National Transportation Safety Board

Marine Accident Brief

Flooding of Dive Support Vessel *Hammerhead*

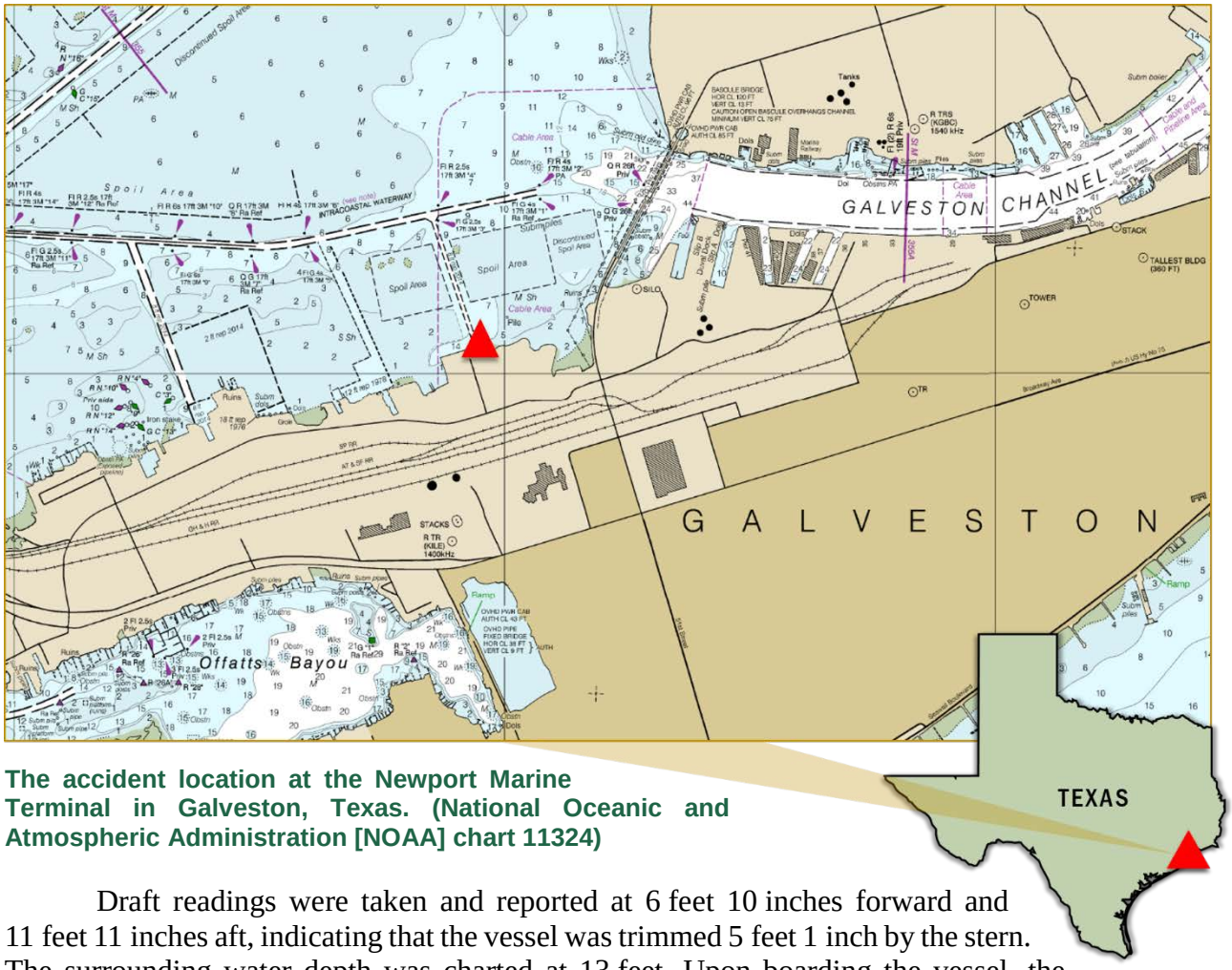
Accident no.	DCA16FM030
Vessel name	*Hammerhead*
Accident type	Flooding
Location	Newport Marine Terminal; Galveston, Texas 29°18.05’ N, 094°50.07’ W
Date	March 7, 2016
Time	1000 central standard time (coordinated universal time − 6 hours)
Injuries	None
Damage	$900,000 est.
Environmental damage	None reported
Weather	Clear visibility at 10 miles,* winds south-southeast at 8.7 knots, calm seas, air temperature 69°F, water temperature 65°F
Waterway information	Located along the upper coast of Texas, Galveston Bay is connected to the Gulf of Mexico. It is surrounded by subtropic marshes and prairies on the mainland.

On March 7, 2016, at 1000 local time, the 164-foot-long dive support vessel *Hammerhead* was discovered partially flooded with an increased aft trim while moored alongside the pier at the Newport Marine Terminal in Galveston, Texas. The vessel was in a layup period with no one on board. There were no reports of pollution. Damage to the vessel was estimated at $900,000.

***Hammerhead* after the flooding. (Photo by US Coast Guard)**

*All miles in this report are nautical miles (1.15 statute miles).

The *Hammerhead* was built in 1972 by Burton Construction & Shipbuilding Company, Inc., in Port Arthur, Texas, and refurbished in 1998. At the time of the accident, the vessel was owned by Emerald O.V., Ltd., and operated by Ranger Offshore, Inc., a marine and subsea construction and support services contractor for the offshore oil and gas industry. Ranger Offshore operated a fleet of eight marine and subsea construction support vessels in the Gulf of Mexico and select international waters; the *Hammerhead* was one of four dive support vessels. Inactive since January 2015, the vessel had been moored for 15 months alongside the dock at the Ranger Offshore facility at the Newport Marine Terminal. On the morning of March 7, 2016, a Ranger Offshore employee making security rounds noticed that the vessel was sitting lower in the water than normal.

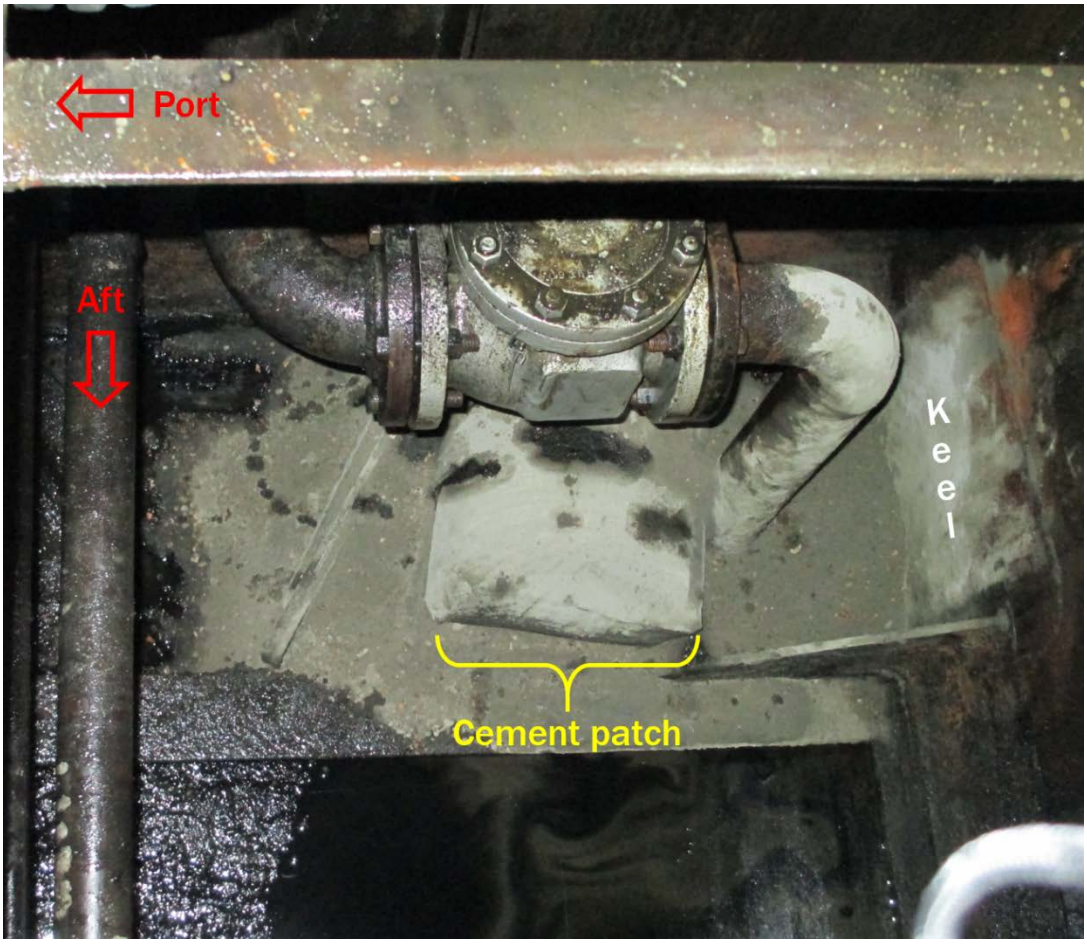


The accident location at the Newport Marine Terminal in Galveston, Texas. (National Oceanic and Atmospheric Administration [NOAA] chart 11324)

Draft readings were taken and reported at 6 feet 10 inches forward and 11 feet 11 inches aft, indicating that the vessel was trimmed 5 feet 1 inch by the stern. The surrounding water depth was charted at 13 feet. Upon boarding the vessel, the Ranger Offshore employee discovered that the engine room was partially flooded. He estimated that the water depth in the forward end of the engine room was 34 inches above the deck plates. No progressive flooding into other compartments was detected. The vessel was not equipped with a bilge alarm system that could be monitored from ashore.

Notifications about the condition of the *Hammerhead* were made to the Coast Guard Captain of the Port, the Coast Guard National Response Center, the Texas General Land Office, and Ranger Offshore. As a precautionary measure, a containment boom was placed around the vessel prior to conducting salvage and dewatering operations. Water was removed using hydraulic submersible pumps. After the vessel was pumped near dry, a flat-head screwdriver was driven into

a hole found in the steel hull plating on the bottom of the vessel. To stem the flow of water, the screwdriver was wrapped in rags, then sealed with an underwater epoxy compound, and finally overlaid with five 100-pound bags of cement mix to create a temporary patch. Coast Guard representatives later examined and approved the cement patch as an acceptable temporary repair.



Temporary cement patch, located a foot to port of centerline and just forward of frame 31 in the engine room bilge. (Photo by Coast Guard)

All liquids from the flooded compartment (water and oil mixtures) were pumped to shoreside reception tanks. No discharge of pollutants into the surrounding waters of Galveston Bay were reported. About 1,000 gallons of diesel fuel and 600 gallons of lubrication oil were aboard the vessel.

The *Hammerhead* was towed on April 19, 2016, by the tugboats *Bill Spence* and *Donna T* to the John Bludworth Shipyard nearby in Galveston, where an ultrasonic examination was conducted on the hull plating to determine its thickness. The source of the water intrusion originated from the 0.25-inch-by-0.50-inch hole in the bottom plate, located a foot to the port of the centerline and just forward of frame 31 below the engine room.

A section of the bottom plating at frame 31 measuring 0.50 inch by 39 inches by 51 inches was cropped and replaced with steel that was approved by the American Bureau of Shipping (ABS). Two additional sections of the bottom plating were cropped and replaced due to the unacceptable results of the measured thickness, which exceeded the allowable corrosion limit. The

first piece was inserted on the port side that measured approximately 0.50 inch by 18 inches by 44 inches, and the second piece, similar in size at approximately 0.50 inch by 18 inches by 32 inches, was replaced under the center vertical keel. Coast Guard personnel conducted visual inspections and witnessed dye penetrant testing of the welded repairs; all welds tested satisfactory. Hull repairs on the vessel were accomplished in 22 days.

The last ABS annual hull and machinery surveys were completed in February 2015. The previous year, in March 2014, an intermediate survey was conducted on the hull to verify the thickness measurements while the vessel was drydocked at a shipyard in Amelia, Louisiana. No deficiencies were recorded regarding the external hull plating and its main structural members that were required to be examined in accordance with ABS rules and Coast Guard regulations.[1] However, the condition of coatings and corrosion prevention was listed as fair, and 8 of the 11 ballast tanks were categorized in poor condition.

At left, the hole found near frame 31 of the bottom plating. At right, the screwdriver placed in the hole as a temporary repair. (Photos by Coast Guard)

The operator did not have written procedures for periodic inspections or continuous monitoring of the vessel when it was in a layup status; therefore, no preservative measures, log reports, or checklists were completed during this time. Furthermore, the *Hammerhead*'s shipboard electrical distribution system was not connected to shoreside power, thereby limiting the capabilities of the bilge monitoring equipment on board.

During the layup period, a company employee at the terminal would visit the vessel intermittently to ensure that it was in a safe condition. The check consisted of inspecting the vessel's mooring lines and fenders as well as the water levels in the bilges of machinery spaces and accessible void spaces. Discrepancies were sent via text to the director of vessel management

[1] ABS rules: *Rules for Survey After Construction: Part 7,* July 2010. Coast Guard regulations: *Notes on Inspection and Repair of Steel Hulls,* Navigation and Vessel Inspection Circular [NVIC] No. 7-68, October 28, 1968.

and maintenance. The only documentation of maintenance that was performed was recorded on employee timecards.

The vessel's cathodic protection system, normally used in conjunction with marine coating, consisted of zinc plates (also referred to as sacrificial anodes) that were mounted to the underside of the hull, rudders, and tail shaft strut bearings.[2] Although the zinc plates were found to be in fair condition, there was no secondary corrosion control method on board to protect the hull, such as an impressed current, an electrochlorination/hypochlorite prevention, or a shaft earthing system.

Marine growth flourished on the idle vessel, blocking and narrowing cooling water intake piping. Clusters of barnacles, mollusks, algae, and sea hair were found on and around the tail shafts, propellers, and rudders. According to the vessel's International Anti-fouling System Certificate, the exterior hull coating was applied during the March 2014 drydock. It was found to be in fair condition, in view of the coating failures that were concentrated around large marine-growth clusters and inlet piping, which developed during the vessel's 15-month layup.

At left, a Coast Guard inspector examines the condition of the port propeller. At right, marine growth on the port tail shaft. (Photos by Coast Guard)

As the primary method for corrosion control, the marine coating in the engine room bilge was severely degraded on the interior bottom plating. The bare steel bottom plates were exposed to seawater, particulate matter, suspended solids, chemicals and detergents, and diesel fuel and lubrication oil.

Within the same month of the ABS surveys, the Coast Guard conducted its annual inspection for vessel certification but was unable to complete it because the inactive vessel could not get under way. The Coast Guard found that the operator had not installed and tested a bilge alarm in the steering gear room, had not repaired seals on the watertight hatches, and had not maintained an operable oily water separator, among a total of 9 deficiencies. After a re-inspection was conducted in June 2015, 5 deficiencies were cleared but 8 new ones were found, while

[2] *Cathodic protection* is a method of corrosion control that is applied to the submerged hull plating and metallic structures. Zink alloy plates, known as sacrificial anodes, are linked electrically to the ship's hull. Sacrificial anodes are consumed by electrical currents moving from the vessel to the water, thus being sacrificed to protect the hull. The anodes are made of metals more reactive than the material used for the ship's hull and piping systems; consequently, they will corrode in place of these systems. Without the anodes, the hull plating would be dissolved by electrolysis.

14 remained outstanding from previous inspections. Consequently, *Hammerhead*'s Certificate of Inspection, which expired on March 28, 2016, was not re-issued. In May 2016, ABS rescinded the vessel's safety management certificate and the company's document of compliance.

As of the date of this report, the *Hammerhead* remained moored alongside the dock at the Ranger Offshore facility at the Newport Marine Terminal awaiting hull and machinery insurance claims.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the engine room flooding of the dive support vessel *Hammerhead* was the localized corrosion of an aging hull structure resulting from the operating company's lack of oversight and maintenance in preserving the hull's metal plating with an adequate marine coating and cathodic protection system.

Oversight and Maintenance of Vessel Hulls

To protect vessels and the environment, it is good marine practice for owners to conduct regular oversight and maintenance of hulls, even during layup periods. Oversight should include monitoring the hull thickness, maintaining sufficient marine coatings, and using cathodic protection systems.

Vessel Particulars

Vessel	*Hammerhead*
Owner/operator	Emerald O.V., Ltd. / Ranger Offshore, Inc.
Port of registry	New Orleans, Louisiana
Flag	United States
Type	Dive support vessel
Year built	1972
Official number (US)	542117
IMO number	7228443
Construction	Steel
Length	163.3 ft (49.8 m)
Draft	14 ft (4.3 m)
Beam/width	38 ft (11.6 m)
Gross tonnage	336 gross tons
Engine power, manufacturer	Two 3,000 hp (2,237 kW) EMD 12-645-BC diesel engines
Persons on board	None

NTSB investigators worked closely with our counterparts from Coast Guard Marine Safety Unit Texas City throughout this investigation.

For more details about this accident, visit www.ntsb.gov and search for NTSB accident ID DCA16FM030.

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