

## 机电词汇

### 2. 数据与资料 Data and Information

#### 数据

总长	Length overall(LOA)
垂线间长	Length bet. perpendiculars (LBP)
首、尾垂线	Forward and after perpendiculars
型宽	Moulded breadth
型深	Moulded depth
建造日期	Date of build
签订建造合同日期	Date of building contract
龙骨安放日期	Date of keel laid
交船日期	Date of delivery
下水日期	Launching date
重大改建	Major conversion
安放龙骨或船舶处于相似建造阶段的日期	Date on which keel was laid or ship was at a similar stage of construction
签订改建合同日期	Date of conversion contract
改建完工日期	Date of completion of conversion
船舶所有人	Owner
经营人	Operator
承租人	Charterer
船舶编号或呼号	Distinctive number or letters
航行区域	Navigation area/Service area/Trade area
曾用过的船名	Former Name
姐妹船	Sister Ship
总吨位	Gross tonnage
净吨位	Net tonnage
排水量	Displacement
载货量	Cargo weight
载重量	Deadweight
空船重量	Light(-ship) weight
吃水(首、尾、平均)	Draft ( fwd, aft, mean)
稳性	Stability
完整稳性	Intact stability
破舱稳性	Damaged stability
分舱(抗沉性)	Subdivision
初稳性高度	Metacentric height
衡准数	Criterion numeral
剖面模数	Section modulus

惯性矩	Moment of inertia
纵总强度	Longitudinal strength
局部强度	Local strength
方形系数	Block coefficient
静水弯矩	Still water bending moment
重心垂直高度	Vertical height of centre of gravity
屈服应力	Yield stress
标准舷弧	Standard sheer
防火分隔	Fire division
航区限制	Navigation area restriction
海况限制	Sea state restriction
天气限制	Weather restriction
最大抗风暴能力	Max. weatherliness
储备浮力	Reserve buoyancy
续航力	Endurance
渗透率	Permeability
盲区	Blind area
共振区域	Resonance region
容许载荷	Permissible load
核定载客数	Number of persons certified to carry
干舷:	Freeboard
热带干舷	Tropical freeboard
夏季干舷	Summer freeboard
冬季干舷	Winter freeboard
北大西洋冬季干舷	Winter North Atlantic freeboard
热带木材干舷	Timber tropical
夏季木材干舷	Timber summer
冬季木材干舷	Timber winter
北大西洋冬季木材干舷	Timber winter North Atlantic freeboard
淡水宽限	Allowance for fresh water
减少干舷的 B 型船舶	Type B with reduced freeboard
增加干舷的 B 型船舶	Type B with increased freeboard
载重线:	Load line
载重线标志	Loadline marks

## (二) 缺陷与损坏的类别与原因

缺陷	defects, deficiencies
制造中缺陷	defects in(during) manufacturing
潜在缺陷	latent (potential 可能的) defects
金属分层	lamination

金属疲劳 fatigue

金属疏松 porosity

如：汽缸套内表面发现金属疏松。

The inner surface of cyl. liner was found porous about XXxXX in area.

如：条状疏松

found to have porosity in strips.

如：气孔

gas porosity

空泡 cavity

气孔 gas cavity

疏松 slag(熔渣) cavity

砂眼 sand cavity

如：螺旋桨有严重的空泡腐蚀

Propeller blades pitted seriously due to cavitation erosion.

缩孔 shrinkage hole

如：断口表面的材料进行了外观检查，发现有七处疏松和二处直径 10 毫米缩孔的缺陷。

The material at the broken surface was visually examined and found with defects of 7 slag cavities and 2 Φ10mm shrinkage holes.

冷隔 cold shuts

结疤 scabs

误差 error

未装 not fitted

如：由于主润滑油泵出口至各分路管上没有调节阀各分路润滑油压力不能调节

L.O. pressure in branch pipes was incapable of being regulated due to no regulating valves being fitted in branch pipes from the output side of main L.O. pump.

未备有 not provided, not available

如：由空气瓶至各柴油发电机组的分路管路上没有截止阀

No stop valves was provided in branch pipes from air vessels to each diesel generating set.

不齐全、不完整 incomplete

不足 insufficient

不足、缺少 deficient

如：冰箱冷量不足

One refrigerator in the Chief Engineer's cabin was deficient in cool capacity.

如：冷藏舱的绝缘有缺陷，以致后舱壁上有冷凝水出现

The insulation of the refrigerating chamber in No.4 cargo hold was deficient so that much condensed water appeared on the aft bulkhead of No.3 cargo hold

缺少 short of

如：起货柱扶梯上端的工作平台未装有保险活动盖板

The working platform at the upper ends of the 4 kingpost ladders was short of hinged covers.

如：重型吊杆的钢索卷车其刹车装置缺少加滑油孔

Two wire reels for the heavy derrick, their brake devices were short of lub. oil filling holes.

如：碱性蓄电池组缺少一节应予以配齐。

The alkaline battery, which was short of one unit, should be completely provided.

遗漏、省去 omitted

如：驾驶室和船长舱室内的部分航海仪器在安装部位处的镶边遗漏。

The inserts of the partial navigation instruments in the wheelhouse and the Captain's cabin omitted in way of the fitting parts.

遗漏、疏忽 neglected

遗失 missing, lost

如：离合器操纵杆的锁销遗失，已用螺栓代替。

The locking pin for the control lever of clutch was missing and had been replaced with one bolt.

如：右锚链第一节拉断，右锚失落。

The std side chain cables were broken at its 1st length and the std side anchor lost.

冲走 washed overboard

易于 liable to, apt to

如：轻型吊杆 24 只起货滑车及导向滑车，因滑轮与外壳间隙太大，使用时经常夹在里面  
Cargo blocks and guide blocks for the light derricks, 24 pcs in total, the steel wire rope is liable to be caught due to excessive play between the sheave and the cheeks.

如：左、右两付吊艇架在救生艇降艇时，均产生卡住情况

Port & std lifeboat davits, 2 pairs in total, are all liable to be caught while the lifeboats being launched.

如：铁易生锈

Iron is apt to rust.

不便

如：钢索滚筒离合器的离合操作不便。

The clutch of the wire drum was inconvenient to operate.

如：右舷舷梯钢索滑车油嘴在外侧，加油不方便。

The nipple for std gangway lifting block was located outside and was not liable to be used for greasing.

如：外档滚筒油嘴的方向不便加油。

The nipple for greasing the outside roller was inaccessible to grease.

堵塞 blocked

如：舱底水管路被散装锌矿砂堵塞

The bilge pipeline of the said hold was blocked by the zinc ores in bulk.

如：经拆检，发现该增压器的轴承壳裂开，冷却水渗漏，轴承及其密封为冷却水结垢物充塞。

After dismantling, the bearing casing of the turbo-charger was found cracked and leaky and a large amount of chemical crystal deposit from cooling water blocking the bearing and its sealing arrangements.

如：卡在 1 螺旋处

blocked at No.1 screw

卡住 caught

如：第 2 货舱口左侧重型吊杆的升降机，起 8 吨重用的传动小齿轮铜衬裂缝，换挡时经常卡住

The lifter of the heavy derrick at the port side of the No.2 cargo hatch, the brass bush of the pinion for lifting weight of 8 tons cracked and always caught while revolution stage being shifted.

封没 blanked

如：所有位于上甲板舱口间的货舱通风筒都拆下，然后用钢板作永久性封闭。

All ventilators for cargo hold situated bet. hatches on upper deck were removed, and blanked permanently with steel plates.

闷塞 plugged

脱出 slipped out

如：离合器手柄的定位插销经常脱出。

The set pins of the handles for the clutch often slipped out.

跌落 dropped (down)

如：在吊好第三块舱盖板后，空杆落至甲板。

After the 3rd hatch cover being heaved up, the derrick without sling of cargo dropped down to the deck.

失灵 out of order

如：付食冷藏用的第一和第三号压缩机的控制系统失灵

Control systems of Nos.1 and 3 compressors for the refrigeration of food provisions were out of order.

不活络

不活络 unmovable, badly movable, not freely

活络 movable, making free

如：轻型吊杆的吊货滑车和导向滑车的滑轮不活络，滑轮槽太窄，以致起货索经常滑出，许多滑车和起货索因此而损坏

Cargo blocks and guide blocks of the light derricks, of which the sheaves ran not freely and grooves of sheaves were too shallow, so that the cargo runners slipped out very often and thus many blocks and cargo runners were damaged.

润滑欠佳 poorly greased  
badly lubricated

(缺乏 be devoid of)

不润滑 devoid of lubrication

不整齐 untidy

杂乱 in a mess

安装不正确（指小型的装置设备）fitted incorrectly

安装不正确（指较大的装置设备）installed incorrectly

如：三台发电机组的手动滑油泵因装置不当，无法使用

Lub. oil manual pumps for three generating sets were unfit for use because of being fitted incorrectly.

## 2. 无线电设备 Radio Equipment

无线电台 Radio station

无线电台（救生艇手提式） Radio apparatus

无线电通信设备 Equipment for radiocommunication

无线电装置 Radio installation

甚高频无线电装置 VHF radio installation

(very high frequency radio installation)

中频无线电装置 MF radio installation

(medium frequency radio installation)

中/高频无线电装置 MF/HF radio installation

(medium/high frequency radio installation)

国际海事卫星组织船舶地面站 INMARSAT SES

(International Maritime Satellite Organization ship earth station)

遇险报警辅助设施 Secondary means of distress alerting

接收海上安全信息的设备 Facilities for reception of maritime safety information

应急无线电示位标 EPIRB

(emergency position-indicating radio beacon)

极轨道卫星 COSPAS-SARSAT

国际海事卫星 INMARSAT

甚高频数字选择呼叫 VHF DSC  
卫星应急无线电示位标 Satellite EPIRB  
甚高频应急无线电示位标 VHF EPIRB  
救生用无线电通信设备 Life-saving radio communication apparatus  
双向甚高频无线电话设备 Two-way VHF radiotelephone apparatus  
甚高频无线电话 VHF radiotelephone  
声力电话 Sound powered telephone  
对讲电话 Walkie talkie  
数字选择性呼叫编码器 DSC encoder  
(digital selective calling encoder)  
数字选择性呼叫值班接收机 DSC watch receiver  
(digital selective calling watch receiver)  
窄带印字电报 NBDP radiotelegraphy  
(narrow band direct printing radiotelegraphy)  
高频窄带印字电报 HF NBDP radiotelegraphy  
直接印字电报 Direct-printing radiotelegraphy  
航行警告电传接收机 NAVTEX receiver  
加强群呼接收机 EGC receiver  
高频直接印字无线电报接收机 HF direct-printing radiotelegraphy receiver  
船用雷达应答器 Ship's radar transponder

无线电导航设备 Radio navigational equipment

雷达 Radar  
环视雷达 All-round looking radar  
(海上)避碰雷达 Anticollision radar  
自动跟踪雷达 Automatic-tracking radar  
信标雷达 Beacon radar  
探测雷达 Detection radar  
搜索雷达 Search radar  
警戒雷达 Warning radar  
罗经 Compass  
主罗经 Master compass  
磁罗经 Magnetic compass  
电罗经 Gyro compass  
操舵罗经、驾驶罗经 Steering compass

灵敏度 Sensitivity  
谐振 Resonance

天线 Antenna

仿真天线 Artificial antenna  
定向天线 Directional antenna

环状天线	Loop antenna
鞭状天线	Whip antenna
室外天线	Outdoor antenna
雷达天线	Radar antenna
无线电天线	Radio antenna
接收天线	Receiving antenna
发射天线	Transmitting antenna

### 3. 发电机和电动机

#### 发电机 Generator

##### 原动机 Prime mover

发电机组	Generating set
主发电机	Main generator
辅助发电机	Auxiliary generator
应急发电机	Emergency generator
备用发电机	Reserve (stand-by) generator
直流发电机	D.C. (Direct current) generator
交流发电机	A.C. (Alternating current) generator
无刷发电机	Brushless generator
轴带发电机	Shaft-driven generator
柴油(机驱动)发电机	Diesel (-driven) generator
燃气轮机(驱动)发电机	Gas turbine (driven) generator
防滴式发电机	Drip-proof generator
电动发电机	Electric motor generator
三相发电机	Three-phase generator
多相发电机	Polyphase generator
单极发电机	Unipolar generator
串励发电机	Series generator
并励发电机	Shunt generator
复励发电机	Compound wound generator
自励发电机	Exciterless generator
恒流发电机	Constant current generator
恒速发电机	Constant speed generator
恒功率发电机	Constant power generator
恒压发电机	Constant voltage generator
自励恒压式交流发电机	Self-regulated type A.C. generator
并联运行直流发电机	D.C. generator running in parallel

#### 发生器 Generator

泡沫发生器	Froth (foam) generator
惰性气体发生器	Inert gas generator



脉冲发生器 Pulse generator  
信号发生器 Signal generator  
涡流发生器 Vortex generator  
造波机 Wave generator

电动机 Motor,  
Electric motor  
交流电动机 A.C. (alternating-current) motor  
直流电动机 D.C. (direct-current) motor  
多相异步电动机 Polyphase asynchronous motor  
多相凸极同步电动机 Polyphase salient synchronous motor  
多相隐极同步电动机 Polyphase non-salient synchronous motor  
多相异步结构同步电动机 Polyphase asynchronous construction synchronous motor  
自动同步电动机 Auto-synchronous motor  
电容式电动机 Capacitor motor  
整流子电动机 Commutator motor  
变极电动机 Change-pole motor  
变速电动机 Change-speed motor  
复励电动机 Compound motor  
差励电动机 Differential motor  
排斥电动机 Repulsion motor  
可逆电动机 Reversible motor  
感应电动机 Induction motor  
伺服电动机 Servo motor  
通用电动机 Universal motor  
全封闭式电动机 Totally-enclosed motor  
分相电动机 Split-phase motor  
调速电动机 Varying-speed motor  
驱动电动机 Drive (driving) motor  
控制电动机 Control motor  
电动机架 Motor frame  
电动机壳 Motor casing(shell)

换向器 Commutator  
整流子片 Commutator segment

#### 4. 配电系统 Distributing system

直流双线绝缘系统  
D.C. two wire insulated system  
直流负极接地的双线系统  
D.C. two wire system with negative pole earthed  
直流利用船体作负极回路的单线系统  
D.C. single wire system with negative to hull return

交流单相双线绝缘系统

A.C. single phase two wire insulated system

交流单相一线接地的双线系统

A.C. two wire system with one pole earthed

交流单相一线利用船体作回路的单线系统

A.C. single wire system with hull return

交流三相三线绝缘系统

three phase A.C. three wire insulated system

交流三相中性点接地的四线系统

three phase A.C. four wire system with neutral earthed

交流三相利用船体作中性线回路的三线系统

three phase A.C. three wire system with neutral earthed and the hull serving as neutral wire

主电源 Main source of power

应急电源 Emergency source of power

蓄电池组 Accumulator battery

应急蓄电池组 Emergency accumulator battery

临时应急蓄电池组 Temporary accumulator battery

蓄电池 Accumulator, battery

充电 charge

放电 discharge

电压 Voltage

电压降 Voltage drop

电流

满载电流

起动电流 Current

Full load current

Starting current

频率 Frequency

绝缘电阻 Insulation resistance

电容 Capacity

电极 Polarity

电枢 Armature

电位、电势（差） Potential (difference)

电耦合 Electric coupling

电平 Level

电键 Key

电刷 Brush

电网 Electrical network

负荷 Load

矽钢片 Silicon steel sheet

电瓶车 Electromobile

汇流排

## Busbar

主汇流排	Main busbar
分区配电板汇流排	Sub-switchboard busbar
裸主汇流排	Bare main busbar
均压汇流排	Phase (pole) busbar
中性线汇流排	Equalizer busbar
相（极）汇流排	Neutral busbar
直流汇流排	D.C. busbar
交流汇流排	A.C. busbar
裸线	Bare conductor
接地线	Earth connection
中性线	Neutral wire
正极	Positive pole
负极	Negative pole

## 配电板

### Switchboard

主配电板	Main switchboard
电力推进装置配电板	Switchboard for electric propulsion installation
应急配电板	Emergency switchboard
蓄电池充放电板	Battery charging and discharging board (panel)
分配电板	Distribution board
区配电板	Section board
控制屏	Control panel

## 绕组 Winding

定子绕组	Stator winding
转子绕组	Rotor winding
整流绕组	Commutating winding
励磁绕组	Exciting winding
补偿绕组	Compensating winding
复激绕组	Compound winding
同心绕组	Concentric winding
合成绕组	Concentrated winding
阻尼绕组	Damping winding
差动绕组	Differential winding
磁场绕组	Field winding
多层绕组	Multi-layer winding
低压绕组	Low-voltage winding
前进绕组	Progressive winding
后退绕组	Retrogressive winding
串激绕组	Series winding

并激绕组	Shunt winding
并联绕组	Parallel winding
分级绕组	Step winding
电枢绕组	Armature winding
重迭绕组	Cumulative winding

#### 保护 Protection

过载保护	Overload protection
逆功率保护	Reverse power protection
欠压保护	Under voltage protection
断路保护	Short circuit protection
过电流保护	Protection against excess current
阴极电流保护装置	Cathodic current protection

#### 振荡 Oscillation

电振荡	Electric oscillation
电磁振荡	Electromagnetic oscillation
强迫振荡	Forced oscillation
自由振荡	Free oscillation
谐波振荡	Harmonic oscillation
弛张振荡	Relaxation oscillation
高频振荡	High frequency oscillation

### 5. 变流机、变压器、收发送机等以及开关

#### 变流机 Converter

变流机组	Converter set
充电变流机	Charging converter
探照灯变流机	Searchlight converter
透平变流机	Turbo converter

#### 变压器 Transformer

风冷式变压器	Air blast transformer
气冷式变压器	Air-cooled transformer
耦合变压器	Couple transformer
升压变压器	Booster transformer
级联变压器	Cascade transformer
恒流变压器	Constant-current transformer
配电变压器	Distribution transformer
三相变压器	Three-phase transformer
三(芯)柱变压器	Three-column transformer
三绕组变压器	Three-winding transformer
灯丝变压器	Filament transformer
仪量变压器	Potential transformer

调节变压器 Regulating transformer  
串联变压器 Series transformer  
静电变压器 Static transformer  
抽头（多节）变压器 Tapped transformer  
降压变压器 Step-down transformer  
增压变压器 Step-up transformer

发射机、发送机 Transmitter  
雷达发射机 Radar transmitter  
无线电发送机 Radio transmitter  
舵角发送机 Rudder angle transmitter  
液压(功率)发送机 Hydraulic (power) transmitter  
自差确定信号发送机 Calibration transmitter  
方位发送机 Bearing transmitter  
差动式同步发送机 Selsyn differential transmitter  
距离及偏差发送机 Range and deflection transmitter  
定向发送机 Directional transmitter  
调频发送机 Frequency modulation transmitter  
干扰发射机 Jamming transmitter  
转数发送机 Revolution transmitter  
激光发射机 Laser transmitter  
声纳发射机 Sonar transmitter  
主发射机 Main transmitter  
备用发送机 Reserve transmitter  
视频发射机 Video transmitter  
发报机 Telegraph transmitter  
中短波发信机 Medium-short wave transmitter

接收机 Receiver  
交流接收机 A.C. (alternating current) receiver  
自差式接收机 Autodyne receiver  
声接收机 Acoustic receiver  
全波接收机 All-wave receiver  
无线电接收机 Radio receiver  
无线电信标接收机 Radio beacon receiver  
罗经接收机 Compass receiver  
雷达接收机 Radar receiver  
舵角接收机 Rudder angle receiver  
跟踪接收机 Track receiver  
自动同步接收机 Selsyn receiver  
目标方位接收机 Target bearing receiver  
超外差接收机 Superheterodyne receiver  
单通道接收机 Single-channel receiver  
单频收音机 Single-frequency receiver

单回路接收机	Single-circuit receiver
单边带接收机	Single-sideband receiver
脉冲压缩接收机	Pulse compressive receiver
气象传真接收机	Radio weather facilities

#### 收发器 Transceiver

#### 调整器 Regulator

电压调整器	Voltage regulator
自励恒压装置	Self-excitation voltage regulator
自动调整器	Automatic regulator
供水调整器	Feed water regulator
电流调整器	Current regulator
励磁调整器	Field regulator
相位调整器	Phase regulator
电位调整器	Potential regulator
分级调整器	Step voltage regulator
温度调整器	Temperature regulator

#### 整流器 Rectifier

铝整流器	Aluminum rectifier
固体整流器	Dry rectifier
全波整流器	Full-wave rectifier
半波整流器	Half-wave rectifier
汞(水银)整流器	Mercury rectifier
汞弧整流器	Mercury-arc rectifier
硒整流器	Selenium rectifier
可控硅整流器	Silicon-controlled rectifier
硅整流器	Silicon rectifier
硫化物整流器	Sulphide rectifier
振动整流器	Vibrating rectifier

#### 继电器 Relay

辅助继电器	Auxiliary relay
闭(联)锁继电器	Block relay
离心继电器	Centrifugal relay
闭合(合闸)继电器	Closing relay
控制继电器	Control relay
电流继电器	Current relay
定时限继电器	Definite time relay
隔离继电器	Disconnecting relay
吸持继电器	Holding relay
阻抗继电器	Impedance relay
脉冲继电器	Impulse relay

感应式继电器	Induction relay
瞬动继电器	Instantaneous relay
联锁继电器	Interlocking relay
中和继电器	Neutral relay
失压继电器	No-volt relay
速动继电器	Quick-acting relay
速放继电器	Quick-releasing relay
逆电流继电器	Reverse current relay
逆功率继电器	Reverse power relay
反相继电器	Reverse-phase relay
短路继电器	Short-circuit relay
热继电器	Thermal relay
热电子继电器	Thermionic relay
限时(延时)继电器	Time-lag relay
定时继电器	Timing relay
脱扣(切断)继电器	Trip relay

## 开关 Switch

自动开关	Automatic switch
辅助开关	Auxiliary switch
转换开关	Change-over switch
万能转换开关	Universal change-over switch
整步开关	Synchronizing switch
接触开关	Contact switch
控制开关	Control switch
延迟开关	Delay switch
双联开关	Coupled twin switch
双极开关	Double-pole switch
双投开关	Double-throw switch
接地开关	Grounding switch
拍动开关	Flap switch
浮动开关	Float switch
平板开关	Flush switch
闸刀开关	Knife switch
闭合开关	Closing switch
隔离开关	Isolating switch
限位开关	Limit switch
舵角限位开关	Rudder limit switch
横向限位开关	Trolley limit switch
联锁开关	Interlocking switch
行程开关	Position switch
总开关	Main switch
主令开关	Master switch

常开(闭)按钮开关 Normally opened(closed) push switch

电源开关 Power switch

速断开关 Quick break switch

保险开关 Safety switch

串并联开关 Series-parallel switch

手捺开关 Snap switch

同步开关 Synchro switch

制动开关 Tappet switch

终点开关 Terminal switch

三向开关 Three-way switch

反向开关 Reversing switch

旋转开关 Rotary switch

摇控开关 Remote switch

音量控制开关 Volume control switch

多极联动开关 Multipole linked switch

断路器 Breaker

空气断路器, 空气断路开关 Air circuit breaker

断路器 Circuit breaker

主开关 Main circuit breaker

自动开关 Automatic circuit breaker

自动空气开关 Automatic air circuit breaker

油断路器、油开关 Oil circuit breaker

快断路器 Quick-break circuit breaker

熔断器 Fuse

封闭式熔断器 Enclosed-type fuse

插入式熔断器 Push-in fuse

螺旋式熔断器 Screw-plug fuse, screw-in type fuse

快速熔断器 Quick-acting fuse

管式熔断器 Cartridge fuse

制动器 Brake

圆盘制动器 Disk (disc) brake

涡流制动器 Eddy-current brake

电动制动器 Electric brake

电磁制动器 Electromagnetic brake

紧急制动器 Emergency brake

磨擦制动器 Friction brake

脚踏制动器、脚刹车 Foot brake

手刹车 Hand brake

液位(水力)制动器 Hydraulic brake

磁铁制动器 Magnetic brake

气压制动器 Pneumatic brake



螺线管制动器 Solenoid brake

接触器 Contactor

主接触器 Main contactor

辅助接触器 Auxiliary contactor

时间接触器 Timing contactor

加速接触器 Accelerating contactor

线路接触器 Line contactor

制动接触器 Brake contactor, damping contactor

电磁接触器 Magnetic contactor

继电接触器 Relay contactor

起动接触器 Starting contactor

正反转(方向)接触器 Reversing contactor

触头 Contact

控制器 Controller

自动控制器 Automatic controller

鼓形控制器 Drum controller

电控气压控制器 Electro-pneumatic controller

手动控制器 Hand controller

磁控制器 Magnetic controller

速度控制器 Speed controller

主(总)控制器 Main controller

主令控制器 Master controller

通用控制器 Universal controller

凸轮控制器 Cam-operated controller

放大器 Amplifier

声频放大器 Audio-frequency amplifier

级联放大器 Cascade amplifier

扼流圈耦合放大器 Choke-coupled amplifier

(直)线性放大器 Linear amplifier

光电(流)放大器 Photoelectric cell amplifier

光电管放大器 Photo-electric tube amplifier

功率放大器 Power amplifier

推挽式放大器 Push-pull amplifier

射频、高频放大器 Radio-frequency amplifier

谐振放大器 Tuned amplifier

半导体放大器 Semi-conductor amplifier

电子管放大器 Valve (electronic) amplifier

电容器 Capacitor (condenser)

电解电容器 Chemical capacitor

云母电容器 Mica capacitor

纸质电容器 Paper capacitor  
腊质电容器 Paraffined capacitor  
瓷电容器 Porcelain capacitor  
可变电容器 Variable capacitor

消音器 Silencer  
电抗器 Reactance (并车电抗器 Paralleling reactance)  
电位器 Potentiometer  
调速器 Governor  
变流器、倒换器 Inverter (倒相器 Phase inverter)  
可控硅逆变器 Thyristor inverter  
自动拍发器 Auto keying device  
离子传感器 Ion fire detection  
频率合成器 Frequency synthesizer  
扬声器 Loudspeaker  
对时喇叭 Timing loudspeaker  
耳机 Headphones  
分股耳机 Split headphones  
播音机 broadcaster

无线电测向仪 Radio direction finder  
测深仪 Echo sounder  
计程仪 Log

相序表 Phase meter  
万用表 Multimeter  
电流表 Ampere meter  
电压表 Voltmeter  
兆欧表 Megohmmeter

## 6. 电缆、电路、电线以及照明装置

电缆 Cable  
船用电缆 Marine cable  
充电电缆 Charging cable  
混合电缆 Compound (composite) cable  
同轴电缆 Concentric cable  
连接电缆 Connecting cable  
配电电缆 Distribution cable  
馈电电缆 Feeder cable  
照明电缆 Lighting cable  
主干电缆 Trunk cable

均压线电缆	Equalizer cable
石棉电缆	Asbestos cable
铠装电缆	Armoured cable
成束电缆	Bunched cable
编包电缆	Braided cable
薄膜电缆	Grout cable
铜质(护套)电缆	Copper-sheathed cable
铅包电缆	Lead-covered cable
塑料电缆	Plastic cable
橡胶电缆	Rubber cable
多芯电缆	Multiple core cable;
Multiple conductor cable	
三芯电缆	Triple-core (three core)cable
动力电缆	Power cable
海底电缆	Submarine cable
软花线	Plaited cable
导电线芯	Conductor
电缆槽	Cable trunk, cable channel
连接箱	Connection box
联接箱	Coupling
导板	Cable tray
管道	Cable conduit
管子	Cable pipe
护套	Sheath
铅合金护套	Lead-alloy sheath
铜质护套	Copper sheath
非金属护套	Non-metallic sheath
防护覆盖层	Protective covering
钢丝铠装防护覆盖层	Steel-wire armour protective covering
钢带铠装防护覆盖层	Steel-tape armour protective covering
金属编织层铠装防护覆盖层	Metal-braid armour protective covering
纤维编织防护覆盖层	Fibrous braid protective covering
电缆敷设路线	Cable runs
电压降	Voltage drop
阻抗	Impedance
机械应力	Mechanical effect
热效应	Thermal effect
绝缘带	Insulating tape
黄腊带	Yellow varnished cambric tape
电路	Circuit
交流电路	Alternating current circuit
直流电路	Direct current circuit
电路	Electric circuit

线路 Line circuit  
主电路 Main circuit  
分电路 Branch circuit, sub-circuit  
次级(副边)电路 Secondary circuit  
初级(原边)电路 Primary circuit  
电源(动力)电路 Power circuit  
推进电路 Propulsion circuit  
操纵电路 Maneuvering circuit  
控制电路 Control circuit  
供电电路 Supply circuit  
输入电路 Input circuit  
输出电路 Outlet circuit  
天线电路 Antenna circuit  
接收电路 Receiving circuit  
通讯电路 Communication circuit  
信号电路 Signal circuit  
照明电路 Lighting circuit  
集成电路 Integrated circuit  
闭合电路 Close circuit  
补偿电路 Compensating circuit  
线路板 Circuit panel  
印刷线路板 Printed circuit board

线路( /线) Line  
分支线 Branch line  
馈电线路 Feeder line  
高压线 High tension line  
电源线 Power line  
单线线路 Single-wire line  
架空线路 Overhead line  
实线 Solid line

电线 Wire (Electric wire)  
铝线 Aluminum wire  
铜皮皮线 Armoured wire  
石棉包线 Asbestos-covered wire  
铅皮包线 Lead covered wire  
胶皮线 Rubber-covered wire  
丝包线 Silk-covered wire  
引入线 Lead-in wire  
背接线 Back-connector wire  
裸线 Bare wire  
裸铜线 Bare copper wire  
电池接线 Battery wire

编包线 Braided wire  
铬镍合金线 Chrome-nickeline wire  
纱包线 Cotton-covered wire  
双芯塑料线 Double core plastic wire  
漆包线 Enamel insulated/Enameled wire  
地线 Earth wire; grounding wire  
接地导线 Grounded transmitting wire  
绝缘线 Insulated wire  
耐燃线 Slow-burning wire  
焊锡线 Soldering wire  
镀锡线 Tinned wire  
多股绞合线 Stranded wire (cable)  
中性线 Neutral wire  
馈电线 Feeder  
保险丝 Fuse  
电热丝 Heating resistance wire  
电话线网 Telephone wire

线圈 Coil  
工作线圈 Actuating coil  
空心线圈 Air-core coil  
合闸线圈 Closing coil  
阻尼线圈 Damping coil  
复合线圈 Compound coil  
扁平线圈 Disc coil  
励磁线圈 Exciting coil  
环状线圈 Encirclement coil  
屏蔽线圈 Shielding coil  
灭弧线圈 Blow-out coil  
空载扼流线圈 No-load choke coil  
接触线圈 Contactor's coil

接线端 Terminal  
入端 Input terminal  
分路线头 Tapping (branch) terminal  
引入端 Leading-in terminal  
引出端 Leading-out terminal  
接线盒 Terminal box

照明系统  
Lighting system  
照明装置 Light (lighting) installation  
照明灯具 Lighting fittings  
Lighting fixtures,

### Lamps and lanterns

照明	Lighting, illumination
装货甲板照明	Cargo lighting
电气照明	Electric lighting
应急照明	Emergency lighting
机仓照明	Engine room lighting
局部照明	Local lighting
固定照明	Fixed lighting
檐板照明	Cornice lighting
壁灯	Panel lighting

### 灯 Light

尾（航行）灯	After light, Stern light
船首灯、旗杆灯	Bow light, Stem light
航行灯	Navigation light
桅灯	Mast(head) light
锚灯	Anchor light
右舷灯	Green side light, Starboard (side) light
左舷灯	Red side light, Port (side) light
失控灯	Not under command light
拖带灯	Towing light
艇甲板灯	Boat deck light
航标灯	Beacon light
浮标灯	Buoy light
固定灯	Fixed light
装货灯	Cargo light
闪光灯	Flashing light
探照灯（用于货舱照明）	Flood light
探照灯	Search light
信号灯	Signal light
防爆灯	Explosion proof light
遇险信号灯	Distress light
警告灯	Warning light
白炽灯	Incandescent light
荧光灯	Fluorescent light
可携照明灯	Portable luminaire
电标志	Electrical signs

### 灯 Lamp

弧光灯	Arc lamp
气体放电灯	Gas discharge lamp
蓄电池灯	Battery lamp
(小)艇甲板灯	Boat deck lamp

桥楼信号灯 Bridge lamp  
篷顶灯 Ceiling lamp  
白昼信号灯 Daylight signaling lamp  
指示灯 Indicating lamp, pilot lamp  
日光灯 Daylight lamp  
荧光灯 Fluorescent lamp  
白炽灯 Incandescent lamp  
防爆灯 Explosion-proof lamp  
火警指示灯 Fire lamp  
风暴灯 Hurricane lamp  
聚光灯 Projector lamp  
防水灯 Waterproof lamp  
壁灯 Wall lamp  
吊灯 Pendent lamp  
台灯 Desk lamp  
手提灯 Portable lamp  
床头灯 Bed lamp  
镇流器 Ballast coils (for daylight lamp)  
手电筒 Electric torch, flashlight

(电子)管 Tube

放大管 Amplifier tube  
绝缘套管 Insulating tube  
检波管 Detector tube  
电子管 Electronic tube  
离子管 Ionic tube  
功率管 Power tube  
整流管 Rectifying [Rectifier] tube  
弯瓷管 Angle porcelain tube  
二极管 Two-electrode tube, diode  
波导管 Wave guide tube

灯泡 Bulb  
灯丝 Filament  
灯杆 Post  
灯头、灯座 Holder  
灯罩 Shade  
灯台 Stand  
插头 Plug  
插座 Socket

7. 报警系统与信号设备

报警系统

### Alarm system

报警器	Alarm
声响报警器	Acoustic alarm
声光报警装置	Audible and visual alarm
自动报警器	Auto(automatic) alarm
火灾报警器	Fire alarm
施放 CO2 报警器	CO2 releasing alarm
烟气报警器	Smoke alarm
过载报警装置	Overload alarm
紧急警铃	Emergency-alarm

### 信号设备

#### Signaling equipment

白昼信号灯	Daylight signaling lamp
号钟	Bell
号灯	Light
号笛	Whistle, siren
号角	Horn
号锣	Gong
号钟	Bell
号型	Shape
烟雾信号	Buoyant smoke signal
引航信号	Pilot signal
检疫信号	Quarantine signal
遇险信号	Distress signal
降落伞信号	Parachute signal
火箭信号	Rocket signal
海上(通信)信号	Nautical signal
通行(要求让路)信号	Right-of-way signal
遇难(求救)信号	Distress signal
灯光信号	Light signal
警告信号	Warning signal
航行灯发生故障时能发出声响和视觉信号的自动指示器	
Automatic indicator giving an audible and visual indication of failure of the navigation light	
自动拍发器	Auto keying device
闪光信号、照明弹	Flare
手把火焰信号	Hand flare
红火号	Red hand flare
救生圈烟火信号	Life buoy flare
火箭照明弹	Rocket flare
火箭降落伞照明信号	Rocket parachute flare
火箭	Rocket



抛绳火箭 Line throwing rocket

警报 Warning

避碰警报 Collision-avoidance warning

强(烈)风警报 Gale warning

寒潮警报 Cold wave warning

冰情警报 Ice warning

无线电航行预告 Wireless navigational warning

欠压报警 Under-voltage warning

CO<sub>2</sub> 预施放报警 Pre-warning device for releasing of CO<sub>2</sub>

CO<sub>2</sub> 施放预告信号 Preliminary warning of discharging of CO<sub>2</sub>

手动失火报警按钮 Manually operated call points

灯标 Light beacon

灯塔 Lighthouse

灯船 Light vessel

灯浮 Light buoy

筒体 body

灯座 light support

护身圈 round guard

灯器 light apparatus

顶标球 light beacon ball

浮体压铁 ballast iron

#### (五) 消防 Fire protection, detection and extinction

控制站 Control station

A 级分隔围蔽防火区域 Fire sections enclosed by “A” class divisions

B 级分隔围蔽防火区域 Fire sections enclosed by “B” class divisions

水灭火系统

Water fire main system

压力水雾系统 Pressure water spraying system

固定式气体灭火系统 Fixed gas fire-extinguishing system

二氧化碳灭火系统 CO<sub>2</sub> fire-extinguishing system

卤代烃灭火系统 Halogenated hydrocarbon fire-extinguishing system

蒸汽系统 Steam system

固定式低倍泡沫灭火系统(机器处所)

Fixed low-expansion foam fire-extinguishing system (in machinery space)

固定式高膨胀泡沫灭火系统(机器处所)

Fixed high-expansion foam fire-extinguishing system (in machinery space)

固定式甲板泡沫灭火系统 Fixed deck foam system

船舶固体式灭火系统 Fixed fire extinguishing system (in ship)

惰性气体系统 Inert gas system

自动喷水系统 Automatic sprinkler system  
自动喷水器 Automatic sprinkler  
固定式气体灭火系统 Fixed gas fire-extinguishing system  
固定式泡沫灭火系统 Fixed froth fire-extinguishing system  
固定式高膨胀泡沫灭火系统 Fixed high expansion froth fire-extinguishing system  
固定式压力水雾灭火系统 Fixed pressure water-spraying fire-extinguishing system

固定式探火和失火报警系统 Fixed fire detection and fire alarm system  
抽烟式探火系统 Extraction smoke detection system  
感烟探测器 Smoke detector  
火灾探测器 Fire detector  
感温探测器 Heat detector  
火焰探测器 Flame detector  
聚烟器 Accumulator

(五) 消防设备 Fire-fighting appliances

消防泵 Fire pump  
消防总管 Fire main  
消防栓 Fire hydrant  
消防水带 Fire hose  
消防水带箱 Fire hose box  
水枪 Nozzle  
水雾枪 Water fog applicator  
泡沫枪 Froth applicator  
太平斧 Fire axe  
国际通岸接头 International shore connection

灭火器 Fire extinguisher

液体灭火器 Liquid fire extinguisher  
二氧化碳灭火器 Carbon dioxide (CO<sub>2</sub>) fire extinguisher  
干粉灭火器 Dry powder fire extinguisher  
泡沫灭火器 Foam [froth] fire extinguisher  
手提式灭火器 Portable fire extinguisher  
半手提式灭火器 Semi-portable fire extinguisher  
舟车式灭火器 Wheelbarrow fire extinguisher  
轻水泡沫灭火器 Light water foam fire extinguisher  
水成膜泡沫灭火器 Aqueous film foam fire extinguisher  
起动氮气瓶 Starting nitrogen bottle  
起动空气瓶 Starting air bottle  
泡沫发生器 Foam generator  
灭火剂 Extinguishing medium, extinguishant  
泡沫液 Foam concentrate

消防员装备 Fireman' s outfits

防护服 Protective clothing

(硬) 头盔 (rigid) Helmet

面罩 Mask

靴 Boots

手套 Gloves

呼吸装置 Breathing apparatus

呼吸器 Breathing device

应急逃生呼吸器 Emergency escape breathing device

(六) 救生设备 Life-saving appliances

登乘站 Embarkation station

救生艇筏 Survival craft

脱险通道 Escape route

救生艇 Lifeboat

全封闭式玻璃钢救生艇 Totally-enclosed glassreinforced plastic lifeboat

机械推进救生艇 Mechanically propelled lifeboat

机动救生艇 Motor lifeboat

摇桨式救生艇 Rowing type lifeboat

自(动)扶正救生艇 Self-righting lifeboat

救生艇属具 Boat equipment

放艇属具 Boat releasing device

固定属具 Boat securing means

艇首缆 Forward painter

横座板 Thwarts

边座板 Side-seats

艇机 Boat engine

吊艇架 Davit

滑车 Block

吊勾 Hook

连接环 Link

绞车 Winch

吊艇索 Falls

调头 Turning end to end

降落装置 Launching appliance

脱钩装置 Release unit

限位器 Limit switch

自亮灯 Self-igniting lamp

浸水保温服 Immersion suit

抗暴露服 Anti-exposure suit  
保温用具 Thermal protective aids

登艇 to embark  
扬出 to turn out  
下水 to lower to water  
降落试验 Lowering test  
回收试验 Recovering test  
脱勾试验 Release gear test  
喷淋系统试验 Spray water system test  
自供空气支持系统 Self-contained air support system  
倒顺车运转试验 Reversing test

救生筏 Liferaft

玻璃钢救生筏 Glassreinforced plastic liferaft  
气胀式救生筏 Inflatable liferaft  
可翻转救生筏、双面救生筏 Reversible liferaft  
刚性救生筏 Rigid liferaft  
救生筏壳 Liferaft container  
降落设备 Launching devices  
救生筏架 Liferaft stage  
蓬柱 Arches  
充气泵 Topping-up pump  
静水压力释放器 Hydrostatic release unit

校验 to service

救生圈 Lifebuoy  
救生衣 Lifejacket

#### (七) 焊接 Welding

焊接方法 Welding processes  
手工电弧焊 Manual arc welding  
埋弧焊 Submerged arc welding  
气体保护焊 Gas shielded arc welding  
电渣焊 Electro-slag welding  
焊接材料 Welding consumables  
焊条 electrode  
焊丝 wire  
焊剂 flux  
保护气体 Shielding gas  
焊接工艺 Welding procedures

母材的钢种、钢级和厚度	Type, grade and thickness of the parent metal
焊接材料的型号、等级和规格	designation, grade and size of the welding consumables
焊接设备的型号和特征参数	Type and model of welding equipment
坡口设计和加工要求	Form of bevel and requirements of edge preparation
焊道布置	Number and order of welding metal disposition
焊接顺序	welding sequence
焊接位置 (平、立、横、仰焊)	Welding positions (downhand, horizontal, vertical and overhead)
焊接系数	Welding parameters
焊接电流	amperage
电弧电压	arc voltage
焊接速度	travel speed
焊前预热	Pre-warming
道间温度	Interpass temperature
焊后热处理	Post-weld heat treatment
焊后消除应力	Post-weld stress-relieving
焊件	Welded piece
焊缝	welds
弧坑	crater
引弧板	Run-on plate
熄弧板	Run-off plate
定位焊	Tack welding
自动焊	Automatic welding
多道焊	Multi-run welding
对接焊	Butt welding
填角焊	Fillet welding
全焊透	Full-penetration
未焊透	Incomplete penetration

#### 舱

- 413-2#舱盖板后端横向密封橡皮脱胶, 从橡皮槽内脱落长度约 3 米。The aft transverse rubber packing of No.413-2 panel unglued and detached from the packing groove about 3m in length.
- 413-6#舱盖板右侧纵向密封橡皮脱胶, 从橡皮槽内脱落长度约 2 米。The std longitudinal rubber packing of No.413-6 panel unglued and detached from the packing groove about 2m in length.
- 第二舱左、右舱盖轨道前端升高部分 (最大高度 440mm, 厚度 20mm, 长度 3100mm) 无肘板加强, 在 413-3#及 413-4#舱盖板开启时发生抖动, 最大幅度约 10mm; The fore raised parts (max. height: 440mm, thickness: 20mm & length: 3100mm for each) of the port & std tracks for No.2 hatchcover not reinforced with brackets, and swung to the max. swing of about 10mm while the Nos.413-3 & 413-4 panels opening;  
另外, 第二舱右侧轨道前端升高部分近端部处较左侧低约 20mm, 长约 470mm, 在开启时, 413-4#舱盖右侧滚轮在近端部时发生腾空现象。Also, the end of the fore raised part, about 470mm in length, of the std track was about 20mm lower than that of the port track, while the

above-mentioned panels opening, the std roller of No.413-4 panel moving at the end of the track run off.

4. 413-9#舱盖后端下垂变形, 最大变形约 10mm; 末端横梁上右侧绞链处已于上一航次进行了临时性修理: 对两侧加强肘板进行了复补 200mmx200mmx10mm 各 1 块, 纵向肘板与横梁面板的焊缝进行了补焊。The aft part of No.413-9 panel sagged about 10mm in max. depth; the end beam at its std hinge had been temporarily repaired during the last voyage:

The both side brackets doubled with plates 200mmx200mmx10mm in size for each, the welding seam for connecting the longitudinal bracket with the face plate of the beam was re-welded.

修理要求 RECOMMENDED

脱落的密封橡皮按原样重新涂胶, 装配至橡皮槽内。To be re-glued, then re-fitted in the groove as original.

脱落的密封橡皮按原样重新涂胶, 装配至橡皮槽内。To be re-glued, then re-fitted in the groove as original.

第二舱左右舱盖轨道前端升高部分外侧在距端部 30mm 处各加设加强肘板 320mmx100mm x10mm x 1 块。The fore raised parts of the port & std tracks for No.2 hatchcover to be reinforced with brackets 320mmx100mm x10mm in size at their outsides 30mm off ends;

第二舱右侧轨道前端近端部加高 20mm, 长度 470mm。The fore end of std track for No.1 hatchcover to be raised 20mm in height and about 470mm in length.

舱盖割换校正。

The cover panel to be cropped & renewed and faired.

割换 To be cropped & renewed:

末端横梁 End beam -

腹板 Web plate 1500mmx400mm

x 10 pcs;

面板 Face plate 1700mmx200mm x 40 pcs.

加强肘板 Bracket -

300mmx300mmx10mm x 2 pcs;

300mmx10mm/160mmx10mm x0.5m x 1 pc.

损坏原因

CAUSE OF DAMAGE

上述 1-3 项损坏或缺陷的产生原因, 本咨询验船师认为显然是舱盖本身的质量问题所引起的, 与船员操作无关。The undersigned consulting surveyor considers that the damages or defects

in the above-mentioned items Nos.1-3 were caused obviously owing to the manufacturing quality of the ship's hatchcovers.

本咨询验船师在查阅了船上自接船以来 4 个航次配载资料及有关的操作手册及装载手册后,未发现船员有未按操作手册与装载手册进行操作和装载的现象,因此也认为上述第 4 项损坏产生的原因是舱盖本身的质量问题所引起的,而不是船员操作不当所引起的。Upon examining the information on stowage for the ship's 4 voyages since delivery and the relevant operating booklet & loading manual on board the ship, it wasn't found that the crew had undertaken operating and loading other than according to the operating booklet and loading manual. Hence, the undersigned considers that the damage in the above-mentioned item No.4 could also be reasonably attributed to the manufacturing quality of the hatchcover.

永久性修理与修理费用

#### PERMANENT REPAIR & COST OF REPAIR

上述舱盖的损坏及缺陷部分已由上海 XX 船厂于某年 8 月 16 日至 20 日在该厂码头按修理要求进行了永久性修理。The above-mentioned damages & defects of the ship's hatchcovers were permanently repaired according to the "RECOMMENDED" at Shanghai XX Shipyard on Aug. 16-20, (year).

但至今为至未收到船厂有关的修理帐单。如果今后收到有关的帐单,我们将以补充报告的方式对该帐单进行审核和评价。But up to date, no account of repair has been received from the shipyard yet, and when it is available, we will comment it in form of an Addendum to this report.

浪击损坏 Wash Damage

THIS IS TO CERTIFY that the undersigned surveyor did, at the request of the Shanghai Branch of the China Ocean Shipping Agency on behalf of the Master of the M.V. "XXXX", attend on board the M.V. "B-251" on Aug. 20, (year) in Shanghai Harbor for the purpose of carrying out a survey without prejudice to ascertain the extent, nature and cause of the damage stated to have been sustained in the following circumstance:

"B-251" 于某年 8 月 15 日遭受 "XXXX" 轮浪击损坏  
M.V."B-251" WASH DAMAGED BY M.V. "XXXX"  
IN HUANGPU RIVER ON AUG. 15, (year)

#### 船舶资料 PARTICULARS

(略)

#### 三

从螺旋桨毂部钢印标志知悉,该螺旋桨是某年由 NAVALIPS 厂制造,并经 XX 船级社检验。从现有可以查到的文件中均未发现有关螺旋桨缺陷的记载。It was known from the identification marks on the propeller boss that the propeller was built by NAVALIPS Factory in (year) (year), and surveyed by XX(classification society). Upon examination of the available documents, no records concerning the defects of the propeller were found.

以上说明, 该螺旋桨在某年 10 月 10 日以前的历次进坞时都经过有关船级社的检验。每次检验均没有遗留项目。To sum up, the propeller was inspected by the Classification Society concerned at the ship's each docking before Oct. 10, (year). And there was no outstanding recommendation in each survey.

## 2. 断口分析 Analysis for the broken surface:

(1) 众所周知, 螺旋桨叶片根部是受力最大的区域。然而, 在第一个叶片根部约 0.2R 处, 内部存在着 7 处以上疏松和二处缩孔。在工作中, 在缺陷的附近, 必然应力集中, 而且, 在工作到一段时间后, 叶片根部由于应力集中加剧, 断落是很难避免的。Generally, the propeller blade root is the part that can bear the greatest force. But owing to that there were more than 7 slag cavities and 2 shrinkage holes inside No.1 blade root at 0.2R, causing the stress concentrated near the defects of the blade root while the propeller working, consequently, it was unavoidable that the blade root was broken due to the intensifying of the stress concentration after the propeller working for a period of time.

(2) 当然, 螺旋桨叶片内部潜在缺陷, 在一般的外部检查中不可能被发现的。因此, 该螺旋桨叶片内部存在着缺陷, 而历次验船师作外部检验时都未被发现, 都认为是合格的, 这也是可以理解的。The latent defects of the propeller blade couldn't be found through a regularly external inspection, therefore, it was also comprehensible that the propeller blade was still considered in normal condition though externally inspected by surveyors.

## 5. 对螺旋桨残存的三个叶片的分析 Analysis for the remaining three propeller blades:

(1) 该螺旋桨残存的三个叶片根部约 0.2R 处, 推力面一侧, 都有不同程度的裂纹, 其中最长一条约为 460 毫米。这就说明, 残存的三个叶片根部也已处在过度疲劳之中, 随时都有断落的可能。The ahead surfaces of the remaining three propeller blades were cracked in various degrees in way of their roots at 0.2R, among which, the longest crack was about 460mm in length. The remaining three propeller blades were also remained serious defects and could be sustained breaking off at any time.

(2) 第二、第四片叶片导边, 都有些小缺口。这些小缺口是由于螺旋桨碰到小障碍物所造成的, 即使如此, 由于这些小缺口对该螺旋桨来说是轻微的损伤, 也就是说, 螺旋桨所碰到的小障碍物是不足以造成叶片断落的。No.2 & No.4 propeller blades were found several slightly notched in way of their leading edges. The notches sustained due to touching small obstacles were such a slight damage for the propeller that the breaking of the propeller blade couldn't be caused by the small obstacles.

该轮螺旋桨损坏的主要原因是由于在螺旋桨叶片根部区域内部潜在着疏松和缩孔等缺陷, 在螺旋桨工作时, 由于应力内部缺陷附近应力的过度集中, 且该螺旋桨使用日久而过度疲劳, 造成断落。The cause of damage of the propeller of the M.V. "XXXX" was sustained mainly owing to that there were the latent defects of slag cavities and shrinkage holes within the area of blade root, causing the stress over-concentrated near the defects while the propeller working, thus, after being used for a long time, the propeller was broken by overfatigue.

## 修理要求

### Recommendation:

“XXXX” 轮损坏的螺旋桨应予换新。The damaged propeller of the M.V. "XXXX" should be renewed.



实际修理情况

Repair to be Effectuated:

上述螺旋桨现准备根据“修理要求”在该轮第二次进坞时用船上备用螺旋桨更换。The above-mentioned propeller will be replaced with the ship's spare one according to the "Recommendation" at the 2nd docking.

检验在场人员

Present at Survey:

船东代表 Owner's Representative

船长 Master

轮机长 Chief Engineer

上海 XX 船厂代表 Representative of Shanghai XX Shipyard.

附件 Attachment:

1. 24 张照片 24 photos.
2. 船长海事声明 Master's Note of Sea protest.
3. 船级证书 Classification certificate
4. 原货船安全构造证书 Original Cargo Ship Safety Construction Certificate.
5. XX 船级社某年 2 月 3 日坞内检验报告 XX docking survey report dated Feb. 3, (year).

可调节螺旋桨轴联轴器安装缺陷

船厂在安装可调节螺旋桨轴的联轴器时,根据制造厂提供的指示中的规定压入套筒内的距离为 57.4 毫米, 并经 WARTSILA DIESEL CO 公司复核, 船厂安装的联轴器符合制造厂的要求。When the coupling for controllable pitch propeller shaft being fitted by the shipyard, the axial pull-up was 57.4mm in accordance with the requirement in instruction supplied by the manufacturer, and that confirmed by WARTSILA DIESEL CO., Shanghai Office, the coupling fitted by the shipyard was found to be in compliance with the manufacturer's requirements.

轴系安装后主机进行码头试车(系泊试验)。轴系上的离合器啮合后,右主机的转速突然降低。螺距角指示器指在倒车 6 格。右主机螺旋桨轴发现向后位移约 60 毫米。The main engine was subjected to a mooring trial on the wharf after the shafting being assembled, and inspected according to the WARTSILA's testing procedures such as starting, stopping, etc. After the clutch on shafting being engaged, the revolution of the std main engine suddenly dropped down. The propeller pitch angle indicator indicated the step 6 astern. The std M.E. propeller shaft was found dislocated afterward about 60mm.

原制造厂规定的为安装检查所使用的 T 字码格与套筒端面距离改为 110 毫米。The distance between the mark "T" in shaft for fitting inspection defined by the manufacturer and the end surface of sleeve was changed to be 110mm.

发现螺旋桨叶在极限倒车部位联轴器的安装套筒与螺旋桨轴有相对移动痕迹。最大倒车螺距角距离为 104 毫米,超过制造厂在车叶上所打的钢印中的规定约 16 毫米。The propeller

blade was found at the limited location of negative pitch angle to have traces of relatively dislocating between the sleeve and the propeller shaft. The max. astern pitch angle distance was 104mm, about 16mm more than as required in the mark of propeller blade made by the manufacturer.

右主机螺旋桨轴在套合处的直径经测量分别在 199.945-199.97 毫米范围内。比钢印要求多压入了 1.4 毫米, 证明测量位置即安装位置, 轴套内径为 200.04-200.03 毫米。The diameter of the std M.E. propeller shaft at the shrinkage area was measured to be within the range of 199.945-199.97mm respectively. The axial pull-up was about 1.4mm more than the required, which proved that the measuring location was the fitting location and the sleeve bore was 200.04-200.03mm.

根据中国船级社规范, 对液压无键套合式有套筒套合在轴上的联轴器应具有传递 2.7 倍额定扭矩的能力。According to the Rules of China Classification Society, the keyless couplings fitted with sleeve type by oil shrink method are to have a capacity of transmitting a torque which is 2.7 times the mean torque.

对一般液压套合的联轴器, 根据计算, 主机轴系的实际传递功率为 1600KW, 轴转速为 180 转/分, 联轴器外径为 80 毫米, 轴套合处和锥度 1/25 处的直径为 200 毫米时, 最小的安装套合允许值为 0.23 毫米。For general couplings, on calculation by the actual transmitting power of 1600 kW, the shaft revolution of 180 r/min, the coupling outside diameter of 380mm, the diameter of shaft at the shrinkage area of 200mm and the taper of 1/25 of the ship's M.E. shafting, the min. shrinkage allowance of fitting was 0.23mm.

根据测量结果, 联轴器套筒与螺旋桨轴的间隙为 0.07 毫米。因此, 这种配合松动的套筒式联轴器是不可能转足扭矩的, 最终, 势必会在轴上滑动。In view of the measuring results, the clearance between the coupling sleeve and the propeller shaft was 0.07mm. Therefore, such a loosely fitted coupling has no capacity of transmitting torque, eventually, the sleeve would slip and move on shaft.

船厂所述的损坏原因是可以接受并符合逻辑的。The cause of damage as stated by the shipyard is acceptable and logical.

#### 主机损坏 Main Engine Damage

(连杆轴承下盖的潜在缺陷所致)

兹应中国人民保险公司上海分公司申请, 下列署名的咨询验船师于某年 11 月 13 日在上海港登“XXXX”轮进行了检验, 以确定损坏原因、范围以及程度, 情况如下:

THIS IS TO CERTIFY that at the request of the Shanghai Branch of the people's Insurance Co. of China, the undersigned consulting surveyor did attend on board the M.V. "XXXX"

Flag: China

Port of Registry: Shanghai

Registered No.: 0000000

Gross Tonnage: 0000

in Shanghai Harbor on Nov. 13, (year) for the purpose of carrying out a survey for ascertaining the extent, nature & cause of damage stated to have been sustained in the following circumstance:

主机于某年 6 月 14 日在海上损坏

M.E. DAMAGED ON JUNE 14, (year) AT SEA

据该轮轮机长告称该轮在从日本航行于新西兰途中, 船位: 23o47' .0 S 165o56' 6 E, 在某年 6 月 14 日 1715 时 (当地时间), 突然机舱内一声尖叫, 立即主机停止运转。轮机员们立刻跑进机舱, 发现在主机 A5 和 B5 缸组外散落着大量主机的损坏部件。主机已不能修理。该轮漂泊了 73 个小时, 直到某年 6 月 7 日 “XXXXX” 轮前来救助。某年 6 月 21 日 1500 时该轮由奥克兰拖轮拖带并于某年 6 月 26 日到达新西兰奥克兰。It was stated by the ship's Chief Engineer that while the ship sailing from Yokohama, Japan to Auckland at the position 23o47'.0 S 165o56'6 E, New Zealand at 1715 hrs on June 14, (year) (local time), a scream was suddenly heard in the engine room and the main engine stopped running immediately. Engineers went into the engine room at once and found a lot of damaged components of the main engine scattered outside the M.E. A5 & B5 units. The main engine could not be repaired so that the ship drifted for 73 hrs until M.V. “XXXXX” arrived for rescue at 1800 hrs on June 17, (year). The ship was towed by Auckland tug at 1500 hrs on June 21, (year) and arrived at Auckland, New Zealand on June 26, (year).

该轮轮机长又告称主机损坏可能是由于第五缸连杆轴承下盖裂纹并断落所致。事实上, 该轮船员不可能发现第五缸连杆轴承下盖的潜在裂纹。It was added by the ship's Chief Engineer that the main engine was damaged probably owing to the interior lower bearing shell of the No.5 connecting rod being cracked and then broken down. In practice, the latent crack in the lower bearing shell of the No.5 connecting rod could not be discovered by the ship's crew.

检验查明 UPON THE SURVEY FOUND

修理要求 RECOMMENDED

主机 Main engine:

型号 Type: KAWASAKI-MAN 10V52/55A

额定功率 Rated power: 7745 kW

缸数 Number of cyl.: 10

缸径 Cyl. bore: 520mm

活塞冲程 Piston stroke: 550 mm

机号 Engine No.: 7308

制造商 Manufacturer: KAWASAKI HEAVY  
INDUSTRIES LTD.

制造日期 Manufactured in: July 30, (year)

额定转速 Rated revolution: 450 rpm

1. A5 & B5 缸缸套打碎。Cylinder liners of A5 & B5 units broken. 应予换新 To be renewed.
2. A5 & B5 缸活塞打碎 (位于活塞销以下), 活塞销及轴瓦打坏。Pistons of A5 & B5 units broken (below piston pin), piston pins and bearing shells damaged. 应予换新 To be renewed
3. No.5 缸主、付连杆轻度变形, 主连杆的曲柄销轴瓦严重变形, 固定下轴承盖的 2 根螺栓断掉, 2 根螺栓仍与残余的下轴承盖和上轴承盖固定在一起且该 2 根螺栓已变形。付连杆与上轴承盖连接的 2 根螺栓断掉。主连杆与上轴承盖连接的 4 根螺栓变形。Main & aux. connecting rods of No.5 unit slightly deformed, bearing shell of crankpin of main connecting rod

seriously deformed, two bolts for securing lower bearing shell broken, two bolts connecting the remainder of the lower bearing shell with the upper bearing shell deformed; two bolts for connecting the aux. connecting rod with the upper bearing shell deformed; four bolts for connecting the main connecting rod with the upper bearing shell deformed. 应予换新 To be renewed.

4. B5 缸缸体右侧打碎 (高 700mm, 宽 500mm)。Std side cylinder body of B5 unit broken 700mm in height and 500mm in width. 应予换新 To be renewed.

5. B5 缸曲柄箱道门上部机架打碎脱落, 曲柄箱内部前上方机架裂纹 (长 300mm)。A5 缸道门前上方机架裂纹 (长 600mm)。A5 和 B5 曲柄箱道门打碎。Engine room in way of upper part of crankpin case port of B5 unit broken and detached and that at forward upper part of interior crankpin case cracked about 300mm in length. Engine frames in way of forward upper part of crankpin case port of A5 unit cracked about 600mm in length. Crankpin case ports of A5 & B5 units all broken. 应予换新 To be renewed.

6. B 侧凸轮轴 (长 4.5m) 严重弯曲变形。6 道凸轮轴轴承座 (从 No.3 缸至 No.6 缸) 断裂。B bank camshaft 4.5m in length seriously bent & deformed. 6 bearing seats of the camshaft (from No.3 unit to No.6 unit) broken. 应予换新 To be renewed

7. B 侧凸轮轴箱体及道门打碎 (从 B3 缸至 B5 缸), 一及外围管系 (滑油、燃油、蒸汽管) 打断, 各长 5m。B bank camshaft casing and ports broken (from B3 unit to B5 unit) and lub. oil piping, fuel oil piping & steam piping in way all broken about 5m in length for each. 应予换新 To be renewed.

8. No.5 缸曲柄臂前后两块平衡块断裂, 前固定平衡块一根螺栓断掉, 一根弯曲变形。后固定平衡块一根打弯, 一根变形。No.4 缸曲柄臂前平衡块裂纹 (长 75mm)。Two balance blocks on fore & aft crankpin web of No.5 unit broken, one bolt for securing fore balance block broken and the other deformed; one bolt for securing aft balance block bent and the other deformed; fore balance block on crankpin web of No.4 balance block on crankpin web of No.4 unit cracked about 75m in length. 应予换新 To be renewed.

9. No.5 缸曲柄销位于油孔处打了 4 个凹坑 (面积分别为: 25mmx25mm, 30mmx30mm, 35mmx35mm, 20mmx50mm, 深度为 5mm 左右) (原曲柄销已磨小直径 7.0mm)。Crankpin of No.5 unit in way of oil hole pitted at 4 places about 25mmx25mm, 30mmx30mm, 35mmx35mm & 20mmx50mm in area respectively and 5mm in depth for each. The diameter of the crankpin already worn by 7.0mm. 应予换新 To be renewed.

10. B5 和 B4 缸高压油泵底座及顶升装置打碎。High pressure oil pump seats and push rod units of B5 & B4 units broken. 应予换新 To be renewed.

11. B 侧主滑油管打断 (长 120cm), No.5 和 No.6 道主轴承进油管打断 (长各 2m), A5, B5 缸气缸油管打断 (长各为 2m)。B bank main lub. oil pipe broken about 120cm in length, No.5 & No.6 main bearing oil inlet pipes broken about 2m in length for each and cylinder oil pipes of A5 & B5 units broken about 2m in length for each. 应予换新 To be renewed.

12. A5, B5, B4 缸进排气阀阀杆 6 根打弯 (其中 B5 缸 2 根排气阀, 一根进气阀, A5 缸一根排气阀)。6 spindles of inlet & outlet valves of A5, B5 & B4 units bent (among which, 2 outlet and 1 inlet valves for B5 unit, 1 outlet valve & 1 inlet valve for A5 unit and 1 outlet valve for B4 unit. 应予换新 To be renewed.

13. B 侧高压油泵齿条传动杆打断 (长 4.5m)。Gear driving rod of B bank high pressure oil pump broken about 4.5m in length. 应予换新 To be renewed.

14. A5, B5, B4 缸 6 根进排气阀摇臂顶杆及护套弯曲变形。The push rods and sleeves of

rocker arms of 6 inlet & outlet valves of A5, B5 & B4 units bent and deformed. 应予换新 To be renewed.

15. B4 和 B5 缸缸盖罩壳变形。Casings of cylinder covers of B4 & B5 units deformed.  
应予换新 To be renewed.

16. B 侧主机油门负荷发送器及 2 只限位开关打坏。Load transmitter of B bank main engine oil door with 2 limit switches broken.  
应予换新 To be renewed.

17. B5 缸缸组冷却追阀打坏。Cooling water valve of cylinder cover of B5 unit broken.  
应予换新 To be renewed.

18. B5 缸安全阀打坏, B5 及 B4 缸油头打坏。Safety valve of B5 unit broken and fuel injectors of B5 & B4 units broken. 应予换新 To be renewed.

19. B5 及 B4 缸曲柄箱道门上 2 根油雾探测器软管打断。2 flexible pipes of oil mist detector on crankpin case ports of B5 & B4 units broken. 应予换新 To be renewed.

20. 主机油底壳循环油柜 12T 滑油渗入大量缸套冷却水。A large quantities of cylinder cooling water leaking to main engine sump and 12-T lub. oil circulating tank. 应予换新 To be renewed.

21. No.5 缸曲柄销下轴承盖断掉。Lower bearing shell of crankpin of No.5 unit broken.  
应予换新 To be renewed.

#### 损坏原因

#### CAUSE OF DAMAGE

经对该主机损坏部分现场检查和认真分析, 下列署名的验船师认为上述损坏的起因在于该主机第五缸连杆轴承下盖在主连杆一侧(B 侧) 靠近连杆螺栓处首先断裂, 接着导致连接连杆轴承盖的螺栓整个脱落。由于摆动的主、付连杆的巨大惯性力, 脱落的轴承盖打坏 A5 及 B5 缸缸组、活塞、机架、凸轮轴及箱体和道门、曲柄箱等。经进一步分析, 下列署名的验船师认为上述损坏的主要原因可能是在上述第五缸连杆轴承下盖 B 侧靠近连杆螺栓处存在内部的潜在缺陷所致。Upon thorough inspection and serious analysis on the damage field, the undersigned surveyor considered that the above-said damage could be attributed to that the lower bearing shell of the M.E. No.5 cylinder connecting rod broken first in the vicinity of the securing bolt of the main connecting rod (B side) and consequently the bolt for connecting bearing shell of the connecting rod wholly detached. Owing to the great inertial force produced by the swing of the main & aux. connecting rods, the cylinder liner, pistons, engine framings, camshaft, cylinder bodies, crankcase doors, crankpin, etc. of A5 & B5 cylinders were damaged by the detached bearing shell. Through further analysis, the undersigned surveyor considered that the main cause of the above-mentioned damage was probably due to the latent defect in the interior of the lower bearing shell of No.5 unit in the vicinity of B bank securing bolts.

#### 修理情况

#### CONDITION OF REPAIR

没有对该损坏的主机进行修理的设备。该运输公司想对该主机进行整台换新。There is no facility available for repairing the damaged main engine. The Shipping Co. is intending to renew the whole set of the main engine.

## 损坏修理报价意见

## COMMENTS ON THE QUOTATION OF DAMAGE REPAIR

上述损坏项目已不能进行修理。如非要修理，修理费可能比一台新主机的价格还要大。The above-mentioned damage items are unfeasible to be repaired. If they being repaired, the cost of repair may be greater or as same as that of a new main engine.

下列署名的咨询验船师同意船东的意见，对该损坏的主机进行更换。该损坏的主机的其它残余部件能否作为备件使用须由中国船级社船级验船师作进一步检查后决定。The undersigned consulting surveyor agrees with the Owner's idea, i.e., the damaged main engine will be renewed. The other residual components of the damaged main engine whether can be used as spares or not are to be decided by the Class surveyor to the China Classification Society after being further examined.

## 主机损坏 Main Engine Damage

(推力轴承没有起到止推作用曲轴前移所致)

## 1. 情况简述 Brief Description

## 1.1 船舶和主机特征 Particulars of Vessel and Main Engine

船籍 Nationality

船籍港 Port of Registry:

总吨位 Gross Tonnage:

净吨位 Net Tonnage:

船长 Ship's Length:

船宽 Ship's Breadth:

船深:Ship's Depth:

主机型号 Type of Main Engine:

缸径 Cylinder bore:

冲程 Stroke:

额定功率 Rated power:

额定转速 Rated speed:

主机制造日期 Date of manufacture for M.E.:

船舶制造日期 Date of manufacture for vessel: XXXXXX

XXXXXXXX

3869

1160

93.91m

15.20m

9.70m

8Z 72/48A-1

480mm

720mm

2853kW (3880HP)



219 r/min

XXXX

XXXX

## 1.2 主机机损过程 Course of Main Engine Damage

### 1.2.1 修理 Repair

“XXXX”轮于某年 12 月 23 日进 S 上海船厂浦西分厂修理。据告称主机修理如下内容:The M.V. “XXXX” was repaired from 23rd Dec., (year) in Shanghai Shipyard Puxi branch. It was informed that the principal repair items of M.E. were as follows:

- (1) 更换主轴承轴瓦 9 道。Nine (9) sets of main bearing shells renewed.
- (2) 更换连杆轴承轴瓦 4 付 (第 1、2、4、8 缸)。Four (4) sets of connecting rod bearing shells of cyl. Nos.1,2,4 & 8 renewed.
- (3) 气缸套 8 只密性检查。Eight (8) cylinder covers removed and tested for water tightness.
- (4) 缸套 8 只拉出, 橡皮水封圈全部换新。Eight (8) cylinder liners pulled out and all water seals renewed.
- (5) 活塞 8 只活塞环全部换新。Rings of eight (8) pistons all renewed.
- (6) 推力轴承正倒车推力块全部转出检查, 间隙调整。All the ahead and astern thrust segments of the thrust bearing turned out and inspected and clearance checked and reconditioned.
- (7) 高压燃油泵全部拆进车间箭检查。Oil fuel pumps removed to workshop and overhauled.
- (8) 调速器拆下进车间调试校正。The governor removed to workshop and adjusted.

### 1.2.2 码头试车和试航 Mooring and sea trial

根据轮机长报告某年 2 月 16 日主机安装完毕。当天 1300 时初次动车, 转速 120rpm, 螺距角 0 度, 2200 时停车, 主机在无载荷下运转 9 小时, 在此期间工厂进行捉漏和调整工作。According to the Chief engineer' s Report, the assembly of M.E. was completed on 16th Feb., (year), the M.E. started running at 1300hrs on the same day, at engine speed 120rpm and controllable propeller blade pitch angle 0 degree and stopped running at 2200 hrs. The shipyard personnel carried out some works for tightness and modifications during this period.

2 月 17 日 1000 时, 主机第二次动车, 转速 190rpm, 螺距角 0 度, 工厂对燃油系统进行调整, 2300 时停车, 码头试车结束。At 1000 hrs on 17th Feb., the M.E. ran again at engine speed 190 rpm and with blade pitch angle 0 degree, and stopped running at 2300 hrs. During this period, the shipyard personnel carried out some modifications for fuel oil system, and the mooring trial was thus accomplished.

2 月 22 日试航, 1245 时 (船上时间) 主机起动, 转速调整至 214rpm, 水压 2kg/cm<sup>2</sup>, 滑油压力 8kg/cm<sup>2</sup>, 排气温度 220-240 度。离开船厂后, 在黄浦江内航行时, 主机转速 214rpm, 螺距角 10-12 度之间。出吴淞口后 1300 时, 螺距角增加到 20 度, 此时主机转速下降到 160rpm。以后作了几次螺距角由 20 度-0 度-20 度试验, 发现螺距角为 10 度时, 主机转速能上升到 214rpm, 螺距角增加到 20 度时, 主机转速下降到 160rpm。根据厂方要求主机停车, 船抛锚, 此时为 1545 时。厂方人员打开调速器盖子进行调整 (调节调速器执行拉杆和高压油泵齿条轴的转动机构)。1710 时调整结束, 主机起动, 转速达到 214rpm, 船起锚继续试航。主机转速 214rpm, 螺距角 20 度, 冷却水压 2.0kg/cm<sup>2</sup>, 滑油压力 8kg/cm<sup>2</sup>, 排气温度 320 度, 主机作示功检查, 参数为: Sea trial was carried out on 22nd Feb., main engine started running at 1245 hrs (ship board time) at engine speed 214 rpm, cooling water pressure 2 kg/cm<sup>2</sup>, lub. oil

pressure 8 kg/cm<sup>2</sup>, exhaust gas temperature 220o-240oC.ter departing from the shipyard, the ship navigated in Huangpu River at engine speed 214 rpm and the blade pitch angle 10-12 degrees and after the ship getting the exit of Wusong Entrance, the blade pitch angle was increased to 20 degrees, and meanwhile, the engine speed dropped down from 214 rpm to 160 rpm. Afterwards, some tests of changing the blade pitch angle from 20-0-20 degrees had been made and that the engine speed could be increased up to and kept at 214 rpm, whilst operating the blade pitch angle at 10 degrees. However the engine speed dropped down to 160 rpm, whilst using the blade pitch angle of 20 degrees. Under the requirements of the shipyard, the main engine stopped running and the ship anchored at 1545 hrs. The shipyard personnel then opened the governor cover and adjusted the acting rod and the turning gear of fuel pump rock. The adjustment work ended at 1710 hrs and the main engine started running once more and reached the engine speed 214 rpm. The ship continued the sea trial after weighing anchor. The main engine ran at 214 rpm with the blade pitch angle 20 degrees, cooling water pressure 2.0 kg/cm<sup>2</sup>, lub. oil pressure 8 kg/cm<sup>2</sup>, exhaust temperature 320oC and the parameter of ignition pressure was recorded through indicator cock as follows:

缸号 Cyl. No.	1	2	3	4	5	6	7	8
爆压 Ignition pressure	kg/cm <sup>2</sup>							
排温 Exhaust temperature	oC							

滑油温度 46oC, 冷却水温 60oC. 1935 时, 工厂认为试航时间已到, 对主机未作必要的交接检查, 未办试航结束文件手续, 2045 时工厂人员登艇离船, 场段试航时间为 2 小时 25 分。And with lub. oil temperature 46oC, cooling water temperature 60oC and the exhaust gas temperature given in the table above. At 1935 hrs, the shipyard personnel deemed that the time for sea trial was accomplished, they neither carried out any necessary hand over inspection nor prepared any document process indicating the completion of the sea trial. At 2045 hrs, they left the ship and embarked on the shipyard boat. This period of sea trial lasted two hours and twenty five minutes.

### 1.3 主机故障 Damage of Main Engine

2045 时工厂人员离船后, 起动主机转速 214rpm, 螺距角 0 度, 而后螺距角增加到 20 度, 主机参数如旧。2330 时, 主机第 1、2、3、4 缸排气管区域冒烟, 轮机长向驾驶台报告后, 螺距角改用 15 度。2337 时第 1-4 缸排气管区域冒火, 主机紧急停车, 当用操纵手轮操作到 “0” 位时, 主机仍以 50rpm 继续运转。此时轮机长将高压油泵齿杆的传动装置用手拉到 “0” 位才使主机停车。2350 时火被扑灭。灭火采用灭火器的消防水。After the shipyard personnel leaving the ship at 2045 hrs, the main engine was restarted to run at speed 214 rpm using blade pitch angle from 0 degree gradually increased to 20 degrees and the parameter of M.E. kept the same as before. At 2330 hrs, smoke took place in the area of exhaust pipes of cyl. Nos.1,2,3 & 4. After the Chief Engineer reporting it to the bridge, the blade pitch angle was altered to 15 degree. and at 2337 hrs, a local fire happened in the above said area. Emergency stop was applied to the main engine, however when operating the maneuvering wheel to “0” position, yet the engine continued to run at a speed of 50 rpm. The Chief Engineer then pulled the transmitting gear of fuel pump rock to “0” position, the main engine stopped running. At 2350 hrs, the local fire was extinguished. Fire extinguishers and fire main were used for fire fighting purpose.



2月23日0030时打开曲柄箱观察孔进行检查,发现缸套漏水,以#6缸最为严重,曲柄箱底盘上有轴承合金痕迹并发现主机再也不能启动。At 0030 hrs on 23rd Feb., sight holes on the engine crank case were opened up for inspection. Water leakage was found on cylinder liners among which cylinder No.6 was most serious, traces of white babbitt of bearing metal were found as well on the bottom of bedplates, and thereafter, the main engine could never be restarted.

2月26日拖船将该轮于1230时拖回至船厂。At 1230 hrs on 26th Feb., the ship was towed back to the shipyard.

## 2. 主机损坏情况检查 Inspection of Damage of Main Engine

该轮拖回船厂后第二天,船厂、船方和XX公司三方会议商定就调查主机故障的方法和手段等取得一致意见,达成协议,就现状初步检查情况如下: On the next day after the ship being towed back to the shipyard, three (3) parties consisted of shipyard, ship's side and XX company held a meeting to discuss measure which should be taken for investigating the damage of engine and attained a consistent agreement adopted by the above three parties. The primary inspection carried out on the basis of the existing condition was as follows:

### 2.1 操纵系统检查 Inspection of maneuvering system

操纵系统没有回到停车正常位置,即操纵手柄处于停车位置,调速器输出端的摇臂位置量得33毫米,燃油泵的进油刻度分别为:(见表1,略),负荷指示器读数为110%。在此数据下,用人力转动调速器输出轴至最小位置,此时燃油泵的进油刻度为:(见表2,略),负荷指示器读数为15%。3月3日开动主机滑油泵,调速器处于有油压的正常工作状态,输出轴连接的摇臂处于正确位置,此时燃油泵的进油刻度为:(见表3,略),负荷指示器读数为20%。此种现象说明操纵系统包括调速器和高压燃油泵没有调整好,相对于操纵手轮的各种工况下均有过量燃油供应,留有隐患。The maneuvering system could not return to the normal position, i.e. when the maneuvering wheel reached "Stop" position, the rock arm connecting the governor output end rested at a position giving a gap of 33mm, at this time, the fuel metering readings per fuel pump were as follows: and the load indicator reading was 110%. At the foregoing data, when the governor output shaft was turned by manual power to the minimum position, the fuel metering readings per fuel pump were as follows: and the load indicator reading was 15%. On Mar. 3, the M.E. lub. oil pump was started, the governor was under the normal working condition with oil pressure and the rock arm connecting its outlet end was at correct position, at this time, the fuel metering readings per fuel pump were as follows: and the load indicator reading was 20%. This phenomenon indicates that the maneuvering system including the governor and fuel pumps were out of order and excessive fuel was supplied relative to the load as required by the order of the maneuvering wheel. Trouble will take place later on.

## 6. 打开曲柄箱刀门检查发如下情况 Inspection after opening the crankcase doors

(1) 第4和第5缸活塞连杆相互对调安装。No.4 and No.5 piston connecting rod units were alternately installed.

(2) 第4-8缸连杆大端轴承中心明显偏后,说明曲轴明显向前移位。The centers of connecting rod bearings of cyl. No.4 to 8 were evidently located aft. This indicated that the crankshaft evidently moved forward.

(3) 第5、9道主轴承断裂(前后向)。No.5 and No.9 main bearing covers fractured in fore and aft direction.

(4) 除第1、2和10道主轴承盖的后端面与曲拐磨擦情况严重。轴瓦烧损。The crank web rubbed heavily against the after end of main bearing covers except Nos.1,2 and 10 and bearing

shells burnt.

(5) 第7道主轴承盖表面油漆已全部烧去,本体变形严重,轴瓦向前移位,并向左转动一角度,切断至该轴承的滑油通路,第5缸连杆轴瓦烧损,曲拐轴颈变色。The paint on the surface of No.7 main bearing cover fully burnt away and the cover seriously deformed. The bearing shell moved forward and turned an angle left, resulting the lub. oil passage to this main bearing blocked. Connecting rod bearing shell of cyl. No.5 burnt, crankpin coloured.

(6) 第8缸曲拐臂前平面与机架左右贯穿螺栓孔外圆壁严重擦碰,表面变色,外圆壁已呈现平面。Cylinder No.8 crank web front end face heavily rubbed against the peripheries of both port and std tie bolt housings of which the surfaces coloured and planes revealed on the peripheries.

(7) 拆出第9道主轴承盖,轴承盖螺栓已弯曲变形,轴承盖断成二块,盖内侧的定位销已陷入盖内。轴瓦已基本不存在,仅发现几块碎片;主轴颈上嵌有许多金属屑。No.9 main bearing cover was dismantled, bearing cover bolts bent, bearing cover fractured into two pieces, set pin for locating the bearing shell got in the cover, no bearing shell could be found except some broken pieces, much metal debris stuck on this journal surface.

(8) 拆下第3道主轴承盖,在油槽区的内表有几条小裂纹,轴瓦定位销凸出表面2.0毫米,无机械损伤,轴瓦外表面有70毫米长拉槽,整块轴瓦向左转动70毫米。No.3 maneuvering cover was dismantled, several small cracks were found in the oil groove area, bearing shell locating pin protruded 2mm beyond the cover surface without mechanical damage and a seizure groove of 70mm in length was found on the outer surfaces of the bearing shell which was turned port by 70mm.

(9) 第8缸活塞连杆组吊出,活塞、活塞环和缸套磨损正常;连杆大端曲拐轴颈无拉痕,轴承上瓦严重磨损,下瓦有线痕,磨损情况尚可。The piston connecting rod unit of cyl. No.8 was pulled out, the wear of piston and piston rings and the liner was in normal condition, the crank journal found without score. The wear in fair condition with only some light scores.

(10) 油底壳内有大量金属粒子,还有铁屑及铁质刨花等。There were a lot of metal particles and iron debris and slices on the bottom of sump tank.

其它损坏情况,待打开后作进一步检查。Further inspection should be carried out for ascertaining other damage after dismantling of engine components.

## 7. 推力轴承检查 Inspection of thrust bearing

(1) 正倒车推力块已全部烧损熔化,推力块间隙已无法测量。Both ahead and astern thrust segments burnt, clearances couldn't be obtained between the segments and thrust collar.

(2) 在上述情况下,在正倒车推力块的背面作了间隙测量。由于测量的地位限制和正倒车推力块合金已全部烧毁熔化,这些数值仅能作为参考,某些数据尚不真实。Under above said condition, clearances were taken from the back of segments, due to the limitation of location and all the thrust segments burnt and jammed to the thrust collar, these values could be only for reference, individual value could not be deemed exact.

(3) 倒车推力块后面,面对飞轮右侧热电偶处有明显合金熔化后的片渣。Obvious white metal melting slices in way of the thermal couple on the std side aft of the astern thrust segments

(4) 倒车推力块面对飞轮左侧边明显咬死外部有明显合金熔化后的片渣。The astern thrust segments on port side obviously jammed with white metal melting slices

(5) 就这次所测得的间隙计算,推力环轴向自由移动的平均值已达2.40毫米,大大超过极限值。According to these measured clearances, the average volume of the axial play of the thrust collar reached 2.4mm which greatly exceeds the limit.

(6) 推力轴承左侧滑油管二根的接头均很松, 仅旋入 2-3 牙。Two joints from the lub. oil supply pipe for the thrust block on the port side extremely slackened, screwed only 2-3 pitch of threads.

#### 8. 润滑油情况检查 Inspection of lub. oil

(1) 在上海船厂浦西分厂主机修理时, 主机滑油作了更换, 新油牌号为 Mobil 412 共 80 桶 Batch No.6LOICHK12010187, 粘度 CST 100oC 13.6-15.1。During the repair of main engine at Shanghai Ship-building & Repairing Yard Puxi Branch, all the sump tank lub. oil was renewed with 80 barrels new oil of Mobil grade 412, Batch No.6LOICHK 1201087, viscosity 100oC 13.6-15.1.

(2) 三方拟定取样分析, 根据化验报告, 共有 6 份油样编号为 No.1-6, 主机循环滑油油样编号为 No.2, No.5。Three (3) parties decided to take oil samples for analysis. According to the Report of Analysis, there were six (6) samples numbered 1 to 6, main engine sump tank lub. oil numbered 2 and 5.

(3) 油样 No.1,2,4,5 的粘度均合格; 油样 No.3,6 粘度均未测试, 并含钠盐成份, 系污油舱油样。The viscosity of oil sample Nos.1,2,4 and 5 are all satisfactory; the sample oil No.3 and No.6 of which the viscosity wasn't analyzed and contained water contaminated with NaCl, which was taken from slop tanks.

(4) 总酸值(TAN)所有油样均符合使用要求。The total acid number (TAN) of six (6) oil samples were all satisfactory.

(5) 6 份油样中除 No.1 和 No.4 不含水份外, 其余油样均有不同程度水份, 以 No.2 油样含水份最多, 达 28.3%。Six oil samples except No.1 and No.4 contained different degrees of water, among which No.2 is the most, its water content reached 28.3%.

(6) 化验报告对 No.2 油样要求研究水的来源和采取水份分离处理。对 No.3、No.6 油样因已沾有海水建议更换。The Report of Analysis suggested to investigate the cause and separate frequently for oil sample No.2, and recommended oil sample No.3 and No.6 which contaminated with sea water to be renewed.

(7) 油样 No.2、No.3、No.6 闪点为开杯闪点, No.1, No.4 油样闪点分别为 210oC 和 225oC (闭杯)。Flash point for oil samples Nos.2,3 and 6 was open cup, and for No.4 and No.5 were 210oC and 225oC respectively (closed cup).

1.

据该轮船长告称该轮与某年 8 月 27 日从鹿特丹开航, 并于某年 10 月 11 日 0912 时到达上海 XX 锚地并抛锚。10 月 14 日该轮又开动主机并在二艘拖轮的帮助下靠泊“XXXXXX”轮进行减载过驳。在此期间, 轮机长打开主机曲柄箱导门检查各轴承的技术状况时, 发现第 2 道和第 3 道主轴承左侧的固定螺栓已断掉, 而右侧的固定螺栓已弯曲变形, 第 2 道和第 3 道主轴承上盖均抬起约 150 毫米。该主机已不能使用。该轮被“XX”拖轮从绿华山锚地拖至吴淞口锚地, 再由港务局的拖轮拖至民生路码头卸货。It was stated by the ship's Master that the ship sailed from Rotterdam on Aug. 27, (year) and arrived at XX Anchorage, Shanghai and anchored at 0912 hrs on Oct. 11, (year). On Oct. 14, (year), the ship was maneuvered to berth alongside the M.V. "XXXXXX" by her own power and with the assistance of two tugs for lightening cargo. During this period, when the M.E. crank case doors were opened by the ship's Chief Engineer in order to examine the technical condition of all bearings, the securing bolts on the port side of Nos.2 & 3 main bearings were found broken, those on the std side bent and deformed and the covers for Nos.2 & 3 main bearings both raised about 150mm. The main engine

was already in unworkable condition. The ship was towed from Luhashan Anchorage to Wusong Anchorage by the tug “XX” and then to Minshenglu Wharf for discharge by the tug owned by Shanghai Harbor Administration Bureau.

## DAMAGE FOUND

### FOUND:检验查明

1. 第 2 道主轴承左侧的固定螺栓根部螺纹处拉断。右侧的固定螺栓弯曲而并断裂。Securing bolt on the port side of No.2 main bearing broken at bottom thread. Securing bolt on its std side bent and broken.
2. 第 3 道主轴承左侧的固定螺栓根部螺纹处拉断。右侧的固定螺栓弯曲变形约 20 度。Securing bolt on the port side of No.3 main bearing broken at bottom thread. Securing bolt on its std side bent about 20o.
3. 第 2 道和第 3 道主轴承下瓦的白合金均敲碎脱落。The babbitt of lower half bushes of Nos.2 & 3 main bearings broken into pieces and detached.
4. 第 2 缸后主曲柄臂与后付曲柄肖的红套松动移动约 5 毫米。The shrink integrating aft main crankweb with aft aux. crankpin of No.2 cylinder loosened and slipped about 5mm.
5. 在螺旋桨的一片叶片的叶尖处有一个打坏的缺口，尺寸约 65 毫米 X30 毫米。The tip of one propeller blade notched about 65mmx30mm in size.

RECOMMENDED:要求

二根固定螺栓应予换新。Two securing bolts to be renewed.

二根固定螺栓应予换新。Two securing bolts to be renewed.

第 2 道和第 3 道主轴承应予重浇白合金或换新。Nos.2 & 3 main bearings to be re-babbitted or renewed.

红套走动应予复原处理。The moved shrink to be dealt with.

应予补焊修复。To be repaired by soldering.

### 损坏原因

### CAUSE OF DAMAGE

摘自该轮轮机长书面报告：“我从船长和二管轮处得知该轮于某年 9 月 28 日到达 XX 港锚地期间，他们发现主机曾在超过正常转速（145rpm）的情况下作了短暂的先倒车方向后顺车方向的运转但运转正常。轮机日志表明某年 9 月 28 日 1320 时主机飞车。在停泊前的

2120 时对该系统进行了检查和下述修理, 并进行了试验。在此期间检查了主机曲柄箱, 未发现明显变化。据了解下述修理已进行。调速器传动装置环形密封圈的导气阀已更换, 溢流阀已校准。再次尝试启动主机未成, 可能调速器传动装置对低空气压力信号没有响应。该传动装置调整决定主机油量的限时阀轴。据说是因为导气阀有缺陷。根据观察发现, 当仅为 7 kg/cm<sup>2</sup> 时空气控制压力为 19 kg/cm<sup>2</sup>。使用高压空气可能会引起导气阀环形密封圈的损坏, 由此而导致发生故障。同时还发现超速释放机械装置没有动作, 假定将空气压力加到溢流阀, 就会切断燃油进入主机内。据了解在正常运转时二只溢流阀都动作, 这说明它们有缺陷并且不能在系统中起到保持燃油压力的作用。上述缺陷可能是主机飞车造成的。” It was extracted from the “DAMAGE TO NO.2 & 3 MAIN BEARING AND SHIFTING OF NO.2 UNIT AFTER CRANK WEB” written by the ship’s Chief Engineer as follows: “ I was made to understand by the Master and then Second Engineer that during the vessel’s arrival at the port of XX anchorage on the 28th Sept. (year), they did encounter the problem with main engine running well over the normal limits (145 rpm) for a brief period in both astern direction and later on the ahead direction. The engine log book indicates that on the 28th Sept. (year) at 1320 hours the engine did overspeed. The system was checked, repaired as stated below and tested at 2120 hrs prior to berthing. During this period main engine crankcase was inspected and nothing was apparent. I was made to understand the following repairs were carried out. The pilot air valve for governor actuator ‘O’ rings were replaced and the spill valve adjusted. An attempt was made to re-start the main engine but failed, which could have been due to the governor actuator not responding to the low air pressure signal. The actuator regulates the timing valve shaft which determines the quantity of fuel to the engine. As mentioned earlier it was due to defective pilot valve. On the observation made I found the control air pressure to be 19 kg/cm<sup>2</sup> while the recommended limits was only 7 kg/cm<sup>2</sup>. Using high pressure air could have caused the sealing ‘O’ rings damage on the pilot valve, thereby causing the actuator malfunction. It was also found the over speed trip mechanism was not operating which is supposed to dump the air pressure to the spill valve, which in effect cuts off the fuel to the main engine. I was made to understand that both spill valves were operated during normal running which indicates them as defective and being unable to maintain fuel pressure on the system. These above mentioned defects could have caused the main engine overspeeding.

“主机飞车可能造成曲轴臂的移动。这样的移动会由于第一和第二道轴颈的轴线不正而最终导致主轴承发生故障, 并影响第三道轴颈的轴线而引起主轴承螺柱损坏。这些螺柱的损坏会由于上述轴线不正和由轴承上瓦转送并作用于螺柱上的巨大撞击力而使螺柱拉长所引起的。另一种可能是该轮到达或行驶在上海港浅滩时螺旋桨碰撞水下物体而造成的。螺柱肯定不会在海上断裂, 因为这样会导致主机曲柄箱因主机转速超过 60rpm 产生异常振动和吵声。” It is my considered opinion that overspeeding could have caused the slip of the web on the side pin. This slip would have caused the eventual failure of the main bearings due to the misalignment of Nos.1 & 2 journals which in turn affected the alignment of No.3 journal, also the failure of the main bearing studs. The failure of the studs would have been due to elongation of the studs caused by the above mentioned misalignment and extra impact forces acting on the studs transmitted by the upper halves of the bearings, as this engine is opposed piston and eventual breaking of the studs. Another could have been when the propeller hitting an underwater object on arrival or steaming in shallow waters in Shanghai. The studs could not have been broken definitely at sea as it could have resulted with abnormal vibration and noise from the main engine crankcase due to engine rpm being over 60.”

另据该轮轮机长告称发现螺旋桨一片叶片的叶尖处有一缺口 60mm 长 30mm 宽, 这个肯定



不会引起主机曲轴红套移动这样的损坏。该轮又没有遭到任何碰撞,所以从这些因素来考虑,主机曲轴红套移动这样的损坏不可能由外力而引起。It was added by the ship's Chief Engineer that the tip of one propeller blade was notched 60mm in length & 30mm in breadth, which definitely could not have caused the damage to the main engine crankshaft shrink slippage. The vessel also did not have any collision either, so taking these factors into account the external forces could not have caused this damage to the main engine crankshaft shrink slippage.

下列署名的验船师认为该轮轮机长所讲的主机第二缸曲轴后臂红套移动原因是有一定的道理的。该轮某年7月在XX船厂进行过坞内检验和对主、付机进行了检验,没有发现任何异常。因此,可以认为红套移动是由于某年9月28日主机飞车时造成的。主机第2缸后曲臂与后付曲柄肖的红套移动5mm而造成主机第2道和第3道主轴颈的跳动量增加,而超过安装间隙。因此在后来的航行中,第2道和第3道主轴颈必然不断挤压和敲击主轴承上、下瓦,不知不觉地形成第2道和第3道主轴承损坏和螺栓断裂 The undersigned surveyor considers that the aft crankshaft shrink slippage of the M.E. No.2 cylinder could be reasonably attributed to the cause as stated by the ship's Chief Engineer. In July (year), the ship's docking survey was carried out and her main & aux. engines were inspected in XX Shipyard, and no any abnormality was found. Therefore, the above-mentioned shrink slippage could be caused by main engine overspeeding on Sept. 28, (year). The mentioned shrink slippage made the eccentric deviation of M.E. Nos.2 & 3 main journals to increase and exceed fitting clearance. In the later sailing, Nos.2 & 3 main journals were continuously pressed and the upper and lower bushes of main bearings were hit, thus causing the Nos.1 & 3 main bearings damaged and bolts broken.

当上述红套位移约5毫米,则No.2主轴颈的跳动量接近2毫米,而曲轴在轴承中的最大间隙为0.37-0.76毫米,因而使此段曲轴弹性变形,形成No.3主轴颈产生跳动量,其值也超过主轴颈在轴承中的间隙量,形成轴颈挤压或敲击轴承,使第2道和第3到主轴承及其固定螺栓承受强大附加应力而损坏。As the above-mentioned shrink slippage was about 5mm, the eccentric deviation of No.2 main journal approached 2mm however the max. clearance between the crankshaft and the bearings was 0.37-0.76mm and hence this section of crankshaft was elastically deformed so that the value of the eccentric deviation of No.3 main journal exceeded the clearance in the bearing and therefore the crank journal pressed and hit the bearing and finally the Nos.2 & 3 main bearings and their securing bolts suffered additionally strong stress and damaged.

#### 修理情况

#### REPAIR CONDITION

某年10月27日,第2道和第3道主轴承的轴瓦已换用船上的备件,主轴承的4根固定螺栓已由XXX公司换新,新螺栓的材料已由LR验船师认可。On Oct. 27, (year), the bushes of Nos.2 & 3 main bearings were replaced with the ship's spare ones and 4 securing bolts of the main bearings were renewed by XXX company and the material of new bolts was approved by XX Surveyor.

据船东机务总管透露船东意见待主机第1和第2缸装复后准备试验一次。如果情况好,可考虑低转速开至香港再解决对主机曲轴红套移动问题。The Owner's attempt was revealed by the Owner's Superintendent that, the main engine would be going to sea trial on completion of reassembly of Nos.1 & 2 cylinders, and if satisfactory, the ship was considered to sail to Hong Kong at low speed for repairing the shrink slippage of the M.E. crankshaft.

但该轮在最低转速下开到吴淞口,当主机转速微升起时后,发现主机主轴承有振动声音

发出，不敢再试验，于是转速拉回最低转速，主机主轴承振动声音没有了。于是该轮又开回黄浦江内浮筒，等待联系船厂修理。当联系好 XXX 船厂修理后该轮又开至外高桥三海码头，等待修理。同时船公司邀请英国专家到上海来现场指导，由 XX 船厂做好准备工作后进行主机曲轴红套移动的校正复位工作。该修理工程于某年 11 月 26 日完成。接着于 28 日试航，该轮经低转速和全转速试验，以及试验后检查主轴承 No.1,2,3,4 及复位的红套情况，情况均正常。经 LR 验船师检验合格。The ship reached Wusongkou at lowest speed. However, when the revolution of the M.E. was slightly increased, the M.E. main bearings were found to vibrate and when the revolution was decreased to the lowest, the vibration of main bearings were disappeared. Therefore, the ship had to return and moor between buoys in Huangpu River for waiting repair. Finally the ship sailed to Waigaoqiao Wharf after XXX Shipyard responding to repair. The British expert was invited by the said company to come to Shanghai for the purpose of giving advice to Donghai Shipyard for the adjustment of M.E. crankshaft shrink slippage. This repair work was completed on Nov. 26, (year). On the following 28th day, the ship sailed with both low revolution and full revolution of the main engine. After sea trial, Nos.1-4 main bearings and re-positioning of the shrink were all examined and found satisfactory by XX Surveyor.

备注

#### NOTES

1. 由 XX 船厂提供的修理主机曲轴第 2 缸后曲臂红套移位复原的帐单共 164,148.00 美元认为是公平和合理的。The invoice for repairing shrink slippage rendered by the XX Shipyard in sum of USD 000,000.00 is considered to be fair and reasonable.
2. 由 XXX 公司对主机第 2 和 3 缸拆机检查，更换第 2 道和第 3 道主轴承的固定螺栓，和装复。Nos.1 & 2 cylinders of the M.E. were overhauled and the securing bolts of Nos.2 & 3 main bearings were renewed by XXX company.
3. 该轮被“XX”机动拖轮从“XXXXX”轮处拖至吴淞锚地，再被港务局机动拖轮从吴淞锚地拖至民生路码头。The ship was towed from M.V. “XXXXX” to Wusong Anchorage by motor tug “XX” and from Wusong Anchorage to Minshenglou Wharf by motor tugs of Shanghai Harbor Administration Bureau.
4. 迄今，未收到有关上述第 2 和 3 项的帐单。So far, the vouchers for the above-said Nos.2 & 3 are not rendered.