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MARINE SAFETY

Coast Guard Should Address Alternatives as It Proceeds With VTS 2000

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The Honorable Howard Coble
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Ranking Minority Member
Subcommittee on Coast Guard and
Maritime Transportation
Committee on Transportation and
Infrastructure
House of Representatives

The Honorable James A. Traficant, Jr.
House of Representatives

Currently, the U.S. Coast Guard and private entities operate radar-based vessel traffic service (VTS) systems in several U.S. ports. A VTS system typically consists of remote surveillance sensors, such as radar or closed-circuit television, and a central data-gathering location (called a vessel traffic center). VTS personnel receive information on marine traffic conditions, assess this information, and pass it on to mariners and the maritime industry by radio. According to the International Maritime Organization,[1] the purpose of these systems is to improve the safe and efficient movement of marine vessels in and around ports and to protect the environment.

In response to congressional direction after the 1989 Exxon Valdez oil spill, the Department of Transportation conducted a study to assess the need for VTS systems in ports throughout the country. On the basis of the study, the Coast Guard is considering constructing new or improved VTS systems in as many as 17 ports. The proposed expansion, called VTS 2000, will cost an estimated $260 million to $310 million in federal funds to build and about $42 million in federal funds to operate each year if installed at all 17 locations.[2] At present, the Coast Guard plans to pay these costs from its budget and not pass them on to local ports or to users, such as shipping companies.

[1]The International Maritime Organization, an agency of the United Nations, is charged with maritime safety matters.

[2]The Coast Guard prepared the current estimate prior to receiving bids on VTS 2000. Coast Guard officials reported that vendors have submitted bids that were considerably less than the current estimate of $260 million to $310 million. Since the costs are competition-sensitive, they cannot be released at this time. Also, the Coast Guard revised its estimate for the cost of operating VTS 2000 from $56 million to $42 million on the basis of more current cost data for staff, telecommunications, and remote site leases.

You asked us to provide you with information to assist in your deliberations about funding the VTS 2000 program, including funding alternatives to build and operate the system. In consultation with your offices, we focused our work on the following four questions:

- What is the current status of the Coast Guard's development of VTS 2000?
- At ports being considered for VTS 2000, to what extent do major stakeholders support acquiring and funding it?
- If major stakeholders are not supportive of VTS 2000, to what extent are they interested in acquiring and funding other VTS systems?
- What other issues, if any, could affect the establishment of VTS systems that are privately funded?

We conducted our work at 8 of the 17 ports that the Coast Guard is considering for VTS 2000. While the views of these 8 ports may not be representative of the views at all 17, we selected the ports that we thought would yield the most useful information in response to the Subcommittee's questions. Four locations were chosen because the Coast Guard identified them as most likely to benefit from a new VTS system. We chose the other four because they currently operate a privately funded system or have expressed an interest to do so. (See app. I for general background on all eight ports.) At each port, we obtained the views of a set of key stakeholders identified by the Coast Guard. These key stakeholders included representatives of (1) ship and barge companies doing business at the port, (2) marine pilots, and (3) port authorities.

Results in Brief

At its current stage of development, VTS 2000 presents uncertainties as to how many ports need such a system and how much it will cost. Development of VTS 2000 has not yet proceeded to the point where a great deal of site-specific information is available. The Coast Guard does not plan to determine how many of the 17 ports under consideration should operate VTS 2000 systems until fiscal year 2000, and development plans have not reached the stage where specific components have been selected for any port. At many of the locations under consideration, the economic benefits of installing VTS 2000 systems are not clearly established. Further, many of the shipping industry, pilots' association, and port authority stakeholders we interviewed said they had little or no involvement to date with the VTS 2000 program. Coast Guard officials said that they will work more extensively with stakeholders as more specific plans emerge concerning which ports will be included in VTS 2000.

We did not find widespread support for VTS 2000 among the interviewed stakeholders at the eight ports where we conducted site visits. At five ports, most of the stakeholders were opposed to VTS 2000. Support was somewhat greater—but still very mixed—at the three other ports. In general, many who opposed VTS 2000 said the proposed system would likely be more expensive than necessary for their port. This concern was reflected in their views about paying for VTS 2000; most opposed user fees or other funding approaches that would pass the cost of VTS 2000 from the federal government to those using the system.

Support among those we interviewed was greater for VTS systems that they perceived to be less expensive than VTS 2000 systems. At the four ports where VTS systems already exist (Houston/Galveston, Los Angeles/Long Beach, Philadelphia/Delaware Bay, and San Francisco), most key stakeholders said the existing systems were sufficient and were needed. At two of these ports, users are already providing financial support, and at the remaining two, key stakeholders have expressed a willingness to fund some type of VTS operation if necessary to ensure that VTS coverage continues. At two of the remaining four ports where VTS systems do not exist (New Orleans and Tampa), most of those we interviewed favored adding some form of VTS capability, though their support for funding the improvements was much more marginal. At the final two ports (Mobile/Pascagoula and Port Arthur/Lake Charles), support for a VTS system was largely nonexistent or mixed.

Several key issues could affect the establishment of privately funded or privately operated VTS systems. These include the private sector's ability to fund the initial start-up costs of such a system, the private sector's exposure to liability, and the Coast Guard's role in planning and overseeing a privately funded system.

Background

A VTS system is one of several methods for improving navigational safety and protecting the marine environment.[3] It helps determine the presence of vessels in and around ports and it provides information to vessels on such matters as traffic, tides, weather conditions, and port emergencies. Other safety measures include training vessel operators, improving navigational aids (such as buoys and markers), dredging wider and deeper channels, and inspecting vessels.

[3]VTS systems can also play a role in waterway management activities by providing data that identify areas of navigational risk and by measuring the results of actions that attempt to reduce the risk of accidents, such as groundings and collisions.

Under the authority of the Ports and Waterways Safety Act of 1972, as amended, the Coast Guard operates VTS systems in eight ports around the United States.[4] Operations and maintenance costs for these systems, which totaled about $19 million in fiscal year 1995, are borne by the Coast Guard and are not passed on to the ports or the shipping industry. Two other ports, Los Angeles/Long Beach and Philadelphia/Delaware Bay, have radar-based systems funded by their users. These systems are sometimes called "VTS-like" systems to distinguish them from the Coast Guard's systems, but for consistency, we refer to them as VTS systems in this report. In 1995, operations and maintenance costs were about $1.4 million for the Los Angeles/Long Beach system and about $345,000 for the Philadelphia/Delaware Bay system.[5,6]

Study of VTS systems was prompted by the Oil Pollution Act of 1990 (P.L. 101-380), passed after the 1989 Exxon Valdez oil spill and subsequent spills in the coastal waters of Rhode Island, the Delaware River, and the Houston ship channel. The act directed the Secretary of Transportation to prioritize the need for a new, expanded, or improved VTS system at U.S. ports and channels. Under criteria for this evaluation, the act specified that in assessing the need for a VTS system, the Secretary consider (1) the nature, volume, and frequency of vessel traffic; (2) the risk of collisions, spills, and damages associated with that traffic; (3) the impact of installing, expanding, or improving a VTS system; and (4) all other relevant costs and data. The resulting report, called the Port Needs Study, was submitted to the Congress in March 1992.

Few Specifics About VTS 2000 Have Been Developed to Date at the Port Level

Although the Coast Guard's VTS 2000 proposal is the result of several years of study, the development of VTS 2000 itself is in its early phases. The Coast Guard is just entering those phases of its planning schedule in which the Coast Guard will (1) finalize the list of ports where it believes a VTS 2000 system should be built and (2) determine the specific mix and number of VTS 2000 components for these ports. At six of the eight ports we reviewed,

[4]The Ports and Waterways Safety Act of 1972 (P.L. 92-340), as amended, states that the Coast Guard "may construct, operate, maintain, improve or expand" VTS systems for ports, harbors, and other waters. It also authorizes the Coast Guard to require vessels that operate in a VTS area to comply with the service. The eight ports are New York, N.Y.; San Francisco, Calif.; Houston-Galveston, Tex.; Puget Sound, Wash.; Valdez, Alaska; Morgan City, La.; Louisville, Ky.; and Sault Sainte Marie, Mich.

[5]In design and operation, these "VTS-like" systems are similar in many respects to the Coast Guard's systems. However, the Coast Guard's regulations and standards do not apply. Coast Guard personnel help operate the Los Angeles/Long Beach system but are not involved in operating the system at Philadelphia/Delaware Bay.

[6]VTS officials from Los Angeles/Long Beach and Philadelphia/Delaware Bay stated that their operating costs are likely to increase in 1996 because of higher personnel costs and upgrades in equipment.

most key stakeholders we interviewed said they had little or no involvement in VTS 2000. The following is a brief summary of what has occurred to date.

Port Needs Study Prioritized Sites for Further Review

The Port Needs Study identified two sets of locations as possible candidates for a VTS system. Both sets were identified on the basis of an estimate of the net benefits of installing a new VTS system at each location. The first set, which included seven locations, was recommended for initial consideration. For these locations, the study's methodology showed that the benefit of a new or improved VTS system would consistently be higher than costs even when different assumptions were considered, such as decreasing benefit estimates by 50 percent or increasing cost estimates by 50 percent. The second set, comprising eight other locations, was identified as the next best candidate for consideration. These locations were not as consistent in showing positive net benefits when the methodological assumptions were changed. Table 1 shows the 15 locations and the estimated net benefits calculated for each one. In addition to the 15 ports in table 1, the Coast Guard added San Francisco, California, and Valdez, Alaska, because both locations currently have Coast Guard-operated VTS systems and because the Coast Guard wants to upgrade the equipment at these ports with VTS 2000 technology.

Table 1: Benefits of a New VTS System Identified by the Port Needs Study for 15 Ports

Dollars in millions

Location	Existing VTS system/ operator	Estimated 15-year net benefits: Net benefit of installing new VTS system	Less: net benefit from existing system	Resulting marginal net benefit from installing new VTS system
Locations identified for initial consideration				
New Orleans, La.[a]	No	$253.7	$ 0	$253.7
Port Arthur, Tex./Lake Charles, La.[a,b]	No	92.4	0	92.4
Houston/Galveston, Tex.[a]	Yes/Coast Guard	61.0	57.0	4.0
Mobile, Ala./Pascagoula, Miss.[a]	No	48.1	0	48.1
Los Angeles/Long Beach, Calif.[a]	Yes/private	42.8	45.8	–3.0
Corpus Christi, Tex.	Yes/private[c]	26.1	11.0	15.1
Boston, Mass.	No	15.1	0	15.1
Other locations identified for consideration				
New York, N.Y.	Yes/Coast Guard	9.0	3.7	5.3
Tampa, Fla.[a]	No	5.2	0	5.2
Portland, Oreg.	No	2.2	0	2.2
Philadelphia, Pa./Delaware Bay, Del.[a]	Yes/private	2.2	6.7	–4.5
Baltimore, Md.	Yes/private[d]	–1.7	1.4	–3.1
Providence, R.I.	No	–2.0	0	–2.0
Long Island Sound, N.Y.	No	–2.3	0	–2.3
Puget Sound, Wash.	Yes/Coast Guard	–4.0	–12.2	8.2

Note: All dollars are discounted to 1993.

[a]Indicates ports that we visited. In addition to the seven ports indicated, we also conducted work at San Francisco.

[b]Port Arthur/Lake Charles has a radio-based system, but the system was not considered in the Port Needs Study's analysis.

[c]Corpus Christi has a radio-based harbormaster system that does not utilize radar.

[d]Baltimore has a nonradar radio-based system operated by the local pilots' association.

Many of the ports have existing VTS systems or other nonradar, radio-based information systems to assist vessel operators, and when the estimated benefits of these systems are taken into account, the marginal net benefits of a new system decrease substantially in some instances. The study's data indicate that over the first 15 years after a switch to a new system, there may be little marginal net benefit in making the conversion at any of the ports with existing radar-based VTS systems. The five Coast Guard-operated systems have either recently been upgraded or enhanced or are scheduled to receive upgrades in the near future regardless of any decision on VTS 2000. These upgrades or enhancements will expand VTS coverage and cost about $39 million for improved software and equipment.[7] According to Coast Guard officials, these ports are included in VTS 2000 so that existing VTS equipment can be replaced when it becomes obsolete. Officials indicated that they will address the timing and affordability of this approach in fiscal year 2000.

The Coast Guard is conducting follow-on studies at a number of the locations to verify whether the benefits of a new VTS system outweigh its costs. So far, five such studies have been completed for Boston, Corpus Christi, Mobile/Pascagoula, Philadelphia/Delaware Bay, and Tampa. The follow-on study for Mobile/Pascagoula was consistent with the results of the Port Needs Study. However, for Boston, the marginal net benefits no longer outweigh the costs, and for Corpus Christi, Philadelphia/Delaware Bay, and Tampa, the marginal net benefits are higher. (See app. II for more information on the Port Needs Study and follow-on studies.)

Candidate Ports for VTS 2000 Are Still Being Evaluated

The Coast Guard developed an initial proposal in fiscal year 1993 to address the Port Needs Study. The Coast Guard said that the expanded or enhanced use of VTS systems would reduce the risk of maritime accidents and support other Coast Guard activities, including national defense and law enforcement. Through greater automation of vessel traffic data under VTS 2000, the Coast Guard also expected to more efficiently carry out its waterway management responsibilities.

In fiscal year 2000, the Coast Guard will decide how many ports will be included under VTS 2000. In all, 17 ports are under consideration. Seven of the ports have existing radar-based VTS systems—two operated privately (Los Angeles/Long Beach and Philadelphia/Delaware Bay) and the

[7]The upgrades include improvements in decision support technology, which includes features such as visual and audio alarms to indicate a vessel's safety zone violations; cross-functionality, which allows for information exchange with other Coast Guard databases; and geographic displays, which provide nautical chart overlays on the VTS operator's display console.

remaining five operated by the Coast Guard. In addition, three ports have privately funded radio-based information systems (Baltimore, Corpus Christi, and Port Arthur/Lake Charles).

The estimated cost of VTS 2000—$260 million to $310 million—is based on the cost of (1) developing the system and (2) installing it in all 17 locations. The system's development—including activities such as developing the software, designing the system, testing, contracting, constructing the land-based support facility, and developing the system engineering of VTS 2000—is being pursued in four phases. The estimated cost of the initial development phase is $69 million, including costs incurred since the program's inception. This phase is scheduled for completion in fiscal year 1999 and, according to Coast Guard officials, will result in operational capability similar to that of the upgraded VTS systems currently operated by the Coast Guard. The development of all phases will cost an estimated $145 million if the systems are installed in all 17 ports. If all phases are implemented, they are scheduled for completion in fiscal year 2004 and will include activities such as developing software that interfaces with external databases and establishing a facility to test and diagnose software to support a national VTS system (land-based support facility). According to Coast Guard officials, a decision on whether to proceed with all four development phases depends, in part, on the number of sites that receive VTS 2000. The additional cost of equipment and installation at specific ports ranges from about $5 million to $30 million per port area.

The Coast Guard, which is in the early phase of the acquisition process, plans to select a single systems integration contractor for the project by the first quarter of fiscal year 1997. The contractor will develop computer software, procure hardware (radar, closed circuit television, and radios), integrate these components of the system, and determine what type of VTS 2000 equipment will be installed at each port. The Coast Guard estimates that the contractor will be needed through 2006 if systems are installed in all 17 locations.

In the next few years, as it moves to acquire and install VTS 2000 systems at specific locations, the Coast Guard plans to increase the size of its funding requests for the program. The Coast Guard has received about $25 million to develop VTS 2000 through fiscal year 1996. For fiscal year 1997, the Coast Guard plans to request $6 million. For fiscal years 1998-2004, the Coast Guard estimates that it will need about $30 million a year to support both the development and installation of VTS 2000 systems in ports.

The contractor for VTS 2000 is scheduled to complete the systems' development in 2004 as it upgrades sensors, develops software, and establishes interface capability with up to 10 different databases. Starting in 1998, the Coast Guard plans to install the first systems in New Orleans and Los Angeles/Long Beach. Starting in 2000, it plans to install systems in Port Arthur/Lake Charles, Houston/Galveston, and Corpus Christi.[8] After systems are installed at the initial sites, the Coast Guard will enhance and upgrade the systems as necessary.

In June 1995, several federal agencies, including the Coast Guard, commissioned a study by the Marine Board of the National Research Council to assess the implementation of advanced information systems for maritime commerce.[9] Among other things, the Marine Board will address the role of the public and private sectors in developing and operating VTS systems and will examine user fees and trust funds as possible funding sources. The Marine Board expects to issue an interim report in June 1996, and the Coast Guard plans to use the report in decisions on the VTS 2000 project.

At the Port Level, Most Key Stakeholders Have Limited Involvement in VTS 2000

Given that the Coast Guard is not yet at the point of determining what VTS 2000 equipment will be installed at each port, it is perhaps not surprising that many key stakeholders we interviewed said they had little or no involvement in VTS 2000.[10] At six of the ports we reviewed, most stakeholders we interviewed said they had little or no involvement in the VTS 2000 system at their port in matters such as the system's needs, design, and cost.[11] Coast Guard officials said that as more specific plans emerge

[8]While the Coast Guard has not yet made a final decision about which ports should receive VTS 2000 systems, it has identified these five ports as having the highest priority. However, the Coast Guard recently reviewed the privately funded system at Los Angeles/Long Beach and determined that it meets most of the VTS 2000 program's operational requirements, and as a result, the Coast Guard is reevaluating whether to give Los Angeles/Long Beach a lower priority in the VTS 2000 program. The remaining four ports are scheduled to receive VTS 2000 systems because the Port Needs Study showed high net benefits at these locations. Mobile/Pascagoula, another port showing high net benefits, was not included among these initial candidates because the follow-on studies showed that Corpus Christi should have a higher priority than Mobile.

[9]The sponsoring agencies include the Advanced Research Project Administration, the Maritime Administration, and the National Oceanic and Atmospheric Administration.

[10]The Coast Guard has made efforts to involve some industry representatives in VTS 2000. For example, in 1993, the Coast Guard convened a team comprising representatives from the Coast Guard (14 members), industry (4 members), and the Army Corps of Engineers (1 member). The team developed a concept of operations and validated requirements for VTS 2000 systems. The members' input formed the basis for the Coast Guard's preliminary operational requirements.

[11]The six ports are Los Angeles/Long Beach, Mobile/Pascagoula, Philadelphia/Delaware Bay, Port Arthur/Lake Charles, San Francisco, and Tampa.

regarding which ports will be included under VTS 2000, they will work more extensively with stakeholders to determine what VTS 2000 components to install at each location. For example, they stated that VTS 2000 systems can be adapted to the needs of stakeholders in each port.

Notwithstanding this lack of specific involvement in VTS 2000, most stakeholders we interviewed believed they knew enough to provide their opinions about the system. Their level of knowledge was based, in part, on briefings about VTS 2000 conducted by the Coast Guard in six of the eight ports.[12] At three of the locations (Philadelphia/Delaware Bay, Mobile/Pascagoula and Tampa), follow-on studies included interview sessions with port and industry officials on VTS-related issues. San Francisco was the only port among the eight we reviewed where a majority of the stakeholders interviewed did not think they knew enough about the system to provide an opinion about whether it was needed at their location.

Support for VTS 2000 Was Not Widespread Among Key Stakeholders at Ports Reviewed

Widespread support was lacking for VTS 2000 among the shipping industry, pilots' association, and port authority stakeholders we interviewed. The opinions about the need for a VTS 2000 system were predominantly negative at five ports, were about evenly split at two others, and were predominantly uncertain at one. (See table 2.) Many who opposed VTS 2000 perceived the proposed system as being more expensive than needed.

[12]The Coast Guard has briefed industry and port officials in Houston-Galveston, Los Angeles/Long Beach, New Orleans, Port Arthur/Lake Charles, San Francisco, and Tampa.

Table 2: Views of Shipping Industry, Pilots' Association, and Port Authority Stakeholders on VTS 2000

Port	Is a VTS system currently in place?	Is a VTS 2000 system needed at your port?	Would you be willing to pay for it?
Ports identified by Coast Guard as receiving significant benefits from a new VTS system			
Houston/Galveston (n=5)	Yes	Split about evenly	Split about evenly
Mobile/Pascagoula (n=7)	No	Most said no	Most said no
New Orleans (n=6)	No	Most said no	Most said no
Port Arthur/Lake Charles (n=14)	No	Most said no[a]	Most said no[a]
Ports with a privately funded VTS system			
Los Angeles/Long Beach (n=10)	Yes	All said no	Most said no
Philadelphia/Delaware Bay (n=10)	Yes	Most said no	Most said no
Ports interested in private funding of a VTS system			
San Francisco (n=9)	Yes	Most were uncertain	Split about evenly
Tampa (n=8)	No	Split about evenly	Most said no

Note: n=number of shipping industry, pilots' association, and port authority stakeholders we interviewed.

[a]When Port Arthur's and Lake Charles' responses are considered separately, Port Arthur's responses are "split about evenly" for both questions, and Lake Charles' responses for whether a system was needed are "all said no" and for willingness to fund a system are "most said no."

The level of support for VTS 2000 was even lower when key stakeholders were asked if they would be willing to pay for the system, perhaps through fees levied on vessels. At six of the eight ports, a clear majority of stakeholders was not willing to fund VTS 2000. At the remaining two—Houston and San Francisco—support was mixed among the stakeholders we interviewed. However, among those who supported VTS 2000, many said their support was conditional. For example, some stakeholders in San Francisco said that they would be willing to fund the system if the alternative were to have no VTS system at all.

One concern expressed by some stakeholders about funding a system was that a user fee could affect the competitiveness of their port. Many port and industry stakeholders commented that a user fee could cause some vessel owners to divert cargo to other ports. Other stakeholders indicated that a fee would probably not precipitate such a decision if the amount were reasonable.

Key Stakeholders Show Greater Support for Alternatives Perceived as Less Expensive

Although most of the stakeholders we interviewed voiced little support for VTS 2000, they did express stronger support for a more limited form of VTS at most of the eight ports. (See table 3.) Support for some form of VTS was generally present at six ports, mixed at one, and completely absent at one (Mobile/Pascagoula). Opinions about paying for such a system were generally supportive at five ports (two were already doing so), mixed at two, and negative at one.

Table 3: Views of Shipping Industry, Pilots' Association, and Port Authority Stakeholders on Other VTS Systems

Port	Is a VTS system currently in place?	Is some form of VTS system needed at your port?	Would you be willing to pay for it?
Ports identified by Coast Guard as receiving significant benefits from a new VTS system			
Houston/Galveston (n=5)	Yes	All said yes	Most said yes, if benefits were sufficient
Mobile/Pascagoula (n=7)	No	All said no	Most said no
New Orleans (n=6)	No	Most said yes	Split about evenly
Port Arthur/Lake Charles (n=14)	No	Split about evenly[a]	Split about evenly[a]
Ports with a privately funded VTS system			
Los Angeles/Long Beach (n=10)	Yes	All said yes	Already supporting
Philadelphia/Delaware Bay (n=10)	Yes	All said yes	Already supporting
Ports interested in private funding of a VTS system			
San Francisco (n=9)	Yes	All said yes	Most said yes, if benefits were sufficient
Tampa (n=8)	No	Most said yes	All said yes, if benefits were sufficient

Note: n=number of shipping industry, pilots' association, and port authority stakeholders we interviewed.

[a]When Port Arthur's and Lake Charles' responses are considered separately, Port Arthur's responses for whether a system was needed are "most said yes" and for willingness to fund a system are "split about evenly." Lake Charles' responses for whether a system was needed are "all said no" and for willingness to fund a system are "most said no."

At the four ports with existing VTS systems (Houston/Galveston, Los Angeles/Long Beach, Philadelphia/Delaware Bay, and San Francisco),

interviewed stakeholders thought the systems were important to vessel safety. At Los Angeles and Philadelphia, where privately funded systems are in place, most stakeholders said they regarded the existing systems as sufficient. In a January 1996 memo, the Commander of the local Coast Guard district stated that the Los Angeles system is a highly professional waterway management tool effectively meeting the needs of the port and the Coast Guard. He noted that in broad terms, the Los Angeles system is entirely consistent with the vast majority of technical specifications identified in VTS 2000 operational documents; he favors admitting the system into the Coast Guard's national VTS network. At Houston/Galveston and San Francisco, where the Coast Guard's VTS systems are in place, stakeholders were generally pleased with the safety and service information provided by the current system but had concerns about the cost of a VTS 2000 system.

At two of the four ports where no form of VTS currently exists (New Orleans and Tampa), most of the stakeholders said some form of VTS, which they perceived to be less expensive than VTS 2000, was needed. At Tampa, for example, many stakeholders believed that a radar-based system would not be the most cost-effective alternative, and some preferred a system based on satellite technology (called a dependent surveillance system) that allows operators to determine the position of their vessel. At New Orleans, proposals from stakeholders included setting up manned watchtowers to monitor traffic in key areas of the Mississippi River.

At Port Arthur, views were about evenly mixed as to whether a more limited VTS system was needed. Some stakeholders thought that VTS would be valuable in certain areas, but not in the entire Port Arthur/Lake Charles area identified in the Port Needs Study. Of the four ports, Mobile/Pascagoula was the only one where stakeholders thought no VTS system was needed. Most of the stakeholders said they did not believe a VTS system was needed because of the low volume of deep-draft traffic in the Mobile area. As a result, these stakeholders generally regarded the current procedures as adequate. These procedures include such measures as permitting only one-way traffic in certain areas and maintaining communications with other vessel operators in the region.

As table 3 showed, views on funding such a system were mixed. In general, because stakeholders we interviewed perceived that other VTS alternatives could be less costly than VTS 2000, they were somewhat more disposed to consider paying for a VTS alternative. However, others were not willing to

pay for a system. At New Orleans, for example, some stakeholders objected to funding a service that would benefit users passing through the port to other destinations because these stakeholders believed the users might be difficult to identify and charge for the service. As with VTS 2000, some stakeholders were concerned about whether charging user fees would affect the competitiveness of their port.

Several Key Issues Could Affect the Establishment of Privately Funded VTS Systems

Most stakeholders at most of the ports we visited raised concerns that could affect the establishment of privately funded VTS systems. These concerns include the private sector's ability to fund the initial start-up costs of such a system, the private sector's exposure to liability, and the Coast Guard's role in planning and overseeing a privately funded system.

Ability to Obtain Adequate Financing May Be Limited

Most key stakeholders we interviewed at three of the six ports that do not have a privately funded VTS system were concerned that if local VTS systems are to be funded by the user community rather than through tax dollars, lack of adequate financing may pose a barrier. The start-up costs depend on the size and complexity of the system, but buying radar equipment, computer hardware and software, and operations space could cost $1 million or more for a system.

Financing the systems at Los Angeles/Long Beach and Philadelphia/Delaware Bay posed similar concerns, and both projects received federal or state financial assistance. The state of California provided a low-interest loan of $464,550 to help pay capital costs, and the ports of Los Angeles and Long Beach each provided $250,000 in grants for VTS equipment. The Marine Exchange of Los Angeles/Long Beach, which operates the system, uses Coast Guard property at no cost. For operators of the Philadelphia/Delaware Bay system, the Commonwealth of Pennsylvania provided a $100,000 grant to help upgrade radar equipment in 1986, and Pennsylvania and Delaware authorized pilotage fee increases in 1995 to pay for further upgrades costing more than $1 million.[13]

To provide you with additional information on this issue, we contacted representatives from five foreign locations with VTS systems that charge

[13]At this location, operation and maintenance costs for the VTS system are paid as part of the pilotage fees assessed on certain types and sizes of vessels using the port. A related example is San Francisco, where the Marine Exchange has said that if federal funding for the Coast Guard's system is cut off, the Marine Exchange would operate the system on a privatized basis, and ownership of the facility would remain with the Coast Guard. Thus, initial capital costs would be minimal.

port fees or user fees to pay for VTS operations.[14] At four of the five locations, the central government paid for all or part of the cost of developing and installing the VTS system. For example, the Port of Rotterdam's VTS capital costs of $180 million were paid both by the central government (66 percent) and by the local government (34 percent). At the Port of Marseilles, France, capital costs totaled about $3.5 million, of which the port paid 66 percent and the central government paid the remaining 34 percent. The central governments of these two countries agreed to pay the development and installation costs as part of their oversight role and their recognition of the need for VTS systems in their country. The Port of London was the only port where capital costs were paid entirely by the port authority. Most funding for this system comes from harbor fees.[15]

Concern About Liability Protection Is Widespread

Liability protection for private operators of a VTS system was a widespread concern among those we interviewed. Coast Guard and privately funded VTS systems generally supply only advisory information, such as vessel traffic or environmental conditions; control of the vessel remains with the master of the vessel. However, most port and industry stakeholders we interviewed at the six ports that do not have a privately funded system were concerned that private VTS operators would be liable if inaccurate information given by the VTS operations center led to an accident. Privately funded VTS systems in both Los Angeles/Long Beach and Philadelphia/Delaware Bay receive liability protection under state laws except in cases of intentional misconduct or gross negligence.

At the foreign locations we contacted, officials said that exposure to liability from operating VTS systems had not been raised as an issue because the master or captain of the vessel has ultimate responsibility for the safe navigation of the vessel. Directives from the VTS operator generally come only when a mechanical failure in the ship occurs or when a situation requires immediate safe traffic management. However, all ports noted that since the area of VTS operator liability has yet to be tested in a

[14]The five locations are Rotterdam, the Netherlands; Marseilles, France; London, England; Antwerp, Belgium; and Hong Kong. At the first three locations, local port authorities operate the VTS systems; in Antwerp, the Belgian government works with the local government to operate the VTS system; and in Hong Kong, the central government operates the system.

[15]We also contacted a representative from Canada to obtain information on Canada's efforts to pay for VTS operations through user fees. The 15 VTS systems operated by the Canadian Coast Guard each require mandatory participation but have no associated user fees. According to the Director, Marine Communication and Traffic Services, there is a strong movement through the government for maritime cost recovery, particularly for VTS operations. He said a study to look at full or partial cost recovery for VTS operations is ongoing. Included in the study is an analysis of what portion of the cost should continue to be paid by the central government, since benefits accrue to the public through environmental protection. This study is planned to be completed in 1997.

court of law, a precedent has not yet been set. At one port, an official noted that the port authority carries third-party insurance ($75 million per incident) as protection from accidents occurring under VTS guidance.

At locations such as Tampa and San Francisco, where the possibility of operating privately funded systems has been discussed, stakeholders we interviewed believe that securing liability protection is a key issue that must be resolved before they would move forward to establish a VTS system.

The Coast Guard's legal counsel has said that the Coast Guard's exposure to liability in jointly operated systems does not differ appreciably from that in other, more formally established, Coast Guard-operated vessel traffic services.[16] If there is no Coast Guard involvement with the privately funded VTS, no federal liability would stem from the actions of Coast Guard personnel.

Coast Guard's Role in Privately Funded Systems Has Not Been Defined

The Ports and Waterways Safety Act of 1972, as amended, provided that the Coast Guard may "construct, operate, maintain, improve or expand" VTS systems; however, the act does not address what role, if any, the Coast Guard should play in privately funded systems.[17] At seven of the eight ports we reviewed, most stakeholders said the Coast Guard should play a role with the private sector in developing privately funded VTS systems, including establishing operating standards. Among the reasons for the Coast Guard to be involved, the stakeholders cited the Coast Guard's regulatory authority to require mandatory participation, the need for consistent and unbiased operations, and the Coast Guard's expertise in and experience with other VTS systems. For example, the consensus of stakeholders in Tampa was that industry, the state, and the Coast Guard should jointly determine the need for a system. A report produced by the state of Florida states that "any interim [VTS] system should be established in conjunction with the Coast Guard since a system without Coast Guard support will have no real authority and may not conform with other U.S. Coast Guard systems."

[16]The liability of the United States (through the Coast Guard) for the acts of its personnel will be determined in the manner and to the extent provided for by the Federal Tort Claims Act.

[17]However, the Coast Guard Authorization Act of 1993 authorized the Coast Guard to provide for personnel support for the interim Vessel Traffic Information Service in Los Angeles/Long Beach. The act states that the Coast Guard shall be reimbursed for all costs associated with providing the Service with these personnel in accordance with a reimbursable agreement between the Coast Guard and the state of California. The act does not address the Coast Guard's interaction with any other privately funded VTS system.

While support for the Coast Guard's involvement in privately funded systems was widespread, opinions were somewhat divided over what form this involvement should take. The two ports that currently have privately funded systems tended to differ in how they saw the Coast Guard's role. At Los Angeles/Long Beach, where the Coast Guard provides personnel for helping to run the system, the executive director of the marine exchange said this arrangement gives the system greater viability in performing its operations. Local Coast Guard officials said they also benefit from the system, since it can assist them with other duties, such as waterway management, search and rescue operations, and law enforcement activities. Private operators of the Philadelphia/Delaware Bay system believed that the Coast Guard had a role in private systems but in a more limited capacity. For example, with the Philadelphia/Delaware Bay VTS, Coast Guard personnel do not participate as VTS operators, but frequent communication on issues of mutual concern occurs between the private operators and the Coast Guard's Marine Safety Office. For example, the VTS operators would notify the Coast Guard if a navigation buoy were reported to them as being missing or in the wrong location. However, operators of the system also said that the Coast Guard should have the authority to approve and set the standards for operating a system.

At the foreign locations we contacted, the central government played a role in most of the locally or privately operated systems. At three of the four locations where the local government or port authority operates the system, the central government established the operating regulations. Officials said that the role of the central government was to provide regulatory control and oversight to ensure standard procedures for operating the VTS systems in their country.

The Coast Guard recognizes that its authority for involvement in privately funded systems is limited. In response to questions in a June 1995 congressional hearing, the Coast Guard stated that

"Statutory and/or regulatory changes are needed to support the development of public-private partnerships for VTS systems. The Coast Guard would need either broad authority to accept reimbursement for personnel it provided, or the authority to approve or sanction non-federal VTSs. Formal certification of VTS-like facilities and development of standard operating procedures would also make sense. They are both good business practices and would enhance the safety and quality of VTS operations."

Conclusions

Difficult choices need to be made about installing and improving VTS systems in the nation's ports. Important questions about the VTS program currently remain unanswered, including how many ports need the system, how much it will cost, and whether other cost-effective solutions are available. At the same time, there is an acknowledged need to improve waterway safety. The available information indicates that several ports under consideration are likely to realize substantial benefits from the installation of VTS systems, and at many ports we visited, stakeholders appeared interested in making improvements—and, in some locations, perhaps paying for them—if the economic soundness of such improvements can be demonstrated.

An immediate and essential next step is for the Coast Guard to more aggressively open lines of communication with key stakeholders at ports under consideration for VTS 2000. This communication is essential in either securing support for VTS 2000 or in developing possible alternatives. Such alternatives could include Coast Guard-operated systems or upgrades that are less extensive than VTS 2000 systems or systems built and operated by the private sector. To encourage more private-sector participation in VTS operations, however, several other issues would need to be resolved, including ways to provide financial assistance, liability protection, and an overseer role for the Coast Guard.

Recommendations to the Secretary of Transportation

We recommend that the Secretary of Transportation direct the Commandant of the Coast Guard to take the following steps regarding the VTS 2000 program:

- To help ensure that the user community has adequate opportunity to provide its views, interact more closely with key stakeholders before making a final decision on the number of ports that will receive VTS 2000 systems. This interaction could be achieved by discussing the need for the system in each location, allowing local officials to participate in designing the system's configuration, or discussing other waterway safety measures that may obviate the need for a VTS 2000 system in their port. Discussions should also include the level of support that exists for privately funded systems and factors (such as financial assistance and liability indemnification) needed to facilitate their establishment. The Coast Guard should report to the Congress on the potential for privatization and the actions needed to develop privately funded systems.
- Given the (1) high development costs for the program (estimated at up to $145 million) and (2) the large number of proposed sites that show

relatively low net benefits from acquiring new VTS 2000 systems, determine whether the safety benefits of VTS 2000 can be achieved more inexpensively by installing other VTS systems, perhaps patterned after existing, recently upgraded Coast Guard systems.

- To ensure that the operation of privately funded systems is consistent with the Coast Guard's responsibility for marine safety and the marine environment, determine with input from industry and other stakeholders, the Coast Guard's appropriate role in overseeing privately funded systems and seek authorization from the Congress to implement this role.

Agency Comments and Our Evaluation

We provided a draft of this report to officials from the Department of Transportation and the Coast Guard for their review and comment. We discussed the report with these officials, including the Coast Guard's VTS 2000 Project Manager, Office of Acquisition, and the Chief of the Vessel Traffic Management Division, who generally agreed with the report's findings and said they would consider the report's recommendations. They provided comments that clarified the cost of developing VTS 2000, which we have incorporated into the report.

We performed our work from August 1995 through March 1996 in accordance with generally accepted government auditing standards. A detailed description of our scope and methodology appears in appendix III.

As arranged with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until 10 days after the date of this letter. At that time, we will send copies to the Secretary of Transportation; the Commandant of the Coast Guard; and the Director, Office of Management and Budget. We will make copies available to others on request.

Please contact me at (202) 512-2834 if you or your staff have any questions concerning this report. Major contributors to this report are listed in appendix IV.

Sincerely yours,

John H. Anderson, Jr.
Director, Transportation and
Telecommunications Issues

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Abbreviations

GAO	General Accounting Office
VTIS	vessel traffic information service
VTS	vessel traffic service

Background on Eight Ports Visited by GAO

Described below is information on the type of vessel traffic at each port we visited, the navigational difficulty for each port, and a description of the current vessel traffic service (VTS) system at each port. For ports with Coast Guard-operated systems, we also supply information on the upgraded or enhanced systems.

Houston/Galveston, Texas

Galveston Bay marks the entrance from the Gulf of Mexico that leads to ports such as Houston, Galveston, and Texas City. This large, irregularly shaped, shallow body of water is about 30 miles long and 17 miles wide at its widest part. Because the bay is generally only 7 to 9 feet deep, deeper-draft vessels must use a 400-foot-wide, 40-foot-deep dredged channel to reach their inland port destinations. Vessels destined for the Port of Houston travel a total of 53 miles up the bay and ship channel to reach their destination, while Galveston- and Texas City-bound vessels transit only 11 miles and 16 miles, respectively. Other factors that affect navigation in this region include fog conditions and tidal changes, which can be exacerbated by wind conditions.

The volume and type of traffic transiting this region add to the navigation challenges noted above. The Houston/Galveston Bay area ranks third among U.S. ports for its handling of crude oil and second for its handling of other petroleum products. This area is one of the busiest ports in the U.S. as well. For example, according to a Coast Guard official, over 17,000 deep-draft and 97,000 barge transits operated under VTS Houston in 1994.

Under the authority of the Ports and Waterways Safety Act, the U.S. Coast Guard established a VTS system for the Houston/Galveston area in 1975. The Coast Guard staffs the VTS system with at least one supervisor and four vessel traffic controllers for each watch 24 hours a day, 7 days a week. The Coast Guard's operating costs for the VTS system were about $3.2 million for 1995. Participation in the VTS system is mandatory for all power-driven vessels over 131 feet long, vessels greater than 26 feet long engaged in towing, and vessels certified to carry 50 or more passengers. On average, about 340 vessels use the Coast Guard's VTS services on a daily basis.

In 1995, the Coast Guard completed a $700,000 enhancement that provided the Houston VTS system with one additional radar site. According to a Coast Guard official, this addition filled a gap in the VTS system's area coverage that had previously affected the Coast Guard's ability to monitor vessel traffic in the upper Galveston Bay/Redfish Bar area.

The Coast Guard also plans to develop a VTS 2000 system for the Houston/Galveston area by 2000. The Coast Guard's estimated costs for a VTS 2000 system in Houston/Galveston include about $8.8 million in acquisition, construction, and improvement costs and about $3 million in annual operating costs.

Los Angeles/Long Beach, California

The ports of Los Angeles and Long Beach are located within San Pedro Bay, a body of water separated from the open sea by a 7-mile-long breakwater. After entering the bay, maritime traffic travels to one of the many deep-water berths located in this 15,000-acre, man-made harbor. According to Coast Guard officials, despite the relatively high marine traffic volume in the harbor, the area is not considered difficult to navigate, as it is relatively free of navigation hazards and weather problems, except for occasional fog. Together, the ports of Los Angeles and Long Beach are responsible for the highest container tonnage of any port in the nation. In fiscal year 1994, these ports received 7,933 commercial vessels, transporting more than 103 million tons of cargo, including automobiles, petroleum products, and other bulk products. In addition, the Port of Los Angeles supports a cruise ship industry.

Since early 1994, the Marine Exchange of Los Angeles and Long Beach have been operating a vessel traffic information service (VTIS) system. This system, initially established as an interim system until the Coast Guard could build its own VTS, was developed with financial assistance from the ports of Los Angeles and Long Beach and a loan from the state of California. The geographic area covered by the system extends out to 20 miles offshore. On the basis of an agreement with the harbor pilots, VTIS does not advise vessels within the breakwater, although it has that capability. State law requires all vessels of a certain size to participate in the system. For example, ships over 300 gross tons participate in the system. The annual operating costs of VTIS, currently about $1.4 million, are covered by user fees levied on vessels using the system's services. Fees currently range from $180 to $340 per entry into the VTIS area, depending on the size of the vessel.

The Coast Guard has played an active role in the Los Angeles/Long Beach VTIS since its inception. Initially developed under the Coast Guard's guidance, the system operates under many of the same rules and procedures that the Coast Guard uses at its own VTS sites. The system uses Coast Guard watchstanders, who along with Marine Exchange personnel, monitor traffic and provide mariners with information. The state of

California reimburses the Coast Guard for the use of its personnel. VTIS also provides the Coast Guard with valuable assistance during its search and rescue efforts and law enforcement actions, and VTIS disseminates information on Captain of the Port Orders.

The Coast Guard currently plans to build a VTS 2000 system that would be fully operational by 1998 in the Los Angeles/Long Beach area. The Coast Guard estimates that acquisition, construction, and improvement costs will be $4.9 million and that annual operating costs will be about $1.7 million.

Mobile, Alabama/Pascagoula, Mississippi

Mobile, Alabama is about 28 miles inland from the Gulf of Mexico. Deep-draft vessels bound for Mobile from the Gulf use a channel that is at least 400 feet wide for their transit up Mobile Bay. This shipping channel, which runs north and south between the Gulf and Mobile, is dredged to about a 40-foot depth, while the remainder of the bay is generally only 7 to 12 feet deep.

Pascagoula, Mississippi, which lies about 24 miles west of Mobile, is also an inland port that requires deep-draft vessels to transit up a narrow channel to reach its harbor area. However, in this location, the transit is only about 10 miles from the Gulf of Mexico.

Navigational challenges in this area (in addition to the narrow channel) are presented by two main factors: weather conditions and crossing marine traffic in certain locations. Relatively frequent and strong weather fronts and fog are typical in this region. Frontal systems occur about 20 times per year and are usually accompanied by heavy rain and strong winds. Fog is most problematic in the winter and spring, and visibilities can fall below one-half mile 4 to 8 days per month from November through April. Crossing marine traffic presents a navigational challenge in two locations where the Intracoastal Waterway (a major shipping channel for shallow-draft vessels) crosses the main ship channels leading to Mobile and Pascagoula. Because of the large volume of shallow-draft traffic transiting east and west along this waterway, there is a potential for collisions with shipping channel traffic in this area. As a result, in both locations, the Coast Guard advises vessel operators to exercise particular caution and requests that they make a security call prior to crossing the Intercoastal Waterway, particularly during periods of restricted visibility. Vessel operators make a security call to advise other vessels in the vicinity of their current location and their intended route.

Deep-draft vessel traffic in the Mobile/Pascagoula area is relatively light compared with that of larger Gulf Coast ports like New Orleans and Houston. According to Coast Guard information, 1,118 deep-draft vessels arrived at the Port of Mobile and 328 deep-draft vessels arrived at the Port of Pascagoula in 1995. In addition, a significant amount of shallow-draft traffic occurs in this region, according to a Coast Guard official. Counting deep-and shallow-draft shipping together, commodities (by tonnage) being moved in and out of the Mobile area include crude or bulk materials (such as forest products, pulp, and iron ore) (38 percent), coal (32 percent), and petroleum and petroleum products (20 percent). At Pascagoula, 85 percent of the tonnage is petroleum and petroleum products.

Currently, no radar-based VTS system monitors vessel traffic in this region. However, port officials in both locations are in contact by radio or telephone with vessels operating in their port to enforce local rules and regulations (such as speed limits) and assign berths to vessels, among other things.

The Coast Guard's plans for VTS 2000 currently include the installation of a VTS 2000 system in this port by 2001. The Coast Guard estimates that costs for the system will be about $5.3 million in facility and equipment costs and $2 million in annual operating costs.

New Orleans, Louisiana

The Port of New Orleans, encompassing a 34-mile stretch of the Mississippi River, is one of the largest ports in the United States. This port area serves vessel traffic from three waterway complexes: ocean traffic entering from the Gulf of Mexico, river traffic moving along the Mississippi and Ohio rivers, and vessel traffic from the Intracoastal Waterway. Vessels coming into this port region from the Gulf of Mexico are typically deep-draft vessels, while the river and Intercoastal Waterway vessels tend to be primarily shallow-draft vessels, according to the Coast Guard.

According to the Coast Guard, several factors influence the difficulty of navigation in this river port area. The first is geography. For example, blind corners, sharp bends, and strong currents in the Mississippi River make it more difficult for vessel operators to both see each other and avoid collisions. The second is the sheer volume of vessels transiting and mooring in the area. The port region has many miles of warehousing facilities and barge mooring on both banks of the river. The amount of activity occurring along the river banks and the number of vessels going up and down the river pose an increased risk of collisions because

maneuvering room decreases. The third is changing river conditions. Because this region is a river environment, it is affected by seasonal changes (such as winter thaw), which can increase the water level and the speed of the river's currents. With faster river currents, vessels must operate at higher speeds to maintain their maneuverability, thereby reducing their time to maneuver and increasing the potential risk of accidents. This condition is exacerbated by spring fog, which can significantly reduce visibility in the region.

In 1995, about 41,600 vessels transited through the New Orleans area. Of this total, about 6,400 were deep-draft vessels, and the remainder were shallow-draft vessels. Cargoes carried by vessels transiting this area include iron and steel, metal ores and scrap, and fertilizers. However, according to a Coast Guard official, about half of the shallow-draft vessels carry dangerous cargoes, such as petroleum and petroleum products.

The Coast Guard currently operates a limited vessel traffic management system in the New Orleans region. It is a radio-based vessel information system that uses red and green signal lights to direct vessel traffic. The scope of its operation depends in part on the river conditions. For example, when there are high water conditions (which may have been created by winter thaw), strong currents create a "boil" at a particular location in the river that is capable of turning a large vessel 180 degrees off course. Because of the added risk under this type of condition, the operators of the system limit the transits in this area to one vessel at a time to ensure that vessels have adequate maneuvering space to accommodate the effects of the river's current as they try to correct their course.

The Coast Guard's plans for a VTS 2000 in this region include installation of two phases of a VTS 2000 system by 2001. The Coast Guard estimates that total facility and equipment costs for both phases would be about $29.7 million and total operating expenses would be about $6.6 million annually.

Philadelphia, Pennsylvania/ Delaware Bay, Delaware

Delaware Bay marks the entrance from the Atlantic Ocean that leads inland to ports such as Philadelphia, Pennsylvania; Wilmington, Delaware; and Camden, New Jersey. The bay itself is an expansion of the lower part of the Delaware River, and the bay's entrance is about 10 miles wide between Cape May, New Jersey, and Cape Henlopen, Delaware. Deep-draft vessels entering Delaware Bay approach this entrance between the capes

utilizing one of two sea lanes that approach the entrance from either the east or the south. Traffic separation schemes identify inbound and outbound lanes and a zone of separation in each of these sea lanes to help reduce the risk of collision in this area. Because parts of Delaware Bay are shallow, deep-draft vessels transit to their inland destinations via a channel that is 40 or more feet deep throughout its 90-mile length. The ports of Philadelphia and Camden, which lie opposite each other along the Delaware River, are about 87 miles from the capes, while Wilmington is about 63 miles from the capes.

The navigational challenges that mariners face when transiting this region include curves with irregular depths; strong currents; shoals, particularly rock shoals in the Marcus Hook, Pennsylvania, region; occasional visibility limitations caused by fog, precipitation, smoke, and haze; and ice conditions in the winter. However, according to a Coast Guard official, the two significant navigational challenges in this region are at the approaches to the Delaware Bay entrance and at the location where the Chesapeake and Delaware Canal enters the Delaware River.

In 1995, 2,570 deep-draft vessels arrived in this region. Pennsylvania terminals accounted for 51 percent of these arrivals, while terminals in New Jersey handled 31 percent and Delaware handled 18 percent. While many of these vessels carried a wide variety of products—ranging from fruit, cocoa, and salt to plywood, steel, and asphalt—about one-third of the vessels arriving in this region were carrying petroleum products. According to a port official, oil and oil-related products accounted for 85 percent of the total tonnage arriving in this port region in 1994.

The Philadelphia Marine Exchange and the Pilot Association for the Delaware Bay and River jointly operate a vessel traffic information system for vessels operating in the Delaware Bay and River. The lower bay area is monitored via radio and radar by the pilots operating out of a watchtower at Cape Henlopen. The upper bay and rivers are monitored by radio via the Maritime Exchange. Vessel traffic is monitored 24 hours a day, 7 days a week, and operating costs for this service are funded through fees paid to the pilots for their piloting services. Unlike the Coast Guard's VTS systems, vessels are not required by law to participate in this privately funded system, but according to a pilot official, all piloted vessels do participate. However, participation in the VTS system by shallow-draft vessels is mixed—according to a local Coast Guard official. The VTS system underwent a $1.2 million dollar upgrade in late 1995 that improved operators' ability to monitor an anchorage area and provided for an

expansion in their offshore coverage of vessels approaching Delaware Bay, according to a pilot official.

The Coast Guard's current plans for VTS 2000 include the installation of a system in this port by 2002. The Coast Guard currently estimates that acquisition, construction, and improvement costs will be $6.5 million and annual operating costs will be $1.3 million for the proposed system.

Port Arthur, Texas/Lake Charles, Louisiana

The Port Arthur region consists of four major ports—Port Arthur, Beaumont, Orange, and Lake Charles—that together had about 2,400 deep-draft-vessel arrivals in 1994. Petroleum products and chemicals are the primary cargos for these areas.

According to Coast Guard officials, navigation in Port Arthur is considered moderately difficult because vessels must transit up to 8 hours through a relatively narrow 56-mile channel and Sabine Lake with virtually no anchorages along the way. In contrast, navigation for Lake Charles involves a 25-mile transit for vessels from the Gulf of Mexico. Coast Guard officials said the transit is considered moderately easy because large vessels are restricted to one-way traffic, thereby eliminating the potential collision hazard between larger ships. Also, as a further precaution, vessels approaching a ship carrying liquified natural gas must maintain minimum distances from it (2 miles ahead or 1 mile behind).

Neither Port Arthur nor Lake Charles has a radar-based VTS system. Instead, both areas have a radio-based scheduling system that provides certain marine traffic with information on vessel movements. Only deep-draft vessels with marine pilots aboard participate in this system; barges and other intercoastal waterway traffic do not usually communicate with the operations center with respect to their locations or other information.

The Coast Guard plans to install and operate a VTS 2000 system in the Port Arthur/Lake Charles area by 2000. The Coast Guard estimates that facility and equipment costs to build the system will be about $6 million and annual operating costs will be about $1.3 million.

San Francisco, California

The San Francisco Bay region comprises a series of connecting bays that make up the largest harbor on the Pacific Coast. Maritime traffic enters the area from the Pacific Ocean and can travel through a number of bays

including San Francisco Bay, San Pablo Bay, and Suisun Bay. The bay traffic destinations include locations such as Oakland, Richmond, and San Francisco, while traffic transiting beyond the bays can travel about 37 or 43 miles upriver to the ports of Stockton and Sacramento, respectively.

This region is considered a difficult navigation area because of its high-traffic density, frequent episodes of fog, and challenging navigational hazards. In 1994, there were 3,502 vessel arrivals in the San Francisco Bay region. Sixty-six percent of these vessels were either full container vessels or tank vessels carrying petroleum products. In addition to vessel arrivals, there is a high volume of ferry traffic in this region, adding to the navigational challenges for vessel operators traveling in the area. The episodes of fog, most frequently experienced in the summer, add to the difficulty of navigating by significantly reducing visibility. According to a Coast Guard official, this region's large volume of vessel traffic and low visibility periods and the navigational hazards presented by narrow channels, shallow depths, prominent shoals, and crossing vessel traffic areas all contribute to the need for mariners transiting in this region to be subject to a number of regulations. One key regulation is a requirement that many of them participate in the VTS system.

The Coast Guard established the VTS system in 1972 shortly after the passage of the Ports and Waterways Safety Act of 1972 and following a serious collision between two tank vessels that resulted in extreme environmental damage to San Francisco Bay. The Coast Guard continues to operate the VTS system today and monitors about 250 vessel movements per day. On average, just over two-thirds of these VTS system contacts are with ferries operating in the region. Participation is mandatory for all vessels meeting certain minimum requirements. For example, all power-driven vessels 40 meters or greater in length must participate in the system. Coast Guard personnel monitor approximately 133 miles of waterway, 24 hours per day, 7 days per week using radio, radar, and camera equipment. According to a Coast Guard official, the geographic area covered by VTS extends from about 38 nautical miles offshore into the central bay area and upriver toward the north and east to the ports of Stockton and Sacramento. Operating costs for the current VTS system are about $2.6 million annually.

The VTS system is currently undergoing a $6.1 million upgrade that will provide two additional radar surveillance sites, two additional camera surveillance sites, and digitized radar displays in the Vessel Traffic Center. The upgraded system is expected to be fully operational in the summer of

1996. In 2004, the Coast Guard plans to replace the system again with a VTS 2000 system. The Coast Guard's estimated costs for the VTS 2000 system are about $6.6 million in acquisition, construction, and improvement costs and about $2.2 million in annual operating costs.

Tampa, Florida

The Tampa Bay harbor is a relatively large, shallow body of water containing three major ports—Tampa, St. Petersburg, and Manatee. Maritime traffic, which included about 10,000 commercial vessel arrivals in 1994, enters the bay from the Gulf of Mexico. Vessels transit through dredged ship channels and take up to 6 hours to reach their destinations. A large portion of the vessels transiting the bay are tank vessels that annually carry more than 4 billion gallons of oil, petroleum products, and hazardous materials. In addition, Tampa Bay supports growing cruise ship and tourist industries, with current arrivals averaging three each week.

According to Coast Guard officials, navigation in Tampa Bay is considered moderately difficult because of its high marine traffic density, the absence of inner-harbor anchorage areas, swift currents, and narrow channels. Reduced visibility caused by fog and severe thundershowers (which occur, on average, 24 and 91 days each year, respectively) also add to the challenges of navigating in this region.

A major oil spill resulting from an accident in the bay in 1993 was the impetus for actions currently underway by state and local officials to develop their own VTS system for the bay area. The state of Florida has established a consortium of maritime interests to design and develop an interim system that will serve the area until the Coast Guard builds its own VTS there. The consortium is developing a proposal for a system that is compatible with the Coast Guard's performance goals for VTS 2000. Under current plans, this privately operated system could be fully operational within the next several years, if funding to build and operate it can be obtained.

Currently, the Coast Guard anticipates building and operating a VTS 2000 system in Tampa that would be fully operational by 2001. The Coast Guard estimates that facility and equipment costs to build the system will be $5.6 million and annual operating costs will be about $1.9 million.

Background on the Port Needs Study and Follow-on Studies at Five Ports

The Research and Special Programs Administration's Volpe National Transportation Systems Center conducted the Port Needs Study from February 1990 through July 1991 at a cost of $2.8 million. The scope of the study involved an examination of the need for VTS systems at 23 locations. The study assessed the need for a VTS system by using two methods of cost-benefit analysis. The first method evaluated the full benefits and full costs of installing a VTS system without considering the costs and benefits of existing systems.[1] Ten of the 17 ports under consideration for VTS 2000, however, currently have some form of VTS system or radio-based information system.[2] The second method took these existing systems into account by evaluating their benefits and costs. On the basis of the second method, the study determined the marginal net benefit, if any, that a new system would bring to eight of the ten locations.[3]

Cost estimates for each port were based on initial investment costs and annual operation and maintenance costs. Investment costs were estimated by developing a "candidate" VTS system for each port zone. The candidate VTS system's design is a preliminary engineering design made for developing cost estimates. For comparison purposes, initial investment costs were assumed to be committed in fiscal year 1993, and operation and maintenance costs are estimated from fiscal year 1996. All costs are in 1990 constant dollars.

Benefit estimates for each port zone were based on the cost of vessel accidents and associated consequences expected to be prevented by the candidate VTS system. The estimates were based on a statistical analysis of historical vessel accidents and traffic and the unique navigational features of each port zone to determine the probability of vessel accidents occurring in each port zone.[4] These probabilities were applied to vessel traffic forecasts to estimate the probable number of future vessel accidents that would occur in the absence of any VTS system. The

[1]The benefit is based on the cost of avoided casualties and associated consequences attributable to a candidate VTS system (the difference between the number of casualties, assuming that a VTS system does not exist at a port, and the number of casualties, assuming that a VTS system does exist).

[2]The Port Needs Study did not evaluate the marginal net benefit of the radio-based information system in Port Arthur. Also, the VTS system in Valdez was not included in the study because the Congress had already legislated the expansion and improvement of the Prince William Sound VTS system in the Oil Pollution Act of 1990.

[3]The marginal benefit is based on the difference in the cost of avoidable casualties and associated consequences attributable to an existing VTS system and the avoidable casualties attributable to a candidate system.

[4]The primary source of accident data was the Coast Guard's Casualty Maintenance database for 1980-89. The only source of traffic data was the Army Corps of Engineers. Volpe used 1987 traffic data as the basis for projecting future traffic patterns.

effectiveness of the candidate VTS system in preventing vessel accidents in each port zone was then estimated as the cost of the losses expected to be avoided by the VTS systems. Benefits and costs were calculated over a 15-year period—1996-2010—and discounted to 1993.

Starting in fiscal year 1993, Volpe issued a series of follow-on studies for the Coast Guard on selected sites. To date, reports on five of the ports considered for VTS 2000 have been completed.[5] Reports were issued on Mobile and Corpus Christi in 1993, Boston and Tampa in 1994, and Philadelphia in 1995. Among other things, the follow-on studies supplement the Port Needs Study by validating and updating vessel traffic patterns and forecasts, documenting traffic management requirements, and updating the VTS cost-benefit analysis. Table II.1 gives the results of the follow-on studies.

The results of the follow-on studies are not comparable with the Port Needs Study for several reasons. For example, the Port Needs Study used a discount rate of 10 percent in calculating costs and benefits, while the follow-on studies used a discount rate of 7 percent.[6] Using a lower discount rate contributes to an increase in the present value of net benefits attributable to a VTS system. In addition, the follow-on studies used more current transit data or adjusted the original data based on input from the local marine community. For example, the follow-on study at Philadelphia/Delaware Bay used 1993 data from the Army Corps of Engineers, while the Port Needs Study was based on 1987 data from the Corps.

[5]The Coast Guard also plans to conduct follow-on studies of Portland, Oreg.; Puget Sound, Wash.; Providence, R.I.; Long Island Sound, N.Y.; and Baltimore, Md. In total, the studies will cost about $2 million.

[6]The lower discount rate was used in accordance with guidance issued by the Office of Management and Budget.

Table II.1: Results of Follow-on Studies at Five Ports

Dollars in millions

	Estimated life cycle costs and benefits over 15 years[a]		
Location	**Total benefit**	**Total cost**	**Net benefit**
Corpus Christi	$89.9	$13.2	$76.7
Mobile	69.7	17.8	51.9
Boston	11.6	18.7	(7.1)
Tampa			
Coast Guard's VTS	53.6	23.5	30.1
Proposed private VTS	18.6	6.6	12.0
Philadelphia			
Coast Guard's VTS	40.6		
Existing private VTS	21.2	18.1	22.6
		3.7	17.6

[a]The costs and benefits for Corpus Christi and Mobile were discounted to 1993. The costs and benefits for Philadelphia, Tampa, and Boston were discounted to 1998. All costs and benefits are in 1992 constant dollars.

Scope and Methodology

This work was prepared at the request of the Chairman, Subcommittee on Coast Guard and Maritime Transportation, House Committee on Transportation and Infrastructure, and Representative James A. Traficant, Jr., who was formerly the ranking minority member of the Subcommittee.

To assess the status of VTS 2000, we examined the Port Needs Study and updated studies on five ports and interviewed officials who were responsible for the study and updates at Volpe National Transportation Center. (App. II provided additional information on the Port Needs Study). We did not conduct an assessment of the accuracy of the data used in the Port Needs Study or the updates. We reviewed program documents and interviewed Coast Guard program managers and acquisition managers for the VTS 2000 program.

To determine the interest of industry and ports in acquiring and funding VTS 2000 or other systems, we obtained information from four ports (New Orleans, Port Arthur/Lake Charles, Houston/Galveston, and Mobile) identified by the Port Needs Study as having the greatest benefit from a VTS system. In addition, we obtained information from four other ports that either have privately funded VTS systems or have expressed interest in funding VTS systems with nonfederal funds. At each port, we obtained information on implementation issues that arise or could arise in privately funded systems. Table III.1 categorizes these ports.

Table III.1 Breakdown of Eight Ports Visited by GAO

Name of port	Top four ports in the Port Needs Study	Ports with privately funded VTS system	Ports considering privately funded VTS
New Orleans, La.	X		
Port Arthur, Tex./Lake Charles, La.	X		
Houston/Galveston, Tex.	X		
Mobile, Ala./Pascagoula, Miss.	X		
Los Angeles/Long Beach, Calif.		X	
Philadelphia, Pa./Delaware Bay, Del.		X	
San Francisco, Calif.			X
Tampa, Fla.			X

The information we obtained at each of the ports we visited was based on multiple data sources. Our work included a standard set of questions with

stakeholders from industry, pilots' associations, and port authorities and reviews of documents. We developed our list of interviewees from the Coast Guard's Port or Safety Advisory Committee in each of the eight ports, or we based our list of interviewees on recommendations from the local Coast Guard office. The committee comprises key users of each port, such as pilots, ship and barge companies doing business at the port, and port officials. We verified with Coast Guard, industry, and port officials that our list of interviewees represented the key stakeholders that had an interest in operations of the port. (See table III.2 for a breakdown of key stakeholders interviewed in each location.) In addition, we reviewed documents on the VTS 2000 program and local correspondence with the Coast Guard. We also reviewed available documents on waterway safety.

Table III.2: Type of Key Stakeholders Interviewed at Each Port

	Type of key stakeholder interviewed		
Name of port	Industry	Port authority	Pilots' association
Houston	3	1	1
Los Angeles/Long Beach	8	1	1
Mobile/Pascagoula	4	1	2
New Orleans	3	1	2
Philadelphia/Delaware Bay	7	2	1
Port Arthur/Lake Charles	8	4	2
San Francisco	6	2	1
Tampa	4	3	1

In addition to obtaining information from ports in the United States, we obtained information from six foreign countries to determine how they have implemented user fees. We judgmentally selected five foreign ports that charge port fees or user fees to fund VTS systems. The selected ports are Rotterdam, the Netherlands; Marseilles, France; Antwerp, Belgium; London, England; and Hong Kong. We also collected information from Canada because it is examining user fees as one means to pay for VTS systems in the future. Using a standard set of questions to obtain information, we conducted telephone interviews with central government officials and operational managers in these countries. These officials were identified to us by representatives of the International Association of Lighthouse Authorities and the European Commission as the most knowledgeable about VTS issues in their respective countries.

We conducted legal analysis of pertinent laws and regulations governing the Coast Guard's responsibilities in operating VTS systems and the

implementation of user fees to pay for such systems. Among other things, we reviewed the Ports and Waterways Safety Act of 1972, as amended, and the Oil Pollution Act of 1990. Also, we interviewed the Coast Guard's legal counsel on legal issues related to VTS 2000.

We reviewed numerous budget and program documents. We also interviewed key stakeholders at the national level, including the American Waterways Operators, the American Association of Port Authorities, and the American Institute of Merchant Shipping. Also, we discussed our approach with the Marine Board of the National Research Council.

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