BRITISH GEOLOGICAL SURVEY
MARINE OPERATIONS RESEARCH PROGRAMME

MARINE REPORT 87/7

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BGS OFFSHORE SAMPLING PROGRAMME 1986

M.V. KOMMANDOR SUBSEA

by

A C Skinner

Murchison House
West Mains Road
Edinburgh EH9 3LA

Tel: 031 667 1000
Telex: 727343

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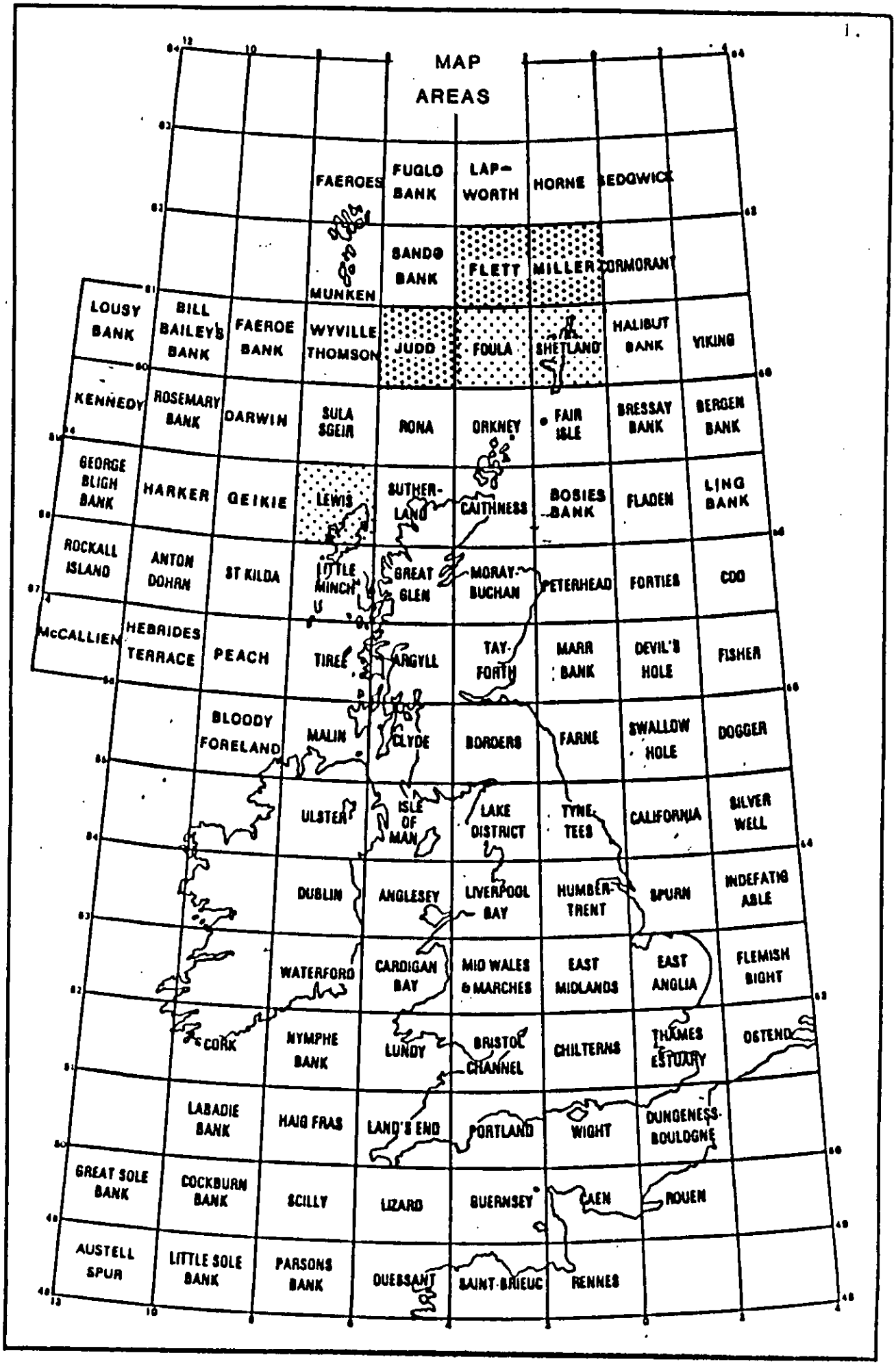

Figure 1 – Location of Sampling areas

Primary area – heavy stipple Secondary area – lighter stipple

INTRODUCTION

For the 1986 Offshore Sampling Programme BGS Marine Operations chartered the M.V. "Kommandor Subsea". This vessel, sailing under the UK flag, was on her first charter and was a newbuilding. Appendix I gives the specification and general layout of the vessel.

The work area was to the north and west of the Shetland Islands in the map areas Miller, Flett and Judd. (See Figure 1).

This sampling programme was to complete the fieldwork of the Primary Offshore Survey funded by the UK Department of Energy.

Work commenced at end September 1986 and continued until end January 1987, but for part of December and January the ship was diverted to other work not connected with the programme.

In a departure from previous BGS operations the vibrocorer was deployed through a moonpool. This allowed more sheltered working and deployment in worse weather conditions than previously possible. Both of these factors were important considerations when selecting a vessel for the programme in such exposed and hostile waters, in the late season and winter periods.

It was not possible to commence operations earlier in the year as programme approval and funding allocation had not been authorised.

BGS EQUIPMENT

Vibrocorer

A BGS 6 metre vibrocorer, complete with modified base for fitting into the moonpool, penetrometer and retraction system was deployed on a combined power and hoist umbilical, reeled from a heave-compensated winch. A fixed sheave over the moonpool, also containing a metering block, was designed and fitted by BGS to allow handling, together with a hydraulic catcher and hiab crane at deck level to facilitate vibrocorer tethering and core barrel removal.

Gravity Core

A gravity corer with 2 and 3 metre long core barrels, plus rock barrels, was set up for deployment over the port side aft of the vessel, together with a launching shute and 'A' frame. A 14mm kevlar cable with hytril sheath was used for the gravity corer hoist line and a spare vibrocorer hydraulic pack, mounted with a staffa motor driven capstan on the rear of the shute, provided the bowsing for bringing the corer out and in.

Shipek Grab

A shipek-type grab was deployed via a davit on the starboard side aft using a 7mm diameter galvanised wire rope.

In addition, a box corer was on loan from RGD, Netherlands for the duration of the programme and a camera system and acoustic release trigger system were on hire for some of the time. The BGS photosea camera system was also carried but was not used.

Appendix II lists the BGS equipment together with a specification of its capability when used with an approved BGS handling system.

METHOD OF OPERATION

The ship held station for sampling using dynamic positioning. While vibrocoring the dynamic positioning was linked to a signal from a transponder mounted on the vibrocorer, or by deploying a clump weight taut wire system. The taut wire system could only be used in water depths up to 350 metres, thereafter the BGS transponders, capable of operation in up to 3000 metres water depth, were used. For gravity coring the dynamic positioning was used simply on joystick control, keeping the ship in harmony with the deployed cable to the gravity corer.

The ship crew comprised fifteen personnel and the BGS crew ten. The BGS crew was made up of a Senior Scientist, Duty Geologist, three Engineers, Data Manager, two Laboratory Geologists and two Deck Assistants, so arranged as to cover all activities over a twenty four hour working day of two twelve hour shifts. Two seamen also operated on a twelve hour shift basis with the BGS crew but the officers maintained a four-hourly watchkeeping system.

SURVEY RESULTS

Within the planned work area the survey was largely completed. A good spread of sample sites was obtained but some are gravity cores where vibrocores were specified during the sample planning stage. This is primarily due to bad weather and equipment problems dictating what could be used at any one time. The grab sampler was rarely used in the deeper water as a combination of bad weather and deep water generally precluded a sample being obtained as the bucket either hit the seabed at the wrong angle or the trigger fired prematurely due to the excessive accelerations and decelerations on the deployment wire. In addition to the regional mapping work, a geochemical sampling programme to the east of Shetland was carried out in periods of bad weather and some additional samples were collected for specific work in Foula and Lewis. Some low priority sample sites on Sula Sgier were not attempted.

In total, four hundred and fifty nine sites were occupied and a total of five hundred and thirty four samples collected. Table 1 shows the type and distribution of these samples according to map area. The table also indicates the map geologist who will be responsible for core examination and map production. All sampled material was Quaternary or Recent.

MAP AREA	VIBROCORES	GRAVITY CORES	GRABS	GEOLOGIST
SHETLAND		3 (incl. 1 box core)	53	Geochemistry
MILLER	50	86	105	C. Graham
FLETT	14	118	12	C. Graham
JUDD	39	51	-	C. Graham
FOULA	2	-	-	M. Stoker
LEWIS	2	-	-	D. Evans

Table 1 - Samples collected in 1986 survey programme. For location of map areas see Figure 1.

CONCLUSIONS

Appendix III gives a summary of ship activities during the charter period as percentages of the total charter. It is not intended to be a contractual document, neither does it take into account some of the sampling carried out while sheltering.

The ship worked well and proved extremely capable in bad weather conditions. Dynamic positioning and generator problems gave rise to significant ship downtime before they were resolved but this was adequately covered for contractually.

Autumn and winter working cannot be recommended as the times to conduct a sampling programme in North Atlantic waters. The operation in generally bad weather precluded the use of cameras and weather sensitive corers for most of the time and imposed severe strains on the equipment which was deployed. The vibrocorer winch drum bearings, spooling gear and umbilical itself all have to be renewed; largely as a result of pushing the equipment beyond its limit in order to get the job done.

The vibrocorer has been proved to 1500 metres water depth and performed well. There were problems with the transmission of the penetrometer signal to deck and with 60 Hz electrical frequency. The latter has been resolved using a convertor to 50 Hz, the former may require a different mode of transmission for the signals.

No problems were encountered with the gravity corer which works extremely well with the kevlar cable. It has operated at depths in excess of 1700 metres with a 3m core barrel. Larger barrels can be deployed but need an additional handling system for the barrel or a large deck space to hold a long shute to take the barrel completely inboard.

The shipek grab was virtually useless in water depths greater than 300 metres, despite trying to improve it with extra weight and a 'shroud'. Indications are that the shroud may have some application to dampen the motion in mid-water thereby reducing the possibility of premature triggering which was frequently a problem in bad weather.

The box corer and camera systems carried were only deployed on trial sites in sheltered waters and were not suitable for operations under routine and bad weather conditions. If such items are to be included in

a sample programme specification, then more time, consideration and expense has to be put into handling systems and due regard will also have to be given to extra waiting on weather for suitable deployment conditions.

The acoustic release system was carried to use on the box corer but was not deployed. The aim was to try and prevent premature (mid-water) triggering. In the event the box corer itself proved unsuitable and the whole system was therefore not used.

The fact that the primary survey was completed at all, at the time of year made available by late funding, was due entirely to the correct BGS ship selection, the decision to change to a new mode of vibrocorer deployment through the moonpool and an excellent work performance from the ship and BGS personnel.

APPENDIX I

SHIP SPECIFICATION

VESSEL'S GENERAL PARTICULARS AND EQUIPMENT SPECIFICATIONS

M.S. "KOMMANDOR SUB SEA"

Built 1986 by Nordsoevaerfted at Ringkobing, Yar No. 182.
Delivered August 1986.

Class - Lloyds Register of Shipping (+100A1, LMC, UMS, DPCM, Offshore Support Vessel).

Registered - London

Length O.A.	- 65.80 M	- 215.87 FT.
Beam	- 11.50 M	- 37.72 FT.
Draft	- 4.05 M	- 13.28 FT.
Freeboard	- 2.55 M	- 8.36 FT.
G.R.T.	- 1573 T	
Deadweight	- 870 T	
Bunker Capacity (Gasoil)	- 280 CU.M	
Water Ballast Capacity	- 588 CU.M	
Fresh Water Capacity	- 100 CU.M	(Plus F.W. Generator - 5 tons/24 hours)
Hold	- 150 CU.M	
Tweendeck	- 190 CU.M	
Cruising Speed/Consumption	- 13 Knots at 8 tons Gasoil/24 hours	
Economical Speed/Consumption	- 11.5 at 6 tons Gasoil/24 hours	
Gasoil Consumption on DIP	- at 5/6 tons Gasoil/24 hours	
Helideck	- rated for Puma SA30	
Accommodation	- 45 persons in single and double cabin	
Autonomy	- 3 months with full compliment	
D. P. System	- Kongsberg Albatross ADP100 with HPR Tracking Sonar	

M.S. "KOMMANDOR SUB SEA"

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Propulsion (Diesel-Electric)	-	4 x Deutz BA 12M 816U (707 BPH Each at 1800 RPM) Directly coupled to 4 x 500 KVA Generators all fully automatically starting/synchronising/load sharing/ shedding/stopping, on demand.
Propellers	-	2 x Hundested C.P. from 2 x 655 KW motors
Bollard Pull	-	20 tonnes
Thrusters Forrd	-	2 x Hundested producing 6 tonnes thrust each
Thrusters Aft	-	1 x Hundested producing 6 tonnes thrust each
Generators Aux'y	-	1 x 106 KVA Deutz 1 x 60 KVA Deutz
Moonpool	-	4.0 M x 4.0 M - Fitted expansion tanks for cranes (Aft portside workdeck) Hydraulic Offshore Crane 5 tonne at 14.5 M (Moonpool/workshop area) Gantry Crane (Travelling) 5 tonne SWL
Electrical Distribution	-	3 x 440V - 60Hz AC 3 x 240V - 60Hz AC 24V DC
Accommodation Boatdeck	-	8 single cabins for client Rep, Party Chief and 6 officers. All self-contained with toilet and bathroom.
Tweendeck	-	18 x 2 man cabins, each with toilet and bathroom.
Maindeck	-	Restaurant for 48 persons
Maindeck	-	Saloon with bar
Maindeck	-	T.V./Video Lounge
Bridgedeck	-	Operations, Control Office, Office, Conference Rooms. All foregoing and other public areas are fully air conditioned.
Hold Workshops	-	The hold doors are designed to accommodate euro pallets and forklift trucks. There are store rooms for charterers exclusive use and a well equipped workshop for joint use.

M.S. "KOMMANDOR SUB SEA"

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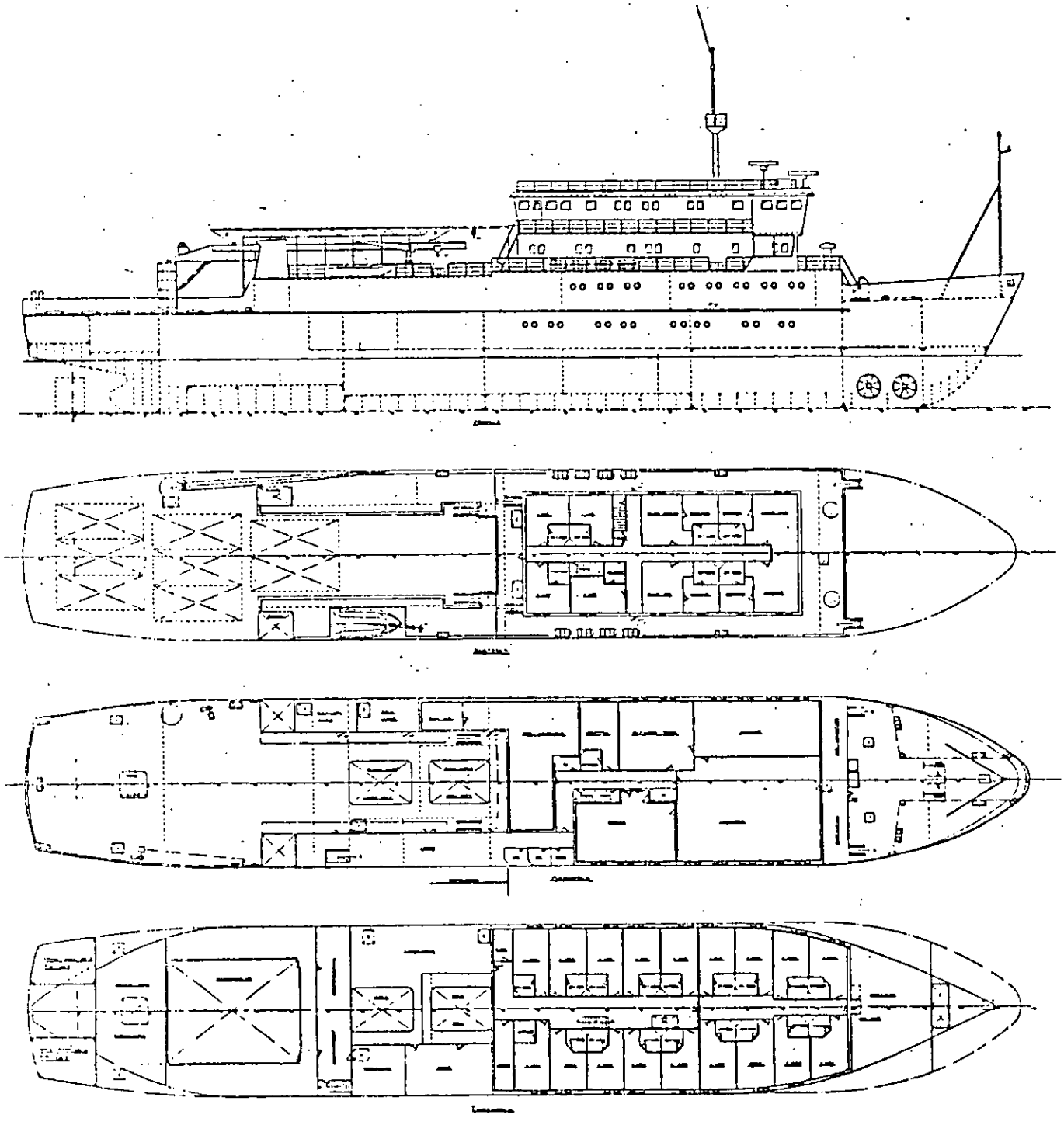
Communications/Navigation Equipment

Radar	- 1 Furono FR1211 fully stabilised interence suppressed with reflection plotter - 1 Furono FRC 1411 - Gyro stabilised
Log	- 1 Hokushin EML - 16B
Echo Sounder	- 1 Furcno FE 880
Gryo Compass	- 1 Kokushin CMZ 200
Closed Circuit T.V.	- 4 Cameras with lens wipers and heating for open deck use. 10 camera sockets and mountings at stragic points. 4 x monitors in Operations Room.
Public Address System	- with radio/tape/integrated general alarm to all public and working areas.
Intercomm	- Automatic telephone system - 35 lines with command priority override.
Radio Telephone	- 1 Skanti TRP 9750D 750 Watt SSB - Semi-Duplex
Telex	- 1 ISR ARQ TT1600 with memory
Telefax	- 1 TC 4001 (SSB and VHF interface)
Watch Receiver	- 1 Skanti WR6000
V.H.F. (1)	- 1 Sailor RT2047 - 25 Watt Duplex
V.H.F. (2)	- 1 Skanti TRP 2500 - 25 Watt Semi-Duplex
V.H.F. (Handheld)	- 1 Storno CQP 813U-1S Intrinsically safe with crystals for aircraft bands.
V.H.F. (Handheld)	- 2 Storno CQP 813U-1S Intrinsically safe with crystals for marine bands.
Lifeboat Radio	- 1 Skanti TRP-1 Marinetta

Kommandor Sub Lea



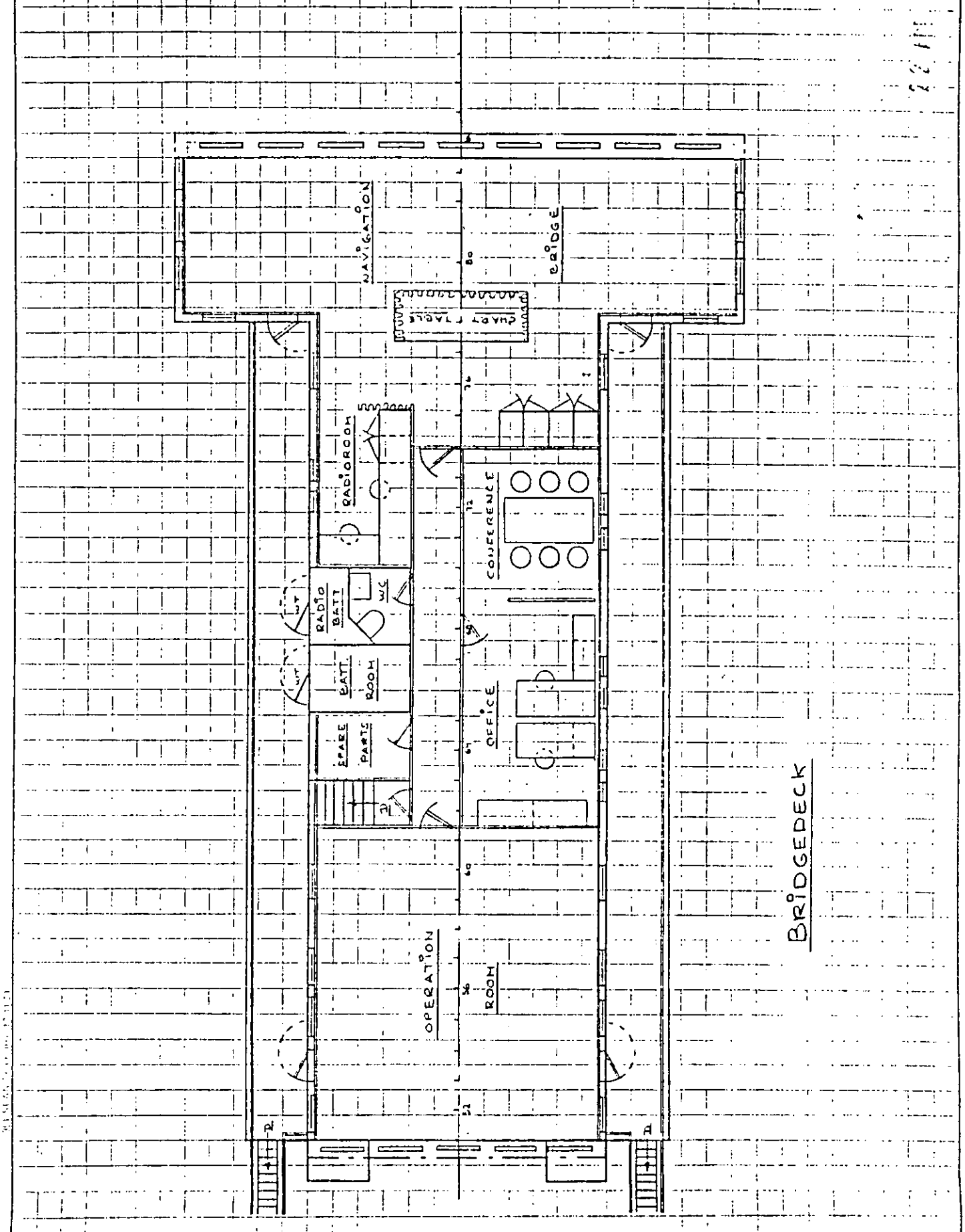
A/S Nordsøværftet, Ringkøbing, Danmark.

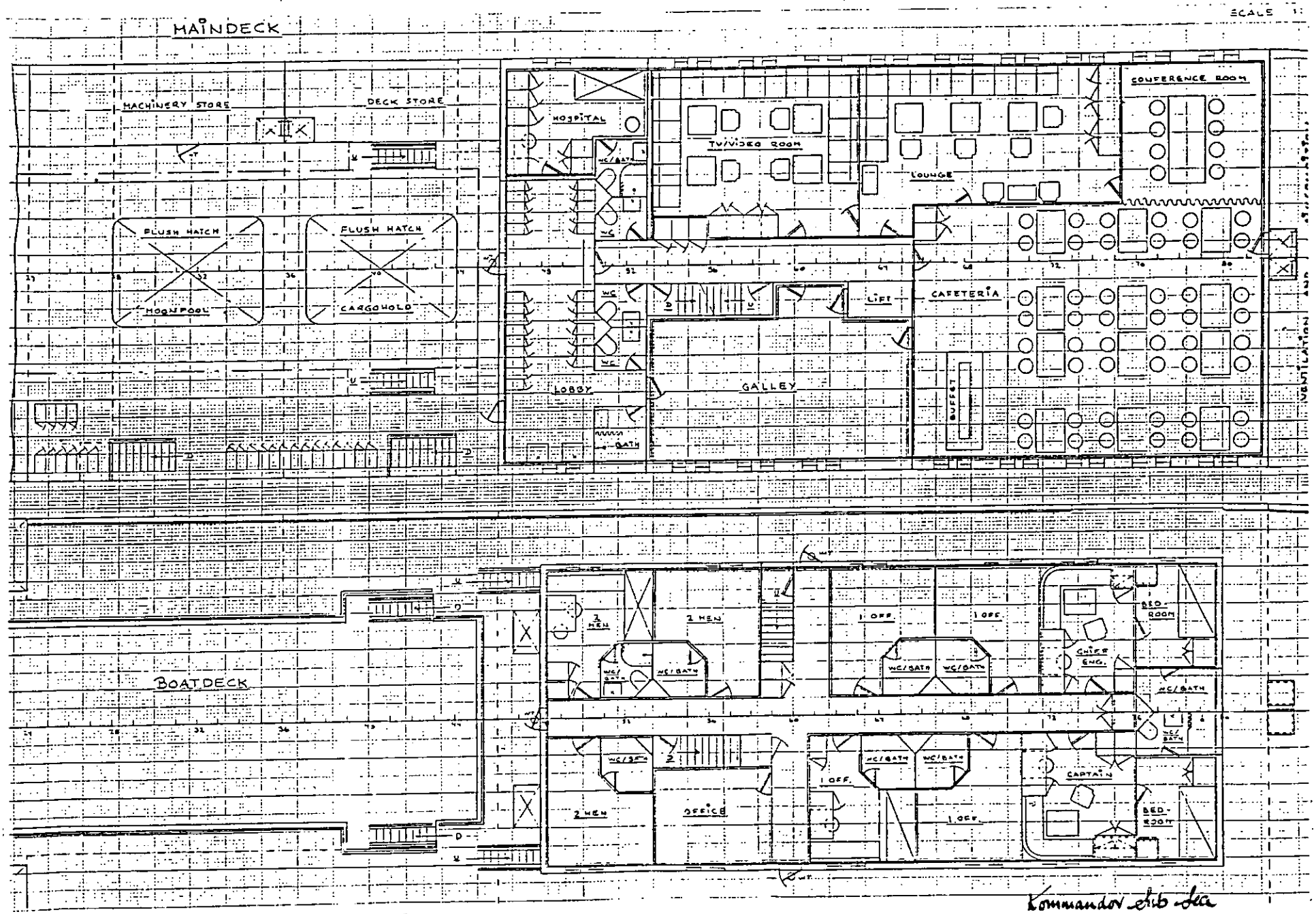
Dato: 11.04.85

STAND-BY AND SUPPORT VESSEL

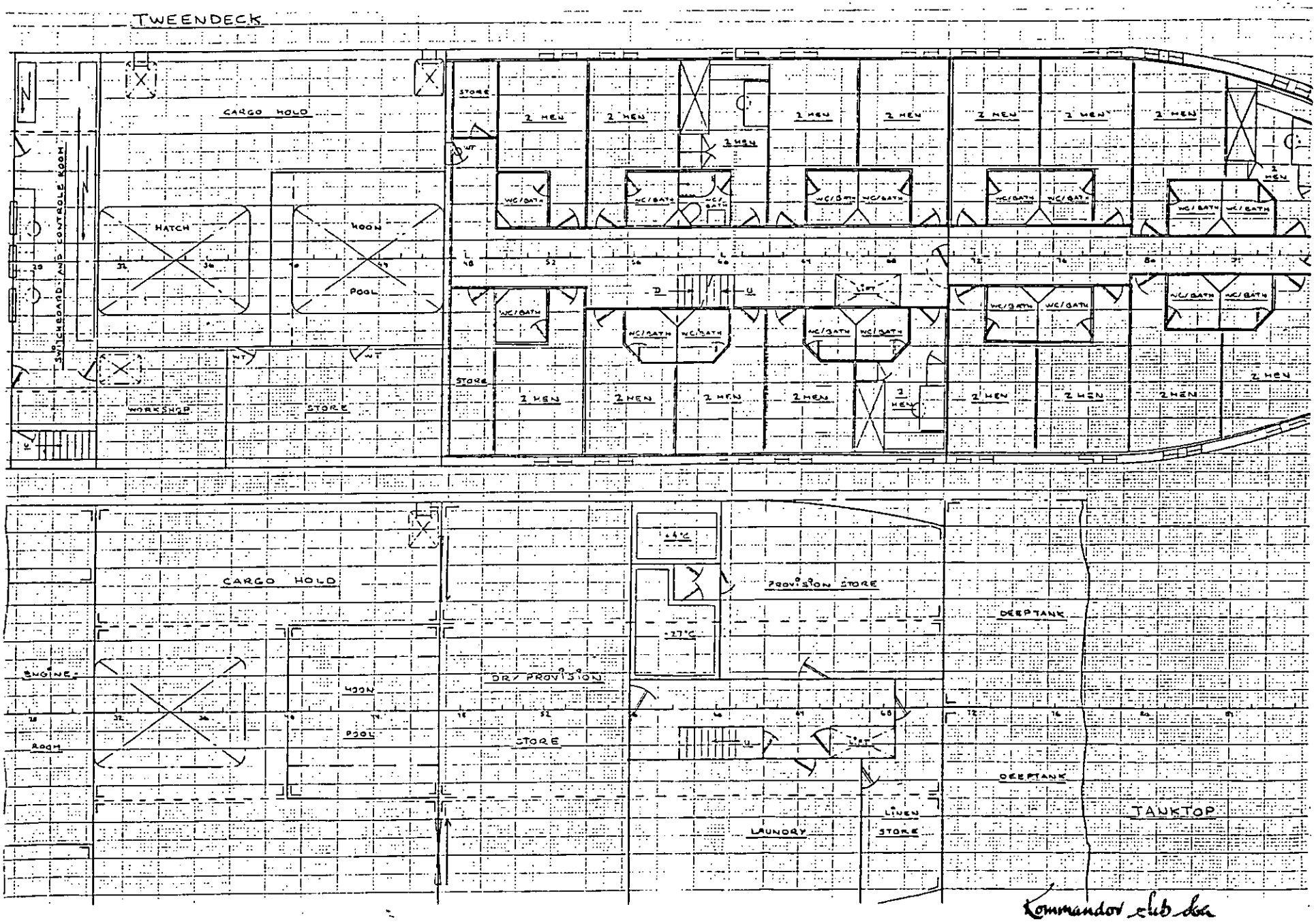
Skala: 1:100

Kommandør Sub Sea





Kommandor club Lea


TWEENDECK
CARGO HOLD
HATCH
ROOM
POOL
SWITCHBOARD AND CONTROLE ROOM
WORKSHOP
STORE
2 MEN
WC/BATH
LIFT
CARGO HOLD
ENGINE ROOM
POOL
+4°C
-27°C
PROVISION STORE
DEEPTANK
DRY PROVISION
STORE
LAUNDRY
LINEN STORE
DEEPTANK
TANKTOP
Kommandor club

APPENDIX II

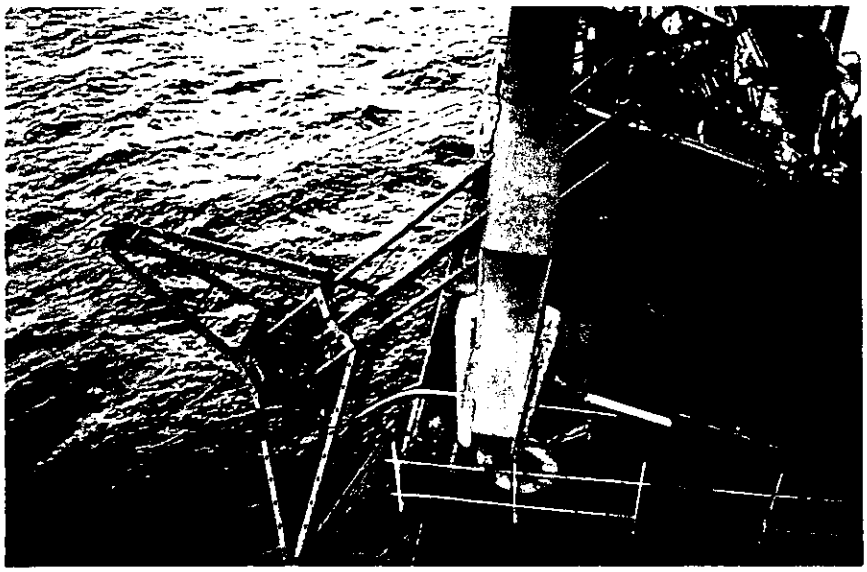
BGS EQUIPMENT

BRITISH GEOLOGICAL SURVEY

SAMPLING AND CORING OPERATIONS

VIBROCORER

Use: **Sampling sediments, including stiff and stoney clays, and soft rock to a penetration depth of 6 metres.**



Description: The vibrocorer consists of a twin vibrator motor housed in a pressure vessel driving a core barrel of 102 mm outside diameter with a vibration force of 6 tonnes at 50 Hz. The standard system weighing in the order of 3½ tonnes uses a 6 m barrel but smaller units with correspondingly lighter frames are available. A base mounted winch on the vibrocorer providing up to 12 tonnes withdrawal force enables full barrel retraction prior to recovery on the main lift wire. A penetrometer with a chart recorder and analog display gives a precise measure of penetration rate and depth. The power requirement is 30 kva 415 v 3 ph 50 Hz.

Sample: The samples are retrieved in a plastic liner tube of 83 mm internal diameter.

Operational depth: the system has been tested to depths in excess of 1,500 metres.

British Geological Survey
Marine Operations Research Programme
Murchison House
West Mains Road
Edinburgh EH9 3LA

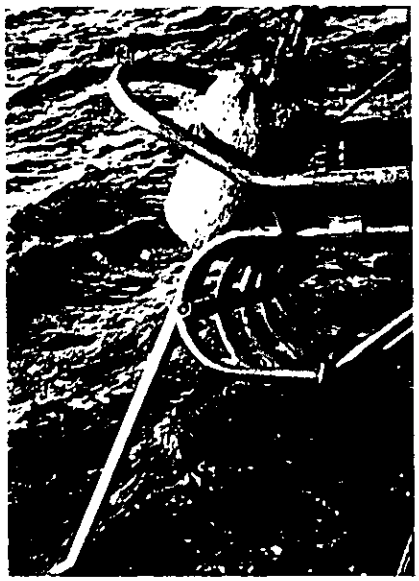
Telephone: 031-667 1000
Telex: 727343 SEISED G.

BRITISH GEOLOGICAL SURVEY

SAMPLING AND CORING OPERATIONS

GRAVITY CORER

Use: **To core unconsolidated sediments up to 6 metres below sea bed and rock at outcrop.**



Description: The gravity corer consists of a 500 kg lead weighted chassis with an attached sediment or rock core barrel that is lowered to approximately 20 metres above the sea bed before being allowed to free-fall. The sediment barrels are 70 mm or 102 mm outside diameter, up to 6 metres in length and have an inner plastic liner to retain the sample. A stainless steel core catcher in the cutting head and a butterfly valve in the corer chassis ensure maximum core retention.

An electro hydraulic winch, complete with metering system, enables the gravity corer to be lowered at an approximate speed of 150 metres per minute.

A buoyant braidline rope or a steel wire can be used with the gravity corer.

A special recovery chute enables the gravity coring operation to be carried out in safety in adverse weather conditions.

Sample: The sediment samples are retained in a plastic liner tube of 57 mm and 83 mm internal diameter.

Operational depth: The present winch system limits operations to 5,000 metres.

British Geological Survey
Marine Operations Research Programme
Murchison House
West Mains Road
Edinburgh EH9 3LA

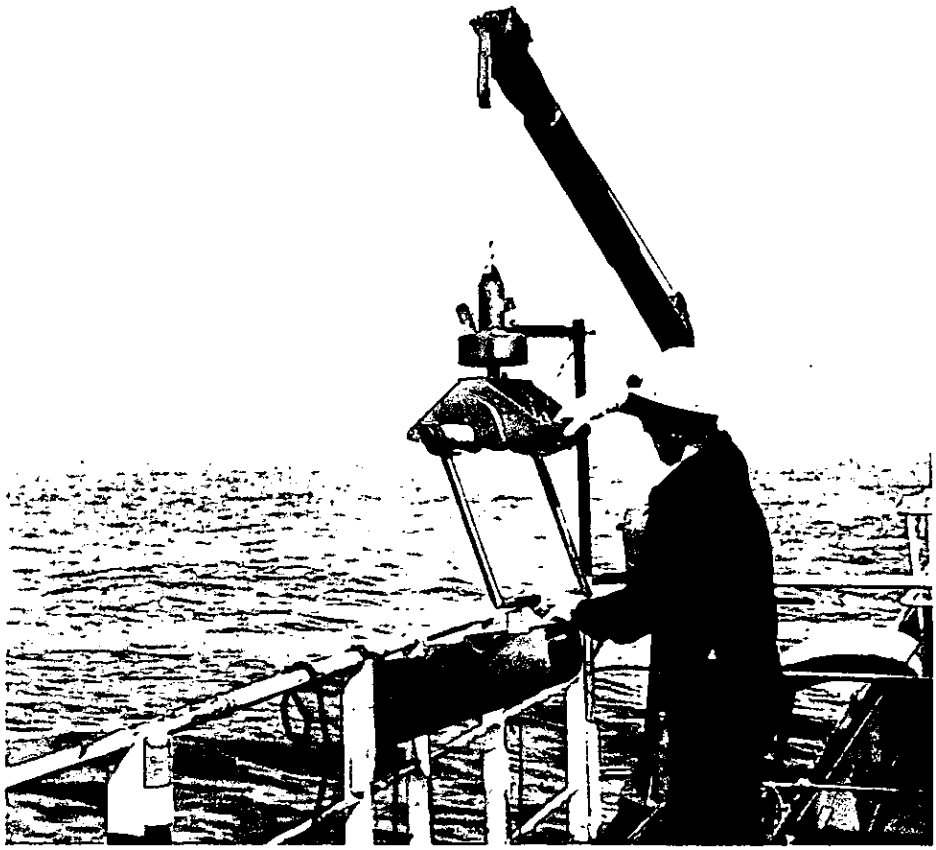
Telephone: 031-667 1000
Telex: 727343 SEISED G.

BRITISH GEOLOGICAL SURVEY

SAMPLING AND CORING OPERATIONS

SHIPEK GRAB

Use: **Sampling sea bed surface sediments.**



Description: The grab is spring loaded and cocked by a lever before being lowered to the sea bed. On contact with the seabed a trigger weight on the grab strikes a release lever and the bucket snaps shut to take a sample of the sea bed sediment.

An electro-hydraulic winch, complete with metering system, is used to lower the grab to the sea bed on a 6mm wire at a speed of 60-70 metres/minute.

Sample: Up to 2kg.

Operational depth: The present winch system limits operations to 3,000 metres.

British Geological Survey
Marine Operations Research Programme
Murchison House
West Mains Road
Edinburgh EH9 3LA

Telephone: 031-667 1000
Telex: 727343 SEISED G.

APPENDIX III

TIME UTILISATION ANALYSES

Notes to Accompany the graphs

1. The figures presented have no contractual significance.

2. Mobilisation and demobilisation are not shown as they were outwith the charter period.

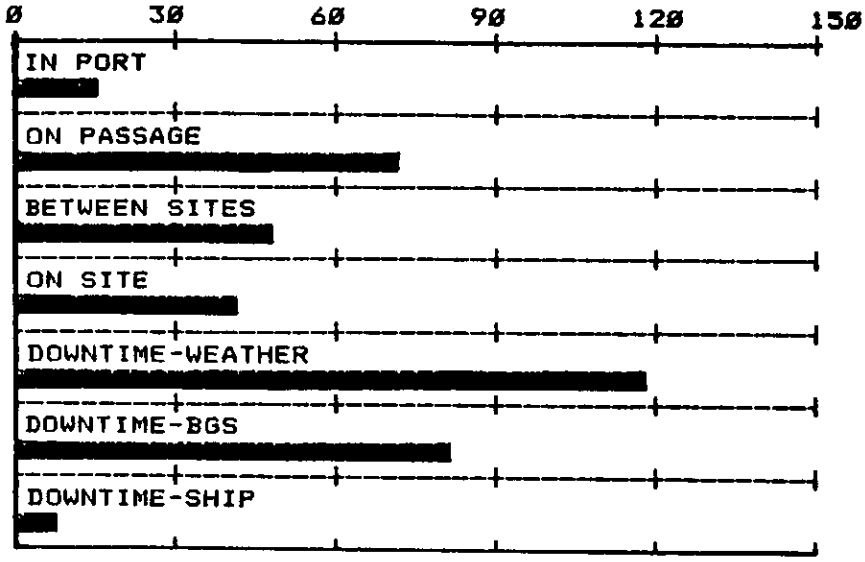
3. In port time was shared between legs using midnight of the arrival day as the changeover time.

4. On passage time is high on legs, 1, 5 and 6 as the ship sailed from, or to, a port well away from the work area.

5. BGS downtime on leg 1 included shakedown problems associated with the new moonpool operation and the heave compensation addition to the winch.

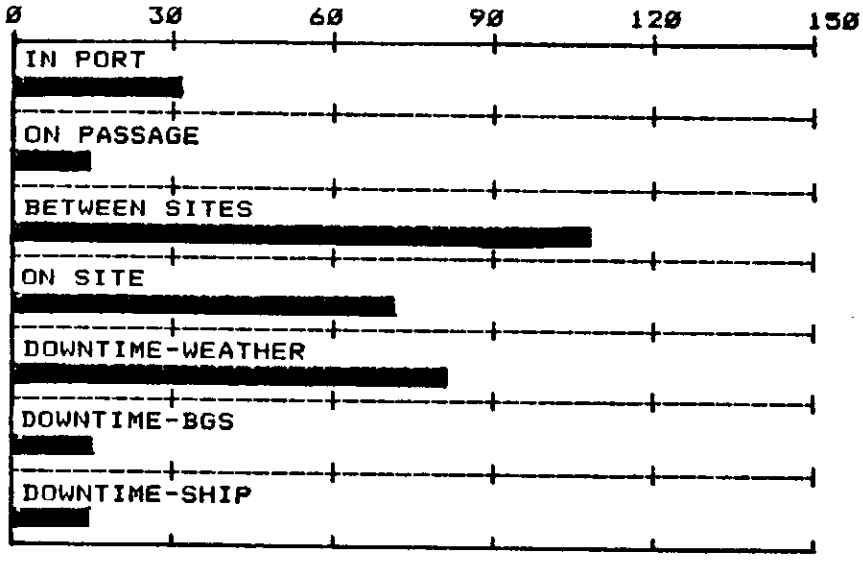
6. Leg 6 was for a shorter period than the other five and is the perid which used the shipdowntime accrued on earlier legs.

TIME UTILISATION ANALYSIS (HOURS) - LEG 1



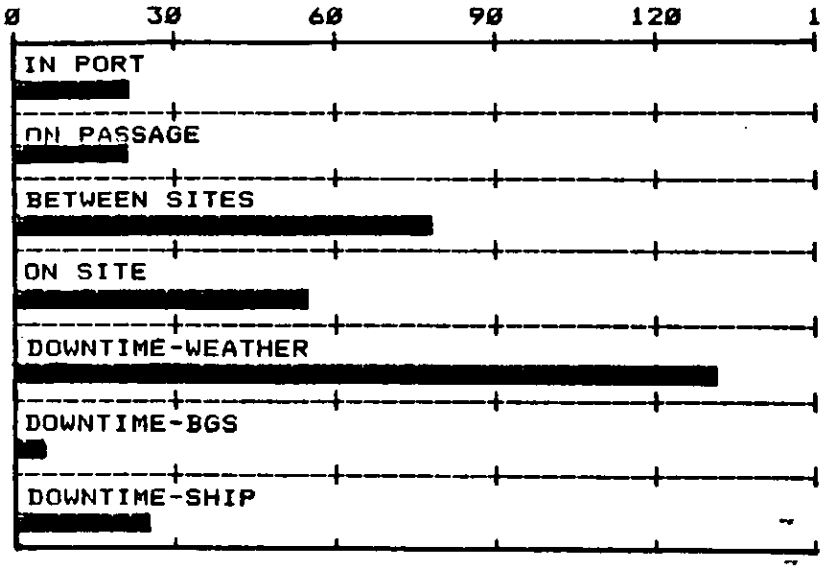
	% OF TOTAL
IN PORT	3.90
ON PASSAGE	18.8
BETWEEN SITES	12.5
ON SITE	10.5
DOWNTIME-WEATHER	30.8
DOWNTIME-BGS	21.4
DOWNTIME-SHIP	1.95

TIME UTILISATION ANALYSIS (HOURS) - LEG 2



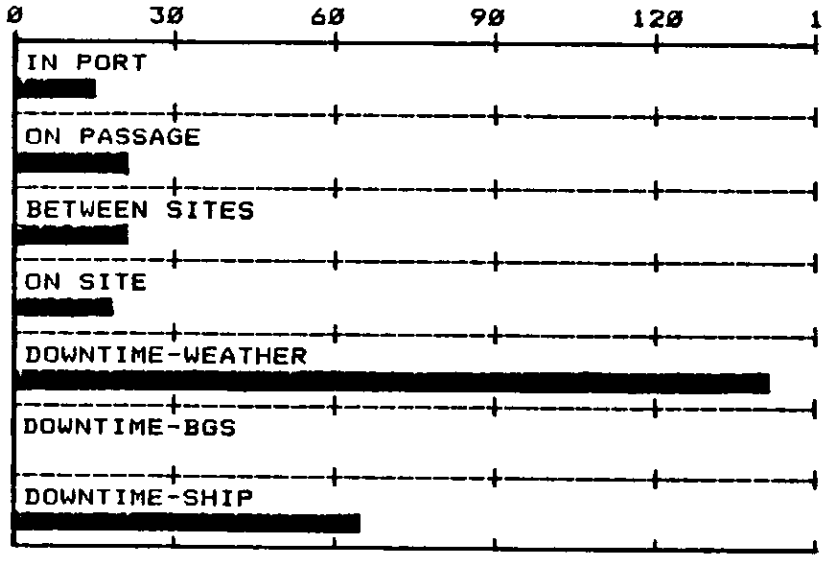
	% OF TOTAL
IN PORT	9.58
ON PASSAGE	4.85
BETWEEN SITES	31.8
ON SITE	20.9
DOWNTIME-WEATHER	23.9
DOWNTIME-BGS	4.01
DOWNTIME-SHIP	4.76

TIME UTILISATION ANALYSIS (HOURS) - LEG 3



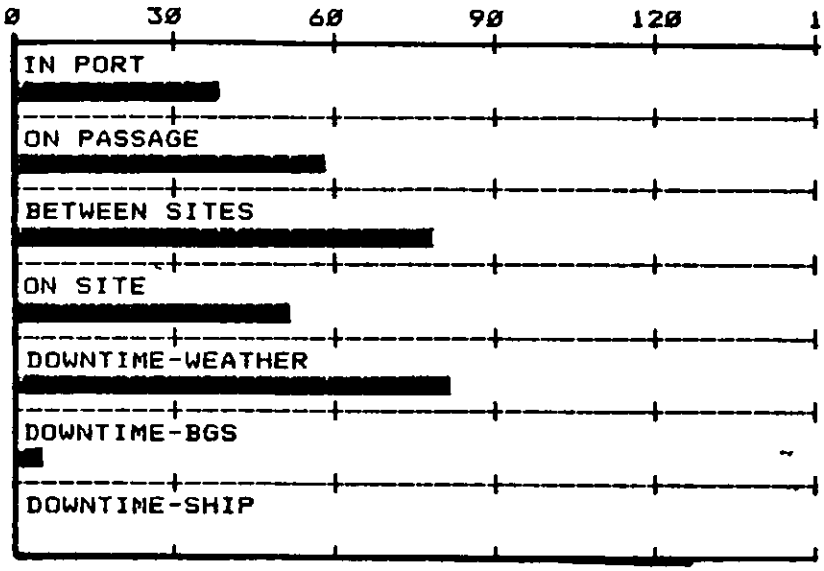
	% OF TOTAL
IN PORT	6.91
ON PASSAGE	6.78
BETWEEN SITES	22.9
ON SITE	16.6
DOWNTIME-WEATHER	38.8
DOWNTIME-BGS	.297
DOWNTIME-SHIP	7.58

TIME UTILISATION ANALYSIS (HOURS) - LEG 4



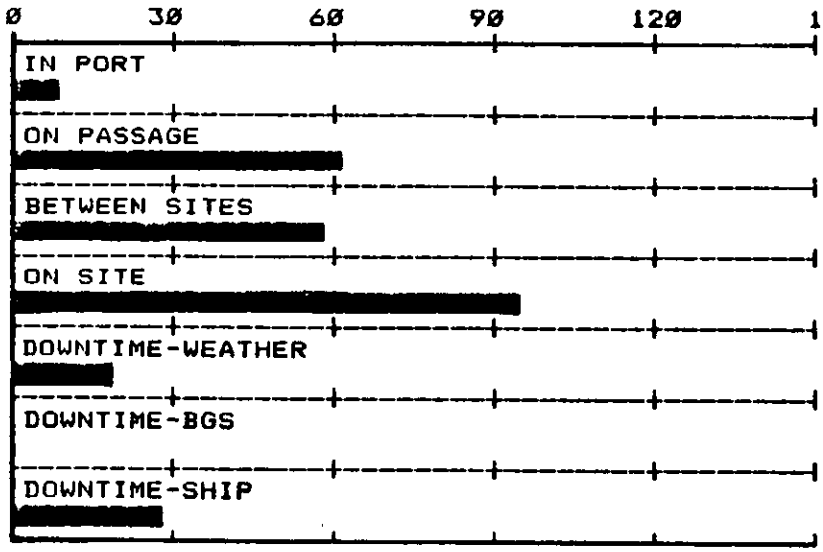
	% OF TOTAL
IN PORT	5.72
ON PASSAGE	7.81
BETWEEN SITES	7.43
ON SITE	6.80
DOWNTIME-WEATHER	49.0
DOWNTIME-BGS	0
DOWNTIME-SHIP	23.1

TIME UTILISATION ANALYSIS (HOURS) - LEG 5



	% OF TOTAL
IN PORT	12.3
ON PASSAGE	18.5
BETWEEN SITES	25.1
ON SITE	16.4
DOWNTIME-WEATHER	25.7
DOWNTIME-BGS	1.76
DOWNTIME-SHIP	0

TIME UTILISATION ANALYSIS (HOURS) - LEG 6



	% OF TOTAL
IN PORT	3.30
ON PASSAGE	23.1
BETWEEN SITES	21.6
ON SITE	34.9
DOWNTIME-WEATHER	6.98
DOWNTIME-BGS	0
DOWNTIME-SHIP	9.92

TIME UTILISATION ANALYSIS (HOURS) - TOTAL CHARTER