普通学校航海与海事类专业系列教材

Vessel Traffic Services System

Editor: Hu Weidong Fan Yaotian Jia Yukang Ma Qingsheng
Reviser: Huang Liwen

船舶交通管理系统

胡卫东　范耀天　贾玉康　马庆生 ◎ 编　著
黄立文 ◎ 主　审

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内容提要

本教材由 VTS 业务篇、VTS 规划决策篇、VTS 设备篇三部分组成。VTS 业务篇包含绪论、规划 VTS、构建 VTS、AIS、VTS 人员、运行 VTS 等六章；VTS 规划决策篇包括风险决策方法简介、风险的分类及风险分析等三章；VTS 设备篇包括 VTS 的基本组成、雷达子系统、VHF 通信子系统、信息传输子系统、雷达数据处理子系统、新技术在 VTS 中的应用等六章。全书共计十五章。

本书面向海事管理专业本科生，是教育部海事管理专业卓越工程师培养计划系列教材之一，也可作为航海技术专业本科生、交通信息工程及控制专业研究生参考教材、VTS 操作员、VTS 维修工程师自学参考用书。

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前　言

卓越工程师教育培养计划是教育部为贯彻落实《国家中长期教育改革和发展规划纲要(2010—2020年)》实施的高等教育重大计划。海事管理专业被批准加入卓越工程师计划。海事管理专业卓越工程师的培养目标是:培养具备海事管理能力,航海技术,港口航道工程、航运业务与海事法律等方面较宽的理论基础、基本技能和较强的实践能力,能在海事管理机构、港航企事业单位、航海教育与培训机构、科研院所等从事海事管理,安全管理,港航工程技术及管理,航运业务与法律,教学培训及科学技术研究等工作的高级专门技术人才和管理人才。其中VTS(船舶交通管理系统)操作员、VTS系统工程师是人才培养的重点目标之一。《船舶交通管理系统》正是围绕此目标而编著。

本书包含三个部分。第一部分VTS业务:介绍IMO、IALA、IHO等国际组织或协会关于VTS的规则、规定,从规划、构建、AIS、VTS人员、运行VTS等方面阐述了VTS业务范畴和程序。该部分分为六章,第一、二章由胡卫东编写,第三章由范耀天编写,第四章由泰州地方海事局贾玉康编写,第五章由泰州地方海事局马庆生编写,第六章由中海石油气电集团有限责任公司肖发编写。第二部分风险决策在规划VTS中的应用:以某内河VTS规划为例,论述IMO推荐的正式安全评估(FSA)理论及其应用,分三章。第一、三章由范耀天著,第二章由胡卫东著,均用英文著写,以提高学生英语素养,使其熟悉海事领域的国际公约、法律法规、技术标准及相关强制性要求,并考虑建议性标准,以便参与跨专业及国际性的竞争与合作。第三部分VTS设备,介绍了VTS的基本组成以及雷达、VHF通信、信息传输、雷达数据处理等子系统原理及应用于VTS的新技术。该部分分为六章,第一章由贾玉康编写,第二章由中海石油气电集团有限责任公司王飞编写,第三章由许晓琴编写,第四章由刘福安编写,第五章由余谦编写,第六章第一节由杨介锐编写,第六章第二节由徐元编写。本书在有限的篇幅中,着重基本原理及基本程序的阐述,尽可能地反映VTS建设中的新理论及新方法。

黄立文教授主审全书,并提出了许多宝贵意见。在本书编著过程中得到了武汉理工大学海事管理系全体教师的大力支持和指导,在此一并衷心致谢。

由于编著组成员水平有限,书中难免存在疏漏和错误,真诚期待广大读者批评指正。

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PART I

VTS Services

1 Introduction

For centuries, shipping has been one of the major means of transportation to support world commerce. There has always been a need for ships to navigate accurately, safely and expeditiously and to assist in many authorities which have provided aids to navigation in and around their coastal waters.

The earliest aids to navigation were beacons and lights followed by the introduction of buoys. Over the years these earlier aids were developed to improve their conspicuousness together with improvement to the range of lights and the introduction of visual fog warning devices.

Not long after World War Ⅱ, it became clear that the limitation of the means of traffic management then available prevented the full utilization of port facilities in bad visibility conditions. In particular, the delays in vessel traffic movements caused by periods of dense fog resulted in serious disruption of port operations, the storage of goods and to other modes of transporting cargoes to and from ports. The general opinion of experts was that shore-based radar could provide traffic images in order to keep maritime traffic flows moving in port areas and their approaches. The first was established in Douglas, Isle of Man, in 1948. Some three months later, in the same year, the port of Liverpool established their radar sites and trials took place in Rotterdam.

In the 1950s, a number of shore-based radar chains were established in other North West European major ports, for example the approaches to the port of Amsterdam (Ymuiden) in 1952 and the entire Rotterdam area was covered in 1956.

These early systems were intended primarily to avoid traffic delays and to increase efficiency of traffic flows in general. However, attention was also being given to the number of accidents and the way in which these might be reduced. This resulted in studies of the effect that shore-based radar was having on the number of accidents in port areas under radar surveillance. The studies concluded that, in addition to increasing the operational hours, providing better utilization of a port's capacity, the number of accidents was reduced significantly.

In the 1970s, major oil tanker disasters (e. g. Torrey Canyon, Metula, Amoco Cadiz and many others) increased the public awareness of the damage being caused and substantial pressure came from environmental groups who want to protect the marine environment. The concern that such disasters might happen in port approaches and port areas caused policy makers to reconsider the concepts of the port radar chains and the co-operation between pilots and radar chain operators. It was also widely felt that some form of international harmonization was needed. However, in those early days of traffic management aided by radar surveillance, the view on how to proceed further was debated at considerable length.

Slowly there was movement towards a coordinated approach that was to become Vessel Traffic Services (VTS). VTS was defined and then the matter was discussed in IMO known as the Inter-Governmental Maritime Consultative Organization (IMCO). An Assembly Resolution was adopted on the implementation of VTS that provided a framework for further harmonization. The requirement was considered by IALA and a follow-up study was initiated. The development of modern technology was very important to the technical concept of VTS. In the mid 1990s, the resolution was reviewed, revised and superseded in 1997 by IMO Assembly Resolution on VTS (A. 857(20)).

The number of VTS systems worldwide increased rapidly in particular during the last two decades. In a limited number of countries, VTS has been established in inland waters with the same overall objectives that apply to the maritime VTS systems.

In summary, VTS has developed from a shore-based radar system with the aim of enhancing navigation in bad visibility conditions to a modern system using multiple sensors with the objectives of enhancing safety, 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, hazardous cargoes and the potential for environmental damage, demand that sophisticated measures be taken to reduce risks. Establishing a Vessel Traffic Service is a significant response to that demand. When established, implemented and operated within the context of international laws, conventions and maritime customs, and with the co-operation of vessel operators, a VTS can contribute substantially to the safety and efficiency of maritime traffic and protection of the environment.

As a result of the improvements in efficiency, safety and the reduction of potential environment pollution experienced by authorities using a VTS, together with the rapid development in computer technology, the number of Vessel Traffic Services has increased considerably and there are now about 500 of these services operational.

As Vessel Traffic Services have grown in number throughout the world, the operating concepts have led to two categories of VTS, coastal services and port or river 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 waters which may be difficult to navigate because of geographical constraints or offshore exploration. A port or river VTS is a service provided to assist the efficiency and safe navigation of shipping when entering or leaving ports and harbors or when sailing along rivers or through waters which similarly restrict the manoeuvring of ships.

IMO Assembly Resolution A. 857 (20) provides guidance on the establishment and operation of Vessel Traffic Services. This Manual is intended to provide more detailed information to Authorities and is based on the principles contained in that Resolution.

2 Planning a VTS

According to IMO Resolution A. 857(20), 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 as VTS area, where appropriate, this area may be subdivided into 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-based 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;

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.

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. Local needs for traffic management should be carefully investigated and determined by analyzing 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