Report of Inspector's Investigation

into lifeboat winch failure on

passenger cruise ship

Arcadia

on 9 December 1998

Extract from

The Merchant Shipping

(Accident Reporting and Investigation)

Regulations 1994

The fundamental purpose of investigating an accident under these Regulations is to determine its circumstances and the causes with the aim of improving the safety of life at sea and the avoidance of accidents in the future. It is not the purpose to apportion liability, nor, except so far as is necessary to achieve the fundamental purpose, to apportion blame.

CONTENTS

SYNOPSIS

The accident occurred at Tenerife, the last port of call on the cruise itinerary of the passenger cruise ship *Arcadia*, before she returned to Southampton. It happened during a routine lifeboat drill. As No 5 lifeboat was being recovered after exercise, it lowered uncontrollably into the water still attached to the fall wires.

It was found that the winch failed because the lubricating oil used for the freewheel sprag coupling was too viscous and did not match the type of oil specified by the manufacturers of the davit.

The electrical engineer was injured after this accident when the lifeboat falls were being wound back onto the drum. The winch hand crank handle had been left attached to the winch drive. Consequently, because the electrical cut-out switch for the handle had been by-passed, the winch was started up spinning the handle which hit the electrical officer on the head.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF VESSEL AND ACCIDENT

Name	:	*Arcadia*
Official Number	:	8611398
Port of Registry	:	London
Owner	:	P&O Cruises (UK) Ltd, Richmond House, Terminus Terrace, Southampton, SO14 3PN
Classification Society	:	Lloyds Registry of Shipping
Gross tonnage	:	63,524
Overall length	:	245.6m
Breadth	:	32.23m
Year of build	:	1989
Type	:	Passenger cruise ship
Date and time of accident	:	9 December 1998, 1300 UTC
Place of accident	:	Tenerife
Injuries	:	1 crewman
Damage	:	None

1.2 NARRATIVE

During routine lifeboat drill, No 5 lifeboat was lowered into the water, released from its fall blocks and tested. It was then reconnected to the falls and hoisted out of the water. When hoisting stopped, the davit winch failed and ran uncontrollably until the lifeboat dropped into the water while still attached to the falls.

So that the crew could investigate the winch failure, they had to wind the falls back onto the winch drum. The lifeboat was again detached from its fall blocks and the crew tried to start the winch. It would not start because of a fault on the hand crank electrical cut-out switch. They started to wind the falls back by hand using the hand crank. Meanwhile, the electrician by-passed the cut-out

switch (**Figure 4**) to regain electrical supply to the winch to speed up the operation.

The winch was started before the crank handle was removed. As the winch drive shaft started to turn, so did the handle, hitting the electrician on the head.

1.3 DESCRIPTION OF THE LIFEBOAT WINCH

The winch and drive system is illustrated in **Figures 1, 2 & 3**.

The No 5 lifeboat winch, specified as a type 3-38, is one of a number of similar types, designed and made by Schat-Harding bv Netherlands. The winches are delivered under the following brand names:

- Davit company (DC)
- Schat-Davit company (S-DC)
- Schat-Harding (S-H)

The gears and coupling run in the same oil bath. The winch types are marked:

- 2(3)-22-.....
- 2(3)-38-.....
- 2(3)-58-.....

Some of these types are used to launch and recover *Arcadia*'s four tenders, two rescue boats and eight lifeboats.

As a safety precaution, an electrical cut-out switch is designed to prevent electrical starting of the winch when the crank handle is still attached. A possibility of injury from a spinning handle is therefore avoided.

The Schat-Harding davit winch maintenance manual specifies particular types of oil that can be used. The specified oils are tabulated at **Annex 1.**

The lifeboat winch gear drive arrangement is illustrated in **Figure 3**.

In the motor driving hoist mode, the motor turns the winch drum through the input and output shafts of the differential gear driving a two stage epicyclic gear in the winch drum. The housing for the differential gearbox has a toothed wheel which is connected to the brake arrangement by a chain drive. The engaged stop brake prevents the housing from turning.

In the hoisting mode the sprags of the free wheel coupling are lifted free by centrifugal force. When hoisting is stopped springs engage the sprags which couple the inner and outer race in the lowering direction. The differential gear input shaft and the motor drive shaft are prevented from turning.

In the gravity lowering mode, with the stop brake off, the load at the drum drives through the epicyclic gear. The differential gearbox housing drives the centrifugal braker via the chain connection. The centrifugal brake controls the speed of descent.

SECTION 2 - ANALYSIS AND CONCLUSIONS

2.1 CAUSE OF THE UNCONTROLLED LOWERING OF THE LIFEBOAT

The stop brake and centrifugal brakes were found to be in good working order. The inside surface of the outer race of the freewheel clutch had severe wear, scuffing with signs of overheating.

The freewheel coupling and oil were changed on No 5 winch about four months before the incident. Similarly, couplings and oil changes were made on seven other winches within the same period.

Schat-Harding reported that No 5 davit winch failed because the oil used in the gearbox was too viscous, preventing the coupling locking mechanism from operating. Slipping of the coupling would cause the oil to overheat. Lubricating properties would then be lost resulting in damage to running surfaces.

Schat-Harding advised that only the oil specified in the maintenance manual should be used. Subsequent to the accident, the oil in the other winches installed on board was replaced by specified oil.

Two similar incidents of inadvertent slipping of davit winch freewheel sprag couplings have been reported to MAIB by P&O European Ferries (Dover) on *Pride of Dover* and *Pride of Burgundy* in 1991 and 1995 respectively. The reason for failures was the same as that found on *Arcadia*, wrong gearbox oil was being used in the davits.

2.2 INJURY TO THE ELECTRICAL ENGINEER OFFICER

In the launching position, hand cranking of the falls onto the drum is a tiring and time consuming effort. Winching the falls back onto the winch drum is far easier. The well intentioned action of by-passing the cut-out switch was a direct cause of the electrician being injured. He eliminated the very safeguard designed to prevent such an accident.

Having accepted that it was necessary to by-pass the switch, compensating safety procedures, properly understood, should have been in place. The lack of planning and procedure for the situation was a contributory factor to the accident.

SECTION 3 - RECOMMENDATIONS

3.1 **P&O Cruises (UK) Ltd** are recommended to:

1. Draw the attention of sea staff onboard its ships to the dangers of using the wrong lubricating oil in davit winches fitted with freewheel sprag couplings.

2. Insist that whenever a malfunction with a lifeboat launching installation arises, any action taken is planned and executed.

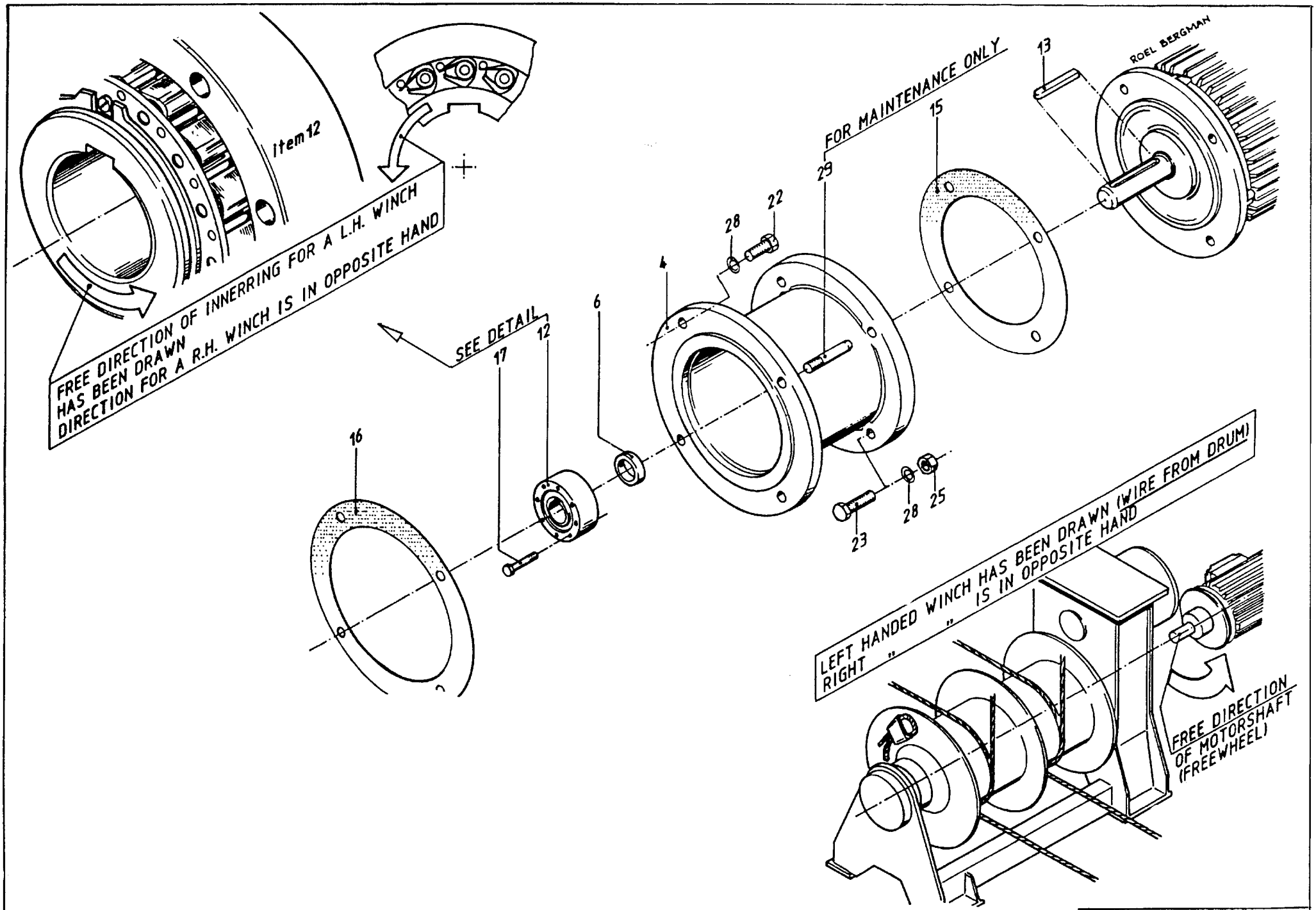
Note

Since the accident on *Arcadia*, there has been a similar accident on P&O Stena ferry *Pride of Calais*. This accident is presently being investigated by MAIB. When this is completed, recommendations will be made to MCA, taking into account the findings of the investigation into the *Arcadia*, *Pride of Dover* and *Pride of Burgundy* accidents.

Marine Accident Investigation Branch
October 1999

Freewheel Sprag Couple

Figure 1



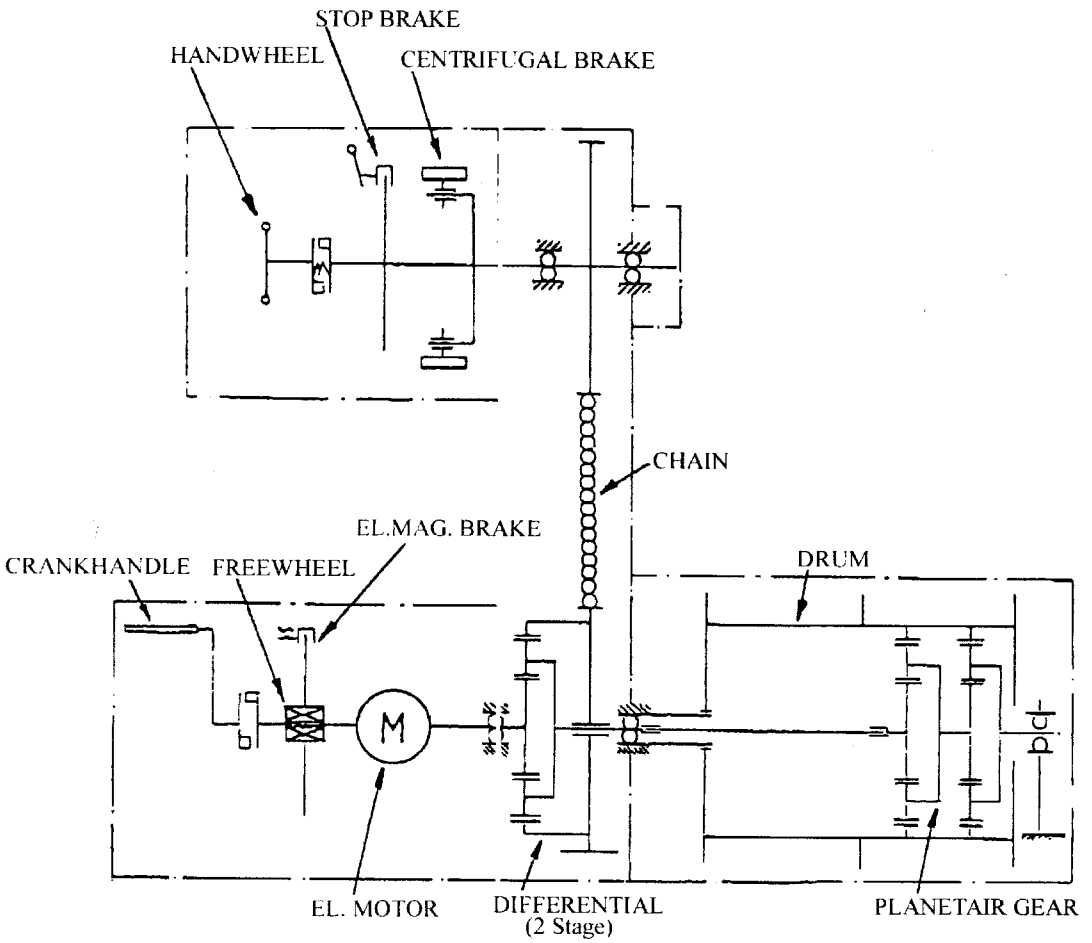
Freewheel Sprag Coupling Assembly

schat-harding

Figure 2

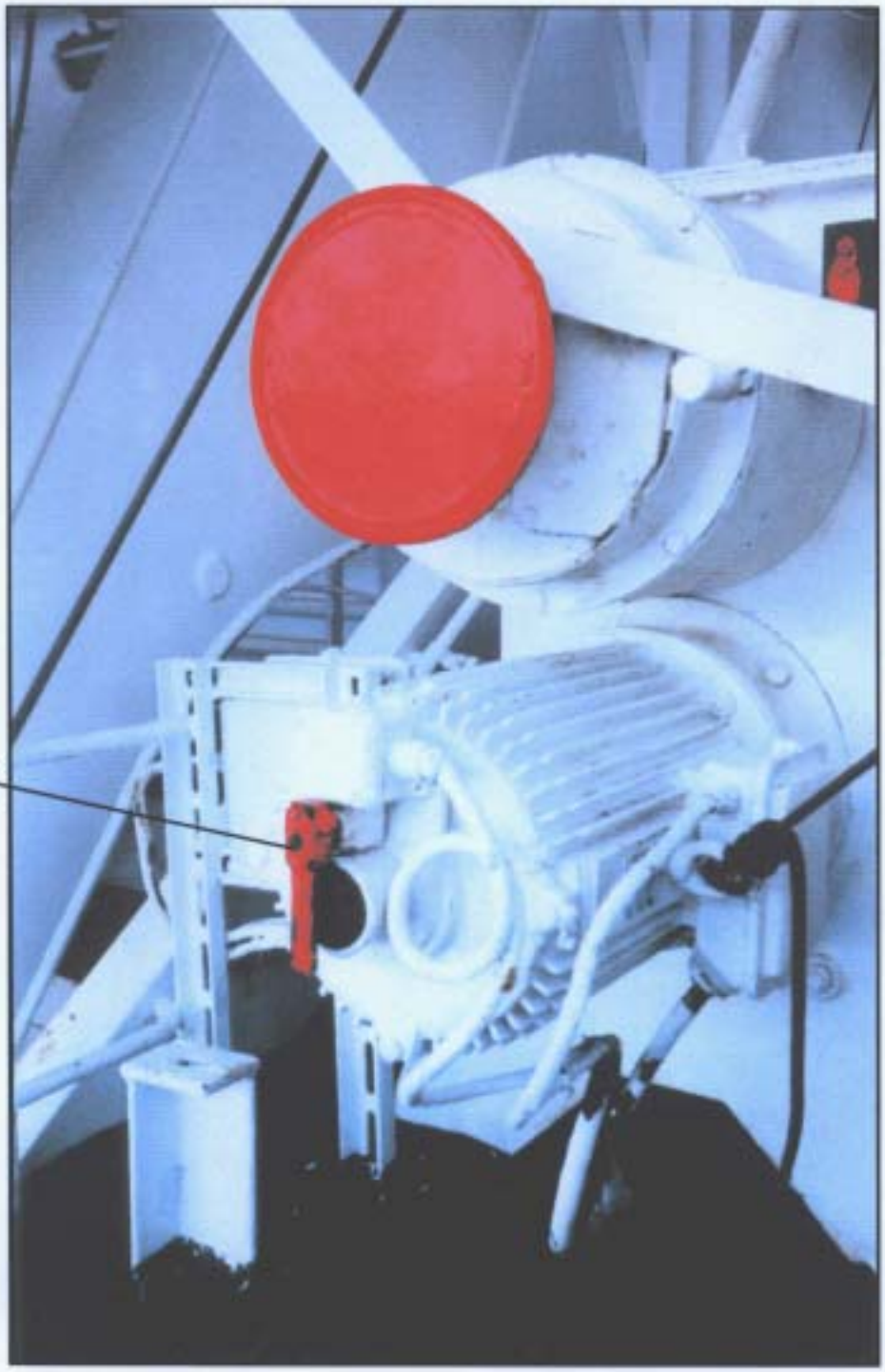
Figure 3

Kinematic Diagram of the Winch



Tender/Life Boat Winch

No5 Life Boat Davit Gear Drive Arrangement



No 5 Life Boat Winch Motor

ANNEX 1

	LUBRICANT SELECTION FOR - 30 UP TO + 50 DEG C AMB TEMPERATURE			
ISO 3445 VG 10 VG 32 LUBRICANT	Speed reducer gear of raft davit winches fitted with an extra crank facility for recovering the unloaded hook	Sub-enclosed epicyclic gear of all other winches	Sub-enclosed bevel gear of all other winches	Release circuit of type F L hydraulic brakes
BP	Energol SHF - LT 15	Energol SHF 32	Energol SHF 32	Energol SHF - LT15
CASTROL	Hyspin AWH 15	Hyspin AWH 32	Hyspin AWH 32	Hyspin AWH 15
CHEVRON	EP Hydraulic OIL 10	EP Hydr OIL 32 HV	EP Hydr OIL 32V	EP Hydr OIL 10
ELF	Spinelf 10	Visca 32	Visca 32	Spinelf 10
ESSO	Nuto HS	Univis HP 32	Univis HP 32	Nuto H 5
MOBIL	DTE OIL 15	DTE OIL 15	DTE OIL 15	DTE OIL 11
SHELL	Tellus C OIL 10	Tellus T OIL 37	Tellus T OIL 37	Tellus C OIL 10
TEXACO	Rando OIL HD-Z-15	Rando OIL HD-AZ-32	Rando OIL HSD-AZ-32	Rando OIL HD-Z-15

Davit winch oil specification