

**MARINE OCCURRENCE REPORT**

**FIRE IN THE ENGINE-ROOM**

**OF THE FISHING VESSEL "NORTHERN VENTURE"  
OFF ST. ANTHONY, NEWFOUNDLAND  
20 JULY 1995**

**REPORT NUMBER M95N0011**

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

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### **Summary**

While the "NORTHERN VENTURE" was en route from the crab fishing grounds to Roddickton, Newfoundland, on 20 July 1995, a fire broke out in the engine-room. The crew on watch, who discovered the fire, alerted the remaining crew members who were in their bunks. Prompt and effective action was taken and the fire extinguished. The vessel then proceeded on her own power, escorted by another fishing vessel, and arrived at Englee, Newfoundland, without further incident. The vessel sustained minor damage and there was no pollution.

*Ce rapport est également disponible en français.*

**Other Factual Information**

**Particulars of the Vessel**

	<b>"NORTHERN VENTURE"</b>
<b>Official Number</b>	809108
<b>Port of Registry</b>	St John's, Nfld
<b>Flag</b>	Canadian
<b>Type</b>	Combination fishing
<b>Gross Tonnage</b>	45.71
<b>Length</b>	15.4 m
<b>Crew</b>	6
<b>Built</b>	1988
<b>Propulsion</b>	Cummins diesel engine
<b>Owner</b>	David Cassell Roddickton, Nfld

The "NORTHERN VENTURE" is a typical Newfoundland longliner with a raised wheel-house and accommodation forward, aft of which are the engine-room, fish hold and lazaret.

After departing from the crab fishing grounds, the vessel was on her return passage to Roddickton. At about 0100 on 20 July 1995, the two crew members on watch noticed smoke emanating from the engine-room ventilators. The hatch cover to the engine-room was opened and fire was observed to be in progress. The other crew members, who were in their bunks, were alerted and mustered on deck while a distress message was transmitted. Power to the lighting and the navigation systems was supplied by the main-engine-driven generator. Within minutes, the main engine stopped and a brief black-out was experienced. The stand-alone generator, which was in operation supplying power to the searchlights, was then used and the lighting restored. The crew, under instructions from the skipper, prepared the liferaft and the lifeboat, and closed the engine-room ventilators. Two portable dry chemical fire-extinguishers were then discharged into the flames on the port side of the engine-room. The fire continued to smoulder. The skipper entered the engine-room long enough to engage the power take-off to the sea water pump run

<sup>1</sup> All times are Newfoundland Daylight Time (NDT) (Coordinated Universal Time (UTC) minus two and a half hours) unless otherwise stated.

from the generator engine. Sea water was then used to completely extinguish the fire.

After the damage was assessed and it had been determined safe to do so, the generator was used to restart the main engine. The distress was cancelled and two of the three vessels which had been tasked were stood down. The fishing vessel "BRENDA AND MICHAEL II" arrived on scene and escorted the "NORTHERN VENTURE" to Englee.

#### Battery and Battery Charging System

The vessel was equipped with two banks of four, eight-volt marine heavy-duty batteries. Both banks were in fibreglass trays positioned one above the other on the port side, just aft of the engine-room bulkhead and adjacent to the port fuel tank. The positive cable connecting the battery to the starter motor passed below the lower bank of batteries.

Investigation into the occurrence revealed that:

- Four filler vent caps had been displaced and there was a hole in the corner of the burned lower battery tray.
- The alternator was defective and had been overcharging the battery.

#### Halon 1211 Fire-extinguishing System

There is no regulatory requirement for the fitting of an automatic fire detection and extinguishing system aboard a fishing vessel of this size and type; however, one such unit was fitted aboard the "NORTHERN VENTURE". The unit was designed for, and used as, a fixed installation in the enclosed area, the engine-room. The assembly consisted of one extinguishing agent storage cylinder, a charge of Halon 1211, one pressure gauge, one Schrader valve (for filling and pressurization), one valve body, and one sprinkler head enclosed in a wire guard. The sprinkler head in use was temperature-rated for 141°C; the lowest temperature rating available was 57°C. The system was installed in accordance with the manufacturer's instructions. The cylinder was suspended from the deck-head beam on the centre line in the forward part of the main engine, and some 2 m to the starboard of the banks of batteries.

Following the occurrence, the fire-extinguishing system was examined and tested at the TSB laboratory and the conclusions drawn included, among others, the following:

- The automatic system did not activate because the fire did not generate enough heat over a long enough period of time at the

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<sup>2</sup> TSB Engineering Report No. LP 117/95. A copy of the report is available upon request.

position of the sprinkler head.

- The temperature rating of the sprinkler head in use was too high for the vessel's engine-room.
- The depleted condition of the Halon system was attributable to a slow, low-volume leak caused by a cracked and deteriorated valve core plunger seat washer.
- Lack of servicing and routine inspection most likely permitted the deteriorated condition of the valve core and the ensuing leak to remain undetected while the equipment was in service.

#### TC Marine Policy - Inspection of Non-Mandatory Safety Equipment

It is the policy and practice of TC Marine to require all non-mandatory life-saving and fire-fighting equipment installed on board vessels to be in proper working order. The owner has the option of removing non-mandatory equipment that is found to be defective, or of restoring it to proper working order.

According to information received from TC Marine, the Halon 1211 fire-extinguishing system was last inspected on 11 May 1993 at which time it was reported to be functioning satisfactorily. However, there is no record on file confirming the inspection nor concerning the acceptance of the equipment for installation on board the "NORTHERN VENTURE".

#### Burn Pattern

Examination of the burn area indicated that the fire spread upward toward the deck-head and then to starboard from a point in the vicinity of the banks of batteries.

#### Crew Training

The skipper and one of the crew members had received Marine Emergency Duties (MED) training as a prerequisite to obtaining a Fishing Master, Class IV, Certificate of Competency.

#### **Analysis**

As battery filler/vent caps were found dislodged, it would suggest that chemical reaction in the battery was intense/violent confirming that the battery was being overcharged by a fault in the alternator. The intense chemical reaction would generate extensive heat, resulting in the release of hydrogen into the engine-room and causing the acid from the battery to overflow. The presence of sulphuric acid between the terminals could create a short at the battery terminals with consequential arcing.

It was not possible to reconstruct the precise condition of the

engine-room at the time the fire started because the site was disturbed before the vessel arrived in port, both during and after the fire-fighting. However, the engine-room of a typical fishing vessel, such as the "NORTHERN VENTURE", would likely contain some oily residues. The wooden structure of the engine-room had most likely absorbed these residues in such quantities as to sustain a fire. If these conditions were present, arcing at the battery terminals in the proximity of combustible materials and hydrogen likely initiated the fire.

The prompt and effective action by the crew in dealing with the emergency situation and successfully extinguishing the fire can be attributed to the MED training that some of them had received.

#### Equipment Maintenance and Inspection

Although the Halon 1211 automatic fire-extinguishing system was fitted with a pressure gauge to indicate the quantity of charge in the cylinder, no examination was carried out by the skipper. As the equipment is required to be used in an emergency and as the fitting of such equipment could provide a false sense of security, it is imperative that the equipment be maintained in proper working order. Failure to do so has the potential to compromise safety.

Although it was reported that the Halon automatic fire-extinguishing system had been inspected by TC Marine, there is no record of it on SIRS II (Ship Inspection Reporting System). As there is no detail of the inspection record, it cannot be determined what criteria, if any, were used by the attending surveyor to ensure that the equipment was in proper working order. Barring the actual temperature measurement, there is no other criterion established by TC Marine for use by attending surveyors to assist in determining that the temperature setting on the equipment is appropriate.

#### Selection of Temperature Settings for Automatic Fire-extinguishing Systems

Timely activation of the automatic fire-extinguishing system is essential to effectively control and successfully extinguish a fire. Hence, an unduly high temperature setting of the sprinkler head would allow the fire to progress and spread undetected for a period of time. Delayed detection of a fire has the potential to cause extensive damage and jeopardize the safety of the vessel and her crew.

Because the automatic fire-extinguishing system is intended to activate in sufficient time to prevent a fire from spreading in a compartment, the temperature rating selection for this type of equipment should be matched to the anticipated hazards being targeted and to the maximum deck-head temperature expected in the enclosure being protected. In order to provide a margin of safety to prevent premature operation of the system (barring the presence of any unique

circumstances), the temperature rating of a sprinkler system is typically selected to be approximately 22°C to 45°C above the maximum ceiling temperature of the room being protected. In this instance, the maximum deck-head temperature expected in the engine-room was 45°C during summer operations, whereas the sprinkler head in use was temperature-rated for 141°C. Hence, it is important that a proper compromise be struck when selecting the temperature rating of an extinguisher sensor to ensure that the margin of safety chosen to prevent premature activation does not jeopardize the quick operation of the system to control a fire and to prevent its spread.

### **Findings**

1. The fire originated in the vicinity of the banks of batteries on the port side, just aft of the engine-room bulkhead.
2. The alternator was found to be defective, overcharging the batteries.
3. The hole in the lower fibreglass tray for the banks of batteries was probably associated with the heat generated by a flame.
4. Overflow of acid from the overcharged batteries probably created a short at the battery terminals with consequential arcing.
5. The arcing at the battery terminals ignited combustible materials initiating the fire.
6. The prompt and effective action by the crew in dealing with the emergency situation and successfully extinguishing the fire can be attributed to the MED training that some of them had received.

### Automatic Fire-extinguishing System

7. The automatic fire-extinguishing system did not activate because the fire did not generate enough heat over a long enough period of time at the position of the sprinkler head.
8. The sprinkler head in use was temperature-rated for 141°C which is a high temperature classification for use in the engine-room of this vessel.
9. When tested following the occurrence, the automatic fire-extinguishing system in the engine-room performed as designed.

10. The depleted condition of the fire-extinguishing system was attributable to a slow, low-volume leak in the Schrader valve.
11. The leak in the Schrader valve was caused by a cracked and deteriorated valve core plunger seat washer.
12. Lack of servicing and routine inspection permitted the depleted condition of the fire-extinguishing system to remain undetected for a period of time.

### **Causes and Contributing Factors**

A fire broke out in the engine-room of the "NORTHERN VENTURE" most probably because arcing at the battery terminals ignited combustible materials. A contributing factor to the occurrence was the malfunction of the alternator which allowed the battery to be overcharged.

### **Safety Action Taken**

In April 1996, TSB Marine Safety Advisory No. 04/96 was forwarded to Transport Canada (TC) concerning the installation of automatic fire-extinguishing systems with improper activation temperature ratings.

As a result, TC Marine issued Ship Safety Bulletin No. 08/96 (dated 03 July 1996) to advise the industry that activation temperature settings for automatic smothering systems on vessels should be no higher than 30°C (86°F) above the highest ambient temperature in the location of the actuator. TC also indicated that a requirement for a minimum/maximum activation temperature will be considered in the proposed Fire Detection and Extinguishing Equipment Regulations (CSA-20).

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson, Benoît Bouchard, and members Maurice Harquail and W.A. Tadros, authorized the release of this report on 24 October 1996.*