

# NOTES FROM SEA

*Readers are invited to discuss either the extracts or the comments in the Correspondence section of the Journal.*

## **Loss of Main Engine Lubricating Oil Pressure**

During an N.B.D.C. damage exercise, a *Leander* Class frigate suffered a total steam and electrical power failure which resulted in the loss of lubricating oil pressure to both main turbines and gearbox. The failure lasted for approximately two minutes. At the time of the failure the starboard shaft was stopped and the port shaft revolving slowly but had stopped within seconds of the loss of lubricating oil pressure.

The events leading up to this loss were as follows. The N.B.D.C. exercise commenced at 10.30 and between the period 10.37 and 10.53, no less than nine fires, in addition to other incidents, were reported to D.C.H.Q. One of the fires was a simulated major fire in the Diesel room and another, a medium size fire, in the boiler room. The T.C.B. operators at D.C.H.Q. were therefore fully extended and at times completely swamped. In the boiler room the port boiler was shut down, the main feed pump was stopped and the starboard boiler fed with the auxiliary reciprocating pump. The boiler-room turbo alternator was tripped. The boiler-room crew were tackling splinter holes in the ship's side and fighting the fire. In the engine room the overflow feed tank was out of action, damage repairs to the ship's side were in hand, a lubricating oil pipe to the port engine was fractured and the port main throttle was jammed open. The main steam cross-connection was therefore shut. Lighting in machinery spaces and throughout the ship was switched off at the commencement of the exercise.

The loss of steam was caused by the after safety valve on the starboard boiler jamming open. It was subsequently found that the actuator valve was seized in the open position. This occurred when the P.O.M(E) was diverted by blowing down the port boiler as the water level was over the top of the glass. The P.O.M(E) immediately took off the sprayers of the steaming boiler and the steam pressure dropped to 200 lb/sq in. within seconds. In the engine room the drop in steam pressure was noted, the motor-driven forced-lubrication pump was switched to alternative supply and run up.

At D.C.H.Q. the first indication was a 'safeguard' report of a steam leak in the boiler room (identified later as the dumping valve drain line). Both blowers were heard to stop. The auxiliary switchboard was told by T.C.B. to start both Diesel alternators, unfortunately the message was passed as 'stop' both Diesels. The Marine Engineer Officer heard the incorrect message being passed and countermanded this on the main broadcast and by despatching a messenger to the Diesel room. The one running Diesel was stopped. The lubricating oil to the shafts was therefore lost during the time when one Diesel was stopped and both Diesels re-started and put on load.

The shafts were later turned by turning gear for two hours while awaiting a tow; there was no increase in the turning motor amperage. The shafts were then locked while the ship was towed into harbour. An examination of the top and bottom halves of all turbine bearings and main condenser tubes revealed that no damage had been sustained.

The points of interest during this failure were:

- (a) The very rapid loss of steam and water from the starboard boiler making conservation of steam impossible
- (b) The absence of any of the usual preliminary warnings of steam failure, e.g., lights—which had been switched off during the exercise
- (c) The complete absence of generator running lights at either the switchboards, D.C.H.Q., or in the engine room—these would have avoided unnecessary and incorrect orders to the auxiliary switchboard.

It was concluded that the power loss was due to an unforeseen material failure. However, it is intended that, in future exercises, more safety numbers will be detailed by ships staff.

#### *Comment*

The importance attached by Commands to the possible dangers liable to occur by the total loss of steam and electrical power during complicated damage control exercises is appreciated.

It is considered that the importance of clear communications is well known throughout the Fleet and that this is an isolated case.

It is for consideration that during an exercise of such magnitude involving the use of the main engines, and where a total steam and electrical failure causes the loss of main engine lubricating oil pressure with possible disastrous results, a safeguard mandatory order be issued that a selected Diesel generator be totally exempted from the exercise, and this generator to be constantly running during the entire procedures.

While it is true that the generator running lights are not provided in the engine room or damage control headquarters, and if fitted in the latter the total loss of electrical power might have been avoided, it should be noted that the fluorescent tubes over the switchboard control sections are, in effect, generator running lights and are fed from the generator side of the supply breakers.

The prompt and correct action of all personnel concerned in this unfortunate incident is most commendable.

### **Refrigerant 11 (Arcton) Asphyxiation**

During preparations to clean the 4-million B.T.U. turbo driven air-conditioning plant in a commando ship, a mixture of gaseous and liquid Refrigerant 11 (R 11) was drained into the compartment bilge where it was diluted with sea water. The rate of pumping with the megator pump was found to be slow, so a hull and fire pump was brought into action via the main line suction. Shortly afterwards, a considerable quantity of R 11 vapour was released into the unventilated pump room, having been vaporized within the pump and discharged by the air pump. The pump was stopped and the vapour cleared by a portable fan. However, later in the day a rating went to pump out a small amount of liquid from the hull and fire pump saveall and was overcome by fresh fumes. He was found 90 minutes later and fortunately recovered after medical treatment.

Refrigerant 11 is of low toxicity in its pure form, but in quantities sufficient to reduce the oxygen content of the atmosphere, asphyxiation could occur. Furthermore, contamination of the refrigerant with air and water and/or subjection to heat can result in decomposition and the formation of small quantities of hydrofluoric acid, hydrochloric acid, phosgene and other organic impurities which reach toxic levels. The discharge of liquid R 11 into bilges should therefore at all times be avoided.

#### *Comment*

Liquid refrigerant 11 should not be discharged to bilges, but the above remarks emphasize the importance of adequate ventilation in all compartments in which refrigerant vapour may be present.

Should it ever be necessary to rig portable fans it should be remembered that vapours of refrigerants used in H.M. ships (R11, R12, R22) are very heavy—the specific volume of R11 vapour at 90 degrees F. is approximately 3 cu ft/lb compared to 14 cu ft/lb for air—and ventilation arrangements should be made accordingly.

It should also be noted that the sense of smell is not an infallible guide to the presence of these vapours. In the contaminated condition described above there may be a pungent smell, but in the pure state they are practically odourless.

### **Allens 450 kW G.T.A.—Inlet Guide Vanes**

On stripping the compressor to adjust the pre-swirl blades (inlet guide vanes) to the tropical setting, the bottom half stator was turned out and two blade locking nuts were found to have sheared or broken off, the threaded portion having sheared immediately below the nut. The fracture indicated that de-zincing had taken place. On slackening back the remainder, one more fracture occurred.

Threaded inserts were manufactured, sealed in with silver solder and the blades replaced. A complete set of replacement blades has been ordered.

#### *Comment*

All other equipment holders have been warned of this defect.

### **G6 Gas Turbine Intake Grill and Splitters**

A motor boat PVC cover was sucked into a G6 gas turbine intake causing the collapse of the grill and denting of the splitters.

Having carried out the necessary repairs and inspected the compressor inlet blading, the engine was run up satisfactorily.

As a result of the above the following conclusions have been drawn:

- (i) The necessity for a careful check of the intake area before starting the G6 gas turbine and awareness of all personnel to the dangers of loose gear in the vicinity of the intakes
- (ii) The requirement for a grill above the intake silencer
- (iii) The possible redundancy of splitters—the G6 ran cooler without them
- (iv) The lack of suitable materials for repair, i.e., aluminium angle and aluminium wire mesh; teak wooden framework and steel wire mesh were used in this instance.

*Comment*

The incident and repair action is noted. Ships so fitted should ensure that the need to check the intake area before the G6 start up is adequately covered in departmental orders.

**Main Steam System—Spiral Wound Gaskets**

The main steam flange joint between the bulkhead piece and the emergency shut-off valve, in a *Tiger* Class cruiser, developed a leak which within twelve hours was causing serious concern. Subsequent examination showed that the gasket steel spiral winding had almost completely disintegrated (only two or three turns remained intact) and most of the asbestos packing had vanished.

The metallurgical examination report stated that disintegration of the spiral winding was attributed basically to a stress corrosion mechanism following contamination in service. In view of the fact that contamination was unlikely to have occurred, it is suggested that this failure merits further investigation.

*Comment*

The suddenness of this steam leak suggests that the gasket unwound due to the failure of the spot welds securing the inner turns of stainless steel strip.

Isolated instances of this nature have occurred due to the unauthorized practice of removing several inner turns of the gasket to suit the steam bore and securing the inner free end with a blob of solder. (Art. 1003, para. 2(e) of B.R. 3001 refers.)

In order to reduce the gap between the spiral wound gasket and the bore of the pipe, two new ranges of spiral wound gaskets to replace the original design have been introduced. D.C.I. 542/66 refers.

**Main Feed Pump TMFP—Trip Testing**

Complete failure of the pump end thrust assembly and partial failure of the turbine end thrust assembly could have been brought about when overspeed trip-testing this pump. It is felt that, with the governor inoperative during the test, there is no guarantee that each 1st-stage impeller will empty at the same rate, thereby creating unbalanced loads on the thrust assemblies.

It is suggested that consideration be given to the method of trip testing these pumps as carried out by C.E. Department, Singapore, whereby the run-up is smooth, tripping speed controlled and the pump discharge pressure does not exceed 700 lb/sq in. without undue noise.

*Comment*

As a result of correspondence and discussions with the manufacturer, revisions to the official method of trip testing (A.F.O. 745/63) and the method carried out by Singapore Dockyard have been proposed, and it is agreed that a comparison trial be carried out in a ship to determine which of the two revised methods is the most satisfactory.

Details of the comparison trial and proposed methods of trip testing will be discussed direct with the Ship Maintenance Authority in the immediate future.

### **Electric Salinometers**

In a *Leander* Class frigate the feed system became contaminated and boiler salinity reached 168 p.p.m. and feed tanks 56 p.p.m. It took seven minutes at low power for the boiler to reach 168 p.p.m.

The electric salinometers fitted were quite inadequate for determining the original source of the contamination and it is considered that an auto-scanning salinometer would be more effective for this purpose. This auto-scanning salinometer should be fitted with an alarm system to indicate which of the sensing points first becomes contaminated.

#### *Comment*

The present policy for new construction is continuous 'light' indication of systems and, in some cases, tanks, with meter reading by selection an additional facility. This policy is being incorporated in the new *Leanders*. Auto-scanning is a refinement which is not supported in view of the added complication, the cost and increase in maintenance load which would undoubtedly arise.

Retrospective fitting of continuous indicating systems in Type 12 frigates is not considered essential.

### **75 ton/hr Hull and Fire Pump**

A steel stud in the discharge flange of a hull and fire pump blew out causing a flood. Examination showed that the threaded portion of the stud hole penetrated into the casing so allowing the stud to corrode. The stud eventually blew out and allowed water to be discharged from the high pressure part of the pump.

Other studs examined were in good condition and screwed into blind holes. Material specified for the studs in PIL WOS/129 is HT steel.

The pump casing was originally internally coated with rubber but this has largely disintegrated leaving the stud open to corrosive attack. The offending stud was replaced in aluminium bronze.

#### *Comment*

The remedial action taken is concurred in. This failure appears to be identical to one reported in 1959.

Investigation into the fastenings used on a variety of pumps has revealed that different threads and materials are specified. These include: BSW, BSF, UNC and UNF threads, aluminium bronze, HT steel, mild steel, steel (cadmium plated), and so on. As a result of this investigation the whole matter is being taken up by D.G. Ships.

### **L.C.M. Propulsion Engine**

The above engine was found to be using an excessive amount of lubricating oil. On stripping it was found that on 'B' bank three of the pistons had the third ring upside down as also was the fourth ring of No. 1 piston.

It was considered that the reversal of the piston rings would account for the heavy consumption of lubricating oil.

#### *Comment*

The position of these rings should be checked by ships' staff during the assembly of the engine.

It is M.O.D. (N) policy that these engines fitted in L.C.M.s will be refitted by replacement at major overhauls.

### **Turbo Blower Lubricating Oil Cooler**

During the full-power trial of a *Daring* Class it was noticed that the turbo blower lubricating oil temperatures were excessive. On examination of the cooler it was found that the tube stack had been replaced incorrectly.

It is considered that future design should be such as to make it impossible to replace the tube stack end for end.

*Comment by S.M.A.*

Attention of equipment holders is drawn to letter Ref. N/DM 11372/63. S.M.A. would appreciate reports from ships experiencing similar defect.

### **Failure of Lubricating Oil to Main Engines and Gearing**

A recent failure of main gearing journal bearings occurred in one of H.M. ships subsequent to an interruption in the lubricating oil supply to the gearbox.

The fact that damage had occurred to the bearings was not immediately recognized and a risk of further damage to machinery ensued when the engine was re-started.

*Comment by the Fleet Marine Engineer Officer*

The following points are given as guidance:

- (a) Forced-lubrication failure of a few seconds is enough to cause failure of modern highly loaded bearings.
- (b) Bearing thermocouples may not indicate that rapid failure has occurred and, after failure, it is unlikely that they will give a true reading of bearing metal temperature, particularly after lubricating oil supply has been restored.
- (c) Bearing temperature monitoring equipment is unlikely to detect rapid failure due to the time lag in switching from one thermocouple to the next.

In the event of an interruption of the supply of lubricating oil to machinery, the affected engine should be stopped as soon as possible and, unless the ship's navigational safety dictates otherwise, the shaft should be locked and selected bearings visually examined to ascertain the extent of failure.

### **Contamination of Feed Systems**

While steaming auxiliary on the main boiler in a Type 81 frigate, a regrettable maloperation caused contamination of the feed system to such an extent that the extraction pump discharge indicated 0.5 grains per gallon with a boiler salinity of 19 p.p.m.

Feed water was discharged to the bilge and supplemented from clear reserve feed tanks until the salinity was reduced to 0.1 grains per gallon. The boiler salinity had risen to 27 p.p.m. by that time.

On sailing shortly afterwards the salinity of the extraction pump discharge rose to 0.3 grains per gallon for a period but before an hour had elapsed was down to 0.04 grains per gallon. It was at this time that the boiler salinity was found to have risen to 196 p.p.m., necessitating the specified internal clean and loss of operational time.

It had not been fully appreciated that the rate of contamination of the boiler

for a given contamination of the feed system increases drastically with the change in forcing rate from the auxiliary to the main steaming state.

Contamination of the boiler beyond 140 p.p.m. could probably have been avoided if it had been blown down frequently when the feed contamination was first detected.

#### **Extract from Commanding Officer, L.C.T.(A)'s Letter**

The following day the MP unit on the port engine started to overheat and the engine was stopped to re-align it. After some 30 hours this had been completed and it was possible to maintain 120 r.p.m. in lieu of the normal 140 without further serious overheating.

The next defect occurred in the starboard main feed pump which had been sticking at the bottom of its stroke for some time and which finally seized on the 18th.

At 0800 on the 19th, the piston of the steam engine driving the port boiler-room forced draft fan broke away from the connecting rod and the fan was brought from 575 r.p.m. to stopped in about 10 seconds. The port boiler was immediately closed down and speed reduced to 70 r.p.m. on both shafts. This was maintained using the starboard boiler and the auxiliary feed pump but the latter, itself in sore need of overhaul, proved to be inadequate to the task and 45 minutes later lost suction and the starboard boiler was also closed down.

With the port boiler-room fan still being repaired, the starboard main feed pump seized, and the starboard auxiliary feed pump only strong enough to support essential auxiliary services, the ship was stopped some 20 miles north-east of Ras Harfun and attempts to sail were initiated. These were not very successful since when stopped the ship lies with the wind 110 degrees on the bow, and she prefers to travel sideways. With a suitable spar to rig as a foremast and on which to hoist a large jib and foresail, it might have been possible to put the wind further abaft the beam and to rig studding sails on the derrick booms.

It took 18 hours to effect repairs to the port boiler-room fan and in the early hours of the 20th, course was reshaped for Cape Guardafui and Aden. However, on the 21st the starboard auxiliary feed pump finally expired, the boiler was shut down again and speed was reduced while repairs were effected. A new set of rings was fitted and some five hours later normal cruising revolutions were resumed on the starboard shaft while the port shaft was maintained at 120 r.p.m.

#### **SNATCHES FROM JOB CARDS**

##### **Evaporator Fresh Water Discharge**

###### *Initial Report*

Flowmeter reads backwards.

###### *Description of Defect/Work*

Remove flowmeter and put back the right way.

##### **F.F.O. Pumps**

Both F.F.O. pumps require shaft drives to Imo pumps to have glands repacked.

###### *Remarks*

Original maker's packing found to be not as per B.R. but consisted of cotton waste, rags and one turn of soft packing on top.

**Feeler Gauges***Initial Report*

Feeler gauges made of unsuitable material.

*Description of Defect/Work*

Require to be strengthened for underwater use.

**Steering Gear***Description of Defect/Work*

All parts of systems to be made free of paint, cleaned, greased.  
All nipple connections to be examined and renewed as necessary.  
(Make a good job of this; she hasn't let us down this commish.)

**Bun and Pie Divider***Description of Defect/Work*

The following items for 'Camwheat' bun and pie divider require to be supplied in accordance with D.787:

- (a) Steak and kidney pie die for bottoms
- (b) 6 in No. bases for tins
- (c) Plate for preventing pies lifting from base.

**Evaporators***Initial Report*

Expensive noises in governor gear of combined pump.

*Description of Defect/Work*

Governor gear casing to be removed, governor gear to be examined and refitted as necessary.

**Evaporators***Description of Defect/Work*

Sight glass cover to be milled out to take standard size glass as issued.

*Remarks*

0915 Stripped milling arbor and set up end mill head  
1030 Clamped down and lined up job  
1040 Proceeded with first cut  
Soon after Two power cuts; total duration 35 minutes  
Approximately half way through the job, Senior Engineer stopped machining process and ground glass to fit, as on all previous occasions.  
Time wasted— $3\frac{1}{4}$  hours.

**Pastimes***Description of Defect/Work*

2 in No. three-dimensional Noughts and Crosses games to be manufactured as follows:

- (i) For Captain—to pass the time during maintenance periods
- (ii) For Mechanics' Mess—to pass the time while the Engineer Officer and the Chief Mechanician are writing out job cards.