

Storm, Ledge and Rescue: Navigation and the 1892 Gallatin

GRADES 6-8 · SCIENCE AND ENGINEERING, HISTORY AND SOCIAL SCIENCE, ENGLISH LANGUAGE ARTS ·
MANCHESTER-BY-THE-SEA, GLOUCESTER

How did sailors find their way before GPS, and how can engineers design warning systems that still work when no one can see?

Two 50-minute class periods (100 minutes total)

On Jan. 6, 1892, a government ship called the Gallatin was crossing Massachusetts Bay when a snowstorm closed in. The crew could not see far, and there was no GPS, radar or radio. Within a few hours the ship struck a hidden ledge off Manchester. In this lesson you will be a weather detective, a navigator and an engineer. You will read real weather data and a real 1892 news account, figure out how the crew tried to find their way and design a better way to warn ships about a danger they cannot see.

Data table

R1. The storm of Jan. 4 to 7, 1892

Excerpt from the Monthly Weather Review, January 1892, page 4 (transcribed from a scan; spelling as printed):

"During the 6th the center advanced to south New England, with pressure below 29.30, a decrease of .50 in 12 hours on the northeastern coast, east gales of 40 to 60 miles per hour on the southeast New England coast, hard gales thence to the Carolinas, a violent thunder and hail storm at Augusta, Ga., in the early morning, and snow, with lower temperature, from the Lake region to the middle Atlantic and New England coasts. During the 7th the center disappeared over the north part of the Gulf of Saint Lawrence without an apparent loss of energy."

Pressure is in inches of mercury, the unit barometers used in 1892. "Below 29.30" means the lowest reading near the center was under 29.30 inches.

When (1892)	Where the low-pressure center was	Pressure near the center (inches)	Weather reported	Source

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Jan. 4	Formed on the southeast slope of the Rocky Mountains	Not given	Not given	Monthly Weather Review, p. 4
Jan. 5, morning	Near the boundary of Louisiana and Arkansas	Below 29.60	Not given	Monthly Weather Review, p. 4
Jan. 5, evening	Upper valley of the Tennessee River	Below 29.50	Rain from the Rocky Mountains to New England, falling as snow north of Tennessee and Virginia; temperature rose sharply in the middle and south Atlantic states	Monthly Weather Review, p. 4
Jan. 6	Southern New England	Below 29.30; fell .50 inch in 12 hours on the northeastern coast	East gales of 40 to 60 miles per hour on the southeast New England coast; snow and falling temperature from the Great Lakes to the New England coast	Monthly Weather Review, p. 4
Jan. 6, morning, off Cape Ann	Not given	Not given	Weather turned thick and snow began after the Gallatin passed the Salvages at 8:50 a.m.	Morning Journal and Courier, Jan. 7, 1892
Jan. 6, off Cape Ann	Not given	Not given	Wind east southeast, blowing fresh and rising	Pawtucket Tribune, Jan. 7, 1892
Jan. 6, 4:30 p.m., Manchester	Not given	Not given	Storm eased enough to see the wreck from shore	Morning Journal and Courier, Jan. 7, 1892
Jan. 7	Northern Gulf of St. Lawrence, where it faded out	Not given	Not given	Monthly Weather Review, p. 4

Source: U.S. Weather Bureau, Monthly Weather Review, vol. 20, no. 1 (January 1892), pages 4 and 17 (low area III and local storms of the 6th). Cape Ann rows: Morning Journal and Courier (New Haven, Conn.), Jan. 7, 1892, page 3, and Pawtucket Tribune (Pawtucket, R.I.), Jan. 7, 1892, page 1, both from the Library of Congress Chronicling America collection.

https://archive.org/details/sim_monthly-weather-review_1892-01_20_1. Rights: Facts from public domain sources (federal weather report and newspapers published 1892); table compiled by Cape Ann Current

Primary source

R2. An 1892 news account of the navigation

Transcribed from a scan; spelling as printed. This was a wire report, so other newspapers printed nearly the same words.

"At 8:50 she passed the Salvages in a course south. The patent log was set at 9:55 and the weather became thick and soon it began to snow. The course of the vessel was then changed, intending to make Gloucester for a harbor. At this time they took in part of the sail and stationed a lookout. At 10:45 took in all sail and put an extra man on the lookout. At this time the quartermaster made land and the engine was slowed and soundings were taken. At 11 o'clock they made land again which looked like Rock Island ahead, sounded and twelve fathoms of water being shown, the engine was stopped and backed. Here the mistake was made. The pilot took the land to be Kettle Bottom island, but instead it was Great Egg Rock. With this idea the boat started ahead, due east, heading for Eastern point. At 11:15 the vessel struck on a sunken ledge. The engine was stopped and backed, but the ship was fast."

Later in the same article: "The fault seems to be with the pilot, who lost his reckoning."

Source: "Wreck of a Cutter," Morning Journal and Courier (New Haven, Conn.), Jan. 7, 1892, page 3, dateline Manchester, Mass., Jan. 6. Library of Congress, Chronicling America. <https://www.loc.gov/resource/sn82015483/1892-01-07/ed-1/?sp=3>. Rights: Public domain (U.S. newspaper published 1892)

Primary source

R3. What the government wrote, then and now

Part 1. From the congressional report (1892 committee text, reprinted 1900; transcribed from a scan, spelling as printed):

"It appears from the statement of Captain Gabrielson, of the revenue cutter Gallatin, that the cutter was wrecked January 6, 1892, on a sunken and unbuoyed ledge off Eagle Head, Mass."

"It also appears that said wreck was not caused by any fault or negligence of officers or crew ..."

Part 2. From today's federal rules for aids to navigation (33 CFR Part 62):

"The term aid to navigation means any device external to a vessel or aircraft intended to assist a navigator to determine position or safe course, or to warn of dangers or obstructions to navigation." (section 62.3)

"Lights on aids to navigation are differentiated by color and rhythm. Lighthouses and range lights may display distinctive light characteristics to facilitate recognition." (section 62.45)

"Often sound signals are located on or adjacent to aids to navigation. When visual signals are obscured, sound signals warn mariners of the proximity of danger." (section 62.47)

"Sound signals are distinguished by their tone and phase characteristics." (section 62.47)

"Buoy sound signals are generally actuated by the motion of the sea and therefore do not emit a regular signal characteristic." (section 62.47)

Source: Part 1: U.S. House of Representatives, Report No. 1830, 56th Congress, "Sufferers by Wreck of Revenue Cutter Gallatin" (1900), reprinting House Report No. 1479 of the 52nd Congress and a Treasury Department letter dated Jan. 26, 1892. Part 2: Code of Federal Regulations, Title 33, Part 62 (United States Aids to Navigation System), sections 62.3, 62.45 and 62.47. https://www.govinfo.gov/app/details/SERIALSET-04027_00_00-075-1830-0000. Rights: Public domain (U.S. federal government works)

Summary by Cape Ann Current

R4. Finding your way before GPS

In 1892 a ship's crew had no satellites, radar or radio. They used several tools together.

Lookout: a sailor whose only job is to watch for land, rocks, lights and other ships. In snow or fog a lookout may see only a short distance.

Compass and course: the compass shows direction. The course is the direction the ship is steered, such as "due east."

Patent log: a device towed behind a ship that counts how far the ship moves through the water. Setting the log starts the count.

Dead reckoning: working out where you are from where you started, which way you steered, how fast you went and for how long. Small errors in speed, current or wind add up over time. A navigator who has lost track of the position has "lost his reckoning."

Soundings: measuring the depth of the water. NOAA explains that "Lead lines were ropes, or lines, with depth markings and lead weights attached." Comparing a sounding with the depths printed on a chart helps show where the ship might be. A fathom is 6 feet, so 12 fathoms is 72 feet.

Landmarks and lights: islands, headlands and lighthouses that a navigator can recognize and find on a chart. A mistake in recognizing a landmark puts the whole position in the wrong place.

Pilot: a navigator hired for knowledge of local waters.

Places in this lesson: Eastern Point is on the east side of the entrance to Gloucester Harbor. A federal report from 1887 describes Kettle Island as lying off the shore of Magnolia, a village of Gloucester west of the harbor. Great Egg Rock is a small island off the Manchester shore, and Eagle Head is a headland in Manchester; both are farther west along the same coast. Boo Hoo Ledge, a rock ledge that stays under the water, is off Eagle Head.

Source: Written by Cape Ann Current. The description of lead lines quotes NOAA Office of Coast Survey, "History of Hydrographic Surveying." Place descriptions from George Brown Goode and others, The Fisheries and Fishery Industries of the United States, Section II (1887), page 143. <https://nauticalcharts.noaa.gov/learn/history-of-hydrographic-surveying.html>. Rights: Text written by Cape Ann Current; NOAA text is a U.S. federal government work; Goode (1887) is public domain

Summary by Cape Ann Current

R5. The Gallatin: the case in brief

The Gallatin was a revenue cutter, a ship of the U.S. Revenue Cutter Service, which later became part of today's Coast Guard. She had an iron hull and was built in 1871 at Buffalo, N.Y. Her station was Boston, and she patrolled the coast from Portsmouth, N.H., to Martha's Vineyard. Her captain was Eric Gabrielson.

On the morning of Jan. 6, 1892, the Gallatin left Kittery, Maine, bound across Massachusetts Bay for Provincetown. A snowstorm closed in. At about 11:15 a.m. she struck Boo Hoo Ledge off Eagle Head in Manchester and began to fill with water. The captain ordered the crew into the boats. As the boats were being lowered, the ship's smokestack fell and struck the carpenter, J. Jacobson, who died. Every other person aboard rowed through heavy surf and reached the Manchester shore.

In Manchester the soaked crew found shelter at the house of J. F. Babcock. The town's history says town officials cared for the men, and most of them left for Boston by train that afternoon. The ship broke in two and was a total loss. Today pieces of her iron hull still lie on the ledge, and the state lists the site as a dive site.

Source: Written by Cape Ann Current from U.S. House Report No. 1830 (1900); D. F. Lamson, History of the Town of Manchester (1895), page 358; the Morning Journal and Courier (New Haven), Jan. 7, 1892; U.S. Coast Guard Historian's Office, "Gallatin, 1871"; and the Massachusetts Board of Underwater Archaeological Resources, "Albert Gallatin." <https://www.history.uscg.mil/Browse-by-Topic/Assets/Water/All/Article/2474869/gallatin-1871/>. Rights: Text written by Cape Ann Current; facts from public domain federal records and an 1895 town history, and facts only from the state page

A1. Weather detectives

Use reading R1 and the data sheet. Answer in complete sentences and point to the row or words you used.

1. Trace the path of the low-pressure center from Jan. 4 to Jan. 7. Which general direction did it travel?
2. On the data sheet, make a line graph of the pressure readings that are given. What happened to the pressure as the center moved toward New England?
3. The report says pressure fell .50 inch in 12 hours on the northeastern coast. Why would a fast drop in pressure worry a ship's captain?
4. What wind direction and wind speeds were reported on the southeast New England coast on Jan. 6?
What did the Gallatin's crew see off Cape Ann that morning?

5. On Jan. 5 the report notes rising temperatures in the middle and south Atlantic states and snow farther north. Use the idea of warm and cold air masses to explain how one storm could bring rain to some places and snow to others.
6. Winds blow counterclockwise around a low-pressure center in the Northern Hemisphere. If the center was over southern New England, explain why the wind on Cape Ann would blow from the east, off the ocean.

A2. Navigation timeline

Use reading R2 and the vocabulary in R4. Fill in the timeline on the data sheet, one row for each time in the account.

1. For each time (8:50, 9:55, 10:45, 11:00 and 11:15), write what the crew observed, the tool or method they used and the decision they made.
2. Which tools from R4 did the crew use? Which ones could not help much in a snowstorm, and why?
3. Find the sentence where the newspaper says the mistake was made. Quote it, then explain in your own words what the pilot thought and what was true.
4. The pilot steered due east toward Eastern Point. Using the place descriptions in R4, explain why that course seemed safe to him and why it was not.
5. The newspaper blamed the pilot, but the congressional committee in R3 said the wreck was not caused by any fault of the officers or crew. List one piece of evidence that could support each view.

A3. A light is a message

Use reading R3 Part 2. Copy the six-box chain from the board and fill it in for each system.

1. Flashlight example from the hook: name the source, encoder, transmitter, receiver, decoder and storage.
2. A lighthouse that shows its own flash pattern: name all six parts. What printed book or chart lets a navigator decode the pattern?
3. A bell buoy rung by the waves: name all six parts. Use R3 to explain one weakness of this system.
4. Snow and fog are noise in the channel. Explain why the federal rules say sound signals matter 'when visual signals are obscured.'

A4. Design brief: mark the ledge

Your team works for a coastal agency. The problem: a sunken ledge near a busy harbor entrance cannot be seen in snow, fog or darkness, and the federal report in R3 called the ledge in this case "unbuoyed." Before anyone

builds anything, the agency needs a precise design brief. Write it on chart paper.

1. Problem statement: one or two sentences that say who needs to know what, where and when.
2. Criteria: at least three things the system must do, each written so it can be tested (for example, a distance, a time or a number of signals per minute that your team chooses and explains).
3. Constraints: at least three limits, such as cost, power, storms and ice, upkeep or rules. Include one impact on people who live or work nearby and one impact on the natural environment.
4. Accessibility: explain how your signal can be identified without relying on color alone.
5. Communication system: describe your idea in words and label its source, encoder, transmitter, receiver, decoder and storage.

Talk about it

- The crew used a lookout, soundings and a log, and still struck the ledge. What does that tell us about relying on a single piece of information?
- The 1892 newspaper blamed the pilot the same day. Why might a reporter write that so quickly, and what should a careful reader do with that claim?
- Modern ships have GPS. Why do lighthouses, buoys and sound signals still matter today?
- Who should pay for warning systems on the coast: the government, shipowners or harbor towns? Why?
- How do we remember people who die in accidents like this one in a way that is respectful to them and their families?

Show what you learned

Write a one-page engineer's report on your own. Part 1 (4 points): Use two facts from the weather table to explain why visibility and wind were dangerous off Cape Ann on Jan. 6, 1892, and how the meeting of air masses caused snow. Part 2 (4 points): Quote the 1892 account to identify the moment the ship's position was misjudged, and explain what information was missing. Part 3 (6 points): Give your final design brief for marking the ledge, with three testable criteria and three constraints, including one impact on people and one on the environment. Part 4 (6 points): Explain your warning system as a communication system, naming and describing all six parts, and explain how it works without relying on color alone.

Points: 20