

PYROGEN CORPORATION SDN. BHD. 356066 K
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INCIDENT REPORT FORM

DATE: 22nd May, 01

IR NO.: 01-0015

LIST OF PERSONNEL PRESENT DURING INCIDENT:

No information was obtained

DESCRIPTION OF INCIDENT:

First notification was by the Singapore Pyrogen Distributor, Cyclect (S) Pte. Ltd. on 15th of May, 2001 by fax pertaining to a fire incident on a PK Class patrol boat which was later found to have occurred on 12th May, 2001.

A site visit by Pyrogen personnel was then immediately scheduled for 2 days later, for an inspection of the patrol boat at the Singapore Police Coastguard (SPCG) Depot in Kallang Way, the morning of 17th May.

LIST OF PERSONS PRESENT DURING INSPECTION ON 17th May, 2001:

<i>NAME</i>	<i>ORGANISATION</i>	<i>DESIGNATION</i>
1) Mr. Philip Neo	Singapore Police Coastguard	Staff Sgt.
2) David Theng	Cyclect (S) Pte. Ltd.	Manager
3) Richard Lee	Pyrogen Corp. Sdn. Bhd.	Manager
4) Kok Chen Yang	Pyrogen Corp Sdn. Bhd.	Engineer

ANALYSIS PERFORMED ON:

Pyrogen Fire Suppression System installed in the engine compartment of one, PK30 patrol boat, and its affected engine compartment.

BRIEF DESCRIPTION OF ANALYSIS PERFORMED:

Visual inspection to ascertain the following were carried out:

- (i) Fire outbreak point and spread
- (ii) Successful activation of installed Pyrogen Fire Suppression System
- (iii) Effectiveness of Pyrogen in extinguishment of fire

LIKELY CAUSES:

Overheating of the port side engine had caused the temperature at the outlet manifold to increase past the flash point of the rubber seal band (Picture G, □) and caused the band to combust & disintegrate.

The combustion process had been hastened to a great extent and projected into the back end of the compartment by the bellowing effect of the turbo (without the band to direct the air out through the exhaust manifold, it took the shortest path into the engine compartment) before the engine could be switched off. This is in contrast with the barely noticeable effect of the fire to either side of the affected rubber seal band. The adjacent engine's band (Picture G, □) was barely 4 inches away from the side of the combusting band and was unaffected whereas the back wall & cables which were at least one and a half feet away (1½ ') suffered the greatest collateral damage.

The pattern of heat damage on the top cover confirms the bellow effect of the operating engine with severe damage seen towards the back end (Picture F□), but not towards the front (Picture F, □). Heat damage on the top cover spanned a greater area due to the natural buoyancy of heated air from the fire.

SUMMARY OF FINDINGS:

It is obvious from the inspection of the Pyrogen Fire Mermaid System's linear heat detector (Picture G, ) that it was activated fairly early on. It could be noted that the placement of the linear heat detector cable route has correctly covered the most likely hot spots within the engine compartment.

All three Pyrogen canisters were successfully activated (Picture D & ). In compliance with SPCG requirements, the Pyrogen Fire Mermaid System was configured for discharge by manual activation only. However, both audible and visual indicators are configured to operate as soon as heat from a fire is detected.

Fire damage was observed to be highly localized and were mainly confined to areas directly affected by the bellow effect of the misdirected exhaust and the top cover. There was no evidence of fire spread beyond the directly affected areas and hence, it could be concluded that Pyrogen had effectively contained and extinguished the fire upon discharge.

It was also noted that there were no permanent staining or discoloration of the general engine surface local to the fire source, as would have been the case, had fire-fighting gases consisting of Halocarbons been used instead. Neither was there any significant residue resulting from the discharge of Pyrogen aerosol within the engine compartment, although the engine compartment had been kept closed until the boat could be brought to port.

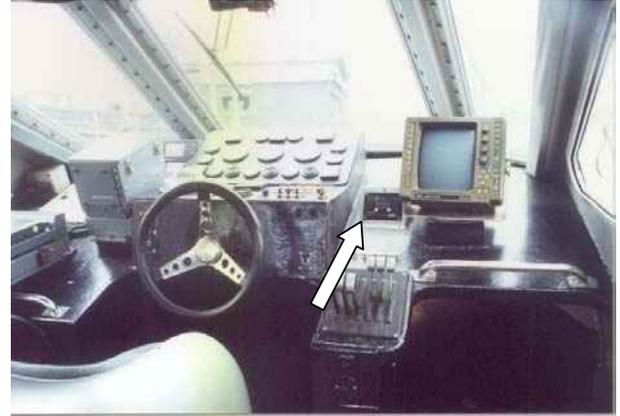
The two bottles of portable powdered fire extinguishers on board were verified by Staff Sgt. Philip Neo to be intact and unused.

IR REPORT PREPARED BY:

KOK CHEN YANG / RICHARD LEE
PYROGEN CORPORATION SDN. BHD.
22nd May 2001



Picture A: External view, of the PK30 patrol boat. Note the open hatch cover of the engine compartment



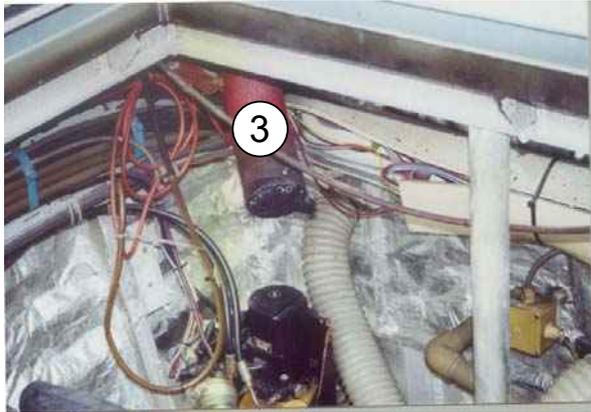
Picture B: Layout of the bridge, note the Fire Mermaid Control Panel (arrow)



Picture C: Two of the three installed MAG-5 generators, as shown in this engine compartment of a similar unaffected boat



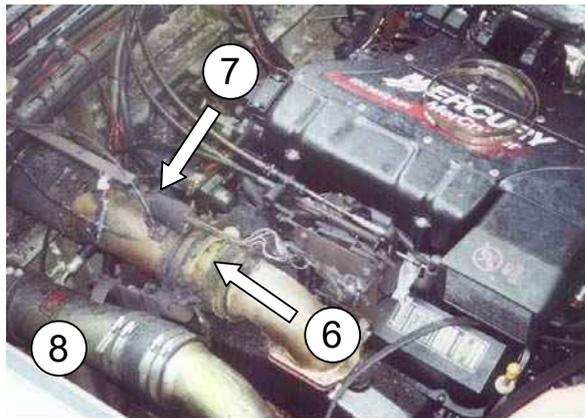
Picture D: The discharged units at the PK30 patrol boat.
 □ : MAG-5 bi-directional
 □ : MAG-5 mono-directional, partly hidden



Picture E: The discharged MAG-5 mono-directional, [redacted], at the front corner of the port side engine compartment



Picture F: The hatch cover, note the burnt area to the left, [redacted]



Picture G: The engine which caught fire, note the burnt rubber seal band around the exhaust manifold, [redacted]



Picture H: The arrangement of the three engines, the affected engine is at the right