

## SYNOPSIS

The port exhaust gas boiler (economiser) of the United Kingdom registered Princess Cruises liner *Island Princess* ruptured killing two people and injuring three others during sea trials in the Bay of Naples on 7 December 1997. No passengers were on board.

The Marine Accident Investigation Branch (MAIB) was notified of the accident on the same day. The investigation was undertaken by Mr J Stuart Withington, Principal Inspector.

Because it occurred in the territorial waters of Italy, the accident was also investigated by the Italian authorities.

The victims and two of those injured were contractors working on a boiler below the economiser when the accident occurred. Without warning, the economiser ruptured and discharged hot water and steam. A seaman working above the economiser was also injured by the escaping steam.

The economiser, a shell-type flat-ended pressure vessel heated by main engine exhaust gas, was not in use at the time, but had been left full of water. It was isolated from the steam plant system, but not vented to atmosphere. The economiser pressurised as the main engine exhaust heated the water but, because the safety valves had seized in the closed position, it overpressurised. Three and a half hours after the vessel put to sea, the economiser ruptured along its lower circumferential weld joint.

The rupture pressure is uncertain but would have been affected by the weakening effect of corrosion fatigue cracks around the circumferential joint.

By jacking open the economiser safety valves using the easing gear, the ship's engineers thought they had taken adequate steps to vent the system. They did not realise they had failed to do so.

The investigation found that the safety valves on the port economiser had remained shut throughout the entire episode, and did not lift under pressure because the spindles had seized in their guides. This was due to an accumulation of corrosion products, corrosive boiler sludge deposits and other extraneous products at the spindle/guide interface. Poor quality boiler water and leaking safety valves created the conditions that weakened the spindles' corrosion resistance.

The investigation revealed a previous history of safety valve seizures and economiser overpressure and rupture. Such a record demanded particular care and attention when operating and maintaining them. This need was not satisfied.