RA No. **MOG-RA-073** Assessment Date: **20.07.2023** Next Review Date: **20.07.2024** Overall Risk: **LOW**

Location/Vessel: **Fleet** Description of Work: **Critical Equipment Risk Assessment**

2. Individual Tasks/Activities associated with the Work.

No	Brief Description of Task/Activity	Hazard/s for Task/Activity	Who/What is at risk?	Initial Risk (No Controls in Place)			Description of Control Measures Required	Residual Risk (Controls in Place)		
				How Serious?	How Likely?	Overall Risk		How Serious?	How Likely?	Overall Risk
1	Main Engine failure	Loss of propulsion	A	S	U	**L**	• Main Engine consists with many components which are redundant or can be temporarily disabled allowing vessel to proceed with reduced speed	S	U	**L**
2	Main Engine Cylinder Cover failure	Loss of propulsion	W, A	S	U	**L**	• Main Engine can operate with one unit taken out of service with reduction of speed and power	S	U	**L**
3	Main Engine Fuel Injector failure	Loss of propulsion	A	H	U	**M**	• Main Engine can operate with one unit taken out of service with reduction of speed and power. Fuel can be relatively quickly shut off for the affected unit. • Considered as a critical equipment	S	U	**L**
4	Main Engine Exhaust Valve	Loss of propulsion, reduced manoeuvring	W, E, A	S	U	**L**	• Main Engine can operate with one unit taken out of service with reduction of speed and power. Fuel can be relatively quickly shut off for the affected unit.	S	U	**L**
5	Main Engine Starting Air Valve	Loos of propulsion	A	H	U	**M**	• Vessel can proceed at any design speed to reach port of shelter where necessary spares can be delivered and repairs undertaken. Due care taken when reversing or starting the engine. In unlikely situation T/G will need to be used to turn the crankshaft to allow starting or reversing of the engine. • Considered as a critical equipment	S	VU	**L**

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6	Main Engine Main Starting Air Valve	Loss of propulsion	A	VH	U	**M**	• Once the Main Engine is Stopped it cannot be started unless repairs are performed. No redundancy. • Considered as a critical equipment	H	VU	**L**
7	Main Engine Piston failure	Loss of propulsion	W, A	S	U	**L**	• Main Engine can operate with one unit taken out of service with reduction of speed and power. Depending of the failure the affected piston can be removed from the unit, or unit operated without combustion process.	S	U	**L**
8	Main Engine Fuel Pump/ Fuel Booster failure	Loss of propulsion	A	H	U	**M**	• Main Engine can operate with one unit taken out of service with reduction of speed and power. Fuel can be relatively quickly shut off for the affected unit • Considered as a critical equipment	S	U	**L**
9	Main Engine Cylinder Liner failure	Loss of propulsion	A	S	U	**L**	• Main Engine can operate with one unit taken out of service with reduction of speed and power. Fuel can be relatively quickly shut off for the affected unit.	S	U	**L**
10	Connecting Rod bearing failure	Loss of propulsion	A, E	H	VU	**L**	• Main Engine can be operated with one unit taken out of service (piston with piston rod and cross head removed) with reduction of speed and power.	H	VU	**L**
11	Main Engine Main Bearing failure	Loss of propulsion	A, W, E	VH	U	**M**	• Main Engine is inoperative in case of main bearing failure. The only remedy is replacement. • Considered as a critical equipment.	H	VU	**L**
12	Main Engine Turbo Charger failure	Loos of propulsion	A, E	S	U	**L**	• T/C can be secured as per makers manual and engine operated with reduced speed and power.	S	U	**L**
13	Main Engine Auxiliary Blower failure	Loss of propulsion, reduced manoeuvring	A	S	VU	**L**	• Engine can be operated at higher loads without any restrictions. At lower load can expect dense, black exhaust fumes. Engine Control system overridden and operated from Local Operation Panel (Emergency Control Station)	S	VU	**L**

14	Main Engine Control System failure	Loss of propulsion	A	H	U	**M**	• Engine operated from Local Operation Panel (Emergency Control Station) overriding control system • Considered as a critical equipment	S	U	**L**
15	Main Engine Emergency Control Station (Local Operation Panel) failure	Loss of propulsion	A	VH	U	**M**	• No redundancy • Considered as a critical equipment	H	VU	**L**
16	Governor failure	Loss of propulsion	A	S	U	**L**	• Engine operated from Local Operation Panel (Emergency Control Station). Engine speed/load set adjusted manually	S	U	**L**
17	Cylinder Oil Lubricator failure	Loss of propulsion and permanent damage to the engine	A	H	VU	**L**	• Main Engine can be operated with one unit taken out of service with reduction of speed and power (removal of the piston from the affected unit).	H	VU	**L**
18	Main Engine SHD system failure	Loss of propulsion and permanent damage to the engine	A	VH	U	**M**	• No redundancy • Considered as a critical equipment	H	VU	**L**
19	Main Engine Oil Mist detection	Explosion, Loss of propulsion	A, E, W	VH	U	**M**	• No redundancy • Considered as a critical equipment	H	VU	**L**
20	Auxiliary Engine failure	Loss of propulsion	A, W, E	VH	U	**M**	• Redundancy • Considered as a critical equipment	H	VU	**L**
21	Auxiliary Boiler failure	Loss of heating resulting in lack of steam for fuel oil heating, lube oil purifying, domestic water heating.	A	S	U	**L**	• Use of MGO which is available on board according to safe bunker reserves, Electric heater used for water heating for domestic needs, Oil purification can be postponed/delayed for couple of days or the charge replaced	S	U	**L**
22	Steering Gear failure	Loss of manoeuvrability	A, W, E	H	U	**M**	• Redundancy only for the hydraulic and control system • Considered as a critical equipment	H	VU	**L**

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23	Incinerator failure	Lacking possibility to incinerate garbage and sludge	A, E	S	U	**L**	• Garbage stored and handled as per Garbage Management Plan, Sludge stored in the sludge retention tanks and discharged to the reception facilities as required	S	U	**L**
24	Lube Oil Pump failure	Loss of power/Loss of propulsion	A	H	U	**M**	• Redundancy • Considered as a critical equipment	S	U	**L**
25	Fuel Pump (Booster, Circulating, Transfer) failure	Loss of power/Loss of propulsion	A	H	U	**M**	• Redundancy • Considered as a critical equipment	S	U	**L**
26	Seawater and Freshwater Cooling Systems (LT, HT, SW, Pumps) failure	Loss of power/Loss of propulsion	A	H	U	**M**	• Redundancy • Considered as a critical equipment	S	U	**L**
27	Air Compressor (starting, control, service) failure	Loss of power/Loss of propulsion/Loss of cargo cooling possibility	A, E	H	U	**M**	• Redundancy • Considered as a critical equipment	S	U	**L**
28	Air drier failure	Loss of power/Loss of propulsion/Loss of cargo cooling possibility	A, E	S	U	**L**	• Redundancy	S	U	**L**
29	Fresh Water Generator failure	Lack of fresh water	W, A	S	U	**L**	• Sufficient stock on board, bottled water on board for domestic use.	S	U	**L**
30	Oily Water Separator failure	Lacking possibility to treat/discharge oily water	A, E	H	VU	**L**	• Oily water stored in the oily water retention tanks and discharged to the reception facilities as required.	H	VU	**L**
31	Oily Water Separator 15 ppm monitoring equipment failure	Pollution, MARPOL violation.	A, E	VH	U	**M**	• Visual monitoring of treated/discharged water • Considered as a critical equipment	H	VU	**L**

32	Fire Pump failure	Loss of firefighting capabilities	W, A, E	H	U	**M**	• Redundancy (Emergency Fire Pump) • Considered as a critical equipment	H	VU	**L**
33	Ballast Pump failure	Loss of stability	A, W, E	H	VU	**L**	• Redundancy	H	VU	**L**
34	Cargo Pump failure	Commercial, lacking possibility to discharge cargo	A	S	VU	**L**	• Redundancy	S	VU	**L**
35	Anchor and Windlass failure	Commercial	A, P	S	U	**L**	• Redundancy	S	U	**L**
36	Mooring Winches failure	Commercial	A, W, P	S	U	**L**	• Vessel leaves the berth if not sufficient mooring winches, partial redundancy.	S	U	**L**
37	Emergency Generator / Emergency Battery systems failure	Loss of power supply	A	H	U	**M**	• Power supplied by Auxiliary Engines • Considered as a critical equipment	H	VU	**L**
38	Emergency Air Compressor failure	Loss of ability to restore power after black out	A, W	H	U	**M**	• Air vessels charged • Considered as a critical equipment	H	VU	**L**
39	Emergency Fire Pump failure	Loss of firefighting mean	A, W, E	H	U	**M**	• Fire main supplied from Fire Pump located in ER and powered from MSB • Considered as a critical equipment	H	VU	**L**
40	Fire Detection System failure	Fire (Personnel/Property)	A, W, E	H	U	**M**	• Fire watch • Considered as a critical equipment	H	VU	**L**

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41	WBLFFS failure	Fire (Personnel/Property)	A, W, E	H	U	**M**	• Fire main • Considered as a critical equipment	H	VU	**L**
42	Fixed CO2 system failure	Fire (Personnel/Property)	A, W, E	H	U	**M**	• Fire main • Considered as a critical equipment	H	VU	**L**
43	Fixed DP system failure	Fire (Personnel/Property)	A, W, E	H	U	**M**	• Fire main • Considered as a critical equipment	H	VU	**L**
44	Fixed Foam System failure	Fire (Personnel/Property)	A, W, E	H	U	**M**	• Fire main • Considered as a critical equipment	H	VU	**L**
45	Gas Detection System Failure	Explosion (Personnel/Property)	A, W, E	H	U	**M**	• Portable gas detection • Considered as a critical equipment	H	VU	**L**
46	RB davit power supply failure	Personnel	A, W, P	H	U	**M**	• Use of Emergency means to hoist of the RB • Considered as a critical equipment	H	VU	**L**
47	Rescue boat Engine failure	Personnel	A, P	H	U	**M**	• Paddles to be used • Considered as a critical equipment	H	VU	**L**
48	Rescue boat Release Gear failure	Personnel	A, W	H	U	**M**	• Considered as a critical equipment	H	VU	**L**
49	Life raft failure	Personnel	W	S	U	**L**	• Use of redundant life raft	S	U	**L**

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50	Radar failure	Personnel	A, P	S	U	**L**	• Use of redundant radar	S	U	**L**
51	AIS failure	Non-compliance to the requirements	A, P	H	VU	**L**	• Request dispensation from Flag State	H	VU	**L**
52	Compass failure	Personnel/Property	A, P	H	VU	**L**	• Use of Gyro, • Use of GPS	H	VU	**L**
53	Gyro failure	Personnel/Property	A, P	H	VU	**L**	• Use of Compass, • Use of GPS	H	VU	**L**
54	GPS failure	Personnel/Property	A	H	VU	**L**	• Use of redundant GPS • Celestial navigation, • Terrestrial navigation,	H	VU	**L**
55	MF/HF Radio failure	Personnel/Property, Non-compliance to the requirements	A	H	VU	**L**	• Use of alternative method of communication (Iridium, V-sat), • Request Exemption from Flag State	H	VU	**L**
56	Lifejacket failure	Personnel	W	H	VU	**L**	• Availability of spare life jackets	H	VU	**L**
57	BA set failure	Personnel	W	H	VU	**L**	• Availability of spare BA sets	H	VU	**L**
58	BA compressor failure	Personnel	W, A	H	U	**M**	• Spare, fully charged BA cylinders which are frequently inspected for charge. • Considered as a critical equipment	H	VU	**L**

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59	ECDIS failure	Non-compliance to the requirements	A, P, E	H	U	**M**	• No barriers • Considered as a critical equipment	H	VU	**L**
60	Portable fire extinguisher failure	Personnel/Property	W, A, E	H	VU	**L**	• Spare portable fire extinguishers and spares available on board as per SOLAS requirements	H	VU	**L**
61	Ballast level monitoring	Personnel/Property	A	H	VU	**L**	• Manual measurements	H	VU	**L**
62	Main Engine remote monitoring system failure	Personnel/Property	A, W	S	U	**L**	• Use of local gauges, Systems maintained as per PMS, ER manned	S	U	**L**
63	Auxiliary Engine remote monitoring system failure	Personnel/Property	A, W	S	U	**L**	• Use of local gauges, Systems maintained as per PMS, ER manned	S	U	**L**
64	Boiler remote monitoring system failure	Personnel/Property	A, W	S	U	**L**	• Use of local gauges, Systems maintained as per PMS, ER manned	S	U	**L**
65	Main Switchboard failure	Personnel/Property (Loss of Power Supply / Loss of Propulsion)	A, P, E, W	H	U	**M**	• Power supply from Emergency switchboard • Main Switchboard can be separated resulting in redundancy. • Considered as a critical equipment	H	VU	**L**
66	Emergency Switchboard Failure	Personnel/Property (Loss of Power Supply / Loss of Propulsion)	A, E, P, W	H	U	**M**	• Power supply only to the equipment fed from MSB • Considered as a critical equipment	H	VU	**L**
67	Navigational Lights failure	Personnel/Property	A, P	S	U	**L**	• Redundancy	S	U	**L**

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68	Lighting failure	Personnel/Property	A, P, W	S	U	**L**	• Redundancy	S	U	**L**
69	Lube Oil Purifier failure	Property	A	H	U	**M**	• Redundancy • Lube oil purification can be delayed few days • Change of oil charge (full oil charge is kept on board as per SMS) • Considered as a critical equipment	S	VU	**L**
70	Fuel Oil Purifier failure	Property	A	S	VU	**L**	• Redundancy, • Use of alternative fuel (MGO which is required on board as per SMS)	S	VU	**L**
71	Ship whistle failure	Property	A, P	S	U	**L**	• Redundancy	S	U	**L**
72	Sewage Plant failure	Environment	E	S	U	**L**	• Untreated sewage can be discharged overboard as per MARPOL, • If discharge is prohibited, sewage is collected on board. • If the equipment fails, the untreated sewage is collected onboard or • discharged in accordance with MARPOL and local regulations.	S	U	**L**
73	Main Engine Starting Air Distributor failure	Loss of Propulsion	A	VH	U	**M**	• If it fails during engine operation, vessel can proceed. Once the engine is stopped it will not start • Considered as a critical equipment	H	VU	**L**
74	Ship's integrity (hull, hatches, watertight doors and portholes)	Loss of watertightness, Loss of seaworthiness	A, W	VH	U	**M**	• Maintenance and operating of the ship as per PMS and Company requirements • Considered as a critical equipment	VH	VU	**L**
75	CPP equipment	Loss of manoeuvrability and propulsion	A, W, E	VH	U	**M**	• Maintenance and operating of the equipment as per PMS and Company requirements • Considered as a critical equipment	H	VU	**L**

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76	Main Gearboxes	Loss of propulsion Loss of power Equipment failure		VH	U	**M**	• Maintenance and operating of the equipment as per PMS and Company requirements • Considered as a critical equipment	H	VU	**L**
77	PTO Gearboxes driving alternators including FiFi			VH	U	**M**	• Maintenance and operating of the equipment as per PMS and Company requirements • Considered as a critical equipment	H	VU	**L**
78	Main Engines (incl. pumps governors and ancillaries)	Loss of propulsion Loss of power	A, E	VH	U	**M**	• Maintenance and operating of the ship as per PMS and Company requirements • Redundancy • Considered as a critical equipment	H	VU	**L**
79	Thruster Remote Control Systems	Loss of manoeuvrability and propulsion. Equipment failure.	A,E,W,P	VH	U	**M**	• Maintenance and operating of the equipment as per PMS and Company requirements • Redundancy • Considered as a critical equipment	H	VU	**L**
80	Shaft Alternators	Loss of power Loss of propulsion Loss of manoeuvring	A,E,W,P	VH	U	**M**	• System faults to be detected by voltage, current relays and abnormal noise • Considered as a critical equipment	H	VU	**L**
81	Side Thruster Systems	Loss of power Loss of manoeuvring	A, E, P	H	U	**M**	• Insulation checking • Careful mooring and manoeuvring as to avoid suction of mooring lines, fishing nets • Considered as a critical equipment	H	VU	**L**
82	Bridge / Machinery Space communication systems	Loss of communication between Bridge and ER	A, W	H	U	**M**	• Redundancy • Considered as a critical equipment	S	VU	**L**

Assessed by: **Arsenii Osipov / Marine Superintendent** Approved By: **Aleksander Kilanowski / DPA** Date: **20.07.2023**

Risk Assessment Severity, Likelihood/Probability and Overall Risk Rating

		How Serious (Hazard Severity)?				
		Negligible (N)	**Slight (S)**	**Moderate (M)**	**High (H)**	**Very High (VH)**
	Affects on People >	Negligible injury, no absence from work	Minor injury requiring first aid treatment.	Injury leading to a lost time accident	Involving a single death or serious injury	Multiple Deaths
	Affect on the environment >	Negligible impact to the environment with no clean up required	Minor impact to the environment requiring clean up	Moderate pollution incurring some restitution costs.	Major pollution with short term implications incurring significant restitution costs	Major pollution with long term implication and very high restitution costs
	Affect on Work or Assets >	Negligible loss of work time with no damage to equipment	Minor loss of work time or damage to equipment requiring minor repair	Significant loss of work time or damage to equipment requiring extensive repair	Stoppage of work or damage to equipment requiring major repair	Stoppage of work or extensive damage to equipment requiring replacement
How Likely is to Occur? (Likelihood)	**Very Unlikely (VU)** A freak combination of factors would be required for an occurrence.	**LOW**	**LOW**	**LOW**	**LOW**	**LOW**
	Unlikely (U) A rare combination of factors would be required for an occurrence.	**LOW**	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**
	Possible (P) Could occur when additional factors are present but unlikely to occur in normal circumstances.	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**	**HIGH**
	Likely (L) Not certain to occur but an additional factor will significantly increase the likelihood.	**LOW**	**MEDIUM**	**MEDIUM**	**HIGH**	**HIGH**
	Very Likely (VL) An occurrence almost inevitable without controls in place	**MEDIUM**	**MEDIUM**	**HIGH**	**HIGH**	**HIGH**

LOW RISK	MEDIUM RISK	HIGH RISK
May be acceptable, however, due care should be employed and task reviewed to see if the risk can be reduced further.	Task should only proceed with authorisation of Master or Manager. Where possible the task should be redefined and/or measures employed to reduce the residual risk.	Task must not proceed. It should be redefined or further control measures put in place to reduce the risk. Controls should be re-assessed prior to the task commencing.

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