

UNITED STATES COAST GUARD

ADDRESS REPLY TO:



NVI
28 NOV 1956
(HEIDBERG - a-3 Bd)

Commandant's Action

on

Marine Board of Investigation; explosion and fire on M/V HEIDBERG (German), off Lewes, Delaware, on 10 August 1956 with loss of life

1. Pursuant to the provisions of Title 46 C.F.R. Part 136, the record of the Marine Board of Investigation convened to investigate subject casualty, together with its Findings of Fact, Conclusions, and Recommendations, has been reviewed.
2. On 10 August 1956 the German motor cargo vessel HEIDBERG, 1595 g.t., built in Germany in 1942, was inbound in the Delaware Bay on a voyage from Puerto Ordaz, Venezuela, with an ore and general cargo on board. Her main propulsion was furnished by a four cycle, 10 cylinder, 1500 h.p. diesel engine located amidships. At 1242, after stopping off Lewes, Delaware, for a pilot to complete her voyage to Morrisville, Pennsylvania, the master ordered full speed ahead to destination. The main engine upon activation apparently suffered a starting air valve failure, thereby permitting combustion gases to enter the starting air lines with a subsequent explosion and bursting of the air lines. The air starting lines being accessible to the crankcase apparently further caused a crankcase explosion. The crankcase was not fitted with pressure relief plates or other pressure relief arrangements. As a result of this casualty, all persons in the engine room were seriously injured, of which three, after being admitted to a local hospital, died. The damage to the vessel was estimated at \$500,000.00.
3. The Findings of Fact, Conclusions, and Recommendations of the Marine Board of Investigation convened to investigate subject casualty are approved.

(signed) J. A. Hirshfield

J. A. HIRSHFIELD
Rear Admiral, U. S. Coast Guard
Acting Commandant

REPORT
OF A
MARINE BOARD OF INVESTIGATION

convened at the
Marine Inspection Office, United States Coast Guard
Third Coast Guard District
Room 803 Custom House, Philadelphia, Pa.

on

13, 15 and 20 August and 18 September 1956;
Lewes Lifeboat Station, U. S. Coast Guard, 16 August 1956
and

Beebe Hospital, Lewes, Delaware, 16 and 23 August 1956

By Order of

Commandant, U. S. Coast Guard

To Inquire Into and Investigate the Circumstances Surrounding The
Explosion and Fire on Board the M/V HEIDBERG In The Delaware
Bay on 10 August 1956 With Loss of Life.

The Board arrived at the following Findings, Conclusions and Recommendations:

FINDINGS OF FACT:

1. At 1424 (Z-4) on Friday 10 August 1956, when the German Motorship HEIDBERG was inbound in the Delaware Bay off Lewes, Delaware, immediately following the arrival on board of a Delaware River Pilot, when the engines were ordered from "Stop" to "Full Ahead", an explosion occurred in the crankcase of the main engine. Seven persons, constituting the entire engine department personnel were burned; three of them subsequently died as a result thereof. Two others of the crew were injured by the concussion which broke the engine room skylight, burst open the doors, port and starboard, on the main deck leading to the quarters amidship, wrecked those quarters on both sides and, traveling via the shaft alley and the after-escape trunk, knocked down wooden bulkheads in the crew's quarters in the after house. The starting air manifold broke in several places, the inspection plates on both sides of the crankcase of the main engine were blown out, and three sides of the casing around the governor at the after end of the engine were blown apart. Fire damage was negligible. There was no known cargo damage. All injured were removed via Coast Guard vessels and taken to Beebe Hospital, Lewes, Delaware.
2. The dead are: Second Engineer Herbert Guldener, age 35, of Hamburg, Germany, who died at 1:15 a.m. on 11 August 1956 of third degree burns of 90 percent of his body. The Third Engineer, Kurt Uhlig, age 48 of Delmenharst, Germany who died at 9:00 p.m. on 24 August 1956 of extensive second and third degree burns of 80 percent of the body surface and blast injuries of his chest. Assistant Engineer Jurgen Schwittner, age 22 of Danzig, Olivia, who died at 8:55 p.m. on 10 August 1956 of third degree burns of 95% of the body surface. The injured are: Chief Engineer-Wolfgang Sturr, age 42; Assistant Engineer-Werner Ramm, age 20; Oiler-Helmut Kaphingst, age 19; Second Mate-Siegfried Furst, age 26; the Cook, Alfred Bradt, age 43; Oiler-Paul Gollnitz, age 20, all citizens of Germany.
3. The weather was clear, sea calm to slight, wind southwest force 3, barometer 29.92, Thermometer 78, visibility 7 miles.
4. The M/V HEIDBERG, German Official Number A 12417, home port, Hamburg, a steel hulled, single screw, dry-cargo vessel of 1,595 gross tons, built in Germany in 1942, length 277 feet, beam 42 feet, is owned and operated by August Bolten of Hamburg, Germany under command of Heinz Mauersberger, of Neumunster, Germany, License No. 2592, Class A-6, with a crew of 22 and one supercargo. The vessel, classed by the German Lloyd with the highest rating, was under charter to the Royal Netherlands Steamship Company of Amsterdam, Holland, which has U. S. offices at 25 Broadway, New York, N. Y.

5. The main engine, located amidships, is a four cycle, ten cylinder diesel of 1,500 horsepower, bore 525 mm., stroke 800 mm., gas-oil fueled, solid injection at 300 atmospheres, normal operating speed 130 r.p.m.'s with air-starting pressure of 25 atmospheres. It was built in 1942 by Carels, S.E.M. at Ghent, Belgium. The cylinders are numbered from aft, forward, with the governor directly abaft No. 1 cylinder. The engine control wheel is on the starboard side between Cylinders Nos. 5 and 6. A fore and aft cast iron camshaft casing extends full length along the starboard side which also houses the controlled starting air manifold, both ends of which were fitted with a 3/4-inch spring-type relief valve, reportedly set to open at 26 atmospheres and installed in this manifold in 1956 after two explosions had occurred in the air starting system. Air from the bottles enters the manifold between No. 9 and No. 10 control air starting valves, the housings of which are of cast iron construction. The camshaft housing is fitted on the side with cast iron inspection plates approximately 14 inches by 16 inches. Cast iron covers, each secured by two studs, are attached to the top of the camshaft casing. The starboard side of the crankcase is fitted with cast iron inspection plates and, on the port side, with hinged cast iron inspection doors, all of which were bolted solid without relief valves or other means of relieving internal pressures. The crankcase opens into the camshaft housing under each cylinder in way of the valve pushrod cams. On the port side, near the top of each cylinder, there are fitted indicator cocks which are accessible to operating personnel from a fore and aft catwalk located above the crankcase inspection doors and about 3 1/2 feet above the floor plates. Starting air is supplied by two electrically driven compressors located to starboard of the main engine in way of cylinders No. 3 to No. 5. They take their air supply direct from the engine room without outside connection. The compressed air is piped to air bottles, (4 1/2" diameter, 11' length), which are fitted with relief valves set at 25 atmospheres. The air is compressed in two stages. The main engine lube oil discharge temperature is 42 degrees Centigrade.

6. The Chief Engineer testified that during his six years service aboard this ship there have been two previous explosions in the controlled air starting line. On 11 November 1955 at LaGuaira, Venezuela, when the engines were ordered from "Stop" to "Full Ahead" an explosion occurred in the air starting line which broke the starting valves Nos. 1, 2, 3 and 4 without other damage. Following that a pressure relief device was installed on each end of the starting air manifolds. At Antwerp, in June, 1956, a small explosion broke off an air starting valve and the repairs included the installation of the present safety valves set at 26 atmospheres replacing the prior installation. On the starting air inlet line on the top of each cylinder there is another one inch line with a small pilot check valve. The Chief Engineer stated that he learned from a representative of the manufacturers of this engine that they have had at least three similar explosions on other ships and, in their opinion, these were caused by this pilot valve sticking, permitting the explosion from the cylinder to blow back down the air starting line.

7. The starting is linked in with the control wheel and so arranged that the highest fuel pressure is automatic when the wheel is in the starting position. It was a practice aboard this ship to open the indicator cocks at the top of each cylinder when the engine was stopped and close them after the engine was again started and the cylinders were firing.

8. The engine room, 47 ft. 6 inches in length at the floor plates, opens into the shaft alley which is about 75 feet in length ending in a vertical escape trunk leading upwards to the first deck below the main deck and opening into the after crew's quarters. The steel bulkheads, which form the engine room trunk upwards from the second deck below the main deck, are pierced on the port and starboard side by doorways which enter into the crew's quarters on the main deck. These doorways are fitted with steel doors 23 inches by 64 inches located 5 feet 5 inches abaft the forward engine trunk bulkhead. On the same deck level this forward bulkhead is pierced by a glass covered window, 15 inches by 19 inches in a small pantry located beneath the stairs leading upwards from the main deck. A conventional steel grating extends thwartship between the engine room doors aforementioned and from this, on the starboard side, a standard type steel ladder leads forward (when descending) and down to the next grating and thence to the floor plates. The engine room telegraph and log desk are attached to a stanchion beneath this ladder near the engine control station. Forced ventilation to the engine room is via ducts, port and starboard.

9. The voyage began at Amsterdam, Holland on 30 June 1956 and, after calling at Madeira, Trinidad, B.W.I., Paramaribo, Dutch Guiana, at Georgetown, British Guiana and Palua, Venezuela, the vessel departed Puerto Ordaz, Venezuela on 1 August 1956 bound for Morrisville, Pennsylvania with 2,558 metric tons of iron ore and 242 metric tons of general cargo, her departure drafts being 19'1" forward and 18'0" aft. The voyage was uneventful, arriving in the Delaware Bay on 10 August 1956 when, at 1417 the engines were ordered slow. At 1420 the engines were stopped, and the pilot, Paul L. Ives, came aboard from a pilot boat. He was greeted by the second and third mates. After a brief discussion of the speed of the vessel and a report to the pilot boat as to their anticipated arrival off Philadelphia, the pilot proceeded up the inside stairway leading from the main deck to the next above, followed by the second mate, who was carrying his bag. At 1424, as he was ascending this ladder and immediately after he heard the telegraph rung and the starting air applied, an explosion shook the vessel. The concussion blew the pilot up the steps; he landed on his hands and knees, on the next deck. The second mate disappeared in the darkness which followed. At that time the master was on the bridge with the helmsman. The Bos'n was standing on the bow near the anchor and shortly thereafter as the master ran below, the pilot ordered the anchor dropped (Position 38-49-42 N.; 75-03-18 W.).

10. In the engine room, all personnel except the chief engineer were at their respective stations awaiting orders. The engines had been stopped for approximately four minutes; the indicator cocks had been opened and the third

engineer, Mr. Uhlig was standing by to close those at the after end while the assistant engineer, Kaphingst was at the forward end of the catwalk. Upon the order "Full Ahead" the second engineer put the control wheel in the starting position. The cylinders began firing and Mr. Uhlig and Kaphingst began closing the indicator cocks. About five cylinders had fired when the explosion occurred. The inspection plates on the starboard side under cylinders Nos. 4 and 5 were blown out, the concussion and blast of fire catching the second engineer at the controls and his assistant, Schwittner, directly behind him at the log desk. On the port side the concussion knocked both Mr. Uhlig and Kaphingst off the catwalk, Mr. Uhlig falling into or close by the blast which came out when the inspection door under No. 4 cylinder, port side, burst. A piece of this door struck and broke the inspection plate on No. 1 generator. The flash flame engulfed the engine room also burning assistant engineer Ramm and oiler Gollnitz who were securing the valves on the lube oil pump forward which had been circulating cooling oil through the main engine while it was stopped.

11. Gollnitz and Ramm were the first to emerge from the engine room, unassisted. Schwittner was able to reach the upper grating where he was found shortly thereafter by rescuers. Kaphingst, in pain and confused by the darkness and smoke, could be heard crying for help and was found trying to crawl into the main engine crankcase through the broken inspection plate believing this was an exit. Rescuers reached him by descending the after escape trunk and coming forward through the shaft alley because the smoke had made impossible descending via the engine room ladder. Meanwhile, Mr. Uhlig had groped his way up the ladder and was met enroute by rescuers and assisted to the deck. Mr. Guldener could not be found immediately but was soon discovered unconscious behind the compressors and carried to the deck in an improvised canvas sling.

12. It is the general opinion of all witnesses that the explosion was initiated by the bursting of the cast iron controlled starting air valve housings. These were broken at Cylinders Nos. 9 and 10 and the pressure relief valve at the forward (#10) end was broken off. The camshaft housing which enclosed the starting air manifold was damaged from No. 5 to No. 10 cylinder, the heaviest rupture being at Nos. 9 and 10 when the side inspection plates were blown off, the web between was cracked, and a piece of the casing on the under side was blown out. Small hand plates, located on the top of the housing over each controlled air starting valve, were broken or cracked from No. 4 to No. 9 inclusive and the screwed inspection plugs for Nos. 4, 5, 6 and 7 controlled starting air intake valves were blown out. The compressed starting air in the bottles was exhausted into the camshaft housing and thence into the crankcase where the main explosion followed causing the bursting out of the inspection plates and inspection door as aforesaid.

13. The concussion blew out the skylight ports overhead. The forward part of the fore and aft engine room trunk bulkheads, both port and starboard,

were blown outward approximately four inches in way of the deck below the main deck. On the main deck both doors to the engine room were blown open, the blast burning the head, face and arms of the chief engineer who was approaching from starboard. The heat slightly blistered the paint on the overhead. The concussion wrecked the quarters which had been partitioned off using 1" x 6" tongue and grooved boards set vertically and covered with a pressed board similar to "Masonite". The cook, Bradt, was buried under the debris of his room on the port side. The blast also emerged through the window from the engine room into the pantry under the stairs in the forward part of the house, main deck, partially wrecking the hospital space, the senior officers' saloon and the chief engineer's quarters which are located there, and also loosening the bannister on the stairs on which the pilot and second mate were then ascending. The second mate, Mr. Furst, was knocked down. In the excitement which followed, he was unaware that his back and chest had been injured. This accounts for the delay in taking him ashore until all other injured persons had been removed.

14. The concussion, traveling aft via the shaft alley and upwards through the escape trunk, blew off the escape hatch door in the crew's quarters aft, knocked down the partitions immediately adjacent thereto and damaged the furniture in those quarters. The explosion blew out of the engine room skylight pieces of burning clothing which landed on the bridge. The chief engineer, immediately after recovering from the shock, pulled the emergency fuel cutoff switch and, as all light and power was off, called for flashlights and volunteers to go below.

15. While awaiting assistance from shore, all the injured were assembled on the after deck where first aid was rendered under the direction of the master by other members of the crew. Meanwhile, pieces of smoldering rags and clothing were sought out and extinguished by the crew using sea water raised over the side in buckets because the usual fire lines were without pressure. The electrician, who had been among the first to descend into the engine room had secured the generator.

16. The explosion was observed aboard the pilot boat which was in radio communication with the Maritime Tower at Lewes, Delaware. They interrupted the conversation to report the explosion. This report was heard by a Coast Guardsman on duty there who noted the time, relayed the information to the Lewes Lifeboat Station and visually checked the position and condition of the ship, noticing that a small cloud of smoke was over the stack. At 1425 the CG-83468 and the CG-30423, berthed at the Boat Haven, Lewes, were ordered to proceed. At 1428 the 30423 was under way; at 1435 the 83468 departed. At 1443 the CG-30423 arrived on the scene, departing at 1448 with Uhlig, Schwittner and Ramm for the Army Dock, Lewes, where their arrival was awaited by ambulances and hospital corpsmen assembled by the Officer in Charge, Lewes Lifeboat Station. Meanwhile at 1445 the CG-40409 departed Lewes with two doctors aboard from the Beebe Hospital. At 1500

the CG-40450 was alongside, took aboard Guldener, Gollnitz and Kaphingst, departing the scene at 1510 for the Army dock. At 1505 the CG-40409 arrived at the HEIDBERG with the two doctors. At 1520 the CG-83468 put a fire party of three men aboard with rescue breathing apparatus and a one and a half inch hose line with all-purpose nozzle. No flames were found; a few rags and clothing in the area of the shaft alley were smoldering and quickly extinguished. A line rigged in the upper part of the engine room trunk was found smoldering as was also clothing. This was extinguished. The fire party secured at 1550. Meanwhile at about 1525 the CG-40409 departed with the chief engineer, the cook and the two doctors. This vessel subsequently returned to the scene, remaining until 1715 when it departed for the Boat Haven with the second mate where he was taken to the hospital in a truck. The CG-83468 remained alongside the vessel until 0915 on 11 August at which time tugs arrived to tow the HEIDBERG to Philadelphia.

17. All the injured were taken to the Beebe Memorial Hospital, Lewes, Del. At 2055 on 10 August the assistant engineer, Jurgen Schwittner died. At 0115 on 11 August, the second engineer, Mr. Guldener, died. Their next of kin were notified via the ship's agents and, in accordance with their wishes, the bodies were cremated at the Silverbrook Crematory, Wilmington, Delaware on 16 August and the ashes shipped to Germany together with all personal effects. On 24 August at 2100 the third engineer, Mr. Uhlig, died. In accordance with the wishes of his next of kin, the body was also cremated on 28 August at the Silverbrook Crematory, Wilmington and the ashes, together with all personal effects shipped to Germany. Arrangements were made for the repatriation of the injured upon recovery. Meanwhile, the vessel, after discharging cargo, was towed back to Germany for permanent repairs.

CONCLUSIONS:

1. The Board cannot make a definitive determination of the exact cause of the casualty for the following reasons:
 - (a) The disassembly of the main engine was deferred until the vessel's return to Germany and
 - (b) The persons who were in a position to observe and who were on the control side of the engine were killed.
2. The Board is of the opinion that the explosion originated when a starting-air valve in a cylinder-head remained open on the compression stroke with the result that the air-starting line between the cylinder-head and the controlled air-starting valve came under compression. This condition resulted in pressures of both compression and explosion being exerted upon the starting-air manifold far in excess of its rated capacity of 375 psi and caused the shattering of certain cast-iron controlled air-starting valves. The rush of compressed air into the hot crankcase further vaporized the lube-oil fumes there present and raised the oxygen content. The ignition was supplied by either the transmitted cylinder combustion, the sparks created by flying cast-iron fragments or by the chemical combination of vaporized lubricating oil and atmospheric oxygen under pressure within the hot crankcase.
3. The Board rejected the possibility of lubricating oil from the compressors or from the engine-room atmosphere accumulating and vaporizing in the starting-air system and chemically combining with the atmospheric oxygen, because of the fact that no appreciable oil was found in the air-bottles nor in the air line accessible for inspection.
4. The location of the air-starting line within the camshaft housing which is open to the crankcase, plus the fact that the valve bodies in this system are of cast-iron, makes engines of this type highly susceptible to casualties of this nature.
5. The personnel of the vessel conducted themselves commendably under the circumstances and special mention is merited by the electrician, Egon Timmerman, and the boatswain, Kurt Stehr, who displayed outstanding courage, energy and resourcefulness in the emergency. Furthermore, there was no negligence, incompetence or misconduct of any person aboard causing or contributing to the cause of this casualty.
6. The prompt, efficient and sympathetic care administered to the injured by the physicians, nurses, officials and employees of the Beebe Memorial Hospital was particularly noteworthy.

7. The Officer-in-Charge, Lewes Lifeboat Station and all other Coast Guard personnel who participated in organizing and executing the assistance operation did so with efficiency and dispatch.

RECOMMENDATIONS:

1. That no further action be taken and the case closed.

(signed) R. Y. Edwards
R. Y. EDWARDS
Commander, U. S. Coast Guard

(signed) L. A. Grundler
L. A. GRUNDLER
Commander, U. S. Coast Guard

(signed) W. R. Sayer
W. R. SAYER
Commander, U. S. Coast Guard

At 4:30 p.m. the Board adjourned to await the action of the Convening Authority.

(signed) R. Y. Edwards
R. Y. EDWARDS
Commander, U. S. Coast Guard
Chairman

(signed) W. R. Sayer
W. R. SAYER
Commander, U. S. Coast Guard
Member and Recorder