



# **THE BAHAMAS MARITIME AUTHORITY**

**“SAGAFJORD”**

**IMO Number 6416043**

**Official Number 399795**

**Report of the Investigation into  
the Fire in the Auxiliary Engine Room**

**on  
26 February 1996**

*The Bahamas Maritime Authority investigates incidents at sea for the sole purpose of discovering any lessons which may be learned with a view to preventing any repetition. It is not the purpose of the investigation to establish liability or to apportion blame, except in so far as emerges as part of the process of investigating that incident.*

*It should be noted that the Bahamas Merchant Shipping Act, Para 170 (2) requires officers of a ship involved in an accident to answer an Inspector's questions fully and truly. If the contents of a report were subsequently submitted as evidence in court proceedings relating to an accident this could offend the principle that a person cannot be required to give evidence against himself. The Bahamas Maritime Authority makes this report available to any interested parties on the strict understanding that it will not be used as evidence in any court proceedings anywhere in the world.*

Bahamas Maritime Authority  
10 Chesterfield Street  
LONDON W1X 8AH  
United Kingdom

**“SAGAFJORD”**  
**IMO Number 6416043**  
**Official Number 399795**

**Report of the Investigation into  
the fire in the Auxiliary Engine Room  
on  
26 February 1996**

**CONTENTS**

1. **Summary**
2. **Particulars of Vessel**
3. **Narrative of events**
4. **Analysis**
5. **Conclusions**
6. **Recommendations**

1. **SUMMARY**

- 1.1. The motor passenger vessel “SAGAFJORD” suffered an engine room fire at 1000 hours, 26 February 1996, in position 12° 28.7' North, 117° 43.2' East. She was on passage between Hong Kong and Kota Kinabalu, as part of a world cruise, carrying 457 passengers and 360 crew.
- 1.2. The fire, in the auxiliary engine room, was the result of a lubricating oil leakage onto No. 6 diesel generator exhaust manifold. It caused a total loss of main electrical power to the vessel.
- 1.3. The fire alarm was sounded at 1003 hours and the fire was extinguished by 1030 hours. The emergency generator was operated to supply power for the vessel's basic emergency systems only. A fire watch was posted and maintained during and after the emergency.
- 1.4. The vessel drifted without propulsive power until a salvage tug commenced towing operations at 2045 hours, 27 February 1996. A second tug later assisted the tow to Subic Bay, Philippines, where the passengers were disembarked on 01 March 1996.
- 1.5. After a period of preliminary repairs at Subic Bay the vessel was towed to Singapore for permanent repairs under Classification Society approval during which time she was sold to new owners.

2. PARTICULARS OF VESSEL

2.1. "SAGAFJORD" was a motor passenger vessel registered at Nassau, Bahamas. She had the following principal particulars:

•	Length overall	-	188.88 metres
•	Length BP	-	168.08 metres
•	Breadth	-	24.49 metres
•	Depth	-	16.90 metres
•	Gross Tonnage	-	24,474 tons
•	Deadweight	-	6,353 tonnes
•	Call Sign	-	C6ZU

2.2. "SAGAFJORD" was powered by two 2 stroke, 9 cylinder, Sulzer type 9RD68 main engines that developed 17,653 kW (24,000 bhp). She had six generators that developed a total of 4,002 kW. These generators were sited in the auxiliary engine room, athwartships across the vessel, immediately below the control room area. They were numbered 1 to 6 from starboard to port.

2.3. She was fitted to carry 509 passengers in 328 cabins.

2.4. The vessel was built in 1965 at La Seyne, France. At the time of the incident she was owned and managed by the Cunard Steamship Company.

2.5. The vessel was first registered under the Bahamas Flag in 1983 and was entered with Det Norske Veritas Classification Society. At the time she complied with all statutory and international requirements and certification.

2.6. "SAGAFJORD" was last subjected to a Bahamas Maritime Authority Annual Inspection at the Port of Vancouver, British Columbia, Canada on 17 August 1995. There were no defects noted or additional comments made.

2.7. Prior to re-entering service "SAGAFJORD" was renamed under the Bahamas Flag and subjected to a satisfactory Bahamas Maritime Authority Annual Inspection at the Port of Bremerhaven on 15 July 1996.

3. NARRATIVE OF EVENTS

- 3.1. At approximately 1000 hours, 26 February 1996, the watchkeeping motorman was working on the alternator of No. 5 diesel generator, on the port side, at the forward of the engine room and aft end of the auxiliary engine room. He heard a whistling sound coming from No. 6 generator, which was next to him, outboard on the port side.
- 3.2. The motorman saw lubricating oil from No. 6 generator spraying upwards from the lubricating oil cooler branch pipe on to the low deckhead above it and then back down onto the exhaust manifold. He attempted to stem the flow of oil with rags but was unsuccessful. The hot oil ignited on the exhaust manifold.
- 3.3. The motorman and watchkeeping mechanic initially fought the fire with portable extinguishers but were unsuccessful and retreated.
- 3.4. At the same time the lubricating oil alarm sounded in the engine room control room and No. 6 generator automatically shut down on “low oil pressure”. The loss of that generator caused an overload on the main switchboard and so the power from the remaining four generators automatically tripped off the switchboard, inducing a black-out. The emergency generator started up and powered the emergency switchboard about eight seconds later.
- 3.5. In the control room the watchkeeping Second Engineer (Bahamas rank of Third Engineer) noted the alarm concerning No. 6 generator and, seeing dense smoke in the auxiliary engine room on the closed circuit television monitor, sounded the fire alarm.
- 3.6. The “HALON” fire extinguishing gas was soon activated having a limited controlling effect on the fire.
- 3.7. The Chief Engineer and the Staff Chief Engineer, later joined by the Chief Electrician, each donned a self contained breathing apparatus. The Chief and Staff Chief Engineers also donned one fireman’s protective suit - between them. They then made an initial assessment of the extent of the fire in the auxiliary engine room and entered the engine room control room. The latter, being immediately above the generators, had quickly filled with smoke.
- 3.8. The remaining generators were noted to have been running off load and it had proved to be impossible to automatically or remotely stop them. The senior officers proceeded to manually “pull the breakers” on the main switchboard thereby safely isolating all electrical systems.
- 3.9. The early stages of the fire had damaged the control wiring from the control room to the generators thus preventing the four remaining running generators being stopped. The cooling water pumps were however shut down when the vessel blacked out. The running engines were subsequently damaged by overheating due to a lack of cooling water.

- 3.10. The majority of day work engine room staff were taking their morning break in the vicinity of the engine room control room or the engineers' office and so were available when the alarm sounded. Those in the immediate vicinity, joined by the Chief and Staff Chief Engineers, attended the scene of the blaze and commenced to fight the fire. The remainder of the vessel's nominated fire fighting personnel assembled at the allotted muster station and, under the direction of the "Fire Leader," teams of fire fighters were sent into the engine room, with an engineer to act as a guide and advisor, to fight the fire.
- 3.11. The fire was extinguished between 1020 hours and 1030 hours.
- 3.12. It transpired, during the investigation, that the Third Mate, who was designated to be in charge of the breathing sets at the fire fighting muster point, did not know the location of the fire parties in the engine room or when the breathing apparatus bottles were due to be replenished. His duties within the vessel's fire fighting plan were therefore isolated and may have been of little value had the fire not been brought under immediate control.
- 3.13. From the bridge the Master had advised the Owners and other relevant authorities.
- 3.14. A fire party and fire watchmen were allocated to maintain a constant watch to protect against any further outbreaks of fire for the remainder of the voyage
- 3.15. Damage to the auxiliary engine room and electrical wiring was extensive. The managers had been kept informed of events and following advice from the Chief Engineer, that the damage was not considered repairable, it was arranged to have the vessel towed to Subic Bay, Philippines. The air and sea rescue services, who had initially responded, were stood down.
- 3.16. The Master advised the passengers of the situation over the vessel's public address system both at the time of the emergency and at regular intervals thereafter. The passengers had very limited hotel facilities for the remainder of the passage due to the absence of electrical power.
- 3.17. "SAGAFJORD" continued to drift in good weather conditions for about 34 hours, exhibiting the signals for a vessel "not under command," until the tug "Smit Sulawesi" attended at 2045 hours, 27 February 1996. A second tug "Boa Odin" assisted the tow from 0245 hours, 28 February onwards. She was towed to Subic Bay, Philippines where the passengers commenced disembarking at 0830 hours, 01 March 1996.
- 3.18. Preliminary repairs were completed at Subic Bay after which the vessel was towed to Singapore where permanent repairs were completed.
- 3.19. After "SAGAFJORD" had been repaired and refurbished she sailed from Singapore as a cargo vessel to Europe prior to re-commencing trading as a passenger vessel under different Ownership and name.

#### 4. ANALYSIS

##### 4.1. The Cause of the Fire

- 4.1.1. Oil was seen to be spraying from a hole in a pipe that carried hot lubricating oil, under high pressure, from the engine to the lubricating oil cooler. Such pipes were fitted with thermometer pockets which consisted of a male screw-threaded section that screwed into a female screw-threaded boss on the lubricating oil line. A thermometer could be fitted into the pocket for local temperature monitoring.
- 4.1.2. An open thermometer pocket of No. 6 diesel generator was later identified as the source of the lubricating oil which eventually caught fire on the exhaust manifold.
- 4.1.3. The hot oil, under pressure, sprayed up to and around the manifold. The oil which reached the low deckhead above it was then deflected down on to the hot manifold. The oil ignited on the manifold either as a result of being sprayed directly onto it or after having been deflected down from the deckhead.
- 4.1.4. Good practice is for thermometer pockets to be welded, locked or sealed into place with tab washers. This particular engine appeared to have had none of the three. There was no indication of welding or flats on the boss to allow for the locating of a sealing device.
- 4.1.5. The six diesel generators were sited athwartships across the vessel, immediately below the control room area. The deckhead above No. 6 generator was very low. The broken lubricating oil line to the cooler was directly below the aft end of the exhaust manifold, close below that deckhead.
- 4.1.6. The plates in the vicinity of the generator were searched after the fire was extinguished but the thermometer pocket was not found. The other five generators had similar piping systems except that the thermometer pockets were all welded and sealed. There was no indication of any welding, sealing or locking arrangement on the boss of No. 6 generator oil cooling pipe.
- 4.1.7. The two crew members who were working near No. 6 generator stated that the thermometer, not the pocket, had been broken for some time before the fire.
- 4.1.8. The maintenance being carried out on No. 5 alternator included the fitting of a new rotor and stator. Space was very limited for such lifting work and the heavy equipment had been observed swinging in the immediate area of the thermometer.

##### 4.2. The Consequences of the Fire

- 4.2.1. The electrical load required by the vessel needed five of the six generators to be run to maintain stable power on the main switchboard.
- 4.2.2. The bulkhead between the forward end of the engine room and the auxiliary engine room had been partially removed in order to maintain a satisfactory air supply to run the five generators. This bulkhead was not designated as being fire resistant or watertight.

4.2.3. The four remaining, operating generators continued to run, off load, after the vessel blacked out. The initial fire damage to the electrical control wiring between the control room and the generators prevented them being remotely shut down.

4.2.4. The sea water cooling for the generators was provided by electric pumps that took power from the main switchboard, independent of the generators. The lack of that cooling water permitted the fresh water cooling and lubricating oil in each of the generators, which were circulated on a closed system by engine driven pumps, to overheat causing serious damage which subsequently required extensive repairs.

4.2.5. The fire caused extensive heat and smoke damage to the following areas:

- The port side engine room and the auxiliary engine room
- The wiring to the control room from all six generators and alternators
- All six generators suffered damage. The four that could not be shut down remotely due to the damaged controls subsequently overheated causing associated general damage
- Smoke damage to the accommodation and ships side.

#### 4.3. **Fire Fighting**

4.3.1. The engine room personnel closest to the start of the fire attempted to control the fire in the first minutes and then retreated.

4.3.2. At the same time the watchkeeping Second Engineer, in the control room, saw dense smoke in the auxiliary engine room on the closed circuit television monitor and sounded the fire alarm.

4.3.3. The “HALON” fire extinguishing gas was activated and had a limited controlling effect on the fire.

4.3.4. The Chief Engineer and the Staff Chief Engineer, being the senior personnel, assessed the extent of the fire in the auxiliary engine room and the effects of the spreading dense smoke through the rest of the engine room. They then ensured that the main switchboard was isolated. The situation was reported to the Master and the vessels fire fighting procedure commenced as described in the previous section.

4.3.5. The fire was swiftly extinguished by between 1020 hours and 1030 hours

4.3.6. The engine room/alternator room bulkhead had been cut away to allow better ventilation to the alternators. This was not designated as a watertight or fire bulkhead, but the removal of part of it to facilitate the ventilation does conflict with the effectiveness of the Halon gas that was released.

4.3.7. When the alarm sounded the engine room staff were starting their morning break. This meant that they were in the immediate vicinity of the machinery spaces as most of them took their break either in the engine room control room or the engineer’s office. This aided the initial speed of response.

4.4. **Additional Observations.**

- 4.4.1. The fact that 5 out of 6 generators had to be run to keep up with the electrical power requirements indicated that the electrical loading may have been too much for the system to cope with under maximum potential loading.
- 4.4.2. Our investigation raises a concern of the Third Mate's situation. He was designated to be in charge of the breathing sets and spare air bottles at the fire fighting muster point. He was however not made aware of the location of the fire parties in the engine room or when the breathing apparatus bottles were due to be replenished. His duties within the vessel's fire fighting plan were therefore isolated and may have been of little value had the fire not been brought under immediate control.

5. **CONCLUSIONS**

- 5.1. The fire was the direct result of a screw threaded thermometer pocket being blown out of a high pressure lubricating oil pipe and the resulting spray of hot oil igniting when it fell onto the hot generator exhaust manifold of No. 5 diesel generator.
- 5.2. The cause of the thermometer pocket blowing out the lubricating oil pipe was identified to the lack of the threaded part which screwed into the pipe being locked or sealed into place. Such a locking device is a fundamental safety precaution. The other five generators all had welded seals to the thermometer pockets.
- 5.3. The fire was brought under control and extinguished within thirty minutes without injury to any person on board. The swift identification of the precise location of the fire and the reaction of the engine room officers and crew ensured the safe outcome of the emergency and the consequent security of over 800 persons on board the vessel.
- 5.4. The actions of the Chief Engineer, Staff Chief Engineer and those of their crew in the immediate vicinity of the fire are both worthy of applause and of criticism.
  - 5.4.1. Their swift actions undoubtedly contained the fire in the first instance. They initially fought the fire with limited protective clothing but without reporting their intentions or details of the fire.
  - 5.4.2. Had they been unsuccessful and been injured, or worse, the vessel's main fire fighting teams, would have been unaware of the precise location and type of fire and therefore not have been able to directly attend to it. Vital time would have been lost during which time the fire may have grown out of control.
- 5.5. Following the initial fire fighting efforts of those in the immediate vicinity of No. 5 generator the ship's fire fighting procedures worked satisfactorily by providing a relay of fire teams, with Engineers as guides, to the area of the fire.
- 5.6. Had the fire fighting been prolonged there was an identified failure in communication to the officer responsible for supply and replenishment of replacement, charged compressed air bottles for the breathing apparatus.
- 5.7. The damage to the control cabling resulted in the lack of any remote controls of the generators and the consequential serious damage which resulted was caused by Generators Nos. 1 to 4 running without sea water cooling, which had stopped when the vessel blacked out.

6. **RECOMMENDATIONS AND ACTIONS**

- 6.1. The locking devices of the vessels thermometer pockets were reviewed as a matter of course.
- 6.2. The results of this investigation were brought to the attention of the Owners who reviewed the fire fighting procedures and conducted exercises after the vessel was repaired to test their effectiveness.