National Transportation Safety Board
***M/V Massachusetts* Fire Factual Report**

Accident

Vessel: SPV *Massachusetts*
Date: June 12, 2006
Location: Near Long Island Bridge, Boston Harbor, Boston, Massachusetts
NTSB No.: DCA06MF016

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SYNOPSIS

On Monday, June 12, 2006 at 1600[1], the M/V *Massachusetts*, a U.S. Small Passenger Vessel carrying 65 passengers and 4 crewmembers, departed Rowe's Wharf in Boston Harbor for its first scheduled afternoon commuter ferry run to Hingham, Massachusetts.

At approximately 1610, in the vicinity of Long Island Bridge, a fire was detected in the engine room from black smoke coming out the stern engine room vents. The master maneuvered the vessel into shallow water south of the bridge, anchored, and awaited shoreside assistance in combating the fire. The master hailed the M/V Laura, another commuter vessel in the vicinity, and safely transferred all passengers to that vessel. A Boston Fire Department fireboat was dispatched to the scene, and subsequently extinguished the fire. There were no major injuries or fatalities caused by the accident.

The fire's damage was contained to the engine space. Damage caused by the fire was estimated at $800,000.

[1] All times are local Eastern Daylight Savings Time (ZD+4)

Figure 1- Massachusetts Photo (Courtesy of Mass Bay Lines)

EVENTS PRECEDING THE ACCIDENT

At 0650, on the morning of June 12, 2006, the, M/V *Massachusetts* departed its berth at Hingham Shipyard to begin the first of 3 morning commuter runs between Hingham Shipyard and Rowes Wharf in Boston. The crew comprised a captain, mate, and two deck hands. The vessel operated as a commuter vessel during the morning and afternoons Monday through Friday. Outside of those times periods, it conducted sightseeing tours, and occasional whale watching tours, including on weekends. About 30 minutes after departing Hingham, the vessel arrived at Rowes Wharf, near Boston's financial district, and disembarked its passengers . The next group of passengers boarded the vessel and it departed for its return trip to Hingham at 0730. Following its 0800 arrival in Hingham, the crew once again offloaded its passengers, took on its final morning's group of commuters, and return to Rowe's Wharf, arriving at 0850. Each commuter trip traveled a distance of approximately 10 miles and took about 30 to 40 minutes.

Following its morning commuter runs, the *Massachusetts* made 2 previously scheduled sightseeing tours of Boston Harbor. The first began at 0930, returning to Rowe's Wharf at 1015. The second tour departed Rowe's Wharf at 1100, and returned to Rowes Wharf at 1230.

After disembarking its sightseeing passengers, the captain got the vessel underway for Charlestown, for some engine repairs scheduled to be conducted before the 3 afternoon commuter ferry runs beginning at 1600 from Rowes Wharf. The vessel arrived dockside at Charlestown about 1245. The captain had previously called ahead to the company's regular contractor, a small company consisting of an owner, a diesel mechanic, a welder, and a mechanic in-training. The contractor regularly serviced the propulsion and generator engines on Massachusetts Bay Lines vessels. The mechanic had been informed about the vessels schedule and met the *Massachusetts* at the Charlestown dock at approximately 1245. The mechanic and captain discussed the scope of work to be perform, which included examining the starboard outboard propulsion engine[2] for excessive blow-by[3] from breathers on the valve covers, an examination of the port generator for sparking that had been reported by a crewmember during the past weekend, and the port inboard propulsion engine, which had been idling at a higher speed than normal.

The mechanic first worked on the starboard, outboard propulsion engine, and diagnosed the problem as a blown head gasket. After conferring with the captain, it was decided the repair work would be started later that week. The mechanic then moved to the port generator. The

[2] The Massachusetts was fitted with four Detroit 12V71 main engines that turned four propellers and two 3V71 diesels that drove two 30 KW generators.
[3] A condition where excessive engine cylinder combustion gases pass from the combustion space into the crankcase, and are vented through the valve cover breather.

mechanic removed the cover for the generator and tested the generator with a full electric load applied, but found no sparking or other indication of faulty operation of the generator. The test of the port generator, conducted by the mechanic, was also witnessed by the mechanic's employer and the captain. The captain elected to call for a marine electrician to look further into the matter, and decided to use only the starboard generator for meeting the vessel's electrical needs until further examination of the generator could be conducted.

The mechanic's last task was to examine and repair the port inboard propulsion engine. The owner of the repair company advised the mechanic to look for a faulty injector, which the mechanic also suspected to be cause of the high idle RPM. The captain and Mass Bay Lines general manager, operator of the vessel, also suspected that the high idle speed of the port inboard engine was being caused by a stuck fuel injector. Then the owner of the repair company left the vessel. The mechanic found that the rack (fuel control) for the No. 3 inboard injector was frozen. He replaced the injector, and, after test-running the engine for about 15 minutes, departed the *Massachusetts*. For additional detail, see "Mechanic's Actions" section of this report.

At 1530, the captain got the vessel underway for Rowe's Wharf for its first afternoon commuter trip scheduled for 1600. During the 15 minute trip to Rowes Wharf, the captain elected to use the two outboard engines for propulsion, a usual practice, in the interest of fuel economy; hence, both inboard engines were not operating.

ACCIDENT NARRATIVE

The vessel boarded 65 passengers, a typical passenger count for the 1600 trip from Boston's Rowes Wharf to the Hingham Shipyard. The Massachusetts departed the dock on schedule with the mate at the helm. See figure 2 below for a diagram of the Massachusetts typical daily commuter route from Rowes Wharf to Hingham Shipyard. Prior to departing, the master of the *Massachusetts* provided a safety briefing to passengers. This briefing was delivered over the PA system to the inner accommodation areas, as well as the outer decks. Passengers were informed about the location and type of lifesaving equipment on board and told to follow the instructions of crewmembers in case of an emergency.

Soon after leaving Rowes Wharf, the captain went to the engine room to bleed air out of the air conditioning system. He did not detect anything out of the ordinary at that time. The captain then returned to the pilothouse. Approximately 10 minutes into the trip, about 1610, the upper deck deckhand entered the pilothouse to report to the captain that she noticed black smoke at the vessel's stern. At the same time, the port inboard propulsion engine high water temperature alarm sounded. The mate secured the alarming engine and slowed the remaining 3 engines from 2000 to 1300 RPM, at the captain's directive. The captain proceeded to the engine room to investigate the cause of the smoke.

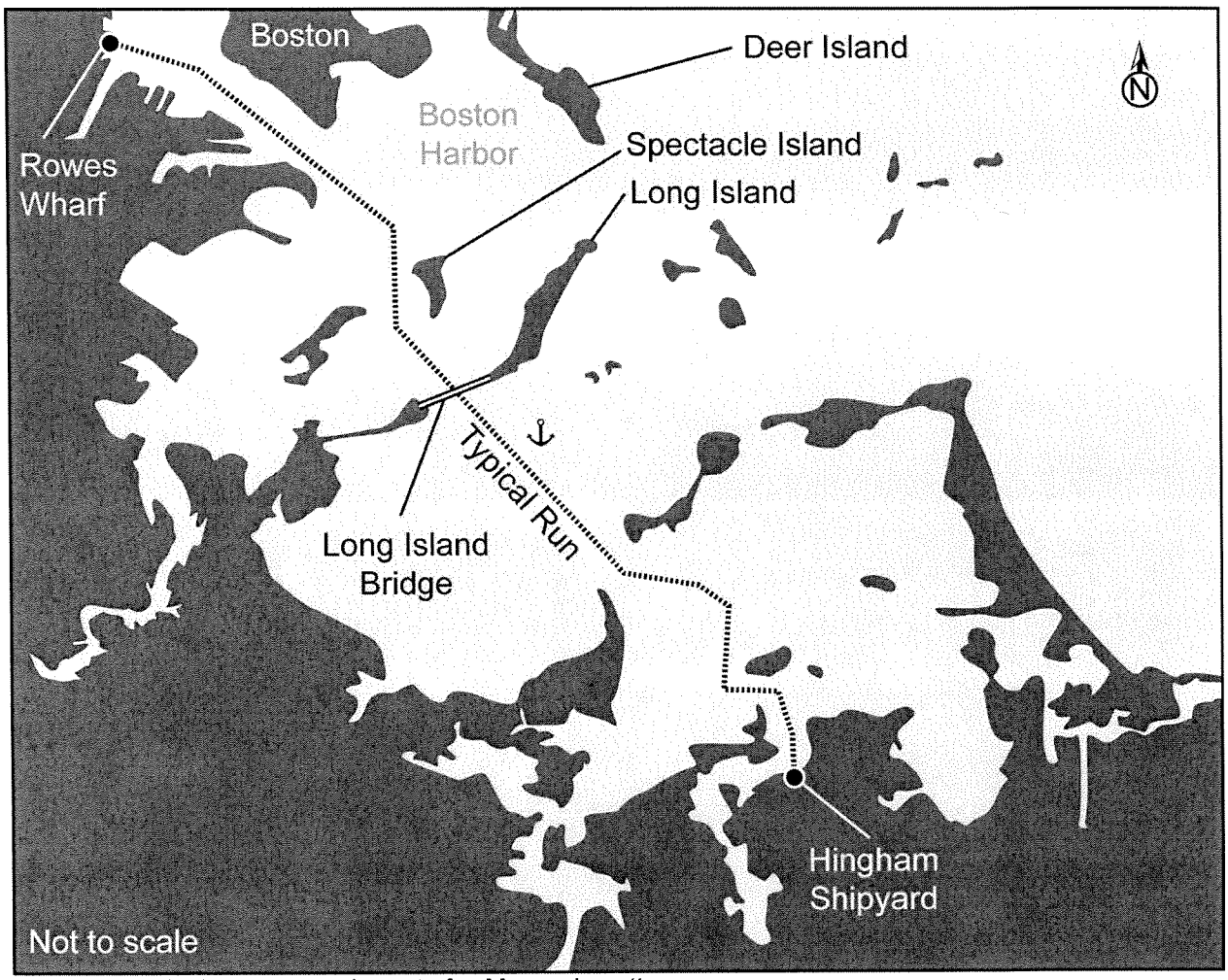

Figure 2- Typical commuter trip route for *Massachusetts*

Upon opening the starboard door to the engine room, the captain encountered heavy smoke, and immediately closed the door. The captain went to the phone at the main deck bar and called the pilothouse, informing the mate of the situation and instructing him to secure 2 of the remaining engines, and leave the starboard inboard engine running. The captain then made his way toward the pilothouse. Along the way, he directed all main deck passengers and the main deck deckhand to proceed to the upper deck. Once on the upper deck, he briefed the passengers about the situation, and informed them he would be hailing another passing commuter vessel, requesting that vessel take them on board. He directed the deckhands to have the passengers, now all on the upper deck, don lifejackets, and then he continued on to the pilothouse. A

passenger on the vessel happened to be a Commander in the Coast Guard commuting home. The captain apprised the Coast Guard officer of the fire, and asked for his assistance in contacting the Coast Guard. The Commander notified Sector Boston Coast Guard about the fire, using his cell phone.

When the captain returned to the pilothouse, the mate informed him that after he left the pilothouse to assess the fire, the port outboard engine had lost RPM, and that he had secured the engine at that time. By this time, the vessel had passed south of the Long Island Bridge. The captain then relieved the mate at the helm, and ordered the mate and one deckhand to go to the bow and prepare to drop the anchor. The mate also instructed the other deckhand to assist with the anchor. While the mate and two deckhands were preparing to drop anchor, the captain, contacted the M\V *Laura,* another nearby commuter ferry vessel, by VHF radio, marine channel 13. The captain informed the Laura's captain that his vessel had suffered an engine room fire. He requested the Laura come alongside to receive the Massachusetts 65 passengers. The *Laura* was about a half mile south, headed north en route from Hingham to Rowes Wharf, with 3 passengers aboard. The *Laura* immediately altered course to assist the *Massachusetts.*

The Coast Guard Commander entered the pilothouse, and reminded the captain to secure the engine room's ventilation supply blowers[4], which the captain did at that time.

[4] The two blowers that supplied air to the engine room could be turned off on the bridge. However, there were no ventilation dampers in either the two supply and two exhaust plenums (ducts); hence, there was no means to restrict ducted air flow to the fire.

Having made contact with the *Laura*, the captain navigated the *Massachusetts* to the east just outside of the channel, approximately one half mile south of the Long Island Bridge, and ordered the mate to drop the anchor. The *Massachusetts* anchor location is designated by the anchor symbol in figure 2. Having safely anchored the vessel, the captain sent the mate to the main deck to secure the emergency fuel oil shutoff valves, located behind the bar service area, on the starboard side. The 2 deckhands returned to the upper deck to attend to the passengers. At this time the captain shut down the starboard inboard engine. The generator shut down due to fuel starvation about 30 seconds after the after the emergency shutoff valves were secured.

About 1620 the *Laura* came alongside and tied up on the starboard side of the *Massachusetts*. The crew then led the 65 passengers, still in their lifejackets, down the forward starboard ladder to the main deck, and out through the starboard forward side door directly onto the *Laura*. It was an orderly transfer, taking less than 5 minutes, according to crew statements. At 1635, the *Laura* untied, and departed the *Massachusetts* with its passengers, bound for Hingham Shipyard.

At the same time the *Laura* was tying up on the starboard side, a Quincy marine police vessel came along the port side, and ask the mate if they needed assistance from the fire department and the mate stated that assistance was needed. The police boat then notified the Coast Guard of the need for Boston Fire Department's fire vessel to assist in fighting the fire. The fire department's vessel "*Firefighter*" was dispatched at that time.

Having transferred the passengers to safety, the captain gathered his crew, and realizing the intensity of the fire in the engine room, informed them that they would not be fighting the fire and that they would wait for city firefighting crews to extinguish the blaze. In his statement, the captain indicated he did not want to introduce any additional oxygen into the engine room by attempting to fight the fire.

At approximately 1645, the crew transferred from the *Massachusetts* to the Quincy marine police vessel at the Coast Guard's request, and remained in the area until the fire was contained.

The "*Firefighter*" arrived on scene at approximately 1730, and extinguished the fire at 1848. Except for a small burnt area in the rug near the port ventilation duct, all fire and smoke damage was confined to the engine room.

The crew were later transferred to a Coast Guard vessel, and transported to the Hingham Shipyard dock, arriving ashore at 2130.

The *Massachusetts* was taken under tow by a local harbor tug at 2240 and moved to a pier at Deer Isle, in Boston Harbor.

MECHANIC'S ACTIONS

The mechanic[5] who performed repairs on the vessel earlier on the afternoon of the day of the fire had no formal training from the engine's manufacturer, Detroit Diesel. Federal regulations

[5] Willis06-16-06 interview.

regarding small passenger vessels do not require mechanics or company personnel performing engine work to have such engine-specific training or credentials in order to effect maintenance or repairs to propulsion or associated machinery on small passenger vessels.

His experience and knowledge of these engines had been achieved exclusively by his having been employed at his current employer for the past 12 years, through on the job training. He told investigators that in his time working for his employer, he "specialized" in Detroit Diesel engine work. He estimated that "80 percent " of the work he does is spent working on Detroit Diesels. He also stated that he had been doing work on Massachusetts Bay Lines vessel engines for approximately 9 years. He stated that he would only work on their engines when he was called in for some type of engine problem, and did not perform periodic inspections of the company's engines.

According to the mechanic's interview with investigators, the following is a detailed description of the steps he took in changing out the #3 injector on the starboard inboard bank of the port inboard propulsion engine earlier in the afternoon the day of the fire:

> [6]After having addressed the concerns of the starboard outboard engine, and the port generator, he turned his attention to the port inboard engine. He had been called to look at this engine as well, as the captain told him that it was idling too fast, and would not come down to its normal idle speed.
>
> During his initial inspection of the engine, he removed the inboard valve cover to check the 6 cylinder fuel injectors located on that side of the engine. On his inspection of these injectors, he noticed the 3rd injector from the front of the engine was stuck in one position. He tried to physically move the injector rack, and noted it was frozen in place.

[6] Willis06-16-06 interview, page 8, line 20 through page 11, line 11.

At this time, he made the decision to replace the injector to correct the engine's high idle speed problem.

In performing the change of the #3 injector, he then removed the supply and return fuel lines connected to the injector. He then unbolted the fasteners holding the injector to the engine, removed it, and bolted another in its place. The mechanic stated that in replacing an injector on this engine, there are no calibrations or settings required once the new injector is in place. When asked if he used a torque wrench during the new injector installation, he stated that he did in fact use one, torquing the rocker stand to 104 foot pounds, and the injector hold down to 25 foot pounds. He stated that he did not use a torque wrench on the fuel supply and return lines because if they are over-tightened, the flare nuts on them can split open. (It was one of these #3 injector's fuel lines investigators found disconnected from its mating surface.)

Upon completing the installation of the new injector, the mechanic told investigators that he ran the engine with the valve cover off to inspect the work he had just completed. [7](The captain, in his interview, stated that he believed the valve covers were on during the test run, but could not confirm it as he was running the engine from the pilothouse, and the mechanic was in the engine space alone observing the engine.)

Having completed this task, the mechanic left the vessel at approximately 1530, and the vessel departed Charlestown for Rowes Wharf to begin their afternoon commuter schedule. The captain ran only the 2 outboard propulsion engines in navigating the vessel back to Rowes Wharf.

[7] Capt Bodie 6-29-06 interview, page 6, line 16.

INJURIES

The injuries sustained in the *Massachusetts* accident, shown in table 1, are categorized according to the injury criteria of the International Civil Aviation Organization (ICAO). One passenger suffered an asthma attack brought on by smoke inhalation and was treated at the scene. Another passenger was treated and released at a local hospital for minor smoke inhalation and a spike in a pre-existing blood pressure condition. The Safety Board uses the ICAO injury criteria in all its accident reports, regardless of transportation mode.

Table 1. Injuries sustained in *Massachusetts* accident.

Type of Injury	Crew	Passengers	Total
Fatal	0	0	0
Serious	0	0	0
Minor	0	2	2
None	4	61	65

Title 49 CFR section 830.2 defines a fatal injury as any injury that results in death within 30 days of an accident. It defines serious injury as that which requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; results in a fracture of any bone (except simple fractures of fingers, toes, or nose); causes severe hemorrhages, nerve, muscle, or tendon damage; involves any internal organ; or involves second- or third- degree burns, or any burn affecting more than 5 percent of the body surface.

DAMAGE

The vessel suffered fire damage in the engine room, and to a much lesser degree, the interior of the main deck level. The estimated costs of repairs necessary to return the vessel to service was $800,000. Additional information about the damage appears in the "Wreckage" section of this report.

PERSONNEL INFORMATION

Captain

The captain of the *Massachusetts,* age 55, began his maritime career as an ROTC Midshipman in college. At graduation in 1973, he received a commission as an officer in the U.S. Navy and was assigned to an aircraft carrier. He served as a deck officer for three and a half years on the aircraft carrier and qualified as an officer of the deck underway. After sea duty, he served a year and a half as an instructor at the Navy's Surface Warfare School at Coronado, California. After leaving the Navy, he did some work on various sail cruising vessels and various jobs ashore. In 1985, he obtained a U.S.C.G. 100-ton masters license and employment operating small passenger vessels for a few months in Boston. After a few months, he obtained employment with Massachusetts Bay Lines and has been employed with the company for over 20 years. He has acquired experience operating various small passenger vessels owned and operated by the company. During most of his employment with Massachusetts Bay Lines, he has been the permanent captain[8] of the *Massachusetts.* In fact, he has was the captain who worked aboard the vessel during the time it was being constructed in the shipyard, and he delivered it to Boston Harbor upon its completion in 1988. He is responsible for the material condition of the vessel and arranges for repairs and ensures the repairs are satisfactory. He is personally involved in changing oil in the diesel engines, starting up the engines, bringing generators on line and starting the air conditioning systems. In preparation for his daily commuter trips, he receives reports from other captains and crewmembers operating the *Massachusetts* on his days off about any condition affecting the condition or functioning of the vessel, and takes action as necessary for any needed repairs.

The captain works four days per week, operating the vessel Monday, Tuesday, Thursday, and Friday. He reports to work at 0600 and generally leaves work about 1845. On weekends he usually goes to bed around 2300, and gets up about 0730. He characterized his work/rest periods as pretty routine and that there had been no dramatic events to affect his schedule.

Mate

The mate, age 27, started work with Massachusetts Bay Lines as a deckhand in May 1997. In May 2001, he acquired a U.S.C.G. 100 ton masters license. The mate stated that he had taken a licensing school course to prepare for the license examination. During the nine years with the company, he had operated various vessels as the captain or mate. For the past two years, he normally works the commuter runs on the *Massachusetts* on Tuesday, Wednesday, Friday, and on other company vessels as needed, depending upon whether the vessels are chartered for various cruises. He is a fully qualified captain, but serves as the mate on the *Massachusetts* when the permanent captain is operating the vessel.

He normally works 50 to 55 hours per week. On Friday, prior to the Monday of the accident, he got to bed that night about 0030. The next day, he worked two cruises, one on Saturday afternoon and one on Saturday night lasting until 0230 Sunday morning. He departed the company a couple hours later, about 0400 and got to bed about 0445. He arose and attended a graduation party Sunday afternoon and went to bed about 2200 or 2230 that evening. He got up Monday morning at 0430, his usual time. He stated that he felt rested.

[8] Each of the seven vessels operated by Massachusetts Bay lines has one captain permanently assigned,

Lower Deck Deckhand

The lower deck deckhand, age 55, had been employed as a deckhand for approximately 8 months and was considered to be an experienced, reliable crewmember. All of his marine experience had been on the *Massachusetts*. His duties involved line handling, serving coffee to passengers at lower deck galley, assisting passengers, counting passengers as they board, and checking the engineroom at the midpoint of each commuter trip, in the vicinity of Long Island Bridge.

Upper Deck Deckhand

The upper deck deckhand, age 20, had been employed by Massachusetts Bay Lines since May 22, 2006. This was her first maritime employment. The captain had given her a familiarization tour of the vessel and had pointed out the storage for the life jackets and other safety equipment. Her responsibilities included line handling, assisting the passengers, and serving drinks at the upper deck bar. (She was the first to notice greater than normal amount of dark smoke astern of the vessel and to report the smoke to the pilothouse.)

Mechanic

The mechanic stated that he had attended Southern Maine Vocational Technical Institute in South Portland, Maine, for marine engineering, and then had shipped out on tankers with Sun Transport (SUNOCO) for a year and a half, and then he had been employed by Steve's Shop, his current employer, for almost 12 years as a diesel mechanic. His diesel repair and maintenance knowledge during his employment time with his current employer has been acquired solely

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who is in charge of the vessel's maintenance and repair.

through "on the job" experience. He estimated that 80% of the diesel engines he works on are Detroit diesels. He is the mechanic who normally works on engines in Massachusetts Bay Line vessels. He described how an injector could cause a high idle speed and how he determined which injector was faulty, the steps in changing the injector, and cited the torque values from memory for the hold-down bolts. He characterized changing an injector as a very simple procedure.

The mechanic stated he normally had a standard work/rest routine, and that he works only at his primary employment, and that he was not involved in any other employment, a second job, or volunteer work. He explained that he normally got up between 0445 and 0500 during the week, obtained coffee en route to the work, and arrived at the shop at 0600. He stated that on the Friday, prior to the accident, he believed he had worked in the shop that day, and he did not recall any unusual activity associated with the workday. He normally arrives home between 1630 and 1700, and believed he did so on Friday. After dinner at home, he had done some work on his car until about 2300, which he described as nothing strenuous. He recalled going to bed around 2330 or 2400 on Friday and Saturday nights and getting up about 0600 on Saturday and Sunday morning. He had dinner at home and he was not involved in any outside activities. He recalled getting to bed Sunday evening about 2130. He states that he gets to sleep soon after lying down and has no problem sleeping. He got up Monday at his usual time between 0445 and 0500. He stated that he felt fine on Monday. He considers his health to be good and was not taking any prescribed medications. He does not wear glasses and states that he reads comfortably. He had eaten lunch prior to going aboard the *Massachusetts* to carry out the examination and repair of the two propulsion diesel engines, and the port generator.

VESSEL INFORMATION

General information

The *Massachusetts* was delivered in 1988 by builder Gulf Craft, Inc., located in Patterson, Louisiana. Massachusetts Bay Lines contracted Gulf Craft to build the vessel for them, to be used in the Boston Harbor commuter trade. It has been used by Massachusetts Bay Lines in the Boston Harbor commuter trade since its delivery in 1988. The Massachusetts is listed at 87.6 feet in length, 25 foot beam, and 99 gross tons on its Coast Guard Certificate of Inspection (COI). The Massachusetts was certified to carry 346 passengers, and 4 crewmembers, for a total of 350 persons.

Due to certification to carry more than 150 passengers, being registered less than 100 gross tons, and carrying passengers for hire, the Massachusetts falls under 46 CFR Subchapter K (Parts 114-122).

The vessel was not equipped, nor was it required to be equipped with, a either fire detection or a fixed fire suppression system.

Vessel layout

The hull is constructed of aluminum and divided into 6 compartments below the main deck. Each compartment is separated by a transverse aluminum bulkhead extending from the bilges upward to the main deck. All of the compartments below the main deck contained a bilge suction, and the 4 aftermost spaces were additionally equipped with high water alarms.

The forward most compartment, beginning at the bow, contained anchor rope and spare lines. The next section aft contained only a sewage holding tank, and its associated macerator pump for emptying the tank shoreside.

The third compartment from the bow contained an area where passengers could access, but according to the lower deck deckhand, they generally did not tend to occupy that space during commuter trips. This same space was also used by the crew for storage of stock amenities such as coffee, etc. The space also contained a small workshop with vessel tools on the port side.

Immediately aft of this space was a narrow compartment, relative to forward and aft, which contained the fuel and potable water tanks. The port and starboard fuel tanks were situated at the far inboard section this compartment, divided at the vessel's centerline. Outboard of the fuel tanks, separated by a void space to insure against contamination, were the potable water tanks, stretching outward to the vessel's outer hull skin.

Aft of the fuel and water compartment is the engine room. Here the four propulsion engines, the vessel's 2 electrical generators, and associated engineering systems piping and equipment are contained.

The last compartment of the vessel below the main deck extended to the stern of the vessel. This space contained the vessel's exhaust piping, steering hydraulic control ram, and its associated rudder control linkages, to position the rudder from the pilothouse.

The *Massachusetts'* main (lower) deck was essentially an open area with folding chairs situated throughout the space for commuter seating, as well as fixed seating in the forward area of the deck. The entire main deck area was enclosed, to keep commuters out of the weather. Restroom facilities were located at the aft end of the main deck. A small open stern deck area was aft of the restrooms, allowing crewmembers to handle lines in securing the vessel during docking.

A small bar/serving area was located midships on the starboard side. Located within this bar area were the emergency fuel shutoff levers for the propulsion engines and generators. The upper deck was accessed by one of 2 main deck ladderways; one at the vessel's port stern, and the other forward starboard on the main deck.

The upper deck had an enclosed section at the midpoint of the vessel for passengers to remain out of the weather. This enclosed area contained the upper deck bar area as well. Passengers could access open deck areas both forward and aft on the upper deck. This deck contained both fixed and folding chairs for passenger seating.

Pilothouse equipment

The pilothouse (figure 3) was accessed from a short forward ladder on the upper deck. The equipment available to the captain consisted of:

- 2 Furuno radars (x and s band)
- 2 Raytheon VHF marine radios
- 1 International depth sounder
- 1 Magellan GPS unit
- Horn
- Searchlight
- Magnetic compass

The pilothouse was also equipped with a vessel public address (PA) system to communicate with passengers and crew throughout the vessel. This PA system was used to announce the their pre-departure safety briefing.

The wheelhouse was also equipped with an engine room high temperature alarm, triggered by a thermal device situated in the overhead between the main engines. According to the company General Manager, this device was installed in the vessel prior to its delivery in 1988. It was intended as a warning to the operator in the event a main engine should overheat.[9] It consisted of

[9] Jay Spence Interview summary 09-28-06

a red light labeled "heat" on a center alarm panel in the wheelhouse. If any alarms on that panel, another included a high engine room bilge level alarm, sounded, it would ring a bell located in the wheelhouse in addition to illuminating the panel light, to alert the operator. Years later, a more sophisticated main engine monitoring panel was installed in the wheelhouse to alert the operator to various, and more detailed, engine faults. Testing of this heat alarm was not conducted on a regular basis, and results were not logged.

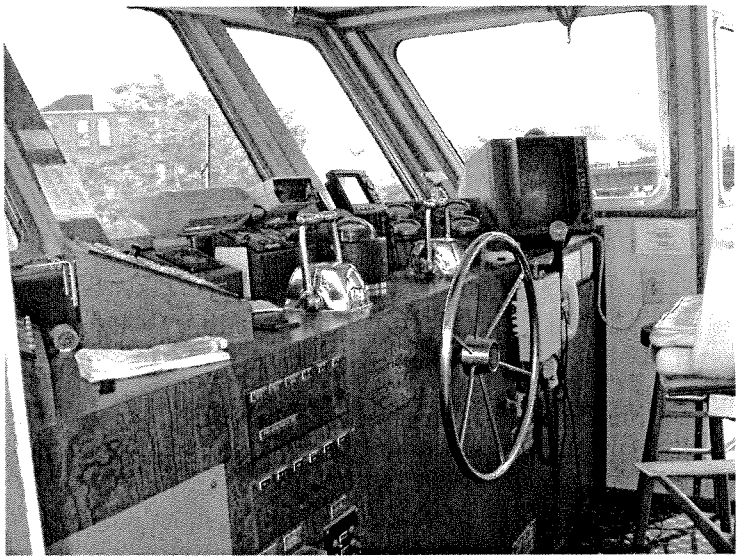

Figure 3- *Massachusetts* pilothouse

Engine room equipment

The *Massachusetts* was propelled by 4 propulsion diesel engines rated at 675 horsepower each. All engines were of the same manufacturer, Detroit Diesel, and model, 12V71. These engines were 12-cylinder, turbocharged engines coupled to individual drive shafts through reduction gearboxes. They were situated in the engine space with 2 of the engines forward and inboard, and the other 2 slightly aft and outboard. The engine identified earlier in this report that had been worked on previously during the day of the fire was the port inboard engine.

The engine space also contained the vessel's 2 electrical generators. Each of these generators was driven by Detroit Diesel 3 cylinder diesel engines. Each generator developed 30 kilowatts of output power. Typically, one generator was used at a time, with the one in use alternated daily to evenly distribute the hours put on each machine.

The day of the fire, the starboard generator was online and in use. The port generator was out of service pending a service technician's looking at it.

Other equipment situated in the engine compartment were: the 2 hydraulic steering gear pumps to control rudder movement; 2 engine space supply blowers (one on each side in the inlet air supply ducting); 12 and 32 volt battery banks to supply power to vessel equipment being serviced by DC power; 2 fire/bilge pumps; and other associated piping and pumps used in the running of the vessel's engineering systems.

Steering System

The steering system was of the electro-hydraulic type. Input rudder commands initiated at the pilothouse steering wheel were received at the pump control in the engine room. This in turn would change the hydraulic cylinder position in the lazarette (aftermost stern section). This hydraulic cylinder was connected by linkages to the 2 individual rudders in the same space, and by the linkages' movement, would move the rudders together to the position ordered by the operator in the pilothouse.

WRECKAGE

The *Massachusetts* exterior sustained minor damage, that being ostensibly sooting of the exterior paint in way of the 4 engine space vents, 2 on each side of the vessel. However, no structural damage was noted to the exterior surfaces of the vessel.

All interior space damage was contained to the main deck level. Even on this level, the damage was limited to primarily cosmetics. Some carpet charring was observed adjacent to the casing of the forward engine space vent ducting on the port side. Seven of the windows around the periphery of the main deck were broken, those as a result of the firefighters efforts during the containment of the fire.

The engine space sustained the majority of the Massachusetts damage. All four propulsion engines encountered both damage from the fire, as well as that from firefighting efforts in their use of water and foam to contain the blaze. The greatest fire-related heat damage was sustained by the port inboard engine, and is detailed in the fire group factual report.

In essence, all machinery and components, including the propulsion engines, the generators, and electrical wiring situated in the engine compartment, were totally lost to the fire.

The upper deck and pilothouse sustained no damage as a result of the fire.

WATERWAY INFORMATION

Boston harbor is a significant commercial port that has figured prominently in US history. Many commercial piers, formerly needed for breakbulk shipping have been transformed into residential complexes and retail shopping, or used for recreation purposed. The switch from break bulk to container shipping starting in the early 1970s resulted in the construction in 1980 of the Paul W. Conley Terminal, a modern, large container terminal, which accounts for most general cargo imported and exported through the port. The port is an important recipient of refined petroleum products and Liquefied Natural Gas (LNG) supplying much of the energy needs of Boston and neighboring cities. The port has one terminal dedicated to importing shipments of foreign built autos. A dedicated cruise vessel terminal facilitates a growing cruise

industry operating from the port, with 81 passenger cruise ships calling, or scheduled to call, in Boston, in 2006.

The harbor is well marked by navigation aids and traffic lanes provide for orderly flow of marine traffic. The tidal range is approximately 9 to 9.5 feet, and maximum currents in the harbor range from 0.8 to 1.5 knots. The weather is characteristic of northern Atlantic coastal cities with cold winters and warm summers. There is no dry season and precipitation every few days is normal and dry spells exceeding 2 weeks are rare, with November being the wettest month. Coastal storms, or "nor' easters" can result in heavy rain and snowfall. The main snow season extends from December through March, and December is the month normally having the greatest snowfall. Freezing weather can be expected from early November through early April, and January is the coldest month with average temperatures ranging from 37°F down to 22°F. Winds exceeding 27 knots or higher can occur in every month. Gales are more sever and more common in winter and produce winds from the northeast and east. At other times winds prevail from the west to northwest. Fog is prevalent throughout the year. Winds occurring from the east to the southwest bring fog and westerly and northerly winds clear it away.

A wide range of services is available to serve the maritime industry. Repair facilities are available for repairs to all sizes of vessels. One 1175-foot long drydock is available for oceangoing vessels. And smaller drydocks are available for small vessels ranging from tugs to large barges.

OPERATIONAL INFORMATION

Massachusetts Bay Lines, the operator of the M\V *Massachusetts*, is currently a family owned corporation. Massachusetts Bay Line is a member of the Passenger Vessel Association, a trade association representing most US small passenger vessels involved in commuter ferry and tour/sight seeing service. The principals of the present corporation have been involved in operating passenger vessels for over 40 years, and at one time their primary operations were operating vessels in a ferry service from Boston to Nantasket primarily for those visiting the beach or the former amusement park. Eventually, for a time the company was involved in other ferry routes in the Boston area. By about1980, the primary focus of operations comprised harbor sight seeing tours, private party trips, whale watching trips, and some commuter operations in the Boston area.

The company currently has 7 small passenger vessels[10] in operation, including the M\V *Massachusetts*. Each of the vessels has a permanently assigned captain who is in charge of the vessel. The company utilizes forms for reporting emergency repair needs. (This form was used to report the sparking by the port generator and excess smoke from the starboard outboard propulsion engine.) The captain in charge makes arrangements for repair work, subject to concurrence with the office, and is responsible for follow-up to ensure repairs are made correctly. Routine vessel maintenance, such as oil changes and filter changes, were typically performed and logged in the vessel maintenance book, by the respective vessel's permanently assigned master.

[10] Massachusetts Bay Line vessels and their maximum passenger capacity: *Harbor Belle* –100; *Seaport Belle* – 120; *Nantascot* – 200; *Samuel Clemens* – 250; *Freedom* – 300; *Massachusetts* – 300; and *New Boston* – 325;

The spring through early fall is the primary season for sigh seeing tours, private party trips, and whale watching trips. Except for the *Massachusetts*, which is regularly dedicated to commuter service between Rowes Wharf and Hingham Shipyard, many vessels are inactive for much of the time during the winter months. However, in recent years large groups from Asia, occasionally booking harbor sightseeing tours throughout the year, have resulted in increased vessel employment during the winter months.

The Massachusetts Bay Transit Authority (MBTA), which has responsibility for urban mass transit needs in the Boston area, operates rail and bus service, and ensures that regularly scheduled ferry service is available on certain routes. The MBTA awards and manages contracts with commercial passenger vessel owner/operators to provide scheduled ferry service on routes prescribed by MTBA as follows:

(1) Quincy – Hull – Boston,

(2) Hingham Shipyard – Rowes Wharf, and

(3) Long Wharf Boston –Charlestown Navy Yard

The contracts specify that vessels must be in compliance with Coast Guard requirements. Vessel operators having contracts with MBTA are permitted to subcontract with other vessel operators in order to meet the terms of their contracts. At the time of the accident, the Massachusetts was operating pursuant to a subcontract with Boston Harbor Cruises, which had a 5-year contract with the MBTA to provide ferry service between Rowes Wharf and Hingham Shipyard. (The

M/V *Laura*, which embarked the passengers from the *Massachusetts,* is owned and operated by Boston Harbor Cruises.)

MANAGEMENT INFORMATION

[11]The *Massachusetts* operator, Massachusetts Bay Lines, Inc., is a family-owned corporation, having been started in 1963. The family's father serves as corporation President. His son acts as the General Manager, taking care of day-to-day operations of the commuter vessels. The sister serves as Chief Financial Officer, and the mother as Secretary-Treasurer. Other management staff include: the Operations Manager, who recently became a full-time employee after having retired from the Massachusetts Bay Transit Authority (MBTA); and, the Maintenance Manager. The Maintenance Manager's responsibilities include oversight of all aspects of the commuter vessel maintenance and repair work being performed.

The number of company employees ranges from approximately 100 during the busy summer months to 15-20 during the winter months, and not all of those are full time employees.

METEOROLOGICAL INFORMATION

[12]Meteorological information was obtained from the National Weather Service. The nearest reporting station was located at Boston's Logan Airport, which is equipped with an Automated Surface Observation System (ASOS). This system was located approximately 5 miles from the fire scene.

No hazardous weather advisories were issued for the day of the accident. Clear skies were reported at 1600, with unrestricted visibility at 10 miles, and broken cloud cover. The air

[11] Spence06-15 interview, page 5, line 6.

temperature was 70 degrees Fahrenheit, with 10-knot winds, gusting to 12 knots, at 110 degrees. The sea temperature at the ASOS was reported to be 60 degrees, with wave heights of approximately 1 foot. The tide for that day was high at 1233 EDT, and low at 1828.

TOXICOLOGY TESTING

Following the fire, none of the crewmembers were tested for the presence of alcohol.[13] Shortly before 1700, the general manager of Massachusetts Bay Lines attempted to reach the contractor that conducts toxicology testing for he company, however, no one answered the after hours telephone number. Once the crew was brought ashore in Hingham around 2130 aboard a US Coast Guard vessel, they were met by the president of Massachusetts Bay Lines, and transported by him to a local hospital for testing. However, the hospital emergency room was too busy to conduct the testing and recommended that the crewmembers return the next day. When the hospital was unable to conduct the testing, Massachusetts Bay Lines president contacted the Coast Guard for assistance, but was informed that the Coast Guard was not set up to conduct post accident testing. On the following morning about 0900, the crewmembers were taken to the office of the testing contractor and urine specimens were collected. However, no alcohol testing was conducted at that time because of the elapse of time since the accident. The

[12] NTSB Meteorlogical Factual report, dated June 28, 2006.

[13] Post accident alcohol and drug testing is required by Federal regulations at 46 CFR 4.06 for any accident meeting the criteria of a Serious Marine Incident. The regulations at 46 CFR 4.03-2 describe a Serious Marine Incident as an accident involving: (1) One or more deaths, (2) Requiring Medical treatment beyond first aid, or that renders a crewmember unable to perform routine duties, (3) Property damage in excess of $100,000, (4) Loss of an inspected vessel, (5) Loss of an uninspected vessel of 100 Gross Tons or more, (6). Discharge of oil of 10,000 gallons or more into navigable waters, or the discharge of a reportable quantity of hazardous substances into the environment of the United States. On June 20, 2006, new Coast Guard regulations, at 46 CFR 4.06, became effective, requiring post accident alcohol testing to be conducted within two hours of the accident meeting the criteria of a Serious Marine Incident. Also, internal Coast Guard directives require Coast Guard personnel to conduct the alcohol testing if the marine employer does not or is unable to conduct the alcohol testing within two hours.

testing for the 5 illicit drugs[14] for which post accident testing is required were negative for all 4 crewmembers.

Coast Guard headquarters has informed the Safety Board that the new regulations at 46 CFR 4.06, in effect since 20 June 2006, requiring alcohol testing in two hours, will be enforced through civil penalties levied against any marine employer failing to conduct the alcohol testing as prescribed. Similarly, a failure to collect urine specimens for drug testing within 32 hours will also result in civil penalties.

Subsequent to the accident, Massachusetts Bay Lines acquired saliva test kits for alcohol testing and a training disc for the test kits. The company, using the training disc, has trained several employees in the use of the test kits.

SURVIVAL ASPECTS

Emergency Response

At 1630 on 12 June 2006, the Quincy Police Boat *Protector* was approaching the Long Island Bridge from the Southwest when the crew observed the *Massachusetts* "dead in the water with smoke showing from its stern"[15]. At 1635 they came alongside the vessel and made contact with the *Massachusetts* mate on the main deck, who informed them that the engine room was on fire[16]. Police on board *Protector* immediately called the Coast Guard on VHF channel 16, notified them of the emergency, and requested a fire boat be dispatched. The crew of *Protector* also notified Quincy PD Headquarters of the fire.

[14] Federal regulations at 46 CFR 16.113 require testing for (1) Marijuana. (2) Cocaine, (3) Opiates, (4) Phencyclidine (PCP), and (5) Amphetamines.
[15] J. Flaherty, Quincy PD, Incident Report # 6029536
[16] Quincy PD Incident Report #6029536

A passing vessel, M/V *Laura*, was called by the *Massachusetts* on VHF channel 13 and asked to provide assistance. The *Laura* agreed to help, came alongside, and made fast to the starboard side of the vessel[17]. Passengers came down the interior stairway on the starboard side forward, and disembarked the vessel out the forward starboard side doorway. All passengers were reported to be wearing life jackets[18]. The *Laura* backed away to a safe distance once all passengers were on board. *Massachusetts*' crew did not remember counting passengers as they left the vessel[19]. A count was taken and logged however, on board the *Laura*[20]. The Captain of the *Massachusetts* and its crew remained on board the burning vessel for a short time after passengers departed. They made a final round of all accessible spaces before escaping to the *Protector*[21].

Boston Fire Department's dispatch operations center, called Fire Alarm, received calls from the Coast Guard and then Quincy Police reporting the fire on the *Massachusetts* at 1641 and 1642 respectively. At 1644 Fire Alarm dispatched the Marine Unit, located at Burroughs Wharf in the North End of Boston, to the Long Island Bridge[22].

Upon receiving the call from Fire Alarm, marine unit personnel boarded M/V *Firefighter* and were underway within 2-3 minutes[23]. The Marine Unit's other vessel, *St. Florian*, was out of service due to an electrical problem that had earlier drained the batteries. Marine Unit Standard Operating Procedures dictate that the smaller faster *St. Florian* would normally have been launched first, with the *Firefighter* following later with land companies as needed.

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[17] Tom Sullivan Interview
[18] Steve Bodie Interview, p. 43, lines 2-5
[19] Peter Noonan interview
[20] Tom Sullivan Interview
[21] Noonan interview
[22] Timeline from emergency calls
[23] Chris Mackin Interview

At 1656 Fire Alarm dispatched Engine Company 2 and Ladder Company 19 to Conley Terminal[24], located at the southeast end of the reserved channel[25] in South Boston, to be picked up by the Marine Unit[26]. At 1703 Fire Alarm dispatched the District 6 Fire Chief John Evans to Conley Terminal, also to be picked up by the Marine Unit[27].

In route to the fire, *Firefighter* stopped at Conley Terminal to pick up the land companies and Fire Chief. According to the pilot of the *Firefighter*, it took around 12-15 minutes to get from Burroughs Wharf to Conley Terminal, and another 10 minutes to get the assembled firefighters and their gear loaded. The remaining trip out to the Massachusetts took an additional 25-30 minutes[28].

Upon arriving on scene, the *Firefighter* approached the vessel on its port side[29]. By this time, there were no passengers or crew on board the *Massachusetts*. Heavy black smoke was noted coming out of the vents and doorways on the stern. There were numerous assets already on scene including boats from the Quincy police, Environmental police, State police, and Coast Guard. A MassPort[30] fireboat also stood by. *Firefighter* made fast to the *Massachusetts* and five firefighters initially went on board to battle the fire. One 2-½ inch fire hose was placed down each of the two engine room accesses aft on the main deck, with 2 men manning each hose[31]. Because of the size of these accesses and the strength of the fire, firefighter were unable to actually enter the engineroom. Fighting the fire amounted to simply filling the engine room up with water. Firefighting foam was also used down the port engine room access with little

[24] Massachusetts Port Authority, Paul W. Conley Terminal
[25] Coast Pilot 1, p. 371. A dredged unmarked channel containing modern and extensive freight terminals.
[26] Pickup point marked on Boston Harbor Chart by Chris Mackin
[27] Timeline from emergency calls
[28] Chris Mackin interview
[29] John Evans interview, Bodie interview from 6/15, p 17, line 23
[30] Fire and rescue boat from Logan Airport
[31] John Evans interview

effect[32]. Initial efforts did not successfully extinguish the fire. The District Fire Chief, who was the On Scene Commander, described the main deck as having "steam coming out of the carpet". Firefighters requested the assistance of one of the ship's crew in finding a better way to access the engineroom and battle the fire. Massachusetts' Captain was delivered to the fireboat by the Quincy Police boat. He told them about soft patches[33] in the main deck, directly above the engines, that could be opened to fight the fire.

Firefighters opened and propped up the soft patch over the port inboard engine, and were able to put out the fire through the access from above. Firefighting efforts filled the engine compartment with water to a height above the tops of the engines, nearly to the main deck level[34]. Worried about the stability of the vessel, firefighters commenced dewatering, and pumped approximately 5-6 feet of water out of the engine compartment[35]. When the water was at a safer level, they entered the compartment, checked for hot spots, and provided a re-flash watch[36]. When the vessel was deemed safe to transport by the Coast Guard, it was towed to Deer Island.

Boston Fire Department Marine Unit[37]

Boston Fire Department's Marine Unit consists of two Fireboats, both located at Burroughs Wharf in the North End of Boston. M/V *Firefighter* is designated as Marine Unit #1. M/V *St. Florian* is designated Marine Unit #2.

Vessel Characteristics:

	Firefighter	*St. Florian*

[32] Mackin and Evans interviews
[33] Metal hatches - Steve Bodie interview, 6/15, p 18, line 16-23
[34] Chris Mackin interview
[35] John Evans interview
[36] Re-flash watch consists of firefighters assigned to the fire scene to be prepared to extinguish any subsequent fire outbreaks.

Length	76 feet	30 feet
Width	20 feet	12 feet
Pumping Capacity	6000 GPM	1000 GPM
4" hose	1000 feet	100 feet
2 ½" hose	1200 feet	200 feet
1 ¾" hose	800 feet	300 feet
Max speed	9-10 knots	23 knots

The *Firefighter* carries 500 gallons of 3% foam, FP-70, discharged through the two forward bow monitors and one forward port side hydrant. Thirteen 5-gallon containers of foam are also carried.

St. Florian carries two 5-gallon containers of foam.

Response Procedures:

Boston Fire Department Standard Operating Procedure Number 15 details operations for the Marine Unit. For vessel fires in the outer harbor (beyond Castle Island Terminal) Marine Unit #2 is designated to respond to the location. Marine Unit #1 is to remain in quarters and the Fire Alarm Office will dispatch land companies in accordance with the running card[38] to the Marine Unit. Members of the land companies will board Marine Unit #1 with their equipment and then respond to the incident. The designated land companies as specified in Fire Alarm's running card #763 for Boston Outer Harbor, Castle Island to Boston Light, are Engine Company 8 and Ladder Company 1.

[37] This section comes from Marine Unit SOP

[38] Boston Fire Department's SOP outlining guidance for dispatch personnel, as to where equipment and personnel will be dispatched to fires in a particular area of the city's jurisdiction.

Firefighting Equipment

As required by Coast Guard regulations, the *Massachusetts* carried approved firefighting equipment on board at all times. The vessel was equipped with one B-I portable fire extinguisher, stored at the operating station, and six B-II portable fire extinguishers stored throughout the ship. Two of the B-II portable extinguishers were mounted in the engine room. The vessel had 2 fire pumps, located in the engine room. The pumps were capable of providing a stream of water to any space on the ship by way of two fire stations, each containing a 50-foot, 1 ½ inch hose with a firefighting nozzle. The vessel also carried one fire axe.

Fixed Firefighting Regulations

When the *Massachusetts* began operating, there was one set of regulations for all small passenger vessels. Subchapter T regulated all vessels under 100GT carrying more than 6 passengers for hire. This subchapter had minor distinctions for larger vessels of greater than 65 feet carrying one or more passengers, called subchapter T-L vessels. In 1996, a complete overhaul to the regulations governing small passenger vessels (vessels under 100 GT, carrying more than 6 passengers for hire) went into effect. One of the notable changes was the implementation of more stringent requirements regarding fixed fire detection and extinguishing systems. A separate subchapter for regulations pertaining to vessels like the *Massachusetts* that carry more than 150 passengers was also created in 46 CFR Subchapter K.

Subchapter K fire protection equipment regulations are applicable to all vessels built on or after March 11, 1996. An existing vessel[39] with a hull or machinery space boundary made of wood or fiber reinforced plastic (FRP) had to comply with these regulations by March 11, 1999. The

[39] Not a new vessel. New vessel is defined in 46 CFR 114.400

Coast Guard viewed vessels with hulls made of combustible materials such as FRP and wood to be in a higher risk category, hence, they were required to retrofit their vessels with fixed fire extinguishing and detecting systems[40]. Because it was constructed prior to the updated regulations and because it has an aluminum hull, *Massachusetts* is grandfathered, and not subject to the new fire protection equipment requirements. Regarding fire detection and suppression systems, the Massachusetts is considered an existing vessel and is required to comply with the fire protection equipment regulations applicable to the vessel on March 10, 1996. These regulations do not require a fixed firefighting system or a means for detecting fire. The applicable regulations only require fixed extinguishing systems in machinery and fuel tank spaces of vessels using gasoline or other fuel having a flash point of 110 degrees F or lower[41]. New vessels[42], built after March 10, 1996, on the other hand, are required to be equipped with a fixed gas fire extinguishing system and a fire detecting system for any spaces containing propulsion machinery[43].

Forty-nine passengers is one of the regulatory breakpoints used by the Coast Guard. Vessels that carry over 49 passengers fall under stricter regulations for several items, including fire pumps, and bilge pumps.

SMALL PASSENGER VESSEL STATISTICS

Using data pulled from the Coast Guard's Marine Information for Safety and Law Enforcement application, it was determined that there are approximately 416 vessels operating today that are subject to Subchapter K regulations based on passenger capacity (>150 passengers). Of this

[40] Federal Register, Vol. 59, 1/13/94, p.2046
[41] Old T regs, 46 CFR 181.20-1, p 223
[42] Definition of New Vessel found 46 CFR 114.400
[43] 46 CFR Subchapter K, 118.400 (a) & (c)

total, 331 vessels were built in 1996 or earlier and therefore would fall under the old fire protection regulations. Seven of these vessels had wooden hulls and would have been required to meet the new regulations by March 11, 1999[44]. This leaves a total of 324 Subchapter K vessels operating today that are not required to have fixed firefighting in spaces containing propulsion machinery.

TESTS

Examination of engine components has been conducted at NTSB laboratories. The port inboard propulsion engine #3 injector fuel supply line found disconnected during the onscene phase of the investigation was examined to assess whether it was disconnected due to thread failure, engine vibration, some other mechanical factor, or possibly to substantiate failure of the mechanic to connect the fitting to its mating surface during the time he worked on the engine previous to the fire.

The same engine's inboard cylinder bank turbocharger was examined to establish the reason for the turbochargers compressor side pronounced leading edge blade erosion, whether due to being struck by particles of some type, or whether it is due to excessive heat.

A lab exam factual report of the findings will be distributed to parties as it becomes available.

FIRE GROUP FACTUAL DOCUMENTATION

See attached fire group factual report file titled "Fire Factual Final"

[44] Fire protection regulations were retroactive for wood or fiberglass vessels. 46 CFR 118.115(b)