

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: August 4, 1978

Forwarded to:

Admiral John B. Hayes
Commandant
U.S. Coast Guard
Washington, D.C. 20590

SAFETY RECOMMENDATION(S)
M-78-56 through 61

On December 17, 1976, the tankship SS SANSINENA was pumping seawater ballast into its cargo tanks while preparing to depart the Union Oil Company Terminal, Berth 46, Los Angeles Harbor, California. About 1938 P.s.t., a fire and explosion occurred; the main deck and midshiphouse were blown away from the ship and landed on the terminal property ashore, and the bow and stern sections of the ship sank at its berth. The SANSINENA was destroyed. Eight crewmembers were killed, and a security guard was listed as missing and presumed dead. The total losses resulting from this explosion are estimated to be \$21.6 million. The losses included damages to about 260 other vessels, mostly pleasure craft, and damages to residents and commercial structures ashore, some of which were more than 3 miles from Berth 46. Berth 46 could not be used for more than 16 months. 1/

The chief mate started ballasting nine of the SANSINENA's cargo tanks about 2 hours before the explosion. While ballasting, the wind's direction shifted so that it was coming from the ship's stern and the wind speed decreased. The chief mate estimated the wind speed to have decreased to about 2 to 3 knots at the time his watch ended, but apparently he was not aware that that wind speed was too low for vapor-emitting operations according to the International Oil Terminal and Tanker Safety Guide, which was placed aboard the SANSINENA for guidance in tankship safety practices.

1/ For more detailed information read "Marine Accident Report - Liberian Tankship SS SANSINENA Explosion and Fire, Union Oil Terminal Berth 46, Los Angeles Harbor, California, December 17, 1976," (NTSB-MAR-78-6).

According to testimony given by the master, the SANSINENA may have taken on considerably more ballast than necessary to get underway. Had the pumping of seawater ballast into the cargo tanks been stopped about 45 minutes before the explosion, as the master's testimony would indicate was sufficient, a lesser quantity of cargo tank gases would have been vented and, more importantly, the gases would have been less concentrated with crude oil vapors, because only gases higher above the residual crude oil layer would have been vented. As a result, the distance from the vent opening to where the gases were diluted too much to be flammable would have been less.

Safe design and operating practices for handling flammable cargo carried by tankships are to prevent flammable gases from occurring near the main deck and superstructures, because these are the most likely places for the gases to be ignited. Potential sources of ignition include sparks from dropping tools, static discharge between ship and shore piping connections, the hot exposed filament of a broken light bulb, and smoking by careless persons on the main deck. Although the specific ignition source was not determined in this case, there were numerous potential sources with which flammable gases near the main deck could have come in contact and resulted in a fire on deck.

Gases within cargo tanks are protected from ignition by flames and other ignition sources outside the tank by covering all tank openings or placing devices such as flame screens in openings to remove sufficient heat from an external flame so that the temperature is too low to ignite gases on the opposite side of the screen. If the SANSINENA had had a closed gauging system, it would not have been necessary to open the covers on the ullage openings to check the level of seawater and, thereby, compromise the tank's protection against external ignition. Further, Coast Guard test data indicate the flame screens that were installed in the ullage openings may not have provided adequate protection against a fire on deck.

The SANSINENA's common-header vent systems could vent cargo tank gases high above the main deck. If the ullage openings had been closed, flammable gases probably would not have accumulated on the main deck. However, the vent outlet size, height, and distance from superstructures are all important to assure that flammable gases do not occur either near the main deck or superstructures.

Because cargo tank vent piping was severely corroded with holes, and because some service openings in the piping were not covered, it is likely that the fire on deck entered tank No. 10-C through the vent piping. The arrangement of vent piping too close to the ship's main deck made adequate inspection and maintenance infeasible. Also, because cargo tanks are connected by common piping, a fire in one tank, which might otherwise burn out, can propagate into other tanks, increasing the possibility of an explosion.

Therefore, the National Transportation Safety Board recommends that the U.S. Coast Guard:

Establish minimum criteria for vapor-emitting operations on tank vessels carrying flammable cargoes in U.S. ports to include monitoring of vapor concentrations on deck and in enclosed spaces located above the cargo tanks, and stopping vapor-emitting operations when vapor concentrations exceed safe limits and under certain low wind velocity conditions. (Class II, Priority Action) (M-78-56)

Require operators of tank vessels carrying flammable cargoes in U.S. ports to develop guidelines for the amount of ballast needed in cargo tanks for the expected range of operating conditions to minimize in-port ballasting of cargo tanks, and establish other ballasting requirements which may be imposed when high velocity venting is installed. (Class II, Priority Action) (M-78-57)

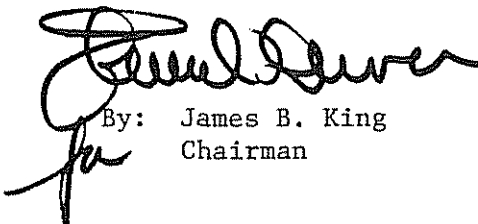
Establish requirements for cargo tank vent systems on tank vessels carrying flammable cargoes in U.S. ports, including independent venting of each cargo tank; location, size, and height of vent outlets, with consideration of ship structures; means of protecting vent systems from flame entry, including proper fit and attachment of flame-quenching devices; and vent system configurations that provide ease of inspection and maintenance. (Class II, Priority Action) (M-78-58)

Require operators of tankships carrying flammable cargoes in U.S. ports to develop training plans for the instruction of persons responsible for cargo handling and vapor-emitting operations, to make these training plans available for Coast Guard review, and to train responsible persons in accordance with the plans, and appropriately document the training. (Class II, Priority Action) (M-78-59)

Require the installation and use of closed cargo level gauging systems on tank vessels carrying flammable cargoes in U.S. ports. (Class II, Priority Action) (M-78-60)

Test flame-quenching devices under conditions of vapor concentrations, constituencies, and size of flammable regions that might occur on the main deck of a tank vessel, to determine the adequacy of such devices. (Class II, Priority Action) (M-78-61)

KING, Chairman, McADAMS, HOGUE, and DRIVER, Members, concurred in the above recommendations.


By: James B. King
Chairman