



IALA

VESSEL TRAFFIC SERVICES MANUAL

Edition 5

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## **FOREWORD**

This fifth 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 a new Vessel Traffic Service 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 organisations. 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 aims to fully meet the needs of the profession and those responsible for managing its activities, and is intended to be a general source of reference on any topic, providing 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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## CHAPTER 1: INTRODUCTION

### 1.1 Purpose of the Manual

This is the fifth edition of the IALA VTS Manual, which is now 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 contents are 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.

### 1.2 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 1950's, 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 1960's and 1970's 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 vessel traffic management.

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 of the case 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 Harbours (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 a Vessel Traffic Service 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 various categories of VTS, including coastal, port or harbour, and rivers as well as inland waterway services. A Coastal VTS is a service provided to assist the safe and expeditious passage of shipping through coastal waters, particularly where there is a high density of maritime traffic or an area of environmental sensitivity or through difficult navigation conditions. Similarly, a port, estuarial or river VTS is a service provided to assist the navigation of shipping when entering or leaving ports and harbours or when sailing along rivers or through restricted waters.

VTS can be active or passive or a combination of both. Vessel traffic can be regulated passively by the utilisation of Traffic Separation Schemes (TSS), by interaction with the VTS centre from which operations are being managed, or both.

At the time of going to press, further developments are under consideration at IALA, brought about by factors that include concerns for maritime security, the need to increase the efficiency of traffic and advances in technology and capability. Shore organisations, other than VTS authorities, at local, national and regional level need to interact with vessels. There is thus a role to be filled in the context of managing vessel traffic at a level higher than the traditional roles of VTS.

It is envisaged that development of this concept will be considered in detail at IALA and incorporated into the work programme with a view to developing proposals that will form the basis of consultation with IMO and other interested bodies.

### **1.3 Consultative Bodies and VTS**

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 organisations:

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

### **1.4 Definitions and Abbreviations**

A list of definitions and a glossary of abbreviations of the terms commonly used in connection with VTS can be found at Annex 5.

**PHOTOS**





## **CHAPTER 2:           LEGAL FRAMEWORK FOR VTS**

### **2.1     Introduction**

The successful organisation 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 route from the global concept, characterised in Lord Donaldson's report in 1993 - "*Safer Ships, Cleaner Seas*" - to the local byelaw 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, for regulatory and procedural purposes, all ports are consistent and where they feel comfortable, 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, that have the potential to be part of the delivery of the safety system envisaged.

### **2.2     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.

### **2.3     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.

(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.

## **2.4 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.

## **2.5 IMO - Mandate**

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 in the 1990s are especially important insofar as they relate to the human element in shipping. On 1 July 1998 the International Safety Management Code entered into force and became applicable to passenger ships, oil and chemical tankers, bulk carriers, gas

carriers and cargo high speed craft of 500 gross tonnage and above. It became applicable to other cargo ships and mobile offshore drilling units of 500 gross tonnage and above from 1 July 2002.

The early part of this century has also seen a focus on maritime security, with the entry into force in July 2004 of a new, comprehensive security regime for international shipping, including the International Ship and Port Facility Security (ISPS) Code, made mandatory under amendments to SOLAS adopted in 2002.

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 Party desires to board a ship flying the flag of another State Party when the requesting Party 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 2010 included:

- responding to the scourge of modern-day piracy, in particular in the waters off Somalia and in the Gulf of Aden;
- addressing the reduction of greenhouse gas emissions from ships and thereby ensuring IMO's contribution to the climate change issue; and
- keeping the safety of life at sea and the human element, especially the seafarer, at the heart of IMO's work.
- IMO's mission statement, as stated in Resolution A.1011(26) - "*Strategic Plan for the Organization*", covers the six year period 2010 to 2015:

"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."

## 2.6 Member States, NGOs and IGOs

IMO currently has 169 Member States and three Associate Members. In 2011 there were 79 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 2011 there were 61 inter-governmental organizations which 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.

## **2.7 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 which 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 which are Party to conventions such as SOLAS even if they are not IMO Member States.

## **2.8 IMO Conventions**

Whilst 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). For other Conventions see Annex 4.

## **2.9 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.

## **2.10 SOLAS Chapter V - Safety of Navigation**

Chapter V identifies certain navigation safety services which should be provided by Contracting Governments and sets forth 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.

## **2.11 SOLAS Chapter V - Regulation 12 - VTS**

Regulation 12, which came into force in July 2002, contains five paragraphs. These can be viewed at Annex 2.

Besides Conventions, IMO has also issued a series of Resolutions and Codes, including guidelines on navigation issues and performance standards for shipborne 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.

## **2.12 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.

### **2.13 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.

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.

## **2.14 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.

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 amendments entered into force on 1 February 1997.

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, vessel traffic service personnel 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 VTS personnel 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 3). This approval by IMO of the IALA standard of training was recognised as a significant milestone for the VTS world in general and for VTS personnel in particular.

## **2.15 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 4.5 provides further explanation on this Convention)

## **2.16 Enforcement**

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.

## **2.17 National Legislation**

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 6 where a table provides a synopsis of some of the various methods used by States to implement international obligations.

## **2.18 Port State Control**

Under the provisions of the IMO Conventions (see Annex 4 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.

## **2.19 European Union (EU)**

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 Directive 2002/59/EC (amending Directive 2002-59) - "*Establishing a Community Vessel Traffic Monitoring and Information System*", 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 which will enhance the safety and efficiency of maritime traffic.

Additionally 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 requirements set out in the Directive.

The Directive imposes responsibilities on Member States for the arrangements for, and conduct of the system and, generally, on most commercial shipping, regardless of flag State, whose passage passes through the sea areas concerned. It imposes mandatory participation requirement on shipping and compliance with the VTS procedures whilst within the territorial seas of Member States.

## **2.20 Some National Legislative Measures**

### **2.20.1 Australia**

The Australian Government shares responsibility for regulating shipping and providing marine aids to navigation with Australia's six State Governments and the Northern Territory Government. The Australian Government is responsible for safety regulation of trading vessels on interstate or international voyages; the State/Northern Territory Governments are

responsible for regulating trading ships on intrastate voyages, fishing vessels, pleasure craft and inland waterways vessels. The Australian Government is responsible for aids to navigation for large ships engaged in ocean navigation and the State/Northern Territory Governments are responsible for aids to navigation required specifically for fishing vessels and recreational craft and covering entry to ports, rivers and approach channels. The State/Northern Territory Governments also are responsible for regulation of ports and several State Governments operate VTS systems to manage vessel traffic around their major trading ports.

**The Navigation Act 1912** regulates ship safety and implements the major international maritime conventions on ship safety, while the Lighthouses Act 1911 (Act No. 14 of 1911 as amended, taking into account amendments up to Statute Law Revision Act 2011) regulates the establishment and maintenance of the national marine aids to navigation network, for which the Australian Government is responsible.

The Australian Government and the Queensland State Government share a particular interest in ship safety and pollution prevention in the World Heritage listed Great Barrier Reef, off the Queensland coast, and Torres Strait, the international shipping strait separating the northern tip of Australia (Queensland) and Papua New Guinea.

In 1996, the IMO approved the establishment of a mandatory ship reporting system, REEFREP, covering the inner shipping route through the Great Barrier Reef and the Torres Strait, to improve navigational safety in the region. The Great Barrier Reef and the Torres Strait are designated as Particularly Sensitive Sea Areas (PSSA), (chapter 4). REEFREP, a mandatory ship reporting system, derives its authority from the Navigation Act 1912 (Marine Orders Part 56, REEFREP) in relation to general safety of navigation powers and relevant regulations under the International Convention for Safety of Life at Sea (SOLAS).

**REEFREP** is operated under a joint Australian Government and Queensland State Government arrangement whereby the Australian Maritime Safety Authority (AMSA), which is the Australian Government's ship safety statutory authority, and Maritime Safety Queensland, the Queensland State Government's ship safety statutory authority, jointly manage the REEFREP facility, REEFCENTRE, located at the port of Hay Point, Queensland. In 2004 the IMO endorsed its designation as a Coastal VTS.

### **2.20.2 Canada**

**The Canada Shipping Act (CSA) of 1989** is Canada's major legislation on maritime affairs. Originally formatted along the lines of the British Merchant Shipping Act, it has, since its inception, undergone a number of amendments. Before 1989, the CSA had no specific provision for the establishment or operation of VTS, nor did it contain any requirements to be met by ships in these respects. When VTS systems were introduced for Canadian waters during the 1960s and 1970s, the establishing authority was indirectly based on an amendment to the CSA dealing with aspects of pollution. It was subsequently decided however that such authority was insufficient for the intended legal mandate for Canadian VTS.

A specific provision was included in the CSA, 1989. Specifically, sections 562.15 - 562.2 of

Part IX of the CSA, 1989 provides the authority for VTS in Canada including the establishment of VTS zones and the development of regulations to be followed by ships when within and approaching such zones. There is also provision for the Coastguard to direct the movement of ships under specified conditions, as well as empowering the Commissioner of the Coastguard to establish the qualifications and training of VTS operators or Marine Traffic Regulators as they are called (MTR).

### **2.20.3 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;
- To carry radio equipment that is capable of operating on the HK VTS working VHF channels;
- To report their arrival, departure and movements in Hong Kong waters to the VTS centre; and
- To 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.

### **2.20.4 France**

The Maritime Ports Code has several Articles, namely;

- **Art L323-1** Inside a maritime port, fairways and access channels, a shipmaster ..... who has not complied with orders given, whatever the means used, by the Harbour Master or his Assistant with regard to the movement of his vessel, is liable to a fine of the amount.....
- **Art R311.3** The Harbour Master's jurisdiction extends to access channels and fairways when safety matters are concerned.
- **Art R311-6** Harbour Masters and their Assistants are responsible for the control and supervision of navigation lights, signals and beacons, in port waters and access channels by day and by night.
- **Art R311-7** Harbour Masters regulate vessel entry to and departure from ports and harbours and direct all maritime traffic movements.

Masters of ships wishing to enter a port should provide the Harbour Master's office, 24 hours in advance or at the latest when leaving the previous port when the journey is shorter than 24 hours, their ETA at the roadstead or at the mooring buoy. The Harbour Master may deny port

access to vessels which may constitute a danger to the port. No vessel may enter a port or move within the port unless authorised by the Harbour Master. Authorised port entry may be subject to previous survey by an authorised surveyor.

#### 2.20.5 Italy

Primary Legislation	Secondary Legislation / Statutory Instruments	Guidance at National Level	Byelaws
Law (14 March 2001 nr 51 art. 5) Maritime transport, pollution prevention and maritime traffic monitoring.	Decree by the Minister of Infrastructures and Transport (28 January 2004) establishment of VTS system.	Coast Guard Directive: VTS001, VTS002, VTS004, VTS005, VTS006.	Port and local byelaws established by the local competent authority.
Legislative Decree (16 February nr 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.	Republic President Decree (3 December 2008 nr 211), reorganization of Ministry of Infrastructure and Transport.  Ministry Decrees regarding establishment of VTS services and geographic limits for each VTS centre.	National regulation for VTS.	VTS regulations (operating procedures adopted by each VTS authority).

#### 2.20.6 Japan

The Japan Coast Guard (JCG) was established in 1948 as an organisation responsible for peace and security at sea, ensuring maritime traffic safety, rescuing ships and persons in distress at sea, the prevention and assistance in maritime disasters, hydrographic survey and protecting the marine environment. Among these activities, 'ensuring maritime traffic safety' is a highly significant role and the JCG have established and operate VTS organisations to meet this requirement.

In Japan, maritime traffic is regulated by three laws:

- Law for Preventing Collisions at Sea, based on the requirement of the International COLREGS;
- Maritime Traffic Safety Law specifies special rules for certain sea areas where traffic is most congested; and
- Port Regulations provide special rules for traffic safety in harbours.

### **2.20.7 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 Byelaws for each port or local area; provisions for the regulation of VTS are included in this legislation.

### **2.20.8 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 and included in the VTS World Guide.

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.

### **2.20.9 United States of America - Authorities and Mandates**

- **Homeland Security Act of 2002 (HSA)** (Pub. L. No. 107-296, 116 Stat. 2135,

November 25, 2002) recognizes marine safety, aids to navigation and ice operations as distinct and enduring Coast Guard missions. These missions, in whole or in part, are executed through the Waterways Management Program.

- **14 USC 2** articulates the primary duties of the Coast Guard, including promoting safety of life and property on, under, and over the high seas and waters subject to the jurisdiction of the United States. It directs the Coast Guard to establish, maintain, and operate aids to navigation; to engage in oceanographic research; and to establish, maintain, and operate icebreaking facilities for that purpose; and pursuant to international agreements, operate icebreaking facilities on waters other than high seas and waters subject to the jurisdiction of the United States.
- **14 USC 89** establishes the Coast Guard's primary enforcement authority. It authorizes the Coast Guard to "make inquiries, examinations, inspections, searches, seizures, and arrests upon the high seas and waters over which the U. S. has jurisdiction for the prevention, detection and suppression of violations of laws of the U. S."
- **14 USC 141, "Cooperation with other Agencies,"** authorizes the Coast Guard to utilize its personnel and facilities to assist, among others, federal and state agencies. Under this authority, the Coast Guard provides icebreaking escort for the U.S. Navy's operations in the Arctic and Antarctic. Icebreaking services are also provided to the National Science Foundation, U.S. Geological Survey, and other federal and state agencies in both the Arctic and the Antarctic. It also provides authority for the Coast Guard to establish, operate, and maintain aids to navigation for the primary benefit of federal agencies other than the Armed Forces and is used to provide support to the National Oceanic and Atmospheric Administration National Data Buoy Center.
- **Ports and Waterways Safety Act of 1972 (PWSA)** (33 USC 1221 et seq.), as amended by the Port and Tanker Safety Act of 1978 (PTSA), provides the basic authority for the Waterways Management Program, particularly to establish and operate VTS; establish Traffic Separation Schemes and fairways, Restricted Navigation Areas, and Safety Zones; and require carriage of specified navigation and communication equipment. It provides the Coast Guard with the authorities to take a variety of actions to prevent damage to vessels, bridges, or other structures on or in the navigable waters of the United States; to protect the navigable waters of the United States from environmental harm resulting from damage to the vessel or shore structure; to promulgate necessary regulations; to impose civil penalties; and to seek criminal sanctions.
- **Port and Tanker Safety Act (PTSA) of 1978** amended the PWSA and provides the Coast Guard with broader, more extensive, and explicitly stated authority. The Act addresses improvements in the supervision and control over all types of vessels, foreign and domestic, operating in U.S. navigable waters, and in the safety of all tank vessels, foreign and domestic, that transport and transfer oil or other hazardous cargoes in U.S. ports. Additionally, the Act addresses improvements in the control and monitoring of vessels operating in offshore waters near our coastline, and vessel manning and pilotage standards. The Act also includes



regulatory authority over areas not previously covered, such as participation with neighboring nations in coordinated vessel traffic systems in boundary waters, and lightering operations in offshore areas. The Act is the basis for the navigation safety regulations.

- **Oil Pollution Act of 1990 (OPA 90)** amended the PWSA. The Act imposes new requirements on the operation of oil tankers in the United States and addresses shortcomings in navigation safety in Prince William Sound, Alaska. OPA 90, section 4107, amended the PWSA's vessel operating requirements, broadening the Coast Guard's authority so that they "... may construct, operate, maintain, improve or expand vessel traffic services...." In addition, section 4107 requires mandatory participation for "appropriate vessels" that operate in a VTS area.
- **Magnuson Act of 1950 (50 USC 191)** amended the Espionage Act of 1917. It implemented broader authority for control of vessels and waterfront facilities. Security zones established under the authority of the Magnusson Act are designated areas of land, water, or land and water established for such time as is necessary to prevent damage or injury to any vessel or waterfront facility; to safeguard ports, harbors, or waters of the United States; or to secure the obligations of the U.S. Within the zone, the Coast Guard may control access and movement of all vessels, persons, and vehicles (including their removal) and may take control or possession of any vessel.
- **Rivers and Harbors Act of 1899** focuses on protecting navigation and protecting U.S. waters from pollution. The Act establishes the federal authority for approval of the construction of bridges over or in navigable waterways (33 USC 401); for penalties for wrongful construction of bridges, piers, etc. or removal of structures (33 USC 406); for alteration, removal, or repair of bridge or accessory obstructions to navigation. The Act provides for civil and criminal penalties for violation; alteration or removal of unreasonably obstructive bridges (not subject to the Truman-Hobbs Act); notice and hearing; specification of changes; time for compliance; notice to United States attorney; misdemeanor; fine; new offenses and proper repair requirements (33 USC 502); and to establish special and general anchorages (33 USC 471, 474).
- **14 USC 2, 81, and 83** contain the primary statutory authority for the Aids to Navigation Program. The Coast Guard shall develop, maintain, establish, and operate, with due regard for the requirements of national defense, aids to maritime navigation for promotion of safety on and over the high seas and waters subject to the jurisdiction of the United States (14 USC 2); establish, maintain, and operate maritime and electronic aids to serve the needs of the Armed Forces or commerce in the United States, on the waters of the continental shelf, and other specified places (14 USC 81); and regulate the establishment, maintenance, and discontinuance of private aids to navigation (14 USC 83).
- **44 USC 1309** authorizes the Coast Guard to disseminate information to mariners concerning aids to navigation, including the publication and distribution of Light Lists and Notices to Mariners.
- **Inland Navigational Rules Act of 1980** (33 USC 151–221 and 2001 et seq.), as

amended, combined the old Inland, Western River, and Great Lakes Rules into the new unified Inland Navigation Rules, which became effective in 1981 with the exception of the Great Lakes, which became effective in 1983.

## **CHAPTER 3: IALA**

### **3.1 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.

### **3.2 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 conference attracted the interest of maritime authorities from around the world. The conference was such a success that it led to several more being organised in Europe and the United States of America.

In 1929, Trinity House invited 29 lighthouse authorities to the first International Lighthouse Conference. As the invitation stated, the meeting was for "*the purpose of an exchange of views and ideas of a technical nature*". Authorities from 24 nations accepted and the delegates organised themselves into committees and working groups, which included plenary discussions.

In the intervening years between 1937 and 1950 much took place that would influence developments in navigation. The United Nations (UN) was formed in 1945 in place of the League of Nations. The International Civil Aviation Organization was incorporated into the new UN as a specialised organization. The International Telecommunications Union was added to the UN. A Safety of Navigation Conference was convened in London in 1948 and creation of an International Maritime Consultative Organization was discussed.

In 1956 Mr. PJG van Diggelen from the Netherlands, Mr P Petry from France, Sir Gerald Curteis from Trinity House and Mr G Wiedemann from Germany drafted a constitution that was to create the future of IALA. On 1st July 1957 the IALA 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.

The statements made by Sir Gerald Curteis and Mr van Diggelen over fifty years ago remain relevant to this day:

"The aim of the work is the safety of mariners" (Sir Gerald Curteis - June 1955)

"The authorities want to do this work well, and in addition wish to do it better' (P.J.G van Diggelen - June 1955)



**The Founders of IALA**

L to R: Paul Pétry, PJG van Diggelen, Sir Gerald Curteis, Gerhard Wiedemann

### **3.3 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.

### **3.4 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 organisations concerned with the provision or maintenance of marine aids to navigation and allied activities, at sea and on inland waterways.

IALA maintains liaison and cooperates with relevant intergovernmental, international and other organisations, offering specialised advice where appropriate.

### **3.5 Functions**

The aim of IALA is achieved by, among other things:

- developing international cooperation by promoting close working relationships

and assistance between members;

- collecting and circulating information about the activities of its members as well as encouraging, supporting and communicating recent developments;
- enhancing mutual exchange of information with organisations representing the users of aids to navigation;
- formulating and publishing appropriate recommendations, standards and guidelines;
- addressing emerging navigational technologies, hydrographic matters (as reflect aids to navigation issues) and vessel traffic services;
- encouraging IALA members to take into account the development of multi-purpose systems which may be also be used, for instance, to monitor the marine environment;
- establishing Committees or Working Groups to study special issues;
- promoting assistance to services or organisations requesting help within the marine aids to navigation and allied fields, whether technical, organisational or training;
- organising Conferences, Symposiums, Seminars, Workshops and other events relevant to its work.

### **3.6 Membership**

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, organisation 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 organisations 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 2011 IALA comprised a membership of 75 national members, 102 industrial members, 48 associate members and 46 personal honorary members.. The headquarters is in St. Germain-en-Laye, on the outskirts of Paris, France.

### **3.7 Committees**

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 Recommendations, Guidelines and Manuals for IALA members and submissions to other organisations. These Recommendations, Guidelines, Manuals and submissions require the approval of the Council.

The Committees meet regularly, normally twice each year, at the IALA Headquarters and are important to the work of IALA, keeping abreast of all developments relating to their area of expertise. They prepare, review and revise relevant IALA publications in accordance with their Work Programme. The programmes for the Committees generally cover a four year period, from one IALA Conference to the next. The IALA Committees that operate over the four year period between IALA Conferences are:

- The Aids to Navigation Management (ANM) Committee deals with the management aspect of aids to navigation services.
- The Engineering, Environmental and Preservation (EEP) Committee deals with engineering, design, maintenance and conservation issues related to aids to navigation.
- The e-NAV Committee deals with the aspects of e-navigation relating to aids to navigation as well as reviewing and developing related IALA documentation on issues such as AIS, future DGNSS systems, the impact of new radar technology on radar aids to navigation and the impact of electronic shipborne navigation aids on aids to navigation systems.
- The Vessel Traffic Service (VTS) Committee deals with all aspects of VTS, including the expanding role of vessel monitoring for maritime safety, environmental protection and security.

### **3.8 VTS Committee**

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 organisations 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 organisations 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;
- Information Management;
- Technical Development; and
- Personnel and Training.

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

### **3.9 VTS Policy**

IALA maintains very strong links with IMO and is recognised as a Non Governmental Organisation (NGO). 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 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.



### **3.10 Conferences, Symposiums and Exhibitions**

IALA holds a general aids to navigation Conference every four years. These Conferences may be attended by IALA members and also by non-member, aids to navigation authorities.

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.

The Industrial Members' Committee generally organises an Industrial Exhibition in conjunction with the Conference.

IALA traditionally holds the General Assembly in conjunction with the Conference. The IALA work term traditionally spans the four years between Conferences.

Likewise every four years, VTS Symposiums are held, which 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.

### **3.10 Publications**

IALA has established a hierarchy of VTS related documents that it publishes and periodically reviews (see Annex 7). 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:

- **IALA Recommendations:** These documents represent the highest level of documentation (equivalent to a 'standard' in an intergovernmental organisation). 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. A 'V' prefix associates Recommendations with VTS.
- **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.

- 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.

### **3.11 Strategy**

A study on maritime operations and management relevant to VTS concluded with the statement:

*"IALA recognises that the trends in maritime operations towards enhanced safety, security, efficiency, accountability and environmental responsibility, together with anticipated technical advances, will result in significant future change. As a consequence and where appropriate, IALA will initiate and lead developments, influence debate, and produce relevant recommendations and guidelines that may impact on the use or management of aids to navigation, including VTS."*

## **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

### **4.1 Introduction**

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

- to aid the mariner in the safe use of navigable waterways;
- to afford unhindered access to pursue commercial and leisure activities; and
- to contribute in 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 Resolution A.857(20) states that: *"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 organisation service is usually provided for, while in a Coastal VTS usually only an information service is rendered."*

The 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 the 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.

### **4.2 Functions of a VTS**

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 related to, contributing to and thereby enhancing:

- Safety of life at sea;
- Safety of navigation;
- Efficiency of vessel traffic movement;
- Protection of the marine environment;
- Supporting maritime security; 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 system's capability for detecting a developing dangerous situation and on the ability to give timely warning 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 thereby main functions to that of a coastal VTS, which is addressed in more detail in chapter 5. When a VTS is established, the existence of and the functions carried out by the VTS, will need to be promulgated to all relevant stakeholders.

### **4.3 Safety of Life at Sea and Safety of Vessel Traffic**

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 the human factor, the improvement that can be gained through the involvement of, and interaction with, the VTS as an additional safeguard can easily be seen.

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 such a risk management tool for this and other aids to navigation management purposes (chapters 6 and 7).

The consideration, implementation and even operation of VTS are, in essence, a risk management activity, trying to reach an acceptable risk level through acceptable costs and efforts. When establishing a VTS the above-mentioned risk management methods can also be useful, but this still remains a mostly skill and experience based activity. Therefore, it is vitally important to develop clear operational procedures, which are properly based on a risk analysis approach and which are consistently applied.

If an incident has occurred or is likely to occur, VTS can be used to support incident mitigation operations. In the context of vessel traffic safety, VTS might support for example Maritime Assistance Services, Places of Refuge, 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.

#### **4.4 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 of 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.

#### **4.5 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 to activities, in particular 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.

**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.

Protection of the environment is often a substantial driving force for determining the need for VTS. It has resulted in VTS being implemented in areas with relatively low traffic volumes (where, for example, the need for safety of vessel traffic did not sufficiently justify VTS), in particular in areas where relatively high quantities of polluting cargoes are transported, especially if these areas 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 by 2009/17/EC) 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.

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 outside port areas at sea, 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 mandatory in international waters or straits that have been adopted by IMO, otherwise VTS participation in these waters is voluntary.

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. As mentioned in section 4.3, IALA has developed a risk management tool to assist in and simplify this task.

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

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.

#### **4.7 Risk Assessment**

As with the safety of vessel traffic and protection of the environment, it is not easy to assess the effect of VTS on protection of the adjacent communities and infrastructure. The impact of VTS on the size and number of accidents is difficult to determine, as is the reduction of the risks for the adjacent communities and infrastructure, which could possibly result from such accidents. This requires a thorough risk analysis, which needs availability and access to data on traffic, circumstances and sensitivity of the adjacent communities and infrastructure. As previously mentioned, IALA has developed a risk management tool to assist in and simplify this task.

#### **4.8 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, whilst at the same time to better plan and utilise their resources, which may reduce the cost base.

Every port seeks improvement in information gathering and dissemination as a means to offer a better service to the shipping community endeavouring to obtain a competitive advantage over other ports. This promotion and enabling of 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 such 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 gaining importance. It improves the optimisation of the overall logistical chain of intermodal transport from producer to consumer.

The transfer of information concerning cargo, position, movement, destination and ETA is part of the interconnectivity within this chain, which is essential to improve intermodal

transport. When the cargo is still onboard the information concerning the whereabouts and intentions of involved vessel is, in part, an acceptable substitute for the desired 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 as to what information it is appropriate to make available. There are legal restrictions and societal sensitivities with regard to the protection of privacy and commercially sensitive information. Modern times have made us more aware of misuse of this information by unlawful individuals and organisations. It needs to be realised that conflicts may occur when the VTS is not the only source of vessel related information.

#### **4.9 Supporting Maritime Security**

As a result of terrorist and piracy attacks and the increased perception of the threat of 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 will have three essential components. First, they must 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. Then, the assessment must 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.

#### **4.10 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 instead of directly. 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 monitors 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. Whilst it is recognised that security issues are a national matter, VTS centres can, at present, only contribute to certain security issues as they are not necessarily able to see all traffic, particularly small craft. In addition VTSOs are not specifically trained to recognise potential security threats, neither are they qualified or equipped to deal with 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.

#### **4.11 Trends in VTS**

Drawing on the work currently being undertaken by IALA the following trends have emerged in a recent study on **maritime operations and management**:

##### **4.11.1 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; and
- Comprehensive and effective risk assessment will increasingly become the basis for the safe management of navigation.

#### **4.11.2 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 between ships and shore organisations;
- Coastal waters and inland waterways will be increasingly used for recreational and other purposes. In addition, inland and short sea shipping will increase their environmental attractiveness 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 improvement of economic performance, particularly where such services may be obtained from external sources.

#### **4.11.3 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.

#### **4.11.4 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; and
- The use of formal and more effective systems to manage safety and security at sea and in port will increase.

#### **4.12 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 supervisors in order to reduce any exposure to increased liability will add to the scope and priority of such training;
- 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 possibility to control traffic by means of instructions, rather than information and advice, will be used more widely as a mechanism for reducing risk; and
- The regulated control of traffic by VTS centres will bring a greater exposure to liability.

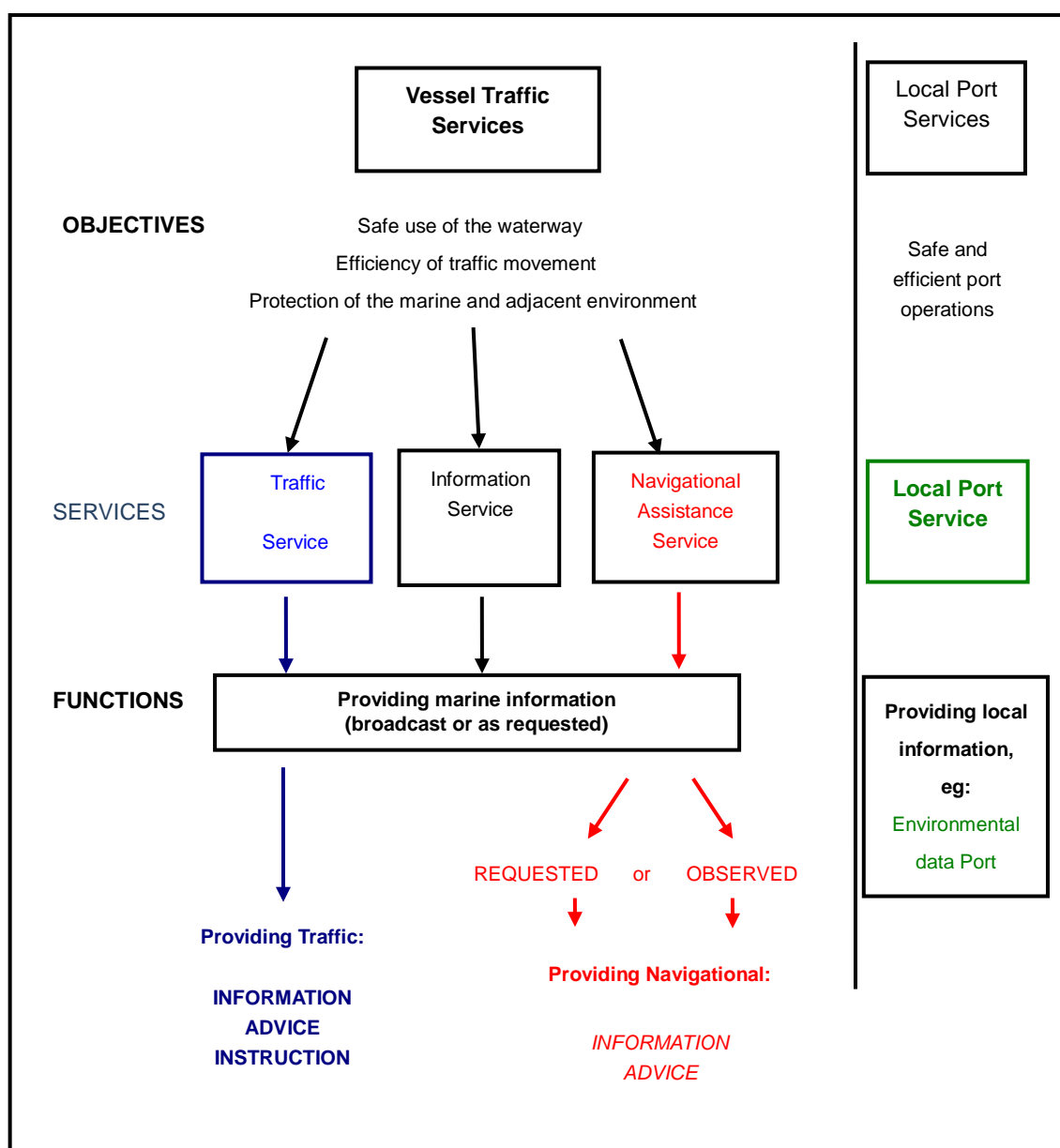
## CHAPTER 5: TYPES AND FUNCTIONS OF VESSEL TRAFFIC SERVICES

### 5.1 Introduction

In many waterways vessels can operate independently under any conditions of traffic and weather. In such circumstances there is no requirement for a VTS and vessels operate 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 is required. The purpose of this chapter is to identify the benefits of VTS and to set out the options available to a Competent Authority for their provision.

### 5.2 Vessel Traffic Services

The diagram below shows a pictorial overview of VTS types and functions.



### **5.3 Prerequisites**

The prerequisites for Vessel Traffic Services (VTS) and Local Port Services (LPS) are:

#### **5.3.1 Vessel Traffic Services**

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

#### **5.3.2 Local Port Services**

- Does not require to be authorised by the Competent Authority;
- Staffed and trained appropriate to task; and
- Equipped appropriate to task.

### **5.4 Local Port Services**

Local Port Services (LPS) is applicable to those ports where it has been identified from their Formal Risk Assessment that a VTS is excessive or inappropriate. It does not imply a lower standard or a poorer service to their customers. The Competent Authority may not, require training of LPS operators to the V-103 standard. Identification of the threshold between LPS and VTS may be difficult to determine. It is likely to be port specific and will only become clear following the Formal Risk Assessment process, when all mitigating factors have been considered.

The main difference arising from the provision of LPS is that it does not interact with traffic, nor is it required to have the ability and/or the resources to respond to developing traffic situations and there is no requirement for a vessel traffic image to be maintained. As such, the training requirement for its operators is less comprehensive. It should be noted that LPS are outside of the scope of this manual, as they do not meet international standards, although they will invariably meet the standards of a lower level of capability sufficient to meet local needs.

Provision of LPS is designed to improve port safety and co-ordination of port services within the port community by dissemination of port information to vessels and berth or terminal operators. It is mainly concerned with the management of the port, by the supply of information on berth and port conditions. Provision of LPS can also act as a medium for liaison between vessels and stevedores or allied services, as well as providing a basis for implementing port emergency plans. Examples of LPS may include:

- Shipping schedules;
- Meteorological and hydrological data;
- Berthing information; and
- Availability of port services.

*"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)

## **5.5 Vessel Traffic Services**

An authorised VTS will be capable of offering one or more of the following types of service:

### **5.5.1 Information Service (INS)**

An Information Service provides essential and timely information to assist the on-board decision-making process. An Information Service does not participate in onboard decision-making.

### **5.5.2 Traffic Organisation Service (TOS)**

A Traffic Organisation Service is a service to provide for the safe and efficient movement of traffic and to identify and manage potentially dangerous traffic situations. A Traffic Organisation Service provides essential and timely information to assist the onboard decision-making process and may advise, instruct or exercise the authority to direct movements.

### **5.5.3 Navigational Assistance Service (NAS)**

A Navigational Assistance Service may be provided in addition to an Information Service and/or Traffic Organisation Service. It is a service to assist in the onboard navigational decision-making process and is provided at the request of a vessel, or when deemed necessary by the VTS. A Navigational Assistance Service provides essential and timely navigational information to assist the onboard decision-making process and may inform, advise, warn and/or instruct vessels accordingly.

## **5.6 Functions**

The functions of each service type are outlined below and identify the major activities that may be expected from each service type, together with an indication of the role that they can be expected to undertake.

### **5.6.1 Information Service (INS)**

This service type involves maintaining a vessel traffic image and allows interaction with traffic and response to developing traffic situations. An INS provides essential and timely marine information to assist the onboard decision-making process, which may include:

- 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 movements; and
- Meteorological and hydrological conditions, notices to mariners, status of aids to navigation; limited manoeuvrability that may impose restrictions on the navigation of other vessels, or any other potential hindrances.

### **5.6.2 Traffic Organisation Service (TOS)**

A Traffic Organisation Service provides essential and timely information to assist the onboard decision-making process. It may involve the provision of information, advice and instructions. Traffic Organisation concerns the forward planning of movements to maintain vessel safety and to achieve efficiency. This service may involve:

- 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 movements; and
- Information such as meteorological and hydrological conditions, notices to mariners, status of aids to navigation.

There may also be a need for specific information such as traffic congestion and special vessels with limited manoeuvrability which may impose restrictions on the navigation of other vessels or any other potential hindrances, such as;

- The allocation of water space;
- Establishing and operating a system of traffic clearances - all or certain classes of vessels may be required to participate in this service and should not proceed without clearance; and
- Establishing routes to be followed and speed limits to be observed and such other measures as may be considered necessary and appropriate by the VTS.

When providing specific information, such as traffic congestion and advice about vessels with VTS sailing/route plans, the category of vessels for which a VTS sailing plan is necessary and the details required should be clearly identified. A VTS sailing plan normally includes the intended route, the estimated time of arrival in the VTS area or the departure from a berth or an anchorage in the VTS area. It may also take into account the general flow of traffic, efficiency and co-ordination with allied services.

In providing guidance for the delivery of VTS services IMO Resolution A.857(20) recommends that, in the provision of information, warning, advice or instruction, IMO Resolution A.918(22) - "*Standard Marine Communication Phrases (SMCP)*" should be

used where practicable. It is also recommended as best practice that Message Markers are always used irrespective of the language ability of the recipient.

*"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."*

IMO Resolution A.857(20)

### **5.6.3 Navigational Assistance Service (NAS)**

A Navigational Assistance Service is envisaged to be an important supplement to the provision of other navigational services including pilotage. It is a service that provides essential and timely navigational information to assist in the onboard navigational decision-making process.

IALA Guideline 1068 – *"Provision of a Navigational Assistance Service by a Vessel Traffic Service"*, provides a detailed guidance on this service. This Guideline was developed and issued to address a perceived need to provide a more detailed guidance on the delivery of a Navigational Assistance Service by a VTS, to ensure that interaction with participating vessels to assist onboard decision making is consistent between VTS Centres.

NAS may be provided at the request of a vessel, irrespective of whether a pilot is onboard, or when a navigational situation is observed and intervention by VTS is deemed necessary. Such assistance requires positive identification and continuous communication throughout the process. It is important that assistance to onboard decision making is provided by the VTS in a timely manner, is clearly understood by both parties and is not open to misinterpretation, to minimise the risk of unexpected and dangerous reactions.

Acceptance by the vessel of NAS should be established and IMO Resolution A.857(20) recommends that NAS *"has a start and end time"*. In addition, IALA Guideline 1068 identifies that, under circumstances when a navigational situation is observed and intervention is deemed necessary, *"it is likely that the immediate priority will be placed on providing the necessary assistance before attempting to formally negotiate the commencement of Navigational Assistance"* and that *"once the immediate situation has been resolved, the continuation or completion of Navigational Assistance should be subsequently clarified"*.

Examples of developing situations where NAS may be requested or deemed necessary by the VTS include:

- Risk of grounding;
- Vessel deviating from the recommended track or sailing 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 navigational or manoeuvring equipment casualty;
- Inclement conditions (e.g. low visibility, high winds);
- Potential collision between vessels;
- Potential collision with a fixed object or hazard; and
- Assistance to a vessel to support the unexpected incapacity of a key member of the bridge team, on the request of the master.

Navigational Assistance may involve the provision of information, such as:

- Course and speed made good by a vessel;
- Position relative to fairway axis, navigational features and/or way-points;
- Proximity to navigational hazards; and
- Positions, identities, intentions and any restrictions of surrounding traffic.

Navigational Assistance may also involve the additional provision of **information, advice, warning** and/or **instruction**. It is very important that the correct terminology is used when providing NAS.

It is recommended as best practice that Message Markers are always used when delivering NAS irrespective of the language ability of the recipient. NAS is often provided when a degree of stress or urgency exists and the use of message markers can help to ensure that the purpose of each part of the message is clear and unambiguous. Messages relating to NAS should always be addressed by name to the vessel participating in Navigational Assistance so that there is no doubt to whom the content of the message is directed and consideration should be given regarding the VHF radio frequency on which the Navigational Assistance Service should be provided.

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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. IALA Guideline 1068 - "*Provision of NAS by VTS*", offers an example checklist which lists a number of key considerations and can be modified for local use.

Clear operational procedures should be in place for the provision of NAS when requested by a vessel or when observed and intervention is deemed necessary by the VTS. The authorisation of VTS personnel to provide this service should also be identified. VTS Authorities should give careful consideration to staffing levels, their qualifications and equipment capability when implementing this type of service.

The provision of NAS when observed/deemed necessary should be expected from all VTS Authorities, with the possible exception of the most basic of VTSs and then only if it is offering just an Information Service. The provision of NAS on request is likely to be specific to a particular VTS area or just a part of it.

A Navigation Assistance Service provides a VTS with measures to assist in the safety of navigation within the VTS Area, particularly in the event of an incident or emergency involving a vessel's navigation or navigational equipment. It is not an alternative to mandatory pilotage.

Clear operational procedures should be in place for the provision of NAS when requested by a vessel or when observed and intervention is deemed necessary by the VTS. The authorisation of VTS personnel to provide this service should also be identified. VTS Authorities should give careful consideration to staffing levels, their qualifications and equipment capability when implementing this type of service.

VTS Operators should be appropriately trained and ready to deliver NAS at no notice when a situation that compromises navigational safety is observed or deemed necessary, whereas the provision of NAS on request may only be appropriate for certain VTS Authorities where the geographic arrangement of the port and its approaches, the capability of the systems, and the training of the operators allow.

Although training in the provision of NAS should normally be undertaken with, or as part of V103/1 VTS Operator Training, the additional local training for NAS should be undertaken as part of V103/3 On-the-Job Training with specific reference made in their local authorisations.

## **5.7 Promulgation of Information and Categorisation of Services**

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.

## **5.8 Certification and Audit of VTS**

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 they set. This includes the resources, staffing levels, training and qualifications.

Appropriate and adequate operational and administrative procedures should be in place. The Competent Authority should ensure that the operational and administration procedures used by a VTS Authority are appropriate for the advertised services through certification. Certification can be achieved by an appropriate auditing and accreditation process. IALA Guideline 1055 - *"Preparing for a Voluntary IMO Audit on Vessel Traffic Services Delivery"* provides guidance on preparing for an audit on the delivery of VTS services.

## **CHAPTER 6: PRINCIPLES OF MANAGING VESSEL TRAFFIC**

### **6.1 Introduction**

This chapter discusses the principles of managing vessel traffic that an authority may wish to implement in order to enhance safety in a port, waterway or coastal waters. These principles may be enacted in conjunction with the various types of VTS discussed in the previous chapter, however, before implementing any measure, the authority should evaluate the local conditions.

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 commercial factors and other activities; a review of the waterspace management techniques, and conclude with an evaluation of the types of VTS 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, a process that is described more fully in Chapter 9.

### **6.2 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.

#### **6.2.1 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. 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.

#### **6.2.3 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.

#### **6.2.4 Hydrology**

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

### 6.2.5 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.

*The object of approach channel design is safety and navigability for the shipping traffic which will use the port. A final stage will be to carry out a marine traffic analysis and risk analysis. Marine risk embraces the risk to life, damage to the marine environment and the potential commercial loss to a port in the event of an accident.*

PIANC PTC II-30

### 6.3 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.

### 6.4 Commercial Factors and Other Activities

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. Recreational activities, issues associated with oil and gas production and military operations may take place within the area to be covered by a Vessel Traffic Service. 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, commercial operations and other activities, and pre-empt such conflicts before they arise.

### 6.5 Waterspace Management Techniques

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' Routeing*".
- **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** - Two-way and one-way management techniques 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.

- **Authorisation of Ship Movements** - Traffic movements may be managed within a port through the authorisation 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 prohibit the movement should this be necessary.
- **Control of Arrivals and Departures** - The control 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 allied services.

## 6.6 Type of VTS Service

Assessment of the issues above are fundamental considerations in determining the need for a VTS (Chapter 7) and in selecting the type of VTS service(s) to be provided (Chapter 5), appropriate to that VTS. Waterspace management techniques such as the establishment and marking of channels and fairways and the establishment of Traffic Separation Schemes (TSS) are passive measures that may be used in conjunction with a VTS, but may also be used in isolation. 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 techniques will be a key consideration in determining the type of service that will be required. For example, the regulatory control of departures and arrivals may be achieved through allied services and, other passive measures such as channels/fairways and TSS may be used to complement a local traffic service. Other measures described above are active measures that would normally dictate the requirement for a Traffic Organisation Service. The complexity of the navigational environment will determine through risk assessment the service type required.

In all cases, the training and qualifications of VTS Operators providing the service and their authorisations (Chapter 13) should be clearly identified and clear operating procedures established (Chapter 18).

## **CHAPTER 7: DETERMINING THE NEED FOR VTS**

### **7.1 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:

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

### **7.2 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 organisation needs to play a role in mitigating risk.

From the risk assessment some authorities may identify the need to provide a VTS as specified in IMO Resolution A.857(20) "*Guidelines for Vessel Traffic Services*" and in IALA publications, such as the IALA Recommendation V-119 - "*Implementation of Vessel Traffic Services*". Other mechanisms, such as Local Port Services (chapter 5), will often provide a suitable level of service to mitigate risk where it has been assessed that a VTS, as described above, either exceeds the requirement or is inappropriate. Identifying the threshold between Local Port Services and VTS is often difficult to determine. It is likely to be port specific and will only become clear in the risk assessment process, when all of the mitigating factors are considered. Local Port Services are applicable where interaction is unnecessary to fulfil the statutory requirements of the harbour authority's duties with regards to navigational safety.

*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

### **7.3 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 marine 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;



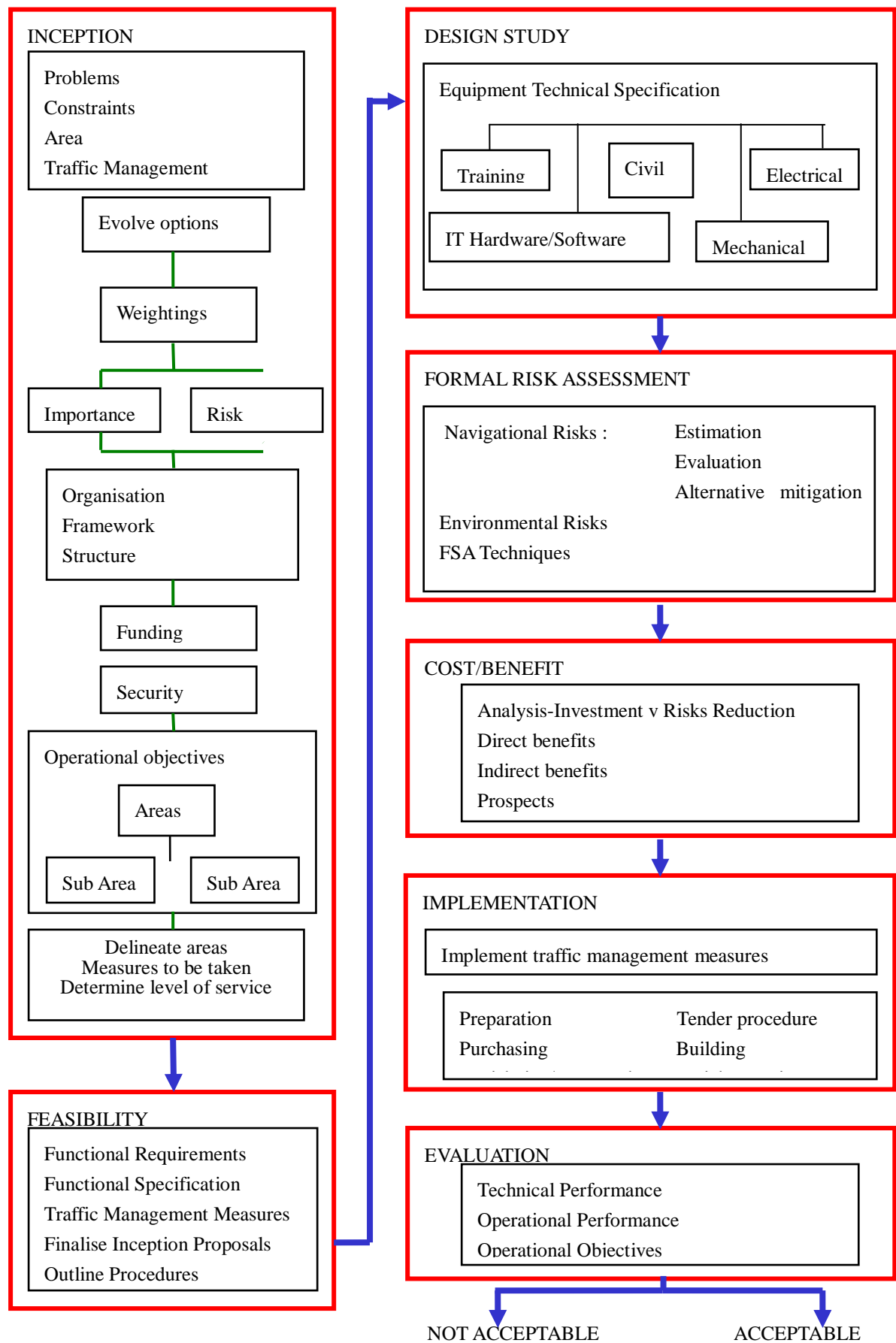
- Number of casualties in an area during a specified period;
- Existing or planned vessel traffic services on adjacent waterways and the need for cooperation between neighbouring states, if appropriate;
- Narrow channels, port configuration, bridges, locks, bends and similar areas where the progress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

#### 7.4 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. The table below 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.

<b>Preliminary Assessment</b>	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.
<b>Feasibility and Design</b>	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.
<b>Formal Risk Assessment</b>	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.
<b>Cost / Benefit Analysis</b>	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.



## **7.5 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 organisational 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 used 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 organisational structure, including its culture, policies, procedures and priorities;
- A review of the legal framework; and
- 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:

- Organisational 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.

## **7.6 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 routing 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.

### **7.7 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 routing 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.

### **7.8 Reference Documentation**

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

- IALA Guideline 1018; and
- IALA Risk Assessment Models

Guideline 1018 - *Risk Management*, breaks down the Risk Management process into five clearly identifiable steps, namely;

- Identification;

- Assessment;
- Control;
- Decision;
- Action; and
- Monitoring

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

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 described in **chapter 8**.

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**

### **8.1 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.

### **8.2 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
- Organisation set-up (e.g. recruitment and training of staff, developing procedures).

Often the costs for preparation, the set-up of the organisation 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 outdated 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.

### **8.3 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 to reduced (risk for) 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; 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.

#### **8.4 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.

#### **8.5 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 vessels domain is calculated, produces objective results, but could be unreliable as a model is a simplification of reality; and
- Simulation methods.

These methods, where certain situations are recreated on a simulator or PC and tested by multiple runs, if possible in faster time, offers statistical 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 little 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.

## 8.6 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 organisation is often used to be able to compare the cost/benefit results of the investment in a VTS with other desired investments by this organisation. 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.

### **8.7 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.

### **8.8 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.

## **CHAPTER 9: PLANNING AND ORGANISATION OF VTS**

### **9.1 Introduction**

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

### **9.2 Geography**

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

#### **9.2.1 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.

#### **9.2.2 Traffic Separation Schemes**

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

#### **9.2.3 Anchorages**

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

#### **9.2.4 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 marine radars should be carefully considered.

### **9.3 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.

## **9.4 Other Considerations**

### **9.4.1 Numbers of Vessels and Types**

The numbers of vessels, including local traffic and their class 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, maneuverability, 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.

### **9.4.2 Commercial Factors**

Any 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.

### **9.4.3 Other Activities**

Military operations, oil and gas production and recreational activities may take place within the area to be covered by a Vessel Traffic Service. These activities will also influence the operation of the service and must be taken into account. A good working relationship needs to be established and maintained with other users of the area.

### **9.4.4 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.

### **9.4.5 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:

- Accuracy;
- Integrity;
- Availability;
- Coverage; and
- 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 Satellite System (GNSS)*" and A.953(23) - "*World-Wide Radionavigation System*".

#### **9.4.6 Datum**

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

#### **9.4.7 Display Symbolology**

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

### **9.5 Service Provision: Mandatory/Voluntary**

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 Conference 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 Regulations for the Prevention of Collision 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.

### **9.6 Types of VTS Service**

Having taken into account the geographical area, traffic density and traffic pattern, the VTS Authority will need to consider the types of service to be provided, as described in **chapter 5**.

### **9.7 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 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.

### **9.8 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.

## **9.9 Operational Management**

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

### **9.9.1 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.

### **9.9.2 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.

### **9.9.3 Places of Refuge**

It may be prudent to identify potential "Places of Refuge" to cater for marine emergencies at local and national level.

### **9.9.4 Separation Criteria**

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

- 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.
- 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 organisation.

### **9.9.5 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 including the coastguard.
- Training - Contingency plans should be exercised.

#### **9.9.6 Pollution Control**

Pollution is a specific concern resulting from an incident or emergency that may have far reaching consequences 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. Prevention measures may include special regulations and controls for vessels carrying hazardous cargoes, which should be addressed in the planning of the VTS.

#### **9.9.7 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).

#### **9.10 Security**

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.

In the current heightened security environment, and following the additional security measures adopted by the IMO at its Diplomatic Conference in December 2002, it is entirely sensible that national security organisations should take full advantage of the information generated by VTS centres (See 4.8). This is best achieved by recognising that security organisations should, where appropriate, become the recipients of VTS generated information as allied services, provided the safety of navigation is not affected.

With the increasing acceptance by national competent authorities of the IALA V-103 Model Courses, it needs to be recognised that such training does not address specific 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. To counter such circumstances, VTS Authorities should consider the need to protect against perceived vulnerabilities. This should be done in conjunction with the relevant national security organisation.

### **9.11 Internal Organisation**

Having identified the VTS Area, the number of sectors and the types of service to be provided, and 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 organisation must be firmly backed by documented administrative processes and operational procedures.

### **9.12 Legal Basis**

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

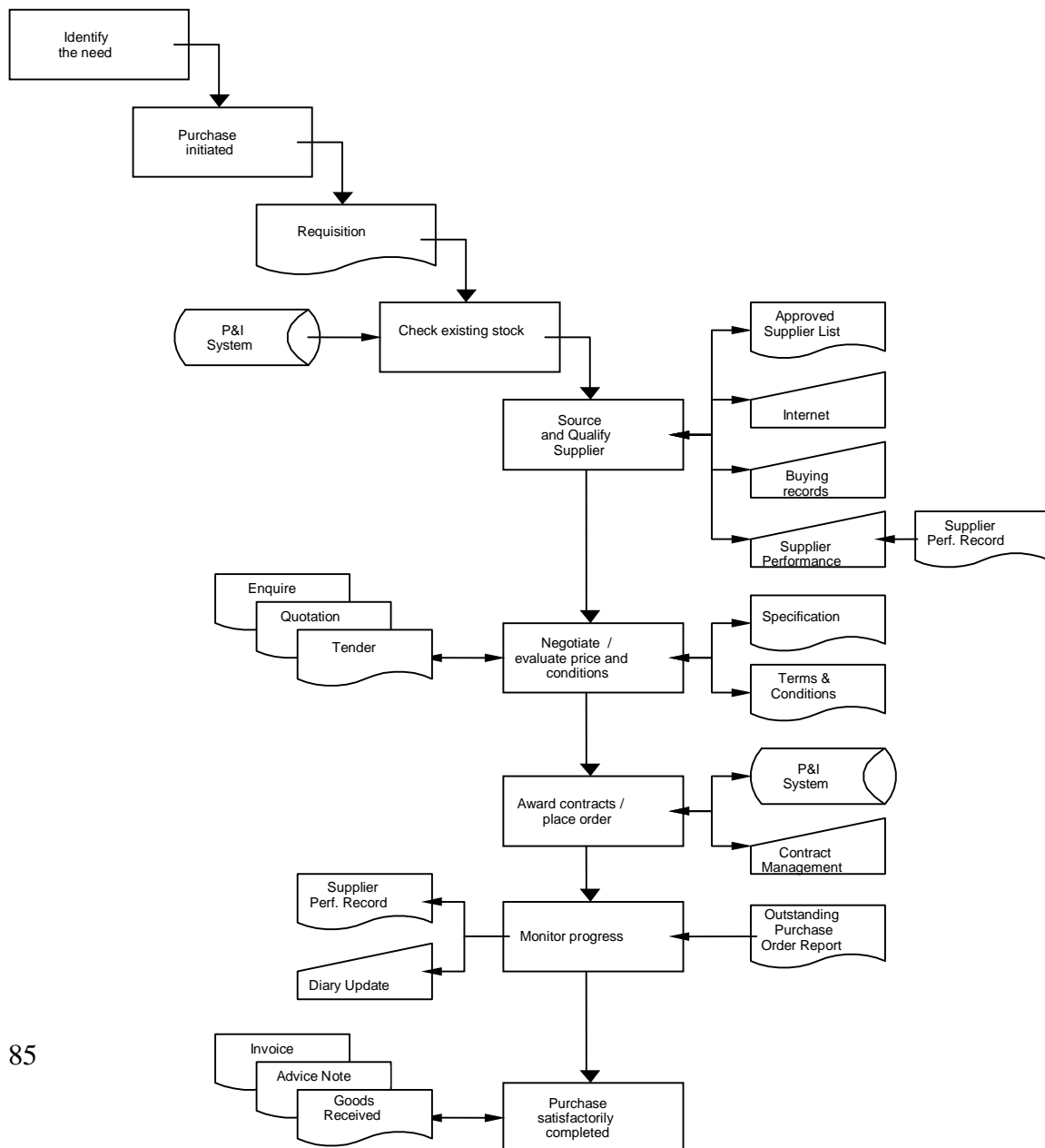
In planning a VTS, the powers and authority delegated to individual VTS Operators will need to be established by the VTS Authority. All VTS personnel should be aware of the legal basis under which they are operating and from which they derive the authority to interact with traffic. The following will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

- The type of service that may be offered by VTSOs. This is particularly relevant in respect of Navigational Assistance Services, 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

### 10.1 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:



The above diagram 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:

- Obtaining value for money through competition among suppliers, avoiding dependence on monopoly suppliers;
- 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 and ensure that the principle of open and effective competition is observed;
- Submitting requisitions in good time to enable effective Supplier competition;
- 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;
- Supporting the standardisation of equipment, goods, services and working practices;
- Securing on time delivery. In some countries this may be achieved through the use of time penalties;
- Verifying the capability of the supplier to provide reliable, quality products and services;
- Testing all products and deliverables at appropriate stages;
- Developing mutually satisfactory relationships;
- Protecting against corporate and financial risk through fraud, unethical behaviour or contractual liability;
- Economies of scale, efficiency gains and general cost savings through consolidated orders wherever possible;
- Ensuring individual and collective performance of all persons involved in the process;
- Publishing operational performance indicators;
- Ensuring appropriate skills are available in specification writing, negotiation,

supplier appraisal, and contract drafting/management;

- Developing key procurement and inventory personnel; and
- Effective monitoring of the progress of the procurement throughout the cycle.

## **10.2 Audit Controls**

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 Voluntary Audit Scheme, although both may impact on the procurement process.

## CHAPTER 11: VTS EQUIPMENT

### 11.1 Introduction

Traffic density and structure, navigation hazards, local climate, topography, environmental requirements, commercial aspects and the extent of a VTS area sets the requirements for VTS equipment and these factors will have substantial impact on life cycle costs of a VTS and the acquisition of VTS equipment. This may include:

- Communications;
- VTS Radar System;
- Automatic Identification System (AIS);
- Closed Circuit TV Cameras (CCTV);
- Hydrometeo Equipment; and/or
- VTS Data System.

The required features and, in particular, the need for coverage by sensors, e.g. radar, should be determined by an assessment of the service to be provided, the safety level to be achieved and the user requirements of the VTS system. Subsequently, suitable positions for the equipment should be determined by site survey, analysis, simulations and/or site-tests to ensure that required functions and coverage will be provided. Detailed guidance is given by IALA Recommendation V-119 - *Implementation of Vessel Traffic Services* and IALA Recommendation V-128 - *"Operational and Technical Performance Requirements for VTS Equipment."* V-128 is divided into three different levels of capabilities:

- **Basic** - applicable to VTS information service and, where applicable, navigational assistance service;
- **Standard** - applicable to all types of VTS as identified by IMO – information service, navigational assistance service and traffic organisational service – for areas with medium traffic density and/or without major navigational hazards;
- **Advanced** - applicable to VTS areas with high traffic density and/or specific major navigational hazards.

The VTS Authority should decide on appropriate levels of capability. These different levels may be used as applicable within a single VTS, for example, part of a VTS area may call for a Basic capability and another part may call for a Standard capability.



## **11.2 Communications**

Communications in a VTS area are currently predisposed towards voice systems, mostly using VHF radio. This requires a complex combination of procedural and language skills, which must be thoroughly understood by all VTS personnel. A VTS Operator will need to communicate with shipping for which he has responsibility and may also need to communicate with other operators or allied services. The ideal situation would be for the control of all communication equipment to be integrated into each VTS Operators console.

## **11.3 Communication with Shipping in the VTS Area**

Normally the communication coverage of the VTS area will be achieved by VHF using telephony or data transmissions.

Communication between shore and participating vessels, using appropriate international VHF channels can take place on simplex, as well as duplex channels. In the case of duplex channels, re-transmission from the shore may need to be carried out if the information received is of interest to other vessels to enable them better to comprehend the traffic situation.

Private channels may also be available for use between VTS centres and local service craft. However, in this case, local service craft should always be able to communicate with shipping on the appropriate international VHF channel.

It is of the utmost importance that the VHF communication network of a VTS is set up properly, with high quality and reliable equipment and interconnection. The number of VHF channels required for specific VTS usage should be assessed during the project definition phase and arranged with their national/international telecommunication authorities well in advance of the commissioning and acceptance phase. Often a VTS has, apart from the sub-area or sector frequencies, one or more general reporting or emergency frequencies.

The number of channels required is dependent upon the number of the various sub-areas and sectors that will be used and the overall traffic density. The VTS Authority should also seek permission from their national telecommunication authority to use VHF Channel 16 for emergencies and for calling ships that are not participating in the VTS.

Shipborne VHF equipment is normally capable of transmitting and receiving on the international channels 1-29 and 60-89 at full power (25W) and reduced power (1W). Where practicable, it is advisable to request low power transmission from ships. Communications with vessels should be recorded, for accident investigation, disputes, etc., in accordance with privacy and data protection requirements.

#### **11.4 Very High Frequency (VHF) Radio Communication**

It is common for the VTS to have its own independent VHF network, for use within specifically designated VHF channels. This network may be comprised of one or more VHF channels in different sectors of the VTS Area. The VTS Authority may require specific VHF channels to be designated by the National Telecommunications Authority for specific types of operations. The VHF equipment must comply with national and international regulations issued by the International Telecommunications Union (ITU).

#### **11.5 Long Range Communication**

In the case where a VTS Authority requires pre-arrival information, the normal maritime communication systems should be used and therefore an independent network is not required.

#### **11.6 Communication with Allied Services**

VTS centres should be equipped with the ability to communicate with allied services by the use of reliable and secure communication networks. It is usual for a VTS centre to be equipped with a point-to-point line with Maritime Rescue Coordination Centres (MRCCs) for this purpose. However, point-to-point lines have been found to be inadequate and unnecessarily expensive to establish and maintain. Therefore it is recommended that VTS centres should be equipped with a digital switched network, with caller identification.

#### **11.7 Other Communications**

The internal communication within a VTS is of the utmost importance. If there is more than one VTS centre it may be necessary for the operators in one VTS centre to communicate easily with operators in other VTS centres so that specific traffic information can be passed from one operator to another with a minimum of delay.

The following general types of communication may be required by a VTS:

- Between VTSOs in the same VTS centre;
- Where appropriate, between VTSOs in different VTS centres belonging to the same VTS;
- Between VTSOs of any adjacent VTS;
- With vessels about to enter a VTS area; and
- With pilotage, tugboats, SAR, port authorities and other authorities.

These types of communication can be achieved by using the following equipment:

- Public telephone lines;
- Private telephone lines;
- Telex;
- Email and other electronic transmissions over the internet;
- AIS;
- Facsimile;
- Radio telephony and microwave links; and
- Automated data transfer systems.

Where there is a need for communication between a VTS and a shore authority to have a high degree of operational importance, consideration should be given to providing direct telephone lines to increase the reliability and decrease the time of the connection.

### **11.8 VTS Radar System**

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);
- Part cover (areas chosen intentionally with some blind sectors);
- Total cover by one radar sensor (without any blind sectors); or
- Total cover by two or more radar sensors (for large VTS areas and to prevent shadow and other effects of radar targets). Stereographic processing of images from two or more radars may also be utilised for elimination of false (ghost) echoes.

In principle, VTS radars typically function like ships radars but they will in most cases need to operate simultaneously on short and long range, preferably without the need for operator adjustments. Weather-related phenomena such as sea clutter and ducting may further influence shore-based radars.

In addition, new challenges have developed over recent years, including:

- Solid state radars (less maintenance required);
- Introduction of other technologies, notably AIS, which require the presentation of radar information to be sufficiently accurate to avoid ambiguity;
- Antenna side lobes and ghost targets (multiple reflections) may lead to false and

dangerous results when radar returns and AIS plots are associated. High precision, low side lobe antennas and careful location of VTS radars is therefore required to allow for unambiguous correlation of position obtained from the two information sources;

- Offshore renewable energy developments, such as wind farms. VTS radars will normally not be dependent on Doppler shift and they are therefore not affected by the rotation of wind turbines, but the large towers may reflect radar signals resulting in false echoes and/or shadows. From a VTS Operator's perspective however, these false echoes are normally easy to distinguish. Shadowing may also present difficulties and Competent/VTS Authorities are therefore encouraged to enter into discussions with offshore renewable energy developers in order to minimise any potential effects on VTS operations;
- Increasing demands to see small targets in rough weather, if objectives include detection of targets for security purposes; and
- Requirement to reduce spurious / out-of-band emissions.

These challenges require new solutions to meet requirements that often are more demanding than those needed for shipboard equipment.

### 11.9 Radar Functions

When radar is required, it should be able to detect and track, for subsequent display, all specified moving or stationary targets which satisfy the detection criteria within the specified coverage areas and during all specified operating circumstances. Each radar should be equipped to reduce the adverse effects of rain and sea clutter and enhance the probability of target detection. The radar should also be designed and installed so as to eliminate, to the maximum extent possible, false echoes caused by side lobes or reflections from nearby structures.

The VTS Radar System should assist in the development of the vessel traffic image, by performing the functions shown in the **Error! Reference source not found.** below.

Parameters / Capability	Basic	Standard	Advanced
Path, time and track prediction			X
CPA	X	X	X
TCPA	X	X	X
Anchor watch			X
Vessels vector	X	X	X

Course, speed and label/identity	X	X	X
Collision alerts	X	X	X

Radar frequencies selected for VTS lie typically within the S band and X band frequencies, although higher frequencies, such as Ku band, are utilised. The majority of VTS services use X band radars as a best compromise, especially since technologies for rain clutter suppression have matured. Also, as a result of production volume, they are the least expensive. The second most used frequency is S band, due to better weather penetration in heavy rainfall. Radar operating in the S band is typically needed if precipitation rates frequently are greater than 25mm/h and required detection distance exceeds a few nautical miles.

The International Telecommunications Union (ITU) grants frequency band allocation, whereas permissions to transmit on given frequencies are granted on a national basis.

#### 11.10 Characteristics of Radar Targets.

The characteristics of VTS radar targets are defined by its height above sea level, its radar cross-section (RCS) and its fluctuations in RCS. Formally, the RCS is defined as the ratio between the power [in W] scattered by the target back towards the radar receiver and the power density [in W/m<sup>2</sup>] hitting the target. Thus RCS is measured in m<sup>2</sup> and has the dimension of an area. There is, however, no simple relation between the physical area of the target and the RCS, as the reflected power depends on the angle of incidence as well as target properties such as material and physical shape. Targets may fluctuate severely in RCS and the returned energy is highly dependent on propagation conditions.

The Table below provides recommended data to be used when defining requirements for a VTS.

TARGET				Design Requirements		
				Type of Capability		Height of Target
				Ba s i c	St a n d a r d	
				Radar cross section		
				S-band	X-band	
1	Aids to Navigation etc.			X		1 m <sup>2</sup>

	without radar reflector. Small open boats, fiberglass, wood or rubber with outboard motor and at least 4 meters long, small speedboats, small fishing vessels, small sailing boats and the like.							1 m ASL
2	Inshore fishing vessels, sailing boats, speedboats and the like.			X			3 m <sup>2</sup>	2 m ASL
3	Aids to Navigation with radar reflector.		X	X		4 m <sup>2</sup>	10 m <sup>2</sup>	3 m ASL
4	Small metal ships, fishing vessels, patrol vessels and the like.	X	X	X		40 m <sup>2</sup>	100 m <sup>2</sup>	5 m ASL
5	Coasters and the like.	X	X	X		400 m <sup>2</sup>	1,000 m <sup>2</sup>	8 m ASL
6	Large coasters, bulk carriers, cargo ships and the like.	X	X	X		4,000 m <sup>2</sup>	10,000 m <sup>2</sup>	12 m ASL
7	Container carriers, tankers etc.	X	X	X		40,000 m <sup>2</sup>	100,000 m <sup>2</sup>	18 m ASL

### 11.11 Detection Performance

The Tables below provide examples of calculated range performance typical for radar equipment suitable for the three levels of capability recommended.

Antenna Elevation	Target Type	Modelled as fluctuating point target		Detection and tracking ranges for standard atmosphere and rain/sea state as indicated					
		RCS	Ht	Basic recommendation		Standard recommendation		Advanced recommendation	
				Clear	2 mm/h rain	Clear	4 mm/h rain	Clear	10 mm/h rain
20m ASL	1	1 m <sup>2</sup>	1 m ASL	N/A		N/A		5 NM	NIL
	2	3 m <sup>2</sup>	2 m ASL	N/A		7 NM	4NM	7 NM	6 NM
						Up to sea state 3		Up to sea state 5	
	3	10 m <sup>2</sup>	3 m ASL	7 NM	4 NM	8 NM	5NM	9 NM	7 NM
				Up to sea state 3		Up to sea state 4		Up to sea state 6	
50m ASL	4	100 m <sup>2</sup>	5 m ASL	9 NM	8 NM	11 NM	9NM	12 NM	10 NM
				Up to sea state 4		Up to sea state 5		Up to sea state 7	
	5	1000 m <sup>2</sup>	8 m ASL	12 NM	10 NM	13 NM	11 NM	14 NM	13 NM
				Up to sea state 5		Up to sea state 6		Up to sea state 8	
	1	1 m <sup>2</sup>	1 m ASL	N/A		N/A		10 NM	NIL
100m ASL	2	3 m <sup>2</sup>	2 m ASL	N/A		10 NM	7 NM	12 NM	9 NM
						Up to sea state 3		Up to sea state 5	
	3	10 m <sup>2</sup>	3 m ASL	10 NM	6 NM	12 NM	8 NM	14 NM	12 NM
				Up to sea state 3		Up to sea state 4		Up to sea state 7	
	4	100 m <sup>2</sup>	5 m ASL	13 NM	12 NM	15 NM	13 NM	17 NM	15 NM
				Up to sea state 4		Up to sea state 5		Up to sea state 7	
	5	1000 m <sup>2</sup>	8 m ASL	16 NM	15 NM	18 NM	17 NM	20 NM	18 NM
				Up to sea state 5		Up to sea state 6		Up to sea state 8	
100m	1	1 m <sup>2</sup>	1 m	N/A		N/A		12 NM	NIL

ASL			ASL				Up to sea state 4
	2	3 m <sup>2</sup>	2 m		13 NM	5 NM	16 NM 10 NM
			ASL		Up to sea state 3		Up to sea state 5
	3	10 m <sup>2</sup>	3 m		17 NM	10 NM	18 16 NM NM
			ASL		Up to sea state 4		Up to sea state 7
	4	100 m <sup>2</sup>	5 m		20 NM	19 NM	22 NM 20 NM
			ASL		Up to sea state 5		Up to sea state 7
	5	1000 m <sup>2</sup>	8 m		23 NM	22 NM	25 NM 23 NM
			ASL				NM
					Up to sea state 6		Up to sea state 8

Antenna Elevation	Target Type	Modelled as fluctuating point target		Detection and tracking ranges for standard atmosphere and rain/sea state as indicated	
		RCS	Height	Standard recommendation	
				Clear	16 mm/h rain
20 m ASL	3	4 m <sup>2</sup>	3 m ASL	4 NM	3 NM
				Up to sea state 4	
	4	40 m <sup>2</sup>	5 m ASL	7 NM	5 NM
				Up to sea state 5	
	5	400 m <sup>2</sup>	8 m ASL	10 NM	8 NM
				Up to sea state 6	
50 m ASL	3	4 m <sup>2</sup>	3 m ASL	7 NM	4 NM
				Up to sea state 4	
	4	40 m <sup>2</sup>	5 m ASL	11 NM	8 NM
				Up to sea state 5	
	5	400 m <sup>2</sup>	8 m ASL	14 NM	13 NM
				Up to sea state 6	
100 m ASL	3	4 m <sup>2</sup>	3 m ASL	10 NM	NIL
				Up to sea state 4	
	4	40 m <sup>2</sup>	5 m ASL	14 NM	12 NM
				Up to sea state 5	
	5	400 m <sup>2</sup>	8 m ASL	18 NM	19 NM
				Up to sea state 6	



For detailed analysis, the recommended method for determination of radar coverage and range performance is a combination of site inspections and radar system performance calculations, made by experts with a sound operational and technical knowledge about the subject.

Calculation of performance should be focused on the smallest targets of interest in poor weather conditions. All applicable losses should be included in the calculations. The probability of detection and false alarm rates used should comply with that required to meet the performance required for the individual VTS.

#### **11.12 Radar Propagation Conditions**

Performance should, in all cases, be evaluated assuming standard atmospheric conditions. In addition, for each individual VTS, the influence from adverse propagation effects should be analysed in detail for areas of the world having tropical climate and dry and hot climate.

Ducting may occur almost anywhere and all systems should be designed to eliminate adverse effects from this. For most parts of the world, evaporation ducting tends to persist most of the time, giving extended range, especially for low mounted antennas. The effect will give average improvement in detection performance and may therefore be very useful in respect to security applications, if required. The effect is usually not stable enough to be calculated as a benefit in safety applications.

#### **11.13 Radar Accuracy and Target Discrimination**

Accuracy as well as range and bearing resolution/precision is necessary in order to have a clear and distinct appreciation of the movement of vessels, including those that are at anchor. Please consult IALA Recommendation V-128 for further guidance.

#### **11.14 Radar Tracking**

Provision of target tracking, where computers automatically follow radar plots and provide information in synthetic form, is done by a plot extraction process followed by an automatic tracking process. Plot extraction should be automatic in the entire VTS area covered by radar. Track initiation should be automatic, except in selected areas or manual depending on the concept of operations.

In automatic track initiation modes, all plots in a scan should be considered potential targets. Some of the plots will be associated with previously established tracks, while the remaining plots should be considered as candidates for new tracks, tentative tracks. Tentative tracks will become confirmed tracks if plots from consecutive scans "fit into the picture" within reasonable physical manoeuvrability limits, otherwise the tentative tracks are discarded.

The tracking system should be able to handle at least a certain number of tentative tracks and to initiate tracks and eventually to confirm tracks under certain conditions of Pd (probability of detection) and Pfa (probability of false alarm). It should also be possible to initiate a track manually. In manual track initiation, the operator using a graphical tool selects a plot on the radar display. When selected, this plot should form the starting point for a tentative track, which eventually should be confirmed or discarded, as in the case of automatic initiation.

If automatically or manually created tentative tracks persist over a certain length of time the tracks should be promoted to confirmed tracks. Confirmed tracks should be shown on the display. The tracking system should be able to handle at least a certain number of confirmed tracks as recommended in IALA Recommendation V-128 - *"Operational and Technical Performance Requirements for VTS Equipment"*.

If a confirmed track either moves outside a user defined maximum range, into a user defined non-tracking area and the quality of the track falls below a predefined minimum, or if the track cannot be updated with new plots over a certain length of time, then the track should be terminated. In certain cases, the operator should receive a warning as defined by the VTS Authority.

False tracks may appear as a result of noise, clutter (including wakes) and ghost echoes. The maximum number of false tracks allowed is dependent on role of the VTS. However, false tracks should generally be avoided and particularly in safety critical areas.

There is a trade-off between the time for confirmation of tentative track and the number of false tracks. A longer confirmation time implies less false tracks and it should be possible to balance this trade-off in the setup of the VTS.

Track loss may occur as a result of  $P_d < 1$  in combination with targets manoeuvring, especially in the vicinity of obstructions such as bridges. A level generally accepted is that each operator should correct up to one track loss per hour.

Swapping of track identity may occur as a result of targets moving close together or even merging for a period of time, especially if targets are overtaking with small difference in speed and course. A simple method of manual correction should be employed. In the case of AIS information being available for the radar track(s) in question, automatic correction should be performed. The problem may also be addressed by implementing operational procedures to separate targets or to prevent overtaking in critical areas.

The VTS authority should analyse critical areas, such as those in the vicinity of bridges, and provided a detailed explanation of their requirements with regard to tracking to VTS equipment suppliers to allow them to offer appropriate solutions.

### **11.15 Automatic Identification System (AIS)**

AIS is intended as a supporting tool to enhance safety of life at sea, the safety and efficiency of navigation, and the protection of the marine environment. In addition, it may contribute to maritime security. SOLAS Regulation V/19 requires that AIS should exchange data from ship-to-ship and with shore based facilities. Therefore, the purpose of AIS is to help identify vessels; assist in target tracking; simplify information exchange (i.e. reduce ship reporting using radiotelephony); and provide additional information to assist situational awareness. In general, AIS will improve the quality of the information available to the VTSO in a VTS centre or the OOW on board a vessel. AIS is a useful source of supplementary information to that derived from other navigational systems and sensors, including radar.

AIS has brought many benefits to VTS centres. Principal amongst these is the automatic and immediate provision of vessel identity (MMSI or call sign) which, where necessary, helps to facilitate rapid radio communication and ships data reception, thereby overcoming safety weaknesses and time consuming procedures inherent in the previous arrangements.

### **11.16 Objectives of AIS**

AIS shall:

- Provide information automatically to appropriately equipped shore stations, other ships and aircraft, including the ship's identity, type, position, heading, course, speed, navigational status and other safety-related information;
- Receive automatically such information from similarly fitted ships;
- Monitor and track ships;
- Exchange data with shore based facilities; and
- Assist in ensuring the highest possible level of safety and efficiency for vessel traffic in the designated area.
- Should reception of AIS data via satellite be included around here or somewhere else?

AIS should improve the safety of navigation by assisting in the efficient navigation of ships, protection of the environment, and operation of VTS, by satisfying the following functional requirements:

- In a ship-to-ship mode for collision avoidance;
- As a means for littoral states to obtain information about a ship and its cargo; and

- As a VTS tool, i.e. ship-to-shore (traffic management).

AIS should provide ships and competent authorities with information from the ship, automatically and with the required accuracy and frequency, to facilitate accurate tracking.

Mandating AIS carriage and establishing a service to receive, process and distribute the AIS signals received from vessels enhances safety and security and improves the ability to manage traffic.

Some shore facilities may need to act on the information received, others may need to monitor AIS and maintain an information database. For these reasons, a nationwide or regional network may be set up.

The service should also be capable of information exchange and distribution among several users ashore and afloat. Government agencies, allied services and commercial maritime interests may have justifiable needs for AIS data.

### **11.17 Use of AIS in VTS Operations**

Automatic Identification System (AIS) is a system that makes it possible to monitor and track ships from suitably equipped ships, and shore stations. AIS transmissions consist of bursts of digital data 'packets' from individual stations, according to a pre-determined time sequence. AIS data consists of shipboard information, such as: position, time, course over ground (COG), speed over ground (SOG) and heading. AIS use a broadcast and interrogation technology that operates ship-to-ship and ship-to-shore and includes limited communication capabilities. Shore stations receive the same information from AIS equipped ships within VHF range.

The International Maritime Organization (IMO) has established carriage requirements for merchant ships. The International Telecommunication Union (ITU) has defined the technical characteristics and ratified the global frequencies. In addition, the International Electrotechnical Commission (IEC) has developed methods for testing AIS for global interoperability.

AIS makes navigation safer by enhancing situational awareness and increases the possibility of detecting other ships, even if they are behind a bend in a channel or river or behind an island in an archipelago. AIS can also solve the problem inherent with radars, by detecting smaller craft, fitted with AIS, in sea and rain clutter. **Should we also mention the disadvantages of AIS? Limitations**

### **11.18 AIS Service**

For VTS purposes, an AIS service provides information from one or several AIS base stations to AIS users. In addition to vessel data, an AIS service provides status on AIS

equipment and management functions for the control of the AIS network. Where applicable, AIS should support regional Vessel Traffic Services between adjoining VTS centres.

### **11.19 Operational aspects**

The AIS service should provide timely, relevant and accurate information to assist the decision-making processes of a VTS. The AIS service may also support port operations by providing information to appropriate shore facilities. It provides automatic vessel position reports and movement information as it is received at remote sites throughout the service area. In support of incident response, the AIS service, operates in conjunction with the port authority, can provide information about traffic and the corresponding situational information. The AIS service also provides information to allied services to support their tasks.

AIS may provide:

- Timely, relevant, and accurate information about vessels within the area that might affect safety, security, or the decision making of the VTSO;
- Timely information about emergency and environmental conditions that might affect safety or the decision making of the VTSO;
- Where required, the transmission of relevant information to the mariner in a manner that does not distract from the task at hand, particularly in narrow, confined channels where there is heavy traffic; and
- Up-to-date knowledge regarding the route to be transited.

AIS, as well as existing aids to navigation and tools, pilotage systems, navigation management systems, and regulations provide information to the mariner but all these systems require integrity monitoring to ensure the information they impart is accurate.

AIS information may support the VTS Service with incident response in alerting vessels in or planning to enter the area of concern; VTS incident analysis may be supported by review of AIS information.

### **11.20 AIS Data and Data Rates**

There are different message types, including the ship's data, required by the IMO performance standards (as well as data necessary for communication management). AIS messages transmitted by AIS Class A mobile devices can be categorised as Static, Dynamic or Voyage Related data.

In general, the following information is available to be transmitted by AIS:

#### **11.20.1 Static (manual input)**

- Maritime Mobile Service Identity (MMSI);
- Call sign and name;
- IMO number;
- Length and beam;
- Type of ship; and
- Location of position-fixing antenna on the ship (aft of bow and port or starboard of centreline).

#### **11.20.2 Dynamic (automatic input)**

- Ship's position with accuracy indication and integrity status;
- Position time stamp (UTC seconds only);
- Course over ground (COG);
- Speed over ground (SOG);
- Heading;
- Navigational status (e.g., not under command (NUC), at anchor, etc. - manual input);
- Rate of turn;
- 

Voyage Related Information (manual input at master's discretion or as required by competent authority)

Ship's draught;

Hazardous cargo (type);

Destination and estimated time of arrival (ETA)

The data is autonomously sent at different update rates as follows:

- Dynamic information dependent on speed and course alteration (see Table 10.5); and
- Static and voyage related data every 6 minutes or on request (responds

automatically without user action).

Ship's manoeuvring condition	Reporting interval
Ship at anchor or moored and not moving faster than 3 knots	3 min
Ship at anchor or moored and moving faster than 3 knots	10 sec
Ship 0-14 knots	10 sec
Ship 0-14 knots and changing course	3 1/3 sec
Ship 14-23 knots	6 sec
Ship 14-23 knots and changing course	2 sec
Ship >23 knots	2 sec
Ship >23 knots and changing course	2 sec
Note: These rates apply to Class A ship borne AIS devices. Class B devices update every 30 seconds (or less frequently).	

### 11.21 Coverage considerations

In general, AIS coverage ranges should approximate VHF voice communication ranges. However, actual vessel traffic density or geographic considerations (i.e., mountains or other VHF occlusions) may determine the need for additional base stations.

AIS interoperability with adjacent VTS Authorities needs to be given careful consideration to ensure adequate coverage is achieved.

### 11.22 Short Safety Related Messages

Short Safety Related Messages are free format text messages. They can be addressed either to a specified destination (by MMSI) or broadcast to all ships in the area. When used by the VTS, their content should be relevant to the safety of navigation (e.g. an iceberg sighted or a buoy not on station). Such messages can contain a maximum of 158-162 characters. Although unregulated, these messages should be kept as short as possible.

Short Safety Related Messages are an additional means to broadcast maritime safety information; their usage does not remove any of the requirements of the GMDSS, such as NAVTEX. The VTSO should not assume that all Short Safety Related Messages have been read onboard.

### 11.23 Binary Messages

Binary Messages are additional predefined messages that may either be addressed or broadcast. Binary Messages may be transmitted and received by mobile AIS devices and

AIS Base Stations that are equipped to process these messages. Shore Base Stations may receive ship's Binary Messages and redistribute them to other ships and/or users.

The display capability of AIS Binary Messages is not part of the mandatory functions of the Minimum Keyboard and Display (MKD). Ships equipped only with MKD may not be able to receive this information unless they have additional hardware, and dedicated software.

These messages are dedicated to specific applications, examples are:

- Meteorological and hydrological data;
- Dangerous cargo indication;
- Fairway closed;
- Tidal window;
- Extended ship static and voyage related data;
- Number of persons on board; and
- Pseudo-AIS targets.

Binary Messages may reduce verbal communications and enhance reliable info exchange and reduce VTSO workload. Binary Messages are not intended to replace standard services such as GMDSS and SAR.

For further details, see IMO SN/Circ.236 - "Guidance on the Application of AIS Binary Messages."

#### **11.24 Assigned Mode**

In order for VTS to take full advantage of AIS, access to the capabilities of an AIS Base Station is required. This access should preferably be through an AIS service. With this access, the VTS may change the reporting rate or AIS channel, send short safety related messages, or perform other functions as necessary.

If authorised by the competent authority, a VTS may use the AIS capability to change the reporting mode (from autonomous to assigned mode, for example) of selected shipboard AIS units. This will enable the ship station to operate according to a specific transmission schedule. For example, the AIS reporting rate for a vessel transiting at a slow speed could be increased.

#### **11.25 Display of AIS data**

In the VTS centre, AIS data may be viewed on an electronic chart, either separately or combined, with the other data sources including radar. The VTSO should have the ability



to filter the displayed information. To gain the most benefit, the AIS information should be presented to the VTSO on an integrated display. For example, a target that is tracked by radar and AIS may be displayed with one symbol based on correlated information received from the two sensor types. The user may have the option to display the input from each sensor with two different symbols. It should also be possible to identify which sensor(s) are used to derive the target position.

IALA Guidelines on AIS include a description of the recommended AIS target symbols; these are intended for the onboard ECDIS/ECS systems. It is acknowledged that for VTS operational requirements a wider range of information may be appropriate; for example, the use of symbols that depict different types and sizes of vessels. Further, it may be necessary to show which vessels have pilots embarked, or other information.

The choice of AIS symbols to be used in VTS centres is matter for the VTS Authority to decide. It must be noted that the IMO and IALA guidance offered for onboard AIS symbology may not be adequate for a VTS, because of the requirement for more information by the VTS centres. IALA Recommendation V-128 - *"Operational and Technical Performance Requirements for VTS Equipment"* provides more information on this subject.

#### **11.26 AIS Data Validity**

Operators should be aware that the validity of AIS data received from ships is dependent on the proper installation of AIS, correctly interfaced and functioning ship's equipment, and correct manual input of static and voyage related data.

Caution has to be taken when using AIS data for processing. Wherever possible, AIS data should be validated and correlated against other sensors and information sources.

#### **11.27 IALA and IMO AIS References**

- IALA Recommendation A-123 - *"The Provision of Shore Based AIS"*;
- IALA Recommendation V-128 - *"Operational and Technical Performance Requirements for VTS Equipment"*; and
- IALA Guideline 1028 - *"Operational Issues AIS"*
- IALA Guideline 1032 - *"Aspects of Training of VTS Personnel relevant to AIS"*,
- IALA Guideline 1050 - *"The Management and Monitoring of AIS Information"*;
- IMO Resolution MSC74(69) Annex 3 - *"Recommendation on Performance Standards for an Universal Shipborne AIS"*

### **11.28 Radio Direction Finder (RDF)**

A number of VTS Authorities use RDF receivers to receive information on the position and assist in the identification of vessels, using their radio emission. In order to ensure accurate localisation, the use of two or more separate RDF stations is required. All bearings should be automatically displayed on the chosen screen when the signal has been received after a delay of no more than 3 seconds. The bearings should remain visible on the chosen screen as long as the vessel is transmitting a signal. Consideration should be given to the requirements for availability of the bearings after the vessel has ceased transmitting, such as through recording or instant replay capability.

RDF may be regarded as being complementary to AIS. However, it may aid in the localisation of vessels not equipped with AIS. RDF is not suitable for being used for continuous tracking.

### **11.29 Hydrological/Metrological Equipment**

It is essential that a VTS Centre has access to hydrological /meteorological (hydro/meteo) systems, which will provide local hydro/meteo information relevant to the VTS Area(s) and can, if required by the VTS Authority, disseminate this to their users and allied services. Where a VTS Authority determines a need to establish their own monitoring stations, the individual VTS Authorities should determine the accuracy and availability requirements for each VTS Centre. IALA Recommendation V-128 provides an indication of typical minimum accuracy and availability requirements.

Typical meteo variables are those provided by weather stations and include air temperature and humidity, wind velocity and direction, and visibility. In certain locations, hydro variables such as tidal level, tidal stream/current direction and velocity may be required. This data may be obtained through sensors or available in tables/databases from national authorities. Sensors providing this data, usually located at remote sites, communicate the variables to a VTS Centre via a telecommunications link. At the VTS Centre, graphical and/or numeric information is presented for use by the VTS Operators.

Hydrological and meteorological information may be integrated into VTS applications to provide the VTS Operator a real time assessment of the environmental situation in the VTS area of responsibility. Information collected from this equipment can be provided to ships to assist in assessing the waterway conditions.

A number of countries operate tide gauges and current meters to assist the prediction of tidal heights and streams or for the broadcast of real time information to shipping. The Intergovernmental Oceanographic Commission (IOC) is responsible for coordinating the Global Sea Level Observing System (GLOSS) program to establish global and regional networks of sea level stations for providing essential information for international oceanographic research programmes.

### **11.30 Closed Circuit TV (CCTV) Cameras**

The performance requirements placed on the CCTV service varies depending on traffic density, levels of VTS, special regional features and the coverage of the VTS area. CCTV information may be integrated into VTS applications to provide the operator a real time assessment of the situation in the VTS area of responsibility. Information collected from this equipment can be provided to ships to assist in assessing the waterway conditions. IALA Recommendation V-128 provides an indication of minimum performance requirements.

### **11.31 Information Management**

It is the task of the information management system within a VTS to collect, process and correlate information from different sources in order to present an integrated image of the traffic, its environment and maintain situational awareness. This information may include:

- Communications, internal and external;
- Sensor data, i.e. data used to generate the vessel traffic image such as radar, CCTV, AIS;
- Shipping information data, i.e. vessel and cargo data, including vessel movement information;
- Meteorological and hydrological data; and
- Data from other sources if relevant.

In parallel to presentation of information to the operators, the information or part hereof, may be recorded and stored for later use.

### **11.32 Operator Interface**

The Operator Interface should include the display of the vessel traffic image, including the traffic situation and corresponding traffic information.

### **11.33 Vessel Traffic Situation Display**

A VTS display having mapping graphics, analytical graphics and overlay information should be provided to enable a VTS Operator to have a concise picture of the geographical features, waterways and navigational lanes. When this information is being displayed, in many cases the radar video echoes of the coastline should be suppressed beyond the coastline, making this area of the display available for other synthetic information. Definitions of the requirements and accuracy of all the graphic possibilities need to be developed during the project definition phase.

If Radio Direction Finders (RDF) are included in the system, the bearing lines should be shown on VTS displays, with an option for the operator to switch them off. IALA has developed a recommendation on the use and presentation of symbology at a VTS centre (including AIS). VTS Authorities should refer to Recommendation V-125 for information on this matter.

#### **11.34 Vessel Traffic Information Display**

In addition to the vessel traffic situation display a VTS should include display of textual information in the form of tables etc. A list of the vessels being tracked by radar and/or AIS should ideally include static and dynamic information concerning the vessel, for example vessel's name, call sign, IMO number, MMSI, ETA, ETD, course, speed and position.

#### **11.35 Work Environment - VTS Operator Positions**

A console should be provided at every VTSO position with the equipment integrated in the most ergonomic arrangement. The illumination of the operator position should be such that all relevant equipment such as the VTS vessel traffic image, communication equipment, target data etc. can be monitored effectively and administrative tasks can be carried out at the same time. Daylight displays for radar equipment have the advantage that they can be operated more efficiently in normal room light levels.

Care should be taken when choosing the site for the VTS consoles that VTSO positions do not interfere with each other especially regarding sound. In addition to the various sensors and communication equipment, access to database information is necessary at a VTSO's position for reference purposes and for providing information to shipping and/or allied services.

#### **11.36 Operational conditions, redundancy and emergency precautions**

The operational conditions for VTS equipment will vary from one place to another. In some countries the availability and reliability requirements need to take into account extremes of temperature or precipitation, whilst in others special attention may need to be paid to wind force (including gusts) or earthquake resistance. The maintenance and availability of remote sensors should be given special consideration and adequate redundancy provided. Likewise, remote sensing equipment may need protection not only from the weather but may also need enhanced security protection.

To ensure adequate availability and reliability, vital parts of the VTS, e.g. all operational VTS communication services, should have backup systems with an emergency power source independent from the normal power supply. The need for redundant sensors and even an alternative site for the VTS centre should be considered - IALA Recommendation V-119 - *"The Implementation of Vessel Traffic Services"*. Where provision is made for an alternative site for the VTS centre, operations should be capable of being easily transferred

to the secondary location in the event of an emergency or maintenance situation that causes the temporary closure of the primary VTS centre.

When determining the position and range of radar equipment, the possibility of radar malfunction should be taken into account, and where practicable the arrangements should enable another radar, or AIS where appropriate, to provide cover for the sub-area or sector affected. One or more spare VTSO consoles should also be considered to:

- Substitute for any console that is unserviceable;
- Be used for on-the-job training;
- Where a need exists, be used by a VTS Supervisor;
- Where appropriate, be used in the co-ordination of emergencies.

Furthermore, the VTS should not be entirely dependent on synthetic (computer generated) images of the traffic. Instead, a combination of raw radar video and extracted information is recommended. This will provide the VTSO with a means to verify track positions and the experienced VTSO will often be able to classify the individual target on the basis of the radar video. A VTS system should also be flexible and easily updateable alongside of the routine operations of the VTS centre, without the need for interrupting VTS operations.

### **11.37 Availability and reliability of equipment**

The equipment performance parameters are strongly dependent upon the services to be provided which influences the Mean Time Between Failures (MTBF) and the availability of the service. Information on availability and reliability methods is given in the IALA Guideline on the Availability and Reliability of Aids to Navigation.

## **CHAPTER 12: VTS PERSONNEL**

### **12.1 Introduction**

VTS Operators, masters, bridge watchkeeping personnel and pilots share a responsibility for good communications, effective co-ordination and 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 personnel at each VTS centre, based on the service type or types 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.

### **12.2 Roles and Responsibilities**

#### **12.2.1 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 being collected.



### **VTS Operator Flushing (Belgium) VTS**

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 the 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 Organisation 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 and/or circumstances; and
- Maintain a log of all incidents/accidents and all other relevant events occurring within the area of responsibility.

### 12.2.2 VTS Supervisor

The VTS Authority may establish the post of VTS Supervisor. The VTS Supervisor is responsible for assisting, managing and/or co-ordinating 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.





### **Duty Port Controller (Supervisor) - London VTS**

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.

#### **12.2.3 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. Ideally, the VTS Manager should also possess a VTS Operator/Supervisor qualification.

Basic knowledge of VTS functions and the tasks performed by the operational personnel 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;
- Ensuring that the training and certification of VTS personnel are appropriate to the service types being provided;
- Ensuring VTS quality standards are maintained;
- Maintaining awareness of continuing development for the VTS centre(s);
- Planning and developing of 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. To this end, the Manager should ensure that all such events are properly recorded and readily available for examination by the Competent/VTS Authority.

#### **12.2.4 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 to the VTS operational personnel. 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.

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.

### **12.3 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 to include emergency 24 hours cover.

#### **12.3.1 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.

#### **12.3.2 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.

### **12.4 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. Invariably this will be a balance between numbers of factors that a VTS Authority will need to keep under periodic review, such as:

- 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;
- 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 organisation 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.

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, as per the current IMO Resolution A.857(20) - Annex 2.

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

## **CHAPTER 13: TRAINING AND QUALIFICATION**

### **13.1 Introduction**

A major factor in the efficient operation of a VTS centre is the standard of competence of its personnel. Recognising that VTS personnel are members of a profession whose principal interaction is with mariners and maritime pilots for the safe management of maritime traffic, their competence needs to reflect that professional responsibility.

In a VTS area, as specified by the relevant VTS Authority, VTS personnel should be capable of interacting with vessel traffic by providing information, navigational assistance and traffic organisation, as and when required by the VTS or vessel concerned. It is for the VTS Authority to ensure that appropriately trained personnel are available to undertake these commitments.

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

### **13.2 Publications**

IALA has prepared several publications that provide recommended standards and guidelines on the aspects concerning the training and qualification of VTS personnel. (Annex 7)

### **13.3 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, annual assessment and revalidation 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 VTS Operators and Supervisors. (See also Annexes 1,2 and 3 - IMO Resolution A.857(20), SOLAS Chapter V Regulation 12 and MSC Circular 1065).

### **13.4 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 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.

### **13.5 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 which 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.

### **13.5 Selection and Recruitment**

Prospective candidates for VTS Operator training (V-103/1) should meet the minimum entry requirements as defined by the Competent/VTS Authority. The selection procedure for newly recruited VTS Operators should, at a minimum, include aptitude assessment, medical examination, together with an assessment of the personal suitability of the candidate.

The selection of personnel already in possession of a VTS Operator's Certificate together with the appropriate On-the-Job Training (OJT) endorsement will depend largely on previous operational experience, if any, as a VTS Operator at a VTS centre.

Personnel 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. The VTS Authority should ensure that such personnel have received VTS Operator training and any additional training as may be necessary to meet the required standards of competence for a VTS Supervisor.

### **13.6 Medical (Physical/Mental) Requirements**

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

### **13.7 Personal Attributes**

Personal attributes are important factors in the selection criteria. A continual assessment should be made of the candidates' suitability throughout the selection process. 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.

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### 13.8 Aptitude Assessment

Aptitude assessments should be carried out prior to recruitment. All prospective candidates should be assessed, even if they have previous maritime experience. Assessments, which employ simulation of traffic movements, can be used. Assessments should be designed to determine the ability of candidates to:

- Select relevant information from non-relevant information;
- Combine auditory and visual information;
- Demonstrate spatial and situational awareness;
- Demonstrate alertness and decisiveness in all situations;
- 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.

### 13.9 IALA Model Courses

The basis of VTS training is set out in the IALA Model Courses. These courses are not intended to be used directly as course material but are a guide that can be adapted in two ways:

- To meet the entry level knowledge of candidates and,
- To enable course design to be matched to the requirements of the appropriate Competent/VTS Authority.

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

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.



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### 13.10 Competence Charts

The competence charts in IALA Recommendation V-103 have been used to develop the detailed teaching syllabus and form the foundation of the Model Courses. The charts 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 Competence Charts in IALA Recommendation V-103 follow a similar format to that of the IMO Model Courses and are based on the STCW 95 Code.

### 13.11 VTS Operator and Supervisor Training

VTS Operator and Supervisor training should be carried out at an accredited VTS training institute 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 institutes and organisations 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 VTS personnel, 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.

### 13.12 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 VTS Operator can be acquired and assessed.

VTS simulation should provide sufficient behavioural realism to allow personnel to acquire skills appropriate to the training objectives. VTS simulation can also be augmented with equipment to enhance realism and provide experience of the operating capabilities of the VTS equipment concerned. The level of physical realism should be appropriate to training objectives and include the capabilities, limitations and possible errors of such equipment. Scenarios may also be used that would not normally be encountered in everyday situations. For more information see IALA Guideline No.1027 - *"Simulation in VTS Training"* contains useful information concerning the design and implementation of VTS exercises using a simulator.



**VTS Training on a Simulator - Port of London Authority**

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

On appointment to a VTS centre, the operator trainee will undergo On-The-Job Training (V-103/3) in order to acquire a thorough knowledge of the particular circumstances and requirements appropriate to the VTS centre and its relevant VTS areas. On satisfactory completion of the On-The-Job Training, the appropriate endorsement will be entered on the

VTS Operator Certificate or 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.

It is important to ensure that the On-The-Job Training programme is properly structured and that operator trainees achieve a common minimum level of knowledge and skill as defined by the VTS Authority. It is useful to deliver this training by utilising a Training Task Book. An example of the VTSO OJT Task Book can be found in Model Course V-103/4. A similar process is followed for a VTS Supervisor endorsement.

#### 13.14 On-The-Job Training Instructor (OJTI) Training

The knowledge, skills and experience of VTS OJT Instructors are key attributes in the successful training of VTS personnel 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.



**OJT - Great Belt VTS**

#### 13.15 VTS Certification - Qualification

This section describes the certification process for new VTS personnel, existing VTS personnel without V-103/1 Course Certificate and how to maintain this certification.

##### **Qualification and Authorisation**

VTSO Course Certificate (IALA V-103/1) + Competent Authority requirements  
= VTSO Certificate

VTSO Certificate + OJT Endorsement (V-103/3)  
= VTS Authorisation to Operate

**13.15.1 Assessment**

IALA Guideline No. 1017 - "Assessment of Training Requirements for existing VTS Personnel, Candidate VTS Operators and the Revalidation of VTS Operator Certificates", describes the assessment of training requirements for existing VTS personnel, candidate VTS Operators and the revalidation of VTS Operator Certificates. The guideline gives advice on prior learning assessment when considering whether training is necessary or not for VTS personnel to be awarded a VTS Operator Certificate in accordance with IALA Recommendation V-103.

**13.15.2 Certification of New VTS Personnel**

A VTS Operator 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 institute. Upon successful completion of the necessary requirements for the Competent/VTS Authority a VTS Operator Certificate and/or 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 as such.

VTS Supervisor training should be carried out at an accredited VTS training institute 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. On-The-Job Training may follow according to the requirements of the VTS Authority.

An On-The-Job Training endorsement for the VTS Operator Certificate 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.

**13.15.3 Certification of Existing VTS Personnel (without IALA V-103/1, 2)**

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

Existing VTS centres may have VTS Supervisors who have operational experience, but have not acquired V-103/1 and V-103/2 Course Certificates. The VTS Authority should take necessary steps to ensure that their VTS Supervisors meet the required level of competence according to V-103/1 and V-103/2.

The following methods may be used for assessing competence of existing VTS Personnel, 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 candidate does not have the required competence, appropriate training should be given.

#### **13.15.4 Maintaining Certification**

In order to maintain certification of VTS operational personnel, the VTS Authority should ensure that all operational personnel, under their jurisdiction, undergo an assessment at regular intervals. This could be in the form of a continual assessment at the VTS centre or at a training institute accredited to train according to IALA Recommendation V-103.

If VTS operational personnel fail an assessment or have had a break in service, for whatever reason and for a period as determined by the VTS Authority, the operator concerned may be required to undergo refresher training, or certificate revalidation as deemed appropriate by the Competent Authority.

#### **13.15.5 Updating/Refresher Training**

Updating/Refresher training is training required by the Competent and/or VTS Authority in order to ensure that the level of competence is maintained appropriate to the types of service provided by the particular VTS centre when, for example, there has been a break in service, new equipment has been installed or new operating procedures/regulations introduced or new developments have occurred affecting the VTS area.

Refresher training may follow an assessment and/or may be given periodically according to the requirements of the Competent and/or VTS Authority or when deemed necessary by the VTS Authority.

Refresher training may be carried out by a VTS Authority or by means of a formalised course, approved by the Competent Authority.

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**13.15.6      Revalidation Training**

Revalidation training is training required by the Competent and/or VTS Authority in order to revalidate the VTS Operator Certificate. The period of revalidation is determined by the Competent and/or VTS Authority.

**13.16      Accreditation of VTS Training Organizations**

Accreditation is the independent review of VTS educational programs at training institutes and organizations involved in VTS training. The purpose of accreditation is to ensure, as far as possible, that the services provided by the institute 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 of VTS Training Institutes for Training VTS Personnel*", sets out the process by which VTS Training Institutes can achieve accreditation and approval to conduct education training leading to the issue of V-103/1, V-103/2 and V-103/4 Course Certificates.

## **CHAPTER 14: PROMULGATION OF VTS INFORMATION**

### **14.1 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.

### **14.2 Requirement**

The IMO has set out the requirement for the publishing of 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 and in the "World VTS Guide.

In setting this requirement, it was recognised that VTS information is published in a variety of nautical publications, including the IALA/IMPA/IFSMA/IAPH/IMHA World VTS Guide, 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.

### **14.3 Promulgation of Information**

VTS authorities are advised to consider the extent and means of publishing information about the services that they provide and particularly to ensure that all potential marine users of their services are fully briefed about 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 World VTS Guide, the appropriate Lists of Radio Signals and marine publications about ports and port entry. Additionally, it is recommended that other, more immediate means of promulgation should be considered: such as a website, 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.

#### **14.4 Information**

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

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
VTS centre	Define location (s) and details of VTS centre(s) (Location, Telephone, Fax and e-mail identities)
Communications	VHF channels to be used Other communications channels Language or 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.
Radar surveillance	Radar coverage and, if appropriate, its 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



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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.
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.

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#### **14.5 IALA World VTS Guide**

VTS authorities having entries in the World VTS Guide, in addition to providing the information listed above, are requested to forward information in the format described below.

#### **14.6 Categorisation of VTS**

When considering the development and implementation of VTS, the Competent/VTS Authority will need to decide on the type of service that is to be provided, the availability of the service and the training standards of the staff that will provide the service. The type and availability of service, when considered together, make up the Categorisation of the VTS. There are two potential beneficiaries of 'categorising' VTS, 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
- The 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.

The categorisation of a VTS, designed to benefit the mariner, is expressed in terms of a coding mechanism (overleaf), which is based on similar regimes already in place in the aviation and maritime worlds. The code is designed to offer essential information, on the type and availability of the service, to the mariner in a simple, easy to read, format. It is a compilation of VTS elements that are the core requirements for categorisation, as identified by IALA. The use of the code enables sub-areas or sectors within a VTS area to be categorised differently, if necessary.

## 14.7 Categorisation Coding

### 1. Service Availability

X = 24 hours

Y – Other, for example

Code Number	Explanation
1	24 hours except holidays
2	24 hours weekdays only
3	All others (between the hours specified)

An entry of Y3 (0900-1700) indicates a service that is provided only between 0900 and 1700 daily.

### 2. Vessel Traffic Image Generation

Indicated by "T" and code number from table

Code Number	Explanation
1	Automatic Identification System (AIS)
2	Real Time Tracking
3	Radar
4	Closed Circuit Television (CCTV)
5	Visual
6	Radio Direction Finder (RDF)
7	VHF Radio Position Reporting
8	Satellite Position Reporting
9	Satellite Surveillance

An entry of T136 indicating that the service provided incorporates the following: AIS; RADAR, and RDF.

### 3. VTS type of Service

Information Service	Indicated by <b>INS</b>
Navigation Assistance Service	Indicated by <b>NAS</b>
Traffic Organisation Service	Indicated by <b>TOS</b>

#### 4. Availability to Allied Services

A service that includes information Indicated by **AS** exchange with other VTS or allied services.

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Example of the Code:

"VTS/Y3(0900-1700)/T136/INS+TOS/AS"

This example describes a VTS that is available from 0900 to 1700 daily; that builds its vessel traffic image using AIS, radar and RDF, that provides information and traffic organisation services, and has communications with other VTS or allied services.

## **CHAPTER 15: ADMINISTRATIVE REQUIREMENTS**

### **15.1 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 will also dictate the extent to which additional VTS administrative support will be required.

### **15.2 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 administration support required for the proper operation of vessel traffic services. This will involve:

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

### **15.3 Personnel**

It is a key function of support to ensure that trained, qualified and well-motivated staff is available for duty, both routine and in an emergency. Detailed guidance about personnel matters, training and qualifications are contained in chapters 11 and 12.

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 organisation, including position descriptions;
- Personal health monitoring; and
- Workplace health and safety management and training.

#### **15.4 Legal Matters**

The international legal basis for VTS is addressed in chapter 2. 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 formally 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.

#### **15.5 Equipment and Facilities**

Details on equipment requirements are contained in chapter 11. 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.

#### **15.6 Processes and Procedures**

Administrative activities in support of operational procedures should include:

- Establishment, maintenance and audit of a Quality Management System. (chapter 18) This may draw on the external support from a classification society;
- Documentation of procedures including configuration management to capture and implement operational changes;
- Management of Pilotage Exemption Certificate (PEC) procedures (if applicable);
- 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.

### **15.7 Finance**

There are two aspects of finances that may need consideration: internal - control of the budget of the VTS centre in terms of income and expenditure: and external billing associated with use of the port or waterway services. Specific tasks associated with finances include:

- Accounting/book-keeping;
- Billing services - if there are charges for VTS services, 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.

### **15.8 Security**

The IMO has established international guidance on maritime security. Many of these requirements are discussed in more detail in the International Ship and Port Facilities Code (ISPS) and in chapter 4.

Two aspects of administration of security requirements for the VTS must be considered: 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.

### **15.9 Other Administrative Activities**

Depending upon the size of the operation, other functions may need to be considered such as transportation, provision of parking facilities, fire fighting arrangements, visits by VIPs or school parties and other public relations activities. Public information is covered in more detail in chapter 16. 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.

### **15.10 Distractions**

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.

The two main types of distractions are:

1. Authorised or necessary; and
2. Unauthorised or unnecessary

Authorised or necessary type distractions may be caused by:

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

It very often happens that certain unauthorised or unnecessary distractions are tolerated by management or even operational colleagues.

Unauthorised or unnecessary type distractions, which are often tolerated, 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. Ways of controlling these unwanted distractions could be 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**

### **16.1 Introduction**

The nature of VTS operations is such that there may be a requirement to access, analyse and review previous events. Therefore, a requirement is 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.

### **16.2 Purpose of Recording and Replay**

Recordings may be required for the following purposes:

- 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.

### **16.3 Types of Data to be Recorded**

The following areas should be considered for data capture (IALA Recommendation V127 - *"Operational Procedures for Vessel Traffic Services"* section 2.1.1), 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.)

Port Management Information Systems 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 handling allocations ;
- Meteorological and hydrological data;
- Logs and textual records; and
- Operator actions (HMI)

#### **16.4 Recording frequency and sampling rates**

The frequency of sampling for recorded data sets should be appropriate for each specific type of data (e.g. continuously for audio, but not so for met or hydro 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 unwanted loss of recordings.

#### **16.5 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 archive a period of recorded data to other media (e.g. DVD-ROM, 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 entities should be considered for this purpose (e.g., archival or statistical administrations).

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 media (DVD-ROM 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.

### **16.6 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**

### **17.1 General**

Vessel Traffic Services operate in the public interest. 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.

### **17.2 Information Policy**

VTS authorities should adopt an information policy. If the VTS centre is part of a larger organisation, its policy will need to align with those of the parent organisation. 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 media liaison person, a suitable person should be nominated to liaise with the media, as necessary, on a case-by-case basis. In every case the media liaison persons 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 appointed media liaison person 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 nominated media liaison person at regular intervals during operations and/or whenever important developments occur. The VTS Authority should ensure that released information is timely, factual, accurate and related 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;
- have a negative effect on a person's privacy; or
- affect the outcome of any investigation or future legal action.

Due care shall 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.

### **17.3 Relationships with the Media**

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 be provided by the media liaison person only, to help ensure that the main resources of the VTS authority and VTSOs are devoted to the incident, without being 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.

### **17.4 Provision of Information**

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 those intent on malpractice or sabotage.

VTS authorities should establish 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. VTS authorities have a duty-of-care to ensure that these procedures are robust.

### **17.5 User Education and Public Awareness Programs**

A VTS may find it beneficial to implement a program 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 organisations and non-traditional VTS stakeholders/users,

such as marine construction companies, shipping agents, and transportation authorities for other modes of transportation.

The program 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 and communications requirements, and national and 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.

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

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. The benefits of the public visiting a VTS centre in operation helps to promote a better understanding of their work and fosters more positive attitudes towards the safety of navigation and the protection of the environment.

### **17.7 Participation in Advisory Committees**

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 organisations.
- 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**

### **18.1 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 type and level 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.

### **18.2 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.

### **18.3 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.

### **18.4 Result Oriented Messages**

A fundamental principle of VTS communications is that advice and instructions should be "result oriented" only; leaving the execution to 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.

## 18.5 Standard Phrases

Guidance on maritime communications can be found in:

- Standard phrases for ship-to-shore communications are defined in IMO Resolution A.918(22) - "*IMO Standard Marine Communication Phrases*"; and
- Standard Reporting Procedures, IMO Resolution A.851 (20) - "*General Principles for Ship Reporting Systems and Ship Reporting Requirements*".

## 18.6 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 probability of the purpose of the message being properly understood. It is at the discretion of the shore personnel or the ship's officer whether to use one of the message markers and, if so, which marker is applicable to the situation. If used, the message marker is to be spoken preceding the message or the corresponding part of the message. The contents of all messages directed to a vessel should be clear; IMO Standard Marine Communication Phrases should be used where practicable.

## 18.7 Message Markers

There are eight types of Communication Messages that are frequently used in VTS

These are:

<b>INFORMATION</b>	<b>WARNING</b>	<b>ADVICE</b>	<b>INSTRUCTION</b>
<b>QUESTION</b>	<b>ANSWER</b>	<b>REQUEST</b>	<b>INTENTION</b>

### 18.7.1 Message Marker "INFORMATION"

This Marker is used to convey observed or predicted facts and situations; it is generally used for navigational and traffic information. The action taken by the recipient is at their discretion. Any decision taken onboard using this message could be influenced by additional information that may not be available to the VTS centre.

Example 1: Vessel *Piero* this is VTS - INFORMATION - Vessel *Goldwing* is predicted to overtake to the west of you in the vicinity of Buoy xx.

Example 2: Vessel *Piero* this is VTS - INFORMATION - the next High Water at Port XX is predicted to be at xx hrs xx mins, at a height of xx.x metres.

### 18.7.2 Message Marker "WARNING."

This Marker is used to convey potentially dangerous situations or observed developing situations. The contents of a Warning Message should be immediately assessed in conjunction with any additional information that may not be available to the VTS centre



and corrective action taken where necessary. The outcome of any action taken based on the warning is the responsibility of the recipient.

Example 1: Vessel *Peiro* this is VTS - WARNING - according to our equipment you appear to be heading towards shallow water - brg xxx degrees, distance xx.x miles/cables from you.

Example 2: Vessel *Peiro* this is VTS - WARNING - according to our equipment you appear to be dragging your anchor. Please check and confirm your position.

### 18.7.3 Message Marker "ADVICE"

This Marker conveys that the message contains a recommendation that should be considered by the recipient in making navigation related decisions.

Advice Messages must not contain extraneous information. As circumstances warrant, VTS shall update information provided to mariners to ensure that the most recent information is available on which to base navigation related decisions.

The duty VTSO should use their professional judgement and all available information in deciding when interaction to provide an Advice Message is appropriate. When interaction to provide an Advice Message is appropriate, the message should be concise and relevant.

Example 1: Vessel *Piero* this is VTS - WARNING - according to our equipment you are still standing into danger with shallow water bearing xxx degrees, distance xx.x miles/cables from you - ADVICE - you should proceed to the West for safer water.

Example 2. Vessel *Sunrise* this is VTS - ADVICE - you should proceed to anchorage Charlie to await further instructions.

### 18.7.4 Instruction: Marker "INSTRUCTION"

This Marker conveys that the message is a direction given by the VTS centre under the provisions of a statutory regulation.

The sender must have delegated authority to send such a message. The recipient has a legal obligation to comply with this message unless contradictory safety reasons exist, which then have to be reported immediately to the sender.

Generally masters of vessels will respond promptly and carry out instructions given by a VTS. However, it should be recognised that there may be occasions when an instruction by a VTS is disregarded because the master has additional information not available to the

VTS centre and he decides on another course of action. For example, a vessel not visible to the VTS may be a contributing factor to the navigational situation.

Example 1: Vessel *Goldwing* this is VTS - INSTRUCTION - do not enter the Prohibited Zone - bearing xxx degrees, distance xx.x miles/cables from you.

Example 2: Vessel *Goldwing* this is VTS - INSTRUCTION - the large Container Vessel *Europa* is experiencing some difficulty swinging in the fairway off your berth. Do not leave your berth until advised by VTS.

#### 18.7.5 Message Marker "QUESTION"

This Marker indicates that the following message is of an interrogative character and calls for a reply. The use of this marker removes any doubt as to whether a question is being asked or a statement is being made, especially when interrogatives such as what, where, why, who, how are additionally used at the beginning of the question. The recipient is expected to reply with an answer.

Example: Vessel *Tatsua Maru* this is VTS - QUESTION - what is your present maximum draft?

#### 18.7.6 Message Marker "ANSWER"

This Marker indicates that the following message is the reply to a previous question. It should be noted that an answer should not contain another question.

Example: VTS this is Vessel *Tatsua Maru* - ANSWER - my present maximum draft is zero seven metres."

#### 18.7.7 Message Marker "REQUEST"

This Marker indicates that the following message is asking for action from others with respect to the vessel. The use of this marker is intended to signal: "I want something to be arranged or provided." For example, ship's stores requirements, tugs, or permission to proceed.

Example: Vessel *Piero* this is VTS - REQUEST - please stand by on VHF channel One Two.

### 18.7.8 Message Marker "INTENTION"

This Marker indicates that the following message informs others about immediate navigational action intended to be taken. The use of this message marker is logically restricted to messages announcing navigational actions by the vessel sending this message.

Example: VTS this is vessel Vessel *Tatsua Maru* - INTENTION - I will reduce my speed in xx minutes.

## 18.8 Developing Operational Procedures

Operational procedures should be drawn together into an Operations Manual available to all VTS Staff. Consideration should be given to including information relating to Policy, Organisation and Administration, linked to chapter 14, to provide guidance for VTSOs in appreciating their role within the agency providing the service either as a part of the Operations Manual or as a standalone linked document.

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

The 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 type and level 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.

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.

IALA Recommendation V-127 identifies a distinction 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. A summary of the procedures is shown at Annex 9.

### **18.9 Standard Marine Communication Phrases (SMCP)**

Attention is drawn to the importance of using standard terminology as prescribed in SMCP. IMO Resolution A.918(22) - "*IMO Standard Communication Phrases*".

## CHAPTER 19: QUALITY MANAGEMENT IN VTS

### 19.1 Background

At its twenty-fourth session, the IMO Assembly adopted Resolution A.973(24) - "*Code for the Implementation of Mandatory IMO Instruments*" and Resolution A.974(24) - "*Framework and Procedures for the Voluntary IMO Member State Audit Scheme*". The two resolutions are complementary, and the Voluntary IMO Member State Audit Scheme described in Resolution A.974(24) is based on the implementation of the Code contained in Resolution A.973(24).

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;
- 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;
- IALA Guideline 1034 on the Certification of Marine Aids to Navigation Products.

The requirement for service providing organisations to adopt quality management principles is well established throughout the world. The 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

## **19.2 Quality Management System**

A Quality Management System is defined as a business management system to direct and control an organisation 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 not only to control the final product, but with the focus on process rather than procedures. A basic but fundamental approach to quality is the quality improvement loop. This can be seen as containing four steps:

1. Preparing and planning;
2. Realisation of the product;
3. Checking of the results also in view of the client's satisfaction; and
4. Reacting to this information to improve further actions.

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.

## **19.3 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 levels of service 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:

- Improve 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 organisation;
- Availability of proper documentation; and
- Assurance of effective management.

## **19.4 Quality Management Principles**

The International Organisation for Standardisation defines eight quality management principles (see 19.15 - References). The basic principles that need to be considered when establishing a quality management environment are:

### **Principle 1 — Customer-Focused Organisation**

Organisations depend on their customers and therefore should understand current and future customer needs, meet customer requirements and strive to exceed customer expectations.

### **Principle 2 — Leadership**

Leaders establish unity of purpose and direction of the organisation. They should create and maintain the internal environment in which people can become fully involved in achieving the organisation's objectives.

### **Principle 3 — Involvement of People**

People at all levels are the essence of an organisation and their full involvement enables their abilities to be used for the organisation's benefit.

### **Principle 4 — Process Approach**

A desired result is achieved more efficiently when related resources and activities are managed as a process.

### **Principle 5 — System Approach to Management**

Identifying, understanding and managing a system of interrelated processes for a given objective improves the organisation's effectiveness and efficiency.

### **Principle 6 — Continual Improvement**

Continual improvement should be a permanent objective of the organisation.

### **Principle 7 — Factual approach to decision making**

Effective decisions are based on the analysis of data and information.

### **Principle 8 — Mutually beneficial supplier relationships**

An organisation and its suppliers are interdependent, and a mutually beneficial relationship enhances the ability of both to create value.

## **19.5 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 IMO Flag State Implementation (FSI) 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 9001:2008 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.

## **19.6 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 9001:2000 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 organisational 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.

## **19.7 Key Elements of a 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 |                           |

## **19.8 Scope**

The scope of activities to be covered under a Quality Management System needs to be clearly defined at the highest management level.



### **19.8.1 Example of a Scope Statement**

#### **Port XRay - VTS Management System**

The scope of activities covered under Port XRay Management System is the development and administration of standards to:

- Deliver VTS services 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; and
- Provide training (both competency and course based) leading to the granting of qualifications for staff.

### **19.9 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 organisation, 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.

### **19.9.1 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"*

Port XRay - 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 are 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;
- Optimising 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.

### 19.10 Responsibilities

The high-level responsibilities for the primary elements of the Quality Management System should be clearly defined and documented; examples are shown overleaf.

Example on Defining Responsibilities	
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
Monitor and review performance Management Review	VTS Manager
Assure regulatory compliance	VTS Manager / Legal Advisor
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

### 19.11 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 services 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 result can in successful resumption of operations..

### **19.12 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 maximum 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.

### **19.13 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 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 product and/or service;
- Corrective action;
- Preventive action; and
- Customer feedback
- When acting on an 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.

#### **19.14 Audits**

Audits are an essential management tool to be used for verifying objective evidence of processes, to assess how successfully processes have been implemented, for judging the effectiveness of achieving any defined target levels, to provide evidence concerning reduction and elimination of problem areas. For the benefit of the organisation, 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.

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.

#### **19.15 References**

References published by the International Organisation for Standardisation for quality management systems are:

- ISO 9000:2005 - Quality management systems - Fundamentals and vocabulary;
- ISO 9001:2008 - Quality management systems - Requirements; and
- ISO 9004:2009 - Managing for the sustained success of an organization - A quality management approach

Note: The ISO 9000 family of standards represents an international consensus on good quality 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 family cover specific aspects such as fundamentals and vocabulary, performance improvements, documentation, training, and financial and economic aspects.

## **ANNEX 1: IMO Resolution A.857(20)**

IMO 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,

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;

INVITES Governments to take account of the annexed Guidelines when developing, implementing and operating vessel traffic services;

RECOMMENDS Governments to encourage masters of ships navigating in areas for which vessel traffic services are provided to make use of such services;

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**

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 vessel 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 organisation 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 organisation 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 - 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 organisation 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 objectives 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 operator's 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 harmonised 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 and in the "World VTS Guide".

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 organisation 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 affect 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 authorised 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 and in the "World VTS Guide"<sup>1</sup>.

## 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<sup>2</sup>. 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 Organisation

### 2.5.1 Elements of a VTS

In order to perform the required tasks a VTS organisation 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 vessel traffic image, which is the basis for its capability to respond to traffic situations developing in its service area. The vessel traffic image allows the VTS operator to evaluate situations and make decisions accordingly. Data should be collected to compile the vessel 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.

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.

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<sup>1</sup> Refer MSC Circular 586 on the IALA/IAPH/IMPA World VTS Guide

<sup>2</sup> Refer to the Guidelines and Criteria for Ship Reporting Systems, Para 2.2, Communication (IMO Resolution MSC 43(64))

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 vessel 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 or 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.

.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.

### 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 organisations or associations.

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 Ship 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 recognised 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.

## 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 utilise 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 recognised 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 existing skills;

.17 VTS category - refers to a means of identifying the type and level of services provided by a VTS based on geographical or organisational considerations. For example, a VTS operating in a port and its approaches could be categorised as a port VTS. A VTS in which participation is required by law could be categorised 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 authorised, 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 Organisation of VTS centre functions - organise the functions according to how they are to be carried out in accordance with the organisation 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 minimised.

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.

### 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 TRAINING LEVEL TRAINING	OF OF	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 a 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 operators;
- .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<sup>3</sup>; principles of organisation of vessel traffic.

6.4 In the definition in 1.2.18 a number of traffic management functions have been identified. A 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 organisation service;

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<sup>3</sup> Refer to the Standard Marine Navigational Vocabulary as replaced by the IMO Standard Marine Communication Phrases



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 organisation 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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## **ANNEX 2: 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 3: MSC Circular 1065

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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 4: IMO Conventions**

- International Convention for the Safety of Life at Sea (SOLAS), 1974, and amendments;
- International Convention for the Prevention of Pollution from Ships (MARPOL), 1973 and Protocols/Annexes;
- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) and amendments;
- Convention on the International Regulations for Preventing Collisions at Sea (COLREG), 1972;
- Convention on Facilitation of International Maritime Traffic (FAL), 1965 and amendments;
- International Convention on Load Lines (LL), 1966;
- International Convention on Maritime Search and Rescue (SAR), 1979 and amendments;
- Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation, 1988 and Protocols.

Note: A more comprehensive list of Conventions and Protocols can be found on the IMO website.

## **ANNEX 5: Definitions and Abbreviations**

### **5a Definitions**

<b>Accident</b>	An unintended event resulting either in fatality or injury, ship loss or damage, property loss or damage, or environmental damage.
<b>Accredited Training Institute</b>	An establishment approved by a competent authority for the purposes of training VTS personnel and is in possession of a valid Certificate of Accreditation.
<b>Advice</b>	SMCP defines ADVICE as a communication whereby the message implies the intention of the sender to influence the recipient by a recommendation.
<b>Aid to Navigation</b>	Any device or system, external to a vessel, which is provided to help a mariner determine position and course, to warn of dangers or of obstructions, or to give advice about the location of a best or preferred route.
<b>Allied Services</b>	Allied Services are services actively involved in the safe and efficient passage of the vessel through the VTS area.
<b>Approved Training Programme</b>	A course of study, following IALA V103 standards, for prospective and currently engaged VTS personnel at an Accredited Training Institute and/or On-the-Job training carried out at the appropriate VTS Centre.
<b>Automatic Identification System (AIS)</b>	AIS is an autonomous and continuous broadcast system, operating in the VHF maritime mobile band that makes it possible to monitor ships from other ships, and from shore based stations. AIS equipped ships continuously transmit a short message containing information of position, course over ground (COG), speed over ground (SOG), gyro course (heading), etc. Ships equipped with AIS meeting anywhere on earth will be able to identify and track each other without being dependent on shore stations.
<b>Competence</b>	The ability to perform defined tasks or duties effectively

<b>Competent Authority</b>	The authority made responsible, in whole or in part, by a Government for the safety, including environmental safety, and efficiency of vessel traffic and the protection of the environment.
<b>e-Navigation</b>	The collection, integration and display of maritime information aboard and ashore by electronic means to enhance berth-to-berth navigation and related services, safety and security at sea, and the protection of the marine environment.
<b>Exclusion Zone</b>	A geographical area, within which vessels should remain clear unless authorised. The size and shape of the area may vary depending on the reasons for exclusion.
<b>Hazardous Cargoes</b>	<p>Hazardous Cargoes include:</p> <ul style="list-style-type: none"> <li>• Goods classified in the IMDG Code</li> <li>• Oils, noxious and harmful substances defined in MARPOL</li> <li>• Radioactive materials listed in the INF Code.</li> </ul>
<b>Incident</b>	An event, such as a non-compliance, which is not considered serious enough to be classified as an accident
<b>Instruction (re a vessel's navigation or movements)</b>	SMCP defines INSTRUCTION as a communication whereby the message implies the intention of the sender to influence the recipient by a Regulation. When a VTS is authorised to issue directives to vessels, these directives should be result-oriented only. The details of execution, such as course to be steered or engine manoeuvres to be executed should be left to the discretion of the master or pilot on board the vessel.
<b>Maritime Assistance Service (MAS)</b>	MAS means a service responsible for receiving reports in the event of incidents and serving as the point of contact between the shipmaster and the authorities of the coastal State in the event of an incident - IMO Resolution A.950(23) refers.
<b>On-the-Job training (OJT)</b>	Training and familiarisation provided at the VTS Centre at which the person will be or is employed.



	It includes training on the particular services provided by the VTS, the facilities and equipment used, the local geography and appropriate port regulations and procedures.
<b>Place of Refuge</b>	A place where a ship in need of assistance can take action to enable it to stabilise its condition and reduce hazards to navigation, and to protect human life and the environment - IMO Resolution A.949(23) refers.
<b>Refresher Training</b>	Training required by the Competent and/or VTS Authority in order to ensure that the level of competence is maintained appropriate to the type(s) of service provided by the particular VTS Centre when, for example, there has been a break in service, new equipment installed or new operating procedures have been introduced.
<b>Revalidation Training</b>	Training required by the Competent and/or VTS Authority in order to revalidate a VTS Operator Certificate. The period of revalidation training is determined by the Competent and/or VTS Authority.
<b>Ship Domain</b>	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. (see 6.5)
<b>Ship Safety Zone</b>	A zone around a vessel within which all other vessels should remain clear unless authorised. (see 6.5)
<b>Stakeholder(s)</b>	Any individual, group, or organisation able to affect, be affected by, or believe it might be affected by decisions, activities or policies made by an organization in which they have a direct interest.
<b>Vessel Traffic Service</b>	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 respond to traffic situations developing in the VTS area - IMO Resolution A.857(20) refers.

<b>VTs Authority</b>	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.
<b>VTs Area</b>	The delineated, formally declared service area of the VTS. A VTS area may be subdivided in sub-areas or sectors.
<b>VTs Centre</b>	The centre from which the VTS is operated. Each sub-area of the VTS may have its own sub-centre.
<b>VTs Certification Log</b>	A record of VTS related certificates and endorsements awarded to VTS personnel by the Competent and/or VTS Authority. The record may, for example, be in the form of a logbook or the certificates themselves may be kept separately - IALA Recommendation V-103.
<b>VTs Manager</b>	Some VTS organisations may require the appointment of a manager to administer and interface with regional or port management authorities. In such circumstances the manager should possess managerial qualifications to the satisfaction of the Competent Authority.
<b>VTs Operator (VTSO)</b>	An appropriately qualified person carrying out VTS operations on behalf of a VTS authority.
<b>VTs Operator Course Certificate</b>	A certificate awarded upon successful completion of the IALA Model Course V103/1 VTS Operator training at an accredited VTS training organisation. This course certificate alone is not an authorisation to operate as a VTSO.
<b>VTs Operator Certificate</b>	A VTS certificate of competence awarded by the Competent Authority after the candidate VTSO has successfully completed both the V103/1 training and OJT at the specific VTS centre where the VTSO is employed, as well as meeting any specific requirements of the Competent Authority.
<b>VTs Personnel</b>	Persons trained in VTS operations, holding the appropriate qualifications required by a Competent Authority and acting as VTS Operator, VTS Supervisor and/or OJT Instructor at a VTS centre. VTS personnel may also include VTS Managers

	and technical support personnel who should hold qualifications appropriate to the duties performed.
<b>VTSO Position or VTSO Workstation</b>	The place in a VTS Centre from which a VTSO carries out his/her duties.
<b>VTS Sailing Plan</b>	A plan that is mutually agreed between a VTS Authority and the master of a vessel concerning the movement of the vessel in a VTS area.
<b>(VTS Route Plan)</b>	
<b>VTS Services</b>	<p>VTs should at least comprise an Information Service and may also include others, such as Navigational Assistance Service and/or a Traffic Organisation Service - IMO Resolution A.857(20) - defined as:</p> <p>An Information Service (INS) is a service to ensure that essential information becomes available in time for onboard navigational decision making.</p> <p>A Navigational Assistance Service (NAS) is a service to assist onboard navigational decision making and to monitor its effects.</p> <p>A Traffic Organisation 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 VTS area.</p>
<b>VTs Supervisor</b>	An appropriately qualified VTsO carrying out supervisory duties in a VTS Centre on behalf of a VTS authority.
<b>VTs Supervisor Course Certificate</b>	A certificate awarded upon successful completion of the IALA Model Course V-103/2 VTs Supervisor training at an accredited VTS training organisation. The course certificate alone is not an authorisation to operate as a VTs Supervisor.
<b>VTs Vessel Traffic Image</b>	A VTs vessel traffic image is the surface picture of vessels and their movements in a VTS area. The traffic image allows the VTs operator to evaluate situations and make decisions accordingly.



## 5b Abbreviations

<b>AIS</b>	Automatic Identification System
<b>AISM</b> (see IALA)	Association Internationale de Signalisation Maritime
<b>ALARP</b>	As Low As Reasonably Practical (Risk)
<b>ARPA</b>	Automatic Radar Plotting Aid
<b>AtoN</b>	Aid(s) to Navigation
<b>CAS</b>	Collision Avoidance System
<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>DCPA</b>	Distance to Closest Point of Approach
<b>DGNSS</b>	Differential Global Navigation Satellite System
<b>DGPS</b>	Differential Global Positioning System
<b>DP</b>	Dynamic Positioning (a vessel control system for precise positioning)
<b>DR</b>	Dead Reckoning
<b>DSC</b>	Digital Selective Calling
<b>ECDIS</b>	Electronic Chart Display and Information System
<b>ECS</b>	Electronic Chart System
<b>EDI</b>	Electronic Data Interchange
<b>EEZ</b>	Exclusive Economic Zone (UNCLOS)
<b>EMPA</b>	European Maritime Pilots' Association

<b>EMSA</b>	European Maritime Safety Agency
<b>ENC</b>	Electronic Navigation Chart
<b>EPIRB</b>	Emergency Position Indicating Radio Beacon
<b>EPTO</b>	European Permanent Traffic Observatory
<b>ETA</b>	Estimated Time of Arrival
<b>ETD</b>	Estimated Time of Departure
<b>EU - EC</b>	European Union - European Commission
<b>FSA</b>	Formal Safety Assessment
<b>GALILEO</b>	Global Navigation Satellite System, EU
<b>GLONASS</b>	Global Navigation Satellite System, Russia
<b>GLOSS</b>	Global Sea Level Observing System
<b>GMDSS</b>	Global Maritime Distress and Safety System
<b>GPS</b>	The Global Positioning System (GPS) is a space-based global navigation satellite system (GNSS) that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS
<b>HAZMAT</b>	Hazardous Material
<b>HDG</b>	The horizontal direction of the vessel's bows at a given moment measured in degrees clockwise from north - through the water
<b>HMI</b>	Human-Machine Interface
<b>HNS</b>	Hazardous and Noxious Substances
<b>HSC</b>	High Speed Craft
<b>IACS</b>	International Association of Classification Societies
<b>IALA (see AISM)</b>	International Association for Marine Aids to Navigation and Lighthouse Authorities

<b>IAMSAR</b>	International Aeronautical and Marine Search and Rescue Manual
<b>IAPH</b>	International Association of Ports and Harbours
<b>ID</b>	Identification
<b>IELTS</b>	International English Language Testing System
<b>IFSMA</b>	International Federation of Shipmasters' Association
<b>IHMA</b>	International Harbour Masters' Association
<b>IHO</b>	International Hydrographic Organization
<b>ILO</b>	International Labour Organization
<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>IMSO</b>	International Mobile Satellite Organisation
<b>INMARSAT</b>	International Maritime Satellite Organisation
<b>INF</b>	Irradiated Nuclear Fuel on board Ships Code
<b>INS</b>	Integrated Navigation System
<b>INS</b>	Information Service (VTS)
<b>IOC</b>	Intergovernmental Oceanographic Commission
<b>ISM</b>	International Safety Management Code
<b>ISO</b>	International Standards Organisation
<b>ISPS</b>	International Ship and Port Facility Security Code
<b>ITU-R</b>	International Telecommunications Union – Radio communication Sector
<b>LPS</b>	Local Port Services

<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>MEDEVAC</b>	Medical Evacuation
<b>MEPC</b>	Marine Environment Protection Committee (Committee of IMO)
<b>MLC</b>	Maritime Labour Convention
<b>MMSI</b>	Maritime Mobile Service Identity
<b>MRCC</b>	Maritime Rescue Co-ordination Centre
<b>MSC</b>	Maritime Safety Committee (Standing Committee of IMO)
<b>MTBF</b>	Mean Time Between Failures
<b>MTTR</b>	Mean Time To Repair
<b>NAS</b>	Navigational Assistance Service (VTS)
<b>NAVGUIDE</b>	IALA Aids to Navigation Guide
<b>NUC</b>	Not Under Command (COLREGS)
<b>OJT</b>	On-the-Job Training
<b>OJTI</b>	On-the-Job Training Instructor
<b>OPRC</b>	International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC), 1990
<b>PIANC</b>	The World Association for Waterborne Transport Infrastructure Permanent International Association of Navigation Congresses
<b>PLA</b>	Prior Learning Assessment
<b>PLAR</b>	Prior Learning Assessment and Recognition
<b>PSSA</b>	Particularly Sensitive Sea Area



<b>RACON</b>	Radar Response Beacon
<b>RCC</b>	Rescue Co-ordination Centre
<b>RCDS</b>	Raster Chart Display System
<b>RDF</b>	Radio Direction Finder
<b>RIS</b>	River Information Service
<b>RNC</b>	Raster Navigation Chart
<b>ROT</b>	Rate Of Turn
<b>RSO</b>	Recognised Security Organisation (ISPS Code)
<b>RTI</b>	Radar Traffic Image
<b>RTT</b>	Real Time Tracking
<b>SAR</b>	Search And Rescue
<b>SART</b>	Search And Rescue Transponder
<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>SPA</b>	Special Protection Area
<b>SRS</b>	Ship Reporting System
<b>STCW</b>	Standards of Training, Certification & Watchkeeping for Seafarers
<b>STDMA</b>	Self Organising Time Division Multiple Access
<b>TCPA</b>	Time to Closest Point of Approach
<b>TOS</b>	Traffic Organisation Service (VTS)
<b>TSS</b>	Traffic Separation Scheme
<b>UKC</b>	Under Keel Clearance

<b>UN</b>	United Nations
<b>UNCLOS</b>	United Nations Convention on the Law of the Sea
<b>UTC</b>	Universal Time Co-ordinated
<b>VDR</b>	Voyage Data Recorder
<b>VDU</b>	Visual Display Unit
<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
<b>WMO</b>	World Meteorological Organisation

**ANNEX 6: Examples: National Legislation, Statutory Instruments and Regulatory Guidance for VTS**

<b>Country</b>	<b>Primary Legislation</b>	<b>Secondary Legislation/ Statutory Instruments</b>	<b>Guidance at National Level</b>	<b>Byelaws</b>
<b>Australia</b>	<p>At National Level: (Applies to REEFREP only) Navigation Act 1912</p> <p>Australian Maritime Safety Authority Act 1991</p> <p>At State Level : Queensland: Transport Operations Marine Safety Act 1994 (TOMSA 1994).</p>	<p>Marine Orders Part 56 (Applies to REEFREP only). Marine Orders are subordinate legislation, made under the Navigation Act</p> <p>Regulations under the TOMSA Act 1994</p>	<p>REEFGUIDE – A Shipmaster’s Guide to the Torres Strait and the Great Barrier Reef.</p>	<p>N/A at national level</p> <p>Regional Harbour Masters in the State of Queensland can direct shipping within port limits</p>
<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
<b>Italy</b>	Law (7 March 2001, Number 51, art 5) Maritime Transport. Pollution Prevention and Maritime Traffic Monitoring.	Inter-Ministry Decree (28 January 2004) Establishment of VTS system	Coast Guard Directive 001, National Regulations for VTS	Local Coast Guard VTS Procedures – User manuals Local Coast Guard Ordinances
<b>Japan</b>	Law for Preventing Collisions at Sea (1977)	Various Cabinet Orders and Regulations	Various notices	

	Maritime Traffic Safety Law (1972) Port Regulation Law (1948)			
<b>Netherlands</b>	Scheepvaartkeerswet (Shipping Traffic Act 1988	Various Statute Orders and ministerial Decrees	None	Port or local area byelaws established by the local competent authority.
<b>United Kingdom</b>	General: Harbours, Docks and Piers Act 1847 Harbours Act 1964 European Communities Act 1972 (Sect 2 (2)) Merchant Shipping Act 1995 (Sect 85 & 86)  Local: An Act setting out the governance of each port by name. (e.g. The Milford Haven Conservancy Act 1983)	Statutory Instruments:  Merchant Shipping Notices (MSN) Harbour Revision Orders  Harbour Empowerment Orders  The Merchant Shipping (Vessel Traffic Monitoring and Reporting Requirements) Regulations 2004	Port Marine Safety Code and accompanying Guide to Good Practice  Marine Guidance Note (MGN) MGN Nos 180,238,239 and 240.  Designation by the Maritime and Coastguard Agency as National Competent Authority to comply with the EC Vessel Traffic Monitoring Directive.	Harbour Byelaws applicable to each port and its locality.  Established by the local competent authority, subject to the granting of relevant powers in local legislation.
<b>United States of America</b>	Port and Waterway Safety Act of 1972, as amended.	Code of Federal Regulations 33CFR, part 161.	US Coast Guard Marine Safety Manual.	Established by each local VTS Authority in the form of 'User's Manuals'

## ANNEX 7: IALA Publications

IALA Recommendations		Date
V-102	Application of "User Pays" principle to VTS	Dec 2005
V-103	Standards for Training & Certification of VTS personnel	Dec 2009
V-119	Implementation of Vessel Traffic Services	Dec 2009
V-120	Vessel Traffic Services in Inland Waters	Jun 2001
V-125	Integration & Display of AIS and information at a VTS centre	Dec 2004
V-127	Operational Procedures for Vessel Traffic Services	Jun 2011
V-128	Operational & Tech Performance Requirements for VTS equipment	Jun 2007
V-136	Participation in the World VTS Guide	Dec 2007
V-145	Inter-VTS Exchange Format (IVEF) Service	Jun 2011
A-123	The Provision of Shore Based AIS	Jun 2007
A-124	AIS Shore Station & Networking Aspects Relating to AIS service	Dec 2008
A-126	Use of AIS in Marine Aids to Navigation	Dec 2008
<b>Prefixes</b>	'V' indicates a Recommendation produced by the VTS Committee 'A' indicates a Recommendation produced by the AIS Committee	
IALA Guidelines		
1014	Accreditation of VTS Training Institutes	Dec 2009
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 2005
1028	AIS - Operational Issues	Dec 2004
1032	Aspects of Training of VTS Personnel Relevant to AIS	Dec 2005
1045	Staffing Levels at VTS centres	Dec 2005
1046	Response Plan for Marking New Wrecks	Jun 2005
1050	Management & Monitoring of AIS Information	Dec 2005
1055	Preparing for a Voluntary IMO Audit on VTS Delivery	Dec 2006
1056	Establishment of VTS Radar Services	Jun 2007
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
IALA Manuals		
	VTS Manual	2012
	Aids to Navigation Guide (Navguide)	2010
IALA Model Courses for Training		
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
	VTS OJT Instructor	Dec 2009

V-103/4		
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**ANNEX 8: Some Examples of Established VTS Codes**

<b>PORT/VTS</b>	<b>CODE</b>
Akashi Kaikyo (Japan)	VTS/X/T23457/INS+NAS+TOS/-
Archipelago (Finland)	VTS/X/T12347/INS+NAS+TOS/AS
Bisan Seto (Japan)	VTS/X/T23457/INS+NAS+TOS/-
Brevik (Norway)	VTS/X/T1234567/INS+NAS+TOS
Den Helder (Netherlands)	VTS/X/T2357/INS+NAS+TOS/AS
Dover (UK)	VTS/X/T234567/INS+TOS/-
Fedje (Norway)	VTS/X/T2357/INS+NAS+TOS/-
Goteborg (Sweden)	VTS/X/T12367/INS+NAS+TOS/-
Helsinki/Kotka (Finland)	VTS/X/T12347/INS+NAS/AS
Hong Kong (China)	VTS/X/T1234567/INS+NAS+TOS/AS
Ijmuiden (Netherlands)	VTS/X/T234567/INS+NAS+TOS/AS
Kanmon Kaikyo (Japan)	VTS/X/T23457/INS+NAS+TOS/-
Kurushima Kaikyo (Japan)	VTS/X/T23457/INS+NAS+TOS/-
Kvitsoy (Norway)	VTS/X/T12357/INS+NAS+TOS/-
London (UK)	VTS/X/T123457/INS+NAS+TOS/AS
Nagoya (Japan)	VTS/X/T23457/INS+NAS+TOS/-
Nakhodka (Russia)	VTS/X/T2357/INS+NAS/AS
Oslofjord (Norway)	VTS/X/T123467/INS+NAS+TOS
Rotterdam (Netherlands)	VTS/X/T234567/INS+NAS+TOS/AS
Scheldemonde (Netherlands)	VTS/X/T234567/INS+NAS+TOS/AS
Scheveningen (Netherlands)	VTS/X/T23457/INS+NAS+TOS/AS
Storebelt (Denmark)	VTS/X/T23467//INS/-
Tokyo Bay (Japan)	VTS/X/T123457/INS+NAS+TOS/-
Vardo (Norway)	VTS/X/T1237/INS

West Coast (Finland)	VTs/X/T2347/INS+NAS+TOS/AS
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## **ANNEX 9: Examples of VTS Operational Procedures**

<b>Internal Procedures</b>	<b>External Procedures</b>
<p>Routine Procedures</p> <p>Gathering and Recording of information</p> <p>Operational staff</p> <p>Equipment operation, maintenance, calibration and updating</p> <p>Interaction with allied services</p> <p>Public Relations</p> <p>Security</p> <p>Training</p> <p>Watch handover</p> <p>Vessel handover</p> <p>Maintenance of marine publications</p>	<p>Routine Procedures</p> <p>Pre-Arrival Information</p> <p>Vessels Entering VTS Area</p> <p>Vessels Transiting VTS Area</p> <p>Vessels at Anchor</p> <p>Vessels at Berth</p> <p>Vessels Departing the VTS Area</p> <p>Transition between Adjacent VTS Areas</p> <p>Environmental conditions</p> <p>Waterway conditions</p>
<b>Emergency Procedures</b>	<b>Emergency Procedures</b>
<p>System Failure</p> <p>Internal emergencies, for example fire and flood</p> <p>Forced evacuation of VTS centre</p> <p>Personnel medical emergencies</p> <p>Security incidents.</p>	<p>Collision, Capsize, Sinking, Grounding, Fire On Vessel, Man Overboard</p> <p>Pollution</p> <p>Places of Refuge</p> <p>Medical Emergency</p> <p>Vessel Not Under Command (NUC)</p> <p>Security incident</p> <p>Protest Action</p> <p>Natural Disaster</p>