Changes in Navigation and Communication

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Over the past century, New Bedford fishermen, along with the rest of New England adopted new technology as it became available. These advancements included everything from engines and building materials to the design and composition of the actual fishing gear. There were also major changes over this time in how fishermen got to and from the fishing grounds and how they communicated with each other. Overall, the adoption of these new technologies has allowed New Bedford's fleet to arrive on the grounds faster, fish safer and have a better general awareness of what is happening at home and at sea.

Improvements in Navigation

New Bedford's fishing industry grew out of the last days of working sail. A captain was expected to “think like a fish” and know where to go, when to go, and how to get there. Navigation at this time had not changed much in centuries and mainly relied upon the ship's compass and navigation charts. Landmarks such as lighthouses, day beacons, and buoys aided the skipper as he made his way. However, much of the navigation was done using dead reckoning. By knowing his course, vessel speed and the estimated time of arrival, a skipper could get his vessel on the fish with only occasional glances at the charts to confirm his location. Most vessels carried a sextant in order for the captain to fix his position. By using the noonday sun or the North star on clear nights, the captain could accurately determine his latitude.

Even the best vessels, with the most seasoned captains could get lost in a “thick of fog” or be blown off-course in storms. It was not uncommon in those days for even highline skippers to miscalculate by a small amount and wind up running aground. With the growth of radio technology, soon local fishermen would have a more precise navigation tool at their disposal.

Radio Direction Finder

The 1930's saw the spread of coastal radio beacons that repeated their Morse code designation at specific intervals. These signals were picked up by fishermen using Radio Direction Finders. This equipment was originally used almost exclusively by the big beam trawlers of Boston, but started turning up in fleets like New Bedford's in the 1940's.

A fisherman would put on a set of headphones and then turn a dial which adjusted a doughnut shaped metal antenna mounted on the pilothouse. By tuning into a the strongest frequency, a vessel could identify which beacon they were receiving and then, based upon the direction of the antenna, which direction they would need to steam.

Although technology, especially the arrival of transistors made the units smaller, they generally worked the same. Other navigation aids would eventually make these direction finders obsolete. The last of the radio beacons that supported the system were finally decommissioned by 2000.

Arrival of LORAN

LORAN (long range navigation) was a hyperbolic navigation system developed during World War II. It used radio signals to determine location by calculating the time difference between two signals. The signals were broadcast by paired Loran-A stations set hundreds of miles apart. One acted as a “master” the other the “slave” and used one of four different frequencies. The Loran receiver would display these signals as blips on a small screen. Initially the devices were not very accurate – up to 1.5 miles in optimal conditions and were difficult to operate correctly. However it was accurate enough to prove useful to fishermen they were adopted soon after coming on the market.

Loran-A became widely available to fishermen in the 1950's in the form of post-war surplus. Many of these early receivers were taken from bombers and other military aircraft. As the military upgraded their equipment to Loran-C, Loran-A units were made available to the public. By the 1970's advances in electronics made Loran units easier to work, some late models were fully automated. However this also meant that Loran-A would soon be phased out and by the 1980's the system was shut down entirely in favor of Loran-C.

Loran-C

The more accurate Loran-C was developed in the late 1950's but was only made available for civilian use in 1974. Unlike the paired stations of Loran-A, Loran-C used multiple stations called “chains” comprising one master station and up to five slave stations. As this new, much more accurate system became integrated into the fishing fleets, many vessels carried Loran units that could receive both A and C signals. As satellite navigation units became affordable, Loran-C began to be phased out in the 1990's. Many fishermen continued to use Loran as a backup to GPS, but after years of delays, the system was finally shut down in 2010.

Radar

Like Loran, radar was a World War II innovation that became available to commercial fishermen starting in the 1950's. Now dangers as old as fishing itself, like fog and foul weather, were a little less perilous. Fishing vessels could now still come home even in a fog or have advanced warning of vessels in their area. The older units, made by Bendix, RCA, and others were large units that utilized vacuum tubes.

GPS

The pilothouse of a modern New Bedford fishing vessel bears little resemblance to the days of the sail or even the early days of Loran. Today a computer screen is right at home alongside the compass as a source of navigation information. By the end of the 20th Century GPS had taken over as the major aid to navigation.

> *"GPS is a satellite-based radio navigation system developed and operated by the U.S. Department of Defense (DOD). GPS permits land, sea, and airborne users to determine their three-dimensional position, velocity, and time 24 hours a day, in all weather, anywhere in the world with a precision and accuracy far better than other radio navigation systems available today or in the foreseeable future."* (US Coast Guard Navigation Center: http://www.navcen.uscg.gov/?pageName=GPSmain)

The adoption of GPS, like all new technologies, was gradual. Before the end of Loran-C, many fishing vessels used a combination of Loran and GPS to navigate. Units that displayed both types of information on a digital screen were available by this time. Loran-C was drawing to a close at the same time GPS units were quickly increasing in accuracy and dropping in price.

Sounding the Bottom

Knowing the depth and nature of the bottom is of critical importance to fishermen. Different species live in different depths, on different types of bottom (rocks, sand, mud, etc.) and at different times of the year. Prior to the 1930s, this was accomplished by use of a sounding lead. Once on the fishing grounds, a sounding lead was heaved over the side to check the depth of the water. Tallow or grease was smeared on the underside of the lead to grab the bottom and bring up samples of the sea floor. The skipper would examine this sample and based on if it was mud, sand, gravel or rock, he could determine if this was the spot he wanted to fish.

The arrival of the fathometer aboard fishing vessels in the 1930's meant that the old sounding lead, used for generations would soon be obsolete. Fishermen could now know the depth (and hence the fishing grounds) from the safety of the pilot house. A fathometer could be used to find new fishing grounds, or, in conjunction with navigation charts, in the case of fog or other foul weather in order to get home safely.

The original fathometer, sometimes known as a "flasher" was fairly big and had a large circular dial. A light would flash along the dial to tell the depth of the water. These were created by the Submarine Signal Company, which was acquired by Raytheon after World War II.

In the 1950's the older neon “flasher” style fathometer gave way to recording sounding machines. A big advantage of these “flashers” was that sounding machines had a paper printout that kept a record of the bottom. Now fishermen could not only know the depth of the water below the vessel, but also see the contours of the bottom as the vessel traveled the fishing grounds. An added bonus in using fathometers and the later sounding machines was that they also acted as fish finders. Schools of fish could be detected within the water column as the device sounded the bottom.

Communication: Ship to Ship/Ship to Shore

Before the arrival of radio communications in the 20th Century, there was no way for a fishing vessel to communicate with the home port. In those days it was common for vessels to “speak” to each other out at sea. In this way, crews could determine their position, trade information and, if a vessel was heading into port, news and messages could be exchanged. The fishermen were more or less on their own while fishing and especially when riding out bad weather.

Once radio communication became affordable for fishermen, they began to adopt the new technology. Locally, it was the Boston trawler fleets that first used radios. New Bedford added radio more gradually owing to the high cost and large size of the early units.

Long Distance Communication

Radiotelephone

Radiotelephones allowed voice communication with land (ship to shore) or with other vessels (ship to ship) via a marine operator. Originally radiotelephones used AM frequencies between 2-23 MHz, which gave them thousands of miles of range. However this was only under ideal conditions. In practice, they were subject to a great deal of interference.

The early radio telephones manufactured by Western Electric and RCA used a regular telephone handset and had 8 channels to select on a dial. Radiotelephones were originally “crystal sets” where a diode (aka crystal) controlled a specific frequency. In order to send and receive signals with these sets a long wire antenna was set between the masts of fishing vessels.

The radiotelephone was available as early as the 1920's, but it took much longer for them to be adopted by the New Bedford fleet. Although the U-boat threat of WWII saw a rise in radio use, by 1945 only 17 New Bedford fishing vessels were equipped with radiotelephones. Eventually, most of the fleet would have them installed.

For many years AT&T operated marine radio stations for ship to shore communications. Today radiotelephone ship-to-shore communications are handled by ShipCom using

either Single Sideband or VHF frequencies.

Single-Sideband

In the 1960's Single Sideband (SSB) was introduced as an improvement over the older AM technology. Sideband radios had much less noise, but longer range since they used shortwave frequencies. In 1977 the use of AM (Dual Sideband) by radiotelephone ended altogether.

Short Distance Communications

Citizens Band (CB)

For short distance communication, especially ship to ship, CB radios were installed on fishing vessels. For a time, a combination of VHF and CB radios handled most of the ship to ship/shore communication. However CB was used more informally, it was not monitored by the Coast Guard and so could not be used to communicate in emergencies.

VHF

Very High Frequency (VHF) marine communications began in the 1950's. Although VHF does not have a very long range, it uses FM, so it is much less noisy. The original 26 channels rose to 52 by the 1960's. In the 1970's VHF took a lead role in short distance communication.

The early VHF radios were “solid state” meaning they used transistors instead of vacuum tubes. However they still relied on “crystals” that were installed and tuned to individual frequencies. Motorola would create a VHF radio called the Modar Triton that needed only one crystal per channel to both receive and transmit. With the arrival of integrated circuits, crystals were no longer needed. Today, all VHF radios are frequency synthesized.

Cell Phones

With increased range in cellular technology, cell phones have been added to the marine communications mix. However the US Coast Guard strongly advises against cell phone use in the event of a maritime emergency.