
Water Transportation Occupations

(O*NET 53-5011.00, 53-5021.00, 53-5021.01, 53-5021.02, 53-5021.03, 53-5022.00, 53-5031.00)

Significant Points

- Merchant mariners spend extended periods at sea.
- Entry, training, and educational requirements for many water transportation occupations are established and regulated by the U.S. Coast Guard.
- Faster-than-average growth and good job opportunities are expected.

Nature of the Work

The movement of huge amounts of cargo, as well as passengers, between nations and within our Nation depends on workers in water transportation occupations, also known on commercial ships as merchant mariners. They operate and maintain deep-sea merchant ships, tugboats, towboats, ferries, dredges, offshore supply vessels, excursion vessels, and other waterborne craft on the oceans, the Great Lakes, rivers, canals, and other waterways, as well as in harbors. (Workers who operate watercraft used in commercial fishing are described in the section on fishers and fishing vessel operators elsewhere in the *Handbook*.)

Captains, mates, and pilots of water vessels command or supervise the operations of ships and water vessels, both within domestic waterways and on the deep sea. *Captains* or *masters* are in overall command of the operation of a vessel, and they supervise the work of all other officers and crew. Together with their department heads, captains ensure that proper procedures and safety practices are followed, check to make sure that machinery and equipment are in good working order, and oversee the loading and discharging of cargo or passengers. They also maintain logs and other records tracking the ships' movements, efforts at controlling pollution, and cargo and passengers carried.

Deck officers or *mates* direct the routine operation of the vessel for the captain during the shifts when they are on watch. On smaller vessels, there may be only one mate (called a *pi-lot* on some inland towing vessels), who alternates watches with the captain. The mate would assume command of the ship if the captain became incapacitated. When more than one mate is necessary aboard a ship, they typically are designated chief mate or first mate, second mate, third mate, etc. Mates also supervise and coordinate activities of the crew aboard the ship. Captains and mates determine the course and speed of the vessel, maneuvering to avoid hazards and continuously monitoring the vessel's position with charts and navigational aides. Captains and mates oversee crew members who steer the vessel, determine its location, operate engines, communicate with other vessels, perform maintenance, handle lines, and operate equipment on the vessel. They inspect the cargo holds during loading to ensure that the load is stowed according to specifications and regulations. Captains and mates also

supervise crew members engaged in maintenance and the primary upkeep of the vessel.

Pilots guide ships in and out of harbors, through straits, and on rivers and other confined waterways where a familiarity with local water depths, winds, tides, currents, and hazards such as reefs and shoals are of prime importance. Pilots on river and canal vessels usually are regular crew members, like mates. Harbor pilots are generally independent contractors who accompany vessels while they enter or leave port. Harbor pilots may pilot many ships in a single day.

Ship engineers operate, maintain, and repair propulsion engines, boilers, generators, pumps, and other machinery. Merchant marine vessels usually have four engineering officers: A chief engineer and a first, second, and third assistant engineer. Assistant engineers stand periodic watches, overseeing the safe operation of engines and machinery.

Marine oilers and more experienced *qualified members of the engine department*, or QMEDs, assist the engineers to maintain the vessel in proper running order in the engine spaces below decks. These workers lubricate gears, shafts, bearings, and other moving parts of engines and motors; read pressure and temperature gauges; record data; and sometimes assist with repairs and adjust machinery.

Sailors or *deckhands* operate the vessel and its deck equipment under the direction of the ship's officers and keep the nonengineering areas in good condition. They stand watch, looking out for other vessels and obstructions in the ship's path, as well as for navigational aids such as buoys and lighthouses. They also steer the ship, measure water depth in shallow water, and maintain and operate deck equipment such as lifeboats, anchors, and cargo-handling gear. On vessels handling liquid cargo, mariners designated as *pumpmen* hook up hoses, operate pumps, and clean tanks; on tugboats or tow vessels, they tie barges together into tow units, inspect them periodically, and disconnect them when the destination is reached. When docking or departing, they handle lines. They also perform routine maintenance chores, such as repairing lines, chipping rust, and painting and cleaning decks or other areas. Experienced sailors are designated *able seamen* on oceangoing vessels, but may be called simply deckhands on inland waters; larger vessels usually have a *boatswain*, or *head seaman*.

A typical deep-sea merchant ship has a captain, three deck officers or mates, a chief engineer and three assistant engineers, plus six or more seamen, such as able seamen, oilers, QMEDs, and a cook. The size and service of the ship determine the number of crewmembers for a particular voyage. Small vessels operating in harbors, on rivers, or along the coast may have a crew comprising only a captain and one deckhand. On smaller vessels the cooking responsibilities usually fall under the deckhands' duties.

On larger coastal ships, the crew may include a captain, a mate or pilot, an engineer, and seven or eight seamen. Some ships may have special unlicensed positions for entry level apprentice trainees. Unlicensed positions on a large ship may include a full-time cook, an electrician, and machinery mechanics.

Motorboat operators operate small, motor-driven boats that carry six or fewer passengers on fishing charters. They also take depth soundings in turning basins and serve as liaisons between ships, between ship and shore, between harbors and beaches, or on area patrol.

Work environment. Water transportation workers' schedules vary based upon the type of ship and length of voyage. While on the water, crews are normally on duty for half of the day, 7 days a week.

Merchant mariners on survey and long distance cargo vessels can spend extended periods at sea. Most deep-sea mariners are hired for one or more voyages that last for several months; there is no job security after that. The length of time between voyages varies depending on job availability and personal preference.

Workers on supply vessels transport workers, supplies (water, drilling mud, fuel, and food), and equipment to oil and gas drilling platforms mostly in the Gulf of Mexico. Their voyages can last a few hours to a couple of weeks. As oil and gas exploration pushes into deeper waters, these trips take more time.

Workers on tugs and barges operate on the rivers, lakes, inland waterways, and along the coast. Most tugs have two crews and operate constantly. The crews will alternate, each working for 2-3 weeks and then taking 2-3 weeks off.

Many of those employed on Great Lakes ships work 60 days and have 30 days off, but do not work in the winter when the lakes are frozen. Others work steadily for a week or a month and then have an extended period off. Those on smaller vessels, such as tugs, supply boats and Great Lakes ships, are normally assigned to one vessel and have steady employment.

Workers on ferries transporting commuters work on weekdays in the morning and evening. Other ferries make frequent trips lasting a few hours. Ferries servicing vacation destinations often operate on seasonal schedules. Workers in harbors generally have year-round work. Work in harbors and on ferries is sought after because workers return home every day.

People holding water transportation jobs work in all kinds of weather, except when frozen waters make travel impossible. Although merchant mariners try to avoid severe storms while at sea, working in damp and cold conditions often is inevitable. While it is uncommon for vessels to suffer disasters such as fire, explosion, or a sinking, workers face the possibility that they may have to abandon their craft on short notice if it collides with other vessels or runs aground. They also risk injury or death from falling overboard and hazards associated with working with machinery, heavy loads, and dangerous cargo. However, modern safety management procedures, advanced emergency communications, and effective international rescue systems have greatly improved mariner safety.

Many companies are working to improve the living conditions on vessels to reduce employee turnover. Most of the Nation's newest vessels are air conditioned, soundproofed to reduce machinery noise, and equipped with comfortable living quarters. Some companies have added improved entertainment systems and hired full-time cooks. These amenities lessen the difficulty of spending long periods away from home. Advances in communications, particularly e-mail, better link



Captains direct all operations on their vessels.

mariners to their families. Nevertheless, some mariners dislike the long periods away from home and the confinement aboard ship and consequently leave the occupation.

Training, Other Qualifications, and Advancement

Entry, training, and educational requirements for many water transportation occupations are established and regulated by the U.S. Coast Guard. Most officers and operators of commercially operated vessels must be licensed by the Coast Guard, which offers various kinds of licenses, depending on the position, body of water, and type of vessel. Individuals must be relicensed when they change the type of ship or the body of water they are on.

Education and training. Entry-level workers are classified as ordinary seamen or deckhands. Workers take some basic training, lasting a few days, in areas such as first aid and fire-fighting.

There are two paths of education and training for a deck officer or an engineer: applicants must either accumulate thousands of hours of experience while working as a deckhand, or graduate from the U.S. Merchant Marine Academy or another maritime academy. In both cases, applicants must pass a written examination. It is difficult to pass the examination without substantial formal schooling or independent study. The academies offer a 4-year academic program leading to a bachelor-of-science degree, a license (issued only by the Coast Guard) as a third mate (deck officer) or third assistant engineer (engineer-

ing officer), and, if the person chooses, a commission as ensign in the U.S. Naval Reserve, Merchant Marine Reserve, or Coast Guard Reserve. With experience and additional training, third officers may qualify for higher rank. Generally officers on deep water vessels are academy graduates and those in supply boats, inland waterways, and rivers rose to their positions through years of experience.

Harbor pilot training usually consists of an extended apprenticeship with a towing company or a harbor pilots' association. Entrants may be able seamen or licensed officers.

Licensure. Coast Guard licensing requirements vary by occupational specialty, type of vessel, and by body of water (river, inland waterway, Great Lakes, and oceans.) The requirements increase as the skill level of the occupational specialty increases and the size of the vessel increases.

Entry level seamen or deckhands on vessels operating in harbors or on rivers or other waterways do not need a license. All others working on larger, ocean-going vessels do need a license. To get the basic entry level license, workers must pass a drug screen, take a medical exam, and be U.S. citizens.

Workers on ocean-going or Great Lakes vessels need specialty licenses to work as engineering officers, or deck officers. On rivers or inland waterways, only the captain or anyone who steers the boat needs a license. For more information on licensing requirements see the Coast Guard's Web site listed in the sources of additional information. Radio operators are licensed by the Federal Communications Commission.

Other qualifications. Most positions require excellent health, good vision, and color perception. Good general physical condition is needed because many jobs require the ability to lift heavy objects, withstand heat and cold, stand or stoop for long periods of time, dexterity to maneuver through tight spaces, and good balance on uneven and wet surfaces and in rough water.

Advancement. Experience and passing exams are required to advance. Deckhands who wish to advance must decide whether they want to work in the wheelhouse or the engine room. They will then assist the engineers or deck officers. With experience, assistant engineers and deck officers can advance to become chief engineers or captains. On smaller boats, such as tugs, a captain may choose to become self-employed by buying a boat and working as an owner-operator.

Employment

Water transportation workers held more than 84,000 jobs in 2006. The total number who worked at some point in the year

was significantly larger because many merchant marine officers and seamen worked only part of the year. The following tabulation shows employment in the occupations that make up this group:

Captains, mates, and pilots of water vessels	34,000
Sailors and marine oilers.....	33,000
Ship engineers.....	15,000
Motorboat operators.....	3,000

About 40 percent of all workers were employed in water transportation services. About 17 percent worked in inland water transportation—primarily the Mississippi River system—while the other 23 percent were employed in water transportation on the deep seas, along the coasts, and on the Great Lakes. Another 24 percent worked in establishments related to port and harbor operations, marine cargo handling, or navigational services to shipping. Governments employed 9 percent of all water transportation workers, many of whom worked on supply ships and are civilian mariners of the Navy Department's Military Sealift Command.

Job Outlook

Employment in water transportation occupations is projected to grow faster than average. Good job opportunities are expected.

Employment change. Employment in water transportation occupations is projected to grow 16 percent over the 2006-2016 period, faster than the average for all occupations. Job growth will stem from increasing tourism and growth in offshore oil and gas production. Employment will also increase in and around major port cities due to rapidly increasing international trade.

Employment in deep-sea shipping for American mariners is expected to remain stable. A fleet of deep-sea U.S.-flagged ships is considered vital to the Nation's defense, so some receive Federal support through a maritime security subsidy and other provisions in laws that limit certain Federal cargoes to ships that fly the U.S. flag.

Employment growth also is expected in passenger cruise ships within U.S. waters. Vessels that operate between U.S. ports are required by law to be U.S.-flagged vessels. The staffing needs for several new U.S. flagged cruise ships that will travel to the Hawaiian Islands will create new opportunities for employment. In addition, increasing use of ferries to handle commuter traffic around major metropolitan areas should increase employment.

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2006	Projected employment, 2016	Change, 2006-16	
				Number	Percent
Water transportation occupations.....	53-5000	84,000	98,000	14,000	16
Sailors and marine oilers.....	53-5011	33,000	38,000	5,200	16
Ship and boat captains and operators.....	53-5020	37,000	43,000	6,300	17
Captains, mates, and pilots of water vessels	53-5021	34,000	40,000	6,000	18
Motorboat operators.....	53-5022	3,000	3,300	300	11
Ship engineers.....	53-5031	15,000	17,000	2,100	14

NOTE: Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook*.

Some growth in water transportation occupations is projected in vessels operating in the Great Lakes and inland waterways. Growth will be driven by increasing demand for bulk products, such as coal, iron ore, petroleum, sand and gravel, grain, and chemicals. Since current pipelines cannot transport ethanol, some growth will come from shipping ethanol. Problems with congestion in the rail transportation system will increase demand for inland water transportation.

Job prospects. Good job opportunities will result from growth and the need to replace those leaving the occupation. Most water transportation occupations require workers to be away from home for extended periods of time, causing some to leave these jobs.

Maritime academy graduates who have not found licensed shipboard jobs in the U.S. merchant marine find jobs in related industries. Many academy graduates are ensigns in the Naval or Coast Guard Reserve; some are selected or apply for active duty in those branches of the Service. Some find jobs as seamen on U.S.-flagged or foreign-flagged vessels, tugboats, and other watercraft or enter civilian jobs with the U.S. Navy or Coast Guard. Some take land-based jobs with shipping companies, marine insurance companies, manufacturers of boilers or related machinery, or other related jobs.

Earnings

Earnings vary widely with the particular water transportation position and the worker's experience. Earnings are higher than most other occupations with similar educational requirements for entry-level positions. While wages are lower for sailors than for mates and engineers, sailors' on-board experience is important for advancing into those higher paying positions. Workers are normally paid by the day. Since companies provide food and housing at sea and it is difficult to spend money while working, sailors are able to save a large portion of their pay.

Median annual wage-and-salary earnings of sailors and marine oilers were \$30,630 in May 2006. The middle 50 percent earned between \$23,790 and \$39,830. The lowest 10 percent had earnings of less than \$19,220, while the top 10 percent earned over \$49,650.

Median annual wage-and-salary earnings of captains, mates, and pilots of water vessels were \$53,430 in May 2006. The middle 50 percent earned between \$38,880 and \$69,570. The lowest 10 percent had earnings of less than \$29,360, while the top 10 percent earned over \$89,230. Annual pay for captains of larger vessels, such as container ships, oil tankers, or pas-

senger ships may exceed \$100,000, but only after many years of experience. Similarly, earnings of captains of tugboats are dependent on the port and the nature of the cargo.

Median annual wage-and-salary earnings of ship engineers were \$54,820 in May 2006. The middle 50 percent earned between \$41,190 and \$74,360. The lowest 10 percent had earnings of less than \$34,140, while the top 10 percent earned over \$92,860.

Median annual wage-and-salary earnings of motorboat operators were \$32,350 in May 2006. The middle 50 percent earned between \$23,340 and \$45,850. The lowest 10 percent had earnings of less than \$17,270, while the top 10 percent earned over \$55,170.

The rate of unionization for these workers is about 16 percent, higher than the average for all occupations. Unionization rates vary by region. In unionized areas, merchant marine officers and seamen, both veterans and beginners, are hired for voyages through union hiring halls or directly by shipping companies. Hiring halls rank the candidates by the length of time the person has been out of work and fill open slots accordingly. Most major seaports have hiring halls.

Related Occupations

Workers in other occupations who make their living on the seas and coastal waters include fishers and fishing vessel operators and members of the Navy and the Coast Guard. Heavy vehicle and mobile equipment service technicians and mechanics perform work similar to shipboard engineers.

Sources of Additional Information

Information on a program called "Careers Afloat", which includes a substantial listing of training and employment information and contacts in the U.S., may be obtained through:

► Maritime Administration, U.S. Department of Transportation, 400 7th St.SW., Room 7302, Washington, DC 20590.

Internet: <http://www.marad.dot.gov/acareerafloat>

Information on merchant marine careers, training, and licensing requirements is available from:

► U.S. Coast Guard National Maritime Center, 4200 Wilson Blvd., Suite 630, Arlington, VA 22203-1804.

Internet: <http://www.uscg.mil/stcw/index.htm>

Information on careers with the Military Sealift Command can be found at:

► Military Sealift Command, CIVMAR Support Center, 6353 Center Drive, Building 8, Suite 202, Norfolk, VA 23502.

Internet: <http://www.sealiftcommand.com>