desirability of limiting the flow of traffic to one-way only for all vessels or for vessels of a particular size, type or cargo.

**Point of No Return** - Ports with significant tidal ranges may need to identify 'points of no return' or 'abort' points to ensure that a vessel can return to safe water, a lay-by berth or an anchorage in the event that the planned berth is unable to accept the vessels.

**Anchorage** - In establishing anchorage areas, consideration should be given to factors such as shelter, depth, holding ground and proximity to channels and fairways. Specific anchorages may be reserved for use by large vessels or those carrying dangerous goods that are unable to proceed to their planned berth.

**Slot Management** - The techniques above of 'point of no return', 'two-way and one-way traffic' management may be combined with the requirement for slot management. This is the process whereby a vessel is allocated a time window/slot or turn to make or begin its transit through all or part of a designated channel.

**Ship Domain** - An operational zone around, above or below a vessel within which an incursion by another fixed or moving object, or another domain, may trigger reactions or processes. The size of a domain may vary for the same vessel dependent on a number of circumstances such as: the dimensions of the waterway; traffic density; ship size; ship characteristics; ship speed; and aspect of encounter. A Ship Domain is widely used in traffic simulation models, encounter criteria, traffic lane design criteria, VTS planning, risk assessment, collision avoidance, and for other applications such as establishing operational procedures and the dimensions of a Ship Safety Zone.



**Ship Safety Zone** - A zone around a vessel within which all other vessels should remain clear unless authorised. The size of the Ship Safety Zone may vary depending upon such factors as: the dimensions of the waterway; ship size; ship characteristics, cargo, and the degree of risk. The dimensions selected should be determined taking into account these details and a relevant risk assessment.

**Exclusion Zone** - A geographical area, within which all other vessels should remain clear unless authorised. The size and shape of the area may vary depending on the risks involved.

**Clearance of Ship Movements** - Traffic movements may be managed within a port through the clearance of ship movements. This requires vessels to seek clearance before entering or navigating within a VTS area and may include the provision for advanced notice to enable the managing authority to assess the situation and set conditions for the movement should this be necessary.

**Organising Arrivals and Departures** - The organization of arrival and departure times to and from the berth or pilot station or port approach point is an effective way of managing traffic movements and establishing priorities for individual vessels. This is frequently achieved through negotiation with terminals and allied services.

## 0606 Types of Service

Assessment of the issues above are fundamental considerations in determining the need for a VTS (Chapter 7) and in selecting the type(s) of service to be provided (Chapter 5), appropriate to that VTS. Waterspace management such as the establishment and marking of channels and fairways and the establishment of Traffic Separation Schemes (TSS) are measures that may be used in conjunction with a VTS, but may also be used separately.

Techniques involving the closer management of vessel traffic, however, will invariably involve the establishment of a VTS. Where it is decided to establish a VTS, waterspace management will be a key consideration in determining the type of service that will be required. Other measures described above are measures that would normally require a Traffic Organization Service. The complexity of the navigational environment will determine through risk assessment the additional arrangements, measures and type(s) of service required.

In all cases, the training and qualifications of VTS Operators providing the service and their authorisations should be clearly identified and clear operating procedures established (CHAPTER 18 - VTS Operational Procedures).





## CHAPTER 7. DETERMINING THE NEED FOR VTS

### 0701 Introduction

This chapter provides guidelines to aid the decision making process in judging the need for establishing a VTS, or for reviewing an existing VTS, by providing a framework to assist competent authorities to:

- ✓ Assess the risks associated with a waterway;
- ✓ Assess the contribution that VTS can provide in mitigating risk and improve the safety and efficiency of navigation, safety of life and the protection of the environment; and
- ✓ Determine the level of sophistication of the vessel traffic system required where it is decided that a VTS is the appropriate tool.

In deciding whether or not to implement a VTS there are essentially two fundamental questions to be addressed by a Competent Authority:

- 1/ What are the environmental, safety and economic consequences of having or not having a VTS, given the currently implemented safety systems?
- 2/ What is the level of investment that can be justified to improve the safety system?

### 0702 Mechanisms to Improve Maritime Safety and Efficiency of Navigation

Each harbour, port or coastal waterway is inherently different and the requirement to manage navigation varies considerably. It should be recognised that a VTS may be essential in some waterways; however, different mechanisms may be more appropriate in others. Determining whether a VTS is an appropriate mechanism to address concerns about the levels of safety is often difficult to assess. In most, if not all cases, the need for a VTS only becomes readily apparent when all mitigating factors are considered. This will normally require a formal assessment of navigational risk to identify what management of navigation is required and to what degree monitoring and traffic organization needs to play a role in mitigating risk.

IALA Recommendation V-119 - 'Implementation of Vessel Traffic Services' provides guidance on the needs analysis process.

*The Inception and the Feasibility and Design Phases should provide details of the VTS requirements to enable cost and performance estimations to be carried out under the Cost/Benefit Study Phase. The Cost Benefit Study should consider direct risk reduction (which may be vague), the less evident benefits that a future VTS might offer and the further value added services for shipping in the future. A realistic cost*

*estimate for running a VTS is important. An estimate of possible future cost reduction to be achieved by slimming down the other waterway infrastructure costs should also be provided. In the case where the Feasibility Study gives a positive result, the Competent Authority may proceed with the final design and planning work and launch a bid for tenders.*

*Sometimes the Inception, Feasibility and Design, Risk Assessment and Cost/Benefit Phases of the project are altogether classified as the Feasibility Study. This approach could be followed in the case where the Competent and/or VTS Authority has carried out a separate initial investigation to identify all the options available to address the risk and has subsequently determined that the preferred solution is to proceed with a Feasibility Study. Furthermore, the Feasibility and Design Phases may be incorporated within one phase, as opposed to comprising two separate phases. In this Recommendation, the Feasibility and Design has been treated as a single Phase.*

*IALA Recommendation V-119*

### 0703 Benefits of VTS

The purpose of VTS is to improve the maritime safety and efficiency of navigation, safety of life at sea and the protection of the marine environment and/or the adjacent shore area, work sites and offshore installations from possible adverse effects of maritime traffic in a given area. VTS may also have a role to play in security.

The benefits of implementing a VTS are that it allows identification and monitoring of vessels, strategic planning of vessel movements and provision of navigational information and navigational assistance. It can assist in reducing the risk of pollution and, should it occur, coordinating the pollution response. Many authorities express difficulty in establishing justifiable criteria for identifying whether VTS is the most appropriate tool to improve the safety and efficiency of navigation, safety of life and the protection of the environment. A VTS is generally appropriate in areas that may include any, or a combination, of the following:

- ✓ High traffic density;
- ✓ Traffic carrying hazardous cargoes;
- ✓ Conflicting and complex navigation patterns;
- ✓ Difficult hydrographical, hydrological and meteorological elements;
- ✓ Shifting shoals and other local hazards and environmental considerations;
- ✓ Interference by vessel traffic with other waterborne activities;



- ✓ Number of casualties in an area during a specified period;
- ✓ Existing or planned vessel traffic services on adjacent waterways and the need for cooperation between neighbouring states, if appropriate;
- ✓ Narrow channels, port configuration, bridges, locks, bends and similar areas where the progress of vessels may be restricted; and
- ✓ Existing or foreseeable changes in the traffic pattern in the area.

### 0704 Needs Analysis

Installation of a VTS invariably requires considerable investment. It is strongly recommended that before considering the establishment of a new VTS, or the enhancement of an existing VTS, the Authority concerned with VTS should undertake a formal study to define clearly the need, the functional requirements and to identify the costs of implementation.

IALA Recommendation V-119 - 'Implementation of Vessel Traffic Services' provides guidance on the items to be addressed. Table 1 shows the four key steps for a needs analysis to determine whether a VTS is an appropriate mechanism to maintain or improve maritime safety and, if so, whether the Competent Authority has the requisite capability and resources to implement one.

Table 1 Key steps in needs analysis

#### Preliminary Assessment

In the Preliminary Assessment phase, all relevant problems in the VTS area concerned should be defined and analysed. Further, as a second step in the process, operational objectives should be established with the ultimate aim of alleviating the defined problems.

#### Feasibility and Design

If the previous Preliminary Assessment phase has indicated that passive measures alone are inadequate to attain the desired level of safety and efficiency of the maritime traffic in the area under consideration, the effect of establishing a VTS should be tested.

#### Formal Risk Assessment

The Risk Assessment Phase is intended to confirm that the measures being designed and introduced will reduce the risk of collisions and groundings in the area to a level considered by the Competent Authority to be satisfactory.

#### Cost / Benefit Analysis

After the completion of the Feasibility and Design and Risk Assessment phases, a Cost Benefit Analysis should be conducted to determine whether the expected reduction in risk would be justified in terms of the level of investment required.

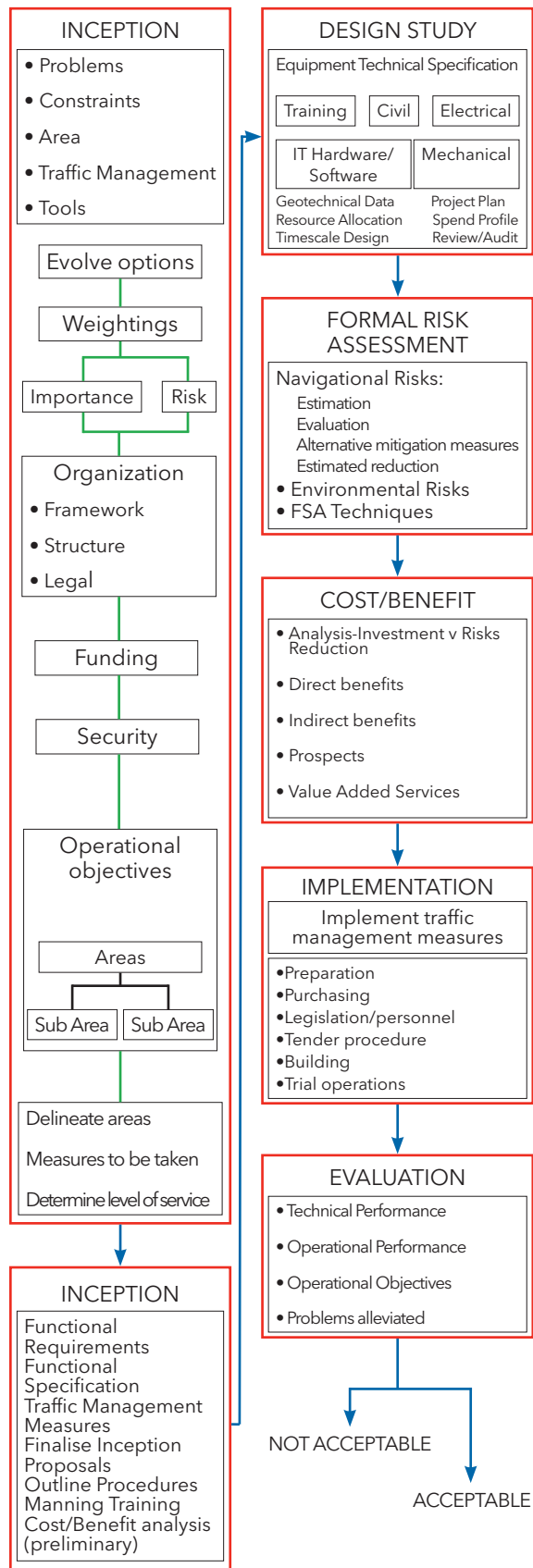


Figure 8 Main activities of the phases of development and procurement of a VTS





## 0705 Preliminary Assessment (Inception)

The purpose of the preliminary assessment phase is to decide the suitability of VTS as an appropriate traffic management option. Where this is confirmed, the information collected will provide the basis for undertaking the feasibility study. The preliminary assessment should identify as a minimum, the potential hazards, as well as the existing organizational infrastructure, operations and procedures.

The preliminary assessment should identify whether active traffic management is an appropriate means to address the local traffic problems. Active traffic management should only be necessary in those areas where other means are inadequate to provide the desired level of safety and protection of the environment.

The preliminary assessment phase should be an iterative process that involves the following key steps:

- ✓ A review of the organizational structure, including its culture, policies, procedures and priorities;
- ✓ A review of the legal framework;
- ✓ A definition of the area under consideration including its oceanographic characteristics.
- ✓ A definition of and/or quantification of:
  - ↳ The inherent navigational and environmental attributes of the waterway;
  - ↳ The stakeholders;
  - ↳ The economic and environmental value of the waterway;
  - ↳ The public interest;
  - ↳ The maritime traffic using the waterway;
  - ↳ Available incident data, such as collisions and groundings;
  - ↳ Available data on traffic problems, including delays, and
  - ↳ Security considerations.
- ✓ An identification of the existing safety management structure, including its strengths and weaknesses;
- ✓ An identification of the key risks to navigation not being addressed by existing safety management structure;
- ✓ An identification of the options to address the key risks;
- ✓ A definition of the operational objectives to alleviate the risks, and
- ✓ An identification of the most appropriate traffic management tools, in terms of effectiveness and costs, to mitigate the defined problems.

These traffic management tools may range from simple routing measures through to the implementation of an advanced VTS system.

It should be recognised that one of the main difficulties faced in undertaking any form of risk assessment is that, in many cases, the full consequences of recorded casualties are not available. In such circumstances they should be estimated by expert judgement. Account should also be taken that future events are not simply an extension of history, so more refined methods need to be applied to assess the estimated casualty costs and other consequences for, say, the next ten years, or so, by taking into account all foreseeable trends. Risk estimation and evaluation form vital inputs to any risk assessment.

Future developments of the port infrastructure and the resulting changes in traffic volumes and composition, including dangerous cargoes, together with any other relevant development in the area concerned should be considered in this phase. In the specific case of a Coastal VTS, future trends in traffic volume and other activities in the coastal area, such as fishing, recreation and offshore activities need to be taken into account. Equally relevant, is the need to consider developments in VTS technology and SOLAS requirements, for navigational and communication equipment on board vessels.

Where it is decided to establish a VTS, the following aspects need to be addressed:

- ✓ Organizational framework of the national and local maritime authorities in relation to implementing new traffic management solutions, VTS in particular; and
- ✓ The adequacy of the existing regulatory or legislative framework, including local by-laws, rules and recommendations. Special attention has to be devoted to ascertain any requirement for adjusting the framework to ensure the effective implementation of a VTS.

In deciding upon the establishment of a VTS, VTS Authorities or Competent Authorities should also consider the responsibilities and the availability of the requisite technology and expertise.

## 0706 Feasibility and Design

The Feasibility and Design Phase is intended to identify the functional requirements needed to achieve the desired level of safety and efficiency of the maritime traffic. The foundation for proceeding with the Feasibility and Design Study Phase is the information compiled in the preliminary assessment (Inception) Phase and the expected functions and benefits of a future VTS. This input may also give an indication of the desired type of service to be provided by the VTS.

To establish the functional requirements for the VTS the VTS/Competent Authority needs to assess the types of vessels using a particular area, the requirements to aid their safe and expeditious passage, the operational benefit of a VTS and the broad implications of providing the service. These considerations should take into account the existing

aids to navigation and traffic separation schemes in the area concerned.

It is very important in this Feasibility and Design phase that the functional requirements to be developed do not lead to unnecessary expense in the future operation of the VTS. Any consultants appointed by the VTS/Competent Authority should be independent from any VTS equipment manufacturers, thus ensuring independent and impartial advice. Furthermore, consideration should be given to the availability of the requisite technology and expertise. This is of particular importance for the required regular maintenance and to remedy defects and other trouble-shooting.

The feasibility and design study phase is also intended to provide a VTS Authority with a framework for proceeding with development against carefully established guidelines of requirement, cost, risk and time. It should comprise some or all of the following:

- ✓ Description of the constraints and context in which the VTS will operate;
- ✓ Evaluation of the technology available and determination of the standards to be used;
- ✓ Evaluation of the human resources needed for operation of the system and consideration of manning levels, training and skills required;
- ✓ Evaluation of the health and safety facilities needed to safeguard staff and other persons associated with the VTS system;
- ✓ Preparation of a management plan for the entire development;
- ✓ Assessment of the method, or methods, to be used for Quality Assurance;
- ✓ Assessment of the probability that the VTS system will be developed, installed, tested and ready for operational use within both the required time scale and the available financial resources;
- ✓ Development and evaluation of system design options, which may include the location of the VTS buildings themselves.

Advances in technology have enabled a number of VTS centres to be sited remotely from the actual harbour/waterway. In addition, security implications may drive the site selection decision.

- ✓ Determination of the Integrated Logistic Support (ILS) requirements, including the identification of the through-life elements of the system and the means for achieving enhancement and upgrades;
- ✓ Automatic data exchange, data validation; and
- ✓ Evaluation of a Cost-Benefit analysis and the identification of any trade-offs.

The feasibility sub-phase should identify the range of activity that will need to be examined during

the technical specification sub-phase, show the feasibility of any actions suggested and eliminate high-risk elements. On satisfactory completion of the feasibility sub-phase the VTS Authority will be in possession of a highly detailed basis for proceeding to technical specification phase with confidence that its outcome will provide a viable solution for developing the system. Attention is also drawn to IALA Recommendation V-119 - 'Implementation of Vessel Traffic Services', which provides a comprehensive list of the functional requirements to be addressed within the feasibility sub-phase.

In order better to facilitate the Cost Benefit Analysis it is important that a basic functional design is provided. Further, a system model, containing in broad outline the key system attributes (sensors and other components), will be required.

The Technical requirements specification should produce the definitive statement of how the system, including buildings, is to be constructed, and how sub-systems and components should interact with each other to produce a viable VTS. IALA Recommendation V-128 - 'Operational and Technical Performance Requirement for VTS Equipment', provides further guidance.

## 0707 Formal Risk Assessment

The Risk Assessment Phase is intended to confirm that the measures being designed and introduced will reduce the risk of collisions and groundings in the area to a level considered by the Competent Authority to be satisfactory. The risk level should be calculated by taking into account:

- ✓ The type, size, speed, manoeuvrability, routes and spatial distribution of ships using the area, including local craft;
- ✓ The types of aids to navigation provided in the area and their locations; and,
- ✓ The traffic routeing schemes in use in the area.

A total risk equation comprises the probability, or frequency, of an incident occurring, the consequences of an incident and the Governmental or public acceptability of such an incident. The risk assessment should identify and quantify each of these aspects.

IALA Guideline 1018 - Risk Management, provides a general risk assessment and risk management methodology for Marine Aids to Navigation including Vessel Traffic Services (VTS) so that all types of risks can be effectively managed. The Guideline may be used when assessing the optimum mix of aids to navigation, including VTS, for mitigating risk.

## 0708 Reference Documentation

Documentation that should be consulted includes, but is not limited to:



1 IALA Guideline 1018 - 'Risk Management' - this Guideline breaks down the Risk Management process into six clearly identifiable steps, namely:

- a. Identification;
- b. Assessment;
- c. Control;
- d. Decision;
- e. Action; and
- f. Monitoring

2 IALA Guideline 1104 - The application of maritime surface picture for Analysis in risk assessment and the provision of Aids to Navigation.

3 IALA Recommendation O-134 on The IALA Risk Management Tool for Ports and Restricted Waterways.

### **0709 Cost Benefit Analysis (CBA)**

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After completion of the Design and Risk Assessment Phases, an extensive analysis of the costs and benefits is needed to justify large public and/or private investments, such as a VTS. Even if not all costs and benefits can be translated into monetary terms, the CBA can assist in a more complete and rational decision-making process. It can also contribute to the proper allocation of the cost recovery by the various benefiting parties, as well as the determination of the system requirements.

CBA forms an integral and essential part of the process for implementation of a new VTS or modification of an existing VTS, which should be considered in conjunction with the implementation of other traffic management instruments to achieve the same objectives. The CBA forms a building block in the process of risk management. The methodology is further described in CHAPTER 8 - Cost Benefit Analysis (CBA) of VTS.

Both the additional direct and indirect benefits and prospects that a VTS might offer, including additional value added services for the traffic in the future as well as the benefits to shore based port operations, should be taken into consideration. A direct benefit that could be taken into consideration, amongst others, is the probable reduction in other waterway infrastructure costs that may arise from implementation of the changes, such as replacing labour intensive processes using traditional equipment with more modern equipment and automated processes.

Indirect benefits should include an estimation of costs that would otherwise have been incurred in the event of an incident/accident, based on the projected difference between the frequency of occurrence of such incidents/accidents before and after implementation of any changes.





## CHAPTER 8. COST BENEFIT ANALYSIS (CBA) OF VTS

### 0801 Introduction

This chapter offers outline guidance on how to carry out a CBA. This is a complex task as quantification of safety benefits and the translation of these benefits in monetary terms is difficult and often comes down to expert opinion. However, there are a number of ways to eliminate, or at least reduce, the subjective element.

### 0802 Determination of Costs

The cost components of a new VTS consist of two distinctive elements, namely the initial investment costs and the lifetime operating costs. All cost components should be identified and quantified in terms of amount and the budget timeline. When considering a modification of an existing VTS, as opposed to a new VTS, only the additional costs should be assessed.

The investment costs are the total costs initially incurred for investments such as:

- ✓ Preparation (e.g. feasibility studies, tendering, procurement, legislation);
- ✓ Building works (e.g. VTS centres, radar locations, VHF masts, power/water/telephone connections);
- ✓ Equipment purchase and installation (e.g. radar, VHF and other communication, computers, software, VTS work consoles, vessels/vehicles);
- ✓ Project management and administration (including intermediate measures); and
- ✓ Organization set-up (e.g. recruitment and training of staff, developing procedures).

Often the costs for preparation, the set-up of the organization and the project management/administration are overlooked.

These investment costs are sometimes depreciated as capital costs during the lifetime of the VTS, depending on the accounting system used;

At the end of the lifetime of the VTS the investments might still have a residual value which needs to be deducted from the initial investment costs at present value.

The operation costs are the annual costs incurred over the lifetime of the VTS for expenditure such as:

- ✓ Maintenance and repairs of the building works (including spare parts);
- ✓ Maintenance and repairs of the equipment (including spare parts);
- ✓ Personnel (including replacement and additional/refresher training);
- ✓ Consumables (e.g. power, water, telephone, data exchange); and
- ✓ Insurance cover (if appropriate).

Electronic equipment quickly becomes out-dated and unviable to maintain. Therefore, regular replacement by more up-to-date equipment during the lifetime of the VTS needs to be considered in the operational costs assessment.

### 0803 Determination of Benefits

The determination of the potential benefits of VTS is even harder than the determination of the costs. However, some guidance is detailed below. The benefits to be gained may include:

- ✓ Reduced risk of damage to life, infrastructure and environment; and
- ✓ Improved economic performance.

The benefits can be for both in terms of a specific vessel as well as for the area as a whole. The area as a whole will include benefits to not only other vessels in the vicinity but also other activities in the vicinity.

Under 'other activities' there is a tendency to only think of the economic activities in ports. However, in or near ports there is often also an extensive population engaged in other activities, which need to be protected. With coastal and offshore VTS the benefits to fishing, offshore activities and tourism should be considered. In-depth knowledge of not only shipping, but all other activities in the area, together with their economic and environmental sensitivities is needed. Account should be given to future developments. In-depth analysis of past incidents, their causes and consequences, together with an insight into the effects a VTS might have on these is required.

The benefits of reduced risk of damage to life, infrastructure and environment are the hardest to determine. The different types of incidents that could have been prevented by a VTS (e.g. groundings and collisions) and of the different types of incidents where a VTS could have limited the consequences (e.g. by acting as co-ordination centre for other emergencies, such as fire on board) should be listed. An assessment can then be made of the number of incidents that could have been prevented by a VTS and the number of incidents where the negative consequences could have been reduced by a VTS.

The benefits to the improved economic performance of the vessel and the area can be quantified by measuring the reduction by the VTS in 'down time' of both the vessel and the related shore based activities, resulting from fog, traffic congestion and other circumstances. Also the economic effects by reduction in operational limitations of other activities based on the introduction of a VTS should be taken into account. More difficult is the determination of the benefits of information provided from the VTS on vessel movements to allied services, which can improve the (economic) performance of these services (e.g. ETA notification to port services).

By multiplying these with the averaged day rates of the average or individual vessels and other activities/facilities on an annual basis, an estimate of these annual benefits can be obtained.

In general terms the benefits to be gained from a VTS include improved safety of traffic by prevention of situations leading to an unacceptable risk, thus contributing to safe passage. The benefits to safety of traffic achievable by a VTS may depend upon the type of service provided and functions performed.

#### 0804 Calculation of Benefits

A calculation of the benefits can be carried out by the following steps:

- ✓ Inventory of incidents which happened in the area under consideration when there was no VTS (types of accidents, e.g. standings, collisions, circumstances during the incidents, e.g. visibility, tide, storms, behaviour of affected ships, probable reasons which led to the incidents);
- ✓ Inventory of traffic related delays by waiting and speed reductions in the area under consideration when there was no VTS;
- ✓ Inventory of amount, composition, dangerous or noxious cargoes and behaviour of traffic and specific conditions which may impair the traffic in the area under consideration;
- ✓ Calculation of probability of incidents in the case of no VTS, resulting from the registered traffic, taking into account fairway layout and width, numbers of encounters and the sizes of concerned ships, distribution of traffic and circumstances; and
- ✓ Calculation of costs caused by the above incidents, taking into account ship and cargo, other affected ships, infrastructure, human life, remedial action, potential consequences for traffic flow and other activities in the area and potential environmental consequences, as well as the costs caused by delays.

#### 0805 Assessment of Avoidable Costs

Taking into account the above factors, an assessment of the costs that can be either avoided or reduced by the use of a VTS can then be made. This provides an indication of the benefits achieved by the VTS in financial terms. There is some research, which indicates that a full VTS can reduce accidents in areas of high traffic density by 50%. However, the number of incidents and associated costs that can be prevented or limited by a particular VTS cannot be calculated exactly. This assessment can be made on the basis of:

- Statistical evaluation of the existing situations and experiences (also elsewhere);

This gives hard facts and figures, but might be misleading if circumstances are significantly different or have changed during the long measuring period needed to obtain reliable statistics;

- Consultation of experienced mariners, VTS-staff and consultants;

This is often an inexpensive method achieving quick results, but subjective (especially when only a few experts are available) and may not be valid for new situations.

- Mathematical models;

These models, where for instance the effect of VTS on the penetration of the vessel's domain is calculated, produces objective results, but could be unreliable as a model is a simplification of reality.

- Simulation methods.

These methods, where certain situations are recreated on a simulator or PC and tested by multiple runs, if possible in faster time, offer statistically reliable results in a short time, incorporating the human factor. However, a simulator is also only a model and can be expensive.

As all methods have certain advantages and disadvantages and none is perfect, a combination should be applied. This should result in quantitative values on reduction of the number of incidents or their consequences by VTS, which will need to be translated into monetary terms.

Some damage is difficult to translate into monetary terms. Damage or loss leads to repair and replacement costs, which can be determined relatively easily, but also leads to loss of earnings, which needs to be taken into the calculations too. The same applies to loss of earning of other affected activities (think of the loss of earnings in fishing and tourism after an oil spill) and the damage to the environment in general. There can be loss of reputation as well (think of the damage to the reputation and therefore business of an oil company after an oil spill), which is almost impossible to translate into monetary terms. If certain effects cannot be translated into monetary terms they should at least be noted and mentioned in the outcome of the CBA.

Estimating the monetary worth of a human life is a sensitive issue, considering that occasionally, people are injured or die as a result of an accident. For the purpose of CBA, the value of a human life is inherently an estimate, one that is pondered upon regularly. Public sector management often draws upon elaborate socio-economic modelling, when decisions are required on the building of roads, railways, etc. Among the several factors taken into account in such models, is a person's life expectancy, the net present value of their future earning potential, and other demographic factors.

On the basis of experience a categorisation of incident sizes for each incident category can be made. A distinction could and should be made between small incidents, which occur frequently but have small consequences, and disasters, which occur seldom, but have large consequences.

With small incidents an actual reduction in the number of incidents by VTS can be determined and





used in the further calculations. As an example: if in an area there are 10 small collision incidents per year with less than 4 million USD damage (average 0.2 million USD) and the VTS could reduce this by 40% a benefit of  $(0.40 \times 10) \times 0.2 = 0.8$  million USD per year could be allocated to the VTS.

With disasters, only a reduction in the risk of a disaster occurring by the VTS can be determined. As an example: if in an area 1 collision disaster is expected every 20 years, with more than 4 million USD damage (average 40 million USD) the VTS could reduce this by 15% and a benefit of  $(0.15 \times 40) / 20 = 0.3$  million USD per year could be allocated to the VTS.

By thus multiplying the (risk) reduction of incident type/size combinations and their consequences with the (average) damage of an incident type/size combination on an annual basis as well as multiplying the reduction in delays with the day rates of the affected activities an estimate of these annual benefits can be made.

### 0806 Comparison of Costs and Benefits

There are well-known and widely used methods for comparing costs and benefits to assist in the decision making process. These are available in many books on business economics. In these methods the costs and benefits are discounted to a fixed point in time, often the starting point of the project  $t_0$ . The discounted value of all costs during the lifetime of the VTS can be calculated as follows:

$$C_0 = [C_y / (1 + i)^y] + [C_n ((1 + i)^n - 1) / i(1 + i)^n]$$

with:

- $C_0$  = discounted total costs at year  $t_0$
- $C_y$  = incidental cost at year  $t_y$
- $C_n$  = recurrent annual costs over the period between  $t_0$  and  $t_n$
- $i$  = interest rate

With VTS the incidental costs  $C_y$  are usually all initial investment costs, spread-out differently over the building years of the VTS, as well as planned midlife modernisation investments. The recurrent annual costs  $C_n$  are usually the operational costs, which vary little over the operational years of the VTS.

The discounted value of all benefits during the lifetime of the VTS can be calculated in a similar manner:

$$B_0 = [B_y / (1 + i)^y] + [B_n ((1 + i)^n - 1) / i(1 + i)^n]$$

with:

- $B_0$  = discounted total benefits at year  $t_0$
- $B_y$  = incidental benefits at year  $t_y$
- $B_n$  = recurrent annual benefits over the period between  $t_0$  and  $t_n$
- $i$  = interest rate

With VTS the incidental benefits  $B_y$  are usually all cost savings, generated by the prevention of a major incident by the VTS at one or more years, selected and determined by experts. The recurrent annual benefits  $B_n$  are usually the annual cost

savings and additional revenues, generated by the improved economic performance of the vessels and the 'area', as well as the annual cost savings, generated by the prevention of one or more small incidents per year by the VTS.

The selection of the interest rate to be used in these calculations depends on the required 'rate of return'. If the VTS is financed with public (national) funds the current interest rate of state bonds is often used in these calculations as this reflects the costs for obtaining funds by the (national) administration in case of a general budget deficit. Generally this varies between 2 and 10%. If, on the other hand, the VTS is financed with private funds, for instance by a private port, the set desired general rate of return on investments by this organization is often used to be able to compare the cost/benefit results of the investment in a VTS with other desired investments by this organization. Generally this varies between 5 and 20%.

The other determining factor is the expected lifetime of the VTS. In general a lifetime for the VTS as a whole of 20 years is used, but in particular electronic equipment outdates quicker and will most likely need to be replaced every 10 years. By deducting the discounted total costs at year  $t_0$  ( $C_0$ ) from the discounted total benefits at year  $t_0$  ( $B_0$ ) the 'net present value' (NPV) can be determined. If this is a positive amount the investment is worthwhile. The size of the positive amount indicates how worthwhile the investment is predicted to be.

### 0807 Sensitivity Analysis

The outcome of these calculations depends very much on assessments and/or modelling, in particular on the influence a VTS has on the (risk) reduction of incidents. Therefore it is advisable to also carry out a sensitivity analysis. This can be done by making the same calculations based on altered input values, such as assessments, modelling and/or interest rates, to obtain insight into the need and necessity of a VTS should future predictions about conditions differ from those expected.

### 0808 Cost Allocation

As part of these calculations not only all or most expected costs and benefits of a VTS are determined in monetary terms, but also who will bear the costs and profit from the benefits is determined. This can form a basis for the cost allocation of the VTS. For instance, if the calculations show that the costs are mostly borne by the VTS Authority but the benefits are mostly for the vessel, in particular by improved economic performance of the vessel, there is an objective case for user charging and an indication as to how much this should be.

For more information, see IALA Recommendation V-102 on The application of the "User Pays" principle to Vessel Traffic Services.



## CHAPTER 9. PLANNING AND ORGANIZATION OF VTS

### 0901 Introduction

CHAPTER 7 addressed the methodology for determining the need for VTS. This chapter addresses the issues involved in planning the subsequent organization of a VTS.

### 0902 Geography

The following need to be taken into consideration when establishing the limits of the VTS Area and its division into VTS sectors.

#### 0902.1 Local geography

The local geography will be the determining influence on the size of the area to be covered by a VTS. In the case of ports these vary enormously in their geography. Some ports are extremely simple and are little more than an indentation in the coast protected by breakwaters. Entry and exit is through a passage between the breakwater heads, which give direct access to the open sea. Vessels are only restricted in their freedom to manoeuvre as they pass through the breakwater and into the port itself. At the other extreme are estuarial ports, often far from the open sea with long approaches encumbered by shallow, shifting sandbanks. Vessels using these ports will be restricted

navigationally and possibly be unable to anchor or reverse course over long stretches of their passage.

#### 0902.2 Traffic Separation Schemes

The existence or addition of traffic separation schemes within or adjacent to the VTS area should be taken into account.

#### 0902.3 Anchorages

Consideration should be given to the designation of anchorages or anchorage areas.

#### 0902.4 Hazards to Navigation

For example, offshore structures, particularly the increasing pressure to site Offshore Renewable Energy Installations (OREI) close to navigable channels, may need to be considered not only in the management of vessel traffic but in the planning of the VTS Area/Sector. The impact of such structures on both shore-based and on board marine radars should be carefully considered.

### 0903 Meteorology and Hydrography

The prevailing weather, in particular visibility and wind together with the tidal range and stream, may impose difficulties on the ability to navigate safely. Together with the local geography, they determine the degree of navigational difficulty likely to be encountered by a vessel. An appreciation of these physical factors, plus any interface with local or regional services, is needed.



Figure 9

Swanson Dock swing basin, Melbourne, Australia



## 0904 Other Considerations

### 0904.1 Numbers of Vessels and Types

The numbers of vessels, including local traffic, their class and traffic pattern is significant. A simple count of vessels, although of value, is not sufficient. The vessels need to be considered with regard to their size, type, equipment, manoeuvrability, spatial distribution and cargo so that the optimum service meeting the needs of all users and without placing unnecessary constraints on the movement of any of the vessels can be identified.

### 0904.2 Commercial Factors

A VTS must take into consideration every potential conflict between safety and commercial operation and pre-empt such conflicts before they arise. Ports must operate in an efficient and timely manner and meet the needs of their users, but this must be done without impinging on the safe operation of the port. The distribution of ship arrivals and departures may be an important factor influencing the port management resources. Unannounced arrivals and departures can have a considerable and adverse effect on the viability of a port. Some ports, such as ferry ports and container terminals, operate to a schedule, which has to be maintained in virtually all weathers.

### 0904.3 Other Activities

Military operations, oil and gas production and recreational activities may take place within a VTS Area. These activities will also influence the operation of the VTS and must be taken into account. A good working relationship needs to be

established and maintained with all the users of the area.

## 0905 Technical Considerations

### 0905.1 The Size of the VTS Area and the Proximity of Hazards and Dangers

These will be key considerations in assessing the positional and navigational accuracy requirements in a VTS system.

### 0905.2 Positional and Navigational Accuracy Requirements

Modern digital charting offers the opportunity of providing greater accuracy and the choice on the level of detail that is provided on the background of the vessel traffic image. However, care must be taken with respect to the date of the source data, when using such products, as this source data may not have been gathered to modern positional accuracy standards. Performance of a radio navigation broadcast service is defined by five basic components:

- 1 Accuracy
- 2 Integrity
- 3 Availability
- 4 Coverage
- 5 Continuity

Advice and recommendations on navigational accuracy requirements are documented in IALA Recommendation R121 - *'Performance and Monitoring of DGNSS Services'* and IMO Resolutions A.915(22) - *'Revised Maritime Policy and Requirements for a Future Global Navigation*



Figure 10

Area of Great Belt VTS, Denmark



Satellite System (GNSS)' and A.953(23) - 'World-Wide Radionavigation System'.

#### 0905.3 Datum

Care needs to be taken to ensure that all data inputs such as AIS and ECS are aligned to a common datum.

#### 0905.4 Display Symbology

Refer to IALA Recommendation V-125 - 'The Use and Presentation of Symbology at a VTS Centre'.

### 0906 Service Provision

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#### 0906.1 Mandatory/Voluntary Participation

Within the Territorial Waters of a State, participation in VTS can be made mandatory. Outside of Territorial Waters, the jurisdiction of a VTS is limited by the provisions of the United Nations Convention on the Law of the Sea (UNCLOS). However, it often occurs that a VTS is sited in close proximity to an IMO approved traffic separation scheme, and transgressions of the scheme may be reported to the offending vessel as information, and to the flag state of the vessel concerned for action, under the Convention on the International Regulations for Preventing of Collisions at Sea (COLREGS). In addition, it may be the case that IMO has agreed Mandatory Reporting by all or certain classes of vessel for specific areas, such as an IMO adopted Traffic Separation Scheme or Ship Reporting System.

#### 0906.2 Types of Service to consider

Having taken into account the geographical area, traffic density and traffic pattern, the Competent/VTS Authority will need to consider the types of service to be provided, as described in CHAPTER 5 - Provision and Types of Services in a VTS.

### 0907 Co-operation

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#### 0907.1 Allied Services

Co-operation with allied services is a supporting activity for the VTS, which may increase the safety and efficiency of the traffic, the protection of the environment and the effectiveness of the VTS, without adding to the reporting burden of the vessel. It may be a continuous process and is of particular importance in cases where a VTS sailing plan is to be established and action between some allied services needs to be agreed. Procedures for the co-operation between parties should be established.

Incidental co-operation with emergency services, such as Search and Rescue and Pollution Response Control should be conducted in accordance with pre-established contingency plans in which the procedures for such co-operation are laid down and responsibilities established. Further issues to

be considered for successful interaction between VTS and allied or other services see IALA Guideline 1102 - 'VTS Interaction with Allied or Other Services'.

#### 0907.2 Adjacent VTS

Co-operation between adjacent VTS centres and/or authorities can be useful where two such services share a common border because they may need to coordinate jointly with the master of a ship when the VTS sailing plan is being agreed. In other cases it should be recognised that the exchange of data between adjacent VTS could give advance notice of arrivals thus relieving the reporting burden on vessels. It could also provide an Administration/Competent Authority/VTS Authority with valuable information on future traffic and cargo flows in its sea area.

### 0908 Operational Management

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The provision of the following capabilities may need to be considered in the planning and organization of a VTS.

#### 0908.1 Surveillance requirements for the VTS area

The extent of the VTS area should be taken into account with regard to the surveillance equipment necessary. In principle the equipment should be able to cover an area well in excess of the designated VTS area, to allow for any decrease in performance in poor weather conditions. The surveillance equipment in most common use continues to be radar although other systems, such as the Automatic Identification System (AIS) and CCTV, are used to good effect. Therefore, depending on the services that a VTS is to carry out the radar coverage can be:

- ✓ Nil (automatic identification systems, voice communication and reporting only);
- ✓ Partly (covered areas chosen intentionally with some blind sectors);
- ✓ Totally by one radar sensor (without any blind sectors); or
- ✓ Totally by two or more radar sensors (for large VTS areas and to prevent shadow and other effects of radar targets).

#### 0908.2 VTS Sectors

The VTS Area may need to be divided into sectors to ensure that the loading is within the capability of each VTS Operator to manage. This will depend on factors such as traffic density, traffic patterns, type(s) of service and surveillance requirements.

#### 0908.3 Marine Communications

The number of sectors will determine the requirement for frequency allocation in a limited VHF marine communications band. Application to regulating authorities will be required and



consideration should be given to frequency allocations in adjacent areas to minimise interference.

#### 0908.4 Prohibited or Dangerous areas

Vessel traffic may need to be kept clear of areas of ecological significance or other hazards. This may influence the routing of traffic and the key points for surveillance and traffic monitoring.

#### 0908.5 Separation Criteria

Safety of navigation can be enhanced in particularly sensitive areas or confined/restricted waters through separation techniques. This may be achieved by:

##### 1 Time separation

Time separation is achieved by a vessel having exclusive use of a certain area or a restricted passage for a given time span. The time slots may be allocated as part of a VTS sailing plan.

##### 2 Distance separation

Distance separation is a method whereby vessels are given a minimum distance between each other in order to transit the whole or certain areas and restricted passages. The separation distances to be maintained are allocated and monitored by the VTS centre and may differ depending upon the categories of vessels or the cargo which is carried. Overtaking restrictions and/or minimum passing distances may be part of this method of traffic organization.

#### 0908.6 Places of Refuge

It may be prudent to identify potential 'Places of Refuge' to cater for marine emergencies at local and national level. If a Maritime Assistance Service (MAS) exists, co-operation with relevant authorities should take place.

#### 0908.7 Emergency and Incident Management

Configuration of a VTS centre should take into account the need to manage incidents and emergencies. Issues that should be addressed include:

- ✓ Workstation(s) - Provision should be made for additional staff to manage the specific incident whilst the VTS continues with the primary traffic management function; This may be in the form of dormant workstations or a plan to reconfigure existing positions to make best use of the facilities available.
- ✓ Planning - Contingency plans and action sheets should be prepared;
- ✓ Liaison - Consideration should be given to the links that may be necessary with emergency services;
- ✓ Training - Contingency plans should be exercised.

#### 0908.8 Pollution Risk Control

Pollution is a specific concern resulting from an incident or emergency that may have far reaching consequences especially for a port or coastal VTS. In addition to the measures mentioned in Emergency and Incident Management above, consideration may need to be given to the control of pollution risks. Prevention measures may include special regulations and controls for vessels carrying hazardous or polluting cargoes, which should be addressed in the planning of the VTS.

### 0909 Security

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Procedures should be in line with local and national requirements and should be clearly documented. They should, as a minimum, ensure the security of:

- ✓ Data transmission and storage;
- ✓ VTS personnel; and
- ✓ VTS buildings and structures.

Procedures should reflect any involvement of the VTS with the PFSP (Port Facility Security Plan) as per the International Ship and Port facility Security Code (ISPS).

VTS is primarily concerned with the provision of services to compliant commercial traffic in order to facilitate navigational safety, efficiency and environmental protection. In order to discharge these responsibilities, VTS facilities are equipped with sensors and communications, capable of generating the required information. Information is often of value to allied services, which typically include, but are not limited to, customs, immigration authorities, ship agents and port service providers.

The Diplomatic Conference on Maritime Security held in London in December 2002 adopted new provisions in the International Convention for the Safety of Life at Sea, 1974 to enhance maritime security. These new requirements form the international framework through which ships and port facilities can co-operate to detect and deter acts that threaten security in the maritime transport sector.

Chapter XI-2 of the International Convention for the Safety of Life at Sea (SOLAS) - 'Special Measures To Enhance Maritime Security' - makes a reference to the International Ship and Port Facility Security (ISPS) Code, which requires ships, companies and port facilities to comply with the relevant requirements of Part A.

A VTS is part of a port's infrastructure and, as such, it is entirely sensible that national security organizations should take full advantage of the information generated by VTS centres. This is best achieved by recognising that security organizations should, where appropriate, become the recipients of VTS generated information as provided to other allied services, as long as the safety of navigation is not affected.



Figure 11 VTS Centre, Zeebrugge, Belgium

It should be noted that the IALA V-103 Model Courses do not specifically address security duties. Accordingly, and in countries where national arrangements require VTS personnel to perform such functions, the staffing and training to fulfil a security role should remain a national responsibility.

VTS centres, systems and personnel are potential targets for hostile activity. VTS Authorities should consider the need to protect against perceived vulnerabilities. This may involve consultation with the relevant national security organization.

## 0910 Internal Organization

Having identified the VTS area, the number of sectors and the types of service to be provided, the manning of the VTS can then be addressed. The number of sectors, traffic density and structure, and the shift patterns will determine the number of VTS Operators required and the complexity of the VTS will decide the need for a VTS Supervisor.

Other functions, such as the management of Allied Services, may be carried out from the VTS centre and additional personnel may be required to undertake these additional tasks in order to prevent VTS Operators from being diverted from their primary responsibility for the Safety of Navigation.

The VTS Authority's organization must be firmly backed by documented administrative processes and operational procedures.

## 0911 Legal Basis

The legal framework for VTS is explained in CHAPTER 2 - Legal Framework and Guidelines for VTS. From these international and national regulations the legal basis for the VTS at a local level will need to be determined.

In planning a VTS, the powers and authority delegated to individual VTS Operators will need to be established by the Competent/VTS Authority. All VTS personnel should be aware of the legal basis under which they are operating and from which they derive the authority to interact with traffic. The following will need to be addressed:

- ✓ The type of service that may be offered by VTSOs. This is particularly relevant in respect of Navigational Assistance Service and Traffic Organization Service, which may require specific authorisation:
  - ↳ To whom the power to issue compulsory directions has been delegated, if any;
  - ↳ How to process and to whom to report infringements of regulations;
  - ↳ Powers of enforcement; and
  - ↳ VTS and Operator liability





## CHAPTER 10 PROCUREMENT CONSIDERATIONS

### 1001 Procurement Process

Depending on the administrative set-up, a VTS centre or Authority may or may not have delegated procurement authority. In a number of cases procurement will be centrally controlled and strict procurement procedures and financial controls, which may be unique to the individual country or region, as in the case of the EU Member States, may apply. This chapter focuses on those aspects of procurement that will be generally applicable and should be given consideration to when sourcing the VTS. A typical procurement cycle is shown below:

Figure 12 assumes that those responsible for the procurement process have access to a Purchase and Inventory System. In a number of cases purchasing may be carried out electronically.

Factors to be considered in the procurement process could include:

1. Obtaining value for money through competition among suppliers, avoiding dependence on monopoly suppliers;
2. Ensuring concise specifications of the goods, services or works to meet operational requirements adequately. The specification must clearly stipulate what the purchaser wishes to buy and the supplier is expected to provide. It must be a true and accurate statement of requirements

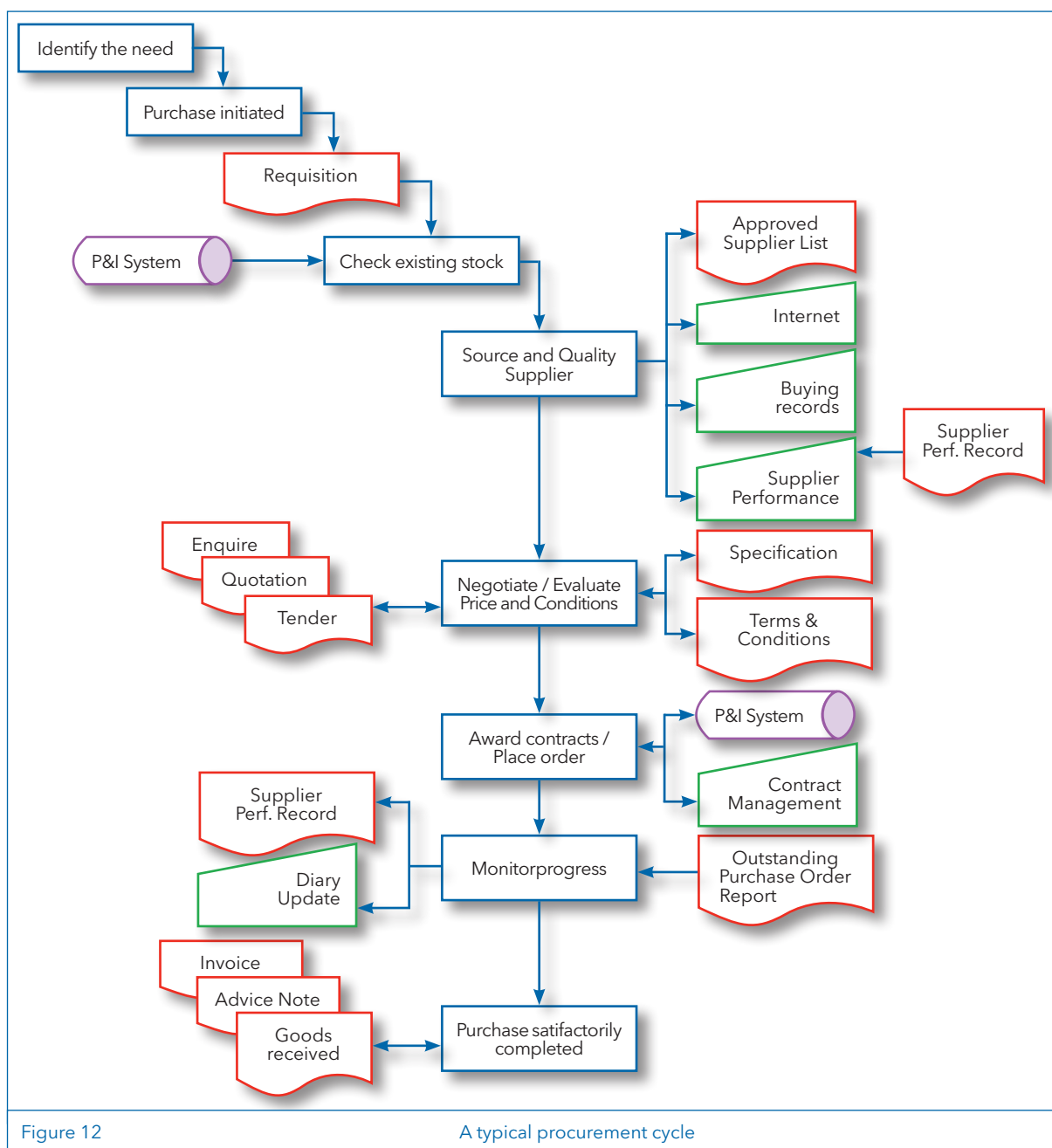


Figure 12

A typical procurement cycle

and ensure that the principle of open and effective competition is observed:

- a- Submitting requisitions in good time to enable effective Supplier competition;
- b- Buying the best combination of quality and price, which meets the need within the resources available, reviewing whole life costs and not necessarily just the lowest initial Tender;
- c- Supporting the standardisation of equipment, goods, services and working practices;
- d- Securing on time delivery. In some countries this may be achieved through the use of time penalties;
- e- Verifying the capability of the supplier to provide reliable, quality products and services;
- f- Testing all products and deliverables at appropriate stages;
- g- Developing mutually satisfactory relationships;
- h- Protecting against corporate and financial risk through fraud, unethical behaviour or contractual liability;
- i- Economies of scale, efficiency gains and general cost savings through consolidated orders wherever possible;
- j- Ensuring individual and collective performance of all persons involved in the process;
- k- Publishing operational performance indicators;
- l- Ensuring appropriate skills are available in specification writing, negotiation, supplier appraisal, and contract drafting/management;
- m- Developing key procurement and inventory personnel; and
- n- Effective monitoring of the progress of the procurement throughout the cycle.

3. The importance of good quality specification writing is essential and VTS Authorities are encouraged to seek external assistance if such capability is not available within their own organisation. The specification of a VTS should not comprise details that have been copied from various supplier brochures. The specification should focus on actual operational and functional performance needs that will be able to be confirmed through testing when the VTS is accepted from the supplier.

## 1002 **Audit Controls**

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It may be a requirement that separate audit controls need to be effected by external and internal financial and quality auditors, to ensure compliance with policies, procedures and any instructions. These financial audits are usually separate from any carried out under a VTS Authority's Safety Management System and under the IMO Member State Audit Scheme, although both may impact on the procurement process.



## CHAPTER 11 TECHNICAL EQUIPMENT OF VTS SYSTEMS

### 1101 Introduction

The aim of this chapter is to introduce technical equipment of VTS systems which will support the operational requirements referred to in CHAPTER 5 - Provision and Types of Services in a VTS.

### 1102 Definitions and references

**VTS Equipment** - VTS Equipment refers to the individual items of hardware and software which make up the VTS System.

**VTS System** - the VTS System is considered to be the hardware, software and their behaviour as a coherent entity. This excludes personnel and procedures.

The following IALA documents should be used as references when setting up a VTS System and dealing with technical equipment:

- *Recommendation V-119 - on the Implementation of Vessel Traffic Services* - describes the process to decide whether a VTS system is required and, if so, the process to establish such a system
- *Recommendation V-128 - on Operational and Technical Performance of VTS Systems*
- *Guideline no. 1089 - Provision of Vessel Traffic Services (INS, TOS, NAS)*
- *Guideline no. 1111 - on Preparation of Operational and Technical Performance Requirements for VTS Systems*
- *Guideline no. 1110 - On Use of Decision Support Tools for VTS Personnel*

### 1103 VTS system specification and operational requirements

IALA Guideline no. 1111 provides detailed guidance to assist the VTS Authority in preparing the definition, specification, establishment, operation and upgrades of a VTS system. The document addresses the relationship between the operational requirements and VTS system performance requirements and how these reflect into system design and sub-system requirements. In order to achieve an adequate solution, the functional requirements should be derived from the operational requirements.

The implementation of VTS also requires consideration of several other aspects, e.g. locations, sensor and radio coverage, radar target characteristics, sea states, climatic categories, wind conditions, infrastructure, the environment, applicable regulations, approval standards and security.



Figure 13 VTS Centre, Travemünde, Germany

The VTS Authority should avoid being overly prescriptive, but require that suppliers propose solutions and equipment to meet the specified operational and functional requirements.

The operational and functional requirements should be applicable to all parts of the particular VTS system which typically comprise one or more of the following elements:

- ✓ Radio Communication
- ✓ Sensors
  - ↳ Radar
  - ↳ AIS
  - ↳ Environmental Monitoring
  - ↳ Electro Optical Systems
  - ↳ Radio Direction Finder
  - ↳ Long Range Sensors
- ✓ Data Processing
- ✓ VTS Human/Machine Interface
- ✓ Decision Support
- ✓ External Information Exchange

The VTS system will need to reflect the type of VTS Service that the VTS Authority will be implementing (INS, TOS, NAS). In reality, the physical equipment required for the services may be similar but it is important to ensure that for the more complex types of Service (TOS and NAS) that the functional capabilities of the system will provide the right facilities to support the VTS Operators with the relevant tasks.

The following example illustrates the approach taken to derive VTS equipment from operational requirements

**Meteorological Information Service:**

- ✓ The operational requirement is to be able to inform vessels (INS) in a VTS area of meteorological conditions. The VTSO needs to provide the meteorological details verbally, either as a broadcast or in response to a request.
- ✓ The VTS functional requirement is, thus, at

least the provision of radio communication and may, in addition, include a VTS user interface, other means of communication, meteorological sensors as a part of the VTS system and/or interface to external sources such as meteorological office, and a possible requirement to automate these functions.

- ✓ Based on the operational and functional requirements and all other considerations in the tendering process, the VTS vendor proposes the solution and the associated equipment.

#### 1104 Radio Communication

VHF Radio communication is the primary means through which Vessel Traffic Services are delivered. It provides the VTSSO with a means to deliver timely services and a real-time assessment of the situation in the VTS area.

The Maritime VHF band comprises a number of internationally defined channels which are used for voice and data communication. Most of the channels are used for voice communication however, the potential expansion of VHF digital communications is increasing. Digital Selective Calling (DSC) and AIS already provide the means to exchange data such as VHF call handling, ship identification, positions and short messages. Digital communication has a number of advantages such as more efficient use of available bandwidth and less prone to errors. Developments in digital data exchange are expected to improve overall maritime communications capabilities. At the World Radio Conference 2015 the International Telecommunications Union (ITU) identified 6 frequencies in the VHF maritime mobile band for the use of digital data transfer. These frequencies form part of the developing VHF Data Exchange System (VDES). With the ability to group the new frequencies together to provide a larger band for data transfer, the VDES will encompass AIS and provide enhanced digital data functionality in the future. IALA is working within an international framework to ensure the development of the VDES meets the needs of IALA members, which includes support for VTS use cases..

#### 1105 Sensors

Sensors are the means through which the VTSSO can build up situational awareness, which is required to provide Vessel Traffic Services. Sensors collect data, which is then processed to extract necessary information.

Different types of sensors, each with their specific advantages, may be used by VTS Systems. Often a combination of sensors is used to increase the quality/reliability of information delivered to the VTSSO, where:

- ✓ Radar is based on reflection of radio waves to detect and track objects in the VTS area. As such it contributes to the creation of a reliable traffic image, without any cooperation from targets.

- ✓ AIS is based on VHF digital data communication and provides identified position reports that are sent at regular intervals. Other data is also sent but on a less frequent basis, for example call sign, ship characteristics, type of cargo and persons on board.

- ✓ Meteorological and hydrographical sensors assist in monitoring prevailing conditions, supporting SAR and managing environmental hazards.

- ✓ Electro-Optical Systems (EOS) consist of imaging devices to provide visual situational awareness.

- ✓ Radio Direction Finder (RDF) is a sensor system that indicates the bearing of a VHF transmitting station. This is useful for identifying targets that cannot be identified by other means.

- ✓ Long Range Sensors, such as satellite-based systems are rarely used in VTS systems. However, they can provide supplementary information to locate vessels. They may also assist SAR operations. LRIT data is sometimes used to provide updated time of arrival information for expected ship visits.

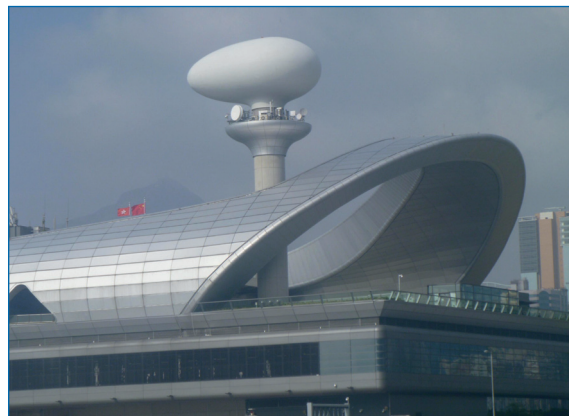


Figure 14 VTS Radar Tower, Kai Tak, Hong Kong

#### 1106 Data Processing

Data processing functions aim to build information that is relevant to the VTS operation by processing real time data gathered by sensors and/or by external systems.

Specific data processing functions comprise target tracking and sensor data fusion, to maintain an up-to-date traffic image.

In addition, data management functions collect process and distribute non real time data to provide information which supports VTS operations. For example, up-to-date vessel and voyage data is maintained and can be accessed by the VTSSO and allied services.

Received sensor and processed data should be recorded, backed up and archived to secure against loss. Section 16 provides more details on recorded data management.



Figure 15

VTS Console, Port of Rotterdam VTS, The Netherlands

#### 1107 VTS Human/Machine Interface

The Human / Machine Interface (HMI) can be broadly defined as the User Interface which is the space where interaction between humans and machines occurs. The primary aim of this interaction is to provide an intuitive, accurate and failsafe presentation of information which aids the VTSO in making operational decisions. Other user interfaces include, for example, recording and replay, system management, security monitoring and maintenance.

In addition to the HMI on screen, the VTS centre user environment is of paramount importance. Ergonomic design should consider providing a comfortable environment for long periods of use and allow for adjustments to minimize fatigue.

#### 1108 Decision Support

Decision Support helps to assess situations, to plan and to provide timely and necessary information for taking decisions.

For example, CPA/TCPA is a commonly used tool in a VTS, delivering TOS, and helps in maintaining traffic separation.

Note that decision support in VTS is under continuous development, resulting in tools that will support an increasing number of aspects of the operation, planning and management of VTS.

IALA Guideline No. 1110 gives further guidance on the use of decision support tools for VTS personnel when considering decisions on evolving or emergency situations in a harmonised way.

#### 1109 External Information Exchange

VTS systems need to be able to communicate with external organisations. These may include relevant allied services, National Points of Contact for services such as LRIT, and neighbouring VTS systems.

Exchange may include information linked to:

- ✓ Traffic Management
- ✓ Hazard management
- ✓ SAR
- ✓ Logistic chain support
- ✓ Law enforcement
- ✓ Environmental protection
- ✓ Waterways infrastructure management
- ✓ Maritime safety information (MSI)

#### 1110 Lifecycle aspects of VTS equipment

When setting up a VTS System or adding VTS equipment, the lifecycle management strategy that is appropriate to the organization is an important consideration. This includes administrative and technical aspects such as:

- ✓ legal and procurement aspects
- ✓ human resource skills
- ✓ financial aspects
- ✓ physical limitations
- ✓ environmental conditions



Creating synergies or collaborations with allied services and complementary organizations should be taken into account.

Technical requirements such as availability, reliability, scalability, modularity, interoperability, maintainability and security should be taken into account. Also obsolescence planning regarding possible technological disruption, such as limited lifetime of equipment and software, should be consistent with the lifecycle management strategy.

The conformance to the functional and technical requirements and performance of VTS equipment should be verified and validated prior to operation, according to an agreed acceptance test plan.

Taking into account the chosen lifecycle management strategy and based on the maintenance capabilities of the VTS organization, specific technical documentation and training should be considered. Responsibility for executing and monitoring the necessary maintenance tasks, defined in an agreed maintenance plan, should be assigned. Where applicable, service level agreements should be established.

In ensuring effective lifecycle maintenance, software licensing and support should be considered in addition to the hardware maintenance. Most software based systems are frequently upgraded to provide new functionality and to resolve security threats. Therefore, it is important to maintain effective software support from the VTS supplier and receive VTS software updates that have been tested and proven. An example would be the need to upgrade VTS Application Software due to the upgrade of the Operating System.

### 1111 Legal and other aspects of VTS equipment

VTS systems should at all times be operated within the legal framework set by the national

Competent Authority and consistent with national and international law. The following paragraphs introduce key issues that should be considered:

- ✓ **Licensing and approval certificates**  
When specifying and purchasing VTS equipment; consideration should be given to the requirement to seek telecommunications authority approval in the form of an appropriate license.

Equipment must conform to the appropriate regulations for the purpose intended;  
Restrictions on the export of certain technologies exist and therefore the VTS Authority must ensure they can obtain this equipment.

- ✓ **Recording and replay, Traffic and incident analysis**

Within both national legal obligations and limitations, provision should be made for the storage, security, retrieval, integrity and presentation of VTS data.

The data type, resolution and period of time for storage have to comply to incident/accident investigation procedures of the VTS Authority and other authorized parties. The data should be recorded automatically and be capable of replay without impact to on-going VTS operations.

- ✓ **Data sharing**

When addressing data sharing and/or collaboration with other organizations, VTS Authorities must consider for example data integrity, confidentiality, availability as well as legal issues, such as privacy. These issues are described in more detail in:

*IALA Guideline No 1086 - The Global Sharing of Maritime Data and Information.*



Figure 16

VTS Centre, Zandvliet, Belgium

## CHAPTER 12 VTS PERSONNEL

### 1201 Introduction

VTS Operators, masters, bridge watchkeeping personnel and pilots share a responsibility for good communications, effective co-ordination and an understanding of each other's role for the safe conduct of vessels in VTS areas. They are all part of a team and share the same objective with respect to the safe movement of vessel traffic.

Depending on the size and complexity of the VTS area, service type provided as well as traffic volumes and densities, a VTS centre may include VTS Operators, VTS Supervisors and a VTS Manager. It is for the Competent/VTS Authority to determine the appropriate levels in order to meet its obligations and to ensure that appropriately trained and qualified personnel are available.

VTS Authorities should develop detailed job descriptions for VTS personnel at each VTS centre, based on the service type(s) to be provided, the equipment available and the co-ordination needed with other internal departments and allied services.

Examples of job descriptions are shown in 'Roles and Responsibilities' below and in IALA Recommendation V-103. These job descriptions can be expanded as necessary to encompass more fully the responsibilities specific to each VTS centre.

### 1202 Roles and Responsibilities

#### 1202.1 VTS Operator

The key person in any VTS operation is the VTS Operator, who is responsible for establishing and maintaining a vessel traffic image, which will facilitate interaction with the vessel traffic thus ensuring the safety of navigation within the VTS area of responsibility. The VTS Operator is also required to decide on actions to be taken in response to developing traffic situations, after careful analysis of the data and information being collected.

The job description for the VTS Operator should include the aims and objectives of the operational work carried out by the Operator, the tasks and responsibilities involved together with the skills and knowledge required to carry out the work efficiently and effectively. The job description should also clearly state what service type the VTSO is authorised to provide.

The following list provides examples of activities carried out by a VTSO:

- ✓ Maintain situational awareness and monitor the vessel traffic image with all available sensors within the area of responsibility;
- ✓ Maintain communication with ships as appropriate to the service type provided by the VTS using all available communication facilities;
- ✓ Operate equipment for communications, data collection, data analysis and establishment of a vessel traffic image;
- ✓ In an Information Service (INS), provide relevant information at appropriate times;
- ✓ In a Traffic Organization Service (TOS), organise and plan the vessel traffic movements within a waterway to prevent congestion, groundings, collisions and other dangerous situations;
- ✓ In a Navigational Assistance Service (NAS), assist and provide such information as may be required to aid a ship in difficult navigational or meteorological circumstances or in case of defects or deficiencies. NAS may be given on request by a vessel or when deemed necessary by the VTS;
- ✓ Communicate with allied services and other agencies as appropriate;
- ✓ Ensure that all adopted standard operating procedures and relevant waterway regulations are adhered to;
- ✓ Take appropriate actions in emergency situations and other special circumstances defined for the VTS area. Where appropriate, co-ordinate communications for such situations



Figure 17

CCS Tenerife



and/or circumstances; and

- ✓ Maintain a log of all incidents/accidents and all other relevant events occurring within the area of responsibility.

### 1202.2 VTS Supervisor

The VTS Authority may establish the post of VTS Supervisor. The VTS Supervisor is responsible for managing and/or co-ordinating and assisting the operational activities of the VTS Operators. A VTS Supervisor should hold a current VTS Operator qualification together with the appropriate endorsements.

The job description for the VTS Supervisor should include the aims and objectives of the operational work carried out by the Supervisor, the tasks and responsibilities involved together with the skills and knowledge required to carry out the work efficiently and effectively. The job description should also clearly state the management responsibilities delegated by the VTS Authority/Manager. Where a VTS Manager is not appointed, the Supervisor may be responsible for the day-to-day running of the VTS centre.

VTS Authorities should develop detailed job descriptions for VTS Supervisors, based on the services to be provided by the particular VTS centre. In addition to the activities appropriate to a VTS Operator, the job description for the VTS Supervisor may include the following activities:

- ✓ Supervising VTS Operators;
- ✓ Ensuring that proper co-ordination takes place between the VTS, allied and emergency services;
- ✓ Ensuring that the service provided meets the requirements of both the stakeholders and the VTS Authority;
- ✓ Ensuring that a log of all incidents/accidents occurring within the area of responsibility is maintained;
- ✓ Assisting in training and assessing the VTS Operators as defined by the VTS Authority and/or VTS Manager;
- ✓ Performing administrative tasks as defined by VTS Manager; and
- ✓ In the absence of a VTS Manager, ensuring that the duties and activities normally carried out by the Manager, are adhered to.

### 1202.3 VTS Manager

The VTS Authority may establish the post of a VTS Manager. The VTS Manager is responsible for managing and co-ordinating the activities of the VTS centre on behalf of the VTS Authority. In some cases, a VTS Manager may have the responsibility for more than one VTS centre. The VTS Manager may also possess a VTS Operator/Supervisor qualification.



Figure 18 VTS Centre - Istanbul, Turkey



Figure 19 VTS Operator, St. Petersburg, Russia

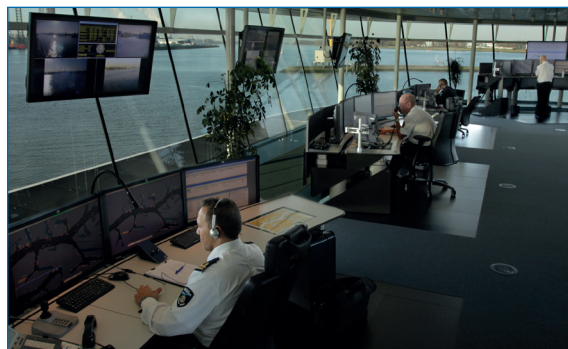


Figure 20 VTS Centre Rotterdam, The Netherlands

Basic knowledge of VTS functions and the tasks performed by the VTS Operator and the VTS Supervisor at the VTS centre are beneficial to good management. It is important for the VTS Manager to understand the needs of stakeholders and vessels using the VTS and to determine their requirements and expectations.

VTS Authorities should develop detailed job descriptions for VTS Managers, to reflect the services provided by the VTS centre(s). In addition to having knowledge of the activities appropriate to a VTS Operator/Supervisor, the job description

for the VTS Manager may include the following responsibilities:

- ✓ Ensuring that the aims and objectives of the VTS are met at all times;
- ✓ Ensuring that all VTS operations follow current rules, regulations and legislation;
- ✓ Managing and coordinating financial, technical and human resources;
- ✓ Ensuring that the standards set by the Competent/VTS Authority for operator qualifications and training are met - and that the training programme is in compliance with the safety and quality management system for the VTS;
- ✓ Ensuring that the training and certification of VTS Operators and Supervisors are appropriate to the service types being provided;
- ✓ Developing and maintaining a Quality Management System and ensuring that periodic assessments and if relevant, certifications, are being performed
- ✓ Maintaining awareness of continuing development for the VTS centre(s);
- ✓ Maintaining a safe working environment by, for instance:
  - ↳ Establishing safety awareness;
  - ↳ Promoting the Safety Culture of the VTS (or overarching organisation).
- ✓ Planning and developing emergency procedures as appropriate to the VTS area of responsibility;
- ✓ Ensuring that all adopted standard operating procedures are reviewed and amended as required;
- ✓ Developing and maintaining a good public information and relations programme; and
- ✓ Being prepared to provide evidence in the event of incidents or accidents occurring in the VTS area and ensuring that any such events are properly recorded and readily available for examination by the Competent/VTS Authority.

#### 1202.4 On-the-Job Training Instructor (OJT Instructor)

The VTS Authority should ideally provide for an OJT Instructor who is responsible for managing and coordinating the OJT for the VTS Operator or VTS Supervisor. In some instances the responsibilities for OJT may fall to a VTS Operator or VTS Supervisor.

The OJT Instructor should have the basic skills and appropriate instructional techniques in order to be able to fulfil the training requirements as defined in IALA Recommendation V-103 and Model Course V-103/4. The OJT Instructor should be fully conversant with the processes and procedures required to meet the OJT requirements of the VTS centre(s) in which the training takes place.

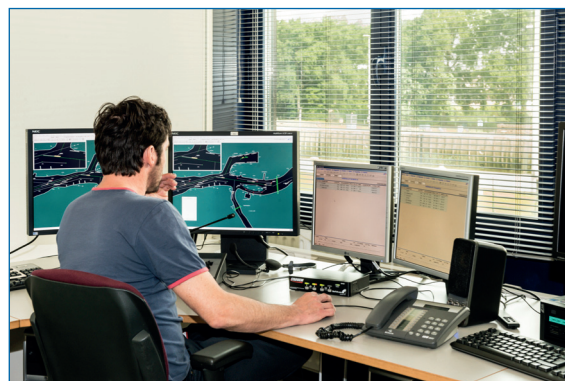


Figure 21 Flemish VTS Training Centre, Belgium

The job description for the OJT Instructor should include the aims and objectives of the operational work carried out by the instructor, the tasks and responsibilities involved together with the skills and knowledge required to carry out the work efficiently and effectively.

The job description for the OJT Instructor may include the following activities:

- ✓ Prepare and provide the OJT programme taking into account the requirements of the Competent/VTS Authority;
- ✓ Review and update the contents of the OJT programme;
- ✓ Assess the trainee's personal ability and adapt the OJT programme accordingly;
- ✓ Continuously monitor and assess the trainee's progress and document this in the trainee's task book;
- ✓ Provide feedback about the trainee's performance to the VTS Supervisor and/or Manager; and
- ✓ Report all pre-OJT training deficiencies to the VTS Supervisor and/or Manager.

### 1203 Technical Support Personnel

The VTS Authority may use internal technical personnel and/or external technical service providers for support and/or maintenance regarding VTS equipment. The VTS Authority should also be mindful of the need to include emergency 24 hours cover.

#### 1203.1 Internal technical personnel

The job description for the own technical support personnel should include the aims and objectives of the technical work carried out as well as the tasks and responsibilities involved together with the skills and knowledge required to carry out the work efficiently and effectively.

#### 1203.2 External technical service providers

The VTS Authority should ensure that the external technical service providers have the necessary skills and knowledge required to carry out the work efficiently and effectively.

## 1204 Staffing Level

The availability of appropriately qualified VTS staff is an essential resource without which VTS operations cannot safely be managed. Determining the adequacy of the number of VTSOs on duty is often difficult to quantify with any degree of accuracy. Prior to establishing the staffing level a Task Analysis must be performed in order to determine the (expected) workload of the VTS and its operators. Invariably this will be a balance between numbers of factors that a VTS Authority will need to keep under periodic review, such as:

- ✓ Traffic volumes and densities;
- ✓ Periods of Duty;
- ✓ Operational Procedures;
- ✓ Physical Working Environment;
- ✓ Human Resource Requirements;
- ✓ Types of Service offered;
- ✓ Interaction with Allied Services and adjacent VTS Centres;
- ✓ Technology, Equipment and Communications;
- ✓ Incidents, accidents and other emergencies;
- ✓ Stress-related workload.

Factors for consideration when determining periods of duty for VTS Operators and Supervisors include:

- ✓ Traffic volumes and densities;
- ✓ Hydro-meteorological circumstances which may affect the workload;
- ✓ Navigational complexity associated with the VTS Area;
- ✓ VHF radio traffic volume;
- ✓ The number of VTS interventions anticipated, e.g. the extent to which navigational assistance and traffic organization is typically required;
- ✓ The limits within which operators may develop and maintain situational awareness;
- ✓ Health and Safety requirements, particularly when working with visual display units;
- ✓ The working environment; and
- ✓ Shift patterns.

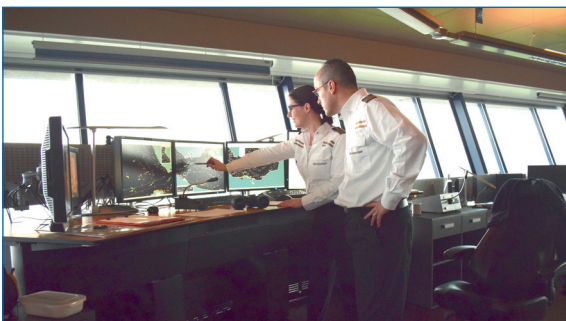


Figure 22 VTS Schedlt, Handover



Figure 23 VTS Quintero, Chile

IMO Resolution A.857(20) Annex 2 - 'Guidelines on the Recruitment, Qualifications and Training of VTS Operators' requires that in planning and establishing a VTS, the VTS Authority should:

- ✓ ensure that the VTS Authority has the equipment and facilities necessary to effectively accomplish the objectives of the VTS and;
- ✓ ensure that the VTS Authority has sufficient staff, appropriately qualified, suitably trained and capable of performing the tasks required, taking into consideration, the type and level of services to be provided.

Further guidance may be obtained from IALA *Guideline 1045 - 'Staffing Levels at VTS Centres.'*





## CHAPTER 13 TRAINING AND QUALIFICATION

### 1301 Introduction

A major factor in the efficient operation of a VTS centre is the standard of competence of its VTSOs and VTS Supervisor. Recognising that VTSOs and VTS Supervisors are members of a profession whose principal goal is to ensure safe, efficient and environmentally friendly movement of vessel traffic by means of interaction with mariners and maritime pilots, their competence needs to reflect that professional responsibility.

In a VTS area, VTSOs should assist vessel traffic by providing Information Service, Navigational Assistance Service and/or Traffic Organization Service, as and when required by the VTS centre or vessel concerned. It is for the VTS Authority to ensure that appropriately trained VTSOs and VTS Supervisors are available to undertake these commitments.

In order to ensure that standards for training of all categories of VTS personnel meet the appropriate level, the relevant Authority will need to provide the necessary accreditation and approval, according to IALA Guideline No 1014 on the Accreditation and Approval Process for VTS Training. This should help to ensure the competence of personnel that occupy operational positions in a VTS centre.

### 1302 Publications

IALA has prepared several publications that provide recommended standards and guidelines on the aspects concerning the training and qualification of VTS personnel. (ANNEX F)

### 1303 IALA Recommendation V-103

IALA Recommendation V-103 - '*Standards for Training and Certification of VTS Personnel*', describes the principles and objectives of VTS training, proposes entry standards and aptitude testing and describes the basis for the conduct and award of qualifications, certification and annual assessment as well as outlining the possibilities for career enhancement. Training of VTS personnel follows the STCW format used by IMO for the training of shipboard personnel and sets out the requirements for competency-based training for such personnel. In order to ensure that the VTSOs and VTS Supervisors maintain an adequate level of competency at all times, the Competent Authority should establish requirements for a Revalidation Process. (See also IMO Resolution A.857(20) ANNEX A, SOLAS Chapter V Regulation 12 ANNEX B & MSC Circular 1065 ANNEX C).

### 1304 STCW Convention

The 1978 STCW Convention was the first to establish basic requirements on training,

certification and watchkeeping for seafarers on an international level. Previously the standards of training, certification and watchkeeping of officers and ratings were established by individual governments, usually without reference to practices in other countries. As a result standards and procedures varied widely, even though shipping is one of the most international of all industries. The Convention prescribes minimum standards relating to training, certification and watchkeeping for seafarers which countries are obliged to meet or exceed.

The 1995 amendments, adopted by a Conference, represented a major revision of the Convention, in response to a recognized need to bring the Convention up to date and to respond to critics who pointed out the many vague phrases, such as 'to the satisfaction of the Administration', which resulted in different interpretations being made. The 1995 amendments entered into force on 1 February 1997. One of the major features of the revision was the division of the technical annex into regulations, divided into chapters as before, and a new STCW Code, to which many technical regulations were transferred. Part A of the Code is mandatory while Part B is recommended.

### 1305 STCW Code

The regulations contained in the Convention are supported by sections in the STCW Code. Generally speaking, the Convention contains basic requirements which are then enlarged upon and explained in the Code. Part A of the Code is mandatory. The minimum standards of competence required for seagoing personnel are given in detail in a series of tables. Part B of the Code contains recommended guidance that is intended to help Parties implement the Convention. The measures suggested are not mandatory and the examples given are only intended to illustrate how certain Convention requirements may be complied with. However, the recommendations in general represent an approach that has been harmonized by discussions within IMO and consultation with other international organizations.

The Manila amendments to the STCW Convention and Code were adopted on 25 June 2010, marking a major revision of the STCW Convention and Code. The 2010 amendments entered into force on 1 January 2012 under the tacit acceptance procedure and are aimed at bringing the Convention and Code up to date with developments since they were initially adopted and to enable them to address issues that are anticipated to emerge in the foreseeable future.

The 1978 STCW Convention (with 1995 and Manila amendments) provides a specific format to be used in the training and assessing of watchkeeping officers. The framework includes:

- ✓ The competencies that are deemed necessary to perform a task or skill and are required by a candidate;

- ✓ Prescribed standards of knowledge, understanding and proficiency that must be achieved by the candidate in order to properly perform their functions aboard a ship in accordance with internationally agreed criteria;
- ✓ The methods for demonstrating competence that provide evaluation techniques to assess the candidate; and
- ✓ The criteria for evaluating competence that provides the means for an assessor to judge whether a candidate can perform the related tasks, duties and responsibilities.

### 1306 Recruitment

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Prospective candidates for VTSO training (V-103/1) should meet the minimum entry requirements as defined by the Competent Authority. The selection procedure for newly recruited VTSOs should, at a minimum, include a well-developed and standardised aptitude assessment (which may include cognitive tests), medical examination, together with an assessment of the personal suitability of the candidate.

The selection of VTSOs already in possession of a V-103/1 qualification will depend largely on previous operational experience, if any, as a VTSO at a VTS centre.

VTSOs may be recruited directly as VTS Supervisors if they can demonstrate to the VTS Authority that they have the required experience to undertake the responsibilities and duties of a VTS Supervisor and have sufficient leadership skills. The VTS Authority should ensure that such personnel have received VTSO training and any additional training to meet the required standards of competence for a VTS Supervisor.

### 1307 Medical (Physical/Mental) Requirements

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Candidates should meet the medical standards of health established by the Competent/VTS Authority prior to recruitment.

### 1308 Selection

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Assessment is the field of specialists. Poorly designed assessment procedures may lead to adverse results. The best results will be obtained when representatives of the VTS centre work together with behavioural specialists. Underneath is an example of a procedure:

Human Resources staff normally select on 'hard criteria', such as prior education, experience and other pre-defined criteria. The candidates who meet these criteria may take part in a personal assessment which gives an estimate of the chances of the candidate to succeed during training by assessing his cognitive abilities, skills and expected behaviour. Test procedures and norms must be especially developed for the job of VTSO.

Furthermore those conducting the assessment should be able to demonstrate the reliability and validity of the test material which is being used. The assessors should write a report containing a description of the norm-group being used and the scores of the assessment and their advice concerning suitability of the candidate.

The question whether the candidate fits in the company culture is best answered by representatives of the VTS centre. It is preferred that they use a semi-standardised procedure when assessing the candidate. The assessment may contain an interview, presentation or other tool. A job-sample may be part of this assessment when the representatives have had training in assessment.

It is very important that the candidate also receives information about the VTS centre, the job, and the culture he/she will work in.

### 1309 Personal Attributes

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Personal attributes are important factors in the selection criteria. They can be measured on different levels such as: 1) personality as a prediction of future behaviour, which should be carried out by a behavioural specialist; and 2) behaviour, which is typically assessed by representatives of the VTS centre. Candidates should at a minimum have an appropriate sense of responsibility, show independence as well as having a willingness to co-operate with others as part of a team.

### 1310 Aptitude Assessment

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Aptitude assessments should be carried out prior to recruitment and employment. All prospective candidates should be assessed, even if they have previous maritime experience. Besides cognitive testing, skills testing and a personality assessment, a standardised job sample (practical test or exercise) may add significantly to the validity of the test procedure. Assessments should be designed to determine, among other qualities, the ability of candidates to:

- ✓ distinguish among relevant and irrelevant information;
- ✓ combine auditory and visual information;
- ✓ demonstrate spatial and situational awareness;
- ✓ demonstrate alertness and decisiveness when required;
- ✓ carry out several tasks simultaneously;
- ✓ carry out routine work without losing situational awareness;
- ✓ show initiative while working within a framework of standards, regulations and structured procedures;
- ✓ recognise and manage work related and personal stress; and
- ✓ demonstrate appropriate communication and literacy skills.

### 1311 IALA Model Courses

The basis of VTS training is set out in the IALA Model Courses.

The Model Courses are designed to produce universally common standards of training and performance. These Model Courses provide a basis for VTS training organisations to design courses. It is for the relevant Competent Authorities to approve the courses undertaken at VTS training organisations.

Depending on the recruitment level and background of candidates, some elements of the Model Course could be addressed through an assessment of prior learning and experience, reflecting both the formal training and experience of the candidate. Any such module exemption should be approved by the respective Competent Authority.

### 1312 Competence Tables

The levels of competence tables contained in IALA Model Courses V-103/1 and V-103/2 have been used to develop the detailed teaching syllabus and form the foundation of the Model Courses. The tables show the subjects for which competence is needed, the knowledge, understanding and proficiency that are required, the methods for demonstrating competency and the criteria by which it should be evaluated. The levels of competence tables in IALA Model Courses V-103/1 and V-103/2 follow a similar format to that of the IMO Model Courses and are based on the STCW 95 Code.

### 1313 VTS Operator and Supervisor Training

VTS Operator and Supervisor training should be carried out at an accredited VTS training organisation and be conducted in accordance with the appropriate IALA Model Courses V-103/1 - 'VTS Operator Training and V-103/2 VTS Supervisor Training'. VTS Operator candidates without previous maritime experience will normally require all modules in Model Course V-103/1.

It is important to note that the training programme concentrates on the learning outcomes, i.e. the degree of competence acquired during formal instruction and structured On-The-Job Training. Where competence can be demonstrated and is documented, training should be developed to reflect this in order to avoid unnecessary instruction. The emphasis should always be on obtaining the end result - namely, professionally qualified VTS personnel.

Training organisations and organizations delivering VTS training should provide training services within the framework of a training management system that fulfil the requirements of an approved quality system standard (CHAPTER 19). It is important to ensure that the programme for the training and assessment of VTSOs and VTS Supervisors for the purpose of certification and endorsement is:

- ✓ able to meet and maintain the standard of competence as indicated in IALA Recommendation V-103;
- ✓ structured in accordance with the established training procedures based on clearly communicated, measurable and achievable objectives;
- ✓ conducted, monitored, evaluated and supported by appropriately qualified instructors; and
- ✓ managed in a manner that ensures the relevancy and accuracy according to experience gained, technological advance, regional, national and international recommendations, laws and regulations.

### 1314 Use of Simulators

Wherever practical, simulation should be used in the training programme. Simulators offer an excellent interactive environment in which the skills and competencies required of a VTSO can be acquired and assessed.

VTS simulation should be a well-designed, standardised procedure containing: learning goals, a written scenario for the instructor and an assessment form. Staff administering VTS simulation



Figure 24

VTS Port of Rotterdam, The Netherlands



should be specially trained for this purpose.

VTS simulation provides a dynamic environment which can be used to train in equipment operation, procedural knowledge, reactive capabilities and responses in emergency situations. The realism and complexity of the exercises should increase as the training proceeds. If possible the capabilities, limitations and possible errors of the equipment used should be part of the simulator training.

Scenarios which rarely occur may also be integrated in simulator training, in order to improve readiness for such situations. For more information see IALA Guideline No.1027 - 'Simulation in VTS Training' which contains useful information concerning the design and implementation of VTS exercises using a simulator.

### 1315 **On-the-Job Training (OJT) (IALA V103/3)**

On appointment to a VTS centre, the operator trainee will undertake On-The-Job Training (V-103/3) for that specific operational VTS environment. This is achieved by practical training at the VTS centre combined with theoretical training in order to provide the operator trainee with a thorough knowledge of:

e.g.

- ✓ traffic management
- ✓ geographic knowledge
- ✓ local regulations
- ✓ operational procedures
- ✓ equipment
- ✓ communication
- ✓ response to emergency situations

Other topics may be added as required.

Practical training, involving the provision of live VTS operations, should normally take place on a one-on-one basis with an On-The-Job Instructor, who is a qualified VTS Operator or a VTS Supervisor. This training should be delivered by utilising a Training Task Book as mentioned in Model Course V-103/4.

On satisfactory completion of the On-The-Job Training, the appropriate endorsement will be entered on the VTS Operator Certificate, VTS Certification Log Book and the VTS Authority may then authorise that person to carry out the duties of a VTS Operator at that particular VTS centre.

A similar process is followed for a VTS Supervisor endorsement.

### 1316 **On-The-Job Training Instructor (OJTI) Training**

The knowledge, skills and experience of VTS OJT Instructors are key attributes in the successful training of VTSOs and VTS Supervisors when

undertaking On-The-Job Training. Potential Instructors should be identified and given the training to meet this demanding role. Model Course V-103/4 (OJT Instructor) has been designed to provide guidance on this training.



Figure 25 VTS Centre, Travemunde, Germany

### 1317 **VTS Certification - Qualification and the revalidation process for VTSOs and VTS Supervisors**

This section describes the qualification process for new VTSOs, existing VTSOs without V-103/1 Course Certification and how to maintain this qualification. A qualification is awarded after the successful completion of the VTSO Initial Training (V-103/1) and the VTSO Sector (or regional) Training (On-The-Job Training V-103/3).

#### 1317.1 Assessment

IALA Guideline No. 1017 - 'Assessment of Training Requirements for existing VTS Personnel, Candidate VTS Operators and the Revalidation of VTS Operator Qualification', describes the assessment of training requirements for existing VTSOs, candidate VTSOs and the re-validation of VTSOs. The guideline gives advice on prior learning assessment when considering whether training is necessary or not for VTSO Qualification in accordance with IALA Recommendation V-103.

#### 1317.2 Certification of New VTSOs and VTS Supervisors

A VTSO Course Certificate should be awarded upon successful completion of the IALA Model Course V-103/1 VTS Operator Training course at an accredited VTS training organisation. Upon successful completion of the necessary requirements for the Competent/VTS Authority a VTSO Certificate and/or VTS Certification Log Book can be issued. After successful completion of V-103/3 On-the-Job Training at the specific VTS centre, the VTSO will be awarded an endorsement that will authorise the VTSO to operate at that VTS Centre.

VTS Supervisor training should be carried out at an accredited VTS training organisation following the IALA Model Course V-103/2. On successful completion of the training, the appropriate endorsement should be made on the VTS Operator



Certificate and/or Log Book. The VTS Authority may require additional On-The-Job Training after completion of a V-103/2 VTS Supervisor course. An On-The-Job Training endorsement is only valid at the VTS centre for which the endorsement is made. A VTS Operator or Supervisor transferring to another VTS centre will be awarded a new endorsement, after having satisfactorily completed On-The-Job Training at the new VTS centre.

### 1317.3 Certification of Existing VTSOs (without IALA V-103/1, 2)

Existing VTS centres may have VTSOs who have operational experience, but have not acquired a V-103/1 Course Certificate. The VTS Authority should take necessary steps to ensure that their VTSOs meet the required level of competence according to IALA V-103/1.

The following methods may be used for assessing competence of existing VTSOs, for example:

- ✓ Portfolio review;
- ✓ Review of evidence not presented in a portfolio;
- ✓ Review of any previous VTS training;
- ✓ Demonstration of skills and knowledge; and
- ✓ Standardised tests.

When the assessment indicates that the VTSO does not have the required competence, appropriate training should be given.

IALA Model Course V-103/5 on the Revalidation of VTS Certification provides guidance to Competent Authorities, Accredited VTS Training Organisations and VTS Authorities on how to maintain and improve the quality of performance of VTSOs, by means of training, in order to enable the revalidation of the qualifications contained within the VTS certification log.

IMO Resolution A.857(20) states that once suitably qualified and trained VTSOs are performing on the job, their performance must be observed and monitored to ensure that it continues to meet the established standards.

To ensure the continued maintenance of a VTS qualification, the Competent Authority should implement a process of refresher training. Within Model Course V-103/5 refresher training consists of recurrent, adaptation and updating training.

- ✓ **Recurrent training** should be carried out at regular intervals and is part of a structured training programme thereby enabling continual professional development and resulting in the maintenance of the VTS qualification.
- ✓ **Adaptation training** is carried out whenever significant changes are expected or when changes have been made, concerning equipment, regulations, operational procedures or any other matter which is relevant to the performance of VTSOs.

- ✓ **Updating training** is tailor made training following a training needs analysis indicating that VTSOs need additional training. Updating training may be required after a break in service, unsatisfactory operational performance or other circumstances leading to a reduced level of competence.

Recurrent, adaptation and updating training, encompasses the definition of refresher training within IMO Resolution A.857(20) by ensuring that training is carried out to maintain a certain level of performance, skills in areas or knowledge which are infrequently used and where consequence of non-performance is great.

The revalidation process ensures that holders of a VTS qualification maintain a satisfactory level of operational performance in order to retain, develop and increase their competency. In turn, this will contribute to the safety and efficiency of navigation in a designated VTS area.

### 1318 Accreditation of VTS Training Organizations

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Accreditation is the independent review of VTS educational programs at training organisations involved in VTS training. The purpose of accreditation is to ensure, as far as possible, that the services provided by the training organisation meet the requirements of IALA Recommendation V-103 and are within the framework of a Training Management System thus meeting the requirements of an approved quality system standard.

IALA Guideline 1014 - '*Accreditation and Approval Process for VTS Training*', sets out the process by which VTS training organisations can achieve accreditation and course approval to conduct VTS training leading to the issue of V-103/1, V-103/2 and V-103/4 Course Certificates.





## CHAPTER 14 PROMULGATION OF VTS INFORMATION

### 1401 Introduction

The purpose of this chapter is to draw attention to the requirements for promulgating information about Vessel Traffic Services and to provide advice as to the information that might be considered appropriate for publication.

There are two potential beneficiaries of this VTS information, namely, the:

- ✓ mariner, who needs to know what services and activities a specific VTS is able to provide and perform and under what circumstances; and
- ✓ VTS Authority and/or the Competent Authority, in deciding what VTS may be required to mitigate identified risks, and thereby what type and availability of VTS should be procured.

### 1402 Requirement

IMO has set out the requirement for publishing VTS information in Resolution A.857(20) as follows:

- ✓ The VTS Authority should, in a timely manner, provide mariners with full details of the requirements to be met and the procedures to be followed in the VTS area;
- ✓ This information should include the categories of vessels required or expected to participate; radio frequencies to be used for reporting; areas of applicability; the times and geographical positions for submitting reports; the format and content of the required reports; the VTS Authority responsible for the operation of the service; any information, advice or instructions to be provided to participating ships; and the types and level of services available; and

- ✓ This information should be published in the appropriate nautical publications.

In setting this requirement, it was recognised that VTS information is published in a variety of nautical publications that are widely made available to the mariner, and by individual VTS Authorities. In the latter case, the data provided may refer to only the local VTS area. It is important that mariners have ready access to the range of information and procedures that they may require when entering or passing through a VTS area, this includes information about vessels that may be encountered when using a waterway.

### 1403 Promulgation of Information

VTS Authorities are advised to consider the extent and means of publishing information about the services that they provide. In particular, they should ensure that all potential marine users of their services are fully informed about their services, the facilities available and the requirements to report information about their vessel and its movements when approaching or entering a VTS area.

It is recommended that VTS Authorities should maintain up-to-date entries in the appropriate Lists of Radio Signals and nautical publications on ports and port entry. Additionally, it is recommended that other, more immediate means of promulgation should be considered: such as a website, Master's Guide, e-mail or other text transfer media, recognising that an appropriate degree of security may be required to avoid the possibility of malicious action resulting from the deliberate misuse of sensitive information.

### 1404 Information

The following list of headings is intended as a guide to the type of information that might need to be promulgated:

Table 2 List of headings - guide to type of information

VTS Authority	The name of the VTS Authority and contact details.
Title of VTS	The name of the VTS or VTS area.
Description	Brief overview of the services and whether participation is voluntary or mandatory and to which vessels it applies.
VTS area	Define the area boundaries.
VTS sectors	Where an area is sub-divided into separate operational sectors provide details of boundaries. Define location(s) and details of VTS centre(s)
VTS centre	(Location, Telephone, Fax and e-mail identities).
Communications	VHF channels to be used. Other communications channels. Mother tongue and languages that may be used. Circumstances when SMCP is required.
Reporting	Details of reports required and when these should be made.
Reporting points	Identify geographical locations at which reports are to be made.
Callsigns	Callsigns to be used where this differs from the VTS name. Sector or local area callsigns.
Hours of operation	Where services are not provided on a continuous basis specify hours of operation.
Traffic Image Generation	Key equipment used to generate the traffic image, coverage and, if appropriate, availability when less than 'continuous'.
Types of Service	Types of service provided (INS, NAS or TOS).
VTS Procedures	Procedures for vessels entering, transiting and departing VTS areas and/or sectors.
Accident Procedures	Procedures for vessels involved in specific accidents or emergencies.
VHF Frequencies	Details of working frequencies and authority/allied service using them.
Information Broadcasts	Details of the schedule, content and purpose of local broadcasts to shipping.
Allied Services	Availability of allied services and/or availability of VTS information to allied services.
Amplifying Notes	Local regulations and practice, and other relevant items not included above.
Diagrams	Include diagrams to indicate key features of the VTS area(s), anchorages and berths, with particular reference to dangers and areas to avoid.





## CHAPTER 15 ADMINISTRATIVE REQUIREMENTS

### 1501 Introduction

Effective administration and support is essential for the proper functioning of a VTS. Administrative guidance and instructions should be documented and available to all VTS staff.

The extent of the supporting activities is likely to be related directly to the size of the VTS area, the number of sub-areas and sectors, the service being provided and the hours of service of the VTS. The existing administrative infrastructure of the VTS Authority or Competent Authority may also dictate the extent to which additional VTS administrative support will be required.

### 1502 Strategy and Planning

VTS Authorities will to a greater or lesser extent be involved in the strategy, planning and continuous development of VTS. This will drive the provision of administrative support required for the proper operation of vessel traffic services. This will involve:

- ✓ Personnel;
- ✓ Legal;
- ✓ Equipment and Facilities;
- ✓ Procedures;
- ✓ Finance;
- ✓ Security; and
- ✓ Other Activities.

### 1503 Personnel

It is a key function of support to ensure that trained, qualified and well-motivated members of staff are available for duty, both routine and in an emergency. Detailed guidance about personnel matters, training and qualifications are contained in CHAPTER 12 - VTS Personnel and CHAPTER 13 - Training and Qualification.

Personnel administrative activities include:

- ✓ Maintenance of personnel rosters, including watch schedules and duty rosters providing assurances for adequate staff rest, working hours and vacations;
- ✓ Maintenance of training records, including:
  - ↳ Training schedules
  - ↳ Records of training completed
  - ↳ Training procedures
- ✓ Recruitment;
- ✓ Management of pay and allowances, including management of overtime;
- ✓ Completion of performance evaluations;
- ✓ Development and maintenance of the VTS chain of command and organization, including job descriptions;

- ✓ Personal health monitoring; and
- ✓ Workplace health and safety management and training.

### 1504 Legal Matters

The international legal basis for VTS is addressed in CHAPTER 2 - Legal Framework and Guidelines for VTS. These obligations are normally amplified by national laws and regulations and invariably include powers derogated to VTS Authorities. Guidance should be available to VTS staff on the extent of the powers delegated to them through the VTS Authority and the limits of their liability.

One of the tasks of a VTS may be the enforcement of regulations within the VTS area. This may lead to prosecutions so it is therefore important to use formal and correct procedures. It is also important that administrative procedures are in place to ensure the accurate reporting and recording of violations and infringements that may be used as evidence.

### 1505 Equipment and Facilities

Information on equipment requirements are contained in CHAPTER 11 - Technical Equipment of VTS Systems. This section deals with administrative support of equipment and facilities. The proper operation of VTS equipment to its designed specification is critical to ensure the continuity, reliability, integrity, and quality of vessel traffic services being provided.

Procedures should be in place for:

- ✓ Scheduled preventive maintenance;
- ✓ Agreement between maintenance and operations in case of repair/maintenance work;
- ✓ Regular monitoring of equipment against set performance targets;
- ✓ Reporting equipment defects;
- ✓ Reporting repair intentions;
- ✓ Reporting progress or completion of repairs; and
- ✓ Acceptance that equipment is operating to the appropriate standard, by the VTS Manager or watch Supervisor.

If a VTS incorporates equipment and/or facility redundancy arrangements, administrative procedures should be in place for the seamless transition to maintain operational functions.

### 1506 Processes and Procedures

Administrative activities in support of operational procedures should include:

- ✓ Establishment, maintenance and audit of a Quality Management System (CHAPTER 19);
- ✓ This may draw on the external support from a classification society.
- ✓ Documentation of procedures including configuration management to capture and implement operational changes;



- ✓ Liaison with allied services;
- ✓ Ensuring completion of required reports and records for Competent Authority and other agencies;
- ✓ Maintenance of reference library, including Notices to Mariners, tidal information, other reference data; and
- ✓ Handling data storage, voice tapes/video/sensor recordings and responding to routine external requests for such data. Guidance on archives and records is contained in CHAPTER 16 - Operational Records, Archives and Replay.

## 1507 Finance

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There are two financial aspects of that may need consideration:

1. Internal - control of the budget of the VTS centre in terms of income and expenditure
  2. External billing associated with use of the port or waterway services.
- Specific tasks associated with finance include:
- ✓ Accounting/book-keeping;
  - ✓ Billing services - if there are charges for VTS, recordkeeping for other services (e.g. pilotage, port tariffs, etc.);
  - ✓ Auditing - there will be requirements for the VTS centre to account for expenditure and income to the relevant authority;
  - ✓ Budgeting; and
  - ✓ Pay and allowances.

## 1508 Security

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IMO has established international guidance on maritime security. Many of the requirements from the International Ship and Port Facilities Code (ISPS) are discussed in more detail CHAPTER 4 - Functions of VTS.

The administration of security requirements for the VTS must consider the security of the VTS infrastructure and VTS contribution to maritime security.

Administrative arrangements for security of the VTS infrastructure may include:

- ✓ Physical security of the VTS centre and remote sites;
  - ✓ Security of information systems supporting VTS; and
  - ✓ Personnel security, including the security clearance of VTS staff and visitors.
- Administrative processes that support VTS contribution to maritime security may include:
- ✓ Gathering security related data;
  - ✓ Validation of security related data;
  - ✓ Data storage;
  - ✓ Authorisation for access to security related data;

- ✓ Liaison and agreements with other agencies; and
- ✓ Exchange of data with security services.

## 1509 Other Administrative Activities

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Depending upon the size of the operation, other functions may need to be considered such as transportation, provision of parking facilities, firefighting arrangements, visits by VIPs or school parties and other public relations activities. Public information is covered in more detail in CHAPTER 17 - Public Information. However, administrative instructions should be in place to ensure that the VTS personnel are aware of their delegated authority for the release of information gathered by the VTS.

## 1510 Distractions

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Care should be taken not to distract VTSOs from their primary duties of ensuring safety of navigation. Systems, processes and procedures should support the needs of VTSOs.

Distractions may be authorised/necessary or unauthorised/unnecessary

Authorised/necessary type distractions may be caused by:

- ✓ Visitors;
- ✓ Phone Calls
- ✓ Emails
- ✓ Report writing;
- ✓ Maintenance.

Unauthorised/unnecessary type distractions are often tolerated by management or even operational colleagues and may be caused by:

- ✓ Visitors;
- ✓ Phone calls;
- ✓ Internet browsing;
- ✓ Television;
- ✓ Music;
- ✓ Sleeping;
- ✓ Eating/drinking; and
- ✓ Smoking.

Any type of distraction, which compromises the safety of navigation, should not be tolerated at any time. These unwanted distractions may be controlled by:

- ✓ Standard Operating Procedures (SOPs);
- ✓ Discipline, including self-discipline;
- ✓ Prioritisation; and
- ✓ Teamwork.

It is up to the authority concerned as well as VTS management to ensure that distractions are kept to an absolute minimum.



## CHAPTER 16 OPERATIONAL RECORDS, ARCHIVES AND REPLAY

### 1601 Introduction

The nature of VTS operations is such that there may be a need or requirement to access, analyse and review previous events. Therefore, proper requirements and processes are needed for the capture, secure storage, retrieval and presentation of VTS related information.

Advances in data storage techniques now make possible archiving and retrieval options that may have appeared unachievable only a short period ago. For example, storage and retrieval of basic raw data may be enhanced by the added capability of recording operator actions, the Human Machine Interface (HMI), which may prove invaluable in justifying the actions of VTS Staff in post incident analysis as well as improving the efficiency of VTS operations.

This chapter provides guidance on recording, archiving and replay techniques that a VTS Authority may wish to consider in selecting systems and procedures that are appropriate to their needs.

### 1602 Purpose of Recording and Replay

Recordings may be required for the following purposes:

- ✓ "Instant replay" during normal operation
- ✓ review of an accident for incident investigation;
- ✓ use as evidence following an accident or incident;
- ✓ technical evaluation and to check the function and performance of sensors etc;
- ✓ quality monitoring of the operation of VTS as a whole and to allow for continuous improvement;
- ✓ statistical analysis of traffic patterns etc.; and
- ✓ training purposes.

### 1603 Types of Data to be Recorded

The following areas may be considered for data capture (see also IALA Guideline 1111 - 'Preparation of Operational and Technical Performance Requirements for VTS Systems' section 1.4.2), as appropriate:

- ✓ Radio Communications;
- ✓ Telephone Communications (national privacy laws may be applicable);
- ✓ Sensor data used to generate the vessel traffic image such as:
  - ↳ Radar
  - ↳ AIS

- ↳ CCTV
- ↳ VHF DF
- ↳ Long-range sensor data
- ↳ Fused sensor data (track data, vessel traffic image, etc.)

- ✓ Meteorological and hydrological data;
- ✓ Management Information Systems data, which may include:
  - ↳ Shipping information i.e. vessel and cargo data, including vessel movement information;
  - ↳ Pilotage management;
  - ↳ Allied service provisions i.e. tug and line handing allocations.
- ✓ Logs and Textual records:
  - ↳ Operator actions (HMI);
  - ↳ System BITE and logs.

### 1604 Recording frequency and sampling rates

The frequency of sampling for recorded data sets should be defined for each specific type of data (e.g. continuously for Voice Communications, and at an appropriate rate for meteorological or hydrological data).

The relevant authority should define the period of time and temporal resolution of sensor data and other tracking performance parameters depending on traffic density and types of tracks.

While the frequency of individual data items may differ from item to item, the recording of all data sets should be continuous and time stamped to a common time frame. A VTS system should have a master time reference to which all components and recordings are aligned.

Proper care should be taken by the relevant authority when considering the recording process and data storage with regard to failure to record or inadvertent loss of recordings.

### 1605 Storage of Recordings

IMO recommends a minimum of 30 days for other shore side activities (such as SAR) as the time period to allow for the full retrieval of data post incident/accident. It can be assumed that this requirement is appropriate for VTS and applies to all data sets that may be used for incident replay. As this data will be recorded in a rolling loop of, for example the most recent 30 days data, there is a requirement to store recordings for a period of time to safeguard recorded data in case of an incident. It should be easy for a VTS operator or supervisor to export and / or archive a period of recorded data to external devices (e.g. Network Attached Storage, DVD, External hard disks tape storage or similar).

Certain data should be considered for longer term storage in support of such benefits as analysis of traffic patterns and their changes over time,

waterway usage changes, input for analysis of changes to buoyage and other aids to navigation and other such strategic vessel traffic management uses. It is possible that such long term archival of data is beyond the capability or responsibility of the VTS; the capabilities of other organisations should be considered for this purpose (e.g., archival or statistical administrations).

VTS Authorities should ensure the integrity and availability of recorded data. A capability should be provided to store recordings of specific incident data beyond the minimum storage time or to produce a permanent record for legal, regulatory or analysis purposes. Consideration should be given to securing recordings from unauthorised access or tampering, particularly those to be used in accident investigation or legal action.

The large file size of some data items such as audio or CCTV images, may necessitate moving of the data to another devices (Network Attached Storage, DVD or similar) for longer term storage. This may also be a consideration in deciding whether to record and store original (raw) video, or digital (extracted) images as presented to an operator.

To ensure that records are consistent and complete, the data recording process should normally be automated and consideration should be given to the provision of a stand-alone replay system that does not interfere with the VTS function. Consideration should be given to allow the retrieval of VTS information in standard formats (e.g. delimited text files or extensible mark-up language (XML)) and non-proprietary audio and video/image files.

## **1606** Replay System

Any replay system must ensure that times are accurately identified so that the traffic situation can be rebuilt during replay. VTS Authorities may consider the integrated and synchronised replay of different data sources to aid incident review. Replay may be required for the following purposes:

- ✓ Technical replay - using previously recorded data to fine-tune the system;
- ✓ Operator replay - replay of data sets as seen by VTSO for internal analysis or OJT training;
- ✓ External replay - 'standalone' replay functionality, for example when replaying to a court or official inquiry.



## CHAPTER 17 PUBLIC INFORMATION

### 1701 General

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Vessel Traffic Services operate in the public interest. Therefore VTS Authorities have a duty to inform the public of their activities and to cooperate with stakeholders. The VTS Authority has access to a large amount of information through the VTS centre and this information can be used to inform stakeholders, either directly or through the media, and to improve public awareness of their activities and of events in the VTS area.

### 1702 Information Policy

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VTS Authorities should adopt an information policy. If the VTS centre is part of a larger organization, its policy will need to align with those of the parent organization. This policy should set out the procedures for dealing with inquiries from the public and media.

VTS Authorities should consider appointing a staff member responsible for media liaison. This person should have a thorough knowledge of VTS operations, as well as handling the media/public, and, ideally, should not be a regular watch-keeper. The main role is to provide a focal point for public information and to be known to the media as a point-of-contact for enquiries. Tasks should include routine contact with the local media, the arrangement of exchange visits, the provision of briefings on day-to-day or small-scale operations, and the arrangement of press facilities during large-scale operations. Where a VTS Authority does not appoint a specific member of staff to liaise with the media, a suitable person should be nominated, as necessary, on a case-by-case basis. In every case the person designated to liaise with the media should have appropriate training.

In an emergency or incident situation, the media will probably try to contact the VTS centre directly and use every means at their disposal in order to obtain information. However, VTS personnel should not express opinions, or speculate on outcomes of incidents, but direct the media to the person appointed to liaise with the media according to the procedures.

When providing information on events of immediate and/or particular interest to the media, the VTS Authority should endeavour to provide that information through the person nominated for media liaison at regular intervals during operations and/or whenever important developments occur. The VTS Authority should ensure that information released is timely, factual, accurate and relates only to the details of the particular incident. Information should not be provided that could:

- ✓ be harmful to security in general;

- ✓ hamper or interfere with VTS operations;
- ✓ intrude on personal privacy; or
- ✓ affect the outcome of any investigation or future legal action.

Due care should be taken not to release proprietary or sensitive information, unless those sources approve of the release, or the passage of time has eliminated the commercial value of the proprietary information.

### 1703 Relationships with the Media

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The maintenance of good working relationships with the media is of considerable potential benefit to a VTS Authority, as it keeps the public routinely informed of matters of general interest. This helps to keep the work of the VTS in the public mind and promotes an awareness of the associated benefits that are derived by the community.

Routine contact and press releases enables an authority to develop a relationship with the public on key matters such as maritime safety, port and waterways efficiency and environmental protection, particularly where other stakeholders might have shared responsibilities or concerns.

For events where the media interest is likely to be high, such as a major incident, it is advisable to have in place a pre-determined media plan, as an integral part of the VTS incident contingency plan. Such a plan should include that all media information will only be provided by the person responsible for media liaison, to help ensure that the main resources of the VTS Authority and VTSOs are devoted to the incident and are not distracted by media enquiries. At the same time, it will be necessary to ensure that the media are kept fully and accurately informed. The VTS Authority may, in cooperation with other relevant authorities, arrange for separate facilities in order to conduct press briefings. It is important to note that, whilst every assistance should be given to the media, their presence should not be allowed to interfere with VTS operations.

### 1704 Provision of Information

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The data collected by a VTS centre may be of great value to many stakeholders and also be of great interest to others. The increase in the ability to collect and access data with electronic systems has made this data easier to share. However, at the same time, unauthorised eavesdropping has become easier, particularly for people intent on malpractice or sabotage.

VTS Authorities should establish robust procedures for the release of different types of information to authorised stakeholders and to safeguard information, whose unauthorised use could, in the wrong hands, jeopardise safety and security.

### **1705 User Education and Public Awareness Programmes**

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A VTS may find it beneficial to implement a programme to target members of the maritime community who desire or need knowledge of VTS operations. It should be flexible enough to adapt to the operational needs of any audience including pilots, licensed mariners, fishermen, yachting organizations and non-traditional VTS stakeholders/users such as marine construction companies, shipping agents, and transportation authorities for other modes of transportation.

The programme should include an overview of the VTS mission, geographic boundaries, equipment capabilities and limitations, and personnel duties. It should also provide an explanation of VTS participation, communications requirements and national/local regulations for VTS users.

Public awareness programs are intended to promote the philosophy that mariners and the VTS work together to make ports and waterways safer and more efficient. The maritime community and the VTS Authority should continually discuss ways in which they can help each other achieve common goals for the benefit of all.

### **1706 Ship / VTS Interaction and Related Facility Visits**

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Experience gained by VTS personnel aboard vessels and visits to maritime facilities operating in their VTS area can provide great benefit to the VTS and to the maritime community. Such activities serve to:

- ✓ provide information directly to VTS stakeholders;
- ✓ enable VTS stakeholders to give feedback directly to VTS personnel; and
- ✓ improve VTS personnel's understanding of the duties, responsibilities, and concerns of the VTS stakeholders.

Competent and/or VTS Authorities may consider making their facilities accessible to the general public, taking into consideration the security of the VTS centres, the impact on VTS operations and other constraints. Public visits to a VTS centre in operation helps to promote a better understanding of the VTS and fosters more positive attitudes towards the safety of navigation and the protection of the environment.

### **1707 Participation in Advisory Committees**

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The VTS Authority should be responsive to public attitudes and interests, and execute a plan of action to promote public understanding and respect. A public relations programme might include:

- ✓ Liaison and co-operation with various

associations and organizations.

- ✓ Establishing a marine industry advisory committee.
- ✓ Public visits to VTS centres.
- ✓ Participating in special events.
- ✓ Humanitarian actions.

VTS Authority representation in local maritime committee meetings, consultative groups and other public forums provides an opportunity to exchange information and discuss maritime related issues. Active participation in such committees also advances the development of strong working relationships with local stakeholders





## CHAPTER 18 VTS OPERATIONAL PROCEDURES

### 1801 Introduction

Operational Procedures are an integral part of a verifiable safety management system for VTS. A properly implemented quality control system, approved by the Competent Authority, can ensure that the standards set for the types of service are consistently maintained and that the service is delivered safely and effectively.

The development and maintenance of VTS centre specific operational procedures is a continuous process. To ensure the safe and efficient management of the service, it is critical that:

- ✓ VTS Staff are made aware of changes and amendments; and
- ✓ Auditable and documented processes are developed that enable the early and effective update of operational procedures.

Best practice indicates that new or changed procedures should be communicated at the watch handover and incorporated into the operational procedures handbooks/manual. This chapter summarises the key points in developing operational procedures for VTS centres.

### 1802 Overview

IALA Recommendation V-127 - '*Operational Procedures for VTS*', has been prepared to assist VTS Authorities in identifying key aspects that should be considered when developing operational procedures for a VTS centre.

### 1803 Communications and VTS Procedures

Recommendation V-127 provides a checklist for preparing operational procedures and this chapter provides guidance in developing recommended procedures. To assist a common and consistent approach to the development of operational procedures, key terminology utilised by the maritime sector has been defined. The key terminology includes:

- ✓ Result Oriented Messages;
- ✓ Standard Phrases; and
- ✓ types of Communication Messages and Message Markers.

### 1804 Result Oriented Messages

A fundamental principle of VTS communications is that advice and instructions should be 'result oriented' only; leaving the execution to the master or pilot onboard the vessel. The execution, such as courses to be steered or engine manoeuvres to be ordered, remains the responsibility of the person

on board accountable for navigational decision making at that time.

The interpretation of 'Result Oriented' will depend on the situation and context. Phrases that are used for vessel conning, such as, 'Stop Engine', 'Hard to Starboard' or 'Steer Course 'XXX'' should not be used.

### 1805 Standard Phrases

Attention is drawn to the importance of using standard terminology, including message markers. Guidance on standard phrases and maritime communications can be found in:

- ✓ IMO Resolution A.918(22) - '*IMO Standard Marine Communication Phrases (SMCP)*', where standard phrases for ship-to-shore communications are defined;
- ✓ IMO Resolution A.851 (20) - '*General Principles for Ship Reporting Systems and Ship Reporting Requirements*', where standard reporting procedures are described; and
- ✓ IMO Resolution A.954(23) - '*Proper use of VHF channels at sea*'.

### 1806 Types of Communication Messages and Message Markers

To facilitate shore-to-ship and ship-to-shore communication in a VTS environment, one of the following eight message markers should be used to increase the likelihood of the message being properly understood. It is recommended that message markers are used when a VTS communicates with vessels. The contents of all messages directed to a vessel should be clear; IMO Standard Marine Communication Phrases (SMCP) should be used where practicable. When language difficulties exist, the VTS operator should ask the officer of the watch of the vessel concerned to use SMCP.

### 1807 Message Markers

There are eight message markers as defined in SMCP. Seven of them are frequently used by the VTS to emphasise the content of the message or to ensure that the message will be properly understood, particularly when language difficulties are apparent between the VTS and the vessel. The message marker is to precede the message or the corresponding part of the message.

The message markers are:

INFORMATION	WARNING	ADVICE	INSTRUCTION
QUESTION	ANSWER	REQUEST	INTENTION

The message markers INSTRUCTION and ADVICE may need authorization by the appropriate authority. However, it is at the discretion of the VTSO which marker is applicable to the situation.



Figure 26

VTS Operator at Zandvliet VTS, Belgium

The message marker INTENTION should not be used by the VTS as it is intended for messages announcing navigational actions by a vessel.

Detailed information on the use of message markers and examples thereof can be found in IALA Guideline No. 1089 - 'Provision of Vessel Traffic Services (INS, TOS & NAS)'.

### 1808 Developing Operational Procedures

To achieve standardised operations/performance within the VTS centre, clearly defined operating procedures, particularly those relating to external communications are paramount. VTS Authorities should therefore develop and document procedures for all operations within a VTS. The operating procedures should be documented in manuals, available to all VTS personnel.

A clear distinction is made between Internal and External Operational Procedures:

- ✓ Internal Procedures - procedures that cover the day-to-day running of a VTS centre or sub-centre, including the operation of systems and sensors, interactions among the staff and the internal management of data.
- ✓ External Procedures - procedures that govern the interaction with participating vessels and allied services (defined as services actively involved in the safe and efficient passage of the vessel through the VTS area).

A further distinction is made between routine procedures and those related to incidents such as search and rescue and environmental protection. The latter are generally referred to as emergency procedures. Examples of procedures are shown at ANNEX G.

Recommendation V-127 provides a reference list to assist VTS Authorities to identify key aspects that should be considered when developing operational procedures for a VTS centre. The list is neither mandatory nor exhaustive and should be adapted to suit individual needs.

Recommendation V-127 recognises that the nature of the tasks and activities to be performed will depend on the capability of the VTS, the VTS area and the types of services to be provided. In general, these tasks and activities all involve collecting, processing, evaluating and disseminating information.

The collection and dissemination of this information will involve both internal and external communications, while information will be processed within the VTS centre itself. The level of decision-making that can be taken within the VTS centre should be clearly identified and promulgated.

It is important that a change or update of the operating procedures is communicated clearly and unambiguously to the VTS personnel concerned, particularly to operational personnel (VTSOs) who will be following set procedures.



## CHAPTER 19 QUALITY MANAGEMENT IN VTS

### 1901 Background

Vessel Traffic Services implemented by a Competent Authority are subject to IMO Member State Audit Scheme (IMSAS). All IMO audits from 1 January 2016 are mandatory and should be arranged and carried out in line with the framework and procedures for the IMO Member State Audit Scheme, using the IMO Instruments Implementation Code (III Code) as the audit standard.

IALA has developed Guideline No. 1115 on 'Preparing for IMO Member State Audit Scheme (IMSAS) On Vessel Traffic Services' in order to provide guidance for Contracting Governments and Competent Authorities to meet the objectives of an IMO Member State Audit Scheme (IMSAS) with respect to the implementation and delivery of VTS and to demonstrate they are fulfilling their responsibilities under the general provisions of treaty law and IMO conventions for promulgating laws and regulations. They are also responsible for taking all other steps which may be necessary to give full and complete effect to SOLAS Chapter V (Safety of Navigation) Regulation 12 (Vessel Traffic Services).

IALA is committed to the provision of high quality services and encourages navigation authorities to adopt internationally recognised standards for the management and delivery of services as set out in IALA Recommendation O-132 - 'Quality Management for Aids to Navigation Authorities'. For the purposes of this Recommendation, VTS is deemed to be an Aid to Navigation. IALA Recommendation O-132 recommends that:

- ✓ Authorities responsible for aids to navigation, implement and maintain a Quality Management System (QMS);
- ✓ Authorities ensure the ongoing integrity of the QMS through periodic:
  - ↳ Certification by an accredited third party; and/or
  - ↳ Assessment by a third party; and/or
  - ↳ Self assessment.

Authorities responsible for aids to navigation use related IALA documentation, including:

- ✓ IALA Guideline 1052 on the Use of Quality Management Systems for Aids to Navigation Service Delivery;

The requirement for service providing organizations to adopt quality management principles is well established throughout the world. IMO introduced a mandatory system for shipping and ship operators in 2002, the International Safety Management (ISM) Code.

*The purpose of the Code is to provide an international standard for the safe management and operation of ships and for pollution prevention.*

*Preamble, ISM Code 2002*

### 1902 Quality Management System

A Quality Management System is defined as a business management system to direct and control an organization with regard to quality, i.e. to achieve its objectives. It is not a simple set of documents but a dynamic process that brings resources, activities and behaviours together and focuses on the achievement of objectives.

The focus in modern quality management is to control the final outcome, but with the focus on process rather than procedures. A basic but fundamental approach to quality is the four steps of the quality improvement loop:

- 1 Preparing and planning;
- 2 Realisation of the objectives;
- 3 Checking of outcomes in the light of the client's expectations; and
- 4 Reacting to this information to improve the service.

There are many ways to implement a quality management system. Some VTS Authorities may choose to use a third party assessment or audit. Others may opt to develop their own mechanisms for certification and review.

### 1903 Benefits derived from a Quality Management System

An active Quality Management System provides a tool to ensure that the objectives of the VTS are met and that the standards set by the Competent Authority for service provision and operator qualifications continue to be met.

Properly conducted, a Quality Management System will ensure that a consistent quality of service is maintained to meet the demands of local maritime traffic. The benefits resulting from having a quality management system are well recognised and wide-ranging. Some of benefits include:

- ✓ Improved stakeholder confidence and satisfaction;
- ✓ Continual process improvement;
- ✓ Increased productivity and efficiency;
- ✓ Prompt and effective action on faults or complaints;
- ✓ Improved teamwork and communication;
- ✓ Enhanced quality awareness within the whole organization;

- ✓ Availability of proper documentation; and
- ✓ Assurance of effective management.

## 1904 Quality Management Principles

The International Organization for Standardisation (ISO) defines seven quality management principles (see 19.15 - References). The basic principles that need to be considered when establishing a quality management environment are:

### 1904.1 Principle 1 – Customer-Focused Organization

Organizations depend on their customers and therefore should understand current and future customer needs, meet customer requirements and strive to exceed customer expectations.

### 1904.2 Principle 2 – Leadership

Leaders establish unity of purpose and direction of the organization. They should create and maintain the internal environment in which people can become fully involved in achieving the organization's objectives.

### 1904.3 Principle 3 – Involvement of People

People at all levels are the essence of an organization and their full involvement enables their abilities to be used for the organization's benefit.

### 1904.4 Principle 4 – Process Approach

A desired result is achieved more efficiently when related resources and activities are managed as a process.

### 1904.5 Principle 6 – Continual Improvement

Continual improvement should be a permanent objective of the organization.

### 1904.6 Principle 7 – Factual approach to decision making

Effective decisions are based on the analysis of data and information.

### 1904.7 Principle 8 – Mutually beneficial service relationships

An organization and its service users are interdependent, and a mutually beneficial relationship enhances the ability of both to create value.

## 1905 Quality Management and the Maritime Industry

Although quality management systems were originally developed for the manufacturing industry, most ship management and marine service companies today have obtained quality

management certification. International regulations are also under review, which may require the certification of flag state administrations. The Implementation of IMO Instruments (III) Subcommittee has also addressed the ability of maritime administrations to provide quality management and implement the international maritime conventions and rules properly.

Quality certification of a maritime administration's management system can be of significant benefit in overcoming the negative connotations about open ship registries and verifying a flag state's ability to implement and administer international rules and regulations in today's evolving maritime regulatory climate. ISO 9001:2015 certification provides an opportunity for well-run ship registries and flag states to have their management operations and administrative functions documented by internationally recognised, unbiased third-party auditors, such as the Classification Societies.

## 1906 ISO and Quality System Management

ISO is the acronym for the International Organization for Standardisation. ISO 9000 is a series of five international standards on quality management and assurance. For example, ISO 9001:2015 is the quality standard used by companies whose products or services have already been marketed, tested, improved and approved. These companies focus their quality efforts on maintaining and improving existing quality systems. ISO defines a quality system as: 'The organizational structure, responsibilities, procedures, processes and resources needed to implement quality management.'

In the case of a maritime administration, this certification encompasses vessel registration, crew examination, officer licensing, seafarers' identification and qualification documents, radio authority, vessel inspections, technical assistance and investigations.

## 1907 Key Elements of a VTS Quality Management System

Key elements of a Quality Management System that should be considered by a VTS Authority include:

- |                           |                           |
|---------------------------|---------------------------|
| 1. Scope                  | 5. Operational Procedures |
| 2. Policy                 | 6. Continuous Improvement |
| 3. Responsibilities       | 7. Audits                 |
| 4. Planning and Reporting |                           |

## 1908 Scope

The scope of activities to be covered under a Quality Management System needs to be clearly defined at the highest management level.





### 1908.1 Example of a Scope Statement

#### Port '<name>' - VTS Management System

The scope of activities covered under Port '<name>' Management System is the development and administration of standards to:

- ✓ Deliver VTS that contribute to achieving the Authority's objectives of improving maritime safety and minimise the risk of ship sourced pollution and environmental damage within region;
- ✓ Provide an ability to respond more quickly in the event of any safety or pollution incident;
- ✓ Provide VTS capabilities to interact with and respond to developing traffic situations, including assisting with distress situations;
- ✓ Improve processes and systems, and capitalise on existing and emerging technologies;
- ✓ Deliver services that are relevant to current shipping management practice, user expectations, and community perceptions;
- ✓ Enhance relationships with allied services, stakeholders and other interested parties;
- ✓ Monitor and analyse the strategic environment to identify future directions, resource requirements etc. as the role of other agencies, allied services and client groups increasingly impact on the VTS;
- ✓ Adopt best practice governance arrangements;
- ✓ Provide corporate wide support for the delivery of VTS services in relation to legal, financial, human resources, contractual arrangements, business services, information technology (including records management), quality management, government liaison, public relations and corporate planning;
- ✓ Provide training (both competency and course based) leading to the granting of qualifications for staff; and
- ✓ Develop Disaster Recovery Procedures to ensure minimal disruption to services in unexpected or extreme circumstances.

### 1909 Policy

The objectives of the VTS should be clearly defined in an Authority Policy Statement that highlights the authority's commitment to good governance, best practice operations, risk management and continuous improvement and key strategies to meet these commitments.

The policy for the conduct of an organization, and the resources allocated, can only be set at the highest management level. It is incumbent upon those at board or director level to establish

clear policy objectives, particularly with regard to quality of performance and delivery, if all personnel involved in the undertaking are to operate effectively.

### 1909.1 Example of a Quality Policy Statement for a VTS

The Aim of the VTS is 'To Deliver a Reliable, Efficient and Cost Effective 'VTS Service' for the Benefit and Safety of all Mariners and other Stakeholders'.

VTS '<name>' - Health & Safety and Environmental Objectives Policy Statement:

- ✓ To ensure safety at sea;
- ✓ Prevention of human injury or loss of life; and
- ✓ Avoidance of damage to the environment.
- ✓ In pursuance of these objectives, VTS is committed to:
  - ✓ Providing for safe practices in operations both in ships and ashore;
  - ✓ Providing a safe working environment;
  - ✓ Establishing safeguards against all identified risks;
  - ✓ Continuously improving health and safety management skills of employees including preparing for emergencies related both to safety and environmental protection;
  - ✓ Continuously improving health and safety performance by proven conformity to accepted national and international safety management standards and quality systems, recognising legal requirements as the minimum standard;
  - ✓ Striving to maintain a positive health and safety culture with the ultimate goal of reducing ill health and accidents to an absolute minimum, eliminating them where possible;
  - ✓ Minimising the consumption of non-renewable resources within practical constraints; and
  - ✓ Investing sufficiently in its assets and resources to meet regulatory obligations in respect of safety and the environment.

The Management System will ensure:

- ✓ Compliance with legislation, mandatory rules and regulations; and
- ✓ Applicable codes, guidelines and standards are taken into account.

### 1910 Responsibilities

The high-level responsibilities for the primary elements of the Quality Management System should be clearly defined and documented; examples are shown in the table that follows.



Table 3

Defining responsibilities - example

Direction	Responsibility
Establish Direction (e.g. Strategic Plan)	Board
Develop and review policy documents	Board / VTS Manager
Develop overall objectives, targets and programmes Business Plan Identify Risks	Board / VTS Manager VTS Manager
Monitor and review performance Management Review	VTS Manager / Legal Advisor
Assure regulatory compliance Identify, record and report on customer expectations (e.g. VTS customer compliments/complaints process, service charter)	Board / VTS Manager
Policies and procedures: Develop and maintain policies and procedures Document Control Review and Update, as required	VTS Manager and Staff Document Controller(s)
Comply with defined procedures	Staff
Conduct internal audits and report on outcomes	Nominated Auditor
Identify and record opportunities for improvement	VTS Manager and Staff
General awareness of the Quality Management System	VTS Manager and Staff

### 1911 Planning

To ensure there is a robust framework to plan, prioritise and define areas of emphasis to ensure the objectives of the VTS are delivered in the best possible manner, consideration should be given to ensuring the operations and delivery of VTS are reflected in all high level documents such as:

Strategic Plan;

- ✓ Annual Report;
- ✓ Risk Management Plan; and
- ✓ Business Continuity Planning.

Note: A business continuity plan enables critical services to be continually delivered to stakeholders. Instead of focusing on resuming a service after critical operations have ceased, or recovering after a disaster, a business continuity plan endeavours to ensure that critical operations continue to be available. Good business continuity planning can result in successful resumption of operations.

### 1912 Operational Procedures

The objectives of the VTS can only be met through co-operation and trust among users of the service, VTS personnel and allied services. This can only be achieved through the reliability of the VTS information, which is dependent on the assured

availability, continuity and quality of the service provided to all stakeholders.

The responsibility for meeting the standards of an individual VTS centre will normally rest with the Manager of the VTS or a VTS Supervisor who should ensure that everything in the centre, particularly the staff, function at optimal efficiency at all times.

Adoption of a Procedures Manual prepared in line with this document and IALA Recommendation V-127 - 'Operational Procedures for VTS' is seen as an integral part of a verifiable safety management system for the VTS.

Operational procedures will evolve on a continuing basis. It is important that any changes made to operational procedures are properly documented. Temporary changes to procedures should be auditable and formally cancelled when expired or regularly incorporated into the appropriate parent document.

### 1913 Continuous Improvement

All staff / managers should be responsible for identifying opportunities for improvement within the scope of the Quality Management System (QMS).

To facilitate this, the process for reporting and managing opportunities for improvement should

be documented to ensure continuous business improvement is achieved and that there is a systematic approach to planning and taking corrective and/or preventive action.

'Opportunities for Improvement' should apply to elements such as:

- ✓ continuous business improvement;
- ✓ non-conforming service;
- ✓ corrective action;
- ✓ preventive action; and
- ✓ customer feedback.

When acting on 'Opportunity for Improvement' results in a change to a process, the VTS manager should ensure that:

- ✓ the change is evaluated to ensure that the desired result has been achieved; and
- ✓ resultant changes in relationships between the process and the service characteristics are documented and communicated.

## 1914 Audits

Audits are an essential management tool to be used for:

- ✓ verifying objective evidence of processes,
- ✓ assessing how successfully processes have been implemented,
- ✓ judging the effectiveness of achieving any defined target levels,
- ✓ providing evidence concerning reduction and elimination of problem areas.

For the benefit of the organization, quality auditing should not only report non-conformances and corrective actions, but also highlight areas of good practice. In this way other departments may share information and amend their working practices as a result, also contributing to continual improvement. See also IALA Guideline 1101 - 'Auditing and Assessing VTS' and Guideline 1115 - 'Preparing for IMO Member State Audit Scheme (IMSAS) On Vessel Traffic Services'.

VTS Authorities should ensure the ongoing integrity of the QMS through:

- ✓ Periodic audits;
- ✓ Certification by an accredited third party; and/or
- ✓ Assessment by a third party; and/or
- ✓ Self assessment.

## 1915 References

### 1915.1 ISO

References published by the International Organization for Standardisation for quality management systems are:

- ✓ ISO 9000:2005 - Quality management systems - Fundamentals and vocabulary;
- ✓ ISO 9001:2008 - Quality management systems - Requirements;
- ✓ ISO 9004:2009 - Managing for the sustained success of an organization - A quality management approach.

The ISO 9000 family of standards represents an international consensus on good quality



Figure 27

Vessel Departing, Zandvliet VTS area, Belgium

management practices. It consists of standards and guidelines relating to quality management systems and related supporting standards.

ISO 9001:2008 is the standard that provides a set of standardized requirements for a quality management system, regardless of what the user organization does, its size, or whether it is in the private, or public sector. It is the only standard in the family against which organizations can be certified – although certification is not a compulsory requirement of the standard.

The other standards in the ISO 9000 family cover specific aspects such as fundamentals and vocabulary, performance improvements, documentation, training, and financial and economic aspects.

#### 1915.2 IMO and IMSAS

Reference IMO documentation on IMSAS as regards VTS include:

- ✓ Resolution A.1067(28) on the Framework and Procedures for the IMO Member State Audit Scheme

This framework describes the objective, principles, scope, responsibilities and capacity-building aspect of the IMO Member State audit, which together constitute the strategy for the audit scheme.

- ✓ Resolution A.1070(28) on IMO Instruments Implementation Code (III Code)

The objective of III Code is to enhance global maritime safety and protection of the marine environment and to assist States in the implementation of instruments to which the State is a Contracting Government or Party, including SOLAS Chapter V (Safety of Navigation) Regulation 12 (Vessel Traffic Services).

- ✓ IMO Circular Letter No. 3425 - Auditor's Manual for the IMO Member State Audit Scheme (IMSAS)

This manual has been developed as guidance to assist in the planning, conducting and reporting by auditors and to promote consistency in the delivery of the audit programme.

- ✓ Resolution A.857(20) Guidelines for Vessel Traffic Services

This Resolution describes the principles and general provisions for the operation of a VTS and participating vessels. Contracting Governments should take account of these guidelines when planning, implementing and operating vessel traffic services.



ANNEX A IMO RESOLUTION A.857(20)

INTERNATIONAL MARITIME ORGANIZATION



A 20/Res.857  
3 December 1997  
Original: ENGLISH

ASSEMBLY  
20th session  
Agenda item 9

**RESOLUTION A.857(20)  
adopted on 27 November 1997**

**GUIDELINES FOR VESSEL TRAFFIC SERVICES**

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention on the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety and the prevention and control of marine pollution from ships,

RECALLING ALSO resolution A.158(ES.IV) entitled 'Recommendation on Port Advisory Services', resolution A.851(20) entitled 'General Principles for Ship Reporting Systems and Ship Reporting Requirements, including Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants' and resolution MSC.43(64) entitled 'Guidelines and Criteria for Ship Reporting Systems',

BEARING IN MIND the responsibility of Governments for the safety of navigation and protection of the marine environment in areas under their jurisdiction,

BEING AWARE that vessel traffic services have been provided in various areas and have made a valuable contribution to safety of navigation, improved efficiency of traffic flow and the protection of the marine environment,

BEING ALSO AWARE that a number of Governments and international organizations have requested guidance on vessel traffic services,

RECOGNIZING that the level of safety and efficiency in the movement of maritime traffic within an area covered by a vessel traffic service is dependent upon close co-operation between those operating the vessel traffic service and participating vessels,

RECOGNIZING ALSO that the use of differing vessel traffic service procedures may cause confusion to masters of vessels moving from one vessel traffic service area to another,

RECOGNIZING FURTHER that the safety and efficiency of maritime traffic and the protection of the marine environment would be improved if vessel traffic services were established and operated in accordance with internationally approved guidelines,

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HAVING CONSIDERED the recommendation made by the Maritime Safety Committee at its sixty-seventh session,

1. ADOPTS the Guidelines for Vessel Traffic Services and the Guidelines on Recruitment, Qualifications and Training of VTS Operators set out in Annexes 1 and 2 to the present resolution;
2. INVITES Governments to take account of the annexed Guidelines when developing, implementing and operating vessel traffic services;
3. RECOMMENDS Governments to encourage masters of ships navigating in areas for which vessel traffic services are provided to make use of such services;
4. REVOKES resolution A.578(14).

## ANNEX 1

## GUIDELINES AND CRITERIA FOR VTS

## PREAMBLE

1 These Guidelines are associated with SOLAS Regulation V/8-2 and describe the principles and general operational provisions for the operation of a vessel traffic service (VTS) and participating vessels.

2 Contracting Governments should take account of these Guidelines when planning, implementing and operating vessel traffic services.

3 These Guidelines should be used in conjunction with the applicable Guidelines and Criteria for Ship Reporting Systems, resolution MSC.43(64) and the IALA VTS Manual.

## 1 DEFINITIONS AND CLARIFICATIONS

1.1 The following terms are used in connection with vessel traffic services:

- .1 *Vessel traffic service (VTS)* - a service implemented by a Competent Authority, designed to improve the safety and efficiency of vessel traffic and to protect the environment. The service should have the capability to interact with the traffic and to respond to traffic situations developing in the VTS area.
- .2 *Competent authority* - the authority made responsible, in whole or in part, by the Government for safety, including environmental safety, and efficiency of vessel traffic and the protection of the environment.
- .3 *VTS authority* - the authority with responsibility for the management, operation and co-ordination of the VTS, interaction with participating vessels and the safe and effective provision of the service.
- .4 *VTS area* - the delineated, formally declared service area of the VTS. A VTS area may be subdivided in sub-areas or sectors.
- .5 *VTS centre* - the centre from which the VTS is operated. Each sub-area of the VTS may have its own sub-centre.
- .6 *VTS operator* - an appropriately qualified person performing one or more tasks contributing to the services of the VTS.
- .7 *VTS sailing plan* - a plan which is mutually agreed between a VTS Authority and the master of a vessel concerning the movement of the vessel in a VTS area.
- .8 *VTS traffic image* - the surface picture of vessels and their movements in a VTS area.
- .9 *VTS services* - VTS should comprise at least an information service and may also include others, such as a navigational assistance service or a traffic organization service, or both, defined as follows:
  - .9.1 An information service is a service to ensure that essential information becomes available in time for on-board navigational decision-making.
  - .9.2 A navigational assistance service is a service to assist on-board navigational decision-making and to monitor its effects.
  - .9.3 A traffic organization service is a service to prevent the development of dangerous maritime traffic situations and to provide for the safe and efficient movement of vessel traffic within the VTS area.
- .10 *Allied services* - services are services actively involved in the safe and efficient passage of the vessel through the VTS area.



- .11 *Hazardous cargoes* - include:
  - .11.1 goods classified in the International Maritime Dangerous Goods (IMDG) Code;
  - .11.2 substances classified in Chapter 17 of the IMO International Code for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC) Code, and in Chapter 19 of the IMO International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC) Code;
  - .11.3 oils as defined in MARPOL Annex I;
  - .11.4 noxious liquid substances as defined in MARPOL Annex II;
  - .11.5 harmful substances as defined in MARPOL Annex III; and
  - .11.6 radioactive materials specified in the Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High Level Radioactive Wastes in Flasks on Board Ships (INF) Code.

## 2 GENERAL CONSIDERATIONS FOR VESSEL TRAFFIC SERVICES

### 2.1 Objectives

2.1.1 The purpose of vessel traffic services is to improve the safety and efficiency of navigation, safety of life at sea and the protection of the marine environment and/or the adjacent shore area, worksites and offshore installations from possible adverse effects of maritime traffic.

2.1.2 A clear distinction may need to be made between a Port or Harbour VTS and a Coastal VTS. A Port VTS is mainly concerned with vessel traffic to and from a port or harbour or harbours, while a Coastal VTS is mainly concerned with vessel traffic passing through the area. A VTS could also be a combination of both types. The type and level of service or services rendered could differ between both types of VTS; in a Port or Harbour VTS a navigational assistance service and/or a traffic organization service is usually provided for, while in a Coastal VTS usually only an information service is rendered.

2.1.3 The benefits of implementing a VTS are that it allows identification and monitoring of vessels, strategic planning of vessel movements and provision of navigational information and assistance. It can also assist in prevention of pollution and co-ordination of pollution response.

The efficiency of a VTS will depend on the reliability and continuity of communications and on the ability to provide good and unambiguous information. The quality of accident prevention measures will depend on the system's capability of detecting a developing dangerous situation and on the ability to give timely warning of such dangers.

2.1.4 The precise objective of any vessel traffic service will depend upon the particular circumstances in the VTS area and the volume and character of maritime traffic as set forth in 3.2 of these Guidelines and Criteria.

### 2.2 Responsibilities and liability

2.2.1 Where two or more Governments have a common interest in establishing a VTS in a particular area, they should develop a co-ordinated vessel traffic service on the basis of an agreement between them.

Where a co-ordinated vessel traffic service is established, it should have uniform procedures and operations.

2.2.2 In planning and establishing a VTS, the Contracting Government or Governments or the competent authority should:

- .1 ensure that a legal basis for the operation of a VTS is provided for and that the VTS is operated in accordance with national and international law;
- .2 ensure that objectives for the VTS are set;
- .3 ensure that a VTS authority is appointed and legally empowered;
- .4 ensure that the service area is delineated and declared a VTS area; where appropriate, this area may be subdivided in sub-areas or sectors;
- .5 determine the type and level of services to be provided, having regard to the objectives of the VTS;
- .6 establish appropriate standards for shore- and offshore-based equipment;
- .7 ensure that the VTS authority is provided with the equipment and facilities necessary to effectively accomplish the objectives of the VTS;
- .8 ensure that the VTS authority is provided with sufficient staff, appropriately qualified, suitably trained and capable of performing the tasks required, taking into consideration, the type and level of services to be provided and the current IMO Guidelines on the recruitment, qualifications and training of VTS operators given in Annex 2;
- .9 establish appropriate qualifications and training requirements for VTS operators, taking into consideration the type and level of services to be provided;
- .10 ensure that provisions for the training of VTS operators are available;
- .11 instruct the VTS authority to operate the VTS in accordance with relevant IMO resolutions;
- .12 establish a policy with respect to violations of VTS regulatory requirements, and ensure that this policy is consistent with national law. This policy should consider the consequences of technical failures, and due consideration should be given to extraordinary circumstances that result.

#### 2.2.3 In operating a VTS the VTS authority should:

- .1 ensure that the objectives of the VTS are met;
- .2 ensure that the standards set by the competent authority for levels of services and operators qualifications and equipment are met;
- .3 ensure that the VTS is operated in conformity with relevant IMO resolutions;
- .4 ensure that the VTS operations are harmonized with, where appropriate, ship reporting and routeing measures, aids to navigation, pilotage and port operations;
- .5 consider, where appropriate, the participation of the pilot both as a user and provider of information;
- .6 ensure that a continuous listening watch on the designated radio frequencies is kept and that all published services are available during the operational hours of the VTS;
- .7 ensure that operating procedures for routine and emergency situations are established;
- .8 in a timely manner, provide mariners with full details of the requirements to be met and the procedures to be followed in the VTS area. This information should include the categories of vessels required or expected to participate; radio frequencies to be used for reporting; areas of applicability; the times and geographical positions for submitting reports; the format and content of the required reports; the VTS authority responsible for the operation of the service; any information, advice or instructions to be provided to participating ships; and the types and level of services available. This information should be published



in the appropriate nautical publications.

2.2.4 The liability element of an accident following compliance with VTS guidance is an important consideration which can only be decided on a case-by-case basis in accordance with national law. Consequently, a VTS authority should take into account the legal implications in the event of a shipping accident where VTS operators may have failed to carry out their duty competently.

2.2.5 Contracting Governments should ensure that ships flying their flag comply with the requirements of vessel traffic services. Those Contracting Governments which have received information of an alleged violation of a VTS by a ship flying their flag should provide the Government which has reported the offence with details of any appropriate action taken.

### 2.3 VTS services

The following guidance concerning the services that are rendered by a VTS should be taken into account:

2.3.1 The *information service* is provided by broadcasting information at fixed times and intervals or when deemed necessary by the VTS or at the request of a vessel, and may include for example reports on the position, identity and intentions of other traffic; waterway conditions; weather; hazards; or any other factors that may influence the vessel's transit.

2.3.2 The *navigational assistance service* is especially important in difficult navigational or meteorological circumstances or in case of defects or deficiencies. This service is normally rendered at the request of a vessel or by the VTS when deemed necessary.

2.3.3 The *traffic organization service* concerns the operational management of traffic and the forward planning of vessel movements to prevent congestion and dangerous situations, and is particularly relevant in times of high traffic density or when the movement of special transports may effect the flow of other traffic. The service may also include establishing and operating a system of traffic clearances or VTS sailing plans or both in relation to priority of movements, allocation of space, mandatory reporting of movements in the VTS area, routes to be followed, speed limits to be observed or other appropriate measures which are considered necessary by the VTS authority.

2.3.4 When the VTS is authorized to issue instructions to vessels, these instructions should be result-oriented only, leaving the details of execution, such as course to be steered or engine manoeuvres to be executed, to the master or pilot on board the vessel. Care should be taken that VTS operations do not encroach upon the master's responsibility for safe navigation, or disturb the traditional relationship between master and pilot.

2.3.5 A VTS area can be divided into sectors, but these should be as few as possible. Area and sector boundaries should not be located where vessels normally alter course or manoeuvre or where they are approaching areas of convergence, route junctions or where there is crossing traffic. VTS centres in an area or sector should use a name identifier. The boundaries should be indicated in the appropriate nautical publications.

### 2.4 Communication and reporting

2.4.1 Communication between a VTS authority and a participating vessel should be conducted in accordance with the Guidelines and Criteria for Ship Reporting systems and should be limited to information essential to achieve the objectives of the VTS. (Refer to the *Guidelines and Criteria for Ship Reporting Systems, paragraph 2.2, Resolution MSC 43(64)*] IMO Standard Marine Communication Phrases should be used where practicable.

2.4.2 In any VTS message directed to a vessel or vessels it should be made clear whether the message contains information, advice, warning, or an instruction.

### 2.5 Organization



### 2.5.1 Elements of a VTS

In order to perform the required tasks a VTS organization requires adequate staff, housing, instrumentation and procedures governing operations and interactions between the various elements. The requirements in each field are determined by the particular nature of the VTS area, the density and character of the traffic and the type of service that is to be provided. Consideration should be given to the establishment of back-up facilities to sustain and maintain the desired level of reliability and availability.

### 2.5.2 Tasks that may be performed in accordance with the service rendered

2.5.2.1 A VTS should at all times be capable of generating a comprehensive overview of the traffic in its service area combined with all traffic influencing factors. The VTS should be able to compile a traffic image, which is the basis for its capability to respond to traffic situations developing in its service area. The traffic image allows the VTS operator to evaluate situations and make decisions accordingly. Data should be collected to compile the traffic image. This includes:

- .1 data on the fairway situation, such as meteorological and hydrological conditions and the operational status of aids to navigation;
- .2 data on the traffic situation, such as vessel positions, movements, identities and intentions with respect to manoeuvres, destination and routing;
- .3 data of vessels in accordance with the requirements of ship reporting and if necessary any additional data, required for the effective operation of the VTS. [Refer to the Guidelines and Criteria for Ship Reporting Systems. Resolution MSC.43(64)]

2.5.2.2 Vessel's reports by communication between vessels and the VTS Centre should also be used as a major source of necessary data.

2.5.2.3 To respond to traffic situations developing in the VTS area and to decide upon appropriate actions the acquired data should be processed and evaluated. Conclusions from the evaluation need to be communicated to participating vessels. A distinction should be made between the provision of navigational information, being a relay of information extracted from the VTS sensors and the traffic image, and the provision of navigational advice, where a professional opinion is included.

### 2.5.3 Operating procedures

Where operating procedures are concerned, a distinction should be made between internal and external procedures. Internal procedures cover operating instruments, interactions among the staff and the internal routing and distribution of data. External procedures cover interactions with users and allied services. A further distinction should be made between procedures governing the daily routine and procedures governing contingency planning such as search and rescue and environmental protection activities. All operational procedures, routine or contingency, should be laid down in handbooks or manuals and be an integral part of regular training exercises. Adherence to procedures should be monitored.

### 2.5.4 Database

A VTS authority should have, if necessary for the operation of the service, a database with the capacity to retain, update, supplement and retrieve data once collected. Any data retained in a system for further use should be made available only on a selective and secure basis.

## 2.6 Participating vessels

2.6.1 Vessels navigating in an area where vessel traffic services are provided should make use of these services. Depending upon governing rules and regulations, participation in a VTS may be either voluntary mandatory. Vessels should be allowed to use a VTS where



mandatory participation is not required.

2.6.2 Decisions concerning the actual navigation and the manoeuvring of the vessel remain with the master. Neither a VTS sailing plan, nor requested or agreed changes to the sailing plan can supersede the decisions of the master concerning the actual navigation and manoeuvring of the vessel.

2.6.3 Communication with the VTS and other vessels should be conducted on the assigned frequencies in accordance with established ITU and SOLAS chapter IV procedures, in particular where a communication concerns intended manoeuvres. VTS procedures should stipulate what communications are required and which frequencies should be monitored. Prior to entering the VTS area, vessels should make all required reports, including reporting of deficiencies. During their passage through the VTS area, vessels should adhere to governing rules and regulations, maintain a continuous listening watch on the assigned frequency and report deviations from the agreed sailing plan, if such a plan has been established in co-operation with the VTS authority.

2.6.4 Masters of vessels should report any observed dangers to navigation or pollution to the VTS centre.

2.6.5 In case of a complete failure of the vessel's appropriate communication equipment the master shall endeavour to inform the VTS centre and other vessels in the vicinity by any other available means of communication of the vessel's inability to communicate on the assigned frequency. If the technical failure prevents the vessel from participation or continuing its participation in a VTS, the master should enter in the vessel's log the fact and reasons for not or further participating.

2.6.6 Vessels should carry publications giving full particulars on governing rules and regulations regarding identification, reporting and/or conduct in the VTS area to be entered.

### **3 GUIDANCE FOR PLANNING AND IMPLEMENTING VESSEL TRAFFIC SERVICES**

#### **3.1 Responsibility for planning and implementing a VTS**

It is the responsibility of the Contracting Government or Governments or Competent Authorities to plan and implement vessel traffic services or amendments to such services.

#### **3.2 Guidance for planning a vessel traffic service**

3.2.1 Local needs for traffic management should be carefully investigated and determined by analysing casualties, assessing risks and consulting local user groups.. Where the risks are considered VTS addressable, in cases where monitoring of the traffic and interaction between Authority and participating vessel is considered to be essential, the implementation of a VTS, as an important traffic management instrument, should be considered.

3.2.2 A VTS is particularly appropriate in an area that may include any of the following:

- .1 high traffic density;
- .2 traffic carrying hazardous cargoes;
- .3 conflicting and complex navigation patterns;
- .4 difficult hydrographical, hydrological and meteorological elements;
- .5 shifting shoals and other local hazards;
- .6 environmental considerations;
- .7 interference by vessel traffic with other marine-based activities;
- .8 a record of maritime casualties;
- .9 existing or planned vessel traffic services in adjacent waters and the need for co-operation between neighbouring States, if appropriate;

- .10 narrow channels, port configuration, bridges and similar areas where the progress of vessels may be restricted;
- .11 existing or foreseeable changes in the traffic pattern resulting from port or offshore terminal developments or offshore exploration and exploitation in the area.

3.2.3 In further deciding upon the establishment of a VTS, Contracting Governments or competent authorities should also consider the responsibilities set forth in 2.2 of these Guidelines and Criteria, and the availability of the requisite technology and expertise.

**3.3 Further guidance on vessel traffic services**

3.3.1 VTS Authorities should, in the planning of the VTS to be established, make use of available manuals prepared by and published by appropriate international organization or associations.

3.3.2 The following references should also be consulted for further details:

- .1 IMO Guidelines and Criteria for Ship Reporting Systems (Resolution MSC.43(64))
- .2 General Principles for Ship Reporting Systems and Ships Reporting Requirements, including Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants (resolution A.851(20))
- .3 The IALA vessel traffic services Manual
- .4 IALA/IMPA/IAPH/World VTS Guide



## ANNEX 2

### GUIDELINES ON RECRUITMENT, QUALIFICATIONS AND TRAINING OF VTS OPERATORS

#### PREAMBLE

1 These Guidelines elaborate specifically on 2.2.2.8 of Annex 1, which requires the VTS authority to be provided with sufficient staff, appropriately qualified, suitably trained and capable of performing the tasks required, taking into consideration the type and level of services to be provided in conformity with the current IMO Guidelines on the subject.

2 These Guidelines describe the skill and knowledge qualifications required by VTS operators to provide these services. They are intended for application in both planned and existing VTS. They provide guidance in determining how VTS authorities can recruit, select and train personnel in order to carry out their tasks to provide the required VTS standards.

3 These Guidelines do not confer any powers on VTS operators, nor shall they be construed as prejudicing obligations or rights of vessels established in other international instruments.

#### 1 INTRODUCTION

##### 1.1 Background

1.1.1 In recent years, there has been a rapid expansion in vessel traffic services, which has led to a significant increase in the number of VTS operators required world-wide. The services offered by VTSs vary considerably, and range from simple broadcasts of meteorological and hydrological information, through exchange of information to sophisticated navigational advice and, in circumstances where the authority exists, navigation-related instruction.

1.1.2 Investigation of existing services reveals a wide variety of VTS operator entry requirements, ranging from personnel with no nautical background to those with a Master's and/or Pilot's licence. There is an equally wide variation in the type and extent of training provided to VTS operators.

1.1.3 The various levels of knowledge and skill required of the operator, and the standard of training necessary to achieve these levels, have never been fully defined on a world-wide basis. At present there are no internationally recognized qualifications for VTS operators, and the approach to recruitment and training varies widely from country to country.

1.1.4 Given the role of VTS in the provision of safety and efficiency services to shipping and in the protection of the environment, the need to avoid confusion on the part of users travelling from one VTS to another and the importance of professionalism on the part of operators in determining the extent of trust placed in the functioning and effectiveness of a VTS, it is essential that VTS personnel be adequately qualified and trained to carry out their functions, and that the standards for such qualification and training be agreed upon internationally to a large extent.

##### 1.2 Definitions

For the purpose of this Annex, the following terms shall have the meanings defined below; however, all other terms used which have already been defined in Annex 1 (Guidelines and Criteria for VTS) shall have the meanings defined therein:

- .1 *Advanced training* - training usually carried out at the supervisory level, designed to enhance and utilize the employees' knowledge and experience to the fullest;

- .2 *Basic training* - the training required in order to carry out the functions assigned to a position. This type of training requires a high level of supervision;
- .3 *Classroom training* - training carried out in a classroom environment that enables trainees to acquire the knowledge and skills necessary to reach the level of proficiency required to fully perform the duties of a position;
- .4 *Knowledge* - information about certain facts, theories, systems, procedures and other subject matter relevant to the duties and responsibilities of the position;
- .5 *On-the-job training* - training within the work environment which is considered formal and reportable when it involves non-productive person hours; it is instructor or computer managed, has specific learning objectives, and has milestones to measure progress. It is structured, has specific resources devoted to or consumed by it, and the trainee within the work environment is relieved of his/her regular or normal duties;
- .6 *Operator competence* means having the qualifications essential to effectively and efficiently carry out the functions or sub-functions assigned to a particular VTS operator position;
- .7 *Personal suitability* means personal traits and characteristics affecting the application of knowledge and skills in the performance of the duties of the position;
- .8 *Qualifications* - education, knowledge, skill, experience or any other attribute which are necessary or desirable for performing the duties of the position;
- .9 *Recruitment and selection* - staffing process in which prospective job candidates are identified or considered for a position in terms of their relative suitability for a position based on certain criteria, e.g., knowledge and experience or any other matters that are necessary or desirable having regard to the nature of the duties to be performed. Candidates are selected by conducting examinations, tests, interviews and investigations;
- .10 *Refresher training* - training carried out to maintain a certain level of performance, skill in areas or knowledge which are infrequently used and where consequence of non-performance is great;
- .11 *Simulator training* - training carried out in an appropriate environment in order to practice skills and perform the duties of the position;
- .12 *Skill* - relevant aptitudes or prescribed level of occupational achievements which are basic to the performance of the duties and responsibilities of the position;
- .13 *Standards* - criteria, features, methods or processes which are recognized as or agreed to be models for imitation against which like activities will be compared or measured;
- .14 *Sub-functions* - specific processes and procedures which are component activities of a particular function;
- .15 *Training* - a process of combining instruction and practice to provide employees with the skill, knowledge and experience necessary to perform in their present/future jobs both efficiently and effectively;
- .16 *Upgrading training* - training to improve skills;
- .17 *VTS category* - refers to a means of identifying the type and level of services provided by a VTS based on geographical or organizational considerations. For example, a VTS operating in a port and its approaches could be categorized as a port VTS. A VTS in which participation is required by law could be categorized as a mandatory VTS, as opposed to a voluntary VTS;
- .18 *VTS functions* - can be subdivided into internal and external functions. Internal





functions are the preparatory activities that have to be performed to enable a VTS to operate. These include data collection, data evaluation and decision making. External functions are activities executed with the purpose of influencing the traffic characteristics. They relate to the primary traffic management functions of rule-making, allocation of space, routine control of vessels and manoeuvres to avoid collisions, as well as to other management functions such as enforcement, remedial and ancillary activities. The reasoning behind these traffic management functions and their relationship to the VTS services is set out in paragraph 6.4;

- .19 *VTS operator* - a VTS operator is an appropriately qualified person performing one or more tasks contributing to the services of the VTS. However, for the specific purposes of these Guidelines, VTS operator further means a person who provides, if duly authorized, instructions and information to vessels and decides what action should be taken in response to data received. This person may be directly responsible for communications within a defined geographical area within a VTS area, or may relay such information and decisions through an intermediary; and
- .20 *VTS operator position* - a position in a specific VTS from which a VTS operator carries out the VTS functions as defined for purposes of these Guidelines.

## 2 OBJECTIVES AND AUTHORITY

### 2.1 Objectives

2.1.1 The objectives of these Guidelines are:

- .1 to provide authorities with a logical process to follow in selecting and recruiting VTS operators, and in establishing qualification and training standards which will ensure that the necessary knowledge and skill profiles exist to enable them to carry out their functions to appropriate standards; and
- .2 to establish knowledge and skill requirements and standards which VTS operators should meet with respect to certain functions.

### 2.2 Competent authority

2.2.1 Subject to their own national and local requirements and constraints, authorities will need to establish training requirements for their VTS operators. Authorities will also need to set specific knowledge, skill and personal suitability standards which operators must meet. Nothing in these Guidelines derogates from that power or imposes any obligation on authorities.

2.2.2 These Guidelines should not be construed as conferring any additional power on authorities with respect to the operation of a VTS outside territorial seas.

## 3 FRAMEWORK

### 3.1 Explanation of framework

3.1.1 These Guidelines provide a framework within which authorities can meet their obligations as laid down in Annex 1 to provide VTS operators with the competence to carry out their designated functions, independent of the level of qualifications of personnel recruited. This framework is shown in figure 1.

3.1.2 The framework outlines the steps that should be taken by a VTS authority to ensure that its VTS operators are competent to carry out assigned tasks. These steps are in two stages:

- .1 Stage 1:

Preliminary steps to be able to take decisions relative to operator competencies (prerequisites for the system).

.2 Stage 2:

Steps to ensure that operators possess or achieve, and then maintain, the level of competence required to carry out their assigned functions (system parameters).

3.1.3 In order to implement the steps outlined above, VTS authorities must be prepared to bring to bear certain competencies which are normally available to them. Specifically, input is required from VTS operations and from training and human resources expertise in order to successfully design and implement a programme to match VTS operator competencies with operational need. The particular areas where such expertise is required are indicated in figure 1.

#### 4 PREREQUISITES FOR THE SYSTEM

4.1 In order to be able to identify, develop and implement a system for VTS operator qualification and training, authorities should first take a number of preliminary steps in order to ensure that the operator's competencies are appropriately aligned with the functions for which he/she is responsible. These steps are as follows:

- .1 *Implementing a VTS* - make a decision, or have made a decision to implement a VTS.
- .2 *Identification of VTS functions* - identify and describe the detailed functions relevant to the given VTS. These detailed functions have been developed from the general VTS functions described in 2.3 and 2.5 of Annex 1.
- .3 *Organization of VTS centre functions* - organize the functions according to how they are to be carried out in accordance with the organization of the internal VTS operation.
- .4 *Establishment of VTS operator positions* - be prepared to establish, or have already established, operator positions within a VTS, determine what functions will be carried out from which positions, and be prepared to ensure that there will be personnel occupying those positions who have been given responsibility for carrying out the identified functions.

4.2 Plans for recruitment and selection of VTS operators can be developed once these steps have been completed.

#### 5 SYSTEM PARAMETERS

##### 5.1 General

5.1.1 The views of authorities on recruitment qualifications may vary between a preference for a low qualification entry requiring a high degree of training, to a preference for a high qualification entry requiring a low degree of training. Clearly, if a high entry qualification is combined with relevant local experience, training requirements will be minimized.

5.1.2 Ideally, authorities should have the ability to specify the background and prior experience a VTS operator should have, but due to circumstances, this is often beyond their control. They should, however, be able to specify the level of skill and knowledge that a recruit must have achieved based on this prior experience (e.g. master mariner, top level air traffic controller).

5.1.3 VTS authorities should therefore establish methods of assessing the skill and knowledge of recruits and existing VTS operators relative to the requirements of the tasks or functions they perform.

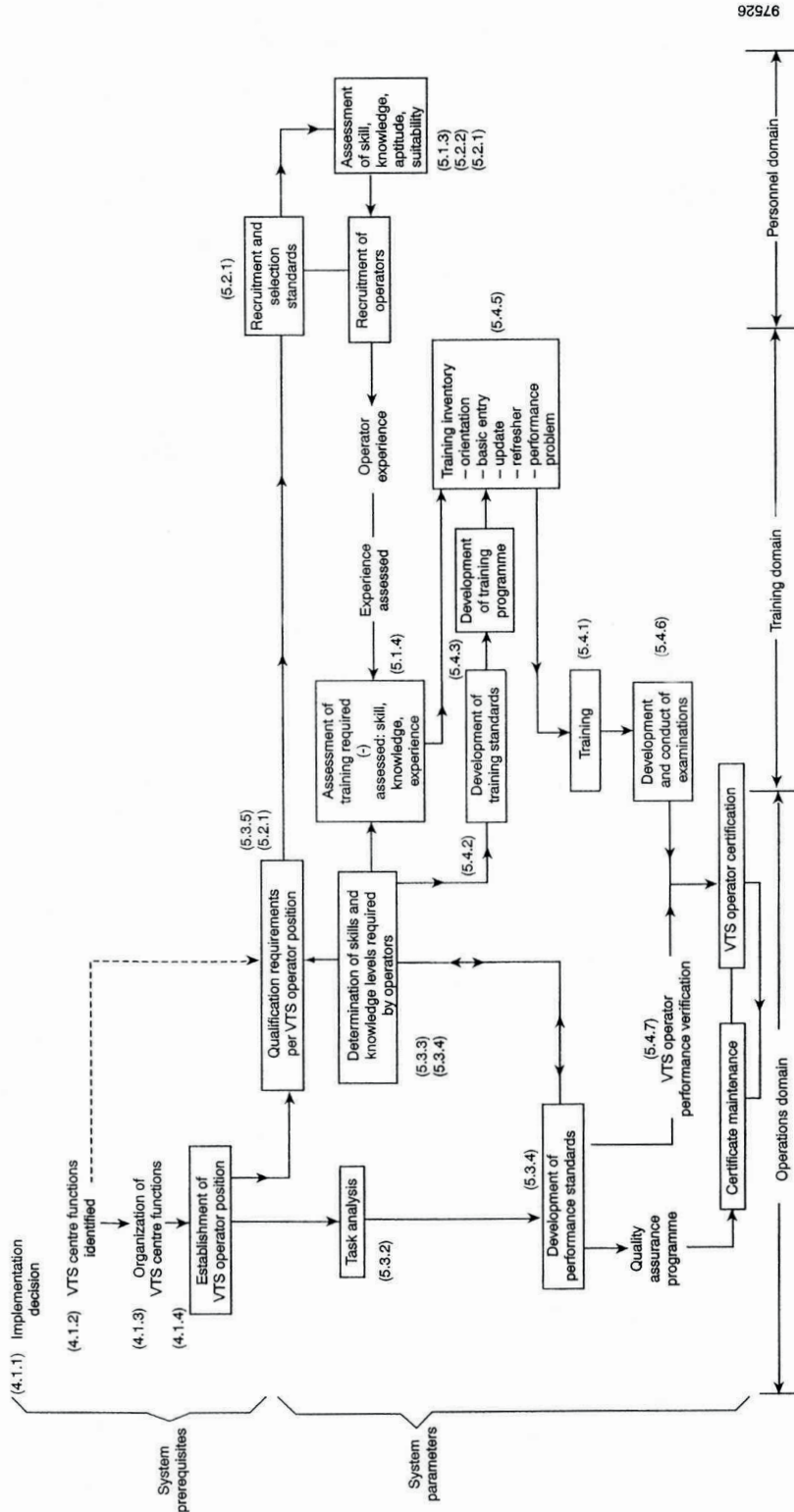
5.1.4 Depending on the skill and knowledge levels previously acquired, and the tasks or functions to be performed, authorities may need to supplement existing qualifications with appropriate training to make up any deficiencies.



## 5.2 Recruitment and selection

5.2.1 Authorities should establish entry standards for new VTS operators coming into the system in terms of prior skills, knowledge, and personal suitability characteristics relevant to the tasks or functions they will be required to perform. These skills and knowledge may in part be assessable through existing qualifications (e.g. master or pilot's licence).

5.2.2 VTS authorities may wish to consider introducing additional screening mechanisms to ensure that recruits have the necessary aptitudes, personal suitability characteristics, and ancillary skills for the functions they will be assigned. These mechanisms will assess, *inter alia*, ability to meet medical standards commensurate with the working conditions of the VTS position in question, spatial problem-solving capabilities and other job-related aptitudes, ability to work under pressure; and language capability required for the particular VTS.



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Figure 1 – A system for development of recruitment, qualifications and training of Vessel Traffic Service operators



### 5.3 Qualifications

5.3.1 Authorities must be able to determine what competencies a VTS operator must possess to carry out assigned functions, in order to establish the combination of prior qualifications and subsequent training required to ensure that their operators are competent.

5.3.2 To this end, they should analyse in detail the tasks which the operator will have to carry out in order to accomplish the specified functions, in terms of the skills and knowledge which he/she must possess to implement them successfully.

5.3.3 Having carried out the task analysis, authorities must specify the types of skill and knowledge which operators must possess in order to perform their functions. These skill and knowledge components should relate directly to the functions to be performed, and should be specified in such a way that authorities will be able to determine whether:

- .1 VTS operators possess them in terms of their prior qualifications and experience; or
- .2 Whether additional training will be needed to provide them.

5.3.4 Once the necessary types of skill and knowledge have been established, authorities should determine to what level they must be possessed by a VTS operator. Authorities therefore have a responsibility to establish performance standards for skill and knowledge types to be acquired.

5.3.5 Because not all VTSs carry out the same range of functions, and because some operators may only carry out limited functions within a particular service, authorities may be required to identify different knowledge and skill levels for operators based on the tasks they perform in the VTS in which they work.

### 5.4 Training

5.4.1 Where the types and/or levels of skill and knowledge possessed by a VTS operator, by virtue of his or her prior experience and qualifications, do not fully conform to those required in order to carry out assigned tasks, authorities should provide compensatory training in areas of deficiency.

5.4.2 Authorities should establish concomitant training standards for those areas where they train VTS operators to the proficiency requirements of their positions. These training standards should form the basis of any training programme to be developed and delivered to VTS operators.

5.4.3 Based on the training standards, authorities should then be prepared to develop and implement a training programme which, when taken together with relevant existing experience, will provide the VTS operator with necessary skills and knowledge to perform his/her tasks to the required standards.

5.4.4 There are a variety of mechanisms by which training can be carried out. These include training provided by authorities directly, contracted out training or any other training establishment common to interested Administrations, which trains VTS operators for a number of authorities.

5.4.5 Authorities may also wish to consider the need to provide different types of training, with different levels relative to each type, in order to ensure the acquisition and maintenance of the relevant skills and knowledge necessary to meet job requirements, according to the following matrix:



TYPE OF TRAINING LEVEL OF TRAINING	CLASSROOM	SIMULATOR	ON THE JOB
BASIC	X	X	X
ADVANCE	X	X	X
UPGRADING	X	X	X
REFRESHER	X	X	X

Authorities should be aware of the advantages of modular approach to training for ease and cost-effectiveness of training delivery.

5.4.6 Authorities may wish to institute a system of examinations to determine whether or not operator experience, qualifications and training are resulting in performance to required standards.

5.4.7 Once suitably qualified and trained employees are performing on the job, their performance must be observed and monitored to ensure that it continues to meet the established standards.

5.4.8 Authorities should be aware that for an operator to carry out VTS functions effectively, training may be required in areas not specifically related to VTS (e.g. typing, supervisory skills), and which are not specifically covered in these Guidelines.

**5.5 Certification**

Authorities may wish to introduce a formal system of certification as a means of ensuring and demonstrating to system users that a mechanism is in place which matches employee competence with task requirements.

**6 DETERMINING SKILL AND KNOWLEDGE REQUIREMENTS ASSOCIATED WITH VTS FUNCTIONS**

6.1 The process used to determine the knowledge and skill types and levels required by VTS operators to carry out specific VTS functions is outlined below. It can also be used by authorities to determine how they might wish to establish the difference between skill and knowledge levels required of VTS operators on recruitment (prior qualifications) and those which will be provided after recruitment (training). Additionally, it can be used to determine the type and degree of training which should be provided to operators already employed by VTS and who may possess some form of prior qualification.

**NOTE:** It must be noted by authorities that this process is a model only. Authorities wishing to make use of this process must keep in mind that it will need to be adapted to meet their specific local requirements.

Also, because it is not a mathematical model, authorities must also keep in mind the importance of the human decision-making function, which cannot be scientifically measured, and therefore cannot be completely addressed in this process.

Consequently, in determining skill and knowledge types and levels for VTS functions, authorities will need to decide on the level of freedom VTS operators will have in making decisions based on judgement.

6.2 The general process for determining skill and knowledge requirements is as follows:

- .1 define terms and identify functions to be considered. Functions or sub-functions may be classed as H(igh) or L(ow) to indicate the involvement of VTS;
- .2 divide functions identified into sub-functions. This process of subdivision will be continued as long as necessary to identify the skill and/or knowledge requirements necessary on the part of the VTS operator in order to perform the function. The results of this breakdown will be a list of skill and



knowledge components, all of which are detailed actions to be performed, the sum of which constitutes carrying out the function (this process is illustrated in figure 2 and an example of it shown in figure 3);

- .3 at the final level of sub-division, make each component action sufficiently detailed to enable it to be classified as either skill or knowledge to be performed; and
- .4 review and verify that sub-division is complete.

6.3 Once the individual component actions have been classified in this manner, the level of skill or knowledge required for their performance will then be evaluated. The following criteria will be used, on a weighted basis:

- .1 frequency - how often the task is performed;
- .2 percentage of time used in performance of the task relative to other tasks.
- 3 value - importance of the particular skill or knowledge in the performance of the task, whether 'must know' (mandatory), 'should know' (important), or 'nice to know' (optional);
- .4 liability - consequence of error or omission during the performance of a function;
- .5 performance standard - how well must the individual perform in the conduct of the task and the learning difficulty associated with it;
- .6 verification and intervention - whether the individual can perform the task with or without supervision;
- .7 performance tools - equipment and established procedures involved in the implementation of the function; and
- .8 reasons why the performance of the task is important.

Skills involved include, but are not necessarily restricted to: ability to operate communications and surveillance equipment; ability to do chart work; ability to provide navigational assistance; and ability to operate ancillary equipment such as telephones, telex, tide and meteorological equipment. Examples of knowledge which may be required include: local geography; principles of navigation; applicable acts, regulations, agreements and publications; communications procedures and vocabulary [*Refer to the Standard Marine Navigational Vocabulary as replaced by the IMO Standard Marine Communication Phrases (currently under trials)*]; principles of organization of vessel traffic.

6.4 In the definition in 1.2.18 a number of traffic management functions have been identified. VTS can play an important role in the execution of these functions, which may be taken as the basis for the process described in 6.1 to determine the skill and knowledge types and levels for VTS operators contributing to the execution of traffic management functions. The objectives of traffic management functions and their relationship to the VTS services are briefly described below:

- .1 *Internal VTS functions:*
  - data collection; and
  - data evaluation/decision making.
- .2 *Traffic management functions:*
  - .2.1 *Primary function:*
    - allocation of space. This is effecting separation in space and/or time between vessels, or certain categories of vessel, by forward planning. It is a strategical function that can be performed by a traffic organization service;
    - routine control of vessels. This is a shipboard process to which a VTS contributes by supplying data relevant to the navigational decision-making

process on board. This function relates to an information service and/or a navigational assistance service;

- manoeuvres to avoid collisions. This is a shipboard function concerning ships in encounter situations. It may be assisted by a VTS. It is a tactical function and relates to an information service and/or a navigational assistance service.

.2.2 *Enforcement function*

The objective of this function is to encourage and monitor adherence to applicable rules and regulations and to take appropriate action where required and within the authority of the VTS. Some aspects of this function might be covered by a traffic organization service.

*Remedial functions*

These functions are aimed, primarily, at reducing the effects and consequences of incidents, such as search and rescue, salvage and pollution. These functions may be performed by a VTS in support of allied activities.

*Other functions*

These functions relate to co-ordination and liaison between vessels and third parties. They may be performed by a VTS as support of allied activities.



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ANALYSIS OF FUNCTION INTO SKILL AND KNOWLEDGE COMPONENTS

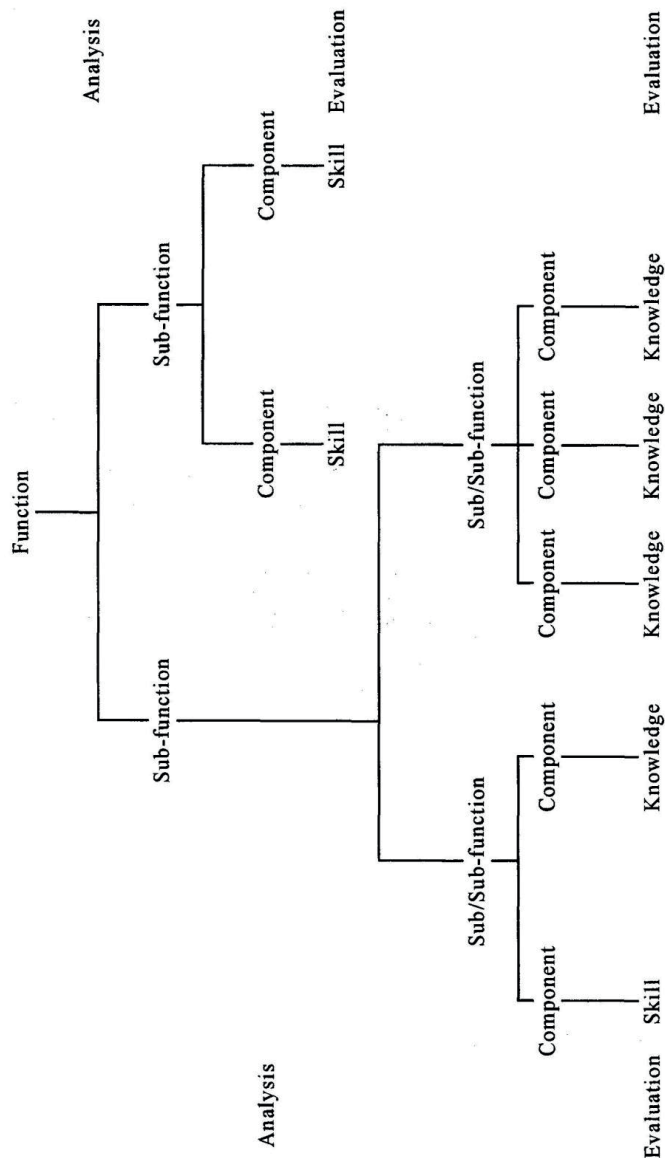
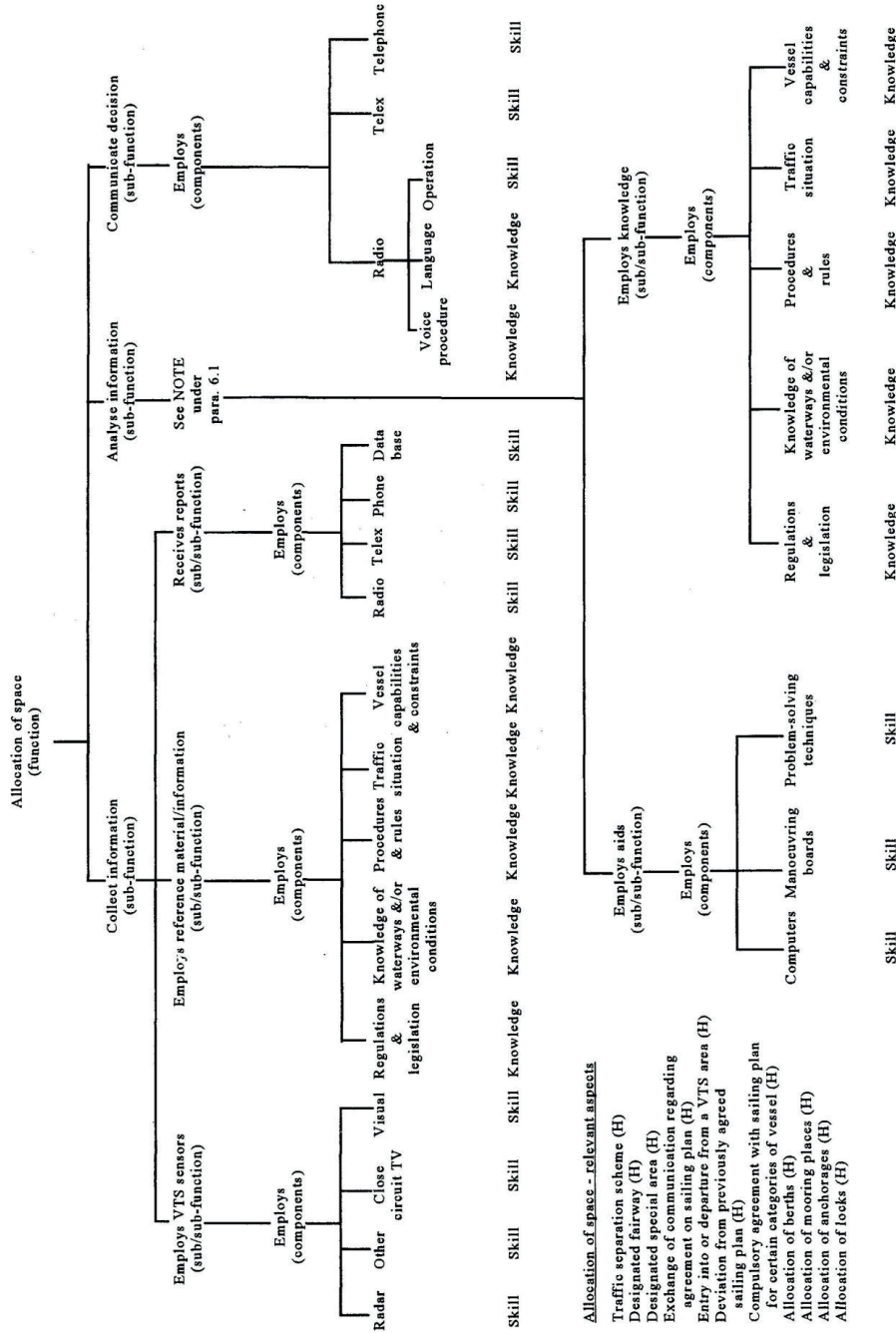


Figure 2:

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A 20/Res.857

Figure 3 ANALYSIS OF TRAFFIC MANAGEMENT FUNCTIONS INTO SKILLS AND KNOWLEDGE COMPONENTS FOR VTS OPERATORS



I:ASSEMBLY20/RES/857.





ANNEX B SOLAS CHAPTER V-12

**REGULATION 12 - Vessel traffic services**

1. Vessel traffic services (VTS) contribute to safety of life at sea, safety and efficiency of navigation and protection of the marine environment, adjacent shore areas, work sites and offshore installations from possible adverse effects of maritime traffic.
2. Contracting Governments undertake to arrange for the establishment of VTS where, in their opinion, the volume of traffic or the degree of risk justifies such services.
3. Contracting Governments planning and implementing VTS shall, wherever possible, follow the guidelines developed by the Organization\*. The use of VTS may only be made mandatory in sea areas within the territorial seas of a coastal State.
4. Contracting Governments shall endeavour to secure the participation in, and compliance with, the provisions of vessel traffic services by ships entitled to fly their flag.
5. Nothing in this regulation or the guidelines adopted by the Organization shall prejudice the rights and duties of Governments under international law or the legal regimes of straits used for international navigation and archipelagic sea lanes.

\* Refer to the Guidelines on Vessel Traffic Services adopted by the Organization by resolution A.857(20).



## ANNEX C MSC CIRCULAR 1065

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*E*

Ref. T2/4.2

MSC/Circ.1065  
13 December 2002**IALA STANDARDS FOR TRAINING AND CERTIFICATION OF  
VESSEL TRAFFIC SERVICE (VTS) PERSONNEL**

1 The Maritime Safety Committee, at its seventy-second session (17 to 26 May 2000), recalled that the 1995 Conference of Parties to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers had adopted resolution 10, which invited the Organization to consider developing provisions covering *inter alia* the training and certification of vessel traffic service personnel.

2 The Committee also recalled resolution A.857(20) on Guidelines for vessel traffic services, which includes guidelines on recruitment, qualifications and training of VTS operators and, having noted the development by IALA of Recommendation V-103 and its associated model courses, approved MSC/Circ.952 inviting Member Governments, pending the development, by the Organization, of additional provisions covering the training and certification of vessel traffic service personnel, to bring the IALA Recommendation and model courses to the attention of their VTS authorities to use when considering the training and certification of VTS personnel.

3 Since the adoption of MSC/Circ.952, the package of model courses has been completed and the following model courses have now been published:

- Model Course V-103/1 VTS Operator
- Model Course V-103/2 VTS Supervisor
- Model Course V-103/3 On-the-Job Training (VTS Operator and VTS Supervisor)
- Model Course V-103/4 VTS On-the-Job Training Instructor

4 Member Governments are invited to bring the IALA model courses to the attention of their VTS authorities, training institutes responsible for the training of VTS personnel and any other parties concerned.

## ANNEX D ABBREVIATIONS/ACRONYMS

Definitions used in this Manual are listed in the IALA Directory and may be found at [http://www.iala-aism.org/products/technical/iala\\_dictionary.html](http://www.iala-aism.org/products/technical/iala_dictionary.html).

Abbreviations and acronyms used are listed in the table below.

<b>AIS</b>	Automatic Identification System
<b>AIMS</b> (see <b>IALA</b> )	Association Internationale de Signalisation Maritime
<b>AtoN</b>	Aid(s) to Navigation
<b>CBA</b>	Cost Benefit Analysis
<b>CCTV</b>	Closed Circuit TeleVision (Surveillance)
<b>COLREGS</b>	International Regulations for Preventing Collisions at Sea
<b>COG</b>	Course Over the Ground
<b>CPA</b>	Closest Point of Approach
<b>DGNSS</b>	Differential Global Navigation Satellite System
<b>DSC</b>	Digital Selective Calling
<b>ECS</b>	Electronic Chart System
<b>EEZ</b>	Exclusive Economic Zone ( <b>UNCLOS</b> )
<b>ETA</b>	Estimated Time of Arrival
<b>FSA</b>	Formal Safety Assessment
<b>GMDSS</b>	Global Maritime Distress and Safety System
<b>GPS</b>	Global Positioning System
<b>HMI</b>	Human-Machine Interface
<b>IALA</b> (see <b>AIMS</b> )	International Association of Marine Aids to Navigation and Lighthouse Authorities
<b>IAPH</b>	International Association of Ports and Harbors
<b>IFSMA</b>	International Federation of Shipmasters' Association
<b>IHMA</b>	International Harbour Masters' Association
<b>ILS</b>	Integrated Logistics Support
<b>IMDG</b>	International Maritime Dangerous Goods Code
<b>IMO</b>	International Maritime Organization
<b>IMPA</b>	International Maritime Pilots' Association
<b>IMSAS</b>	IALA Member State Audit Scheme
<b>IMSO</b>	International Mobile Satellite Organization
<b>INF</b>	Irradiated Nuclear Fuel on board Ships Code
<b>INS</b>	Information Service ( <b>VTS</b> )
<b>ISM</b>	International Safety Management Code
<b>ISO</b>	International Standards Organization
<b>ISPS</b>	International Ship and Port Facility Security Code



<b>ITU-R</b>	International Telecommunications Union – Radio communication Sector
<b>IWRAP</b>	IALA Waterway Risk Assessment Programme
<b>LRIT</b>	Long Range Identification and Tracking
<b>MARPOL</b>	International Convention for the Prevention of Pollution from Ships 1973/1978
<b>MAS</b>	Maritime Assistance Service
<b>MSC</b>	Maritime Safety Committee (Standing Committee of IMO)
<b>NAS</b>	Navigational Assistance Service ( <b>VTS</b> )
<b>NAVGUIDE</b>	IALA Aids to Navigation Guide
<b>NUC</b>	Not Under Command ( <b>COLREGS</b> )
<b>OJT</b>	On-the-Job Training
<b>OJTI</b>	On-the-Job Training Instructor
<b>PAWSA</b>	Ports and Waterways Safety Assessment
<b>PIANC</b>	The World Association for Waterborne Transport Infrastructure Permanent International Association of Navigation Congresses
<b>PSSA</b>	Particularly Sensitive Sea Area
<b>RDF</b>	Radio Direction Finder
<b>SAR</b>	Search And Rescue
<b>SMCP</b>	Standard Marine Communication Phrases
<b>SOG</b>	Speed Over the Ground
<b>SOLAS</b>	Convention on the Safety Of Life At Sea
<b>STCW</b>	Standards of Training, Certification & Watchkeeping for Seafarers
<b>TCPA</b>	Time to Closest Point of Approach
<b>TOS</b>	Traffic Organization Service ( <b>VTS</b> )
<b>TSS</b>	Traffic Separation Scheme
<b>UKC</b>	Under Keel Clearance
<b>UNCLOS</b>	United Nations Convention on the Law of the Sea
<b>VHF</b>	Very High Frequency (radio in the 30-300 MHz band)
<b>VTMIS</b>	Vessel Traffic Management and Information System
<b>VTS</b>	Vessel Traffic Services
<b>VTSO</b>	Vessel Traffic Services Operator



**ANNEX E      EXAMPLES: NATIONAL LEGISLATION, STATUTORY INSTRUMENTS  
AND REGULATORY GUIDANCE FOR VTS**

**ANNEX E      EXAMPLES:      NATIONAL      LEGISLATION,      STATUTORY  
INSTRUMENTS AND REGULATORY GUIDANCE FOR VTS**

Country	Primary Legislation	Secondary Legislation/ Statutory Instruments	Guidance at National Level	Bye-laws
<b>Australia</b>	Navigation Act 1912	Marine Orders 64 (Vessel Traffic Services) 2013	Marine Notice 8/2014 (Australian Vessel Traffic Services)  VTS Compliance and Enforcement Policy	N/A
<b>Hong Kong, China</b>	The Shipping and Port Control Ordinance, Chapter 313 of the Laws of Hong Kong SAR.	Sub-legislation: The Shipping and Port Control Regulations (Chapter 313A of the Laws of Kong Kong SAR)	N/A	N/A



Country	Primary Legislation	Secondary Legislation/ Statutory Instruments	Guidance at National Level	Bye-laws
Italy	<p>Law 14 March 2001 No. 51 (<i>Maritime transport, pollution prevention and vessel traffic monitoring</i>).</p> <p>Legislative Decree 19 August 2005 No. 196 (<i>implementation of 2002/59/EC Directive establishing a Community vessel traffic monitoring and information system</i>), as amended by Legislative Decree 16 February 2011 No. 18 (<i>implementation of 2009/17/EC Directive amending 2002/59/EC</i>).</p> <p>Legislative Decree 16 February No 18 amending Legislative Decree 19 August 2005 nr 196), implementation of Directive 2009/17/CE (amending Dir. 2002/59/CE) establishing a Community vessel traffic monitoring and information system.</p>	<p>Decree by the Minister of Infrastructures and Transport 28 January 2004 (<i>establishment of VTS system</i>).</p> <p>Presidential Decree 3 December 2008 No. 211 (<i>organization of Ministry of Infrastructure and Transport</i>).</p> <p>Ministerial Decrees regarding establishment of VTSs and related areas.</p>	<p>Coast Guard Directives: VTS001, VTS002, VTS004, VTS005, VTS006, VTS007.</p> <p>National Regulation for VTS.</p>	<p>Port and local bye-laws established by the local competent authorities.</p> <p>VTS regulations (<i>operating procedures adopted by each VTS Authority</i>).</p>
The Netherlands	Scheepvaartkeerswet (Shipping Traffic Act 1988)	Various Statute Orders and ministerial Decrees	None	Port or local area bye-laws established by the local competent authority.

Country	Primary Legislation	Secondary Legislation/ Statutory Instruments	Guidance at National Level	Bye-laws
<b>Turkey</b>	<p>Law on Ports No: 618 (14.04.1925)</p> <p>Law on the Protection of Life and Property at Sea No: 4922 (14.06.1946)</p> <p>The International Convention for the Safety of Life at Sea, 1974</p>	<p>National regulation on the establishing and operating VTS (18.02.2007)</p>	<p>TSVTS User Guide</p>	<p>Port, Local or Regional bye-laws.</p>
<b>United Kingdom</b>	<p>General: Harbours, Docks and Piers Act 1847 Harbours Act 1964 European Communities Act 1972 (Sect 2 (2)) Merchant Shipping Act 1995 (Sect 85 &amp; 86)</p> <p>Local: An Act setting out the governance of each port by name. (e.g. The Milford Haven Conservancy Act 1983)</p>	<p>Statutory Instruments:  Merchant Shipping Notices (MSN) Harbour Revision Orders  Harbour Empowerment Orders  The Merchant Shipping (Vessel Traffic Monitoring and Reporting Requirements) Regulations 2004</p>	<p>Port Marine Safety Code and accompanying Guide to Good Practice</p> <p>Marine Guidance Note (MGN) 401, 434.</p> <p>Designation by the Maritime and Coastguard Agency as National Competent Authority to comply with the EC Vessel Traffic Monitoring Directive.</p>	<p>Harbour Bye-laws applicable to each port and its locality.</p> <p>Established by the local competent authority, subject to the granting of relevant powers in local legislation.</p>



## ANNEX F IALA PUBLICATIONS

The following tables list IALA publications relevant to VTS and are correct as of June 2016. For the latest editions and publications issued since this Manual was published, visit IALA website.

IALA Recommendations		Date
V-102	Application of 'User Pays' principle as applied to VTS	Dec 2011
V-103	Standards for Training & Certification of VTS personnel	Dec 2013
V-119	Implementation of Vessel Traffic Services	Dec 2009
V-120	Vessel Traffic Services in Inland Waters	Dec 2013
V-125	Use and Presentation of Symbology at a VTS Centre (including AIS)	Jun 2012
V-127	Operational Procedures for Vessel Traffic Services	Jun 2011
V-128	Operational & Technical Performance Requirements for VTS equipment	May 2015
V-145	Inter-VTS Exchange Format (IVEF) Service	Jun 2011
A-123	Provision of Shore Based AIS	Jun 2011
A-124	AIS service	Dec 2011
A-126	Use of the AIS in Marine Aids to Navigation Service	Dec 2011
O-132	Quality Management for Aids to Navigation Authorities	Dec 2013
O-134	IALA Risk Management Tool for Ports & Restricted Waterways	May 2009
R-121	Performance and Monitoring of DGNSS Services in the Frequency Band 283.5 – 325 kHz	May 2015
<b>Prefixes</b>	'V' indicates a Recommendation produced by the VTS Committee 'A' indicates a Recommendation produced by the former AIS Committee 'O' indicates a Recommendation produced by the former Operations Committee 'R' indicates a Recommendation produced by the former Radio Navigation Committee	
IALA Guidelines		
1014	Accreditation of VTS Training Courses	Dec 2011
1017	Assessment of Training Requirements for Existing VTS Personnel, Candidate Operators & Revalidation of VTSO Certificates	Dec 2005
1018	Risk Management	Dec 2008
1027	Simulation in VTS Training	Dec 2008
1028	AIS - Operational Issues	Dec 2004
1029	AIS - Technical Issues	Dec 2002
1032	Aspects of Training of VTS Personnel Relevant to the introduction of AIS	Dec 2005
1045	Staffing Levels for VTS personnel	Dec 2005
1046	Response Plan for Marking New Wrecks	Jun 2005
1050	Management & Monitoring of AIS Information	Dec 2005
1068	Provision of NAS by VTS	May 2009
1070	VTS Role in Managing Restricted or Limited Access Areas	Dec 2009
1071	Establishment of a VTS Beyond Territorial Seas	Dec 2009
1081	Virtual Aids to Navigation	Mar 2010
1082	Overview of AIS	Jun 2011
1083	Standard Nomenclature to identify and refer to VTS centres	Jun 2011
1086	The Global Sharing of Maritime Data & Information	Jun 2012
1089	Provision of Vessel Traffic Services	Dec 2012
1101	Auditing and Assessing VTS	Dec 2013
1102	VTS Interaction with Allied Services	Dec 2013
1103	Train the Trainer	Dec 2013
1104		Dec 2013

1110	Application of MSP for analysis in Risk Assessment and Provision of AtoN	Dec 2014
1111	Use of Decision Support Tools for VTS Personnel	May 2015
1115	Preparation of Operational and Technical Performance for VTS Equipment	Dec 2015
	Preparing for IMO Audit Scheme VTS	
<b>IALA Manuals</b>		
	VTS Manual	2016
	Aids to Navigation Guide (NAVGUIDE)	2014
<b>IALA Model Courses for Training</b>		
V-103/1	VTS Operator	Dec 2009
V-103/2	VTS Supervisor	Dec 2009
V-103/3	VTS Operator & VTS Supervisor – On-the-Job Training (OJT)	Dec 2009
V-103/4	VTS OJT Instructor	Dec 2009
V-103/5		
<b>Other documents</b>		
Brochure	Guide for VTS Authorities on Fatigue Awareness and Human reliability	Dec 2009
Brochure	Vessel Traffic Services – What a Shipmaster can expect of a VTS and what is expected of the Shipmaster	May 2009





**ANNEX G EXAMPLES OF VTS OPERATIONAL PROCEDURES**

<b>Internal Procedures</b>	<b>External Procedures</b>
<b>Routine Procedures</b>	<b>Routine Procedures</b>
Gathering and Recording of information	Pre-Arrival Information
Operational staff	Vessels Entering VTS Area
Equipment operation, maintenance, calibration and updating	Vessels Transiting VTS Area
Interaction with allied services	Vessels at Anchor
Public Relations	Vessels at Berth
Security	Vessels Departing the VTS Area
Training	Transition between Adjacent VTS Areas
Watch handover	Environmental conditions
Vessel handover	Waterway conditions
Maintenance of marine publications	
<b>Emergency Procedures</b>	<b>Emergency Procedures</b>
System Failure	Collision, Capsize, Sinking, Grounding, Fire On Vessel, Man Overboard
Internal emergencies, for example fire and flood	Pollution
Forced evacuation of VTS centre	Places of Refuge
Personnel medical emergencies	Medical Emergency
Security incidents.	Vessel Not Under Command (NUC)
	Security incident
	Protest Action
	Natural Disaster







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