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The Coast Guard's Role in Safeguarding Maritime Transportation: Selected Issues

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Summary

Congress has made the U.S. Coast Guard responsible for safeguarding vessel traffic on the nation's coastal and inland waterways. Congress typically passes Coast Guard authorization bills every one to two years and appropriates funds to the agency annually under the Department of Homeland Security appropriations bill. H.R. 2518, reported by the House Transportation and Infrastructure Committee, and S. 1129, reported by the Senate Commerce Committee, authorize appropriations for the Coast Guard for FY2018 and FY2019 and have provisions related to the agency's safety mission.

The fleet of vessels the Coast Guard inspects for safety reasons recently doubled because the agency is now responsible for inspecting tugs and towboats that push or pull barges (towing vessels), in addition to ships. In June 2016 the Coast Guard issued a final rule on this matter. The Coast Guard is now considering an hours-of-service limit for crews working on towing vessels in an effort to reduce accidents caused by fatigue and is reevaluating the crewing requirements for certain seagoing barges. These potential changes are controversial and could raise the cost of transporting petroleum and chemical products by barge.

Other current controversies related to the Coast Guard's vessel safety responsibilities include the following:

- Whether the agency should place greater reliance on nonprofit vessel classification societies to perform vessel inspections in place of Coast Guard personnel, as recommended by an independent review panel requested by Congress.
- The effectiveness of Coast Guard vessel traffic service centers in preventing harbor accidents, which is questionable due to insufficient staff experience and expertise.
- The Coast Guard's ability to operate in the Arctic, where a decline in sea ice during the late summer has led to increased maritime activity.
- The potential for replacing physical aids to navigation, such as channel marking buoys and beacons, with virtual aids utilizing GPS and electronic charts, at significant cost saving.
- The potential use of unmanned aerial vehicles (drones) to increase the efficiency and reduce the cost of Coast Guard sea patrols.
- Guidelines for the safe refueling of ships using liquefied natural gas (LNG).
- Enforcement of cleaner fuels for ships; cleaner fuels are reportedly causing some ships to have engine problems and are believed by some to be part of the reason for a ship collision in Houston in March 2015.
- Coast Guard guidelines for establishing buffer zones between offshore wind farms and shipping corridors.

Contents

Introduction 1
Towing Vessel Safety 1
Tug/Towboat Crew Work Hours 2
Crew Size on Articulated Tug-Barges 2
Vessel Safety Inspections 3
Outside Review Is Critical of Vessel Traffic Services 4
Arctic Polar Code 5
Passenger Vessel Lifesaving Equipment 5
Accident Data 6
Great Lakes Pilotage Rates 7
Electronic Navigation 7
Unmanned Aircraft Systems (UAS) 8
Emission Control Areas (ECAs) 9
LNG Bunkering 9
Shipping Corridors and Offshore Wind Farms 11

Appendixes

Appendix. Maritime Safety: Key Elements 12

Contacts

Author Information 16

Introduction

The U.S. Coast Guard is the nation's principal law enforcement authority on U.S. waters. Its missions include maritime safety and security, marine environmental protection, search and rescue, drug and migrant interdiction, fisheries enforcement, and defense readiness. The Coast Guard's responsibilities are specified in legislation establishing the agency as well as authorization bills typically passed by Congress every one to two years and in Department of Homeland Security appropriations acts. This report discusses selected issues related to the agency's mission safeguarding maritime transportation, particularly those that have arisen in recent Coast Guard authorization or appropriations legislation or hearings.[1] H.R. 2518, reported by the House Transportation and Infrastructure Committee, and S. 1129, reported by the Senate Commerce Committee, authorize appropriations for the Coast Guard for FY2018 and FY2019 and have provisions related to the agency's safety mission, as discussed in this report.

To carry out its safety mission, the Coast Guard interacts with key maritime safety institutions: harbor pilots, vessel traffic services and marine exchanges, classification societies (independent third-party inspectors), the International Maritime Organization (IMO), and ship flag registries. The **Appendix** provides background information on these institutions.

Towing Vessel Safety

In 2004, Congress directed the Coast Guard to establish an inspection regime for towing vessels—the tugs or towboats that push or pull barges—similar to that which exists for ships (The Coast Guard and Maritime Transportation Act of 2004, P.L. 108-293, Section 415). This inspection regime was to include establishing structural standards for towing vessels as well as standards for the number and qualifications of crew members. Section 409 of the 2004 act also authorized the Coast Guard to evaluate an hours-of-service limit for crews on towing vessels. In the Coast Guard Authorization Act of 2010 (P.L. 111-281, Section 701) Congress directed that the final rule be issued by October 15, 2011. The Coast Guard missed this deadline, but did issue a final rule pertaining to the inspection of vessels on June 20, 2016, while leaving the hours-of-service limit for further consideration and potentially a separate rulemaking.[2] Inspection of these vessels will add about 2,500 vessels to the Coast Guard's marine inspection program, approximately doubling the number of vessels the agency inspects.

The new safety requirements for towing vessels are going into effect at a time when more crude oil and chemicals are being transported by barge due to an increase in domestic production of oil and of natural gas, which is a feedstock for many chemical plants.[3] According to oil spill data compiled by the Coast Guard,[4] from 1995 to 2011 (the latest year available) barges spilled about 2.7 times more oil in U.S. waters than did tanker ships. During this time, the number of oil spill

[1] For a report on the Coast Guard's role in ballast water management, see CRS Report R44181, *The Vessel Incidental Discharge Act in the 114th Congress: Background and Issues*, by Claudia Copeland. For discussion of issues specific to oil spills, see CRS Report RL33705, *Oil Spills: Background and Governance*, by Jonathan L. Ramseur.

[2] 81 *Federal Register* 40004, June 20, 2016.

[3] U.S. Army Corps of Engineers, Internal U.S. Waterway Monthly Indicators; http://www.navigationdatacenter.us/.

[4] U.S. Coast Guard, Polluting Incidents In and Around U.S. Waters, A Spill/Release Compendium: 1969-2011, Washington, DC; January 2013, http://homeport.uscg.mil/.

incidents and the amount spilled annually have declined significantly for both barges and tankers.[5]

Tug/Towboat Crew Work Hours

In its 2011 notice of proposed rulemaking on work hours, the Coast Guard stated that a typical towing vessel schedule providing six hours of work followed by six hours of rest gradually increases crew members' fatigue levels over a multi-day voyage.[6] The Coast Guard cited a number of expert studies supporting this contention. Barge operators filed comments opposed to addressing hours of service as part of this particular rulemaking (which also included the proposed rules on tug vessel inspection), while maritime unions have filed comments in favor of a mandatory eight-hour rest period.[7] The National Transportation Safety Board (NTSB) filed comments reiterating its support for a crew schedule that allows for 8 hours of uninterrupted sleep per 24-hour period (which could require a 10-hour rest period). A report by a group of experts in sleep and circadian biology at Northwestern University contends that a rotating schedule of six hours of work followed by six hours of rest (referred to as the "square-watch system") does allow for adequate sleep by barge crews.[8]

The Coast Guard's decision on hours of service for barge crews could have important ramifications for the economics of barge transportation. For example, providing for longer rest periods could require towing vessels (like ships) to employ three teams of crew rather than two, potentially increasing their costs.

Crew Size on Articulated Tug-Barges

The Coast Guard is currently reexamining the crewing requirements for articulated tug-barges (ATBs).[9] An ATB is a coastal tank barge designed for open seas that can hold 50,000 to 185,000 barrels of oil.[10] Some recently built ATBs can carry 240,000 to 340,000 barrels, a capacity comparable to that of coastal tankers. Seagoing barges have speeds of about 10 knots (12 miles per hour), a few knots slower than a tank ship.

According to an original designer of the ATB, "the American coastwise shipping business has grown in a way that differs from many other nations. The high cost of manning and building ships has led over the years to a coastwise transportation network dominated by tugs and barges."[11] ATBs are sometimes referred to as "rule breakers" within the maritime industry because they operate with smaller crews.[12] The Coast Guard determines crewing requirements based on the

[5] For further information, see CRS Report R43653, *Shipping U.S. Crude Oil by Water: Vessel Flag Requirements and Safety Issues*, by John Frittelli.

[6] 76 *Federal Register* 49976-50050, August 11, 2011.

[7] See http://www.regulations.gov, docket no. USCG-2006-24412.

[8] Transportation Research Board, *Enhancing Sleep Efficiency on Vessels in the Tug/Towboat/Barge Industry*, NCFRP Report 36, 2016; http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_036.pdf.

[9] The Coast Guard has tasked the Towing Safety Advisory Committee to make recommendations for updating its manning policy with respect to ATBs; (Task #15-02), http://homeport.uscg.mil/tsac.

[10] It is called "articulated" because the bow of the tug fits into a notch in the stern of the barge and the tug is hinged to the barge on both sides of its hull, allowing fore and aft (pitch) movement, such as over sea swells.

[11] Robert P. Hill, Ocean Tug & Barge Engineering, "The Articulated Tug/Barge – ATB: The History and State of the Art," n.d.

[12] See Jeff Cowan, "The Articulated Tug Barge (ATB) Quandary," February 13, 2013; Robert P. Hill, "Responding to "The Articulated Tug Barge Quandary," April 5, 2013; and Tom Allegretti, "Safe Operation, Proven Results," April 17,

registered tonnage of a vessel, which for barges includes only the tug, not the barges the tug may be pushing. As a result, an ATB typically has a crew of 6 to 12, versus 21 to 28 for a tank ship. The precise number for any particular vessel depends on that vessel's level of advanced technology (more automated vessels may need smaller crews).

If the Coast Guard were to require ATBs to carry larger crews, it could reduce their economic advantage compared to tankers. Such an outcome occurred previously with a precursor to the ATB called the integrated tug barge; when the Coast Guard increased their manning requirements in 1981, integrated tug barges lost their economic advantage, and none have been built since.[13] The Coast Guard increased manning requirements because integrated tug barges operated essentially as ships since the tug and barge seldom separated. While ATBs are designed for easier separation of tug and barge, they also seldom separate. A river barge can be used in "drop and swap" operation—that is, the tugboat can drop a loaded barge at a facility where it can be used for storing product while the tugboat is free to make other barge movements—but the tugs designed for ATBs sail poorly without the barge, so they generally do not perform drop and swap operations.[14]

Some stakeholders have criticized the distinction in crewing requirements between ships and ATBs because they believe it distorts the domestic shipping market by encouraging the use of otherwise less efficient barges instead of ships.[15] Since 1980, the amount of cargo carried by coastal ships in domestic commerce has declined by 72% while the amount carried by coastal barges has increased by 35%, with barges now carrying more cargo than ships.[16] Since ships are needed for military deployments overseas, a primary objective of U.S. maritime policy is development of the skills and know-how for building and crewing oceangoing ships. Addressing this may require reducing manning requirements for coastal tankers to make them more competitive.

Vessel Safety Inspections

In the Howard Coble Coast Guard and Maritime Transportation Act of 2014 (P.L. 113-281, Section 605), Congress asked for an independent review of Coast Guard requirements for U.S.-flag vessels that are different from international standards. The expert panel convened by the Transportation Research Board concluded in a 2016 report that the Coast Guard's requirements for vessel equipment in many cases differ from standards set by the International Maritime Organization (IMO, a United Nations body described in the **Appendix**) but do not provide a higher level of safety.

The expert panel found that stricter U.S. equipment requirements could discourage owners from registering their ships under the U.S. flag. Most manufacturers do not build their equipment to requirements of the relatively small U.S.-flag fleet. The report also recommended that the Coast Guard accept international practices for "reduced manning" of engine room operations with automated equipment (particularly for ship operators with proven safety track records) rather than

2013, all at http://www.MarineLink.com.

[13] Navigation Vessel Inspection Circular (NVIC)-2-81, February 25, 1981.

[14] George H. Reid, *Primer of Towing*, 3rd ed. (Centreville, MD: Cornell Maritime Press, 2004), p. 22.

[15] IHS Global Insight, *An Evaluation of Maritime Policy in Meeting the Commercial and Security Needs of the United States*, January 7, 2009, p. 37.

[16] For further analysis, see CRS Report R44831, *Revitalizing Coastal Shipping for Domestic Commerce*, by John Frittelli.

requiring additional equipment, trial periods, and a period of Coast Guard onboard observation. The report suggested that the Coast Guard rely more on independent vessel classification societies (described in the **Appendix**) to perform inspections of U.S.-flag vessels, particularly because the classification societies update their equipment standards more frequently than the Coast Guard does.[17]

While the Coast Guard testified in April 2016 that it was taking steps in line with the TRB report's recommendations, it noted that the container ship *El Faro*, which sank in a hurricane near Puerto Rico in October 2015 (killing all 33 crew members), was enrolled in a classification society inspection program. The Coast Guard said it would wait for the results of official investigations into the sinking before considering changes to vessel inspections.[18]

Congress is debating to what extent commercial fishing vessels should be inspected by classification societies.[19] In 1988, Congress required that fish processing vessels be built and maintained to class (P.L. 100-424). In the 2010 and 2012 Coast Guard Authorization Acts (P.L. 111-281 and P.L. 112-213), Congress required that newly built fish catching and fish tender vessels over 50 feet in length also be classed.[20] However, due to concerns over the cost to classify fishing vessels, in 2015 Congress provided an alternative option for independent inspection of fishing vessels (P.L. 114-120). H.R. 2518 and S. 1129 contain further provisions that reflect a concern for the cost of independent inspection for commercial fishing vessel owners by, among other things, postponing the deadline.[21]

Outside Review Is Critical of Vessel Traffic Services

A September 2016 review by the National Transportation Safety Board (NTSB)[22] of the Coast Guard's Vessel Traffic Service (VTS) centers (described in the **Appendix**) found that they may not be achieving their purpose of reducing vessel accidents in harbors.[23] The primary reason, according to the NTSB, is as lack of workforce experience due to the regular turnover of VTS personnel. For example, the NTSB's survey of VTS watchstanders found that 95% had never worked on a commercial vessel and 93% had five years of experience or less working at a VTS center. Thus, most of the recommendations the NTSB made to improve the effectiveness of VTS centers concerned the training and qualifications of the personnel working in them.

S. 1129 (§405) requires the Coast Guard to examine whether it is feasible to establish a VTS center in U.S. arctic waters.

The Coast Guard's technical expertise in providing effective safety oversight of certain maritime operations has been a persistent issue. In 2007, the then chairman of the House Committee on

[17] Transportation Research Board, "Impact of United States Coast Guard Regulations on United States Flag Registry," Letter Report, 2016; http://www.trb.org/Main/Blurbs/173981.aspx.

[18] Testimony of Rear Admiral Paul F. Thomas, Assistant Coast Guard Commandant for Prevention Policy, Hearing: Maritime Transportation Safety and Stewardship Programs, House Committee on Transportation and Infrastructure, Subcommittee on Coast Guard and Maritime Transportation, April 14, 2016.

[19] Inspections of fishing vessels are codified at 46 U.S.C. §4503.

[20] 81 *Federal Register* 40438, June 21, 2016.

[21] See Sections 405 and 415 of H.R. 2518 and Sections 307 and 308 of S. 1129.

[22] The NTSB is an independent oversight agency; CRS Report R44587, *The National Transportation Safety Board (NTSB): Background and Possible Issues for Reauthorization and Oversight*, by Bart Elias.

[23] National Transportation Safety Board, *An Assessment of the Effectiveness of the U.S. Coast Guard Vessel Traffic Service System*, September 13, 2016.

Transportation and Infrastructure considered creating a civilian agency within the Department of Transportation to take over maritime safety functions.[24] In an internal report, the Coast Guard acknowledged that its practice of regularly rotating staff geographically or by activity, as military organizations typically do, hinders its ability to develop a cadre of staff with sufficient technical expertise in marine safety.[25] In response to this problem, the agency revamped its safety program,[26] and Congress has appropriated additional funds specifically for safety personnel. Under the revamped safety program, the Coast Guard created additional civilian safety positions, converted military positions into civilian ones, and developed a long-term career path for civilian safety inspectors and investigators. Congress may inquire whether these changes have brought about the desired outcome, given the NTSB's recent findings with respect to Coast Guard VTS personnel.

Arctic Polar Code

The Coast Guard Authorization Act of 2015 contained a provision to facilitate development of an Alaskan port along the Bering Strait that the Coast Guard could use as a base of Arctic operations (§531 et al.). At a July 2016 hearing, the Coast Guard indicated its preferred strategy was to rely on mobile assets (vessels and aircraft) and seasonal bases of operation rather than pursue a permanent port in the Arctic.[27] Less sea ice during late summer has led to increased maritime activity in the Arctic. The Bering Strait along the west coast of Alaska is the entrance and exit waterway for ships transiting the Northern Sea Route along Russia's north coast as well as the Northwest Passage through the Canadian archipelago. The latter appears to be far less viable as a route for large commercial vessels, as it is more constricted by shallow and narrow straits and unpredictable ice movement. Most cargo ship activity has taken place along the Northern Sea Route, while cruise vessel excursions have increased in the Northwest Passage. Before the recent fall in oil prices, there was also exploratory oil drilling activity off Alaska's North Coast.

The Coast Guard has defined a shipping lane in the Bering Strait and continues to work on improving its ability to operate in the Arctic; its search and rescue capability is a priority.[28] The Coast Guard was also instrumental in developing a specific IMO code for ships sailing in the Arctic that went into effect January 1, 2017. The code contains requirements related to ship construction, lifesaving equipment, and crew training.

Passenger Vessel Lifesaving Equipment

In the Cruise Vessel Security and Safety Act of 2010 (P.L. 111-207) as modified by the Coast Guard Authorization Act of 2015 (§608), Congress required that cruise ships install technology

[24] House Committee on Transportation and Infrastructure, Subcommittee on Coast Guard and Maritime Transportation, Hearing on Challenges Facing the Coast Guard's Marine Safety Program, July 27, 2007.

[25] See the 2007 report on the Coast Guard's marine safety mission by a retired Coast Guard vice admiral at http://www.uscg.mil/hq/cg5/cg54/docs/VADM%20Card%20Report.pdf.

[26] U.S. Coast Guard, "Enhancing the Coast Guard's Marine Safety Program," September 25, 2007. See also *Coast Guard Proceedings*, Summer 2008, pp. 20-28, available at http://www.uscg.mil/proceedings.

[27] Oral testimony of Admiral Charles D. Michel, Coast Guard Vice Commandant, House Committee on Transportation and Infrastructure, Subcommittee on Coast Guard and Maritime Transportation, *Coast Guard Arctic Implementation Capabilities*, July 12, 2016.

[28] For further discussion, see CRS Report R41153, *Changes in the Arctic: Background and Issues for Congress*, coordinated by Ronald O'Rourke.

for capturing images of passengers falling overboard or detecting passengers falling overboard, if possible, depending on the extent that such technology is available. In the Coast Guard's notice of proposed rulemaking implementing this provision,[29] the Coast Guard states that most cruise lines are employing video cameras that record a passenger going overboard (with date and time to aid search and rescue). Most cruise lines are not employing other detection systems because they have found that this technology does not yet work reliably.

Congress has debated whether smaller passenger vessels, such as tour boats and harbor ferries, should be equipped with lifeboats or inflatable rafts that would keep passengers completely out of the water as opposed to the current regulation that these boats be equipped with life floats that keep passengers afloat but not out of the water (and thus still subject to hypothermia). The 2015 Coast Guard Authorization Act requires the former for vessels built in 2016 or thereafter and that operate in cold waters as determined by the Coast Guard (§301).

Accident Data

In the Coast Guard Authorization Act of 2015 (§307), Congress requested that the Coast Guard indicate how it intends to implement the Department of Homeland Security Inspector General's (IG's) recommendations for improving marine casualty reporting. The IG, as well as other observers, has noted that the number and quality of the Coast Guard's investigations and reports of marine accidents, as well as the lack of a "near-miss" reporting system, are missed opportunities to learn from past incidents. The May 2013 IG audit concluded:[30]

> The USCG does not have adequate processes to investigate, take corrective actions, and enforce Federal regulations related to the reporting of marine accidents. These conditions exist because the USCG has not developed and retained sufficient personnel, established a complete process with dedicated resources to address corrective actions, and provided adequate training to personnel on enforcement of marine accident reporting. As a result, the USCG may be delayed in identifying the causes of accidents; initiating corrective actions; and providing the findings and lessons learned to mariners, the public, and other government entities. These conditions may also delay the development of new standards, which could prevent future accidents.

The IG found that at the 11 sites it visited, two-thirds of accident inspectors and investigators did not meet the Coast Guard's own qualification standards. The IG stated that the shortage of qualified personnel would be further compounded by the new towing vessel safety regime, which would expand the inspection workload.

Similarly, the NTSB found in its investigation of Coast Guard VTS centers (cited above) that personnel at these centers were not adequately recording interventions and near-miss events so as to analyze the data for trends, despite a Coast Guard policy that each VTS keep a monthly activity log.[31]

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[29] 80 *Federal Register* 2350, January 16, 2015.

[30] DHS, Office of Inspector General, "Marine Accident Reporting, Investigations, and Enforcement in the U.S. Coast Guard," OIG-13-92, May 2013; http://www.oig.dhs.gov/assets/Mgmt/2013/OIG_13-92_May13.pdf. The Towing Safety Advisory Committee also has recommendations for improving accident reporting; https://homeport.uscg.mil/cgi-bin/st/portal/uscg_docs/MyCG/Editorial/20160505/TSAC%20Task%2013-09%20Final%20Report_Marine%20Casualty%20Reporting.pdf?id=4d0e8d483ddeb440f9437a16b3a71547f57d3c30&user_id=8afb946da4be8ca9d7d6d7038a1275d7.

[31] NTSB, *An Assessment of the Effectiveness of the U.S. Coast Guard Vessel Traffic Service System*, September 13, 2016, p. 20.

Great Lakes Pilotage Rates

Congress has long tasked the Coast Guard with determining U.S. pilotage rates for foreign trading vessels transiting the St. Lawrence Seaway and the Great Lakes.[32] (See the **Appendix** for a description of the role of harbor pilots.)[33] A ship navigating the entire system from the mouth of the St. Lawrence River to the Port of Duluth, MN, must hire and pay for five pilots, two of them Canadian for the easternmost portions of the St. Lawrence River. In March 2016, the Coast Guard increased pilotage rates so that the 37 American pilots each would receive a total compensation of $326,000 per year, with 10 days off each month during the nine-month shipping season between late March and late December.[34] The Coast Guard determined this rate based on the compensation of Canadian pilots and its judgement as to the rate necessary to attract a sufficient number of pilots to avoid traffic delays. Reportedly, pilots in some coastal ports earn annual salaries of around $500,000.[35]

Great Lakes ports contend that the cost of pilotage at this rate now exceeds a ship's daily operating cost in the Great Lakes and is eroding the competitiveness of the Great Lakes navigation system.[36] Great Lakes ports have sued the Coast Guard arguing its methodology for determining pilotage rates violates the Administrative Procedure Act.[37] In 1995, Great Lakes pilotage rate-making was transferred from the Coast Guard to the St. Lawrence Seaway Development Corporation, the federal agency tasked with promoting use of the Seaway. However, some pilotage groups sued, claiming the Department of Transportation did not have the authority to make this change. After a court ruling in favor of the pilot groups, pilotage rate-making was transferred back to the Coast Guard in 1998.[38]

Electronic Navigation

A primary and resource-intensive function of the Coast Guard is installing and maintaining aids to navigation (ATON). This includes buoys, beacons, and other visual aids which mark and guide vessels through harbor and waterway channels (see "Marine Exchanges and Vessel Traffic Services" in the **Appendix** for further explanation of how ships navigate in harbors). According to the Coast Guard, there are about 50,000 federally owned visual aids, and an equal number of nonfederal visual aids. Because storms or ice can move buoys out of place and channels can move due to shoaling, the Coast Guard services about 134 buoys and fixed aids to navigation on an average day.[39] Part of the Coast Guard's fleet includes 68 "buoy tenders," which are vessels designed for the proper positioning of channel markers.

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[32] In this case, foreign trading vessels means ships of any flag moving to or from overseas ports, not ships trading across the lakes between the United States and Canada.

[33] As per the Great Lakes Pilotage Act of 1960 (P.L. 86-555).

[34] 81 *Federal Register* 11908, March 7, 2016.

[35] *Journal of Commerce*, "Terminal Operators, Carriers Resist San Francisco Pilot Salary Hike," August 24, 2015; *Los Angeles Times*, "L.A.'s Port Pilots Awash in OT Pay: Union Contract Boosts Incomes in Unusual Ways, Costing The City Millions of Dollars," July 25, 2016.

[36] American Great Lakes Ports Association's final comments on the 2016 Great Lakes Pilotage Rate Increase, http://www.greatlakesports.org/wp-content/uploads/2016/03/FINAL-Comment-to-Docket-ID-2015-0497.pdf.

[37] *American Great Lakes Ports Association et al. v. Zukunft et al.*, No. 16-1019 (D. D.C. filed May 31, 2016); http://www.joc.com/sites/default/files/u1390826/2016-05-31%20%281%29%20Complaint.pdf.

[38] 63 *Federal Register* 10781, March 5, 1998.

[39] Coast Guard 2016 Budget in Brief; http://www.uscg.mil/budget/docs/2016_Budget_in_Brief.pdf.

Mariners continue to rely on these physical visual aids even though vessels are now equipped with electronic navigation aids, such as GPS, Automatic Identification System (AIS), and electronic charts.[40] These technologies, in essence, allow channel markings to be made known to a vessel operator by electronic transmission (e-navigation), either enhancing or potentially replacing a physical aid to navigation. The increase in size of the largest ships transiting U.S. harbors, as well as a general increase in the number of vessels on many waterways, places a premium on the accuracy of aids to navigation. The Coast Guard has begun testing electronic aids to navigation on the west coast and the Mississippi River.[41]

ATON activities consume about 20% of the Coast Guard's discretionary budget. While e-navigation offers the potential of significant savings in maintaining physical aids to navigation, key questions have yet to be answered. How reliable and resilient is e-navigation? Should e-navigation replace physical aids or merely supplement them? Are e-navigation aids as accessible to recreational craft? Are there cybersecurity concerns associated with e-navigation? The Coast Guard's ATON budgetary needs in coming years will depend on the answers to these questions.[42] Congress has expressed specific interest in the feasibility and advisability of using e-navigation in U.S. areas of the Arctic Ocean.[43]

Unmanned Aircraft Systems (UAS)

In FY2016, Congress provided an additional $12 million above the President's request for the use of UAS (drones) aboard national security cutters.[44] Congress has also expressed interest in receiving a more detailed plan showing how the Coast Guard could take advantage of this technology.[45] Like e-navigation, greater use of UAS potentially offers significant efficiencies in the vessels, aircraft, and crews needed to perform various Coast Guard missions. The Coast Guard has tested both smaller, hand-held UAS and larger UAS to extend the surveillance range of its patrol vessels. In April 2015, the Coast Guard announced that it would be testing UAS in the Arctic for missions such as surveying ice conditions, marine environmental monitoring, marine safety, and search and rescue.[46] The unmanned aircraft being tested can be launched from land or a Coast Guard cutter.

H.R. 2518, as reported by the House Transportation and Infrastructure Committee, requests a study by the National Academy of Sciences as to how drone aircraft could be used to enhance the Coast Guard's maritime domain awareness.[47] The bill also places restrictions on the Coast Guard's pursuit of UAS, making it dependent on a lack of funding for Offshore Patrol Cutters and UAS procurement by the Departments of Defense and Homeland Security.

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[40] Whether a back-up system to GPS is needed is debated; see H.R. 1678, 114th Congress.

[41] *Professional Mariner*, "U.S. Coast Guard Begins Testing Synthetic Aids, Virtual Buoys," August 2014.

[42] House Committee on Transportation and Infrastructure, Subcommittee on Coast Guard and Maritime Transportation, Hearing; "Finding Your Way: The Future of Federal Navigation Programs," February 4, 2014. For further information on developments in navigation technology, see *Coast Guard Proceedings*, Summer 2015 issue; http://www.uscg.mil/proceedings/archive/2015/Vol72_No2_Sum2015.pdf.

[43] Senate Committee on Appropriations, S.Rept. 114-68, p. 76.

[44] H.Rept. 114-215, p. 59.

[45] House Committee on Transportation and Infrastructure, Subcommittee on Coast Guard and Maritime Transportation, Hearing: "Coast Guard Mission Needs and Resources Allocation," June 14, 2016.

[46] 80 *Federal Register* 18431, April 6, 2015.

[47] Maritime Domain Awareness is the effort to know what is happening at all times on the ocean, coastal, and interior waters of the United States, and aboard the vessels that transit in or through waters under U.S. jurisdiction.

Emission Control Areas (ECAs)

The United States has established a perimeter up to 200 miles from its coastlines within which maritime vessels must reduce their emissions. To meet a stricter requirement that was triggered on January 1, 2015, ships are switching to cleaner-burning (lower-sulfur) fuel when they reach this zone.[48] The Coast Guard is responsible for enforcing correct fuel use. Given the additional costs associated with cleaner-burning fuels, ocean carriers are concerned that the level of enforcement be uniform to ensure a level playing field. The House Appropriations Committee requested that the Coast Guard provide information on ECA enforcement actions taken since January 1, 2015, as well as the number of reports by vessels that cleaner-burning fuel was not available and, hence, the number of waivers or exemptions granted to vessels.[49]

The recent drop in world fuel prices has dampened the economic impact of ECA requirements, but additional emission caps pending in 2020, which will apply to all shipping routes, could have a more significant impact on shipping costs, according to an OECD report.[50]

Reportedly, some ships have experienced loss of propulsion (LOP) during the switchover to cleaner fuel as well as subsequently while operating with the cleaner fuel. This loss may be due to "thermal shock," since the cleaner fuel is less viscous than bunker fuel and does not need to be heated before entering the engine.[51] The temperature difference is believed to cause fuel pump seizures, leaks, and wax buildup in filters, especially in colder months. In March 2015, the Coast Guard issued a safety alert to vessels about LOP, stating that "many losses of propulsion have occurred in different ports and have been associated with changeover processes and procedures."[52]

Loss of propulsion creates serious safety and environmental protection concerns. The Houston Pilots Association contends that a March 2015 collision between two ships that resulted in an 88,000-gallon chemical spill was most likely caused by a switch to low-sulfur fuel and consequent loss of speed.[53]

LNG Bunkering[54]

Liquefied natural gas (LNG) as a ship fuel may offer a means of meeting the tighter emissions requirements enforced within emissions control areas.[55] Some cargo ships serving U.S. noncontiguous trades (Alaska, Hawaii, Puerto Rico) have converted to LNG. Operators of ferries, cruise ships, and other vessels that sail entirely or mostly in ECA waters also are interested in LNG. In February 2015, Harvey Marine launched the first of six LNG-fueled offshore oil service

[48] The stricter emissions requirement is an amendment to Annex VI of MARPOL, the IMO Convention for the Prevention of Pollution from Ships (see IMO in the **Appendix**). For further information of ship emission requirements, see https://www3.epa.gov/otaq/oceanvessels.htm#interstands.

[49] H.Rept. 114-215, p. 58.

[50] *American Shipper*, "OECD: Ocean Carrier Costs Skyrocketing Under New Fuel Regulations," May 23, 2016.

[51] *Ship and Bunker*, "Fuel Switching-Related Power Losses Persist in ECAs," March 30, 2015; *Bunkerworld*, "Surge In Engine Blackouts Feared at ECA Borders in 2015," September 22, 2014.

[52] U.S. Coast Guard, *Marine Safety Alert 2-15*, March 3, 2015; https://www.uscg.mil/hq/cg5/cg545/alerts/0215.pdf.

[53] *Houston Chronicle*, June 19, 2016.

[54] Bunker is an industry term that refers to a ship's fuel.

[55] CRS Report R42566, *Alternative Fuel and Advanced Vehicle Technology Incentives: A Summary of Federal Programs*, by Lynn J. Cunningham et al.

vessels in the Gulf of Mexico. In 2015, TOTE Maritime launched two LNG-fueled container ships that will provide service between Florida and Puerto Rico. Crowley Maritime will take delivery of two LNG-fueled cargo ships for service in the same trade lane in 2017 and 2018. Carnival Cruise Lines announced that it has ordered four LNG-powered cruise ships for delivery beginning in 2019.[56]

The Coast Guard is developing regulations as to the placement of LNG fuel tanks on vessels, the protocol for LNG refueling operations in ports, and spill response requirements.[57] In February 2015, the Coast Guard issued voluntary guidelines for using LNG as vessel fuel, including training of personnel, safeguards during fuel transfer operations, safeguards for shoreside LNG fueling facilities, and the design of barges carrying LNG for fueling operations.[58] The guidelines are not new regulations but identify existing regulations pertaining to the carriage of LNG as cargo and to storage of LNG in bulk at waterfront terminals. For example, the same safeguards required for loading or unloading LNG as cargo aboard an LNG tanker are applicable when transferring LNG to fuel a ship. In April 2012, the Coast Guard issued guidelines regarding the specifications for LNG engines and fuel system machinery and equipment on vessels.[59] LNG-fueled ship engines are not entirely new, as LNG tankers often have engines that are fueled by "boil-off" (LNG that has re-gasified in cargo tanks). Both guidelines are issued as policy letters, not as final rules in a rulemaking procedure, and are meant to inform industry and local Coast Guard officials about existing regulations that are enforceable with regard to LNG used as fuel.

There may be uncertainty concerning aspects of LNG bunkering that existing Coast Guard regulations do not specifically address. For instance, a shoreside LNG fueling facility has different siting needs from an LNG cargo terminal.[60] Existing regulations for LNG cargo terminals therefore may not take into account the surrounding environment that may be different for an LNG fueling facility, posing different safety issues. Another matter left unclear is whether LNG-fueled cargo ships may load or unload cargo, passengers, or crew supplies simultaneously while loading LNG fuel; existing regulations for transferring LNG as cargo do not envision other operations that an LNG-fueled ship might need to engage in while refueling is taking place. The guidelines currently state that an LNG fuel supplier should conduct a formal quantitative risk assessment to assist the Coast Guard in evaluating whether simultaneous operations can occur. Also, current regulations concerning spill response are written with heavy marine oil or marine diesel fuel in mind. These requirements are not readily adaptable to LNG, which would vaporize in the event of a spill.

While the policy letters are intended to assist the Coast Guard in applying a uniform national policy with regard to LNG fuel, some issues will be determined on a case-by-case basis. The local Coast Guard captain of the port often is left to make the final determination based on the information provided by local fueling operators. Some amount of local discretion is not unique to LNG fueling, as safety and security risk profiles of ports differ significantly due to differences in geography and mix of maritime activity taking place.

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[56] Transportation Research Board, 95th Annual Meeting, Sessions 574 and 776 on natural gas as a marine fuel, January 12 and 13, 2016, Washington, DC.

[57] In February 2015, the Coast Guard issued interim guidelines for LNG bunkering operations; http://www.regulations.gov/#!documentDetail;D=USCG-2013-1084-0031.

[58] 80 *Federal Register* 10131, February 25, 2015.

[59] Coast Guard Policy Letter No. 01-12, April 19, 2012; http://www.uscg.mil/hq/cg5/cg521/docs/CG-521.PolicyLetter.01-12.pdf.

[60] LNG cargo terminals, whether for import or export, are permitted by the Federal Energy Regulatory Commission.

In June 2015, the IMO finalized safety standards, known as the "IGF code," for ships using LNG as fuel.[61] The standards became effective January 1, 2017, and are an annex to the Safety of Life at Sea (SOLAS) convention, to which the United States is a signatory.

Shipping Corridors and Offshore Wind Farms

Projects to develop offshore wind energy resources are in various stages of development. The Coast Guard conducted a study to serve as a guide in determining desirable buffer zones between wind farms and shipping routes along the Atlantic Coast.[62] The 2016 study noted that wind farms could funnel vessels into narrower shipping corridors, thereby increasing traffic density and the risk of collisions. The study also found that wind farms could force seagoing barges to transit further offshore than is desirable. Wind farm advocates have commented that the Coast Guard study is overly restrictive toward wind farms in making room for navigation corridors.[63]

H.R. 2518 requests that the Coast Guard report on the actions it has taken to carry out the recommendations contained in its port access route study.[64]

[61] IGF - International Code of Safety for Ships using Gases or other Low-flashpoint Fuels.

[62] Atlantic Coast Port Access Study, https://www.uscg.mil/lantarea/ACPARS/docs/ACPARS_Final_Report_08Jul2015%20Combined%20Appendix-Enclosures%20-%20Final%20After%20LMI%20Review-Corrected%20Date.pdf.

[63] Comments can be viewed at http://www.regulations.gov under docket no. USCG-2011-0351.

[64] The recommendations are on page 16 of the study.

Appendix. Maritime Safety: Key Elements

Harbor Pilots

Maritime pilots play an important role in maritime safety because they drive many of the ships arriving and departing U.S. harbors. Maritime pilots possess navigational expertise for a particular harbor and are hired by ocean carriers to take command of their ships for harbor transits. The pilots board ships at the entrance to a harbor (with use of a pilot boat) and take position at the bridge alongside the master (captain) of the vessel and other bridge crew. The pilot will order instructions to the helmsmen to steer the ship through the harbor and may direct tugboats, if they are assisting. Pilots describe turning a ship like turning a car on ice—it slides through the turn. Pilotage is described as a process of continually watching how the ship responds to a maneuver, which will dictate the pilot's next command. How a ship responds is affected by the characteristics of the ship, weather, and water conditions. A pilot needs to be aware of multiple cues: wind, tide and river currents, and (in the case of estuaries) the salt water versus fresh water mix that affects buoyancy. While the pilot is in command of the navigation of the ship through the harbor, the captain of the ship remains in command of the ship and retains ultimate responsibility for its safe passage.

Often the pilot will board the ship with a computer laptop or other handheld device that contains his or her own set of charts for that harbor as well as ship tracking technology. The laptop may also be plugged into the ship's navigation console to incorporate the ship's navigation technology into the pilot's navigation software. When the pilot boards the ship, the captain is required to inform the pilot about the navigation particulars of the ship, such as the draft, air draft (highest point on the vessel), and maneuvering characteristics. A "pilot card" is used for this purpose. Although English is the required language of international shipping, language can be a barrier to expansive communication between the pilot and captain.

Most U.S. ports make it compulsory for a ship to hire a pilot, although in some ports hiring a pilot may be voluntary. In these latter cases, if a ship captain regularly calls at a port and is confident that he or she can navigate the ship through the harbor, the captain may elect not to hire a pilot, but the shipping line will still be charged either the full pilotage fee or some portion thereof. For liability reasons, many shipping lines will take on a pilot even if it is not compulsory. On the west and Gulf coasts, the pilot usually navigates the ship from the harbor entrance to the dock (and vice versa), but on the east coast, some ports require a "docking pilot" to take over from the pilot when docking the ship. Docking pilots are usually former tugboat captains and are not members of the local pilot association. In Louisiana, in addition to hiring a harbor pilot, shipping lines may also be required to hire one or two "river pilots" depending on how far up the Mississippi River the ship is transiting (to call at the Port of Baton Rouge or South Louisiana). Especially large ships may be required to hire two pilots, or a full pilot and an assistant pilot.

A maritime pilot typically works as an independent contractor through the pilot association at a given port. The association takes care of administrative functions such as dispatching pilots to vessels, maintaining pilot boats, and billing and collecting pilotage fees. Pilots are assigned to ships on a rotating basis and the shipping line has no choice in the selection of the pilot. Pilot associations are regulated by a state board of commissioners, or in some cases, by city government. Typically, a pilot board is composed of 3 to 10 members who serve part time. Representation on the board must consist of a specific ratio of pilots, members of the broader maritime industry in the port area, and members of the public not connected with the maritime industry. The pilot board is responsible for ensuring the qualifications of the pilots, setting

pilotage fees charged to the vessel operators, and reviewing the performance of pilots.[65] Pilotage fees are based on the draft and tonnage of the vessel and, in some cases, the distance piloted.

Pilots do not work in a competitive environment. Pilot associations are effectively local or regional monopolies. The pilot association only selects enough member pilots to service the traffic at hand. Pilot associations chartered by state and local governments have jurisdiction only over the pilotage of ships in foreign trade—that is, ships carrying import or export cargo. Congress has decided not to exercise federal control over pilotage of foreign trading ships.

The federal government has jurisdiction over the pilotage of ships in domestic trade, such as a tanker carrying oil from Alaska to California. Typically, a sea captain engaged in domestic trade will carry a Coast Guard pilot's endorsement on his or her captain's license and therefore will not need to hire a pilot upon entrance to a harbor. This type of federal pilot authorization is the most common. There are also a few independent federal pilots who are not employed by a coastwise shipping line, but offer their piloting service at the particular port for which they are licensed. Like a state pilot license, the federal pilot license pertains to a specific port. Therefore, the ship captain must obtain a pilot license for each port that he or she expects to call on a routine basis. Generally, all state and local pilots licensed to pilot foreign trade vessels also hold a federal license to pilot ships in domestic trade. Most state and local pilot associations require a federal pilot's license as a minimum requirement for being allowed to work toward a state pilot's license. The federal government will grant a federal pilot's license to anyone who qualifies, unlike states, which limit the number of licenses based on the perceived need for pilot services.

Marine Exchanges and Vessel Traffic Services

To assist the pilot and crew with safe navigation, the Coast Guard has established vessel traffic services (VTSs) in many ports. From the VTS, Coast Guard "watchstanders" can monitor and provide guidance to harbor traffic with the use of electronic communication, radio, radar, differential global positioning system (DGPS), surveillance cameras, and binoculars. A VTS operates 24 hours a day, seven days a week. VTSs vary depending on the geography and the nature and volume of vessel traffic in a port area, but they generally are staffed with both uniformed and civilian Coast Guard watchstanders. Currently there are VTSs in 12 U.S. ports staffed by about 155 civilian and 130 active-duty personnel.

VTSs may also be staffed by members of a "maritime exchange" from which they have evolved. U.S. ports without a Coast Guard-led VTS have a maritime exchange that provides "VTS-like" services, and are more accurately called Vessel Traffic Information Services (VTIS). A maritime exchange may be jointly operated or run by a pilot association and be staffed by pilots. VTSs and VTISs are funded from some combination of user fees charged to vessel operators, financing from port authorities, state governments, and the Coast Guard.

The original purpose of maritime exchanges was to alert ship service providers in port (i.e., agents, pilots, tugs, stevedores, longshoremen unions, terminals, U.S. Customs, and other vendors and government agencies) of a ship's pending arrival. Before the development of current technology, a lookout was posted with a telescope, signal flags, and flashing signal lights. While maritime information exchange is still the central function of marine exchanges, in the 1960s and 1970s they also began offering a VHF radio communication and radar system for pilots and captains to avoid collisions and groundings. Participation was initially voluntary and unregulated

[65] A pilot who struck a bridge tower in San Francisco Bay in 2007, causing the ship's fuel to spill, was later found medically unfit for the position. After this incident, some states/harbor communities reevaluated their pilotage oversight boards.

and there were no protocols. However, after a ship collision in San Francisco Bay in 1971, Congress passed the Ports and Waterways Safety Act of 1972 (P.L. 92-340), which directed the Coast Guard to establish VTS systems at ports where the Coast Guard deemed them necessary. In the 1970s, VTSs were established in San Francisco, Puget Sound, New York, New Orleans, and Houston-Galveston. VTSs were added in Morgan City, Port Arthur (including Lake Charles), Louisville, Valdez, Los Angeles, and Sault St. Marie thereafter.[66] The Oil Pollution Act of 1990, passed in response to the *Exxon Valdez* oil spill, made participation in the VTS mandatory where they exist.

While VTSs or VTISs might be compared to an air traffic control tower in an airport, the key difference is that maritime watchstanders do not direct whether and how a vessel is to proceed in a harbor. For instance, they do not issue orders to pilots about vessel heading and speed. Those decisions are entirely left to pilots, who maintain open radio communication with other vessels in the area to avoid collisions. VTSs are an advisory service, not a traffic control center.[67] The Coast Guard describes them as offering a range of four basic services that represent an increasing continuum of involvement: (1) monitoring of harbor traffic; (2) providing information to mariners so that they can navigate more safely or efficiently; (3) advising or recommending a course of action to a vessel (usually infrequently); and (4) in rare circumstances, directing a vessel to move to a certain location or hold at anchor or at the dock until safe to proceed, but without giving direct maneuvering orders.[68]

The level of VTS involvement in harbor navigation varies depending on the circumstances of the harbor. For instance, in busy harbors or in harbors with a drawbridge, the VTS may enforce a harbor traffic management plan that dictates one-way traffic or order of procession through a waterway. In these cases, the VTS could be described as traffic management, as opposed to traffic control. VTSs could potentially exert more control over harbor traffic in bad weather conditions. The Coast Guard already has authority to restrict vessel movements during hazardous weather conditions, but does not regularly do so. In the Coast Guard Authorization Act of 2014 (P.L. 113-281, Section 228) Congress directed the Coast Guard to establish a process for marine exchanges to send relevant navigation information to vessels via the Automatic Identification System, a short-range communication system among vessels for transmitting vessel headings and speeds, among other information, to avoid collision.

The International Maritime Organization (IMO)

Due to the international nature of the shipping industry, maritime trading nations have adopted international treaties that establish standards for ocean carriers in terms of safety, pollution prevention, and security. These standards are agreed upon by shipping nations through the International Maritime Organization (IMO), a United Nations agency that first met in 1959.[69] The Coast Guard represents the United States at the IMO and has been the lead proponent of some amendments regarding shipping safety and security.

Key conventions that the 168 IMO member nations have adopted include the Safety of Life at Sea Convention (SOLAS), which was originally adopted in response to the *Titanic* disaster in 1912 but has since been revised several times; the International Convention for the Prevention of

[66] For a map of VTS locations, see http://www.navcen.uscg.gov/?pageName=vtsLocations.

[67] Rather than an ATC tower, a closer parallel in aviation may be Flight Service Stations (FSS) which provide weather briefings and flight planning services largely to general aviation pilots.

[68] "U.S. Coast Guard Vessel Traffic Services," *Coast Guard Proceedings of the Marine Safety and Security Council*, vol. 64, no. 2, summer 2007, pp. 10-13.

[69] See http://www.imo.org/ for more information.

Pollution from Ships (MARPOL), which was adopted in 1973 and modified in 1978; and the Standards for Training, Certification, and Watchkeeping for Seafarers (STCW), which was adopted in 1978 with the most recent amendment coming into force January 1, 2017. It is up to ratifying nations to enforce these standards. The United States is a party to these conventions, and the U.S. Coast Guard enforces them when it boards and inspects ships and crews arriving at U.S. ports and the very few ships engaged in international trade that sail under the U.S. flag.

Flag Registration

Like the United States, most of the other major maritime trading nations lack the ability to enforce IMO regulations as a "flag state" because much of the world's merchant fleet is registered under so-called "flags of convenience" or "open-registry" countries. While most ship owners and operators are headquartered in developed countries, they often register their ships in Panama, Liberia, the Bahamas, the Marshall Islands, Malta, and Cyprus, because these nations offer more attractive tax and employment regulatory regimes.[70] For instance, crews do not have to be nationals of these countries.[71] Because of this development, most maritime trading nations enforce shipping regulations under a "port state control" regime—that is, they require compliance with IMO standards as a condition of calling at their ports. The fragmented nature of ship ownership and operation can be a further hurdle to regulatory enforcement. It is common for cargo ships to be owned by one company, operated by a second company (which markets the ship's space), and managed by a third (which may supply the crew and other services a ship requires to sail), each of which could be headquartered in different countries.

Classification Societies

Classification societies are independent third parties that inspect and certify that a ship meets their specifications in design and operation.[72] The inspection process occurs at various stages as the ship is constructed and periodically after the ship is in operation. Inspection becomes more thorough as the ship ages. Insurance companies and banks require a ship to be classed before they will underwrite or finance it and, thus, class certification is necessary if a vessel is to enter and remain in commercial service. The Coast Guard may refer to a set of classification society standards in its regulations when identifying requirements that ship operators must meet.

Decades ago the credibility of classification societies began to be questioned because they were paid by vessel owners who found it advantageous to have their ships built to the societies' standards ("built to class"). From an insurer's or banker's perspective, a classification society had a conflict of interest if it was being paid by a ship's owner. In response, some insurers and banks began hiring their own inspectors to survey ships, in addition to requiring class inspection. Also, classification societies typically have a for-profit side of their business, selling technical expertise

[70] Establishment of the Panama registry can be traced to U.S.-flag cruise ships seeking to avoid prohibition laws in the 1920s. In the 1930s, U.S.-flag ships reflagged under Panama to avoid the U.S. Neutrality Act so as to carry weapons to Europe. After World War II, U.S. mining interests established the Liberian flag due to political instability in Panama. Richard Coles, Edward Watt, *Ship Registration: Law and Practice*, 2nd ed. (London: Informa, 2009).

[71] Filipinos account for over a third of the crew population on foreign-flag ships, followed by China (9%), India, Ukraine, Russia, and Poland. U.S. Maritime Administration, *Foreign-Flag Crewing Practices*, November 2006.

[72] They date back to the mid-18th century when insurers would hire ex-sea captains to survey ships. Their pragmatic knowledge of ships was useful for insurers assessing risk. Eventually, ex-captains were replaced by naval engineers and technicians and standards were formalized in writing.

to vessel owners. This places them in competition with one another and raises the possibility that they might allow for some leeway when enforcing standards in order to gain business.[73]

Some of the classification societies established a trade association in 1969 to set industry practices to address these concerns.[74] In 2004, Congress required that the Coast Guard not accept certifications by classification societies that are not members of this trade association or that have not been approved by the Coast Guard under specified criteria.[75] The criteria include the requirement that the society not be involved in any activity that could be a conflict of interest.[76]

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[73] "Quality Stem to Stern: The Changing Role of Classification Societies," *Marine Technology and SNAME News*, vol. 34, no. 3 (July 1997).

[74] The International Association of Classification Societies (IACS).

[75] The Coast Guard and Maritime Transportation Act of 2004 (P.L. 108-293, Section 413). The Coast Guard issued a final rule on August 9, 2012; 77 *Federal Register* 47544. For a listing of approved classification societies, see http://www.uscg.mil/hq/cg5/acp/. See also 46 U.S.C. §3316.

[76] 46 C.F.R. §8.230 (a)(23).