CHAPTER 29

NAVIGATION REGULATIONS

SHIP ROUTING

2900. Purpose and Types of Routing Systems

Navigation, once independent throughout the world, is an increasingly regulated activity. The consequences of collision or grounding for a large, modern ship carrying tremendous quantities of high-value, perhaps dangerous cargo are so severe that authorities have instituted many types of regulations and control systems to minimize the chances of loss. These range from informal and voluntary systems to closely controlled systems requiring strict compliance with numerous regulations. The regulations may concern navigation, communications, equipment, procedures, personnel, and many other aspects of ship management. This chapter will be concerned primarily with navigation regulations and procedures.

There are many types of vessel traffic rules. However, the cornerstone of all these are the *Navigation Rules: International-Inland*. The International Rules (Title 33 U.S.C. Chap. 30) were formalized in the Convention of the International Regulations for the Preventing of Collisions at Sea of 1972 (COLREGS '72) and became effective on July 15, 1977. Following the signing of the Convention, an effort was made to unify and update the various domestic navigation rules. This effort culminated in the enactment of the Inland Navigation Rules Act of 1980.

The Inland Navigation Rules (Title 33 U.S.C. Chap. 34) recodified parts of the Motorboat Act of 1940 and a large body of existing navigational practices, pilot rules, interpretive rules previously referred to as the Great Lakes Rules, Inland Rules and Western River Rules. The effective date for the Inland Navigation Rules was December 24, 1981, except for the Great Lakes where the effective date was March 1, 1983.

The International Rules apply to vessels on waters outside of the established lines of demarcation (COLREGS Demarcation Lines, 33 C.F.R. §80). These lines are depicted on U.S. charts with dashed lines, and generally run between major headlands and prominent points of land at the entrance to coastal rivers and harbors. The Inland Navigation Rules apply to waters inside the lines of demarcation. It is important to note that with the exception of Annex V to the Inland Rules, the International and Inland Navigation Rules are very similar in both content and format.

Much information relating to maritime regulations may be found on the World Wide Web, and any common search engine can turn up increasing amounts of documents posted for mariners to access. As more and more regulatory information is posted to new Web sites and bandwidth increases, mariners will have easier access to the numerous rules with which they must comply.

2901. Terminology

There are several specific types of regulatory systems. For commonly used open ocean routes where risk of collision is present, the use of **Recommended Routes** separates ships going in opposite directions. In areas where ships converge at headlands, straits, and major harbors, **Traffic Separation Schemes** (TSS's) have been instituted to separate vessels and control crossing and meeting situations. **Vessel Traffic Services** (VTS's), sometimes used in conjunction with a TSS, are found in many of the major ports of the world. While TSS's are often found offshore in international waters, VTS's are invariably found closer to shore, in national waters. Environmentally sensitive areas may be protected by **Areas to be Avoided** which prevent vessels of a certain size or carrying certain cargoes from navigating within specified boundaries. In confined waterways such as canals, lock systems, and rivers leading to major ports, local navigation regulations often control ship movement.

The following terms relate to ship's routing:

Routing System: Any system of routes or routing measures designed to minimize the possibility of collisions between ships, including TSS's, two-way routes, recommended tracks, areas to be avoided, inshore traffic zones, precautionary areas, and deep-water routes.

Traffic Separation Scheme: A routing measure which separates opposing traffic flow with traffic lanes.

Separation Zone or Line: An area or line which separates opposing traffic, separates traffic from adjacent areas, or separates different classes of ships from one another.

Traffic Lane: An area within which one-way traffic is established.

Roundabout: A circular traffic lane used at junctions of several routes, within which traffic moves counterclockwise around a separation point or zone.

Inshore Traffic Zone: The area between a traffic separation scheme and the adjacent coast, usually designated for coastal traffic.

Two-Way Route: A two-way track for guidance of ships through hazardous areas.

Recommended Route: A route established for convenience of ship navigation, often marked with centerline buoys.

Recommended Track: A route, generally found to be free of dangers, which ships are advised to follow to avoid possible hazards nearby.

Deep-Water Route: A route surveyed and chosen for the passage of deep-draft vessels through shoal areas.

Precautionary Area: A routing measure comprising an area within defined limits where vessels must navigate with particular caution and within which the direction of traffic may be recommended.

Area to be Avoided: An area within which navigation by certain classes of ships is prohibited because of particular navigational dangers or environmentally sensitive natural features. They are depicted on charts by dashed or composite lines. The smallest may cover less than a mile in extent; the largest may cover hundreds of square miles. Notes on the appropriate charts and in pilots and *Sailing Directions* tell which classes of ships are excluded from the area.

No Anchoring Area: A routing measure comprising an area within defined limits where anchoring is hazardous or could result in unacceptable damage to the marine environment. Anchoring in a no anchoring area should be avoided by all ships or certain classes of ships, except in case of immediate danger to the ship or the persons onboard.

Established Direction of Traffic Flow: The direction in which traffic within a lane must travel.

Recommended Direction of Traffic Flow: The direction in which traffic is recommended to travel.

There are various methods by which ships may be separated using Traffic Separation Schemes. The simplest scheme might consist of just one method. More complex schemes will use several different methods together in a coordinated pattern to route ships to and from several areas at once. Schemes may be just a few miles in extent, or cover relatively large sea areas.

2902. Recommended Routes and Tracks

Recommended Routes across the North Atlantic have been followed since 1898, when the risk of collision between increasing numbers of ships became too great, particularly at junction points. The International Convention for the Safety of Life at Sea (SOLAS) codifies the use of certain routes. These routes vary with the seasons, with winter and summer tracks chosen so as to avoid iceberg-prone areas. These routes are often shown on charts, particularly small scale ones, and are generally used to calculate distances between ports in tables.

Recommended Routes consist of single tracks, either one-way or two-way. Two-way routes show the best water through confined areas such as among islands and reefs. Ships following these routes can expect to meet other vessels head-on and engage in normal passings. One-way routes are generally found in areas where many ships are on similar or opposing courses. They are intended to separate opposing traffic so that most maneuvers are overtaking situations instead of the more dangerous meeting situation.

2903. Charting Routing Systems

Routing Systems and TSS's are depicted on nautical charts in magenta (purple) or black as the primary color. Zones are shown by purple tint, limits are shown by composite lines such as are used in other maritime limits, and lines are dashed. Arrows are outlined or dashed-lined depending on use. Deep-water routes are marked with the designation "DW" in bold purple letters, and the least depth may be indicated.

Recommended Routes and recommended tracks are generally indicated on charts by black lines, with arrowheads indicating the desired direction of traffic. Areas to be Avoided are depicted on charts by dashed lines or composite lines, either point to point straight lines or as a circle centered on a feature in question such as a rock or island.

Note that not all ship's routing measures are charted. U.S. charts generally depict recommended routes only on charts made directly from foreign charts. Special provisions applying to a scheme may be mentioned in notes on the chart and are usually discussed in detail in the *Sailing Directions*. In the U.S., the boundaries and routing scheme's general location and purpose are set forth in the Code of Federal Regulations and appear in the *Coast Pilot*.

TRAFFIC SEPARATION SCHEMES

2904. Traffic Separation Schemes (TSS)

In 1961, representatives from England, France, and Germany met to discuss ways to separate traffic in the congested Straits of Dover and subsequently in other congested areas. Their proposals were submitted to the

International Maritime Organization (IMO) and were adopted in general form. IMO expanded on the proposals and has since instituted a system of **Traffic Separation Schemes (TSS)** throughout the world. See Figure 2904 for a depiction of how a TSS may appear on a paper chart.

The IMO is the only international body responsible for establishing and recommending measures for ship's routing in international waters. It does not attempt to regulate traffic within the territorial waters of any nation.

In deciding whether or not to adopt a TSS, IMO considers the aids to navigation system in the area, the state of hydrographic surveys, the scheme's adherence to accepted standards of routing, and the International Rules of the Road. The selection and development of TSS's are the responsibility of individual governments, who may seek IMO adoption of their plans, especially if the system extends into international waters.

Governments may develop and implement TSS's not adopted by the IMO, but in general only IMO-adopted schemes are charted. Rule 10 of the International Regulations for Preventing Collisions at Sea (Rules of the Road) addresses the subject of TSS's. This rule specifies the actions to be taken by various classes of vessels in and near traffic separation schemes.

Traffic separation schemes adopted by the IMO are listed in *Ship's Routeing*, a publication of the IMO. Because of differences in datums, chartlets in this publication which depict the various schemes must not be used either for navigation or to chart the schemes on navigational charts. The *Notice to Mariners* should be consulted for charting details. The symbology for TSS tracks and routes are described in more detail in section "M" of *U.S. Chart No. 1*, (12th edition, 2013).

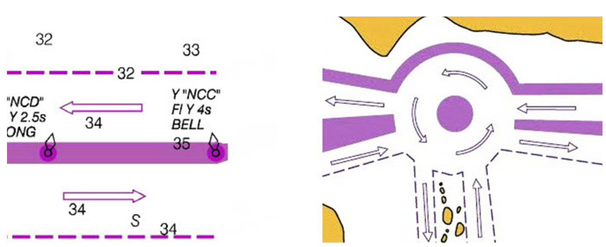

Figure 2904. Traffic separation scheme examples.

2905. Methods and Depiction

A number of different methods of separating traffic have been developed, using various zones, lines, and defined areas. One or more methods may be employed in a given traffic scheme to direct and control converging or passing traffic. These are discussed below. Refer to definitions in section 2901 and Figure 2905.

Method 1. Separation of opposing streams of traffic by separation zones or lines. In this method, typically a central separation zone is established within which ships are not to navigate. The central zone is bordered by traffic lanes with established directions of traffic flow. The lanes are bounded on the outside by limiting lines.

Method 2. Separation of opposing streams of traffic by natural features or defined objects. In this method islands, rocks, or other features may be used to separate traffic. The feature itself becomes the separation zone.

Method 3. Separation of through traffic from local traffic by provision of Inshore Traffic Zones. Inshore traffic zones provide an area within which local traffic may travel at will without interference from through traffic in the lanes. Inshore zones are separated from traffic lanes by separation zones or lines.

Method 4. Division of traffic from several different directions into sectors. This approach is used at points of convergence such as pilot stations and major entrances.

Method 5. Routing traffic through junctions of two or more major shipping routes. The exact design of the scheme in this method varies with conditions. It may be a circular or rectangular precautionary area, a roundabout, or a junction of two routes with crossing routes and directions of flow well defined.

2906. Use of Traffic Separation Schemes

A TSS is not officially approved for use until adopted by the IMO. Once adopted, it is implemented at a certain time and date and announced in the *Notice to Mariners* and by other means. The *Notice to Mariners* will also describe the scheme's general location and purpose, and give specific directions in the chart correction section on plotting the various zones and lines which define it. These corrections usually apply to several charts. Because the charts may range in scale from quite small to very large, the corrections for each should be followed closely. The positions for the various features may be slightly different from chart to chart due to differences in rounding off positions or chart datum.

Use of TSS's by all ships is recommended but not always required. In the event of a collision, vessel compliance with the TSS is a factor in assigning liability in admiralty courts. TSS's are intended for use in all weather, both day and night. Adequate aids to navigation are a part of all TSS's. There is no special right of one ship over another in TSS's because the *Rules of the Road* apply in all cases. Deep-water routes should be avoided by ships that do not need them to keep them clear for deep-draft vessels. Ships need not keep strictly to the courses indicated by the arrows, but are free to navigate as necessary within their lanes to avoid other traffic. The signal "YG" is provided in the International Code of Signals to indicate to another ship: "You appear not to be complying with the traffic separation scheme." TSS's are discussed in detail in the *Sailing Directions* for the areas where they are found.

No.	INT	Description	NOAA	NGA	Other NGA	ECDIS	
Routing Measures						Supplementary national symbols: d–e	
Basic Symbols							
10		Established (mandatory) direction of traffic flow					Traffic direction in a one-way lane of a traffic separation scheme
11		Recommended direction of traffic flow					Single traffic direction in a two-way route part of a traffic-separation scheme
12		Separation line (large scale, small scale)					Traffic separation line
13		Separation zone					Traffic separation zone
14		Limit of restricted routing measure (e.g. Inshore Traffic Zone (ITZ), Area to be Avoided (ATBA))	RESTRICTED AREA				
15		Limit of routing measure					Traffic separation scheme boundary
16		Precautionary area					Traffic precautionary area as a point
	Precautionary Area						Traffic precautionary area as an area
17	ASL (see Note)	Archipelagic Sea Lane (ASL); axis line and limit beyond which vessels shall not navigate					Axis and boundary of archipelagic sea lane
18	FAIRWAY 7.3m	Fairway designated by regulatory authority with minimum depth	SAFETY FAIRWAY 166.200 (see note A)				Fairway, depth is obtained by cursor pick
	FAIRWAY <7.3m>	Fairway designated by regulatory authority with maximum authorized draft					

Figure 2905. Extract from U.S. Chart No. 1. Routing measures symbology.

Certain special rules adopted by IMO apply in constricted areas such as the Straits of Malacca and Singapore, the English Channel and Dover Strait, and in the Gulf of Suez. These regulations are summarized in the appropriate *Sailing Directions (Planning Guides)*. For a complete summary of worldwide ships' routing measures, the IMO publication Ship's Routing should be obtained. See Section 2904.

VESSEL TRAFFIC SERVICES (VTS)

2907. Description and Purpose

Vessel Traffic Services in the U.S. are implemented under the authority of the Ports and Waterways Safety Act of 1972 (Public Law 92-340 as amended) and the St. Lawrence Seaway Act (Public Law 358).

The purpose of a **Vessel Traffic Service (VTS)** is to provide active monitoring and navigational advice for vessels in particularly confined and busy waterways. There are two main types of VTS, surveilled and non-surveilled. Surveilled systems consist of one or more land-based sensors (i.e. radar, AIS and closed circuit television sites), which output their signals to a central location where operators monitor and manage vessel traffic movement. Non-surveilled systems consist of one or more reporting points at which ships are required to report their identity, course, speed, and other data to the monitoring authority. They encompass a wide range of techniques and capabilities aimed at preventing vessel collisions and groundings in the harbor, harbor approach and inland waterway phase of navigation. They are also designed to expedite ship movements, increase transportation system efficiency, and improve all-weather operating capability

A VTS is a service implemented by a Competent Authority, designed to improve safety and efficiency of vessel traffic and to protect the environment. VTS's are equipped, staffed and enabled to interact with marine traffic through the provision of specific services and to respond to developing situations in the interest of safety and efficiency. In those ports where a VTS has been determined to be the appropriate traffic management tool, three levels of service have been defined to assist Competent Authorities in determining the type of service provided. The services and functions provided include:

Information Service (INS), this service normally provides the position, intentions and destination of vessels operating within the VTS area, usually by broadcasting information at fixed times and intervals or when deemed necessary by the VTS.

Traffic Organization Service (TOS), this service provides advance planning of movements and is particularly useful during times of congestion or waterways restriction. The VTS monitors traffic and enforces adherence to rules and regulations. The service may also include prioritization of movements, allocation of space, mandatory position reporting, established routes, speed limits, and/or other measures that may be considered necessary and appropriate by the VTS.

Navigation Assistance Service (NAS), this service may be provided in addition to an Information Service and/or Traffic Organization Service. The NAS is designed to assist in the on-board navigational decision-making process and is provided at the request of a vessel, or when deemed necessary by the VTS. The NAS provides essential and timely navigational information and may inform, advise and/or instruct vessels accordingly. Most major maritime nations now operate vessel traffic services in large, congested ports and harbors.

VHF-FM communications network forms the basis of most major services. Transiting vessels make position reports to a vessel traffic center by radiotelephone and are in turn provided with accurate, complete, and timely navigational safety information. The addition of a network of radars, AIS, and close circuit television cameras for surveillance and computer-assisted tracking, similar to that used in air traffic control, allows the VTS to play a more significant role in marine traffic management, thereby decreasing vessel congestion, critical encounter situations, and the probability of a marine casualty resulting in environmental damage.

Automatic Identification Systems (AIS) may be integrated into VTS operations. This rapidly developing technology is similar to the transponder in an aircraft, which sends out a radio signal containing information such as the name of the vessel, course, speed, etc. This data appears as a text tag, attached to the radar blip, on systems designed to receive and process the signals. It enhances the ability of VTS operators to monitor and control shipping in busy ports.

AIS technology relies upon global navigational positioning systems (GPS), navigation sensors, and digital communication equipment operating according to standardized protocols (AIS transponders) that permit the voiceless exchange of navigation information between vessels and shore-side vessel traffic centers. AIS transponders can broadcast vessel information such as name or call sign, dimensions, type, GPS position, course, speed, and navigation status. This information is continually updated and received by all AIS-equipped vessels in its vicinity. An AIS-based VTS reduces the need for voice interactions, enhances mariners' ability to navigate, improves their situational awareness, and assists them in the performance of their duties thus reducing the risk of collisions.

The Coast Guard recognized the importance of AIS and has led the way on various international fronts for acceptance and adoption of this technology. The Coast Guard permits certain variations of AIS in VTS Prince William Sound and has conducted or participated in extensive operational tests of several Universal AIS (ITU-R M.1371) precursors. The most comprehensive test bed has been on the Lower Mississippi River. AIS is discussed in greater detail in Chapter 30.

The **Nationwide Automatic Identification System (NAIS)** consists of approximately 200 VHF receiver sites located throughout the coastal continental United States, inland rivers, Alaska, Hawaii and Guam. NAIS is designed to collect AIS transmissions from local vessels. Currently, NAIS collects valuable maritime data in 58 critical ports throughout the United States for use by Coast Guard operators and port partners. The primary goal of NAIS is to increase Maritime Domain Awareness (MDA) through data dissemination via a network infrastructure, particularly focusing on improving maritime security, marine and navigational safety, search and rescue, and environmental protection services.

In response to the Maritime Transportation Security Act of 2002, the NAIS Project was initiated and officially chartered in December 2004. NAIS allows the USCG to collect safety and security data from AIS-equipped vessels in the nation's territorial waters and adjacent sea areas, and share that data with USCG operators and other government partners. AIS data collected improves the safety of vessels and ports through collision avoidance and the safety of the nation through detection, identification, and classification of vessels.

NAIS consists of an integrated system of AIS, data storage, processing, and networking infrastructure. In addition, NAIS integrates with other systems for purposes of sharing infrastructure, quicker implementation, and improved performance.

Ports and Waterways Safety System (PAWSS) is a major acquisition project to build new Vessel Traffic Services where necessary and replace existing systems. It is also a process that reaches out to port stakeholders to comprehensively assess safety and identify needed corrective actions.

The PAWSS Vessel Traffic Service (VTS) project is a national transportation system that collects, processes, and disseminates information on the marine operating environment and maritime vessel traffic in major U.S. ports and waterways. The PAWSS VTS mission is monitoring and assessing vessel movements within a Vessel Traffic Service Area, exchanging information regarding vessel movements with vessel and shore-based personnel, and providing advisories to vessel masters. Other Coast Guard missions are supported through the exchange of information with appropriate Coast Guard units.

The Coast Guard has a statutory responsibility under the Ports and Waterways Safety Act of 1972 (PWSA), Title 33 USC §1221 to ensure the safety and environmental protection of U.S. ports and waterways. The PWSA authorizes the Coast Guard to "...establish, operate and maintain vessel traffic services in ports and waterways subject to congestion." It also authorizes the Coast Guard to require the carriage of electronic devices necessary for participation in the VTS system. The purpose of the act was to establish good order and predictability on United States waterways by implementing fundamental waterways management practices. In 1996 the U.S. Congress required the Coast Guard to begin an analysis of future VTS system requirements. Congress specifically directed the Coast Guard to revisit the VTS program and focus on user involvement, meeting minimum safety needs, using affordable systems, using off-the-shelf technology, and exploring public-private partnership opportunities. The Coast Guard's PAWSS project was established to meet these goals.

The VTS system at each port has a Vessel Traffic Center that receives vessel movement data from the Automatic Identification System (AIS), surveillance sensors, other sources, or directly from vessels. Meteorological and hydrographic data is also received at the vessel traffic center and disseminate as needed. A major goal of the PAWSS VTS is to use AIS and other technologies that enable information gathering and dissemination in ways that add no additional operational burden to the mariner. The VTS adds value, improves safety and efficiency, but is not laborious to vessel operators.

Surveilled VTS's are found in many large ports and harbors where congestion is a safety and operational hazard. Less sophisticated services have been established in other areas in response to hazardous navigational conditions according to the needs and resources of the authorities.

Designated radio frequencies are port specific and denoted on the U.S. Coast Guard's Navigation Center webpage (www.navcen.uscg.gov). In the event of a communication failure either by the vessel traffic center or the vessel or radio congestion on a designated VTS frequency, communications may be established on an alternate VTS frequency. The bridge-to-bridge navigational frequency 156.650 MHz (Channel 13), is monitored in each VTS area; and it may be used as an alternate frequency, however, only to the extent that doing so provides a level of safety beyond that provided by other means.

2908. History of Vessel Traffic Services

The concept of managing ship movements through a shore-side radar station is generally accepted to have first appeared in the port of Liverpool in 1949. In 1956, the Netherlands established a system of radar stations for the surveillance of traffic at the port of Rotterdam. As VTS evolved and spread in Western Europe, the commercial well being of the port was the stimulus for new or expanded service. This contrasts sharply with the U.S. experience, where the first Federal (Coast Guard) VTS was an outgrowth of a 1968 research and development effort in San Francisco Bay called Harbor Advisory Radar. It was, as the name suggests, an advisory activity and participation in the system was voluntary. Because it was voluntary, not all vessels availed themselves of VTS assistance or contributed to the service.

On January 18, 1971, the tankers Arizona Standard and Oregon Standard collided under the Golden Gate Bridge. The incident received nationwide attention and resulted in two significant maritime related safety initiatives - The Bridge to Bridge Radiotelephone Act, Title 33 USC §1201 and The Ports and Waterways Safety Act of 1972 (PWSA), Title 33 USC §1221. It is from the latter that the Coast Guard draws its authority to construct, maintain and operate VTSs. It also authorizes the Coast Guard to require the carriage of electronic devices necessary for participation in the VTS system. The purpose of the act was to establish good order and predictability on United States waterways by implementing fundamental waterways management practices.

Using PWSA as the authority and the San Francisco Harbor Advisory Radar as the operational model, the Coast Guard began to establish VTSs in critical, congested ports. San Francisco was formally established along with Puget Sound (Seattle) in 1972; Louisville, KY which is only activated during high water in the Ohio River (approximately 50 days per year) was started in 1973; Houston-Galveston, Prince William Sound; Berwick Bay (Louisiana) and the St. Mary's River at Sault Ste Marie, MI. New Orleans and New York provided services on a voluntary basis throughout the 1970-80's, however; these operations were curtailed in 1988 due to budgetary restraints. And, brought back on-line subsequent to the EXXON VALDEZ disaster, when the Coast Guard was mandated by the Oil Pollution Act of 1990 to make participation mandatory at existing and future VTSs.

2909. U.S. Operational Systems

The Coast Guard operates 12 Vessel Traffic Centers (VTC): Prince William Sound (Valdez), Puget Sound/Seattle, San Francisco, Los Angeles/Long Beach, Houston/Galveston, Berwick Bay, Louisville, Saint Mary's River, Lower Mississippi River, Port Arthur, Tampa, and New York. Each center is discussed in greater detail in the paragraphs below.

VTS New York has the responsibility of coordinating vessel traffic movements in the busy ports of New York and New Jersey. The VTS New York area includes the entrance to the harbor via Ambrose and Sandy Hook Channels, through the Verrazano Narrows Bridge to the Throgs Neck Bridge in the East River, to the Holland Tunnel in the Hudson River, the Kill Van Kull including Newark Bay and all of Arthur Kill, and Raritan Bay.

The current operation uses surveillance data provided by several radar sites, AIS and three closed circuit TV sites.

VTS San Francisco was commissioned in August of 1972. When the original radar system became operational in May 1973, the control center for VTS San Francisco was shifted to the Yerba Buena Island. This center was designated a Vessel Traffic Center (VTC).

VTS San Francisco is responsible for the safety of vessel movements along approximately 133 miles of waterway from offshore to the ports of Stockton and Sacramento. On 3 May 1995, federal regulations went into effect establishing regulated navigation areas within the San Francisco Bay Region. These regulations, developed with input from the Harbor Safety Committee of the San Francisco Bay Region, were designed to improve navigation safety by organizing traffic flow patterns; reducing meeting, crossing, and overtaking situations in constricted channels; and by limiting vessels' speeds. Major components of the system include a Vessel Traffic Center (at Yerba Buena Island), two high resolution radars, AIS, a VHF-FM communications network, a traffic separation scheme, and a **Vessel Movement Reporting System (VMRS)** which is the system used to monitor and track vessels movements within a VTS or VMRS area.

VTS San Francisco also operates an **Offshore Vessel Movement Reporting System (OVMRS)**. The OVMRS is completely voluntary and operates using a broadcast system with information provided by participants.

VTS Puget Sound became operational in September 1972 as the second Vessel Traffic Service. It collected vessel movement report data and provided traffic advisories by means of a VHF-FM communications network. In this early service a VMRS was operated in conjunction with a Traffic Separation Scheme (TSS), without radar surveillance. Operational experience gained from this service and VTS San Francisco soon proved the expected need for radar surveillance in those services with complex traffic flow.

In 1973 radar coverage in critical areas of Puget Sound was provided. Efforts to develop a production generation of radar equipment for future port development were initiated. To satisfy the need for immediate radar coverage, redundant military grade Coast Guard shipboard radar transceivers were installed at four Coast Guard light stations along the Admiralty Inlet part of Puget Sound. Combination microwave radio link and radar antenna towers were installed at each site. Radar video and azimuth data, in a format similar to that used with VTS San Francisco, were relayed by broad band video links to the VTC in Seattle. At that center, standard Navy shipboard repeaters were used for operator display. Although the resolution parameters and display accuracy of the equipment were less than those of the VTS San Francisco equipment, the use of a shorter range scale (8 nautical miles) and overlapping coverage resulted in very satisfactory operation. In December 1980 additional radar surveillance was added in the Strait of Juan De Fuca and Rosario Strait, as well as increased surveillance of the Seattle area, making a total of 10 remote radar sites.

The communications equipment was upgraded in July 1991 to be capable of a two frequency, four sector system. Channels 5A and 14 are the frequencies for VTS Puget Sound. A total of 13 communication sites are in operation (3 extended area sites, 10 low level sites). The three extended area sites allow the VTS the ability to communicate in a large area when needed. The low level sites can be used in conjunction with one another without interference, and have greatly reduced congestion on the frequency. VTS Puget Sound now covers the Strait of Juan de Fuca, Rosario Strait, Admiralty Inlet, and Puget Sound south as far as Olympia.

The major components of the system include the Vessel Traffic Center at Pier 36 in Seattle, a VHF-FM communications network, a traffic separation scheme, radar surveillance of about 80% of the VTS area, AIS and a Vessel Movement Reporting System. Regulations are in effect which require certain classes of vessels to participate in the system and make movement reports at specified points. The traffic separation scheme in the Strait of Juan de Fuca was extended as far west as Cape Flattery in March 1975 in cooperation with Canada and was formally adopted by the International Maritime Organization in 1982.

Since 1979, the U.S. Coast Guard has worked cooperatively with the Canadian Coast Guard in managing vessel traffic in adjacent waters. Through the **Cooperative Vessel Traffic Service (CVTS)**, two Canadian Vessel Traffic Centers work hand in hand with Puget Sound Vessel Traffic Service. Prince Rupert MCTS (Marine Communications and Traffic Services) manages the area west of the Strait of Juan de Fuca. North of the Strait of Juan de Fuca, through Haro Strait, to Vancouver, B.C. is managed by VICTORIA MCTS. The three Vessel Traffic Centers communicate via a computer link and dedicated telephone lines to advise each other of vessels passing between their respective zones.

VTS Houston-Galveston became operational in February 1975 as the third U.S. Vessel Traffic Service. The Vessel Traffic Center is located at Sector Houston-Galveston in Southeast Houston. The VTS operating area includes the Houston Ship Channel from the sea buoy to the Buffalo Bayou Turning Basin, Galveston Channel, Texas City Channel, Bayport Ship Channel, Barbours Terminal Channel, and 10 miles of the ICW. The area contains more than 70 miles of restricted waterways. The main part of the Houston Ship Channel is 530 feet wide with a depth of 45 feet. Several bends in the channel are in excess of 90 degrees.

The major components of the system include the VTC at Galena Park, Houston; a VHF-FM communications network; low light level, closed circuit television (LLL-CCTV) surveillance covering approximately three miles south of Morgan’s Point west through the ship channel to City Dock #27 in Houston; a Vessel Movement Reporting System; and a radar surveillance system covering lower Galveston Bay approaches, Bolivar Roads, and Lower Galveston Bay.

A second radar was installed in 1994. This radar provides surveillance coverage between the Texas City channel and Morgan’s Point. The entire VTS area is covered by AIS.

VTS Prince William Sound is required by The Trans-Alaska Pipeline Authorization Act (Public Law 93-153), pursuant to authority contained in Title 1 of the Ports and Waterways Safety Act of 1972 (86 Stat. 424, Public Law 92-340).

The Vessel Traffic Center is located in Valdez. The Coast Guard has installed a dependent surveillance system to improve its ability to track tankers transiting Prince William Sound and requires these vessels to carry position and identification reporting equipment. The ability to supplement radar with dependent surveillance bridges the gap in areas where conditions dictate some form of surveillance and where radar coverage is impractical. Once the dependent surveillance information is returned to the vessel traffic center, it is integrated with radar data and presented to the watchstander on an electronic chart display.

The system is composed of two radars, two major microwave data relay systems, and a VMRS which covers Port Valdez, Prince William Sound, and Gulf of Alaska. There is also a vessel traffic separation scheme from Cape Hinchinbrook to Valdez Arm.

The Coast Guard installed a dependent surveillance system to improve its ability to track tankers transiting Prince William Sound, however, that system was ultimately retired and replaced by AIS.

The southern terminus of the pipeline is on the south shoreline of the Port of Valdez, at the Alyeska Pipeline Service Company tanker terminal. Port Valdez is at the north end of Prince William Sound, and Cape Hinchinbrook is at the south entrance. Geographically, the area is comprised of deep open waterways surrounded by mountainous terrain. The only constrictions to navigation are at Cape Hinchinbrook, the primary entrance to Prince William Sound, and at Valdez Narrows, the entrance to Port Valdez.

VTS Saint Mary’s River has been operational since October 1994 when it became a mandatory system operating year-round with an area of responsibility encompassing the entire length of the St. Mary's River (Approx. 80 miles).

On March 6, 1896, Title 33 USC 474 directed the Commandant of the Revenue Cutter Service to prescribe appropriate rules and regulations regarding the movement and anchorage of vessels and rafts in the St Marys River from Point Iroquois on Lake Superior to Point Detour on Lake Huron. This marked the beginning of the St Marys River Vessel Traffic Service (VTS). Originally named the River Patrol Service, this fledgling VTS operation was initially comprised of the Revenue Cutter MORRELL and Lookout Stations at Johnson's Pt (#1), Middle Neebish Dyke (#2) and Little Rapids Cut (#3). The stations were connected by telegraph lines linked back to the Pittsburgh Steamship Company offices in Sault Sainte Marie, MI. “Soo Control”, the call sign for the original traffic management control center, evolved into a vessel movement reporting system which relied heavily on mariners to provide information on traffic flow and hazards. Formerly renamed the Vessel Traffic Service in 1975, VTS St. Marys River was initially a voluntary vessel movement reporting system.

The St Marys River is a complex waterway. It features strong currents, wind driven water level fluctuations and narrow channels which challenge the most seasoned of navigators. Within the VTS area the water level drops approx. 21 feet from the level of Lake Superior to the level of the lower lakes. Thus, the Soo Locks were constructed and are presently maintained by the Corps of Engineers. In most of the areas of the river there is adequate room for vessels to maneuver or anchor during periods of low visibility, or when other problems hinder safe navigation. However, there are three areas extremely hazardous to transit or anchor in low visibility: West Neebish Channel (down-bound traffic only), Middle Neebish Channel (Up-bound traffic only), and Little Rapids Cut (two-way traffic). During periods of low visibility it is customary to close the entire river. Today VTS St. Marys River, a sub unit of Sector Sault Sainte Marie, maintains close alliances with their Canadian counterparts in Sarnia Ontario, the Army Corps of Engineers and the Great Lakes Maritime Industry. Coordination among these key players is paramount particularly during the ice breaking season. Each winter when plate ice can reach a thickness of three to five feet, the cooperation and exchange of information fostered by these corporate and governmental partnerships is the key to the safe and efficient movement of commercial interests.

VTS Lower Mississippi River is a component of the Waterway Division of USCG Sector New Orleans. VTS Lower Mississippi River manages vessel traffic on one of the most hazardous waterway in the United States due to the complexity of the marine traffic and the powerful currents of the Mississippi River. The Vessel Traffic Center is located in a high rise office building in the New Orleans Central Business District. Its area of responsibility spans from twenty miles above the Port of Baton Rouge (Mile 255 above the Head of the Passes) to twelve miles offshore of Southwest Pass Light in the Gulf of Mexico. Within this VTS service area the VTS monitors the Eighty One Mile Point Regulated Navigation Area (Mile 187.9 to Mile 167 Ahead of Passes) and the New Orleans Harbor Sector (Mile 106 to Mile 88). The VTS provides advisory and navigational assistance services at all times in these areas of responsibility. When the river reaches high water levels of eight feet in New Orleans, the VTS controls traffic at the Algiers Point Special Area (Mile 93.5 to Mile 95). VTS Lower Mississippi River is a unique Coast Guard Vessel Traffic Service because it maintains advisory service and direct control of vessel traffic with a workforce of highly trained and experienced civilian Coast Guard personnel with the assistance of pilot advisors.

VTS Berwick Bay manages vessel traffic on another hazardous waterway influenced by strong currents and a series of bridges that must be negotiated by inland tows traveling between Houston, Baton Rouge and New Orleans. The Vessel Traffic Center is located at Coast Guard Marine Safety Office Morgan City, LA. Its area of responsibility encompasses the junction of the Atchafalaya River (an outflow of the Mississippi River), the Gulf Intracoastal Waterway, the Port Allen-Morgan City Alternate Route and several tributary bayous. Narrow bridge openings and a swift river current require the VTS to maintain one-way traffic flow through the bridges. During seasonal high water periods, the VTS enforces towing regulations that require inland tows transiting the bridges to have a minimum amount of horsepower based on the length of tow. VTS Berwick Bay is unique among Coast Guard Vessel Traffic Services because it maintains direct control of vessel traffic.

VTS Port Arthur actively monitors all waters of the Sabine-Neches Waterway to Port Arthur, Beaumont, and Orange, TX, including the offshore fairway to the sea buoy, the east/west crossing offshore fairway extending 12 miles on either side of the main channel, and the Gulf Intracoastal Waterway from mile 260 to mile 295. This area is home to the Ports of Port Arthur, Beaumont, and Orange, Texas. Additionally, it is the home of four large oil refineries, two Liquefied Natural Gas terminals, twenty-five percent of the nation's Strategic Petroleum Reserves, and the largest commercial military outload port in the U.S.

VTS Louisville is a vessel movement reporting system designed to enable vessel operators to better cope with problems encountered during high water on the Ohio River between miles 592.0 and 606.0. The VTS has four cameras surveying the waterway. It monitors traffic via VHF Channel 13 communications only. The VTS is activated when the upper river gauge at the McAlpine Lock and Dam is approximately 13.0 feet and rising. It remains in 24-hour operation until the upper river gauge falls below 13.0 feet. River conditions vary widely, especially during springtime. A series of thunderstorms can, at times, necessitate activation of the VTS in a matter of hours.

VTS Tampa has the responsibility of coordinating vessel traffic movements in the busy ports of Tampa, Manatee, and St. Petersburg. VTS Tampa's area includes the entrance to Tampa Bay via Egmont and Mullet Key Channels, the Sunshine Skyway Bridge, Old Tampa Bay, Hillsborough Bay, and the waters surrounding MacDill Air Force Base.

VTS Los Angeles/Long Beach assists in the safe navigation of vessels approaching the ports of LA/LB in an area extending 25 miles out to sea from Point Fermin (LAT 33 42.3'N LONG 118 17.6'W). The LA/LB VTS developed a unique partnership with the state of California, the Coast Guard, the Ports of Los Angeles-Long Beach, the Marine Exchange, and the local maritime community. With start up funds provided by the ports of Los Angeles and Long Beach, the VTS operations are supported by fees assessed against commercial vessels operating in the LA/LB area.

2910. Vessel Traffic Management and Information Systems

An emerging concept is that of Vessel Traffic Management and Information Services (VTMIS) wherein a VTS is only part of a larger and much more comprehensive information exchange. Under this concept, not only can vessel traffic be managed from the standpoint of navigation safety and efficiency, but also tugs, pilots, line handlers, intermodal shipping operators, port authorities, customs and immigration, law enforcement, and disaster response agencies and others can use vessel transit information to enhance the delivery of their services.

A VTS need not be part of a VTMIS, but it is logical that no port needing the latter would be without the former. It is important to note that VTMIS is a service, not a system, and requires no particular set of equipment or software. VTMIS development and installations are proceeding in several busy ports and waterways worldwide, and mariners can expect this concept to be implemented in many more areas in the future.

REGULATED WATERWAYS

2911. Purpose and Authorities

In confined waterways not considered international waters, local authorities may establish certain regulations for the safe passage of ships and operate waterway systems consisting of locks, canals, channels, and ports. This generally occurs in especially busy or highly developed waterways which form the major constrictions on international shipping routes. The Panama Canal, St. Lawrence Seaway, and the Suez Canal represent systems of this type. Nearly all ports and harbors have a body of regulations concerning the operation of vessels within the port limits, particularly if locks and other structures are part of the system. The regulations covering navigation through these areas are typically part of a much larger body of regulations relating to assessment and payment of tariffs and tolls, vessel condition and equipment, personnel, communications equipment, and many other factors. In general, the larger the investment in the system, the larger the body of regulations which control it will be.

Where a waterway separates two countries, a joint authority may be established to administer the regulations, collect tolls, and operate the system, as in the St. Lawrence Seaway.

Copies of the regulations are usually required to be aboard each vessel in transit. These regulations are available from the authority in charge or an authorized agent. Summaries of the regulations are contained in the appropriate volumes of the *Sailing Directions (Enroute)*.