Puerto Rican — Maritime Chemical Accident

1984, October 31 — Off the coast west of San Francisco, California, USA

Caustic soda solution 50% (Class 8) in a cargo tank; corrosive solution that reacts with many metals, e.g. zinc generating hydrogen gas, which is flammable and explosive.

Summary: The U.S.-registered chemical tankship **Puerto Rican** was preparing to disembark a pilot about 8 miles west of the Golden Gate Bridge when an explosion occurred in the vicinity of the vessel's center void space No. 6. The main deck over the void and adjacent wing tanks was lifted up, blown forward and landed inverted over center cargo tank. An intense fire erupted and burned out of control for several hours. At the time of the explosion, the pilot, a third mate and an able seaman were standing on the port side of the main deck. As a result of the explosion, the three men were thrown over the side. The pilot and the third mate were seriously injured, but were recovered alive from the water. The able seaman was not found. The remaining 26 people onboard abandoned the ship safely. A few hours after the explosion, the vessel was towed farther offshore in an effort to avoid polluting the coastline if the vessel sank. Several days later the vessel broke in two while in heavy seas, and the stern section sank. The bow section remained afloat and was later towed in to a shipyard.

Cause of Accident: The proximate cause of this casualty was the failure to repair a hole through the stainless steel cladding on the bulkhead separating 5 central port (5CP) and 6 center void (6CV). About 400-500 m^3 of caustic soda solution leaked through the hole from 5 CP into 6CV, creating a liquid level height of about two feet. The caustic soda reacted with the zinc-rich epoxy coating on the bulkheads, tank supports and deck of 6CV, consuming the zinc and liberating hydrogen gas. Approximately 200 m^3 of alkyl benzene in 5CP also leaked into 6CV through the hole. This created a flammable mixture which was ignited shortly before the explosion which inverted the main deck section. The most probable ignition source was a spark within 6CV, either from metal-to-metal contact or an electrostatic discharge.

Comments on Response: Contributing to the cause of this casualty was the failure of the captain to use all reasonable means to account for the caustic soda discrepancy from 5CP. Three weeks before the accident **Puerto Rican** completed loading a 50 percent caustic soda solution, at a terminal in Louisiana. Two weeks later after discharging caustic soda from three tanks in San Pedro, California, a discrepancy was noted in the amount left tank number 5CP, indicating there could be leakage. The captain of the **Puerto Rican** determined that the discrepancy was due to a recording error. Nevertheless, all double bottom and void spaces around 5CP were sounded, with the exception of 6CV. This space was supposed to be sealed and inerted with nitrogen gas. The adjacent cargo tanks were also checked for leakage of caustic soda from 5CP. No evidence of leakage was found. The captain decided to inspect tank No. 5CP later after the tank had been emptied of cargo and cleaned. Although the presence of caustic soda in space No. 6CV also could have been detected by activating the eductor system, but the crew was not aware that the eductor system existed.

Source of Information: Reports by US Coast Guard Marine Board of Investigation and US National Transportation Safety Board.
(Abstracted July 1993 by Björn Looström, Swedish Coast Guard H.Q.)