Alaska Marine Highway System

High Speed Craft

Operating Manual, Rev B

Original High Speed Craft manuals prepared by Robert E. Derecktor, Inc. under contract with the State of Alaska (DOT&PF Project No. 73691/SHAK-9500(76)) The State has updated and republished the manuals per legal right, *see* Contract §104-1.01, and acknowledgment from Derecktor. *See* email from Dereckor's James Brewer email to AMHS' William "Butch" Miller, dated 8.29.2012 @ 9:57 a.m.

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List of Figures:

INTRODUCTION

The Craft Operating Manual provides an overview of the craft and its operating systems. The descriptions of the systems are general and broad in scope. There are (4) Manuals in the set of High Speed Craft Code Manuals for the M/V *Fairweather*, they are as follows:

- Craft Training Manual
- Craft Operating Manual
- Maintenance and Servicing Manual
- Route Operating Manual

For a more detailed description regarding any particular system please refer to the Maintenance and Servicing Manual for this vessel under the appropriate section or the Technical Documentation Manuals, which provide access to the manufacturers technical information.

AMHS – High Speed Craft

RECORD OF REVISIONS

Last Revised: April 24, 2017

INSTRUCTIONS: This page contains a record of revisions to the contents of this publication. If this page is not replaced by a revision, details of the revision(s) must be recorded below.

Part Affected:	*Write in details of Chapter, Section, section title, or page number affected by the revision*
Revision Number:	*Write in the revision number of the revised page(s).*
Issue:	*Write in the issue status or date of the revised page(s).*
Brief Details:	*Write in brief details the revision affected in this publication.*
Date Revision Inserted:	*Write in the date the revision(s) were accomplished for this publication [e.g. mm/dd/yy]*
Revision Inserted by:	*The individual that inserted the revision(s) signs and puts in their position on vessel.*

PART AFFECTED	REVISION NUMBER	ISSUE	BRIEF DETAILS OF REVISION	DATE REVISION INSERTED	REVISION INSERTED BY	LETTER DATE USCG APPROVAL
All	A		New engines and systems	6/30/2016		
Sec. 8, Pg. 5-8	A		New Pages for AIS Info	6/30/2016		
Sec. 14	A		Test Data included, new pages added (5-9)	6/30/2016		
Sec. 17, Pg. 5-51	A		Evacuation Procedures, substantial page increase	6/30/2016		
Sec. 17 Pg. 52-55	A		Operating Limitations, Former Section 14 Material	6/30/2016		
Sec. 7	B		Replaced Welin-Lambie davit with an Allied Marine davit.	4/24/2017	Glosten	

PART AFFECTED	REVISION NUMBER	ISSUE	BRIEF DETAILS OF REVISION	DATE REVISION INSERTED	REVISION INSERTED BY	LETTER DATE USCG APPROVAL

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Metric Conversion Table

To Change	To	Multiply by:
Btu/hour	Horsepower	.0003930
Centimeters	Inches	.3937
Centimeters	Feet	.03281
Cubic feet	Cubic meters	.0283
Cubic meters	Cubic feet	35.3145
Cubic meters	Cubic yards	1.3079
Cubic yards	Cubic meters	.7646
Feet	Meters	.3048
Feet	Miles (nautical)	.0001645
Feet/second	Miles/hour	.6818
Gallons (U.S.)	Liters	3.7853
Horsepower	Btu/hour	2,547
Liters	Gallons (U.S.)	.2642
Liters	Pints (liquid)	2.1134
Meters	Feet	3.2808
Meters	Miles	.0006214
Metric tons	Tons (long)	.9842
Miles	Kilometers	1.6093
Miles	Feet	5280
Millimeters	Inches	.0394

1 Metric Ton = 1000kg
1 Metric Ton = 2204lbs
1 Long Ton = 2240 lbs
1 kilowatt = 1.341 horsepower
1 cubic meter per hour = 4.403 gallons per minute
1 bar = 14.5 PSI
1 PSI = .703 meters of water
1 PSI = 2.31 feet of water
1 kg = 2. 204 lbs
1 Newton-meter = .7376 lb-ft
1 meter per second = 196.85 feet per minute
1 meter = 39.4 inches

The High Speed Craft Manuals use the following abbreviations:

Abbreviation	Definition
/	per
<	Less than
=	Equal to
>	Greater Than
A/C	Air Conditioning
ABS	America Bureau of Shipping
AC	Alternating Current
Al	Aluminum
AMHS	Alaska Marine Highway System
ANSI	American National Standards Institute
API	American Petroleum Institute
ARPA	Automatic Radar Plotting Aid
ASTM	American Society for Testing and Materials
Aux.	Auxiliary
AVS	Auxiliary Visual Signaling
Br	Bronze
C	Degrees Celsius
c.c.w. (engine rotation)	Counter Clock Wise
c.w. (engine rotation)	Clockwise
CA	Case Approved
CCTV	Closed Circuit Television
CG	Center of Gravity
COI	Certificate of Inspection
Compt	Compartment
CPU	Central Processing Unit
CuNi	Copper Nickel
DB	Double Bottom
DC	Direct Current
DGPS	Differential Global Positioning System
Diag.	Diagram
diff	Differential
DIN	Deutsches Institut fur Normurg
Dk	Deck
DNV	Det Norske Veritas
DSC	Digital Selective Calling
DSY	Derecktor Shipyard
Dwg.	Drawing
E/R	Engine Room

Abbreviations continued

Abbreviation	Definition
ECDIS	Electronic Chart Display and Information System
ECU	Electronic Control Unit
Elec.	Electrical
Electro	Electric powered
Emer.	Emergency
EPIRB	Emergency Position Indication Radio Beacon
F	Degrees Fahrenheit
F.O.	Fuel Oil
F.W.	Freshwater
FMEA	Failure Mode and Effects Analysis
Fr.	Frame
Ft	feet
Fwd	Forward
GA	General Arrangement
Gal	Gallons
GMDSS	Global Maritime Distress and Safety System
gpm	Gallons per minute
H	Head Pressure
HAT	Harbor Acceptance Trials
HHT	Hydrosonic Hull Tender System
HMON	Hull Monitoring
hp	Horsepower
HP	High Pressure
HPU	Hydraulic Power Unit
Hr	hours
HSC	High Speed Craft
HSCC	International Code of Safety for High Speed Craft
HSLC	High Speed Light Craft
HVAC	Heating, Ventilation, and Air Conditioning
Hz	Hertz, Frequency
I/C	In charge
IBS	Integrated Bridge System
IMACS	Integrated Machinery and Alarm Control System
IMO	International Maritime Organization
In	Inches
ISO	International Standards Organization
kg	kilograms
kW	Kilowatts

Abbreviations continued

Abbreviation	**Definition**
L.O.	Lube Oil
L/R J-Box	Local/Remote Junction Boxes
lbf.	Pounds force
LED	Light Emitting Diode
LF/HF	Low Frequency/High Frequency
LP	Low Pressure
LPT	Linear Position Transducer
LSA	Liferaft Systems Australia
M	Meters
M/E	Main Engines
Mach.	Machinery
Max	Maximum
MDI	Maritime Dynamics, Inc.
MES	Marine Evacuation System (Liferaft system)
Min	Minimum
Mm	millimeters
MOB	Man Overboard
MTU	Motoren-Und Turbinen-Union Main Engine Mfgr.
N	Newtons
Nav	Navigation
NiBrAl (propeller material)	Nickel-Bronze-Aluminum
Nm	Nautical miles
NPSHa	Net Positive Suction Head Available
NPSHr	Net Positive Suction Head Required
P	Pressure
PA	Public Announcement System
PC	Personal Computer
PFD	Personal Flotation Device (lifejacket)
Ph	Phase
PLC	Programmable Logic Controller
POCV	Pilot Operated Check Valve
Port	Port
PR	Pressure Reducing
psi	Pounds per square inch
PSIG	Pounds/Inch^2 Gage
PSW	Passenger service worker
PTO	Power Take-Off
Q	Flowrate

Abbreviations continued

Abbreviation	Definition
QA	Quality Assurance
QTY	Quantity
R/G	Reduction Gear
RCS	Ride Control System
Recirc	Recirculating
RHIB	Rigid Hull Inflatable Boat
RV	Recreational Vehicle
s or sec	seconds
S.W.	Sea Water
SAE	Society of Automotive Engineers
SART	Search and Rescue Transponder
SAT	Sea Acceptance Trials
SAT-C	Satellite Communications, Type C
Schem.	Schematic
SOLAS	International Conventions for the Safety of Life at Sea
SP	Sound Powered Telephone
SS	Stainless Steel
SSDG	Ship Service Diesel Generator
Stbd	Starboard
Struc	Structural
SWBD	Switchboard
TA	Type Approved
Temp	Temperature
TPA	Thermal Protective Aid
ups	Uninterrupted Power Supply
US	United States
USCG	United States Coast Guard
V	Volts
VAC	Volts alternating current
VDC	Volts direct current
VDR (Raytheon)	Voyage Data Recorder
VHF	Very High Frequency
Vol.	Volume

General Information Regarding the Craft and Its Primary Equipment

The craft is one of a class of vessels which has been designed for the Alaska Marine Highway System. The vessel type can be described as a fast vehicle and passenger ferry carrying a maximum of 250 passengers and up to 35 vehicles. It is an aluminum catamaran, with intended service less than twenty miles from safe anchorage.

This vessel was built by Derecktor Shipyards, Bridgeport, CT and designed in conjunction with Nigel Gee & Associates, Southampton, England.

Regulatory Compliance and Certification

The vessel meets the requirements for USCG Inspection per SOLAS/HSC Code Category B as an equivalent to 46 CFR Subchapter H for domestic voyages. The vessel was designed and built in accordance with the DET NORSKE VERITAS (DNV) Rules for High Speed Light Craft with the following notation:

Det Norske Veritas (DNV) Classification

+1A1 HSLC R3 Passenger Car Ferry A E0

+1A1 HSLC Passenger designates that this vessel is a craft of light weight displacement and is a high speed craft in compliance with the High Speed Craft Code as well as the DNV High Speed Light Craft Parts 1-5.

The R3 is a Coastal service restriction limiting the range of the vessel to 20 nm in the winter, 50nm in the summer and 100nm in tropical conditions from safe anchorage.

Car Ferry A designates that the craft is arranged for carriage of vehicles in enclosed spaces with fuel in their tanks for their own propulsion, into and from which such vehicles can be driven and to which passengers have access, including spaces intended for the carriage of cargo vehicles.

EO designates that the craft has periodically unattended machinery spaces.

The vessel has a certificate of compliance for the High Speed Craft Code (HSCC) and a certificate of inspection (COI) from the USCG.

General Arrangement

The general arrangement for the vessel is provided in the Appendix. This vessel consists of the following levels:

- Bridge deck,
- Passenger deck
- Vehicle deck
- Hulls.

See Appendix--General Arrangement Drawing.

The frames on this vessel are spaced a distance of 4 feet apart. **Frame 0** is the transom of the vessel and **Frame 54** is the forward most frame.

Primary vessel particulars and values are listed below:

Vessel Particulars	Value
Length Overall	235’ 5’’
Length at Waterline	210’ 8’’
Beam moulded	59’ 1’’
Design Draft	8’ 6’’
Gross Tonnage	3442 ITC
US Gross Domestic Tonnage	1280 GT
Full load displacement	787.4 Long Tons
Sewage capacity	3600 U.S. gallons
Total Horsepower	19,311 hp
Bow Thruster Horsepower	2 x 100 hp
Passenger capacity	250 passengers
Vehicle Capacity	447,037 lbs.
Fuel Oil	13,800 gallons
Potable Water	1000 gallons
Main Engines/ Reduction Gears	(4) x MTU 20V4000 M73L (4) x Reintjes VLJ2230
Propulsors	(4) KaMeWa 90SII
Ship Service Generators	(4) 185kw diesel generator sets
Vehicle Loading Doors	Starboard side forward and stern
Passenger Loading	Through vehicle loading doors
Vehicle Service Speed	36.5 knots @ 100% MCR, fully loaded 35 knots @ 90% MCR, fully loaded

Vessel Dimensions	Value
Vehicle Capacity	375,571 lbs Total

This section provides brief descriptions of the following equipment and a reference is noted for the section containing equipment operating information or **schematic diagram located in Section 18--Appendix:**

Equipment	Descriptions	Operating Information	Schematic Diagram
Command and Control Systems	Sec. 2 p. 2		no
Communication Equipment	Sec. 2 p. 3		no
Navigation Equipment	Sec. 2 p. 4		no
Bridge Console Layout	Sec. 2 p. 5		no
Monitoring, Alarm and Indicating Equipment	Sec. 2 p. 6		Drawing database
Main Propulsion Equipment			
Main Engines	Sec. 2 p. 7	Section 6 p. 2-6	MTU Manual
Waterjets	Sec. 2 p. 8	Section 8 p. 5-6	Hydraulic, Lube Oil
Gearboxes	Sec. 2 p. 9	Section 6 p. 7-8	no
Electrical Equipment			
Switchboard	Sec. 2 p. 10	Section 9 p. 2	Electrical System
Generators	Sec. 2 p. 11	Section 9 p. 3-4	no
Auxiliary Systems	**Descriptions**	**Operating Information**	**Schematic Diagram**
Potable Water	Sec. 2 p.24	Section 7 p. 2	yes
Sanitation	Sec. 2 p.28	Section 7 p. 4	yes
Seawater Cooling	Sec. 2 p.29	Section 7 p. 6	yes
Bilge	Sec. 2 p.12	Section 7 p. 7	yes
Bow Thruster	Sec. 2 p.13	Section 7 p. 9	no
Ride Control	Sec. 2 p.25-27	Section 7 p. 10	yes
Fuel Oil	Sec. 2 p.19-20	Section 7 p. 13	yes
Compressed Air	Sec. 2 p.14	Section 7 p. 14	yes
Firemain	Sec. 2 p.18	Section 7 p. 15	yes
Sprinkler		Section 7 p. 16	yes
Deluge		Section 7 p. 17	yes
FM200		Section 7 p. 18	yes
Davit		Section 7 p. 19	no
Ventilation		Section 7 p. 27	no
Heating, Ventilation and Air Conditioning		Section 7 p. 31	no
Hydraulic (power pack, door, ride control)	Sec. 2 p.21-23	Section 7 p. 33	yes
Deck Machinery/ Mooring	Sec. 2 p.15-17	Section 7 p. 35	no
Waste Oil/Oily Bilge	Sec. 2 p.30		no

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Command and Control Systems

PMC IMAC System

The PMC IMAC system is an advanced Human Machine Interface (HMI) that consists of two separate PC computers communicating over a high speed ArcNet bus to the alarm processors.

The PC computers allow the operator to view new alarms as well as machinery and control system status. The IMAC system includes data logging of alarms and trending of analog values. The displays can be real time or pulled from computer archived records.

The engineer can manually start/stop the main engines, generators, pumps and fans and open/close motorized circuit breakers remotely from the Engineer's Console in the Operating Compartment. The IMAC system can automatically start/stop generators and open/close breakers when set to power management mode.

Operating Compartment (Bridge)

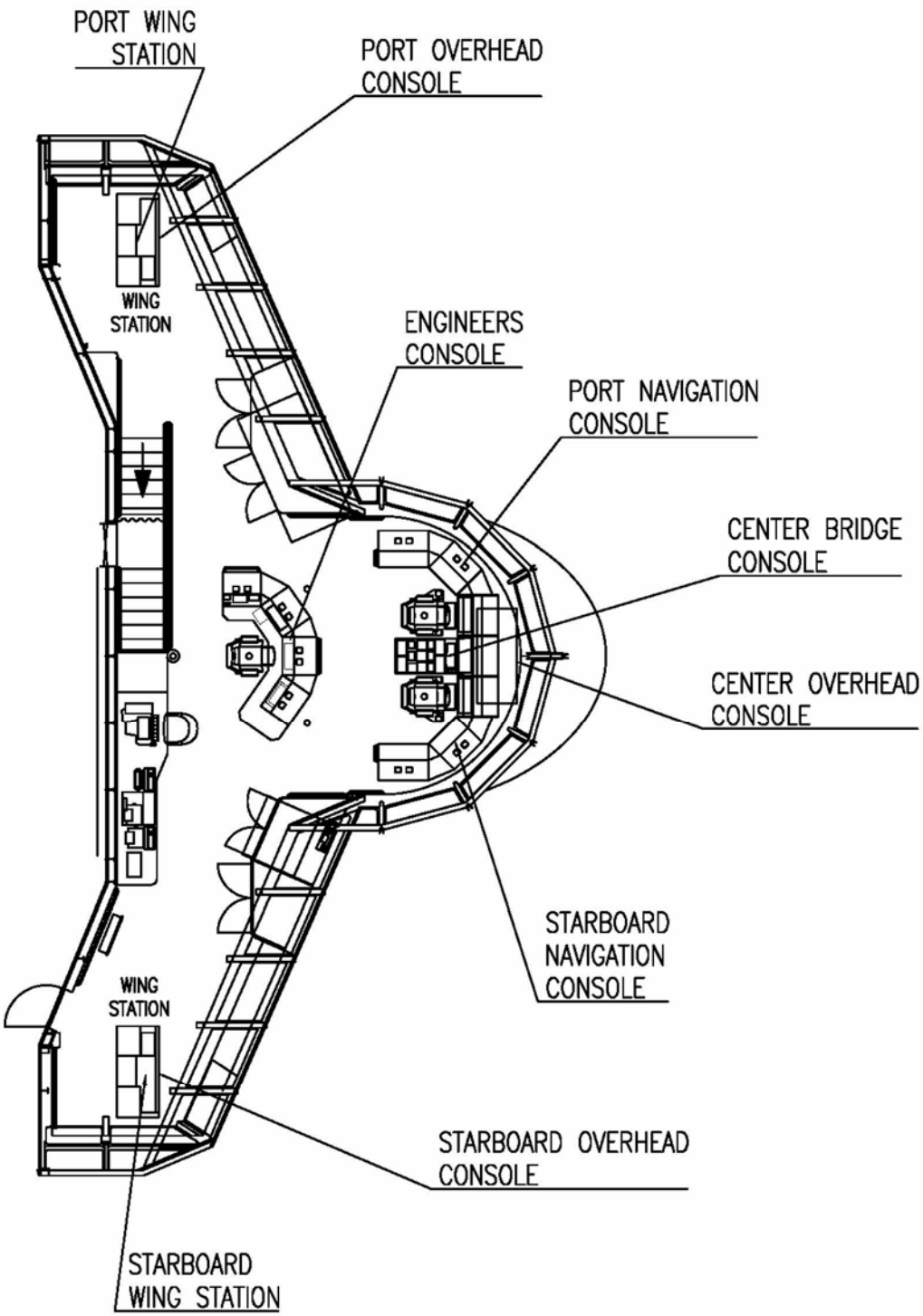
The Operating Compartment is fitted with one (1) helm station with vessel propulsion controls and navigation monitoring, one (1) navigator's station with propulsion controls and navigation monitoring, one (1) Engineer's Console with IMACS control and monitoring, and two (2) wing stations with vessel propulsion controls.

Primary communication equipment is listed below:

MFG	P/N	QTY	DESCRIPTION
CRESTRON / NEC / MATRIX		1	VID INFO audio / video system with 16 18" monitors and PA interface in passenger spaces
Hose	UM-ICSC-2271	1	PA System with speakers
Hose McCann		1	SPT Sound Powered Telephone system with Auxiliary Visual Signaling Beacons
Hose McCann	UM-MPBX-40/15	1	TEL Automatic micro processor Controlled, 40 line, 15 Trunk Telephone System with Auxiliary Visual Signaling Beacons and 6" Gongs
JRC	NCR-330	1	NAVTEX RECEIVER/PRINTER
Motorola	HT750 or HT1000	10	Handheld company VHF with interface to PA
ICOM	IC-A110	1	Air Band Transceiver Coverage of 118 to 136.975 MHz provided with 25 kHz channel spacing. This provides 2 way, on scene, radio communications.
ACR	Global Fix Pro	1	EPIRB Class 1
Furuno	FA 150	1	AIS Vessel Transponder including DSC dual channel VHF transceiver
Raytheon	E43011	1	Raycom cellular VHF
Rutter	VDR-100G3	1	VDR System
SKANTI	1000DSC	2	Company VHF
SKANTI	SCANBRIDGE A3 1250	1	GMDSS system including (2) DSC VHF, (1) DSC MF/HF and (1) SAT-C unit with computer and printer
Icom	IC-GM1600	3	GMDSS portable VHF
SERPI-IESM	Rescuer SART 9 GHz	3	SART Rescuer
	JAX-9A	1	WEATHERFAX

Primary Navigation Equipment is listed below:

MFG	P/N	QTY	DESCRIPTION
Current Corp	85	1	NIGHT VISION System with 2 CRT monitors
PMC		1	IMACS System including (2) computers, (1) printer and COMM's TO FIRE, HVAC, VDR, KMW, INS, MTU, POWER MGMNT
PMC	80	1	NAVIGATION LIGHT PANEL
Raytheon	20	1	AUTOPILOT 2015 OPERATOR UNIT
JRC	JLR-7800	2	DGPS COMBO ANTENNA C/W CABLE
JRC	JLR-7800	2	DGPS NAVIGATOR
Raytheon	NSC ECDIS	1	ECDIS system with (1) 29" MONITOR and (2) 18" MONITOR with radar overlay
Raytheon	GDS 101	1	Echosounder Model Bst 7622 with 200kHz transducer and 50kHz transducer
Raytheon	Digital Gyro STD 22	1	GYRO CONTROL UNIT c/w Rate of turn indicator and 3 repeaters
Barber	Magnetic Compass	1	MAGNETIC COMPASS with sonde pickup and Comnav repeater
Raytheon		1	Nautoconning system with (4) 15" Monitor
Raytheon	NSC Chartradar	2	NSC Chartradar, ARPA equipped 25kW X-band with 40rpm antenna and (2) 29" Monitor
Walker	70	1	SPEED Log Indicator (speed and distance)
Walker	70	1	WIND Wind speed and direction Indicator system
Zollner	SRD-414/2	1	Sound Receptor System. The operator panel is in the center bridge overhead console.
Raytheon	NB090660002	1	GYRO Rate of Turn Indicator is located near centerline of the Center Bridge Overhead Console.
Carlisle and Fitch Co.	1000W XE SL	2	Fully directional 1000 Watt Searchlights



BRIDGE CONSOLE ARRANGEMENT

Monitoring, Alarm and Indicating Equipment is listed below:

IMAC System—This system monitors all of the vessel equipment and alarms, including hatch open/close indication and car deck water leak detection system.

MFG	P/N	QTY	DESCRIPTION
Pelco / NEC		1	CCTV system with 26 remote cameras located throughout the vessel and (4) monitors located on the Bridge
Weir Jones Engineering, Inc.		1	HMON system
Bauer/PMC			Vehicle door & securing position indicating system
DSY			Car deck hatch open/close system
PMC		4	Car deck water leakage detection system
PMC		6	Tank Level sensors
Ansul	IQ-301	1	Fire Detection System
PMC		2	PC workstations c/w redundant network communication and printer
PMC		1	Bridge Collector c/w redundant network communication and communication ports to VDR, and HMON
PMC		1	Bridge Electronics Room Collector c/w redundant network communication and communication ports to FIRE, HVAC, and Propulsion Controls (KaMeWa)
PMC		2	Switchboard Room Collectors c/w front mounted alarm annunciator Network Hubs and redundant network communication
PMC		2	Switch board remote collectors
PMC		2	Fwd Machinery Space Collectors c/w front mounted alarm annunciator, Main Engine communication ports and redundant network communication
PMC		2	Aft Machinery Space remote collectors
PMC		2	Compartment4/5 remote collectors
PMC		2	Redundant 24 VDC power sources

Main Engine Description

This ferry is powered by **(4) MTU 20V4000 M73L high-speed diesel engines**. Each engine has 20 cylinders arranged in the V configuration. This engine is a basic liquid-cooled, four-stroke diesel engine with direct fuel injection, sequential exhaust gas turbocharging and charge air cooling. The maximum continuous rating of each engine is 4828 hp at 2050 rpm.

Note: The key to the engine model designation is as follows:

20	=	Number of cylinders
V	=	Vee configuration
4000	=	Engine series
M7	=	Application segment: M7=Marine engine with high load factors
3	=	Design index
L	=	Addition engine features: L = power uprated

Kamewa Waterjets

Main propulsion for this vessel is through four **(4) KaMeWa 90SII waterjet units**. These pump units include a 6-bladed impeller and a separate impeller chamber. All required bearings and seals are integrated in the pump unit.

Each unit provides 3,600 kW providing a net thrust of 380 kN at cruise speed (36.5 knots) and a maximum of 420 kN. Maneuvering times for the unit are 7 seconds from 30 degrees port to 30 degrees starboard (or reversed). Time for the jet to go from full ahead to full reverse (or reversed) is 7 seconds as well.

Each water jet consists of a hydraulic (biodegradable oil) power pack and a lube oil (mineral oil) pack. The hydraulic power pack consists of (2) PTO pumps driven by the reduction gear and (1) electric pump. One PTO pump operates the two steering cylinders on the bucket for each water jet. The electric pump circulates the system oil through a filter and can act a backup to one of the PTO pumps in an emergency. The PTO pumps are Rexroth AV10SO variable displacement pumps. The lube oil pack consists of (1) electric pump. The pump circulates oil through the water jet bearing. The lube oil packs are each equipped with a circulation pump filter pack. This filter pack separates water and filters the lube oil packs. An electric element, inline heater is used in the filter pack system to aid in water separation.

Reintjes VLJ 2230/ HL/HR Gearboxes

The gearboxes fitted on this vessel are Reintjes marine reduction gearboxes with a hydraulically operated clutch for waterjet propulsion. The reduction ratio of the gearbox is 2.828 to 1 and the input shaft is horizontally offset 460 mm from the output shaft. The spur wheels are helically toothed, case hardened, and tooth flank ground, with oil pump, control valve, oil filter and heat exchanger.

Each of the gearboxes is fitted with two power take off pumps to drive the Kamewa waterjet hydraulic systems functions. Gearboxes Numbers 1 & 2 are fitted with tandem PTO arrangements, while Gearboxes 3 & 4 are fitted with a side by side PTO's.

An electrically driven gearbox trailing pump will be stored ashore and connections will be provided to bring the trailing pump on board in the case the vessel must be run with a waterjet trailing. The electrically driven trailing pump provides lube oil to the reduction gear in this operating mode.

The gearboxes are monitored at the Engineer's Console through the IMAC system.

Switchboards

AC power is distributed throughout the vessel by **(2) 480VAC switchboards** located in the port and starboard switchboard rooms. The port switchboard houses generator Number 2 and Number 4 control panels and 300 Amp generator circuit breakers, 480 VAC distribution, and a panel section for monitoring and controlling generators Number 1 and Number 3.

The starboard switchboard houses generator Number 1 and Number 3 control panels and 300 Amp generator circuit breakers, 480 VAC distribution, a panel section for monitoring and controlling Generators Number 2 and Number 4, and a section for 208 VAC distribution.

Diesel Generators

Main power generation on this vessel is provided by **(4) Northern Lights M6125T generators**, two in each machinery space capable of providing 185 kW of power each. The generators output 480 Volts, 3 phase, 60 hz and they are arranged in the Y- configuration. The two generators in each hull supply a single 480V switchboard from which power is distributed throughout the vessel. The two switchboards are connected by motor operated bus ties to form a unified power system. The generator sets include voltage regulators, a load sharing module, a synchronizer, and a governor.

In addition to the 480VAC supply, the vessel also has 208 VAC, 120 VAC, 24 VDC and 12 VDC circuits to supply power to smaller consumers as necessary. Details of the electrical system are available on the one-line electrical diagrams.

Specifications of the diesel generators are given below.

Diesel Generators

Manufacturer:	Northern Lights
Model:	M6125T
Quantity:	4
Number of Cylinders:	6
Generator:	Marathon Electric
Power Produced:	185 kW each
Supply Voltage:	480V/3phase/60hz
RPM:	1800

Bilge System

REF DWG: NG 432-500-01-1

The M/V *Fairweather* is fitted with submersible, AC driven bilge pumps, one in each compartment except the fore peak spaces, and one each in Double Bottoms 5, 6, 7, and 8. Each fore peak space contains one installed hand pump. In addition, the vessel has (1) 440V portable submersible pump (located in the STBD Bos'n compartment) available to assist with dewater any compartment. There are (3) 440V outlets on the vehicle deck. In the engine rooms, in addition to the submersible pump, there is an independent suction strainer coming from the fire pump suction.

Each compartment and double bottom that a bilge pump serves includes a high level alarm that is monitored through the IMAC system. In addition, each engine room has a high-high level alarm as well. Operation of the bilge pumps is local from each compartment for Thruster Rooms 1 & 2 and Compartments 1, 2, 3 and 4, located just inside the hatch to the space. Compartments 5 & 6, Engine Rooms 1 & 2, and Jet Rooms 1 & 2 have local control of the bilge pumps just outside of the space. Each of the forepeak spaces is fitted with a hand pump to dewater the space as necessary.

Bilge Pumps (Info from Allweiler Technical Specification)

Manufacturer:	Lowara
Model:	DIWA 116 T
Type:	Submersible Centrifugal
Flowrate:	56 US Gallons/Minute
Head Pressure:	29.5 ft (12.8 psi)
Motor Power:	1.5 hp
Power Supply:	208V/60hz/3 phase
Casing Material:	Stainless Steel
Impeller Material:	Stainless Steel
Shafting Material:	Stainless Steel
Quantity:	16 Fixed, 1 Portable

Hand Pump

Manufacturer:	Edson
Model:	217AL-150
Type:	Lever Action, Manual Diaphragm Pump
Casing Material:	Aluminum
Diaphragm Material:	Nitrile Rubber

Bow Thrusters

The vessel is fitted with two bow thrusters, one in each hull located in Thruster Rooms 1 & 2. The bow thrusters are used to aid in maneuvering the vessel during mooring procedures. The bow thrusters are electrically driven by 100 hp motors, with a set of counter-rotating 20" Kaplan style propellers. The maximum thrust generated by each bow thruster is 2716 pounds force.

Bow Thrusters

Manufacturer:	Quantum Marine (Wesmar)
Model:	V2-20
Motor Power:	100 HP
Power Supply:	480V/60hz/3 phase through Variable Frequency Drive
Propeller Material:	NiBrAl
Tunnel Material:	½" Aluminum
Shafting Material:	Stainless Steel
Quantity:	2

Compressed Air System
REF DWG: NG 408-506-01-1—Piping systems, Compressed Air Schematic
EBDG Dwg No. 13031-001-251-1, Starting Air System Modifications
MTU drawing starting system XZ59617000001

A compressed air system is fitted on this vessel providing both high-pressure and low-pressure service. Compressed air is generated by two compressors, one in each engine room.

Each compressor has its own receiver. The receivers are 132 gallon capacity and operate at 580 psi.

High pressure air is reduced to 130 psi, at high volume, for main engine starting and low pressure air is provided for ship services through a reducing station at a pressure of 120 psi.

The compressor is arranged so that it automatically starts if the air in the receiver drops below 460 psi, and will run until the pressure in the receiver reaches 580 psi before it shuts down. The compressor pressure and operation is monitored through the IMAC system.

The two independent air systems are cross connected via a high pressure line should a compressor become inoperative.

Compressor/Receiver Unit

Manufacturer:	Sperre
Model:	HL2/90 with 132 gallon high pressure receiver
Type:	Aircooled, 2-stage, 2-cylinder electric driven compressor
Capacity:	101 US gallons per minute
Working Pressure:	580 psi
Motor Power:	8.45 hp
Power Supply:	460V/60hz/3 phase
Receiver Capacity:	132 gallons
Compressor Material:	Steel
Receiver Material:	Steel
Quantity:	2

Deck Machinery

This vessel is fitted with one electro-hydraulic anchor windlass and four electric capstans. The anchor windlass is a drum type, fitted with 712ft of plasma synthetic line with a breaking strength of 147,000 lbs. In addition there is 45 ft of grade 3 chain fitted between the synthetic line and the anchor. The anchor is of super high holding power type with a weight of 1285 lbs.

The four capstans are located with two at the forward mooring station and one each at the aft port mooring station on the vehicle deck and the aft starboard mooring station on the passenger deck. The capstans can be set up either single speed reversing or single direction two speed. They have a pull of 13,488 lbs at 30 feet per minute, and 8,990 lbs at 60 feet per minute.

Anchor Windlass

Manufacturer:	Hypac PTY Ltd.
Model:	HHAW60-30-Al
Motor Power:	15 hp
Power Supply:	480V/60hz/3 phase
Windlass Output:	10,364 lbs Force
Retrieval Speed:	33 feet per minute
Drum Material:	Aluminum
Band Brake Holding Power:	112,400 lbs force
Cable Stopper Holding Power:	224,800 lbs force
Quantity:	1

Anchor Line

Manufacturer:	Puget Sound Rope
Model:	Vectran 12-Strand
Nominal Diameter:	1.125”
Minimum Tensile Strength:	147,000 lbs force
Material:	Plasma Synthetic
Specific Gravity:	1.4

Anchor Chain

Vendor:	BBI International
Model:	Grade 3 Stud Link
Diameter:	1.125”
Proof Load:	105,000 lbs force
Break Load:	150,000 lbs force

Anchor

Manufacturer:	Edgewater Marine & Fabricators
Model:	Pool Type Super High Holding Power
Anchor Weight:	1285 lbs
Execution:	Fully Balanced
Material:	High Strength Steel

Mooring Capstans

Manufacturer:	Hypac PTY Ltd.
Model:	VEMC6001
Motor:	17.5 hp, 2-speed reversing with heater
Power Supply:	480V/60hz/3 phase
Windlass Output:	13,488 lbs @ 30 feet per minute 8,990lbs @ 60 feet per minute
Capstan Material:	Aluminum, 12”
Quantity:	4

Mooring Lines

Manufacturer:	Samson Rope
Model:	Round Plait SSR-1200 w/ No Pro Guard Finish
Nominal Diameter:	1-5/16" Summer, 1-5/8" Winter
Minimum Tensile Strength:	43,200 lbs force
Material:	Polyester & Ultra Blue Fiber
Specific Gravity:	1.2
Length:	230 feet with 6' eyes on each end
Quantity:	3 fwd, 2 aft

Firemain System
REF DWG: NG 432-519-01-1

The firemain system on this vessel consists of two centrifugal fire pumps, one located in each main engine room port and starboard. The fire stations (hydrants) are located so that any location on the same deck can be reached by a single length of hose from one station and two lengths of hose from the next closest station. On the vehicle deck, the stations are located such that a single length of hose from two stations can reach all points in the space.

Control and monitoring of the fire pumps is from IMACS with local control provided at the pumps. The fire hoses can be pressured by opening the valve located in the fire hose box.

When necessary, the fire pumps can provide water to supplement the sprinkler and deluge systems.

Fire Pumps

Manufacturer:	Allweiler
Model:	NB32-200U3
Type:	Horizontal, Close Coupled, Single Stage
Centrifugal Flowrate:	110 US Gallons/Minute
Head Pressure:	85 psi (196.4 ft)
Motor Power:	14.75 Hp
Power Supply:	480V/60hz/3 phase
Casing Material:	Aluminum Bronze
Impeller Material:	Aluminum Bronze
Shafting Material:	Stainless Steel
Quantity:	2

Fuel System

REF DWG: NGA 408-250-01-1

Modifications

EBDG Dwg No. 13031-001-261-1, Fuel Oil System Modifications, Rev B

EBDG Dwg No. 13031-001-160-1, Fuel Oil Service Tank, Rev B

The fuel system on this vessel consists of two independent tanks, located in Double Bottoms 3 & 4. The capacity of each tank is 6900 US gallons. Fuel is drawn from the storage tank through a coarse suction strainer by one of two electrically driven gear pumps, the FO Service Pumps, then discharged to the NFV filter unit. The NFV filter unit has water separation capability, with auto draining function to an adjacent sludge tank. From the NFV filter unit the fuel flows to a 265 gallon service tank. The FO Service Tank feeds three valved lines to the main engine room, one for each main engine and one for both auxiliary engines. Each ME supply line is fitted with a 10 micron cartridge type filter, the ME FO Pre-filter provided by MTU. Return fuel is fed to the FO Service Tank and leak-off fuel to the double bottom.

There are two FO Service pumps in each hull, but only one should be used at a time for fuel oil service. The FO Service Pump takes suction from the storage tank via a strainer and pumps fuel through the NFV filter to the service tank with a capacity of 265 US gallons. Excess fuel in the service tank returns to the fuel storage tank via overflow piping.

Each main engine has an electro-pneumatic controlled supply valve from the service tank. The fuel passes through a duplex 10 micron FO Pre-filter, then connects to the main engine fuel inlet.

The two generators in each hull are supplied by a single electro pneumatic controlled supply valve from the service tank.

Transfer of fuel between hulls is possible using the fuel oil service pumps and operating a three-way valve at the pump discharge, then opening the fuel oil fill valve in the other hull.

The fuel system in compartments 3 & 4 each contain the following equipment:

Fuel Oil Service Pumps

Manufacturer:	Rotan
Model:	GP41EMR-1U3B2
Type:	Mono-bloc horizontal internal gear pump
Flowrate:	17.24 US Gallons/Minute
Head Pressure:	35.3 psi (81.5 ft)
Motor Power:	1.1 HP

Power Supply:	480V/60hz/3 phase
Casing Material:	Cast Iron
Shafting Material:	Stainless Steel
Quantity:	2

MTU NFV Filter/Separator Units

Manufacturer:	Mahle
Model:	KFWA-3
Type:	Simplex Fuel Filter and Water Separator
Max. Flowrate:	19.37 US gpm
Max. Pressure Loss:	1.5 bar
Quantity:	1 per hull

Aft Power Unit, C30-104

The aft power unit outputs approximately 9.6 gpm to operate the aft vehicle loading door and the vessel's interceptor ride control system. Maximum system pressure is limited by controlling the pumps' compensator pilot pressure with a direct acting relief valve.

The power unit employs two pressure compensated, variable displacement axial piston pumps - each driven by a 7.5 Hp IEEE 45 type electric motor. Each pump is connected to its motor with a jaw type flexible coupling. Each pump and motor is fixed together and aligned by an aluminum bell housing. The bell housings are fixed to the top surface of a 55 gallon aluminum reservoir in a vertical configuration such that both pumps are enclosed within the reservoir.

The power unit assembly includes a tank-top mounted manifold assembly with an integral flange-mounted, non-bypass type pressure filter. This assembly includes pump isolation check valves, a direct acting main system relief valve, a remote compensator control relief valve, a visual filter element condition indicator, and an analog filter element condition transducer. The remote compensator pilot pressure relief valve sets the compensating pumps' cut-off pressure and is set to 2250 psi. The direct acting system relief valve exists for safety and to trim pressure spikes. It is set at 2500 psi.

The reservoir assembly is also fitted with a desiccant type air breather/filter, oil heater, thermometer, visual sight gauge, oil cooler, level/temp switch assembly, oil cooler and water- regulating valve. The oil heater includes an integral thermostat and will maintain an approximate minimum oil temperature of 70 degrees. The visual oil level sight gauge includes shut off valves to isolate it from the reservoir if the glass is broken. The oil cooler and attached water-regulating valve cools returning oil with metered seawater, supplied by the #4 ME sea water pump, to maintain a system oil temperature below 150 degrees. The level/temp switch assembly offers a high oil temperature alarm and two separate oil level alarms through the IMACS system.

The aft hydraulic power pack is located in the Port Jet Room. Filling of the reservoir is local on the tank top.

Aft Hydraulic Power Unit

Pump Manufacturer:	Rexroth
Model:	10VSO10DRG
Type:	Axial piston, variable displacement w/ remote pressure control
Capacity:	9.6 US gallons/minute
Working Pressure:	2250 psi
Motor Power:	Baldor 7.5 hp IEEE
Motor Power Supply:	480 V/60 hz/3 phase
Reservoir Capacity:	44 gallons
Reservoir Material:	Aluminum
Quantity:	1

Forward Power Unit, C30-103

The forward power unit provides approximately four gpm hydraulic oil to operate the starboard vehicle-loading door. A direct acting relief valve set at 1800 psi limits maximum system pressure.

The power unit employs a single section, fixed displacement external gear pump driven by a 5 Hp IEEE 45 type electric motor. The pump and motor shafts are connected through a jaw type flexible coupling. An aluminum bell housing fixes and aligns the pump and motor relative to each other. The bell housing is fixed to the top surface of a 25 gallon aluminum reservoir in a vertical configuration such that the pump is enclosed within the reservoir.

A hand operated – reciprocating piston type pump is mounted on the side of the reservoir for emergency manual door operation.

The power unit assembly includes a tank-top mounted return filter with 25 psi bypass and visual element condition indicator.

The electric pump, hand pump, and return filter are plumbed to a tank-top mounted manifold assembly. The manifold assembly houses the system relief valve (set at 1800 psi), pump isolation check valves, system pressure gauge, and a solenoid operated directional control valve. Both pumps are normally vented back to the reservoir through the directional control valve and then the return filter.

The forward hydraulic power pack is located on the forward starboard side of the vehicle deck between Frames 50 and 51. Filling of the reservoir is local on the tank top.

The reservoir assembly is also fitted with a desiccant type air breather/filter, oil heater, thermometer, and visual sight gauge. The oil heater includes an integral thermostat and will maintain an approximate minimum oil temperature of 70 degrees. The visual oil level sight gauge includes shut off valves to isolate it from the reservoir if the glass is damaged.

Forward Hydraulic Power Unit

Pump Manufacturer:	Cassappa
Model:	Whisper 20 Series-WSP-20.9 SO-31S1
Type:	Fixed displacement gear pump
Capacity:	4 US gallons/minute
Working Pressure:	1800 psi
Motor Power:	Baldor 5hp IEE Motor
Power Supply:	480 V/60 hz/3 phase
Reservoir Capacity:	25 gallons
Reservoir Material:	Aluminum
Quantity:	1

Potable Water System
REF DWG: NGA 408-502-01-1

The potable water system on the M/V Fairweather consists of a 1000 gallon potable water tank and two centrifugal pumps to circulate potable water to consumers throughout the vessel.

Filling of the potable water tank is possible from two locations. There is a filling station on the vehicle deck on the forward starboard side between Frames 38 and 39. The other filling station is located on the aft starboard mooring station on the vehicle deck. Fill pressure is to be limited to 60 psi. The potable water tank is located in compartment 2.

Potable Water Tank

Manufacturer:	Bittner Industries
Capacity:	1000 US Gallons
Design Pressure:	10.83 psig
Material:	Fiberglass
Design Forces:	2g Lateral Deceleration
Surface Treatment:	Post Cured for Potable Water
Design Standards:	ASTM –D4097

Freshwater Pumps

Manufacturer:	Desmi
Model:	DPV 4-60
Type:	Vertical In-Line Multistage Centrifugal
Flowrate:	17.6 US Gallons/Minute
Head Pressure:	92.2 psi (213 feet)
Motor Power:	2 HP
Power Supply:	480 V/60 hz/3 phase
Casing Material:	Stainless Steel
Impeller Material:	Stainless Steel
Shafting Material:	Stainless Steel
Quantity:	2

Ride Control System (RCS)

The RCS reduces pitch, roll, and heave motions to reduce the incidence of passenger motion sickness.

The RCS utilizes two interceptors for control surfaces. As the control surfaces move through the water, they generate forces to counter the forces that waves put on the ship. The control surfaces move to create forces of different magnitudes and directions to compensate for wave forces. The Electronic Control Unit determines the position of the control surfaces.

The Electronic Control Unit is the central component of the electrical system. The ECU houses the digital controller that positions the control surfaces for ride control. The digital controller determines the required control surface commands based on the ship's pitch angle, roll angle, pitch rate, roll rate, yaw rate and accelerations. The hydraulic system will position the interceptors based on command signals from the digital controller. The aft hydraulic power pack, located in the Port Jet Room, supplies hydraulics for the ride control system.

Listed below is a description of the major equipment that comprises the Ride Control System:

Interceptors

An interceptor is a movable structure mounted at the transom of each hull. Hydraulic actuators installed on the transom raise and lower the interceptors on command. The actuators move the interceptors from 0% (full up) to 100% (full down).

The interceptors may impede the operation of the waterjets if they are not in the fully raised position when the waterjets are operated for astern thrust. Therefore, *before astern thrust* is used, the interceptors must be raised to their full up position. This is referred to as *stowing* the interceptors.

The RCS will automatically stow the interceptors when the ahead thrust is reduced to below 30% or when the ship's speed falls below 8 knots. Should the automatic stowing function fail to raise the interceptors to the fully up position, the Emergency Interceptor Stow Switch should be used. The captain should always be sure that the interceptors are stowed before taking the ship to an area that may require astern thrust (e.g. a harbor).

HYDRAULICS

The hydraulic components supplied by MDI and referred to in this manual are described in chapter (1) of the technical manual.

ELECTRONICS

Electronic Control Unit

The Electronic Control Unit (ECU) is the central component of the RCS electronics. The ECU houses the digital controller that processes operator parameters and motion sensor data to compute the control surface positions that provide ride control. It also contains the analog signal conditioning electronics and interface terminations that connect the ECU to the other RCS components and to other vessel systems. The layout of the ECU is shown in Figure 1-1 in chapter (1) of the technical manual.

System Display

The System Display is the primary operator interface for the RCS. The system display comprises a vacuum fluorescent screen and eight operator switches. Two of the switches are dedicated to switching the RCS power on and off. The other multi-function switches provide for operator input and for changing between display pages. The operator input allows for adjustment of ride control settings and certain alarm level settings. Operator input is encoded within the display unit then fed via a fiber optic link to the ECU. This data is then fed to the digital controller. The digital controller also feeds vessel motion information and interceptor command and position data back to the system display via a fiber optic link.

The System Display is shown in Figure 1-2 of the technical manual. One display unit is provided and is mounted on the starboard side of the operating compartment Nav Console.

Control Panel

The manual control panel comprises position indicators, mode switches and backup controls for the interceptor. The 'mode' switches are used for changing the control function of the interceptor between NORMAL and BACKUP modes. NORMAL mode utilizes the digital controller to position the interceptors. In BACKUP mode, the interceptor is positioned by the operator using the backup controls.
The backup controls for the interceptors are spring-centered toggle switches that act directly on the directional valves, bypassing servo valve control.

The position indicators for each manual control panel comprise two columns of LED lamps, one column for each interceptor. Each column is made up of two blocks of 10 LEDs. The relative position of the interceptor is indicated in real time by one of the LEDs being lit. As the interceptor moves, the illuminated LED changes to reflect the new relative position. The interceptor control panel is shown in Figure 1-3. One interceptor control panel is provided and is mounted on the stbd side of the operating compartment nav console.

Motion Sensor Package

The Motion Sensor Package consists of a group of sensors that measure the pitch, roll, yaw and acceleration motions of the ship. The motion sensor package provides the following information to the RCS.

Pitch angle (trim)	Yaw rate
Roll angle (list)	Lateral acceleration at CG point
Pitch rate	Vertical acceleration at CG point
Roll rate	Longitudinal acceleration at CG point

The Motion Sensor Package is specifically positioned near the vessel's CG and should not be relocated. The Motion Sensor Package is shown in Figure 1-4 in Chapter (1) of the technical manual.

Local/Remote Junction Boxes

Local/Remote Junction Boxes (L/R J-Box) are installed one in each of the waterjet compartments, close to the interceptors. These J-boxes allow the operator to take local control of the interceptors. When local control is taken, the operator can position the interceptors manually using controls within the L/R J-boxes. If local control is taken, the system display mode indicator for that interceptor will change to read BKUP (backup). See Figure 1-7 Chapter (1) of the technical manual.

Sanitation System
REF DWGS: NG 408-504-01-1 and NG 408-504-04-1

The M/V *Fairweather* sanitation system consists of a USCG Type 3 sewage holding tank with a capacity of 3600 gallons. All grey and black water drains are gravity fed into this tank and stored until discharge to the shore facility. For discharge of the raw sewage, a centrifugal macerating pump is fitted on the vessel allowing discharge of the entire tank in less than one hour. The sewage discharge pump is sized with suitable margin to meet the various discharge configurations the pump may encounter, ensuring that in all cases the tank can be emptied in less than 1 hour.

The sewage holding tank is located in Compartment 3. There are two sewage pump out connections on the vehicle deck; one forward starboard between Frames 38 and 39 and one aft starboard between Frames -1 and 0. Details of the sewage holding tank and the sewage discharge pump are provided below.

Sewage Tank

Manufacturer:	Bittner Industries
Capacity:	3600 US Gallons
Design Pressure:	10.83 psig
Material:	Fiberglass
Design Forces:	2g Lateral Deceleration
Design Standards:	ASTM –D4097

Sewage Discharge Pump

Manufacturer:	Herborner
Model:	3HK50/1
Type:	Close-Coupled Horizontal Centrifugal Macerating Pump
Flowrate:	86.7 US Gallons/Minute
Head Pressure:	27.5 psi (63.6 Feet)
Motor Power:	4.83 HP
Power Supply:	480 V/60 hz/3 phase
Casing Material:	Cast Iron
Impeller Material:	Cast Iron
Shafting Material:	Stainless Steel
Quantity:	1

Sea Water Cooling System
REF DWGS:
NG 408-507-01-1 Sea Water Cooling System
Modifications:
EBDG Dwg No. 13031-001-256-1, Sea Water Cooling System Modifications
MTU drawing XZ59620000014 Coolant System

The vessel is fitted with six sea chests, two in each main engine room and one each in Compartments 1 and 2. Each engine room sea chest provides cooling water to one main engine/gear and one diesel generator, with the aft sea chest in each engine room also supplying water to the fire pumps. The Compartment 1 and 2 chests serve the sprinkler/deluge pumps and the Compartment 2 sea chest also provides cooling water for the A/C chiller units. Sea chest valves are electro pneumatically controlled from IMACS.

There is no major equipment directly associated with the seawater cooling system. Each main engine and diesel generator is provided with a raw water cooling pump. The discharge side of the main engine raw water cooling pump branches into two internal lines, one supplying water to the main engine heat exchanger and the other supplying seawater to the reduction gears, waterjet shaft seal, and the aft hydraulic power pack (in the port hull only). The generator raw water pump circulates water to the generator heat exchanger and then discharges it overboard.

Waste Oil/Oily Bilge System
REF DWG: NG 432-500-01-1

Each engine room and jet room is capable of being serviced by the waste oil/oily bilge system. The waste oil/oily bilge system consists primarily of an air-driven diaphragm pump that serves to clean up oily bilge water in the bottom of the engine room and jet room through suction hoses fitted in each space. In addition, the waste oil/oily bilge pump serves to discharge waste oil from the main engines, generators, and general waste oil from the waterjet hydraulic and lube oil systems when performing maintenance and servicing.

The discharge of the waste oil/oily bilge pump is to a portable tank cart through fittings on the vehicle deck both port and starboard side where it is taken ashore and properly disposed.

Waste Oil/Oily Bilge Pump

Manufacturer:	Warren Rupp
Model:	Sandpiper diaphragm pump
Type:	Air powered double-diaphragm pump
Casing Material:	Aluminum
Diaphragm Material:	Buna
Check Valve Material:	Buna

Flooding Alarm Sensors

REF DWG: NG 408-650-01-1, General Arrangement

The vessel is divided into 11 compartments port and starboard. The forepeak compartment is common to both hulls and does not contain high level alarms. Double Bottoms 1 & 2 are not fitted with alarms or pumps. Double Bottoms 3 & 4 are fuel tanks with associated TLI instrumentation. The remaining compartments contain a flooding alarm that is monitored through the IMAC system at the engineers console in the Operating Compartment. A list of hull compartments is given below:

Forepeak #1:	Stbd Hull Fr. 50-54
Forepeak #2:	Port Hull Fr. 50-54
Vehicle Dk Fwd	Stbd Hull Fr. 51
Vehicle Dk Fwd	Port Hull Fr. 51
Thruster Room #1:	Stbd Hull Fr. 41-50
Thruster Room #2:	Port Hull Fr. 41-50
Compartment #1:	Stbd Hull Fr. 31-41 above double bottom
Double Bottom #1	Stbd Hull Fr. 31-41 (sound manually)
Compartment #2:	Port Hull Fr. 31-41 above double bottom
Double Bottom #2	Port Hull Fr. 31-41 (sound manually)
Compartment #3:	Stbd Hull Fr. 23-31 above double bottom
Double Bottom #3	Stbd Hull Fr. 27-31 (Fuel)
Compartment #4:	Port Hull Fr. 23-31 above double bottom
Double Bottom #4	Port Hull Fr. 27-31 (Fuel)
Double Bottom #5	Stbd Hull Fr. 22-27
Double Bottom #6	Port Hull Fr. 22-27
Compartment #5:	Stbd Hull Fr. 18-23 above double bottom
Compartment #6:	Port Hull Fr. 18-23 above double bottom
Double Bottom #7	Stbd Hull Fr. 18-22
Double Bottom #8	Port Hull Fr. 18-22
Engine Room #1:	Stbd Hull Fr. 3-18
Engine Room #2:	Port Hull Fr. 3-18
Jet Room #1:	Stbd Hull Fr. 0-3
Jet Room #2:	Port Hull Fr. 0-3
Vehicle Dk Aft	Stbd Hull Fr. -1
Vehicle Dk Aft	Port Hull Fr. -1

If a flooding alarm in any of these spaces were to sound, this would indicate the presence

of water in the compartment. A crew member should be sent to assess the cause of the alarm, report results of investigation to bridge, and commence appropriate damage control actions.

Upon inspection, if the bilge pump cannot efficiently dewater the space, it is probable that the buoyancy compartment was breached. A diver should be used to inspect the hull and if necessary, the vessel should be dry-docked to perform the necessary repairs.

Double Bottom Sounding

The double bottoms of the port and starboard hulls contain level alarms and submersible bilge pumps, with the exception of Double Bottoms 1 & 2. The means of checking the integrity of Double Bottoms 1 & 2 is through a sounding tube fitted on the top of each double bottom. The sounding tube contains both a threaded cap and a test cock.

The list of double bottom compartments is given below:

Double Bottom #1:	Stbd Hull Fr. 31-41
Double Bottom #2:	Port Hull Fr. 31-41
Double Bottom #5:	Stbd Hull Fr. 22-27
Double Bottom #6:	Port Hull Fr. 22-27
Double Bottom#7	Stbd Hull Fr. 18-22
Double Bottom #8	Port Hull Fr. 18-22

The procedure for checking the integrity of each double bottom is outlined below.

Daily

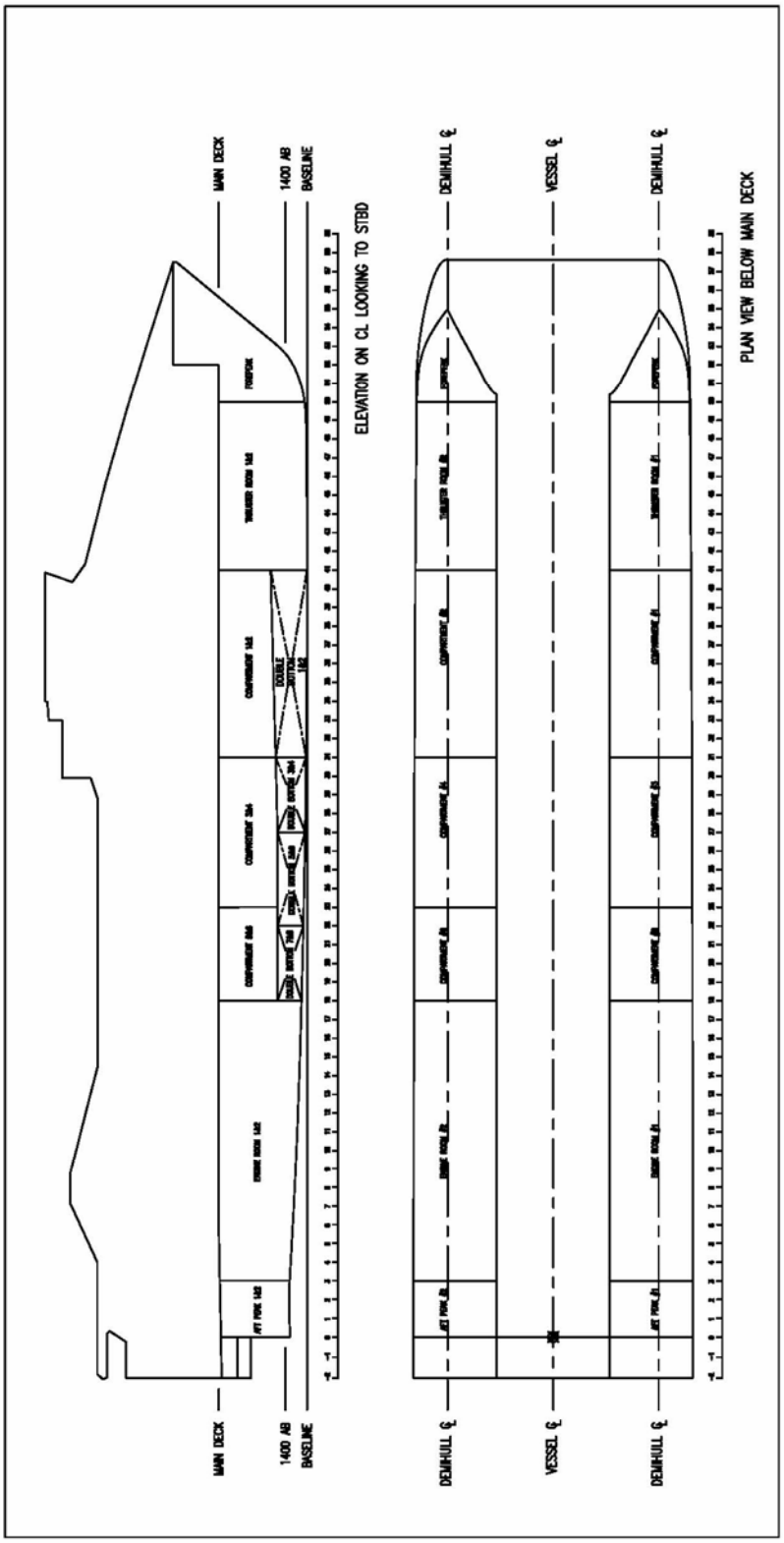
1) From the vehicle deck, open the hatch to the compartment above the double bottom and enter the space.
2) Locate the sounding tube on the corresponding double bottom.
3) Open the test cock and listen for air pressure and/or water escaping. If you hear a rush of air escaping (indicating the double bottom is under pressure), but no water at the test cock, remove the sounding cap and sound the compartment for presence of water. Report any water found to supervisor.
4) Use the portable bilge pump to dewater the space. After pump-out, monitor the void to see if water returns. If pump-out does not keep up with the rate of incoming water, close-off the space and follow Step 5.

5) If water is detected at the test cock, immediately close the test cock and notify supervisor the void is flooded. It is recommended to send a diver to inspect the hull for damage, drydock the vessel as required for repairs.

Fuel Tanks

1) Double Bottoms #3 and #4 are the fuel tanks. These tanks are normally monitored through the IMAC System for fuel oil level. If the occurrence of water in the fuel filter/separators becomes common and excessive, the hull in the area of the fuel tank may be damaged. A diver should be sent to inspect the hull.
2) Sounding the Fuel Tank—Daily before and after fuel filling
    a. From the vehicle deck, open the hatch to the compartment above the fuel tanks.
    b. Locate the fuel oil sounding tube.
    c. Open the threaded cap and sound the tank using water indicating paste to confirm the fuel level and also ensure there is no water in the fuel. After sounding the tank, close the threaded caps.

The figure to the right shows the reserve buoyancy compartments.



Intact Stability in the Displacement Mode

This vessel has been designed in accordance with IMO 2000 HSC Code Chapter 2 in that the vessel has sufficient intact stability, when in still water conditions, for the inclination of the vessel not to exceed 10 degrees from the horizontal under all permitted cases of loading and controlled passenger movements as may occur.

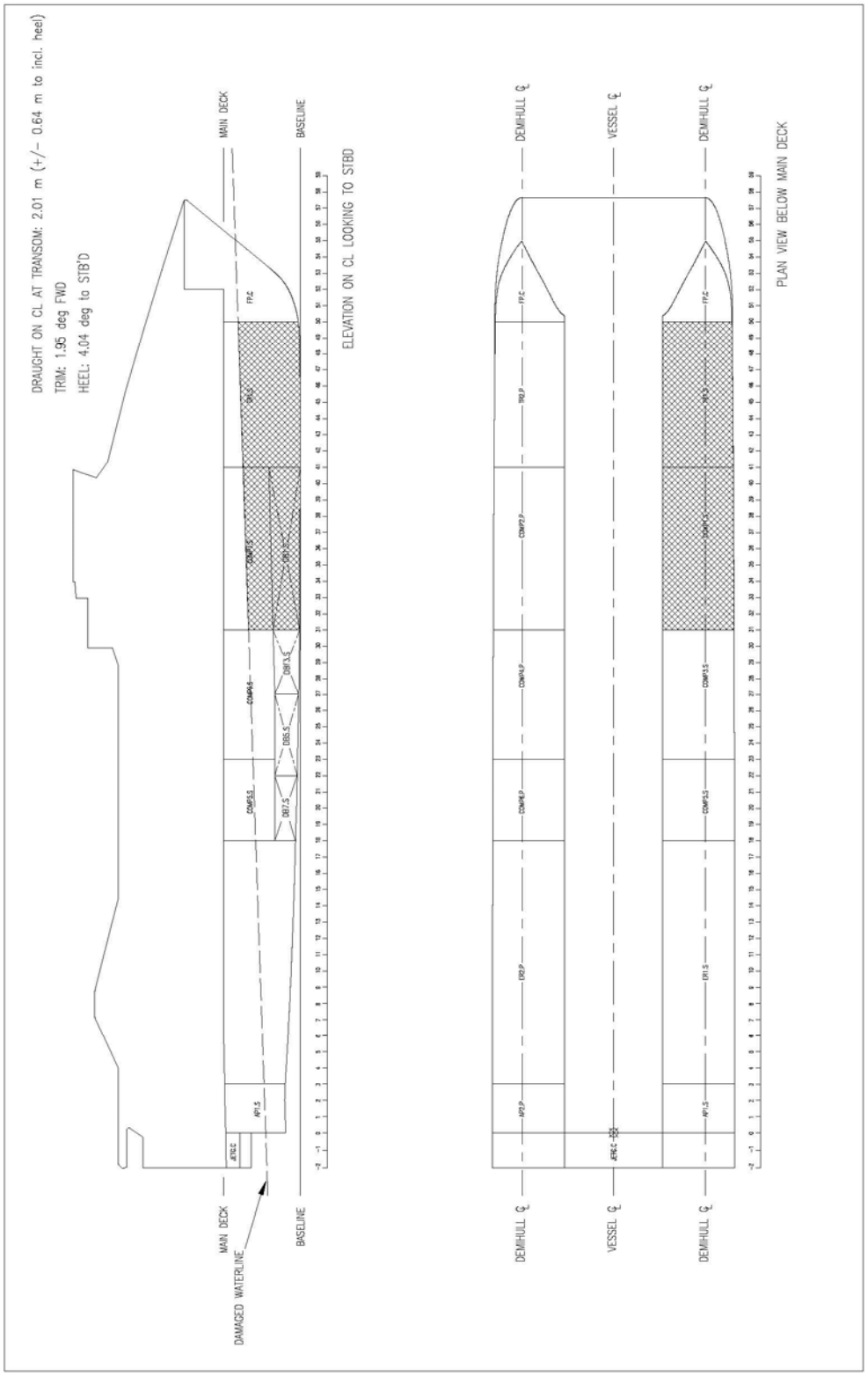
Buoyancy and Stability in the Displacement Mode Following Damage

In accordance with IMO 2000 HSC Code Chapter 2.15, following any postulated damage the vessel still has sufficient buoyancy to ensure that the angle of inclination of the vessel from the horizontal will not exceed 15 degrees in any direction. The reserve buoyancy compartments are shown in the previous figure. The maximum forward and aft trims for the worst case damage scenarios are in the following figures.

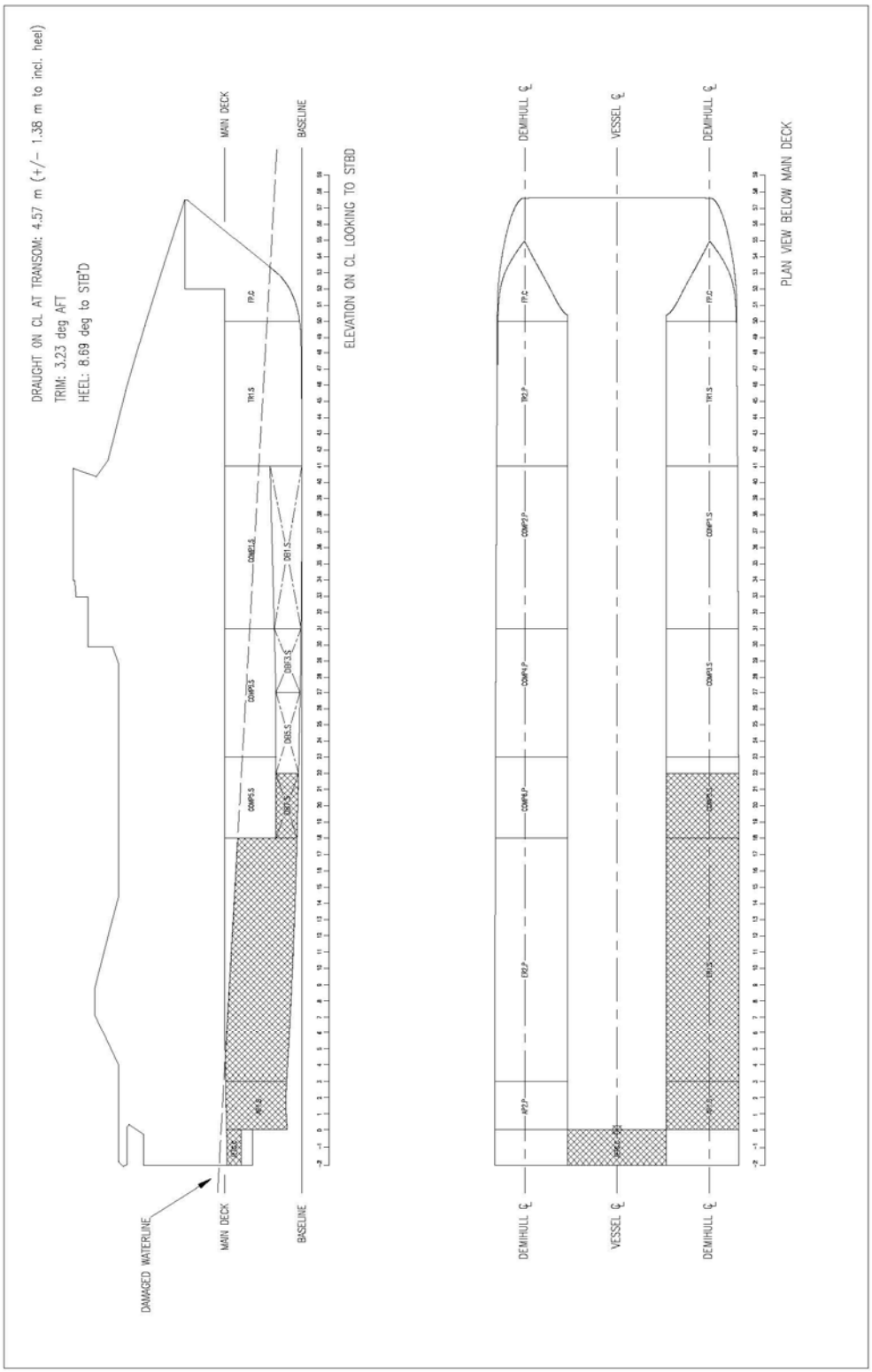
Refer to the following drawings:

Trim and Stability (Maximum Induced) – Largest Forward Trim, Section 4, page 3

Trim and Stability (Maximum Induced) – Largest Aft Trim, Section 4, page 4



DAMAGED STABILITY SCENARIO – LARGEST FWD. TRIM



DAMAGED STABILITY SCENARIO – LARGEST AFT TRIM

Flood control

The voids are fitted with submersible pumps as described in Section 3, Page 1. In addition to the sixteen (16) fixed bilge pumps, one portable pump is carried in the starboard Bos'n Locker. Fire pumps can also act as bilge pumps in emergencies only in the engine rooms.

The portable pump is electric, 480 volt, and can be carried in way of any void space requiring dewatering. This pump operates using the special reefer receptacles located on the vehicle deck. Normal operation is to lower the pump into the space that is flooded, position the discharge hose into a scupper leading overboard and plug the pump into the nearest reefer outlet.

Note: The forepeaks are served by two separate hand operated pumps.

Hull compartments should always be dry. Water level in the space will be indicated by a high bilge alarm on the IMAC page referring to the bilge system. Minor leaks should be handled by the normal operation of the bilge pump. The bilge pumps for the port and starboard engine rooms, jet rooms and Compartments 5 & 6 / Double Bottoms 7 & 8 are controlled just outside of the access to the space. For all other compartments and double bottoms bilge pump control is just inside the hatch in the compartment that it serves. Communicate to the Operating Compartment the status of the flooding. Turn pump on and start dewatering space and observe to make sure the space is dewatering. A good indication that the compartment may be flooding is if the bilge alarm sensors continue to indicate high water or if the operation of the pump is not keeping up with the rate that water is entering the space. Communicate to the Operating Compartment if the bilge pump can not keep up with the flooding. Close the hatch and secure the space.

Sounding tubes are located in each compartment that has a double bottom. The sounding tube should be opened and double bottom water level checked to indicate a flooding problem or breach of the hull.

Some sizes of wooded tapered plugs are stowed in the Forepeak for the purpose of driving into leaking pipes and hull plating as a means of stopping leaks until they can be repaired at the next port.

In the event compartment investigation indicates the space is flooded and rapidly filling, the watertight hatch should be secured and flooding condition reported to the bridge.

Normal Water in Bilges

At times pump packing glands will leak some water into the bilge, condensation will accumulate, or the crew may change a sea strainer allowing water to enter the bilge.

Routinely bilges of each compartment will be inspected by the crew. Normal accumulation of bilge water will be discharged as deemed necessary by the Chief Engineer. Oily bilge water from the engine room (oil coming from the main engines) will be retained in the engine room bilge for pumping ashore at the scheduled discharge port.

DAMAGE CONTROL PROCEDURES

This section provides procedures for the following damage control situations:

- ***Fire***
  - Refer to Appendix—Station Bill for the M/V Fairweather emergency procedures.
  - Refer to Section 2 of this manual for discussion on Firemain System.
  - Information regarding fire fighting equipment and systems on board the vessel is located in the HSC Training Manual, specifically sections 1,2,9,19,20 and 21.

- ***Flooding***
  - Refer to Flood Control--Section 4 of this manual and Sections 22, 23 of the HSC Training Manual.

MACHINERY SYSTEMS

This section includes information on the following Machinery Systems:

Machinery Systems	Descriptions	Operating Information	Schematic Diagram
Main Engines	MTU 20V4000 M73L diesel engines	Sec. 6 p. 2-6	MTU Manual
Waterjets	KaMeWa 90SII	Sec. 6 p. 7, Sec.8 p.5-6	Hydraulic, Lube Oil schematics only
Gearboxes	Reintjes VLJ 2230/ HL/HR Gearboxes	Sec. 6 p. 7-8	None
Generators	Northern Lights / Marathon Electric 185 kw	Sec. 9, p. 3-4	None

MTU-Order Number 1199172

Diesel Engine—Application Group 1B—Operating Instructions

Note: These instructions are taken from the MTU Manual MA15187_00E Operating Instructions.

Operational availability, reliability, as well as low operating and maintenance costs can be achieved only by adherence to the operating, maintenance and care instructions.

In addition:

- Trained personnel must be used
- Proper tools must be used
- Original spare parts, fluids and lubricants must be used in accordance with MTU Fluids and Lubricants Specification A001061 and
- Maintenance tasks must be carried as per the MTU Maintenance Schedule.
- All page references refer to MTU Manual MA15187_00E Operating Instructions

Putting the engine into operation after scheduled out-of-service-period

Preconditions

☑ Engine is stopped and starting disabled.

Putting into operation

Item	Action
Lube oil system	Check engine oil level (→ Page 128); Preheat engine oil if required.
Coolant circuit	Check coolant level (→ Page 144).
Coolant circuit	Heat coolant with coolant preheating unit.
Engine control system	Switch master switch to ON; Press illuminated pushbutton READY FOR OPERATION (→ Page 43).
LOP	Press illuminated pushbutton LAMP TEST (→ Page 43).
ECU	Check plug connections (→ Page 167).
EIM	Check plug connections (→ Page 169).
EMU 8	Check plug connections (→ Page 168).

Putting the engine into operation after extended out-of-service periods (>3 months)

Preconditions

☑ Engine is stopped and starting disabled.

☑ MTU Fluids and Lubricants Specifications (A001061/..) are available.

Putting into operation after extended out-of-service periods (>3 months)

Item	Action
Engine	Depreserve (→ MTU Fluids and Lubricants Specifications A001061/..).
Lube oil system	Check engine oil level (→ Page 128); Preheat engine oil if required. Lubricate valve gear (→ Page 98).
Raw water pump (if located above waterline)	Fill with water (approx. 3 – 4 liters).
Coolant circuit	If engine is out of service for more than one year, change coolant (→ Page 145).
Coolant circuit	Check coolant level (→ Page 144).
Coolant circuit	Heat coolant with coolant preheating unit.
HP fuel pump	Only for engines without oil priming pump Fill HP fuel pump with new engine oil (→ Page 103).
Engine control system	Switch master switch to ON; Press illuminated pushbutton READY FOR OPERATION (→ Page 43).
Engine Control Unit ECU	Check plug connections (→ Page 167).
EIM	Check plug connections (→ Page 169).
EMU 8	Check plug connections (→ Page 168).
LOP	Press illuminated pushbutton LAMP TEST (→ Page 43).

Starting the engine

Preconditions

☑ External start interlock is not active.

☑ Emergency air shut-off flaps (if fitted) are open.

DANGER

Rotating and moving engine parts.
Risk of crushing, danger of parts of the body being caught or pulled in!
- Before cranking the engine with starter system, make sure that there are no persons in the engine's danger zone.

WARNING

High level of engine noise when the engine is running.
Risk of damage to hearing!
- Wear ear protectors.

The engine can be started from the following points

Item	Action
Control stand	(→ Operating instructions for electronic system)
Local Operating Panel LOP	(→ Operating instructions for electronic system)
Local Operation Station LOS	(→ Operating instructions for electronic system)
CCU	(→ Operating instructions for electronic system)

Tasks after extended out-of-service periods (>3 weeks)

Tasks after extended out-of-service periods (>3 weeks)

Note: Operate fuel treatment system for at least 5 minutes.

1. Start up fuel treatment system (→ Page 51).
2. Shut down fuel treatment system (→ Page 55).

Operational checks

DANGER

Rotating and moving engine parts.
Risk of crushing, danger of parts of the body being caught or pulled in!
- Only run the engine at low power. Keep away from the engine's danger zone.

WARNING

High level of engine noise when the engine is running.
Risk of damage to hearing!
- Wear ear protectors.

Operational checks

Item	Action
Engine oil	Check engine oil level (→ Page 128).
Engine under load, engine at nominal speed	Visually inspect engine for leaks and general condition; Check speed, pressures and temperatures; Check engine and external lines for leaks; Check for abnormal running noises and vibration; Check exhaust color (→ Page 62).
Air filter	Check signal ring position of service indicator (→ Page 126); Replace air filter (→ Page 124) if the signal ring is completely visible in the service indicator observation window.
Intercooler	Check condensate drain(s) for water discharge and obstruction (→ Page 123).
Exhaust gas system	Check condensate drain for obstructions.
Fuel prefilter(s)	Drain water and contamination from fuel prefilter (if fitted) (→ Page 113). Check pointer position of differential pressure gage at fuel prefilter (if applicable).
HT coolant pump	Check relief bore for oil and coolant discharge and contamination (→ Page 151).
Raw water pump	Check relief bore for oil and water discharge and contamination (→ Page 156).

After stopping the engine

Preconditions

☑ MTU Fluids and Lubricants Specifications (A001061/..) are available.

After stopping the engine

Item	Action
Coolant circuit	Drain coolant (→ Page 146) if: • freezing temperatures are expected and the engine is to remain out of service for an extended period, but engine coolant has no antifreeze additive; • the engine room is not heated; • the coolant is not kept at a suitable temperature; • the antifreeze concentration is insufficient for the engine-room temperature; • antifreeze concentration is 50 % and engine-room temperature is below -40 °C.
Raw water	Drain • If freezing temperatures are to be expected and the engine is to remain out of service for an extended period.
Engine control system	Switch off.
Air intake and exhaust system	Out-of-service-period > 1 week • Seal engine's air and exhaust sides.
Engine	Out-of-service-period > 1 month • Preserve engine (→ MTU Fluids and Lubricants Specifications A001061/..)

The water jets are operated through the propulsion control system as defined in Section 8, p. 5 and 6 of this manual.

Refer to Section 18—Appendix—Kamewa for hydraulic and lube oil drawings.

Note: This information can be found in the Reintjes Operating Manual. For further information, please refer to that manual.

Hydraulic System

The hydraulic system comprises a gear type pump, an oil filter, heat exchanger,temperature regulating valve, pressure limiting valve, control valve, pressure oil system and lubrication oil system. Oil supplied by the pump is filtered and cooled, so the oil temperature does not rise above the normal operating temperature. The oil flows around the tube bundle, the cooling water flows through the tube bundle. The cooling water connections can reciprocally be used for inlet, outlet respectively. The oil pressure is regulated to operating pressure in the pressure limiting valve. The pressure gauge on the gearbox indicates the operating pressure. When the engine is running at full speed, the clutch engaged and the gearbox at normal operating temperature, the pressure should be within the green area on the gauge.

The normal operating pressure is approx. 21 - 25 bar (2100 - 2500 kPa or 305 - 363 psi).

With the control valve in STOP position (NEUTRAL position) the overflowing oil from the pressure limiting valve in used for cooling the clutch discs and lubrication of all bearing points and tooth meshings. If the control valve is actuated into position clutch ENGAGED, the pressure oil is flowing from the control valve to the clutch and the pressurizing valve. The excess oil is used for lubrication.

Operating Instructions

Safety and maintenance are prerequisites for trouble free operation, maximum performance and a long service life. Safety is, initially, an abstract definition and cannot, in all cases, be defined by regulations. The necessary safety measures can normally be determined by experience and common sense. Be alert at all times. Observe possible danger sources. Take all necessary precautions. Safety is EVERYBODY'S business.

This Operating Manual includes descriptions of maintenance services, which have to be completed periodically.

Familiarize yourself with the "Maintenance" chapter. Periodic supervision and registration of measured parameters provides a duty profile for the engine and marine gear. If certain conditions change then a changed display may indicate a potential problem. The necessary repairs can be laid down before an actual failure occurs with resultant non-scheduled down time.

Engagement Procedures

The engaging speed range specified in the order acknowledgment has to be observed.

Engagement

If the control valve is set to NEUTRAL and the JET-shaft stationary or turning only very slowly: Set engine to engaging speed, engage and remain in this status for approximately 3 seconds. Then increase engine revolutions to the desired propulsion speed.

Trailing Operation, Engine STOP and Impeller Rotating

This condition covers all operating conditions in which the propulsion plant is shut down and the impeller, the JET-shaft line and the gearbox shafts are caused to rotate by entrained water.

Restricted Trailing Operation

With the standard marine gear without an additional trailing oil pump, this is possible without any special precautions. Should this condition last longer than 12 hours all marine gear lubrication points must be lubricated for at least 5 minutes. This can be achieved by starting the propulsion engine or by operating the trailing pump. If the above-mentioned short-term lubrication is not possible, the JET-shaft/impeller must be locked.

This section provides information on the following Auxiliary Systems:

Auxiliary Systems	Descriptions	Operating Information	Schematic Diagram, located in Figures Section
Potable Water	Sec. 2 p.24	Section 7 p. 2	yes
Sanitation	Sec. 2 p.28	Section 7 p. 4	yes
Seawater Cooling	Sec. 2 p.29	Section 7 p. 6	yes
Bilge	Sec. 2 p.12	Section 7 p. 7	yes
Bow Thruster	Sec. 2 p.13	Section 7 p. 9	no
Ride Control	Sec. 2 p.25-27	Section 7 p. 10	yes
Fuel Oil	Sec. 2 p.19-20	Section 7 p. 13	yes
Compressed Air	Sec. 2 p.14	Section 7 p. 14	yes
Firemain	Sec. 2 p.18	Section 7 p. 15	yes
Sprinkler		Section 7 p. 16	yes
Deluge		Section 7 p. 17	yes
FM200		Section 7 p. 18	yes
Davit		Section 7 p. 19	no
Ventilation		Section 7 p. 27	no
Heating,Ventilation and Air Conditioning		Section 7 p. 31	no
Hydraulic (power pack, door, ride control)	Sec. 2 p.21-23	Section 7 p. 33	yes
Deck Machinery/ Mooring,	Sec. 2 p.15-17	Section 7 p. 35	no
Waste Oil/Oily Bilge	Sec. 2 p.30		no

Potable Water System
REF DWG: NG 408-502-01-1

The potable water system consists of a 1,000 gallon potable water tank fitted in Compartment 2. The potable water tank is filled from either the forward or aft filling station located on the vehicle deck.

Potable water is distributed throughout the vessel using either of two centrifugal pumps located in Compartment 2. Control of these pumps is provided from the Wheelhouse through the IMAC system and locally in Compartment 2. The motor controller for each pump will have a switch to choose between off/manual/remote control. Only one pump is required for system operation: the second pump is provided for redundancy. The system is designed to constantly re-circulate water throughout the piping to prevent any freezing in the system. As a result, the pump runs constantly during operation and overnight while the vessel is tied up.

Potable Water Filling Instructions

1) Check the valve in the filling line on the top of the tank, ensure that it is open.
2) At either the forward or aft filling station, remove the cap on the Camlock fitting and connect the filling hose.
3) Begin filling the tank, gradually increasing the flow rate of water to maximum filling flow rate.
4) The tank level will be monitored at the local fill station TLI vice at IMACS.
5) As the tank approaches 90% capacity, gradually decrease the filling flow rate while filling the rest of the tank.
6) When the level sensor reaches 95% stop the flow of freshwater to the tank.
7) Wait 30 seconds to allow for water in the fill piping to drain to the tank.
8) Disconnect the hose from the Camlock fitting and place the cap on the fitting.

Potable Water Service Instructions

1) In Compartment 2, confirm that the outlet valve from the tank is open.
2) Open the valves in the suction and discharge lines of the pump intended to be used and check that the valves in the suction and discharge lines of the other pump are closed.
3) Switch the motor controller to the “remote” setting, making control of the pump through the IMAC system.

4) From the Engineer's Console, start the freshwater pump through the IMAC system.
5) Monitor the discharge pressure of the pump as well as the tank level from the Operating Compartment through the IMAC system.
6) In the case where the low freshwater level alarm activates, shut down the freshwater pump at the engineers console using the IMAC system to prevent dry running of the pump.

Note: In normal winter operation, it is intended to run the pump 24-hours a day to constantly circulate water throughout the vessel and prevent freezing of supply and return piping.

Sanitation System
REF DWGS: NG 408-504-01-1, Piping Systems, Grey Water
NG 408-504-04-1, Piping Systems, Black Water
NG 408-507-01-4, Seawater Flush

The vessel is fitted with a USCG Type III sewage holding tank with a capacity of 3600 gallons, located in Compartment 3. The toilets, urinals, and grey water drains are gravity fed into the holding tank. A centrifugal macerating pump is fitted to pump the sewage ashore at one of two discharge stations located on the vehicle deck.

The toilets and urinals are supplied with seawater for flushing from two dedicated pumps in Compartment 1. The sinks are supplied from the potable water system. Automatic faucets are fitted throughout the passenger space lavatories to prevent excess drainage to the sewage tank and reduce potable water consumption.

Monitoring of the sewage holding tank level will be from the Wheelhouse and at each discharge station. The sewage discharge pump can be controlled from the discharge stations on the vehicle deck, and locally in Compartment 3. The motor controller will feature an off/manual/remote switch. Setting the switch to manual gives control locally at the pump. Setting the switch to remote allows operation from the forward or aft discharge station. Shutoff of the pump is automatic controlled by the low-level alarm on the sewage tank to prevent dry-running of the pump or by switching the motor controller to "off".

A compressed air blow down is included at each discharge station to blow back the discharge lines of the pump and also to purge the hose between the vessel and the shore connection after pump-out of the tank is complete. This function serves to prevent sewage standing in the discharge lines and possible freezing. In addition to the air blow down, the discharge stations are fitted with a seawater flush as well.

The sanitary system is a closed loop system. For cold weather operations the overboard valve at the aft pump out station must be set to flow sufficient water to prevent system freezing.

Sewage Pumpout Instructions

Operation and monitoring of the sewage discharge function is normally from the discharge station itself with control of the pump and corresponding valves operable from each station. Monitoring of the pump can be carried out in the Wheelhouse through the IMAC system at the Engineer's Console as well.

The following instructions are for pump out of the sewage tank to either the forward of aft discharge station on the vehicle deck:

a.) At the discharge station, remove the cap from the camlock fitting on the sewage discharge line.

b.) Connect the hose between the discharge station on the vehicle deck and the shore facility connection.

c.) Switch the selector from "Off" to "Pump out" on the discharge station control panel. This opens the pneumatic valves on the suction side of the pump

d.) Ensure the compressed air and seawater flush valves are closed and open both the tank cutout and shore cutout valves to allow sewage to flow to the shore facility.

e.) Press the “Start” button on the discharge station control panel. This starts the pump out process.

f.) Monitor the tank level at the discharge station TLI, when the tank is at 7% press the stop button, securing the pump.

g.) Switch the valve selector switch to "Off".

h.) Close the tank cut out valve from the sewage discharge pump, located on the discharge station.

i.) Open the seawater flush valve to flush out the hose to the shore facility.

i.) When you have flushed the hose sufficiently, close the seawater flush valve and open the compressed air valve to blow out the hose.

k.) When you have all the water out of the hose, secure the compressed air valve and open the tank cutout valve and turn the selector switch to "Backflush" to drain any residual water to the holding tank.

l.) Close the shore cutout valve to the shore facility.

m.) Open the sea water flush valve to flush the discharge piping back to the tank, flush no more than (3) minutes to reduce quantity of water being flushed back to the tank.

n.) Close the seawater flush valve and open the compressed air to blow out any water in the line.

o.) Secure the compressed air cutout valve, close the tank cutout valve and disconnect the hose to the shore facility.

p.) Replace camlock fittings and wash down/mop up/sanitize any spills on the deck.

Seawater Cooling System

REF DWG: NG408-507-01-1

Modifications

EBDG Dwg No. 13031-001-256-1, Sea Water Cooling System Modifications

MTU drawing XZ59620000014 Coolant System

There are two sea chests located in each engine room. Cooling water taken off each sea chest travels through one of two circuits. In one of the two circuits the propulsion engine driven raw water pump supplies water primarily to the engine jacketwater and lube oil coolers. In addition to this, the engine driven pump supplies raw water for cooling of the propulsion gearbox lube oil and also cooling water for the corresponding waterjet shaft seal. All raw water that passes through heat exchangers is then piped overboard for discharge.

The other seawater cooling circuit taken off of each sea chest supplies seawater to a generator heat exchanger through a diesel-generator driven raw water pump. After passing through the diesel-generator heat exchanger, the raw water is discharged overboard.

The only difference between the port and starboard sea water cooling schematics is that on the port side, sea water is branched off the line to the jet seal to provide cooling water to the aft hydraulic power pack, located in the port side jet room.

Operation Instructions for Sea Water Cooling System

1. On the IMAC system at the Engineer's Console, for Sea Chests #1-4, confirm that the sea chest inlet valve, main engine outlet, and diesel generator outlet valves are all in the "Open" position. (Open them in the case any of them happened to be closed.)
2. Start the diesel generator and the main propulsion engine as necessary.
3. Through the IMAC system at the Engineer's Console, monitor the pressure and temperatures of the raw water cooling water through the MTU propulsion engines and the Northern Lights generators. Address any fault alarms that may occur.

Chiller Cooling

For the HVAC system, a self-priming centrifugal pump supplies both chiller units with seawater for cooling. This pump takes suction from the forward port sea chest in Compartment 2. The seawater circulates through the chillers and discharges it overboard. Operation of the pump is tied to air conditioning operation. The pump automatically starts and stops when the A/C is turned on and off. The pump runs continuously while the chiller units cycle during A/C operation.

Bilge System
REF DWG: NG432-500-01-1

This vessel is fitted with submersible bilge pumps with a flow rate of 56 US gpm and a head of 29.5 feet. Operation of the bilge pumps is local from each compartment for Thruster Rooms 1 & 2, Compartments 1, 2, 3 and 4, and Double Bottoms 5 & 6, located just inside the hatch to the space. Compartments 5 & 6, Double Bottoms 7 & 8, Engine Rooms 1 & 2 and Jet Rooms 1 & 2 have local control of the bilge pumps just outside of the space. Each of the forepeak spaces is fitted with a hand pump to dewater the space as necessary. Monitoring of the bilge pumps and the bilge flooding alarms is through the IMAC system.

The bilge pumps are piped directly overboard in each space at a sufficient height above waterline.

In addition to the submersible bilge pumps there is an emergency bilge suction in each main machinery space that uses the firemain pump to discharge water overboard. This function is used only in the case of an emergency by operating a series of pneumatic valves from the Wheelhouse. In addition, there is a portable submersible bilge pump that can be used as necessary in any of the double bottoms or compartments by plugging it into a 440VAC receptacle.

Bilge System Operation

1) Monitor the flooding alarms through the IMAC system at the Engineer's Console in the Wheelhouse.

2) Upon alarm, a crewmember should be sent to the compartment of alarm and open the hatch, determining the content of the bilge water, confirming there is no oil.

3) If it is only water flooding the space, the pump can be started from either within the space or just outside of the space, depending on which compartment is flooded.

4) Check the integrity of the space as it dewaters. If necessary, the portable bilge pump can be used to assist in dewatering of the space.

Emergency Bilge System Operation

If in the case that either of the machinery spaces becomes excessively flooded, the firemain pumps can be used to dewater the space.

1) At the Engineer's Console through the IMAC system, observe through the CCTV and from the high-level alarms which space is excessively flooded.
2) For the corresponding flooded space, start the firemain pump.
3) At the Engineer's Console using the IMAC system, open the pneumatic valve to the overboard discharge.

4) At the Engineer's Console through the IMAC system, open the pneumatic valve in the firemain pump inlet line for the bilge suction.
5) At the Engineer's Console through the IMAC system, close the pneumatic valve for fire pump suction from the sea chest.
6) Monitor the dewatering of the flooded machinery space through the CCTV monitor and the high-level alarm.

Note: Pressing the Port of Stbd Bilge button on the IMACS fire machinery page will properly align the valves.

Bow Thruster

Bow thruster control is from the Operating Compartment helm station and each wing. Both thrusters are proportionally controlled by a single joystick and are independent of the waterjet control. Bow thruster operation is limited to maneuvering of the vessel either during mooring or departure of the vessel from the pier and the bow thrusters are turned off at all other times during operation. Emergency backup control of the bow thrusters is available locally in Thruster compartments 1 and 2.

During mooring, the thrusters can be set at a constant thrust in a specific direction to hold the vessel up against the pier by locking the joystick in that position. To lock press down on the joystick and to unlock press down again.

Bow Thruster Operation

1) When approaching the harbor, ensure reserve power is available for the thrusters by engaging the "Bow Thruster Reserve" feature of Power Management at the Engineer's Console.
2) Confirm the bow thrusters are ready and in remote through the bow thruster indication panel on the propulsion overview page.
3) At the desired control station, press the "In Comm" button on the bow thruster control panel; then a light on the panel indicates control from that location. Bump the bow thruster briefly to confirm function.
4) Move the joystick port or starboard depending on how much thrust and in what direction is required for mooring.
5) After maneuvering is finished, return the joystick to the zero thrust position and press the "off" button on the bow thruster control panel.
6) Bow thruster reserve power may now be secured through the IMAC system at the Engineer's Console.

Ride Control System

The interceptors can be operated using one of two modes:

NORMAL — The interceptors are controlled by the digital controller inside the ECU. The interceptors must be in NORMAL to be used for MOTIONS ON.

BACKUP — The interceptors are controlled by a backup jog switch on the manual control panel. The command from the manual control panel bypasses the digital controller and can be used if a failure occurs with the digital controller. The interceptor backup controls act directly onto the directional solenoid valves on the hydraulic servo manifold.

The interceptor modes are selected by switches on the Manual Control Panel.

Controls are provided near the interceptor locations for operation within view of their actuator assemblies. This is referred to as LOCAL operation. These controls are mounted inside the Local/Remote Junction Boxes (L/R J-Boxes). When local operation is selected, the interceptors are operated via switches within the L/R J-Boxes. There is no indication of the position of the interceptor at the local positions.

Ride Control Modes

There are two modes of operation for ride control:

MOTIONS ON — The interceptors (in NORMAL) are automatically positioned to reduce ship motions. MOTIONS ON is also termed AUTO ON. Each term has the same meaning.

MOTIONS OFF — Automatic control is terminated. The interceptors (in NORMAL) may be positioned by the operator via the UTILITIES display. MOTIONS OFF is also termed AUTO OFF. Each term has the same meaning.

The RCS also enters MOTIONS OFF mode when the ship speed is less than 8 knots or the waterjet thrust command is below 30% ahead. Automatic control is terminated. The interceptors are commanded to the full up position. The system will not leave MOTIONS OFF mode until commanded by the operator.

Operating instructions taken from Maritime Dynamics Technical Manual MD-R-2739 (Revision A)

STARTUP PROCEDURE

The procedure detailed below should be carefully followed when powering-up the RCS.

a. Verify that no hydraulic power is applied to the interceptors.

b. Press the ON switch at the System Display. When the RCS controller starts, it will perform self-tests. If the controller passes all tests, the screen will clear and the MAIN display will appear. If a system error occurs, refer to Section 2.12.

c. Start the hydraulic pumps to the interceptors. Verify that all hydraulic pumps are running with no alarms.

d. Verify that the interceptors are full up.

NOTE:
The ON switch should not be pressed if any RCS hydraulic system is running.

SHUTDOWN PROCEDURE

a. Verify that the Ride Control MOTIONS mode is set to OFF.

b. Verify that the system is in the STOW mode, the interceptors are fully raised.

c. Shut down the hydraulic systems in sequence.

d. When the all the hydraulic systems have been stopped and all accumulators have been bled, press the OFF switch on the system display. It is only necessary to switch off the system display if the RCS is not to be used for an extended period (more than one day), otherwise it may be left switched on. NOTE:As switching off the RCS will remove power to the servo valves, the OFF switch should not be pressed if any RCS hydraulic system is running.

MANUAL CONTROL PANEL (Figure 1-3)

Interceptor BACKUP Operation

1. Switch MOTIONS to OFF.
2. Set the MODE switch to BACKUP for the interceptor.
3. Use the backup UP/DOWN jog switch to position the interceptor.
4. To return the interceptor back to NORMAL set the MODE switch to NORMAL again.

   NOTE:

   Do not switch back to NORMAL until at least five seconds after moving the interceptor in BACKUP

Fuel Oil System
Reference Schematic: NG 408-250-01-1
REF DWGS NG408-250-04-1 to -5
Updated by: EBDG Dwg No. 13031-001-261-1, Fuel Oil System Modifications
MTU drawing XZ59607000002 fuel system

The fuel system on this vessel consists of two independent tanks, located in Double Bottom 3 & 4. The capacity of each tank is 6900 US gallons. There are two FO Service Pumps in each hull. Only one is used at a time for fuel oil service. The FO Service Pump takes suction from the storage tank and pumps fuel through the NFV filter to the service tank with a capacity of 265 US gallons. Excess fuel in the service tank returns to the fuel storage tank via overflow piping.

Each main engine has an electro-pneumatic controlled supply valve from the service tank. The fuel passes through a duplex 10 micron pre-filter than connects to the main engine fuel inlet.

The two generators in each hull are supplied by a single electro-pneumatic controlled supply valve from the service tank. In order to start a SSDG, the corresponding pneumatically actuated fuel valve needs to be opened.

During normal operation fuel is lifted, filtered and pumped into a day tank, which then supplies a gravity feed to the mains and auxiliaries. When there is a need to transfer fuel, valves direct fuel from one tank through the fuel fill and cross over line to the tank in the other hull.

Excess fuel is returned to the day tank through a lines linked to both main engines and both generators.

Dead Ship Start Procedure

From dead ship the day tank will supply fuel to the generators. In order to start a generator, its air operated fuel supply valve needs to be opened. In the absence of a compressed air supply, the pneumatic actuator for the generator supply valve must be removed and the valve manually opened. Once a generator is started and power is supplied to the switchboard, air compressors can be started. Once the compressed air system is restored, main engines and generators may be returned to normal operation.

Compressed Air:Reference Schematic NG 408-506-01-1

Reference Drawings NG408-506-04-1 to -4

Updated by: **EBDG Dwg No. 13031-001-251-1, Starting Air System Modifications**
MTU drawing starting system XZ59617000001

The compressed air system consists of two (2) independent systems, one (1) to port and one (1) to starboard, linked via a cross over line between the two (2) compressor units. A compressor unit provides 580 psi pressure. The 580 psi air receivers have 2 reducing stations, 130 psi for starting air, and 116 psi for ships service air.

A high pressure (580 psi) cross over line is provided to facilitate back up starting air for the engines in the opposite hull. A low pressure (116 psi) cross over line is provided for the ships service air system.

See drawing NG408-506-01-1.

The compressor is designed to recharge the receivers within one hour. A fully charged receiver can supply enough air for 12 total main engine starts.

Firemain System
REF DWG: NG 432-519-01-1

The firemain system on this vessel is a dry-pipe system consisting of two fire pumps, one located in each engine room. Each of these fire pumps is capable of supplying seawater to the firemain, which branches off to stations located throughout the vessel. In emergency situations, the fire pumps are capable of supplying water to the sprinkler & deluge systems through a normally closed isolation butterfly valve and a non-return check valve.

There are two pneumatically operated firemain supply valves accessible on the vehicle deck for manual override in case pneumatic operation fails. These valves are *fail open* valves as well for further safety. In the case of a fire, opening of the supply valve for the corresponding running fire pump should be done through the IMACS system. In the case where the second fire pump is required, it is necessary to start the pump and open the firemain supply valve associated with this pump from the Engineer's Console through the IMACS system.

In the case where remote operation for either of the fire pumps or the firemain supply valves fails, there is local control of the fire pumps from each engine room, and there is local manual override of each firemain supply valve, one of which is located on the vehicle deck in the aft port bosun's locker and the other of which is located on the vehicle deck in the starboard stairwell landing. The fire pump motors are supplied with power from two independent sources for redundancy.

The firemain system can also be provided with water through an international shore connection and a fire department connection if necessary. These connections are located in two places on the vessel, one on the aft port mooring station and one just outside the forward starboard vehicle door between Frames 43 & 44.

Once the system is pressurized, flow of water through the hoses is controlled by a manual valve at the fire station. The hoses at each station are required to be connected to these valves at all times during normal operation.

Following use of the firemain system, the piping should be drained down to prevent the possibility of standing water in the firemain piping. The drain is piped to the overboard discharge and the system can be drained from the engine room.

Sprinkler System
REF DWG: Hiller FP-WS-JG5916

The sprinkler system servicing the passenger space on this vessel is a dry type system broken into two zones separated by the smoke tight doors located between Frames 26-27. The heads are fusible element type so that in the case of a fire, only the heads in the area of the fire will open and extinguish it. The fusible link opens when the temperature exceeds 155° F.

Seawater is supplied to the system by a self-priming centrifugal pump with a flowrate of 1074 US gpm at a pressure of 60psi. This pump is located in Compartment 2.

For each zone there is a control valve that must be opened to allow water to flow to the zone. The control valves for the passenger deck sprinkler system are located in the Crew Day Room. Remote control of the control valves and the sprinkler pump is capable from the Operating Compartment through the IMACS system and also from the aft bulkhead of Air Handler Room # 3. Local manual override of the control valves is by manually opening the valve in the Crew Day Room.

The sprinkler pump is provided with power from two separate sources. In case the sprinkler pump fails to operate, the deluge pump can provide backup through a crossover in the wet deck. (Both sprinkler and deluge pumps discharge to a common header) Both the sprinkler and deluge pump are the same size and each is sized to flow water to two adjacent zones on the vehicle deck.

In the case of a fire on the passenger deck, the sprinkler pump would be started from the Wheelhouse through the IMACS system. Once the pump is running, the control valve for the area with the fire is opened flowing water to the zone. If the control valve fails to open, a crew member would manually open the control valve in the Crew Day Room. Operation of the sprinkler system can also be carried out from the aft bulkhead of Air Handler Room # 3 by starting the pump and opening the necessary control valve.

If neither of the remote pump start works, either the deluge pump could be started to flow water to the sprinkler system, or the sprinkler pump could be started locally in Compartment 2.

Means for a full flow test and a single head test are provided at the required test point in the system. The piping is arranged so that after activation the system can be drained overboard.

Note: The sprinkler head stub piping will retain water on the sprinkler heads causing rapid corrosion due to dissimilar metals in the system. If the system is charged for any reason notify the Chief Engineer immediately.

Deluge System
REF DWG: Hiller FP-WS-JG5916.dwg

The deluge system on this vessel is a dry type system broken into three zones on the vehicle deck. The heads on the vehicle deck are open heads so that all the heads in the entire zone will spray water if the control valve to that zone is opened.

Seawater is supplied to the system by a self-priming centrifugal pump with a flowrate of 1074 US gpm at a pressure of 60psi. This pump is located in Compartment 1. This pump is sized to provide enough water to the two largest adjacent zones on the vehicle deck.

Each of the three zones has a control valve. The control valves are located in the landing of the stairwell on the vehicle deck starboard side amidships. Remote control of the deluge pump and the control valves is from the Wheelhouse through the IMACS system. The second location of control of the valves and the deluge pump is the stairwell landing itself. If necessary, the control valves can be manually opened by a crewmember.

The deluge pump is provided with electrical power from two independent sources. In the case where the deluge pump fails to start, the sprinkler pump can be used as a backup to the deluge system. (Both sprinkler and deluge pumps discharge to a common header The deluge pump can be started locally in compartment 1 as well.

In the case of a fire on the vehicle deck, the deluge pump would be started from the Wheelhouse through the IMACS system. Once the pump is running, the control valve for the area with the fire is opened flowing water to the zone. If the control valve fails to open, a crew member would manually open the control valve in the starboard stairway landing. Operation of the deluge system can also be carried out from the starboard stairway landing by starting the pump and opening the necessary control valve(s).

Testing of the deluge system on the vehicle deck is through a full-flow test which actually requires activation of the deluge system flowing water through two zones. The piping is arranged so that after activation the system can be drained overboard via deck scuppers.

FM-200 System
REF DWG: DWG 10-FP-JG5418

Fixed gas fire suppression is provided in both engine rooms. The agent used for this system is FM-200, which is a non-harmful active extinguishing agent. The FM-200 is stored in two 900 pound cylinders located in the port switchboard room on the vehicle deck. The agent is stored as a liquid and vaporized upon release. The amount of agent available is sufficient to provide for two releases into either space, or one release into both spaces. Under normal conditions, a single discharge into either space should be sufficient to suppress the fire, however, if necessary a second release into the same space is possible if the fire needs further extinguishing. FM-200 does not leave any residue nor is it harmful to human life if it is discharged into a manned space. Following discharge, normal ventilation is all that is required to exhaust the FM-200 from the space.

The FM-200 system has remote control from the Operating Compartment, and also outside the space at the exit of both the port and starboard engine rooms. Local activation of the system is possible at the cylinders themselves in the port switchboard room. Activation of the FM- 200 system is a three step process - open valve on top of pilot cylinder and open the two (2) pilot valves. This prevents any type of pre-mature or unnecessary discharges of the system. Once the valves are opened, there is a 60 second time delay before the agent is released into the space. During this time, a warning horn will sound, and all of the engine and ventilation dampers close and the fuel pumps will shut down. These functions are controlled off of the pressure switch on the FM-200 system.

If a second dump into the same space is required, this can only be done locally at the FM-200 cylinders. Two three-way ball valves must be arranged to allow for agent to be crossed-over and discharged into the space that the cylinder would not normally discharge into. The second dump is not arranged to be carried out remotely to prevent an accidental discharge of the FM-200 agent.

WARNING: The second dump must ONLY be initiated by opening the control valves on top of the FM-200 cylinders. If FM-200 (second dump) is discharged in any other way - the machinery, fuel, and ventilation in the operational engineroom will be stopped.

Note: Refer to HSC Training Manual, Section 3-Davit for additional information.

Leading Particulars of Davit System:

Davit Specifications:

The Allied Marine Crane Type D2500S Davit is all hydraulic operation and completely self contained. The davit meets SOLAS/DNV/USCG regulatory requirements.

SWL	1134 kg (2,500 lbs)
Slewing radius	3.8 m (12 ft. 6 in.)
Drop height	12.2 m (40 ft)
Hydraulic hoist	18 m/min (60 ft/min.)
Hydraulic hoist/slew motor	11.2 kw (15 hp)
Electric supply	480V/3ph/60hz
Slew	By hydraulics—270 degrees
Emergency slew	By emergency hydraulics—270 degrees
Emergency hoist	By hand
Operation condition	20 degrees list- 10 degrees trim
Approval	SOLAS 83/ABS/DNV

General Description of Davit

The davit is a fixed radius, single arm, slewing type, as shown in the figure *General Davit Layout*. It rotates on a ball bearing type slew ring that is fixed between the post and the pedestal. Slewing is achieved by a geared drive, powered by a hydraulic motor, backed up by the SOLAS accumulator.

A hydraulic winch is used to power hoist the boat (backed up by a manual crank mechanism). It is mounted on the back of the arm with a rope leading directly to the head sheave. A limit switch is fitted to the davit head to automatically stop hoisting before “block to block” damage can occur.

The winch will hoist the safe working load of 1134 kg (2500 lb) at 18 m/min (60 ft/min). the system locks automatically to hold the load when hoisting stops. Lowering is also hydraulic and is controlled similarly in the opposite direction with the controls.

Davit Operating Instructions

OPERATION

WARNING: Before commencing any operation, check that all personnel in the immediate vicinity are aware of your intentions and will be in no danger from the equipment. Pre-Operational and Initial Operational tests must be conducted prior to Operation.

The davit is operated by hydraulics, if there is an electrical power failure, then the davit can be operated using the backup hydraulic/mechanical system.

For emergency launching/recovery without electrical power, the hydraulic system can be powered using the charged SOLAS accumulators for launching. For emergency recovery, the winch can be operated using a mechanical adapter applied to the winch drum.

See figures below.

REMOTE CONTROL CONSOLE

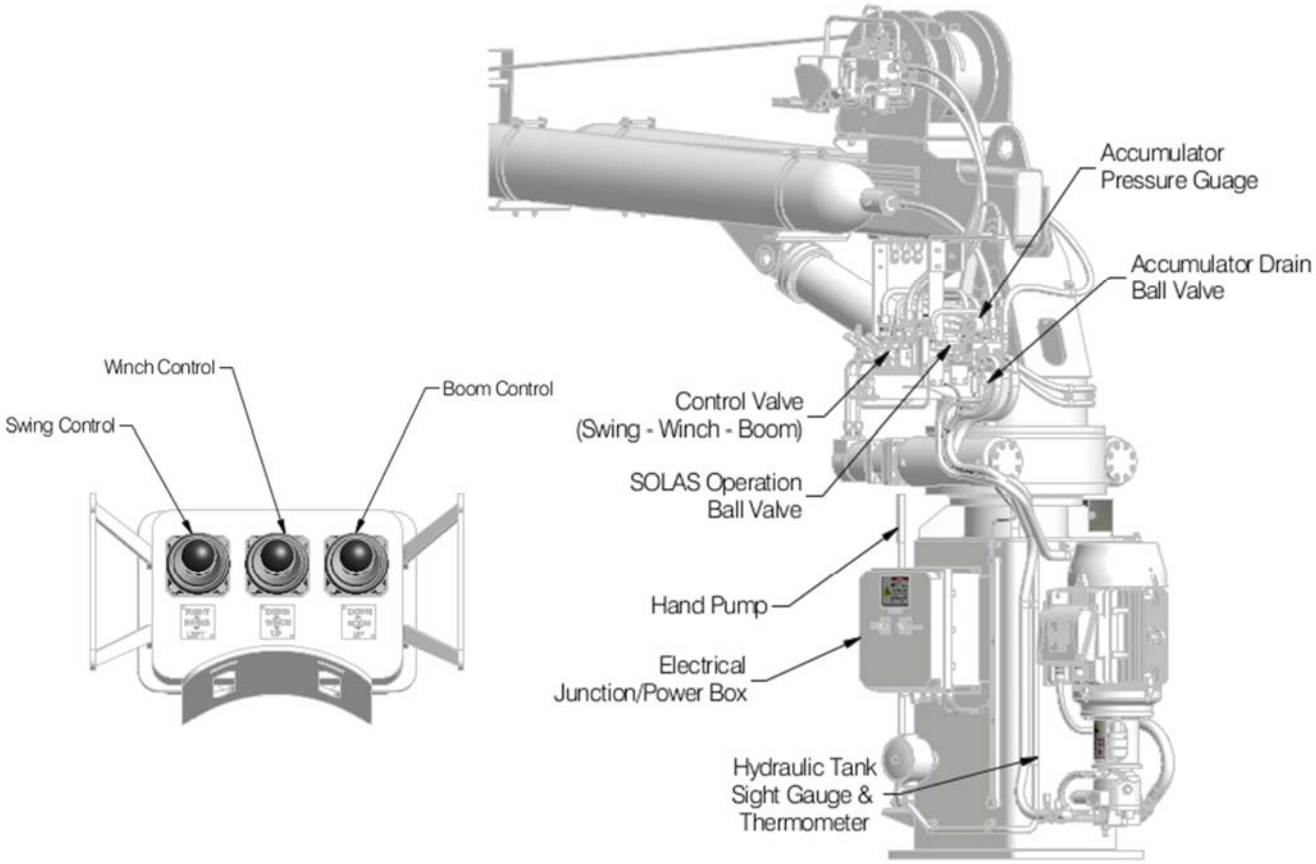
1) **Swing (Slew) Control**. Pull lever to swing davit to the left. Push lever to swing davit to the right. In the neutral position (center), the davit is stopped and locked in place.
2) **Winch Control**. Pull lever to winch up. Push lever to winch down. In the neutral position (center) the winch is stopped and locked in place.
3) **Boom Control**. Pull lever to raise boom. Push lever to lower boom. In the neutral position (center), the davit is stopped and locked in place.

DAVIT CONTROLS

1) **Swing Control Lever**. Pull lever down to swing davit to the left. Push lever up to swing davit to the right. In the neutral position (center), the davit is stopped and locked in place.
2) **Winch Control Lever**. Pull lever down to winch up. Push lever up to winch down. In the neutral position (center) the winch is stopped and locked in place.
3) **Boom Control Lever**. Pull lever down to raise boom. Push lever up to lower boom. In the neutral position (center), the davit is stopped and locked in place.
4) **Accumulator Pressure Gauge**. This gauge registers accumulator and SOLAS system pressure available for operations.
5) **SOLAS Operation Ball Valve**. This ball valve must be opened to allow the discharge of the accumulators during SOLAS operations. It can also be open during normal davit use, but must be closed when not in operation. Having it open during normal operation allows an increase in gallons per minute.

WARNING: **Select the desired emergency function with the control lever, swing, winch, or boom, before opening the SOLAS operation ball valve. Leaving control levers in the neutral position while the SOLAS ball valve is open will allow the accumulator pressure to slowly drain to tank.**

6) **Hand Pump**. This pump develops pressure to charge the accumulator allowing davit operation without electrical power.
7) **Accumulator Drain Ball Valve**. This valve allows the accumulators to drain. It must be closed at all times unless maintenance is being performed and the accumulators need to be drained. Opening of this ball valve will drain the accumulator pressure and all SOLAS functions are lost.



Control Systems (Remote Control Console on Left)

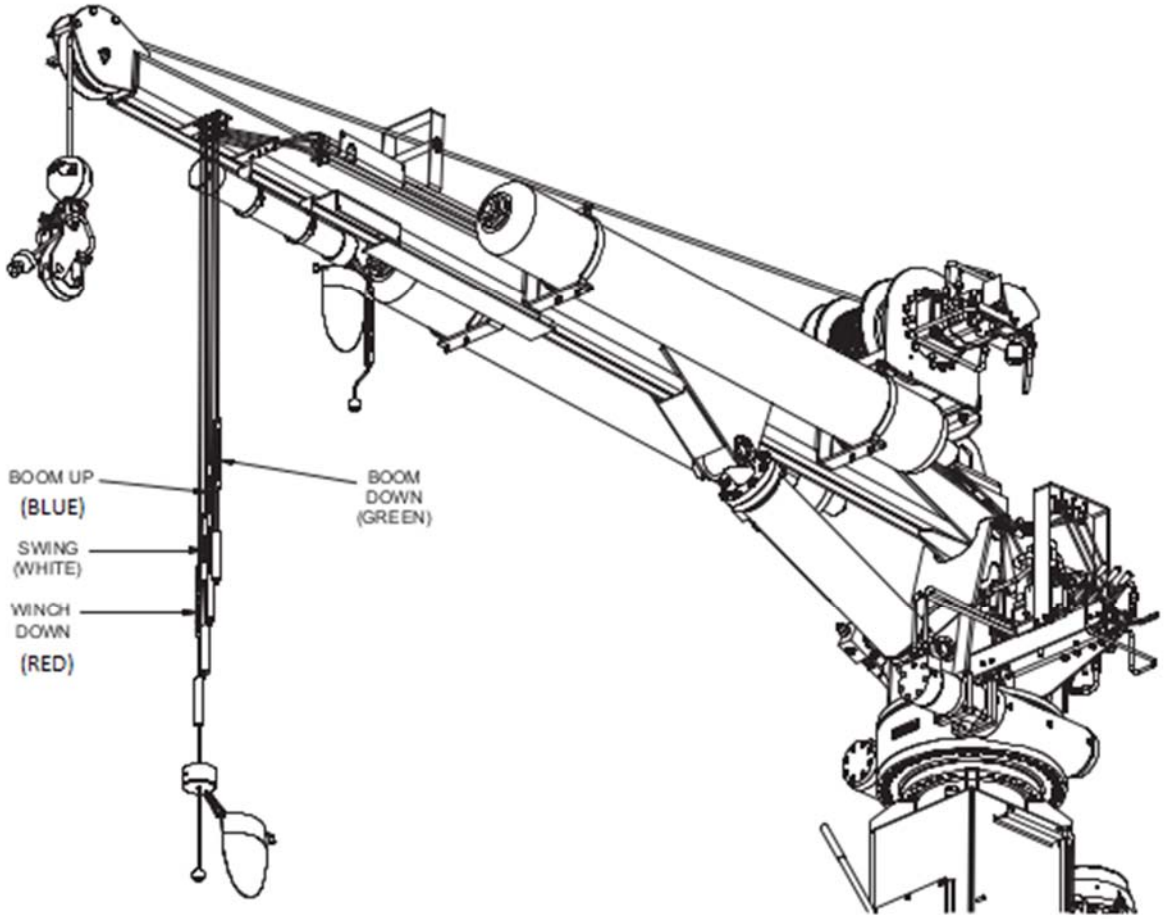
SOLAS EMERGENCY LAUNCHING CONTROLS

1) **SOLAS Control Ropes**. Stowed at the head of the boom and can be reached from the RHIB. Pulling a line operates the hydraulic control valve and moves the davit, releasing the line stops the motion.

2) **Boom Controls**. Pull on Blue line to Boom Up and Green line to Boom Down.

3) **Swing Control.** Pull on White line to swing right.

4) **Winch Control.** Pull on Red line to lower.



SOLAS Control Ropes Deployed

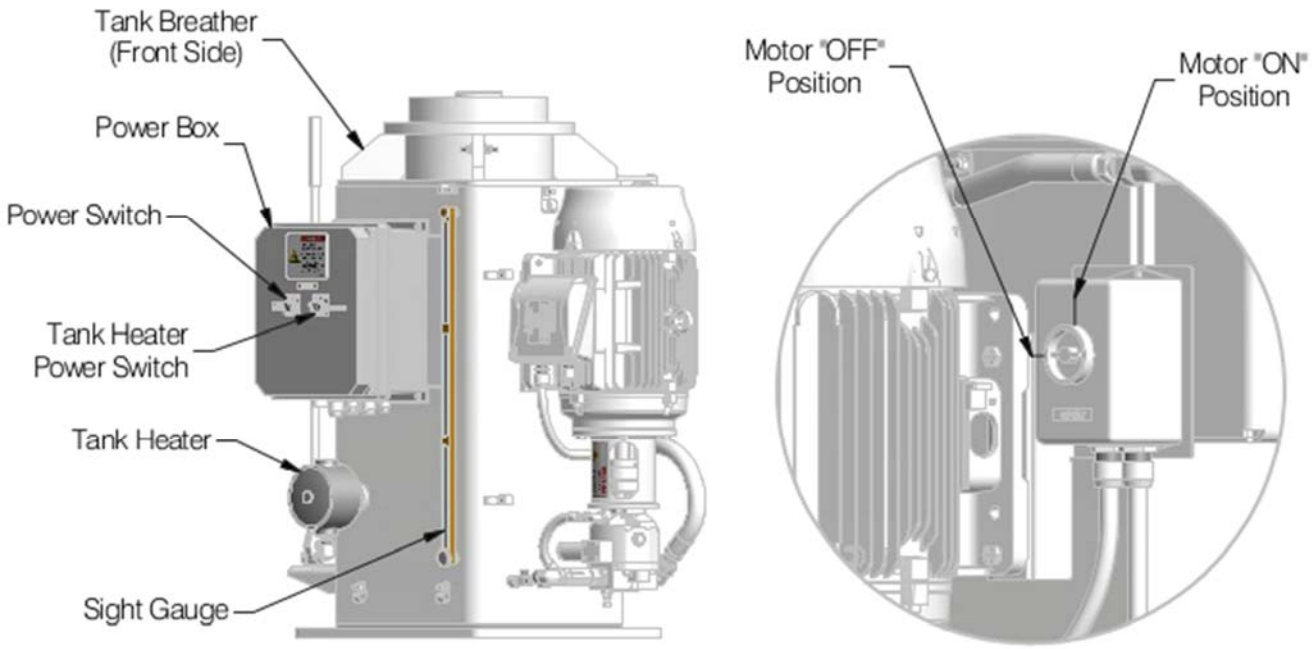
HPU (HYDRAULIC POWER UNIT)

1) **Sight Level Gauge**. Shows the level of hydraulic fluid in the tank.

2) **Tank Heater**. Tank heater keeps oil warm so davit is at the ready at all times.

3) **Power Box Power Switch**. This switch initiates power to the remote control chest pack.

4) **Power Box Tank Heater Switch**. This switch powers the hydraulic power unit (HPU) tank heater.



HPU and Motor Starter Switch

*Also see Training Manual Section 3 for specific operation and launching procedures.

Engine room ventilation system

Two ventilation fans are fitted in each engine room to supply fresh outside air to each main engine and each diesel generator set and to provide air to remove heat loads created by engine radiation.

Each fan is two-speed, approximately 1800 rpm and 900 rpm. Fan motor starters are fitted in each respective engine room for starting either locally or remotely from the Engineer's Console on the bridge.

Fan capacities are designed to maintain approximately ½ inch pressure in the space during summer months when the main engines are operating at full rpm.

Fire dampers are fitted on each supply fan inlet and engine room exhaust outlet. Each damper is automatically kept open by pneumatic pressure energized from a 120VAC solenoid from the bridge battery bank through an inverter. Ships air must be maintained to keep the dampers in the open position.

Outside air supplied to each engine room is passed through a fixed vane separator located on the vehicle deck. The vane separator will eliminate approximately 99 percent of the moisture in the air before the air enters the engine room.

Fan control

Local control:

Turn transfer switch to the local position.

Push the low speed start button.

Fan will come up to speed.

For high speed operation, press the high speed push button.

Press the stop button to stop the fan.

Remote operation:

Turn the control transfer switch to remote control.

Control is now transferred to the Engineer's Console in the Operating Compartment.

Fans can be operated same as in local control via the appropriate page on the IMAC system.

Emergency operation:

Emergency stop pushbuttons are located on the Engineer's Console (Operating Compartment) and at the entrance to each engine room. Activation of the emergency stop switch will stop the ventilation fans, and close inlet fire damper and exhaust fire damper in the respective engine room.

Fan operation

Normally one fan on high speed or two fans on low speed can be used to supply combustion air and cooling air.

On hot days, when both engines are operating at full rpm, two fans on high speed can be used to supply combustion air and cooling air.
In general, main engine air pressures and engine room temperatures should be observed. The number and speed of the fans should be operated as space temperature and engine load demands.

Vehicle deck ventilation

Four ventilation exhaust fans are fitted on the vehicle deck, two aft and two forward. The aft units are located between Frames 5-6 port and starboard, and the forward fans are located in the forward bulkhead port and starboard side.

A motor starter with control transfer, fan start pushbutton and stop pushbutton is supplied for each fan. For the forward vehicle deck fans these motor starters are located in the forepeak. For each of the aft vehicle deck exhaust fans the motor starters are located in the bosun's lockers, port and starboard.

Fan control

Local control:

Turn transfer switch to the local position.

Push the start button.

Fan will come up to speed.

Press the stop button to stop the fan.

Remote operation:

Turn the control transfer switch to remote control.

Control is now transferred to the Engineer's Console in the Operating Compartment.

Fans can be operated same as in local control via the appropriate page on the IMAC system.

Emergency operation:

Emergency stop pushbuttons are located on the Engineer's Console (Operating Compartment). Activation of the emergency stop switch will stop the ventilation fans and exhaust fire dampers on the vehicle deck.

Fan operation

<u>During stern loading</u>: with the stern door open, the aft fans are secured and the forward fans are exhausting to allow air flow through the deck area. Both fans should be running to supply the required amount of air flow.

During side loading: With the forward doors open, the forward fans are secured and the aft fans are exhausting to allow air flow through the deck area. Both fans should be in operation to supply the required amount of air flow.

At sea; doors secured: Sufficient air flow may be obtained by leaving all four louvers open and the fans off. In extreme cold conditions, the louvers should remain closed.

Heating, ventilation and air conditioning systems (HVAC)

Ventilation systems

Mechanical supply and natural exhaust ventilation is fitted in various compartments including each bow thruster space, Compartment Numbers 2, 3 and 4 as well as each Waterjet Compartment. The starboard switchboard room is fitted with mechanical supply and natural exhaust system while the port switchboard room is fitted with natural supply and mechanical exhaust so that accidental discharge of FM-200 agent will be cleared from the room sufficiently. Fan control switches are located in panel P113.

Compartments not normally manned or fitted with equipment are fitted with natural supply and exhaust.

Ventilation supply dampers are fitted on the vehicle deck and can be shut or opened manually from the vehicle deck.

Heating and air conditioning systems

Conditioned air is supplied to the passenger deck, crew spaces and Operating Compartment by three air handler units. Each air handler unit consists of an outside electric pre heater, water coil for air cooling or air heating, supply fan and return air fan.

Two air conditioning sea water cooled fresh water chillers are fitted in Compartment Number 2 for tempered water to each air handler coil via one or two fresh water circulating pumps. Air conditioning chillers are automatically controlled to keep coil water temperature at desired setting for the intended cooling load.

One 200 kw electric hot water heating boiler is also fitted in Compartment Number 2 for supplying heated water to the air handler coils during the heating season.

Air handler units are automatically controlled by thermostats and humidistats located throughout the various passenger, crew and Operating Compartment spaces.

Air Handler Number 1, port side bridge deck, serves the Operating Compartment and crew spaces. Air Handler Number 2, starboard side Bridge Deck, serves the Forward Passenger Deck and Air Handler Number 3, Aft Bridge Deck, serves the Aft Passenger Deck.

Exhaust fans are fitted for removing air in way of the toilets and passengers spaces to insure a constant flow of outside air. The toilet exhaust systems are independent of the main exhaust systems on the Passenger Deck.

Windows on the Passenger Deck are kept clear by a defogging system consisting of heaters and fans within the Passenger Deck overhead. The defogging system fans will operate on demand to clear the windows.

System control

Air handlers one, two and three control the entire air conditioning and heating system in the passenger deck, crew area and Operating Compartment. Control settings and inputs are shared between air handler unit control through a Lon Works Bus.

Fresh air is continuously changed depending on outside air conditions, inside air temperature, inside air humidity and occupancy.

Pumps, chillers, boiler panel on request of any air handler activates required mode, starts pumps, positions valves properly and activates chillers or boiler. During operation, water temperature is monitored to ensure that the system is safe. Detected alarms are passed to a command display panel and the HVAC page on the IMAC system. Whenever desired, the system can be switched from automatic control to manual control for operator intervention.

Three operating modes can be selected; full operation, crew only operation, ship keeping operation and system off.

Full operation: the system is totally automatic and will activate the boiler or air chillers depending on outside air conditions and inside air conditions. All air handler units are operating along with exhaust systems.

Crew only operation: in this mode, the Operating Compartment and crew spaces are fully activated and the passenger deck will be kept at five degrees centigrade. This mode of operation can be used for vessel transits without passengers.

Ship keeping operation: for nights when the vessel is moored along side without crew on board. The entire system is maintained at five degrees centigrade. The engineer would manually set up the desired set points to maintain the vessel safe from freezing.

Emergency operation: All air handler unit supply and exhaust fans can be remotely stopped from the Operating Compartment in event of fire. Electric smoke dampers can be remotely closed from the bridge and locally closed. Damper locations are clearly marked throughout the passenger deck for location of control.

Vehicle Door Operation

Stern and Sideport Door Operation

NOTE: This equipment is intended to be opened and closed while being visually monitored by the operator. All door motion will stop when the open/close selector switch is released.

To Open

- At the Motor Controller, throw disconnects to the closed position, allowing Motor Starters to be powered.
- At the IMACs control station, set the door function to the "Harbor Mode" setting.
- At the local control station, turn the motor Start/Stop Selector switch to "Start". The "motor running" light should energize, indicating that the motor has starter.
- Turn the Open/Close Selector Switch to "Open" and hold.
- For the first 5 seconds of operation, the horn will sound and several resetting functions are performed (the hydraulic cylinders are fully retracted and the locking cylinders are fully unlocked).
- Following the 5 seconds, the hydraulic system first supplies hydraulic power to the dogging cylinders, causing them to extend and fully undog the door. The moment the dogging cylinders begin to undog, the "Door Closed and Secure Light" is de-energized and the "Door Not Secure Light" is energized.
- When all four dogging cylinders are fully extended, hydraulic power is directed to the open/close cylinders and the door is raised to the open position. When in the fully open position, the hydraulic power is directed to the locking cylinders that secure the door in the open position when fully extended. At that time, the "Door Not Secure Light" is de-energized and the "Door Open and Locked" light is energized.
- When the door is completely open and visually confirmed to be locked, release the open/close selector switch.
- Turn the motor start/stop selector switch to stop and release.

To Close

- At the Motor Controller, throw disconnects to the closed position, allowing motor starters to be powered.
- At the IMACs Control Station, set the door function to the "Harbor Mode" setting.
- At the local control station, turn the Motor Start/Stop Selector Switch to "Start". The "Motor Running" light should energize, indicating that the motor has starter.
- Turn the Open/Close Selector Switch to "Close" and hold.
- For the first 5 seconds of operation, the horn will sound and several resetting functions are performed (the hydraulic cylinders are fully extended and the dogging cylinders are fully undogged).
- Following the 5 seconds, the hydraulic system first supplies hydraulic power to the locking cylinders, causing them to retract and thus unlock the door. The moment the locking cylinders begin to unlock, the "Door Open and Locked" light is de-energized and the "Door Not Secure Light" is energized.
- Once both locking cylinders are fully retracted, hydraulic power is directed to the open/close cylinders and the door is lowered to the closed position. When in the fully closed position, the hydraulic power is directed to the dogging cylinders that secure the door in the closed position when fully retracted. At that time, the "Door Not Secure" light is de-energized and the "Door Closed and Secure" light is energized.
- When the door is completely closed and visually confirmed to be dogged, release the open/close selector switch.
- Turn the motor start/stop selector switch to stop and release.

Deck Machinery

The capstans are wireless remote control. Each capstan has its own frequency for operation and is controlled by the deckhand on the corresponding mooring station as required. A spare controller is stored in the Operating Compartment.

The anchor windlass is accessible from the forward mooring station. Operation of the anchor windlass is as follows.

WARNING
- Winch not in use always tighten band brake and engage cable stopper pin

DROP ANCHOR
- Ensure band brake is set
- Disengage lock pin
- Ensure bypass valve is open
- Release band brake
- Control dropping speed with band brake

POWERED PAYOUT
- Ensure band brake is set
- Remove Devil's Claw
- Disengage lock pin
- Close bypass valve
- Start power pack
- Loosen band brake slightly
- Energize hydraulic valve

ANCHOR DEPLOYED
- Tighten band brake
- Engage lock pin

RAISE ANCHOR
- Close bypass valve
- Start power pack
- Disengage lock pin
- Loosen band brake slightly
- Energize hydraulic valve

ANCHOR STOWED

- Deenergize hydraulic valve
- Tighten band brake
- Engage lock pin
- Switch off power pack
- Attach Devil's Claw/Anchor Holdback.
- Open bypass valve

This section provides a description of the following Remote Control and Warning Systems:

PMC IMAC System

The PMC IMAC system is an advanced Human Machine Interface (HMI) that consists of two separate PC computers communicating over a high speed ArcNet bus to the alarm processors.

The PC computers allow the operator to view new alarms as well as machinery and control system status. The IMAC system includes data logging of alarms and trending of analog values. The displays can be real time or pulled from computer archived records.

The engineer can manually start/stop the main engines, generators, pumps and fans and open/close motorized circuit breakers remotely from the Engineer's Console on the bridge. The IMAC system can automatically start/stop generators and open/close breakers when set to power management mode.

Automatic Identification System (AIS) Introduction

AIS is a shipboard broadcast transponder system in which ships continually transmit their ID, position, course, speed and other data to all other nearby ships and shoreside authorities on a common VHF radio channel. AIS is designed to operate in one of the following modes: In a ship-to-ship mode for collision avoidance; In a ship-to-shore mode as a means for coastal states to monitor and obtain information about a ship and its cargo; As a traffic management tool when integrated with a Vessel Traffic System (VTS)

The primary operating mode for AIS will be autonomous ship-to-ship reporting. In this mode, each ship transmits its data to all other AIS-equipped ships within VHF range. The unique communications scheme permits these data transmissions to take place independently without the need for a master control station.

In coastal waters, shoreside authorities may establish automated AIS stations to monitor the movement of vessels through the area. These stations may simply monitor AIS transmissions from passing ships, or may actively poll vessels via the AIS channels, requesting data such as identification, destination, ETA, type of cargo and other information. Multiple AIS coast stations and repeaters may be tied together into Wide Area Networks (WAN) for extended coverage.

When integrated with shore-based vessel traffic systems (VTS), AIS provides a powerful tool for monitoring and controlling the movement of vessels through restricted harbors and waterways. The AIS can augment traditional radar-based VTS installations, providing an AIS “overlay” on the radar picture, or can provide a cost-effective alternative in areas where it is not feasible to establish radar-based systems. When integrated with radar, the AIS can ensure continuous coverage, even when the radar picture is degraded by heavy precipitation or other interference.

The AIS channels can be used to transmit port data, pilotage, berth assignments, shipping agency information, tides and currents, notices to mariners and other information from shore to ship, as well as ship to ship and ship to shore AIS reports. It is also possible for VTS to broadcast the complete harbor picture.

AIS Operating Instructions

When integrated with shore-based vessel traffic systems (VTS), AIS provides a powerful tool for monitoring and controlling the movement of vessels through restricted harbors and waterways. The AIS can augment traditional radar-based VTS installations, providing an AIS "overlay" on the radar picture, or can provide a cost-effective alternative in areas where it is not feasible to establish radar-based systems. When integrated with radar, the AIS can ensure continuous coverage, even when the radar picture is degraded by heavy precipitation or other interference. The AIS channels can be used to transmit port data, pilotage, berth assignments, shipping agency information, tides and currents, notices to mariners and other information from shore to ship, as well as ship-to-ship and ship-to-shore AIS reports. It is also possible for the VTS to broadcast the complete harbor picture.

For detailed operating instructions see manufacturer's manual.

Auto Pilot Operating Instructions

The NP2015/2025 has the following standard operating features:

- Heading control in consideration of a radius or R.o.T. limit value adjustment
- Track control in consideration of a radius or R.o.T. limit value adjustment (in conjunction with a track planning system or navigation receiver)
- Rate-of-turn control via an R.o.T. tiller
- REMOTE operation (in conjunction with a serial preset heading transmission system) The intended operating mode can be called up via command keys.

The REMOTE operation is to be selected from an external position only.

On selecting an operating mode, all necessary sensor data is checked for plausibility. Additional LEDs in addition to the command keys indicates the active operating mode. In case of disturbance, an error message in plain text appears in the alphanumeric line. Operator inputs are possible only when the alarm has been acknowledged. Function keys permit calling up and varying parameters, sensors and permanent information indication within the text line.

The adjustments selected for this purpose are applicable to all **NP2015/2025** operating modes.

For detailed operating instructions see manufacturer's manual.

Propulsion Controls

Propulsion control of the water jet steering nozzle, reversing bucket and engine speed is provided by a microprocessor back remote system furnished by the water jet manufacturer, Kamewa.

Steering controls the port and starboard direction while bucket controls the ahead and astern of each water jet.

Only one control station can be in control at a time. Center console control stations and wing control stations are fitted with "in command" transfer switch and indicating lamps.

In addition to the main lever control system, a non-follow up back up system is fitted to control the reversing bucket and steering nozzles. This system directly controls the solenoid actuated hydraulic directional control valves on the water jet hydraulic power pack and is electrically independent of the main control system.

Nozzle position, bucket direction, engine speed and thrust are indicated on the overhead panel above each control station on the bridge in addition to the propulsion page of the IMAC system.

The control system comprises several components for propulsion control and monitoring. This vessel is equipped with the following:

Jet position indication panel
Control select panel
Back up panel
Clutch panel
Lever control unit
Steering tiller mounted in each helm seat arm rest
Joy stick control lever

Control device operation

Jet position indication panel: two meters are located at each control station overhead panel for indicating steering position and bucket position for each water jet. The steering meter reads nozzles position from zero degrees to 30 degrees port and starboard, while the bucket position meter reads from zero position to full ahead and full astern.

Control select panel: The center console station is fitted with a panel of push buttons and indicating lamps to select the control device. Three control modes are provided, separate mode, common mode and joystick mode. *In separate mode* the steering and thrust of each jet is individually controlled from the corresponding separate lever.
In common mode the steering is controlled by the steering tiller and thrust controlled by the lever.
Joystick mode the steering and thrust of each jet is controlled by the joystick lever and rotation knob. The system calculates and sends out the required commands to each jet to perform the maneuver ordered by the joystick.

Back-up panel: each water jet is fitted with a back up panel consisting of one set of push buttons, spring return manipulator for controlling steering and bucket direction, engine speed, and selection of back up power.
Back up on / off: push button for switching over from main control system to back up system and vice versa. When the back up system is selected the main system is automatically disconnected.
Steering manipulator: spring return joystick for changing the steering nozzle and reversing bucket in the back up mode. This is non follow up control only.
rpm on off: push button for switching over engine rpm control from lever to push button control and vice versa.
rpm + / -: engine speed can be set separately when separate rpm or back-up is ordered.

Clutch panel: located on the back up panel for each engine, these push buttons and indicating lamps can be used to clutch in or clutch out each main engine.

Lever control unit: controls the steering of each pair of jets by rotating the lever +/- 30 degrees and the thrust by moving the handle ahead or astern. Indication lamps, "steering in command" and "thrust in command" indicates when the lever is in command for steering and or thrust. The "thrust sync" lamp is used to synchronize the lever before transferring command between the control stations on the bridge.

Steering tillers mounted in helm seat arm rests: this steering tiller is a single axis lever to control all jets in parallel. The knob on top of the stick is used to override the autopilot. If the knob is pushed the autopilot will be disconnected and the steering can be manually operated from the tiller. When releasing the button, the system will return to autopilot steering.

Joy stick control lever: in the "harbor mode" the joystick combines the commands to the water jets in order to achieve a resulting force corresponding to the direction and magnitude ordered with the single lever joystick. The vessel can also be rotated by turning the moment knob. The joystick lever is fitted with an indicating lamp when this lever is "in command".

This section covers the following Electrical Equipment:

Switchboards

AC power is distributed throughout the vessel by two 480 VAC switchboards located in the port and starboard switchboard rooms. The port switchboard houses Generator Number 2 and Number 4 control panels and 300 amp generator circuit breakers, 480VAC distribution, and a panel section for monitoring and controlling Generators Number 1 and Number 3.

The starboard switchboard houses Generator Number 1 and Number 3 control panels and 300 Amp generator circuit breakers, 480VAC distribution, a panel section for monitoring and controlling Generators Number 2 and Number 4, and a section for 208VAC distribution.

Analog metering is provided on each switchboard for monitoring generator and bus functions including kW load, voltage, amps, power factor and frequency. Both synchro-scopes and synchronizing lights are fitted for manual and automatic paralleling of all generators.

Shore power circuit breakers are fitted in the starboard switchboard along with phase rotation meter. The vessel electric load is capable of momentary closed transition transfer of power to and from the shore. A second 208VAC distribution panel is located in the electric room on the Passenger Deck.

Two 85kVA transformers are fitted to supply power to the 208 volt section of the starboard switchboard and 208 volt distribution panel in the electric room. Ground detection lamps are located in both switchboards and 208 volt distribution panels.
208 volt and 120 volt power is distributed throughout the vessel through power and lighting panels located in accordance with the electric one line diagram.

Vital emergency pumps, including fire, sprinkler, deluge and bilge, starters are fitted with an independent power feeder from each switchboard. Both feeds are fitted with motor operated circuit breakers. A loss of voltage in the supplying feeder will automatically cause transfer to the standby feeder via automatic operation of the circuit-breakers. Direct current (DC) power for vital control and navigation circuits is supplied by several battery banks and power supplies. Two battery banks, one operating and one standby located on the bridge deck, supply power to the Operating Compartment consoles for navigation, communication and propulsion control.

Generators

Each engine room is fitted with a 24 VDC battery bank and power supply for propulsion control and IMAC monitoring. In addition, a third battery bank is fitted in the port switchboard room as back up power supply to either engine room battery bank.

Each diesel generator is fitted with its own 24 VDC battery bank and charger for starting and generator control.

All battery banks are monitored by the IMAC system. Failure of one power supply automatically transfer power to the standby power supply.

Refer to the dc one line drawing for 24 volt power distribution to the various panels and control circuits.

AC plant operation

Refer to the generator operation and service manual and switchboard operation manual before starting and putting any generator on line.

Transfer of electrical power, shore to ship:

One generator only!

1. The 1 A/E is responsible for power transfer.
2. Remove stack covers and close stack drains.
3. Test run all generators locally, then switch to remote.
4. Check with Chief as to which generator to start. (1 or 3)
5. The Chief may choose to arrange primary and standby generators at this time.
6. Chief will reduce load to less than 140 Kw
7. 1 A/E will see 100 amps or less on each shore leg at switchboard.
8. Start proper engine in starboard hull and wait 30–60 seconds for generator to stabilize.
9. Transfer source to ship.
10. After switching occurs immediately transfer control to IMACS.

11. Chief will accept control and initiate automatic operation to demonstrate auto start of 2nd primary generator.

12. 1 A/E will check running generators for proper operation.

13. Open shore switches on ramp.

14. Open switches on tie up station.

15. Disconnect cables and ground.

16. Cover and stow cables. Swing davit arm away from ship.

17. Stow ramp extension.

Transfer ship to shore:

1. Connect shore power and ground cables to ship.
2. Close knife switches on ramp.
3. Close disconnect switches on ship.
4. At starboard switchboard, transfer control from IMACS to Switchboard.
5. Verify phase and rotation at shore power panel.
6. Verify load within shore capacity.
7. Verify voltage on all legs of both cables
8. Move transfer switch from ship to shore.
9. The system will execute a closed transfer automatically when in phase. Verify that generator breakers have opened.
10. Verify load on all legs of both cables
11. Switch generators off. Automatic cool down timers will shut down generators in two minutes.

Operation from IMACS

1. On the Power Management page, set which generators will be prime and which standby. Regulations require a prime generator in each hull.

2. Accept control from the switchboard when ready.
3. Engage automatic power management. The second prime generator will start automatically.
4. Increase load as required to operate the vessel.
5. Standby generators will start and stop as determined by the Power Management system.

6. The engineer may assist the system by selecting additional generators as prime in anticipation of higher loads.

Operation of DC electrical systems

All DC power supplies and battery banks are fully automatic and self-monitoring. Any malfunction will be identified by the IMAC system. Only operator intervention should be opening or closing dc circuits for the desired load.

Uninterrupted power supplies

Several uninterrupted power supplies are located in the bridge electric room, Engineer's console and engine rooms.

Failure of the main power supply will automatically transfer power to the vital system from the standby 24VDC battery bank. The uninterrupted power system consists of a bank of standby batteries, battery charger to always keep the standby batteries in a fully charged state, and battery bank monitoring system to warn the operator of a potential fault.

Uninterrupted power supplies are fitted for the following services:

Fire detection system
Hull monitoring system
Ship's computer and network (independent of any other network system)
IMAC System in each engine room.

Each DC power supply, DC–1, DC-2, DC-3 and DC-4 is fitted with a standby battery bank. In event of failure of the main power supply, the battery bank will automatically supply power for approximately thirty minutes to the particular distribution panel. As with the other ups systems, the power supply will automatically keep the standby battery bank in a fully charged state. Each battery bank is monitored with fault detection reported to the IMAC page at the Engineer's console.

Operation and control of the Uninterrupted Power Supply (UPS) is completely automatic without any operator intervention except monitoring of the various systems.

Backup Power, Diverting Power

Since two complete generator sets are located in each hull, any generator can act as the emergency generator. Normally, when three generators are operating, the stand-by generator will be the emergency generator. All generators are sized for the required emergency load. In the case where there is an emergency or failure in one or more diesel generators, the electrical load management system controls backup and diverting power. The electrical system response to emergency and failure scenarios are outlined below:

Emergency Modes

1) Normal operation, three generators running two port and one starboard, fire or flooding in port engine room: switchboards bus ties are opened and Generators 2 and 4 removed from the port switchboard, load management system removes all or some of non-essential loads. Generator 1 or 3 remote manually started from the Operating Compartment, so both starboard side generators supplying power. Non-essential equipment remote manually put on line up to desired maximum load of the two running generators.

2) Normal operation, three generators running, fire or flooding in starboard engine room: switchboards bus tie opened, Generators 1 and 3 removed from the starboard switchboard, load management system removes all or some of non-essential loads. Generator 2 or 4 remote manually started from the Operating Compartment, so both port side generators supplying power. Non-essential equipment remote manually put on line up to desired maximum load of the two running generators.

3) Normal operation, three generators running, fire in port switchboard room: generators 2 and 4 remotely tripped off the line, switchboard bus tie breaker on both switchboards open, load management system removes all or some of non-essential loads. Generator 1 or 3 remote manually started from the Operating Compartment, so both starboard side generators supplying power. Non-essential equipment remote manually put on line up to desired maximum load of the two running generators.

4) Normal operation, three generators running, fire in Starboard Switchboard Room: Generators 1 and 3 remotely tripped off the line, switchboard bus tie breaker on both switchboards open, load management system removes all or some of non-essential loads. Generator 2 or 4 remote manually started from the Operating Compartment, so both port side generators are supplying power. Non-essential equipment remote manually put on line up to desired maximum load of the two running generators.

Failure Modes

1) Two generators on line; one generator trips off line: load management system removes non-essential loads for one generator operation, second generator automatically started and paralleled with the running generator. Non-essential equipment remote manually put on line up to desired maximum load of the two running generators.
2) Three generators on line; one generator trips off line: load management system removes non-essential loads for two generator operation, third generator automatically started and paralleled with the running generators. Non-essential equipment remote manually put on line up to desired maximum load of the three running generators.
3) Four generators on line; one generator trips off line: load management system removes non-essential loads for three generator operation.
4) If port side 480 / 208VAC transformer fails, power to the port side 208VAC panels is lost. The starboard side 208VAC panels are not affected by this failure.
5) If starboard side 480 / 208VAC transformer fails, power to the starboard side 208VAC panels is lost. The port side 208VAC panels are not affected by this failure.
6) Propulsion control power supply failure, port engine room: stand-by battery bank automatically provides power. Battery bank rated for 30-minute operation without recharging.
7) Propulsion control power supply failure, starboard engine room: stand-by battery bank automatically provides power. Battery bank rated for 30-minute operation without recharging.

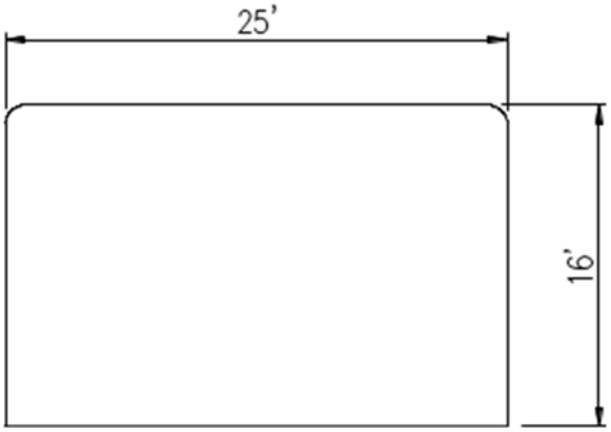
    a. Each bilge pump panel is fed from the 208-volt section of each switchboard by automatic transfer switches; failure of either power source will not cause an outage of bilge service.

Essential fire fighting systems, including fire pumps, fire fighting sprinkler pump, fire fighting deluge pump, and bilge pumps are supplied power from each switchboard via an automatic transfer switch. Failure of one feeder will cause automatic switching to the standby feeder. All fire fighting pumps and associated control valves can be remotely controlled for the Engineer's Console on the Operating Compartment and locally.

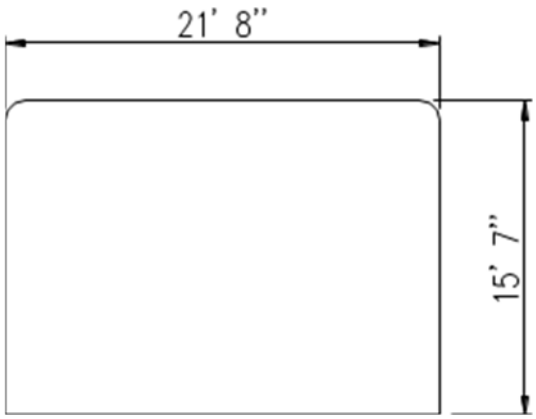
Motor starters of essential consumers are fitted with low voltage release for automatic starting after a black out and resumption of power. Starters of important and non important consumers are designed with under voltage protection for remote starting from the Engineer's console on the Operating Compartment.

Vessel Loading Door Clearances

The following maximum clearances should be considered during all loading operations.



Aft Door Clearance



Side Door Clearance

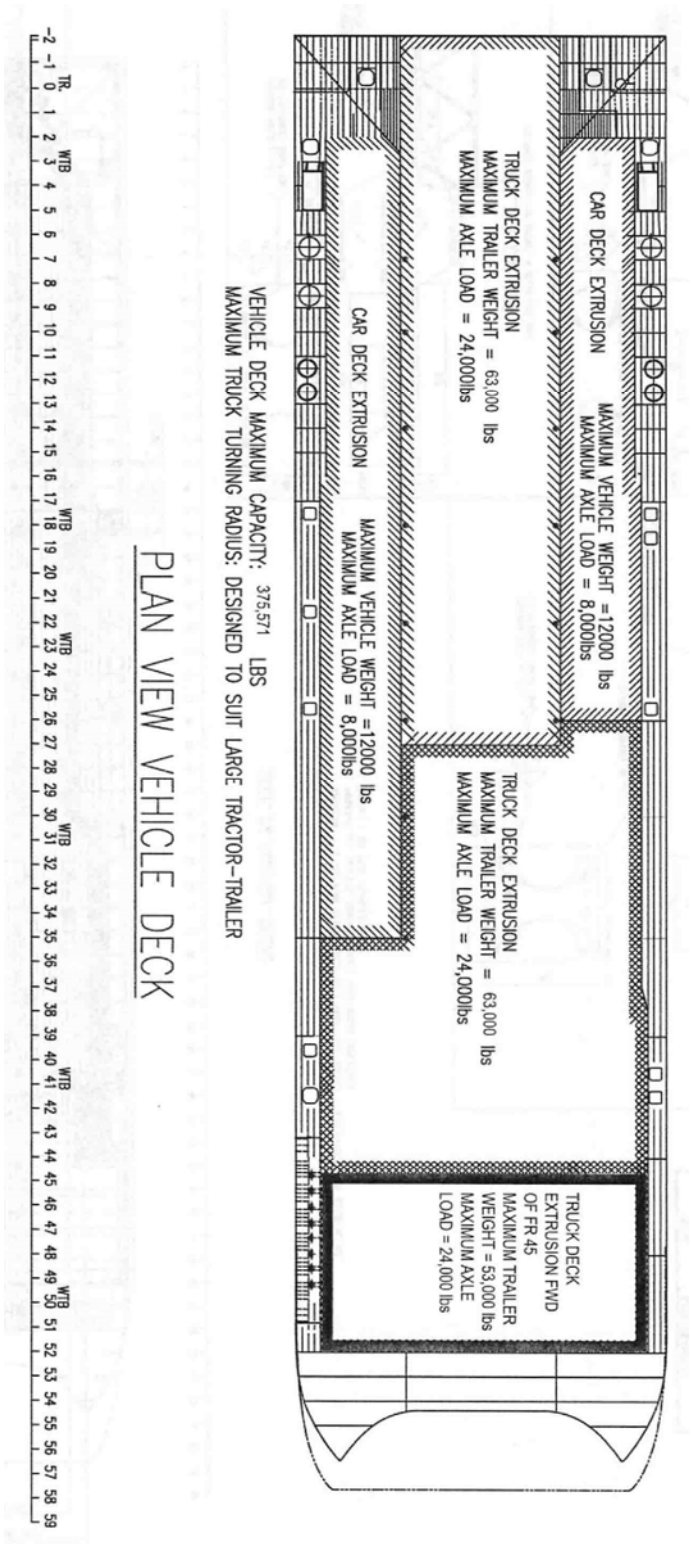
The aft and side door clearances have been designed using a maximum trailer height of 14'. Special care must be taken, with regard to trailer height, at extremes of the tidal range where linkspans are not horizontal. Extreme linkspan angles greatly reduce the clearance at the top of both loading doors. All vehicles, where the height is in question, should be measured using a dedicated measuring aid.

Vehicle Dimensions

In accordance with DetNorskeVeritas (DNV) classification 'Car Ferry A", vehicle axle loads on vehicle decks are not to exceed:

Truck deck area:	24,000 lbs (10.9 tons) on double wheels 13,000 lbs (5.9 tons) on single wheels
Car deck area:	8,000 lbs (3.6 tons) on double wheels 4,000 lbs (1.8 tons) on single wheels

Vehicle Deck Layout located on the next page.


CAR DECK EXTRUSION
MAXIMUM VEHICLE WEIGHT = 12000 lbs
MAXIMUM AXLE LOAD = 8,000lbs
TRUCK DECK EXTRUSION
MAXIMUM TRAILER WEIGHT = 63,000 lbs
MAXIMUM AXLE LOAD = 24,000lbs
CAR DECK EXTRUSION
MAXIMUM VEHICLE WEIGHT = 12000 lbs
MAXIMUM AXLE LOAD = 8,000lbs
TRUCK DECK EXTRUSION
MAXIMUM TRAILER WEIGHT = 63,000 lbs
MAXIMUM AXLE LOAD = 24,000lbs
TRUCK DECK EXTRUSION FWD OF FR 45
MAXIMUM TRAILER WEIGHT = 53,000 lbs
MAXIMUM AXLE LOAD = 24,000 lbs
VEHICLE DECK MAXIMUM CAPACITY: 375,571 LBS
MAXIMUM TRUCK TURNING RADIUS: DESIGNED TO SUIT LARGE TRACTOR-TRAILER
PLAN VIEW VEHICLE DECK
TR.
WTB

Optimal Sailing Trim

On completion of loading of the vessel and prior to its departure on a voyage, the master shall determine the trim and stability of the vessel and also ascertain and record that the vessel is in compliance with the relevant stability criteria

The optimal initial trim is slightly aft at between 0.25 degrees and 0.50 degrees for speeds around 36 knots. A slightly forward trim of about 0.30 degrees may be required at lower speeds up to around 30 knots.

Operational Weight

Maximum Vehicle Load	:	447,037 lbs (199.57 LT)
Lightship Displacement	:	1,105,194 lbs (493.39 LT)
Maximum Displacement	:	1,763,776 lbs (787.4 LT)
Maximum VCG	:	23.2'
Trim (normal maximum)	:	+/- 2° +/- 8 1/2"

Maximum displacement includes 112,436 lbs (50.21 LT) of ice accretion.

Stowage of Hazardous Materials

AMHS has three special permits that allow the stowage of Hazardous Materials on the vehicle deck - provided the required stowage requirements in each permit are met. They are renewed as needed prior to their expiration dates, and apply to the the entire AMHS fleet.

Reference: Appendix Stowage Permits.

DOT-SP 7465
DOT-SP 7928
DOT-SP 11232

Fire Detection System

Fire detection on the vessel is through an Ansul IQ-301 fire detection system. This Ansul IQ-301 is a fully addressable system that monitors the smoke and heat detectors as well as all of the manual pull stations located throughout the vessel. The following areas are covered by the smoke detection system:

Pilothouse
Crew Day Room
Air Handler Room #1
Air Handler Room #2
Air Handler Room #3
Passenger Deck
Vehicle Deck
Port Engine Room
Starboard Engine Room
Port Aft Peak/Jet Room
Stbd Aft Peak/Jet Room
Forepeak
Thruster Room #1
Thruster Room #2
Compartment #1
Compartment #2
Compartment #3
Compartment #4
Compartment #5
Compartment #6

Smoke detectors are used throughout the vessel in the Operating Compartment, Crew Day Room, Air Handler Rooms, Passenger Deck, Vehicle Deck, Forepeak, Bow Thruster Rooms and Compartment 1, 2 ,3, 4, 5 and 6 and both port and starboard Aft Peaks. In the Engine Rooms, heat detectors rated for 190F are fitted directly above the main propulsion engines while smoke detectors are fitted as well.

Manual fire pull stations are located at the exit from each space and are spaced not more than 20m apart throughout the vessel.

Alarms are monitored by the Ansul IQ-301 control panel located in the electrical room. A digital display of the control panel is located in the Operating Compartment as well. Any fire alarm will be monitored through the IMACS system as well. Audible bells indicating an alarm are located in the Operating Compartment, Crew Day Room, and port and starboard Engine Rooms and Aft Peak/Jet Rooms.

The Ansul IQ-301 system does not require any normal operation, it should be on at all times. This detection unit is provided with an uninterrupted power supply, containing a battery bank, a charger, and battery monitor to indicate possible faults. Any alarm should be considered serious and addressed by the crew to investigate if a fire exists.

For additional monitoring, CCTV cameras are provided in each engine room as a means to address an alarm originating from the engine room.

Firemain System

The Firemain system is discussed in Section 7 of this manual. Please refer to that section for additional information.

Fixed Fire Suppression Systems

The Fixed Fire Suppression System is discussed in Section 7 of this manual. Please refer to that section for additional information.

Portable Fire Extinguishers

Portable fire extinguishers are provided throughout the vessel in required locations. The locations of the portable fire extinguishers can be seen on the vessel fire plan. It is important to note that portable fire extinguishers should only be used for small fires onboard the vessel. In the case of any fire, the crew should be ready and well prepared to fight the fire using the firemain system and the corresponding fixed fire suppression system fitted on the vessel in order to contain the fire before it spreads out of control. When practical it is recommended that portable fire extinguishers be used to extinguish fires on board the vessel.

Portable fire extinguishers are stored with a pin lock that prevents unintentional release of the extinguishing agent. In the case of the fire, the extinguisher should be carried to the affected area with the pin still inserted. Once the area is reached the pin can be removed and the agent released by squeezing the handle. When operating the portable fire extinguishers as with any fire, always aim the extinguishing agent at the base of the fire. Always have a backup extinguisher ready in the case that the first extinguisher does not work or that the entire extinguishing agent is used before the fire is put out.

Once the fire appears to be extinguished, check the area and be prepared for any possible re-ignition or flare-up of the fire before the area is no longer considered a fire risk. Keep passengers away from the area until proper cleanup and repair of the area is carried out.

Fire Dampers

Fire dampers on this vessel are located on the port and starboard engine room supply fan inlets and engine room exhaust outlets. In addition, fire dampers are fitted on the forward and aft vehicle deck exhaust fan outlets. The fire dampers are A-60 rated. Each damper is compressed air driven for open/close through a 24 VDC solenoid supplied from the bridge deck battery bank. In order to keep the dampers open, air pressure must be maintained to the solenoid, if air pressure is lost the dampers will automatically close for fire safety.

Normal opening and closing of the dampers is tied to the operation of the fans. If the fans are switched on the dampers automatically open. When the fans are shut down the dampers automatically close.

In case of fire in either engine room there are redundant controls for emergency closing the fire dampers. The fans and dampers will be directly tied to the pressure switch on the FM-200 system so that when this system is activated the fans will automatically shut off and the dampers will close. In addition, at the Engineer's Console in the Operating Compartment there are fan and damper shut-down buttons on an emergency panel for the port and starboard engine rooms. Finally there are fan and damper shut downs located at the exit of each engine room outside the space.

For the vehicle deck, the fans and dampers are provided with emergency shut down buttons on the Engineer's Console in the case of a fire in the Vehicle Deck. Each vehicle deck fan also has an emergency shutdown on its associated controller.

Structural Fire Protection Arrangements

Fire Integrity Plan: NGA Dwg. No. NG408-687-01-1

Vessel Structural Fire Protection Arrangement:
The vessel has structural fire protection in areas as required by the HSC 2000 Code. On this vessel, there is 60-minute and 30-minute structural fire protection fitted in various spaces.

Areas of major fire hazard are required to be protected with A60 boundaries, providing 60-minute protection of the structure. On this vessel, A60 structural fire protection is installed in each machinery space and throughout the Vehicle Deck. The structural fire protection is required in each machinery space on the hull sides above the waterline, and in the overhead as well as on the forward and aft bulkheads. Likewise, the Vehicle Deck sides, forward bulkhead, aft bulkhead, and the overhead are protected by A60 rated structural fire protection.

Areas of moderate fire hazard require A30 structural fire protection, providing 30 minute protection of the vessel structure. The purpose of this is to protect the passenger areas from areas of moderate fire risk. On this vessel, A30 structural fire protection is installed around the bulkheads of the food storage/preparation area, and A30 is also installed on the bulkheads of the Electrical Room and the underside of the Operating Compartment. This A30 boundary encompasses what is considered a control station, the combination of the Electrical Room and the Pilothouse.

All other boundaries on the vessel are required to be smoke tight divisions, but do not require structural fire protection arrangements.

For a layout that distinguishes the boundaries, the Fire Integrity Plan for the vessel should be referenced, NGA Drawing No. NG408-687-01-1.

Primary communication equipment is listed below. Operating instructions can be found in the designated technical manual provided by the manufacturer.

MFG	P/N	QTY	DESCRIPTION
CRESTRON / NEC / MATRIX		1	VID INFO audio / video system with 16 18" monitors and PA interface in passenger spaces
Hose McCann	UM-ICSC-2271	1	PA System with speakers
Hose McCann		1	SPT Sound Powered Telephone system with Auxiliary Visual Signaling Beacons
Hose McCann	UM-MPBX-40/15	1	TEL Automatic micro processor Controlled, 40 line, 15 Trunk Telephone System with Auxiliary Visual Signaling Beacons and 6" Gongs
JRC	NCR-330	1	NAVTEX RECEIVER/PRINTER
Motorola	HT750 or HT1000	10	Handheld company VHF with interface to PA
ICOM	IC-A110	1	Air Band Transceiver Coverage of 118 to 136.975 MHz provided with 25 kHz channel spacing. This provides 2 way, on scene, radio communications.
ACR	Global Fix Pro	1	EPIRB Class 1
Furuno	FA150-UAIS	1	AIS Vessel Transponder including DSC dual channel VHF transceiver
Raytheon	E43011	1	Raycom cellular VHF
Rutter	VDR-100G3	1	VDR System
SKANTI	1000DSC	2	Company VHF
SKANTI	SCANBRIDGE A3 1250	1	GMDSS system including (2) DSC VHF, (1) DSC MF/HF and (1) SAT-C unit with computer and printer
Icom	IC-GM1600	3	GMDSS portable VHF
SERPI-IESM	Rescuer SART 9 GHz	3	SART Rescuer
	JAX-9A	1	WEATHERFAX

Primary navigation equipment is listed below. Operating instructions can be found in the designated technical manual provided by the manufacturer.

MFG	P/N	QTY	DESCRIPTION
Current Corp	8540	1	NIGHT VISION System with 2 CRT monitors
PMC		1	IMACS System including (2) computers, (1) printer and COMM's TO FIRE, HVAC, VDR, KMW, INS, MTU, POWER MGMNT
PMC	8012	1	NAVIGATION LIGHT PANEL
Raytheon	2015	1	AUTOPILOT 2015 OPERATOR UNIT
JRC	JLR-7800	2	DGPS COMBO ANTENNA C/W CABLE
JRC	JLR-7800	2	DGPS NAVIGATOR
Raytheon	NSC ECDIS	1	ECDIS system with (1) 29" MONITOR and (2) 18" MONITOR with radar overlay
Raytheon	GDS 101	1	Echosounder Model Bst 7622 with 200kHz transducer and 50kHz transducer
Raytheon	Digital Gyro STD 22	1	GYRO CONTROL UNIT c/w Rate of turn indicator and 3 repeaters
Barber	Magnetic Compass	1	MAGNETIC COMPASS with sonde pickup and Comnav repeater
Raytheon		1	Nautoconning system with (4) 15" Monitor
Raytheon	NSC Chartradar	2	NSC Chartradar, ARPA equipped 25kW X-band with 40rpm antenna and (2) 29" Monitor
Walker	7070	1	SPEED Log Indicator (speed and distance)
Walker	7070	1	WIND Wind speed and direction Indicator system
Zollner	SRD-414/2	1	Sound Receptor System. The operator panel is in the center bridge overhead console.
Raytheon	NB0906600028	1	GYRO Rate of Turn Indicator is located near centerline of the Center Bridge Overhead Console.
Carlisle and Fitch Co.	1000W XE SL	2	Fully directional 1000 Watt Searchlights

NG Alaska Marine Highways FVF Ahead and Astern Steering Trials	PROJECT NG408 REPORT 925-01 - Issue 2 DATE 15th Nov 2003

F.	Ahead and Astern Steering Trials	Test Memo - 00-5540-02-21106
	Date conducted	23rd February 2004

These trials were only conducted from the captains steering position. With the feedback to the steering jets being electronic control, this would not have varied between the Captains steering position and any other steering position.

These trials confirmed that the steering buckets manoeuvre from hard over port to hard over stbd in approximately 7 seconds.

Both ahead and astern trials were successful and did not highlighting any control issues or high hydraulic oil pressure alarms. The engine RPM remained constant for each trial.

7.5 knots Steering Astern	
0-Stbd-Port-Stbd-0 from Center Console	
Initial heading	256, COG 081
Initial RPM	1000
Initial Speed	7.5
Time amidships - stbd	5
Max. steering angle to stbd	29
Time stbd – port	7
Max. steering angle to port	30
Time port – stbd	6.5
Max. steering angle to stbd	29
Time stbd – amidships	3.8
Final RPM	970
Max. hydraulic pressure	110 bar
Max. lube oil pressure	
Steering station used	Captains

32 knots Steering Ahead	
0-Stbd-Port-Stbd-0 from Center Console	
Initial heading	360
Initial RPM	1722
Initial Speed	32
Time amidships - stbd	3.5
Max. steering angle to stbd	30
Time stbd – port	7.3
Max. steering angle to port	30
Time port – stbd	7.2
Max. steering angle to stbd	30
Time stbd – amidships	3.7
Final RPM	1730
Max. hydraulic pressure	125 bar
Max. lube oil pressure	
Steering station used	Captains

NG Alaska Marine Highways FVF Turning Circle Trials	PROJECT NG408 REPORT 925-01 - Issue 2 DATE 15th Nov 2003

H.	Turning Circle Trials	Test Memo - 00-5540-02-26046
	Date conducted	24rd February 2004

Turning circles were conducted at two speeds, 20 knots and 32 knots using full helm of 30 degrees. It was determined that trials at 15 degrees of helm were not required. The results are given in the summary table below and the following turning circle diagrams.

The turning circles were plotted using the DGPS Latitudes and Longitudes and a curve drawn between the points. The longitudes were scaled as a ratio of the latitudes to give a square grid.

In each test the variation between the compass heading and course over the ground was recorded so that an estimate for any drift angle could be made. This was seen to be up to 9 degrees.

During the second pull out test with the tiller in the central position the vessels rate of change in course reduced, however, it did not reduce to zero. It required a small amount of opposite helm to straighten the vessel and then the vessel ran straight. This was not observed at 20 knots.

This is a typical response for a water jet propelled vessel as these generally do not have rudders or other skeg type appendages and therefore a small level of drift is experienced if directional control is not maintained by small amounts of helm applied by the captain.

This was verified during the manoeuvring section of the model tests. The results of the spiral tests given in the Marintek Report No 601970.00.02Rev1, shows that the loop or rudder dead band width at 30 knots was ± 2 degrees. At 25 knots this was non-existent.

On completion of these tials it was agreed that spiral tests would not be necessary as the vessel showed no signs of directional instability.

Results

Sea Trials	Tactical Diameter at 180 degrees	Transfer at 90 degrees	Advance at 90 degrees	Turning Radius
20 knots 30 degrees helm.	857 ft	562 ft	639 ft	351 ft
32 knots 30 degrees helm	997 ft	529 ft	717 ft	451 ft

NG — Alaska Marine Highways FVF
Turning Circle Trials

PROJECT	NG408
REPORT	925-01 - Issue 2
DATE	15th Nov 2003

NG NIGEL GEE AND ASSOCIATES LTD

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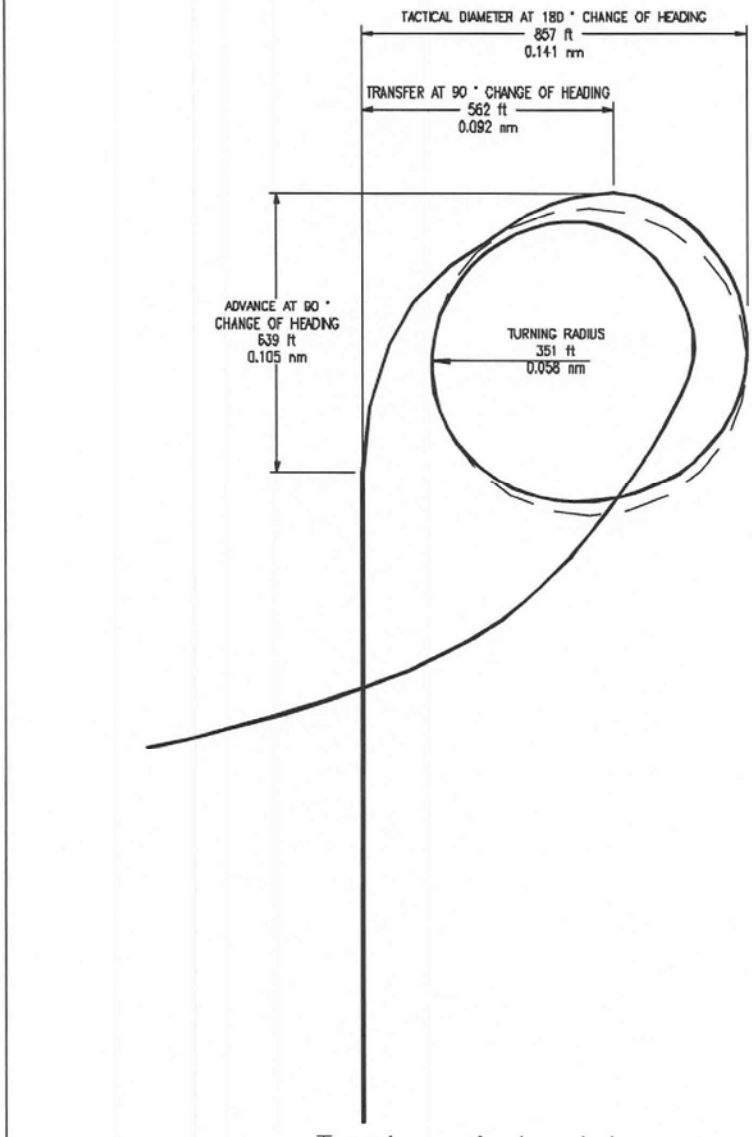

Turning circle data
20 knots, 30 degs helm, Turn to Starboard.

NG — Alaska Marine Highways FVF
Turning Circle Trials

PROJECT	NG408
REPORT	925-01 - Issue 2
DATE	15th Nov 2003

NG NIGEL GEE AND ASSOCIATES LTD

ISSUE A 1 2 3 4 5 6 7 8

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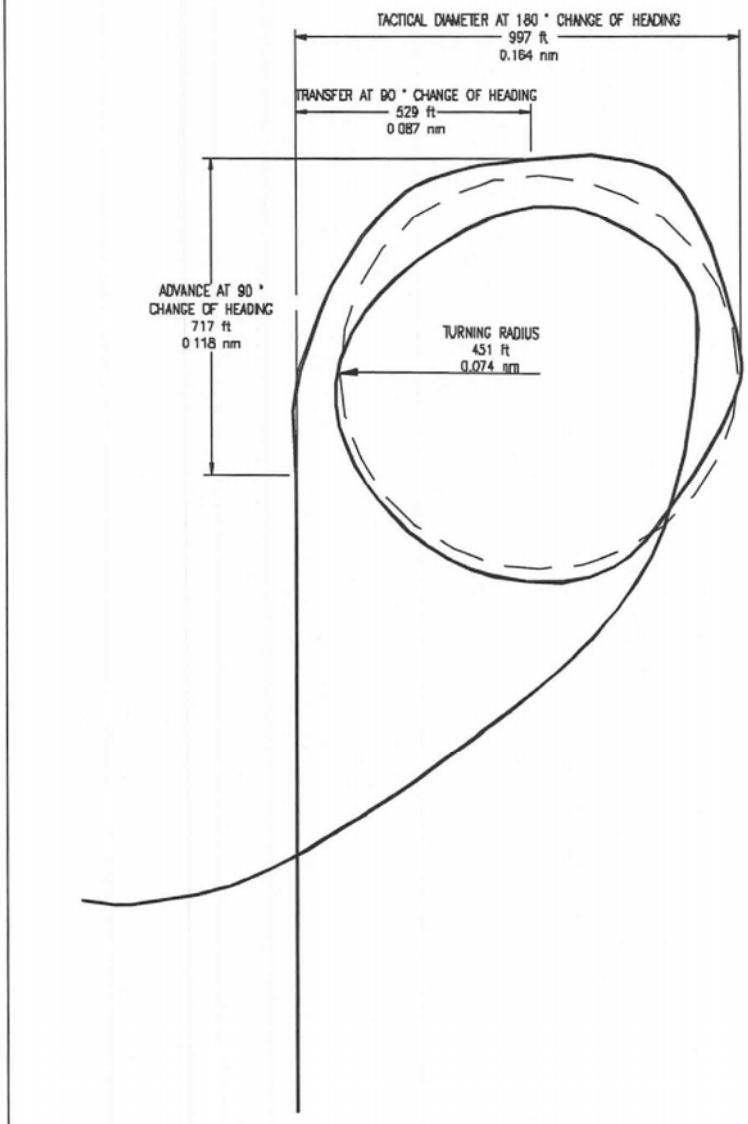


Turning circle data

32 knots, 30 degs helm, Turn to Starboard.

NG Alaska Marine Highways FVF Z-Manoeuvre Trials	ENCL.	30
	PROJECT	NG408
	REPORT	925-01 - Issue 2
	DATE	15th Nov 2003

I.	Z-Manoeuvre Trials	Test Memo - 00-5540-02-26066
	Date conducted	24th February 2004

Z-manoeuvre trials were conducted at 20 knots with 20 degrees helm and 32 knots with 30 degrees of helm. Each test used a 45 degree change in course to starboard, then to port, then back to starboard. Additional tests at other nozzle angles or heading changes were not deemed to be necessary.

The completion of these tests did not reveal any concerns with manoeuvring.

The plots of the Z-manoeuvre tests are as follows.

NG

Alaska Marine Highways FVF

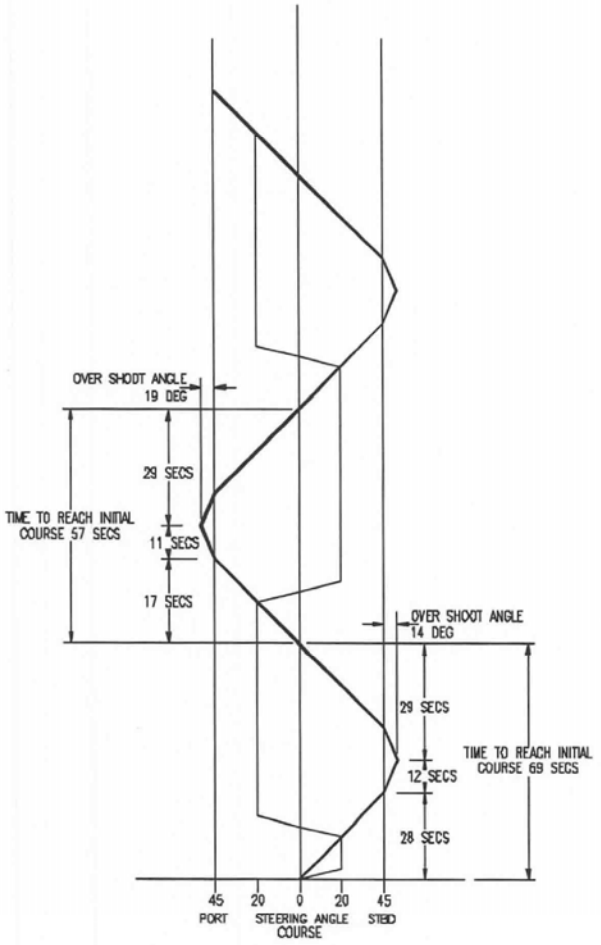
Z-Manoeuvre Trials

PROJECT	NG408
REPORT	925-01 - Issue 2
DATE	15th Nov 2003

NG NIGEL GEE AND ASSOCIATES LTD

ISSUE A (1) 2 3 4 5 6 7 8

DOCUMENT No. NG408-925-01



Z – Maneuver Data

20 knots, 20 degs helm, 45 deg change in course

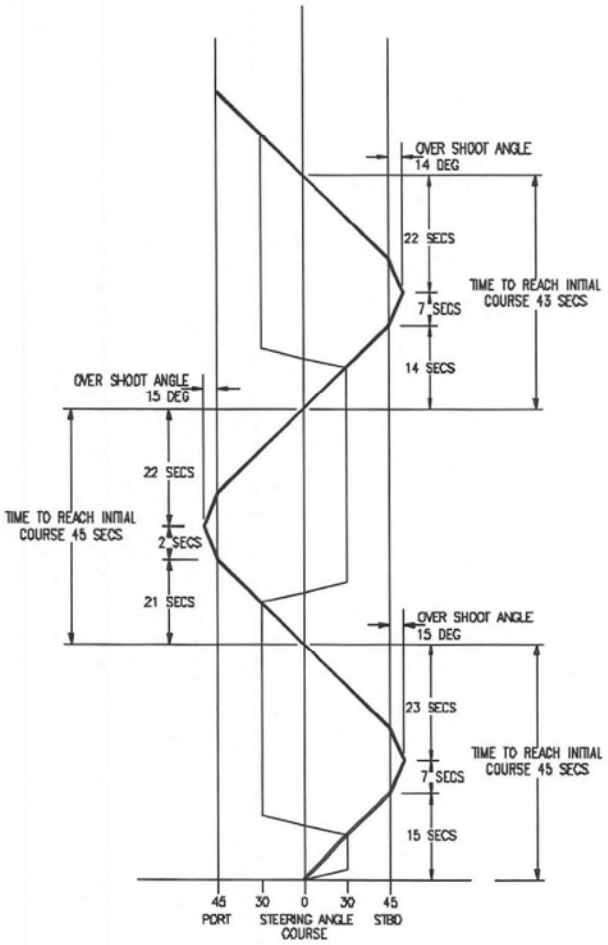
NG — Alaska Marine Highways FVF
Z-Manoeuvre Trials

PROJECT	NG408
REPORT	925-01 - Issue 2
DATE	15th Nov 2003

NG NIGEL GEE AND ASSOCIATES LTD

ISSUE A (1) 2 3 4 5 6 7 8

DOCUMENT No. NG418-925-11



Z – Maneuver Data

32 knots, 30 degs helm, 45 deg change in course

NG	*Alaska Marine Highways FVF* **Thruster Trials**	PROJECT NG408 REPORT 925-01 - Issue 2 DATE 15th Nov 2003

L.	Thruster Trials	Test Memo - 00-5540-05-58206
	Date conducted	23rd February 2004

Thruster trials were successfully completed; however, the data from these trials was not recorded.

These trials will be repeated for the second vessel.

NG	*Alaska Marine Highways FVF* **Quick Reversal – Astern to Ahead**	PROJECT NG408 REPORT 925-01 - Issue 2 DATE 15th Nov 2003

M.	Quick Reversal from Ahead to Astern	Test Memo - 00-5540-02-26016
	Date conducted	24th February 2004

Trials were conducted at 20 knots and 32 knots, stopping the vessel then accelerating in reverse to approximately 6 knots. The results recorded were as follows.

Speed at start	20.8 Knots	32.2 knots	32.0 knots
Time to stop	29 secs	29.4 secs	24.0 secs
Dist to stop	0.07 nm	0.16 nm	0.14 nm
Speed Astern	6.0 knots	6.1 knots	6.0 knots
Time to max astern	29 secs	23.6 secs	36.0 secs
Dist to max astern	0.02 nm	0.12 nm	0.02 nm
Max hydr pressure	150 bar	100 bar	140 bar

The results show that in a crash stop situation, from operating speed, the vessel will stop in 972 feet which is approximately 4 boat length.

NG Alaska Marine Highways FVF Quick Reversal – Astern to Ahead	
	PROJECT NG408
	REPORT 925-01 - Issue 2
	DATE 15th Nov 2003

N.	Quick Reversal from Astern to Ahead	Test Memo - 00-5540-02-26026
	Date conducted	24th February 2004

Trials were conducted at 6 knots, stopping the vessel then accelerating forward to operating speed. The results recorded were as follows.

Speed at start	5.9 Knots
Time to stop	14 secs
Dist to stop	0.02 nm
Speed Forward	32.3 knots
Time to operating speed	56 secs
Dist to operating speed	0.29 nm
Max hydr pressure	100 bar

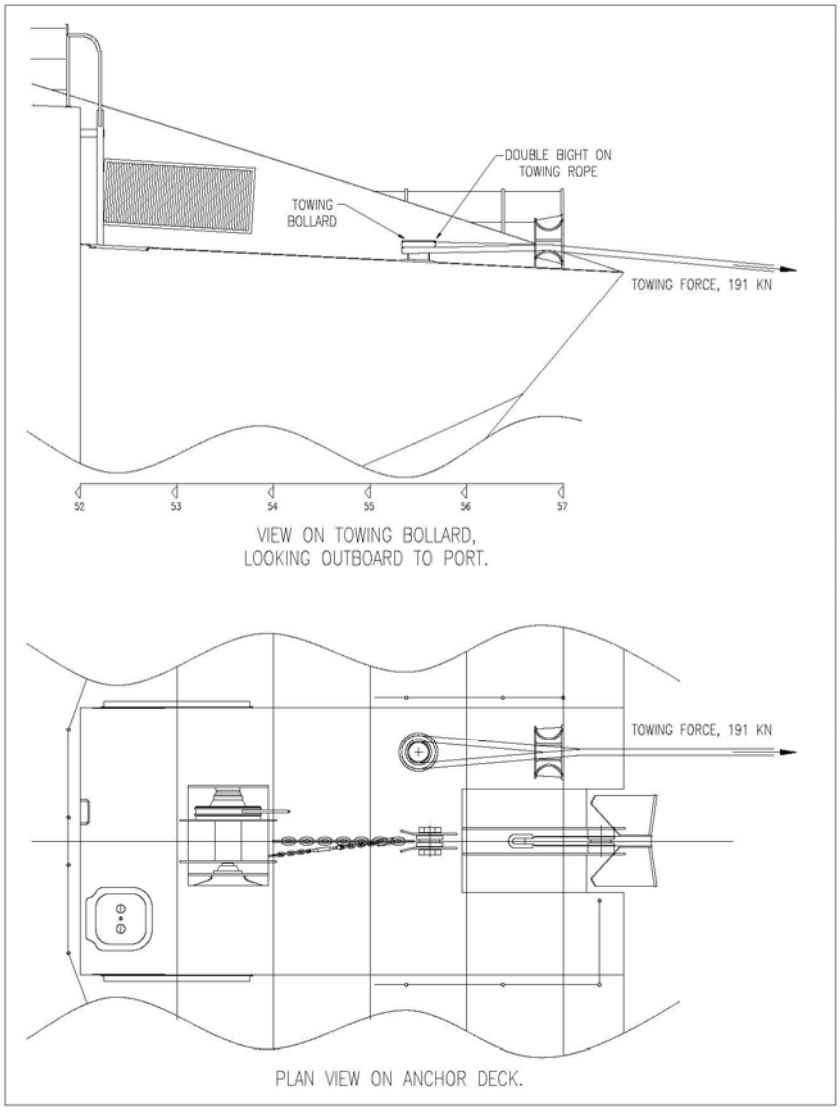
The results show that in a crash stop situation from astern the vessel will stop in 122 feet which is approximately half a boat lengths.

Maximum Permissible Towing Speed and Loads

The towing arrangements are in accordance with DNV HSLC Pt.3 Ch.5 Sec.3.

Design Towing Force = 191 kN

Maximum Towing Speed = 5 knots



Procedures for Dry-Docking

Dry Docking

Docking Plan – NG408-803-01-1 should be consulted prior to carrying out any dry-docking or lifting of the vessel.

The following characteristics and dimensions should be used as a guide to dry-docking and lifting of the vessel.

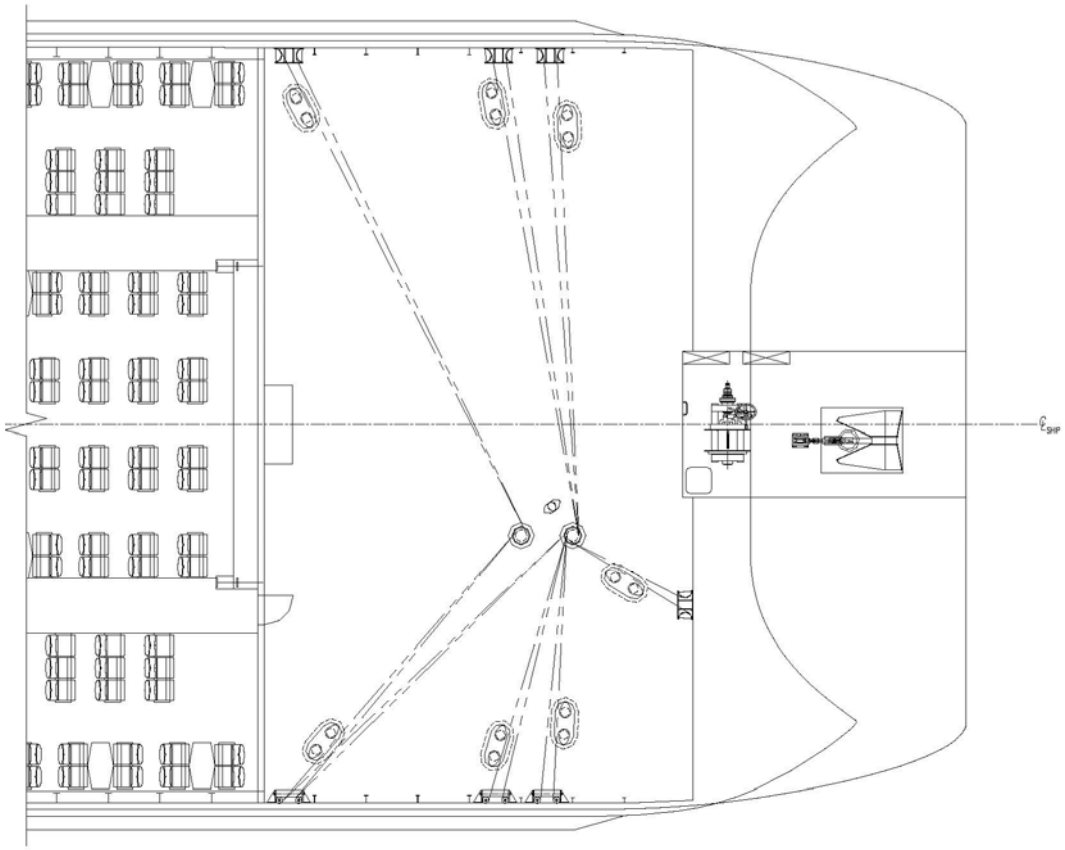
Length	**:**	**71.75 m (235’ 5’’)**
Beam	**:**	**18.00 m (59’ 1’’)**
Beam at Guard (measured)	**:**	**18.5 m (60’-7”)**
Beam at Wings (measured)	**:**	**18.9 m (62’)**
Draught	**:**	**2.59 m (8’ 6’’)**
Freeboard	**:**	**3.09 m (10’ 2’’)**
Max. Allowable Fwd. Trim	**:**	**TBC**
Max. Allowable Aft Trim	**:**	**TBC**
Lifting Weight	**:**	**TBC**

Mooring

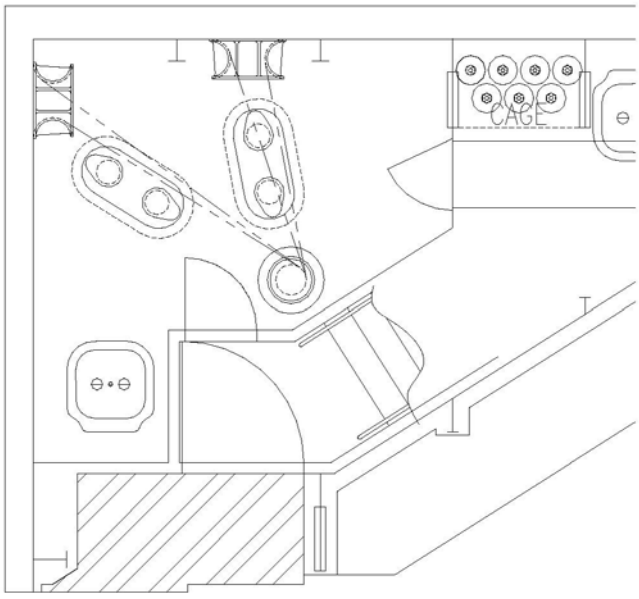
The following loads are in accordance with DNV Equipment Number calculations.

Capstan Working Load	60 kN (13,460 lbs)
Bollard Working Load	108 kN (24,228 lbs)
Mooring Rope Minimum Breaking Load	108 kN (24,228 lbs)

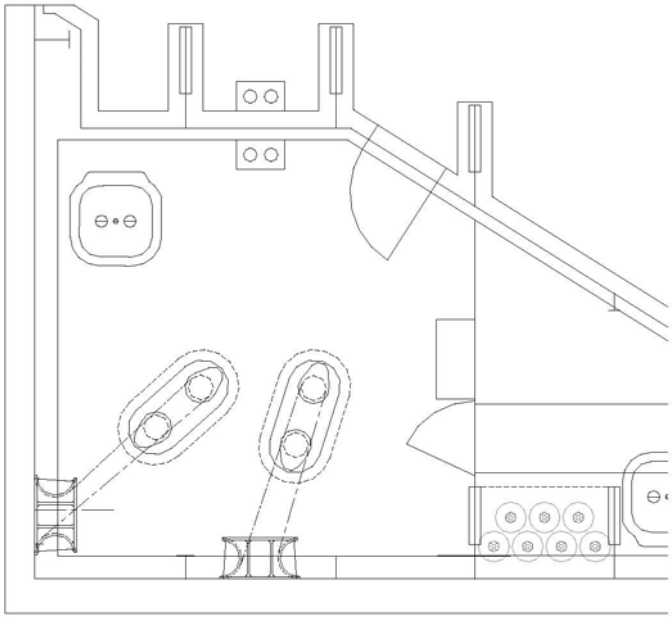
The mooring areas are shown below.



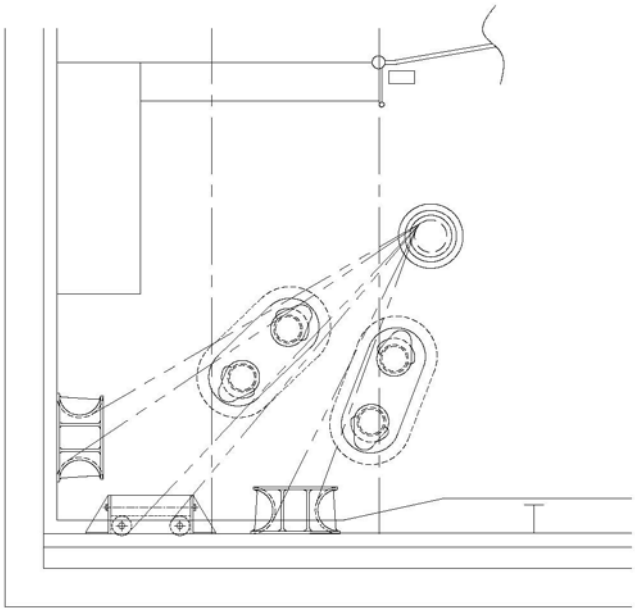
Forward Mooring Deck



Port Aft Mooring Deck



Lower Starboard Aft Mooring Deck



Upper Starboard Aft Mooring Deck

Additional information included in this section is as follows:

No Additional information to be included in this section.

Refer to Station Bill located in Section 18--Appendix.

Overview

This vessel is equipped with (2) Marine Evacuation System locations, port and starboard on the Passenger Deck. Additionally, there are (2) link liferafts located one on port and starboard on the Bridge Deck.

The MES system inflates to produce an evacuation slide which is then used by the crew and passengers to evacuate the vessel. After deployment of the slide, the designated crew member descends the slide to the inflated liferaft. The maximum capacity of each of the liferafts is 100 persons. The additional liferaft or the link liferaft as it is referred to can be released overboard and secured to the MES system liferaft to provide an additional space for 100 persons.

The link liferaft on either the port or starboard side can be towed around to the opposite side for use in evacuation as required. The rescue boat tows the link liferaft around the vessel to the appropriate side. This provides additional capacity for another 100 persons.

Deployment Procedures

Refer to the **LSA MES Operating Manual** for deployment procedures, located in the High Speed Craft Training Manual Appendix section.

Evacuation Procedures

- **Please refer to the Appendix—Station Bill for information regarding vessel evacuation procedures.**
- **Also, refer to HSC Training Manual—Section 1—Donning Lifejackets, Immersion suits and Thermal Protection Aids for information regarding emergency safety equipment on board the vessel and how to use it.**

Purpose

The following procedures are to be used as guidelines in the event the Master decides that the best course of action in order to save the passengers and crew is to abandon the vessel.

Definitions

Assembly Stations Areas of safe refuge on the vessel where the passengers will be gathered under the direction and control of one of the crew in the event of an emergency.

MES Marine Evacuation System, the slide and life rafts fitted to the vessel.

HSC Code 2000 HSC Code
International Code of Safety for High Speed Craft, 2000

Responsibility

Master The Master has the sole responsibility in determining when and if the vessel should be abandoned. The Master is also responsible to subsequently reconcile passengers and crew evacuated with the passenger and crew count.

Chief Mate If the Master becomes incapacitated in any way that stops him/her from fulfilling the role of Incident Commander, the Chief Mate will assume the Master's role.

Chief Engineer In the event the Chief Mate takes over the role of Master, the Chief Engineer will assume as many duties as possible that were previously assigned to the Chief Mate – but will still have his/her engineering role as the priority.

Officers and Crew The officers and crew have the responsibility to support the Master in this decision and to ensure that the *Abandon Ship* procedure is carried out in an effective and orderly manner.

The officers and crew are to ensure that the Master is kept informed of any and all circumstances that may pose a threat to the orderly evacuation of the vessel and to assist him/her in maintaining discipline and minimizing panic.

Personnel Protection

All Crew — All crew except for the crews assigned to the rescue boat and the MES shall don life jackets on hearing the *code black* alarm.

MES Crew — MES crew don immersion suits as part of preparing the MES. This is to be done after the passengers have their life jackets but prior to the actual order to *Abandon Ship*.

Rescue Boat Crew — Rescue boat crew don immersion suits prior to launching the rescue boat.

Procedure

The evacuation procedure is broken up into individual steps, but in an evacuation timeline some of the individual steps will be undertaken simultaneously. The Master may change the order of these steps as the circumstances of the evacuation warrant.

Emergency Announcements and Alarms — Emergency announcements and Alarms will be made by the Master and/or designate. Announcements will be made over the public address system, talkback and/or radio

Code Black / Code Purple — *Code Black* is an emergency announcement spoken three times over the PA. This signal requires all crew members to immediately respond according to their duties assigned on the Station Bill (Muster List). *Code Black* is the first stage in the *Abandon Ship* procedure. *Code Black* informs the crew to prepare the passengers and evacuation equipment and to await the Master's command to launch MES Equipment. *Code Purple* is the order to launch MES Equipment.

Abandon Ship — The signal for *Abandon Ship* is seven short blasts followed by one long blast on the ship's whistle, supplemented by the same signal on the general alarm bells and the words *Abandon Ship* announced three times over the PA.

The Master shall inform the Chief Engineer of his/her intent to abandon the ship.

Bridge Duties – Deck

Communications The Master shall direct the Chief Mate/Second Mate on Con to use all available communication equipment to broadcast the intention to abandon the ship.

GMDSS Global Maritime Distress and Safety System

DSC Digital Selective Calling

SAT C When depressed, can send an encoded message including the vessel's identity, position, course & speed to the International Maritime Satellite Organization (Inmarsat) maritime distress service. Typical Inmarsat search and rescue procedures then follow.

VHF Mayday call.

EPIRB Activate.

SART Activate.

Note: During emergency situations the base port must be notified as soon as safely possible. Refer to Route Operational Manual, Base Port (Section 6, Page 1 of 2, Radio Communications) for communication details with the base port.

Bridge Duties – Engineering

Machinery Shutdowns The Chief Engineer will make every attempt to keep the machinery in operation up to and until the Master and the Chief Engineer leave the vessel.

When given the order to *Abandon Ship*, the Chief Engineer trips and stops all machinery not directly needed in the *Abandon Ship* operations.

The Chief Engineer will ensure all over-side emergency lighting is on battery back-up.

Note: Fuel oil supply lines shall also be shut down as part of the machinery shutdown. Refer to the High Speed Craft Operating Manual (Section 7, Page 14, Auxiliary Systems, Fuel Oil) for details of the emergency shut-down of fuel oil supply lines.

Assembly Stations

The vessel is has two Assembly Stations, Station "A" is forward of the smoke doors and Station "B" is aft of the smoke doors.

During the *Code Black* phase, the passengers will already be in position at the designated assembly station or safe areas as directed by the Master. Normally some event will occur prior to the *Code Black* (a *Code Red* or *Yellow*). It is during this time that the passengers will be moved to the assembly stations and prepared for any subsequent emergency activities.

The crew will make a count of the passengers in their assembly station and relay the number to the Master.

See vessel Training Manual.

Passenger Control

The crew responsible for the Assembly Stations will retain control of the passengers by seeing that they don their life jackets and instructing them on the marine evacuation slide procedures.

Once passengers are mustered it is important to obtain an accurate passenger count. Once the count is obtained, inform the Operating Compartment / Master.

Identify and enlist a couple of passengers to assist in distributing life jackets. Once the life jackets are distributed, go through a demonstration on how to put on the life jacket. Point out the whistle, and water-activated light and their purpose. Have the passengers assist each other and have the children don their life jackets first with their parents helping them.

Keep the passengers busy and informed; do not let the passengers wander away from the Assembly Station. Try to keep families together. Do not let passengers go to the vehicle deck. Be persuasive.

The passengers are then to be seated or lined up towards the MES evacuation station. This is to prepare and shorten the awareness and travel time required by the passengers to respond to instructions should an *Abandon Ship* order be issued. The passengers and passenger control crew will await the Master's order to either stand down or abandon the ship.

Keep the Master informed of any changes at your Assembly Station, but do not call him/her unnecessarily as he/she will be busy with other emergency duties.

See vessel Training Manual.

Donning Life Jackets

The crewmembers in charge of the assembly station are to demonstrate the correct way to don a life jacket, assist where possible and ensure all passengers have life jackets as soon as possible after moving the passengers into the assembly station areas. This will normally be carried out during the initial response to a *Code Red* or *Yellow* incident.

See details later in this section

See vessel Training Manual.

See Safety Cards.

Rescue Boat Operations

The rescue boat is to be readied when the order for a *Code Black* alarm is given, and launched prior to the MES, when the order to deploy the slides is given. *Code Purple.*

See vessel Training Manual for duties and operations.

MES Operations

The operation of the MES will use the following commands.

The MES is carried out in two steps: the deployment and preparation for the evacuation and the actual *Abandon Ship* phase.

See vessel Training Manual.

Deploy

The *Code Purple* command given three or more times on the ship's public address system will direct the crew to activate the MES such that the slide and raft inflate and are made ready for use.

Abandon Ship

The verbal command *Abandon Ship* spoken three times from the Master will direct the crew to start sending the passengers down the slide(s) and into the life rafts.

See vessel Training Manual.

Special Needs Persons

Unless they choose to descend without assistance, special needs passengers will go down the slide with the assistance of crew after all the other passengers have been evacuated. Special needs passengers descend paired up with an able-bodied person; both persons facing forward with the able bodied person in front and the special needs passengers behind and straddling the person in front with their legs. It is a requirement of the 2000 HSC Code that special needs passengers, their location, and the special care required are identified to the Master at the commencement of the voyage. Passengers with special needs, elderly persons, and persons traveling with infants will be separated during the initial response in order that they may be given special attention during evacuation.

See vessel Training Manual.

Checking Vessel It is the responsibility of the Chief Mate with assistance from the Crew to ensure no passengers are on the vehicle deck. It is with this understanding the vehicle deck will not be swept for passengers during an *Abandon Ship* procedure as the vehicle deck is secured during the voyage and all passengers have moved off the vehicle deck. Those passengers remaining on the vehicle deck for medical reasons will be supervised by a crewmember. The Master will be advised of the locations and number of personnel on the vehicle deck.

The Master and the Chief Engineer will sweep the passenger spaces prior to leaving the vessel.

Survival and Rescue The Master will remain in charge of the passengers and crew during the survival and rescue phase of the operations.

See vessel Training Manual.

First Aid The Passenger Service Worker in Charge (PSWIC) is the person in charge of first aid, and all crewmembers can be designated as responsible for first aid response.

Vessel Log Books The Master and the Chief Engineer will be responsible for ensuring that their respective log books and records of events are taken with them as they leave the vessel.

Checklists There are a set of emergency response checklists in the Operating Compartment; they include but are not be limited to fire, collision, grounding, helicopter evacuation and *Abandon Ship*.

Safety Cards Vessel safety cards with evacuation and life jacket donning instructions are located throughout the passenger spaces. The safety card shall be available to each person on board and is located behind each seat's headrest.

Passenger Control Passenger announcement cards are located next to forward and aft passenger deck PA microphones.

Records

When the vessel is abandoned, the following records are to be removed from the vessel: bridge log, engineering log and passenger list.

References

AMHS SMS Crew Safety Training Manual

AMHS SMS Contingency Plan

AMHS SMS Emergency Checklist - Forms

Responsibility

The Master will be responsible for ensuring that all crewmembers are familiar with the craft's emergency response signals and codes. The Chief Engineer will be responsible for the maintenance of all equipment that is required to trigger the emergency signals and codes.

Procedure

As detailed below, the following emergency signals will be used on board the Fairweather Class vessel.

Each sounding of the emergency signal will be followed by a PA announcement detailing the course of actions required by both passengers and crew.

Code Black

Code Black, repeated three times followed by the instructions to the crew and an emergency instruction announcement to the passengers.

This signal indicates the Master feels that the vessel may have to be abandoned. Prepare as much as possible without the actual launch of the rescue boat or deployment of MES.

Code Purple

Code Purple, repeated three times followed by the instructions to the crew and an emergency instruction announcement to the passengers.

This signal indicates the order to launch rescue boat and MES and prepare MES for evacuation. Line up passengers at the MES doorway

Abandon Ship

Seven short blasts followed by one long blast on the ship's whistle, supplemented by the same signal on the general alarm bells. Also, the words *Abandon Ship*, repeated three times over the PA followed by the instructions to the crew and an emergency instruction announcement to the passengers.

This signal indicates the order to start passengers down the MES slides into the rafts.

Fire

Code Red, repeated three times, followed by the instructions to the Emergency Squad and an emergency instruction announcement to the passengers. This signal indicates there is a fire aboard the ship.

Damage Control

Code Yellow, repeated three times, followed by the instructions to the Emergency Squad and an emergency instruction announcement to the passengers.

This signal activates the Emergency Squad in the event of a power loss, grounding, collision, major machinery failure, oil spill, or any unexpected emergency that may be encountered.

Man Overboard	*Code Blue*, repeated three times, followed by the instructions to the Emergency Squad and an emergency instruction announcement to the passengers
Medical Emergency	The PSWIC is the person in charge of First Aid – to be called via VHF handheld radio if necessary.

Purpose

The purpose of this procedure is to detail the recommended Station Bill – Muster Station designations as set up on the Fairweather Class vessel.

Definitions

Muster List The Master of the craft shall, before the craft proceeds on a voyage, assure that there is a muster list showing for each member of the crew the special duties that are allotted to him/her and the stations to which that crewmember shall go in the event of an emergency, including duties and stations applicable for extinguishing fire.

Muster Station Safe location for passengers to muster.

Station Bill Interchangeable with muster list.

Assembly Station Interchangeable with muster station.

Responsibility

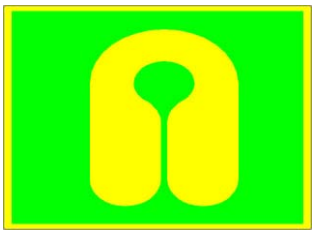
The Master will be responsible for ensuring that all officers and crews are trained and drilled using the craft's Station Bill assignments. *See Station Bill Functions below.*

Procedure

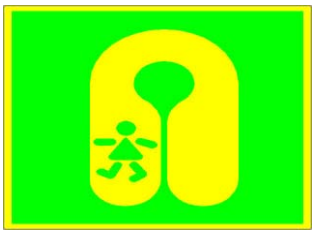
Initial Response During the initial response to an emergency, the ship's crew will move the passengers to a safe area or assembly station as directed by the Master. In preparation for a possible *Abandon Ship*, the crew will issue life jackets located in lockers fitted throughout the craft and ready the passengers for possible evacuation from the vessel by means of the marine evacuation slides located on the port and starboard sides of the craft.

Life jackets Clear instructions for the fitting of life jackets will be posted throughout the craft and on the passenger safety card.

Life jacket lockers will have placards with signage indicating their contents.



Adult



Child

Station Bill Functions

In support of the Station Bill, additional duties and clarification of duties are outlined below for emergency duties and all alarm signals on the Fairweather Class vessel.

MASTER

General Emergency Duties

The Master in all emergencies is to respond as Incident Commander, utilizing the resources of the ship's complement and equipment to respond immediately and effectively to assess, contain, extinguish and/or coordinate the response to any and all incidents with focus on safety of life of passengers and crew, prevention of loss of ship and protection of the environment.

The Master is responsible to make informed decisions, to maintain an orderly response to ever-changing requirements in an emergency, and to monitor situational assessments.

The Master is to ensure that internal and external communications are established and that assistance as required is requested by all available means in the event of any serious incident. The Master keeps passengers and crew informed (time permitting) by use of announcements from bridge or passenger control personnel.

The Master shall retain an expert knowledge of safety systems and equipment available including emergency response protocols.

Duties of the Master in response to emergencies include but are not limited to the following:

MASTER (cont.)

CODE RED (Fire Response)

- On bridge, assumes role of Incident Commander.
- Assesses appropriate response to incident, coordinates internal response focusing on safety of life of passengers and crew and containment of fire.
- Continually monitors the progress of fire containment.
- Ensures that passenger control personnel take immediate care of and control of passengers, including movement of passengers to a designated safe area as required.
- Issues clear instruction and maneuvers the craft as necessary to best meet the emergency needs.
- Establishes external communications with outside agencies as required.
- Ensures that emergency response protocols adopted for fire response are administered continually.
- Assesses fire response, focusing on passenger and crew safety.

CODE BLACK (Evacuation Stations)

- On bridge as Incident Commander, and as the emergency situation dictates, the Master will issue the *Code Black* alarm.
- Monitors the progress of the emergency situation including crew complement at each evacuation location and rescue boat.
- Keeps passengers and crew informed (time permitting) by use of announcements from bridge or passenger control personnel.

CODE PURPLE (Issue MES Launch)

- Issues launch and preparation of equipment for evacuation order as required.
- Monitors the progress of launch and preparation of equipment.
- Modifies evacuation procedure as required dependent on passenger complement.
- Ensures internal communications is maintained for care and control of passengers.

ABANDON SHIP

- Issues evacuation order, *Abandon Ship,* as required and broadcasts location and condition of craft, including passenger and crew complement.
- Maneuvers the craft as required to assist in the evacuation process.
- Ensures available electronic aids are activated, including SART, EPIRBS and GMDSS radio call. Retains possession of one of the emergency portable GMDSS radios.

MASTER (cont.)

ABANDON SHIP (cont.)

- Reports to #1 MES Station, dons immersion suit, assists in the evacuation procedures, monitors evacuation of crew and passengers and ensures that no personnel remain on board prior to his/her evacuation in life raft.
- Once the craft is evacuated, the Master remains in command of all lifesaving appliances, marshals all rafts to one location to be tethered together, and continues to establish communications with coast station or assistance vessels advising of situation.
- Establishes an internal command structure in the survival craft and ensures proper lifesaving techniques are established and adhered to.

CODE BLUE (Man-Overboard, Rescue Boat Launch)

- Assumes command on bridge and maneuvers craft as required to facilitate rescue boat launch.
- Establishes internal and external communications.
- Coordinates response to incident including potential injured person recovery.
- Apprises rescue boat crew of location of incident and situational awareness of incident, including man-overboard situation, vessel in need of assistance or other emergency requiring rescue boat launch.
- Issues order to launch rescue boat, when satisfied of craft's position.
- Monitors emergency response checklist.
- Is responsible to monitor and adjust emergency response as required to meet nature of incident.
- Keeps passengers and crew informed (time permitting) by use of announcements from bridge or passenger control personnel.

CODE YELLOW (Damage Control)

- On bridge as Incident Commander.
- Assesses appropriate response to incident, coordinates internal response focusing on safety of life of passengers and crew and damage control.
- Continually monitors damage assessment and damage control measures.
- Ensures that passenger control personnel take immediate care and control of passengers, including movement of passengers to a designated safe area as required.

MASTER (cont.)

CODE YELLOW (cont.)

- Issues clear instruction and maneuvers the craft as necessary to best meet the emergency needs.
- Establishes external communications with outside agencies as required.
- Ensures that emergency response protocols adopted for damage assessment and control are administered continually.
- Assesses damage assessment and control response, focusing on passenger and crew safety.
- Keeps passengers and crew informed (time permitting) by use of announcements from bridge or passenger control personnel.

CHIEF MATE/ SECOND MATE

Chief Mate/ Second Mate have interchangeable duties

The Chief Mate and Second Mate are required to have interchangeable duties for alarm responses, excepting *Code Black* and *Code Purple* where specific duties for each classification in *Code Black* and *Code Purple* are separate and distinct.

The Chief Mate or the Second Mate will remain *on the Con* with and assist the Master should an alarm be activated. The *Off Con* Deck Officer reports to the scene and assumes *Off Con* duties and is in charge of the response team.

CODE RED (Fire Response)

Chief Mate/ Second Mate – <u>On Con</u>

- Assists the Master by all available means in performance of his/her duties in responding to a fire.
- As a key member of the bridge team, assists the Master in emergency response protocols and in establishing internal and external communications.
- Maintains and records an accurate log-book of incident.
- Sees that emergency response protocol checklist is available dependent on type and location of emergency.
- Assists the Master as required in vessel maneuvering and position updates including identifying potential navigation or traffic hazards.
- Relays instructions from the Master and information between the Master and the passenger control party and the fire party, including external communications.
- Keeps passengers informed as instructed by the Master, by use of the public address system.

CHIEF MATE/ SECOND MATE (cont.)

CODE RED
(Fire Response)

Chief Mate/ Second Mate – Off Con

- If necessary, reports to emergency gear locker to assist with fire party suit-up.
- Reports to alarm / fire location, assesses fire situation and informs the Master.
- As required, utilizes immediate fire containment measures, such as portable extinguishers and hoses.
- Activates sprinkler or deluge system or machinery space flooding FM 200 as directed.
- Importantly, keeps the Master informed at all times, as information is critical to enable the bridge team to respond correctly to the incident.
- Utilizes fire party as necessary at all times, focusing on containment of fire and safety of the fire party.
- Where possible, fire locations should be contained and boundary cooled using fixed extinguishing systems.
- Fire party response can be assisted by information available from the bridge team, such as IMACS information and emergency response checklists prompting activation or ensuring emergency protocols are followed.

CODE BLACK
(Evacuation Procedures)

Chief Mate-Specific

- Is in charge of # 1 MES station, reports to station, reports to bridge that crew is present and accounted for.
- Ensures that passenger control is carried out in preparation for evacuation.
- Obtains emergency portable GMDSS radio for use.
- Awaits order of the Master to deploy and prepare system for evacuation.
- Ensures that MES slide bottom crews are adequately dressed in immersion suits.

CODE BLACK
(Evacuation Procedures)

Second Mate-Specific

- Is in charge of # 2 MES station, reports to station, reports to bridge that crew is present and accounted for.
- Ensures passenger control is carried out in preparation for evacuation.
- Obtains emergency portable GMDSS radio for use.
- Awaits order of the Master to deploy and prepare system for evacuation.
- Ensures that MES slide bottom crews are adequately dressed in immersion suits.

CHIEF MATE/ SECOND MATE (cont.)

CODE PURPLE (Issue MES Launch)

Chief Mate-Specific

- Dependent on passenger complement and Master's requirements, launches MES and links additional raft in preparation for reception of passengers. Reports to Master that MES Station #1 is readied when system launch is completed and ready for passengers.
- During preparation, an evacuation order may or may not have already been given by the Master. The Chief Mate ensures that the order to evacuate has been received prior to commencing evacuation of passengers.
- Ensures at all times correct deployment and evacuation procedures are being carried out by MES station complement, including care and control of passengers, and that accurate count of passengers and deployed crew is maintained.
- Prior to descent, sweeps assembly station for remaining passenger or crew. Dons immersion suit and ensures SART is available.

ABANDON SHIP

Chief Mate-Specific

- Assists in the evacuation procedures.
- Monitors evacuation of crew and passengers and ensures that no personnel remain on board prior to his/her evacuation.
- Descends slide, assumes command and establishes survival routine in craft.

CODE PURPLE (Issue MES Launch)

Second Mate-Specific

- Dependent on passenger complement and Master's requirements, launches MES and links additional raft in preparation for reception of passengers. When system launch is completed ready for passengers, reports to Master that MES Station #2 is readied.
- During preparation, evacuation order may or may not have already been given by the Master. The Second Mate ensures that the order to evacuate has been received prior to commencing evacuation of passengers.
- Ensures at all times that correct deployment and evacuation procedures are being carried out by MES station complement, including care and control of passengers, and maintaining accurate count of passengers and crew deployed.
- Prior to descent, sweeps assembly station for remaining passenger or crew. Dons immersion suit and ensures that SART is available.

CHIEF MATE/ SECOND MATE (cont.)

ABANDON SHIP

Second Mate-Specific

- Assists in the evacuation procedures.
- Monitors evacuation of passengers and crew and ensures that no personnel remain on board prior to his/her evacuation.
- Descends slide, assumes command and establishes survival routine in craft.

CODE BLUE
(Man Overboard Rescue Boat Launch)

Chief Mate/ Second Mate – On Con

- As a member of the bridge team response, records position of craft by available means.
- Assists Master in establishing internal and external communications and gives assistance required by incident response.
- Maneuvers craft or assists Master in maneuvering the craft to facilitate launch and recovery of rescue boat, depending on navigational or traffic hazards.
- Relays instructions or information to / from Master internally and externally; keeps accurate log book and radio log of events as they transpire; and confirms response with emergency response protocol checklist, ensuring compliance as deemed necessary.

CODE BLUE
(Man Overboard Rescue Boat Launch)

Chief Mate/ Second Mate – Off Con

- Reports to rescue boat and assists in preparation and launch of the rescue boat. Provides handheld radio and SART.
- Assists boat crew, briefing in the required response to incident. Ensures preparation and launch procedures are carried out in accordance with established procedures.
- Prepares for recovery of rescue boat and assists in providing or preparing for recovery of persons in need of assistance.
- At all times informs bridge team of status of launch and recovery of rescue boat.

CODE YELLOW
(Damage Control)

Chief Mate/ Second Mate – On Con

- By all available means, assists the Master in performance of his/her duties in responding to the incident.
- As a key member of the bridge team, assists the Master in emergency response protocols and assists in establishing internal and external communications.
- Maintains and records an accurate logbook of the incident. Sees that emergency response protocol checklist is available, dependent on type and location of emergency.
- Assists the Master as required in vessel maneuvering and position updates including identifying potential navigation or traffic hazards.

CHIEF MATE/ SECOND MATE (cont.)

CODE YELLOW
(Damage Control)

Chief Mate/ Second Mate – <u>On Con</u>
(cont.)

- Relays instructions from the Master and information between the Master and damage control party, including external communications. As instructed by the Master, keeps passengers informed by use of the public address system.

CODE YELLOW
(Damage Control)

Chief Mate/ Second Mate – <u>Off Con</u>

- Immediately reports to emergency location, assesses situation and informs the Master.
- Utilizes immediate containment measures as required.
- Importantly, keeps the Master informed at all times, as information is critical to the bridge team responding correctly to the incident.
- Utilizes damage control party as containment party and as is necessary, at all times focusing on containment incident.
- Damage control party's response can be assisted by information available from the bridge team such as IMACS information and emergency response checklists prompting activation or ensuring emergency protocols are followed.

CHIEF ENGINEER

CODE RED
(Fire Response)

- The Chief Engineer is required to be on position at the IMACS to assist the Master (bridge team) in response to an incident.
- The Chief Engineer's knowledge of the IMACS operation and available information is of paramount importance in assisting the Master and the fire party in the appropriate fire response.
- Through information obtained on IMACS, the Chief Engineer will be able to monitor fire containment or spread of fire, recommend or ensure activation of fire suppression systems, and effect ventilation shutdowns.
- Monitors the smoke and heat detectors on the IMACS fire page, and initializes and monitors the performance and activation of fire deluge and sprinkler pumps.
- Has visual oversight of machinery spaces by means of CCTV monitors and can give technical information to the Master and fire party on all areas of the craft. Has the ability to remotely isolate areas electrically, and isolate fuel valves and ventilation as required by the nature of the incident.

CHIEF ENGINEER (cont.)

CODE RED
(Fire Response)
(cont.)

- As outlined in the emergency response checklist, can isolate a zone or compartment and activate available fire suppression equipment for containment and extinguishing of fire.

Note: The fire party in charge will often communicate directly with IMACS for information or action to assist in the fire response.

CODE BLACK / CODE PURPLE
(Evacuation Procedures)

- At IMACS station, the Chief Engineer shall assist the Master in preparing the craft and bridge response for preparation of evacuation of the craft.
- Ensures that fire suppression systems remain active. Electrical power shall be provided as much as is practicable given the circumstances of the incident.
- Advises the Master on the condition of the craft, depending on the nature of the incident: loss of power, activation of the fire suppression system, new alarm activation, and flooding of compartments as indicated by high-level bilge alarms.
- Ensures lighting of MES stations and over-side light are activated and maintained. Isolates non-essential services, electrical services, and fuel ventilation machinery. Keeps essential machinery such as fire suppression, deluge, and bilge pumps active up to and including commencement of evacuation of the craft.

ABANDON SHIP

- On issuance of the evacuation (*Abandon Ship*) order, the Chief Engineer reports to #2 MES station, dons immersion suit and assists the Officer in Charge in directing passengers to the survival craft by way of the slide.
- Once all passengers are safely cleared from the assembly station or as directed by the Officer in Charge, Chief Engineer descends to the survival craft to assist as required.

CODE BLUE
(Man Overboard)

- Chief Engineer reports or remains at IMACS and, as a member of the bridge team, assists the Master as required in the operation of the craft for launch and recovery of the rescue boat.

CHIEF ENGINEER (cont.)

CODE YELLOW
(Damage Control)

- The Chief Engineer, as a member of the bridge team, is required to be on position at IMACS to assist the Master in response to the incident.
- The Chief Engineer's knowledge of IMACS operation and available information is of paramount importance in assisting the Master and the damage control party in the appropriate response to the incident.
- Through information obtained on IMACS, the Chief Engineer will be able in most instances to monitor the containment or progression of damage such as flooding.
- Using emergency protocol checklists, the Chief Engineer will ensure that recommended containment measures are in place and are done as a matter of course, depending on the location and nature of the incident.
- The Chief Engineer's ability to monitor and obtain information at IMACS from the various sensor points on the craft will assist in developing a correct response to the incident.
- Members of the damage control party will work closely with the Chief Engineer to ensure the correct response to the incident.

ASSISTANT ENGINEER

CODE RED
(Fire Response)

- The Assistant Engineer reports to the scene immediately and assists the Deck Officer in the initial response to the incident, including activating fire suppression system, ventilation shutdown, and electrical containment of space.
- Attacks immediately with portable equipment or prepares equipment such as hoses for attacking or boundary cooling or additional equipment as required; awaits arrival of secondary fire team (Deckhand #1, Deckhand #2) for further assistance.

CODE BLACK
(Evacuation Procedures)

- Assistant Engineer immediately reports to #1 MES, dons immersion suit and awaits order to deploy and prepare evacuation equipment.

CODE PURPLE
(Issue MES Launch)

- Assistant Engineer assists with MES launch.

ASSISTANT ENGINEER (cont.)

ABANDON SHIP

- Assistant Engineer descends slide, prepares slide bottom as required, including linking rafts as necessary, and carries out MES station duties as per MES training protocols.
- Communicates with rescue boat as required, assists in preparation of linking raft as required, and directs passengers in proper procedures in rafts.

CODE BLUE
(Man Overboard)

- Assistant Engineer reports to rescue boat; assists as required in launch and in preparation of boat or possible repair of equipment prior to launch.

CODE YELLOW
(Damage Control)

- The Assistant Engineer reports to the site of the emergency, assists, and recommends to Deck Officer the appropriate response to the incident.
- As an engineering officer experienced on board the Fairweather Class vessel, the First Engineer's function is to advise and assist the damage control party to facilitate and/or effect containment and repair procedures to isolate the incident and commence to clean up where possible.
- The Deck Officer and Assistant Engineer must work closely with the support of the other members of the damage control party to bring an effective overall response to the incident, including subsequent passenger control.
- Emergency response protocol checklists being activated by the bridge response will support the efforts of the damage control party.
- It may be required by the on-scene damage control party to request or be prompted by these procedures to carry out prescribed procedures or alter or recommend additional steps to contain and/or repair, depending on the type and nature of the emergency.

PASSENGER SERVICE WORKER IN-CHARGE

Passenger Service Worker In-Charge Functions

- The primary role of the Passenger Service Worker In-Charge in the event of an emergency prior to evacuation is care of, control of, and communication with passengers and passenger control response.
- Reports to, informs, and follows orders issued by the bridge team in passenger control and movement of passengers to safe areas.

PASSENGER SERVICE WORKER IN-CHARGE (cont.)

Passenger Service Worker In-Charge Functions (cont.)

- Designated Medical Person In Charge
- Passenger Service Worker In-Charge communicates with the bridge and ensures effective passenger control is being carried out; assists as required.
- Makes announcements as necessary to the passengers to assist in maintaining an orderly, informed, passive passenger control environment throughout the emergency response.
- Relays information to the bridge and reports the movement to or location and amount of passengers in assembly stations.
- Depending on passenger count, may elect to move all passengers to one safe location to facilitate a concentration of resources in passenger control and preparation of passengers in the event of evacuation.
- During the initial response to an emergency, it is of paramount importance that the passenger control crew and Passenger Service Worker In-Charge take charge and muster passengers in appropriate assembly station (or stations).
- Prepares the passengers (with life jackets correctly donned) as required by the nature of the incident. Instruction information is provided to the passenger regarding the *Code Black* signal, the passenger flow to the MES and other techniques identified in the MES training.
- Shortly after the commencement of every voyage, the Passenger Service Worker In-Charge is responsible for identifying for the Master the locations of person(s) who will require special attention (wheelchair persons, small infants, special needs persons) in the event the craft has to be evacuated. During passenger control in an emergency this person (or these persons) will be identified and separated to facilitate the special requirements in the unlikely event of the evacuation of the craft.
- Creates a successful passenger control scenario: All passengers are in life jackets correctly donned; special needs persons are identified and separated in a safe area at the assembly station.
- Reports the passenger count from assembly station(s) to bridge. Briefs passengers on evacuation procedures and readies them for evacuation.
- These steps will assist to calm the passengers by keeping them occupied and informed in the unlikely event of an emergency.

PASSENGER SERVICE WORKER IN-CHARGE (cont.)

CODE RED
(Fire Response)

- Establishes communication with the bridge.
- Ensures effective passenger control is being carried out and assists as required. Makes announcements as necessary to the passengers to assist in maintaining an orderly, informed, passive passenger control environment throughout the emergency response.
- Monitors passenger control crew in assembly stations and assists as required.
- Depending on passenger count, may elect to move all passengers to one safe location to facilitate a concentration of resources in passenger control.
- Advise bridge team and request their intentions. Keep Master informed. Following directions of the bridge team in moving passengers to a designated safe area.
- Obtain accurate passenger count, advise bridge, and commence care and control of the passengers in preparation for possible evacuation.

CODE BLACK
(Evacuation Procedures)

- Immediately reports to #2 MES, dons immersion suit and awaits order to deploy and prepare evacuation equipment.

CODE PURPLE
(Issue MES Launch)

- Assists crewmember in charge of slide with passenger control.

ABANDON SHIP

- Assist Slide Bottom if necessary to prepare raft / link rafts. Provide First Aid. Assist and Direct Passengers. Final Passenger Count.

CODE BLUE
(Man Overboard)

- Responds as required by Master. Establishes communications with the bridge team, prepares for First Aid of MOB.
- Informs passengers by announcements as necessary.

PASSENGER SERVICE WORKER IN-CHARGE (cont.)

CODE YELLOW (Damage Control)
- Responds as required by the Master.
- Establishes communications with the bridge team and awaits further instruction.
- Keeps passenger informed by announcements. Gives additional assistance as required by incident.

PASSENGER SERVICE WORKER #2

CODE RED (Fire Response)
- Immediately report to PSWIC. Sweep passenger deck with PSW #3 and muster passengers as directed by PSWIC. In Charge Assembly Station "A"
- Takes passenger count from the assembly station and informs PSWIC or Bridge as required.
- Distributes life jackets ensuring that all passengers have life jackets correctly donned.
- Identifies special needs persons and separates them in safe area within assembly station.
- Moves passengers to the safe area as required or instructed.
- Briefs passengers on evacuation procedures and readies them for evacuation.
- These steps will assist to calm the passengers by keeping them occupied and informed in the unlikely event of an emergency.

CODE BLACK (Evacuation Procedures)
- Immediately reports to #2 MES, dons immersion suit and awaits order to deploy and prepare evacuation equipment.

CODE PURPLE (Issue MES Launch)
- Assists in passenger control and preparation for possible evacuation.

ABANDON SHIP
- In Charge # 2 MES Slide Bottom – Exit Controller. Descends slide, prepares slide bottom as required (linking rafts as necessary). When prepared, informs Entry Controller that raft is ready to receive passengers. Assists and directs passengers.

CODE BLUE (Man Overboard)
- Immediately reports to craft's bow appropriately dressed for weather conditions.
- Establishes communications with bridge and acts as spotter / pointer / lookout, or performs services as required by bridge team.

PASSENGER SERVICE WORKER #2 (cont.)

CODE YELLOW (Damage Control)
- Passenger control response level as required by PSWIC or Master.
- Report to assembly station "A" and advise passengers of alarm, then await further instruction from the PSWIC. In Charge Assembly Station "B."

PASSENGER SERVICE WORKER #3

CODE RED (Fire Response)
- Immediately report to PSWIC. Sweep passenger deck with PSW #2 and muster passengers as directed by PSWIC in Charge Assembly Station "B"
- Takes passenger count from the assembly station and informs PSWIC or Bridge as required.
- Distributes life jackets ensuring that all passengers have life jackets correctly donned.
- Identifies special needs persons and separates them in safe area within assembly station.
- Moves passengers to the safe area as required or instructed.
- Briefs passengers on evacuation procedures and readies them for evacuation.
- These steps will assist to calm the passengers by keeping them occupied and informed in the unlikely event of an emergency.
- Secondary Evacuation Leader – Muster and guide passengers isolated from MESs, down aft stairs, across aft vehicle deck, and up stbd stairs through #1 MES.

CODE BLACK (Evacuation Procedures)
- Immediately reports to #1 MES, dons immersion suit and awaits order to deploy and prepare evacuation equipment.

CODE PURPLE (Issue MES Launch)
- Assists in passenger control and preparation for possible evacuation.

ABANDON SHIP
- In Charge # 1 MES Slide Bottom – Exit Controller. Descends slide, prepares slide bottom as required (linking rafts as necessary). When prepared, informs Entry Controller that raft is ready to receive passengers. Assists and directs passengers.

CODE BLUE (Man Overboard)
- Passenger control response level as required by PSWIC or Master.
- By announcement informs passengers as necessary.
- Assists PSWIC as necessary with First Aid / MOB recovery.

PASSENGER SERVICE WORKER #3 (cont.)

CODE YELLOW (Damage Control)
- Passenger control response level as required by PSWIC or Master.
- Reports to assembly station "B" and advises passengers of alarm, then await further instruction from the PSWIC or Master.

DECKHAND #1

CODE RED (Fire Response)
- Immediately reports to emergency gear locker. Dons fire suit and SCBA and brings spare bottle to scene. Nozzle Man. Assists Deck Officer in fire containment and response as instructed by fire party in charge.

CODE BLACK (Evacuation Procedures)
- Reports immediately to rescue boat and takes charge. Dons immersion suit and prepares boat for launch ensuring that all required equipment is available and ready for use in the boat. Establishes communications with bridge and awaits orders to launch.

CODE PURPLE (Issue MES Launch)
- On launch order, rescue boat is launched; then performs duties of Coxswain-in-Charge.
- Rescue boat's main function is to assist in the effective launch of the MES and assist in marshaling rafts and personnel.
- Assists and troubleshoots as required or directed by MES personnel, as may be necessary to effectively launch or clear MES's.
- As required, assists in linking rafts and personnel recovery.

CODE BLUE (Man Overboard)
- Reports immediately to rescue boat and takes charge. Dons immersion suit and prepares the boat for launch, ensuring that all required equipment is available and ready for use in the boat. Establishes communications with bridge and awaits orders to launch.
- As Coxswain, must have a sound knowledge of incident information (man overboard, vessel in distress, etc.). Maintains radio communications at all times with bridge, relaying information, or requesting direction or assistance.

CODE YELLOW (Damage Control)
- Reports immediately to the scene and assists Deck Officer as required in response to the incident.

DECKHAND #2

CODE RED
(Fire Response)

- Immediately reports to emergency gear locker. Dons fire suit and SCBA and brings spare bottle to scene. Back up Nozzle Man. Assists Deck Officer in fire containment and response as instructed by fire party in charge.

CODE BLACK
(Evacuation Procedures)

- Reports immediately to rescue boat and assists In-Charge. Dons immersion suit and prepares boat for launch ensuring that all required equipment is available and ready for use in the boat. Establishes communications with bridge and awaits orders to launch.

CODE PURPLE
(Issue MES Launch)

- Assists Coxswain-in Charge in launch of rescue boat.
- Rescue boat's main function is to assist in the effective launch of the MES and assist in marshaling rafts and personnel.
- Assists and troubleshoots as required or directed by MES personnel, as may be necessary to effectively launch or clear MES's.
- As required, assists in linking rafts and personnel recovery.

CODE BLUE
(Man Overboard)

- Reports immediately to rescue boat and assists In-Charge. Dons immersion suit and prepares the boat for launch, ensuring that all required equipment is available and ready for use in the boat. Establishes communications with bridge and awaits orders to launch.
- May take charge of rescue boat preparation and launch.
- As Assist in Boat, must have a sound knowledge of incident information (man overboard, vessel in distress, etc.) Maintains radio communications at all times with bridge, relaying information or requesting direction or assistance.

CODE YELLOW
(Damage Control)

- Reports immediately to the scene and assists Deck Officer as required in response to the incident.

The following Passenger Control Announcement will be given by the Passenger Service Worker using the vessel's public address system at the direction of the Master:

Start of announcement:

Code Red Passenger Control Announcement

May I have your attention please. This is the (state your title). Will you please take you seats or stay where you are while I give you this important announcement.

The announcement you have just heard is the signal from the Captain that an emergency situation has occurred. This is just a precaution. For your safety we would like you to follow these important instructions.

Until the situation can be assessed, we ask all passengers to remain calm and follow the instructions of the officers and crew. As information becomes available, announcements will be made to keep you informed. For your safety (insert at what Assembly Station(s) you want the passengers to muster). A crewmember will be available to assist you momentarily and will commence precautionary emergency procedures.

Code Yellow Passenger Control Announcement

May I have your attention please. This is the (state your title). Will you please take you seats or stay where you are while I give you this important announcement.

The announcement you have just heard is the signal from the Captain that an emergency situation has occurred. This is just a precaution. For your safety we would like you to follow instructions from the crew until the situation has been assessed. Please return to your seats or stay where you are. You will be informed as information becomes available.

Once again, there is no cause for alarm and an updated arrival time will be announced. Thank you.

Code Blue Passenger Control Announcement

May I have your attention please. This is the (state your title). Will you please take you seats or stay where you are while I give you this important announcement.

The alarm you just heard is the signal from the Captain that we will be launching a rescue boat. We ask all passengers to refrain from congesting the area on the aft end of the ship, but to follow the instructions of the officers and crew. There is no cause for alarm. This is a standard signal alerting crewmembers to go to their stations to prepare the rescue boat launch. As information becomes available, announcements will be made to keep you informed.

Once again, there is no cause for alarm and an updated arrival time will be announced. Thank you.

Code Black Passenger Control Announcement

May I have your attention please. This is the (state your title). The announcement you just heard is the "**prepare to evacuate ship"** signal. Would all passengers please remain calm and follow the instructions of the officers and crew.

The crewmembers will instruct you on how to evacuate the ship should the Captain deem it necessary. We ask all passengers to follow the instructions of crewmembers who are trained in this response.

Once again, please remain calm and follow the instructions of the officers and crew. We will keep you informed of the situation.

Code Purple Passenger Control Announcement

May I have your attention please. This is the (state your title). The announcement you just heard is the signal **"to launch the evacuation system".** Would all passengers please remain calm and follow the instructions of the officers and crew.

The crewmembers will instruct you on how to evacuate the ship should the Captain deem it necessary. We ask all passengers to follow the instructions of crewmembers who are trained in this response.

Once again, please remain calm and follow the instructions of the officers and crew. We will keep you informed of the situation.

Abandon Ship Passenger Control Announcement

May I have your attention please. This is the (state your title). The Captain has ordered the evacuation of the vessel. Please remain calm and follow the instructions from the crew. Leave behind sharp objects, high heeled shoes, purses and carry-on luggage.

Purpose

As part of the craft's evacuation procedures, the method of donning life jackets for both adults and children shall be clearly explained to the passengers by the craft's crew. The instructions on donning the life jackets must be posted conspicuously throughout the craft.

Responsibility

The Master shall ensure that all crewmembers can fully demonstrate and explain the correct method of donning both adults' and children's life jackets. The Master shall further ensure that all crew are aware of the location of the craft's life jackets.

Procedure

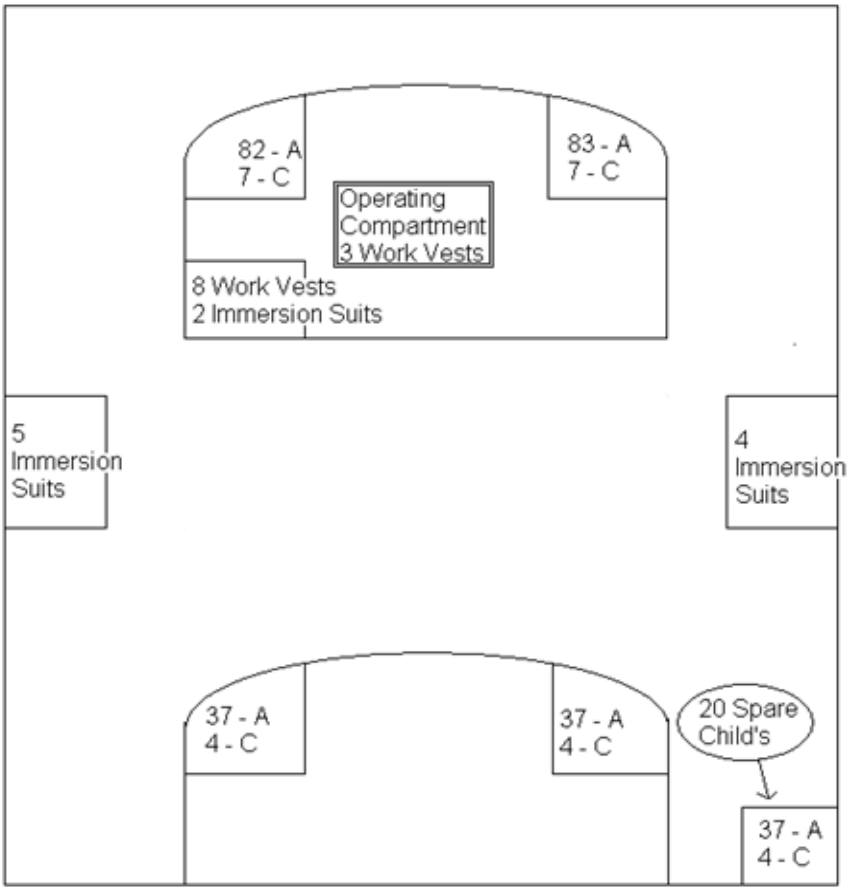
Life jackets – Adult and Children

This vessel has:

- 276 adult life jackets for those over 75 lbs—Seahorse LP10A
- 26 child life jackets for those under 90lbs, plus 20 spares — Seahorse LP10C
- 344 Water Lights—TBC Electric Fuel WAB-MX8 (one light per life jacket, work vest, and immersion suit)
- 11 Work vests for crew use — Type III
- 11 Immersion suits—Mustang OC 8000.

Location	Adult Life Jackets	Child Life Jackets	Work Vests (Crew)	Immer-sion Suits
Passenger Deck: Locker Stbd. Fwd by Quiet Study	83	7		
Passenger Deck: Locker Port Fwd by Electrical Room	82	7		
Passenger Deck: Locker Stbd Aft. by First Aid Room	37	4		
Passenger Deck: Locker Stbd Aft. by Solarium Exit	37	24		
Passenger Deck: Locker Port Aft by Passenger Service Office	37	4		
Passenger Deck: Crew Drying Room			8	2
Bridge Deck			3	
Port MES				5
Stbd MES				4
Total	**276**	**46**	**11**	**11**

Passenger Deck Stowage



COI Requirements

276 Adult and 25 Child Life Jackets
10 Immersion Suits

Procedure

At the sounding of Codes Red, Black, Purple, Abandon Ship, and Yellow passengers will don life jackets. Crewmembers will assist passengers in donning life jackets.

The Passenger Safety Video, which illustrates the donning procedures, is shown at the commencement of every voyage. The procedures are also detailed on the safety instruction cards.

As part of the craft's type rating procedures, all crew will be instructed in the methods of donning life jackets, on instructing passengers in donning life jackets and on the location of the life jackets.

Instructions

Donning instructions for the life jackets are the same for adult and children and are as follows:

Step 1 Unwrap the strap from around the life jacket. Split apart the life jacket.

Step 2 Place the life jacket over your head and around the neck.

Step 3 Bring the strap around the back of your body to the front. Snap the hook onto the D ring in front of the jacket.

Step 4 Tighten the strap by pulling the loose end.

Step 5 Tie tapes under chin. Tuck in all loose straps.

Note: Children should be assisted in donning their life jackets.

Whistle and Light

These life jackets come with a survival whistle and water-activated rescue light. The whistle is USCG approved and has a loud, shrill, dual-tone audible sound that can be heard at great distances. Instruct the passengers that if they fall into the water, the light will automatically activate.

Specifications and Approvals

Adult Life jacket: over 75 lbs. Model LP-10A
USCG Approval No. 160.055/164/0 & 160.055/4/0
Complies with SOLAS 74/83
32 lbs. min. buoyancy.

Child Life jacket: under 90 lbs. Model LP-10C
USCG Approval No. 160.055/165/0 & 160.155/5/0
18.25 lbs. min. buoyancy.

Child Life jacket: under 90 lbs. Model LP-10C
USCG Approval No. 160.055/165/0 & 160.155/5/0
18.25 lbs. min. buoyancy.
Water Light: TBC Electric Fuel WAB-MX8
Complies with SOLAS 74/83; USCG 161.012/26/0, 161.112/20/0,
Canadian CG approved (L8-7 also approved by DOT (UK/MSA).

References

HSC Training Manual Section 1
Passenger Safety Information Cards

Purpose

Under the 2000 HSC Code the craft must be evacuated in a pre-determined time based on the craft's structural fire protection.

Definitions

Marine Evacuation System (MES) is an appliance designed to rapidly transfer a large number of persons from an embarkation station directly into associated survival craft or by means of a passage to a floating platform for subsequent embarkation into associated survival craft.

Responsibility

The Master shall ensure all officers and crew are fully trained and drilled in their role and responsibilities during an evacuation of the craft.

Procedure

The craft's evacuation procedure shall be as per the Passenger Evacuation Card.

Passenger Area Primary Evacuation Route

See Passenger Evacuation Card.

Passenger Area Solarium Deck Evacuation Route

See Passenger Evacuation Card.

Disabled Persons Evacuation

Special needs persons shall be identified, moved to a safe area at assembly station, and evacuated last.

Secondary Evacuation Routes

See Passenger Evacuation Card.

MES Procedure

Refer to the HSC Training Manual, Section 3, and Training Manual, Appendix for detailed instructions and LSA Operations Manual.

When the Code Purple signal is given, the crew reports to their assigned MES station, deploys the MES, and prepares for evacuation.

Open the access door(s) at the MES stations, located amidships at both the port and starboard sides on the passenger deck. There is a sliding smoke door (see arrow) fitted adjacent to each MES station. The smoke doors allow areas of the passenger deck to be isolated as required.

If required, the Master will deploy the slides from the bridge.

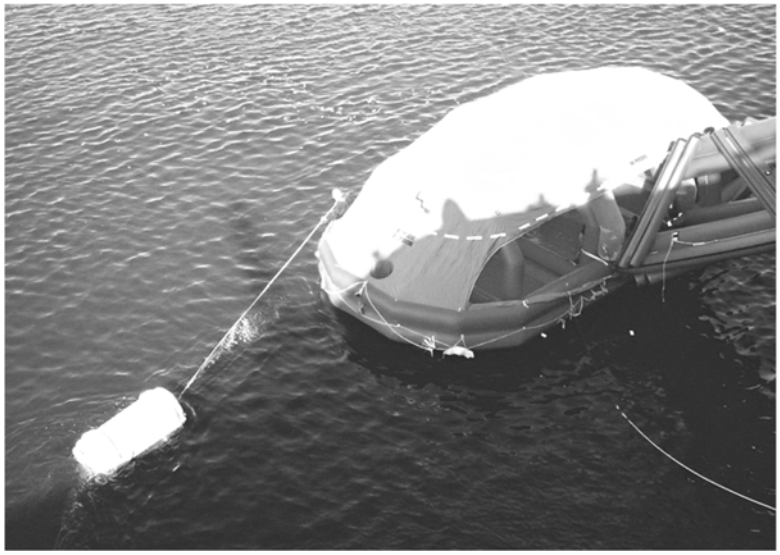
Check that the slide and life raft are fully inflated before sending passengers down into the life raft below. Crew members assigned to the slide bottom should descend first. If the linkraft is going to be used, no Passengers may descend until it has been deployed from the Bridge Deck.

When the verbal command *Abandon Ship* is given by the Master, instruct the passengers to sit and slide down into the life raft below. If passengers wish to go more slowly, they may press their feet as they descend against the edge of the slide.

Assign two passengers to assist in moving the evacuees away from the bottom of the slide. Position them where the slide meets the life raft and instruct them to direct the evacuees throughout the life raft. Have the key passengers count the evacuees as they enter the life raft. This will assist the crew at the top of the slide to ensure that an accurate evacuation count is passed to the Master.

Slide and life raft must be inflated and ready for use.

A secondary life raft can be deployed and brought alongside the main life raft if it is required by a high passenger count or if damage or fire prevents evacuation on the opposite side of the craft. Link life raft must be deployed from Bridge Deck before any passengers go down the slide. The link life raft retrieving line is attached at the bottom of the slide.



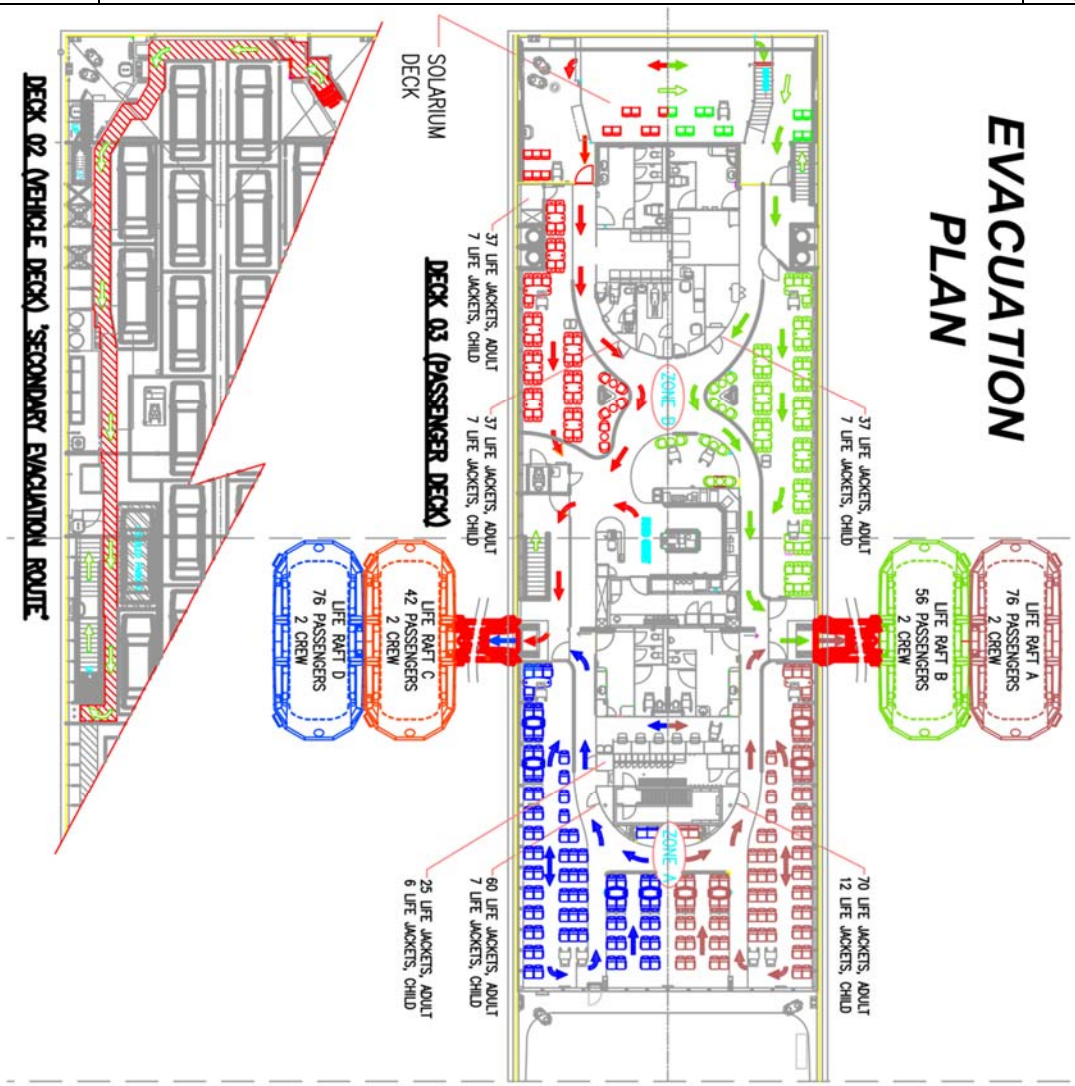
When the link life raft is launched from the craft, pull the link life raft over to the main life raft and position it with the tether attachments and wording facing the main life raft. Blue and yellow markers will show how to align the link raft to the MES raft. Attach the link life raft and pull on the painter to inflate.

When it is fully inflated, move the passengers from the main life raft into the secondary life raft. When the secondary life raft is full, signal the marshaling rescue boat to tow it clear.

Each life raft contains the safety equipment and survival supplies required by USCG regulations. Immediately after abandoning the craft, the crew and passengers should begin survival procedures.

References

MES Side Evacuation Training Program – available aboard ship
HSC Training Manual Section 3, pages 1-7
LSA MES Operations Manual (HSC Training Manual Appendix)



EVACUATION ALARM

SHOULD IT BECOME NECESSARY TO EVACUATE THE VESSEL, A SIGNAL OF 7 SHORT BLASTS AND 1 LONG BLAST WILL BE GIVEN ON THE WHISTLE AND ON THE GENERAL ALARM BELL.

THIS WILL BE FOLLOWED BY AN ANNOUNCEMENT ON THE PUBLIC ADDRESS SYSTEM.

THE CAPTAIN OR CREWMEMBER WILL GIVE INSTRUCTIONS EITHER BY MEANS OF ANNOUNCEMENT OR DIRECTLY WHEN TO DON LIFEJACKETS IN AN EMERGENCY.

FOLLOW THE LIFEJACKET DONNING INSTRUCTIONS ON THE OTHER SIDE OF THIS CARD.

BAGGAGE, HIGH-HEEL SHOES, AND SHARP OBJECTS MUST NOT BE CARRIED OR WORN DURING THE EVACUATION.

THE EVACUATION PLAN ILLUSTRATES YOUR SEATING COLOR CODE AND THUS YOUR CORRESPONDING LIFERAFT. PLEASE REMAIN IN YOUR PRESENT LOCATION AND AWAIT INSTRUCTIONS FROM THE CREW.

THE 'SECONDARY EVACUATION' ROUTE (ILLUSTRATED BELOW LEFT) IS ONLY TO BE USED IN EXTREME CIRCUMSTANCES BY PASSENGERS ON THE SOLARIUM DECK WHEN THE CENTRAL AISLE IS IMPASSABLE BOTH SIDES.

IN ALL EMERGENCIES, FOLLOW THE INSTRUCTIONS OF THE CREW.

ONLY IN THIS CASE WILL THE CREW ALLOW ACCESS BY ANY PASSENGER TO THE VEHICLE DECK DURING EVACUATION.

Purpose

A rescue boat is carried on board the *Fairweather* Class to marshal survival craft, transfer crew, and conduct man-overboard retrievals. The following procedure is to ensure the rescue boat is operated and maintained in a proper manner.

Responsibility

The Master shall ensure that the rescue boat is adequately crewed and maintained. The Chief Engineer will be responsible for ensuring the mechanical integrity of the rescue boat.

Crewing

The rescue boat will have crewmembers assigned who are capable of operating the engine and carrying out minor adjustments.

The rescue boat will operate with a crew of two. Each crewmember in the rescue boat will wear appropriate flotation and safety gear when carrying out emergency operations or when deemed necessary by Master.

Drills

As far as is reasonable and practicable, rescue boats shall be launched each month as part of the evacuation drill, with their assigned crew aboard, and maneuvered in the water. In all cases this requirement shall be complied with at least once every three months.

Launching

See Training Manual Section 3, for detailed instructions.

The rescue boat must be in a state of continuous readiness such that launching will take not more than 5 minutes.

Marshaling Survival Craft

The rescue boat can tow one loaded life raft at a time. A towing bridle is made up in the FRB equipment bag

Note: The rescue boats shall tow the life rafts away from the vessel. The life rafts should be marshaled together so as to assure quick location and rescue of passengers and crew.

Spare bowsing lines are fitted to all life rafts and are stowed on the external life lines at either end of the life raft front entrance, for use as required. Each life raft is fitted with two girth line bowsing patches and connecting ring. Use the spare bowsing lines in each life raft to secure all life rafts together using the connection ring on the appropriate girth line bowsing patch.

Retrieval

See Training Manual Section 3.

References

HSC Training Manual Section 3

Worst Intended Conditions

This vessel was designed to Det Norske Veritas (DNV) and carries the following class notation.

+ 1A1 HSLC R3 Passenger Car Ferry A E0

+1A1 HSLC Passenger designates that this vessel is a craft of lightweight displacement and is a high speed craft in compliance with the High Speed Craft Code as well as the DNV High Speed Light Craft Parts 1-5.

The service notation R3 represents the following maximum distances from nearest harbor or safe anchorage:

Winter zone:	20 nautical miles
Summer zone:	50 nautical miles
Tropical zone:	100 nautical miles

The zones are defined in the International Conference on Load Lines, 1966, Annex II. It should be noted that the HSC code Ch 1.3.2. requires a maximum 4 hours to place of refuge when fully loaded.

The service notation Car Ferry A implies that the craft is intended for transport of passengers and that vehicles are carried in enclosed spaces.

Design Load Pressures arising from the above design parameters imply that the following restrictions to operating speed with respect to significant wave height are complied with:

Limiting Sea Conditions

Limits on speed for various sea conditions, as per USCG COI, are listed below.

Significant Wave Height (feet)	Maximum Speed (knots)
Calm 4 ft	36.5
4-8.2 ft	35.5
8.2-11.5 ft	27
Above 11.5	Seek shelter at slow speed

Limiting Wind Conditions

Wind speed limitations are due to damage stability calculations as per the Trim and Stability Book under Instructions to the Master. It states "The vessel shall not go to sea if conditions are forecasted for significant wave heights greater than 13 ft or wind speeds over 50 kts."

Procedures for Operation of the Craft within the Limitations

The vessel shall not be operated in excess of these design restrictions. This involves close monitoring of the weather conditions, and further that the vessel shall not leave port when sea or wind states exceeding the maximums are expected. Particular attention should be given to the likelihood of wet deck slamming occurring at high speed.

The above statements do not remove the Masters' overriding responsibility towards the safety and comfort of passengers and crew at all times.

Guidance to the Master for Avoiding Dangerous Situations in Following and Quartering Seas

When sailing in severe following or quartering seas, a ship is likely to encounter various kinds of dangerous phenomena, which may lead to capsizing. Although the dynamic behavior in following and quartering seas is not yet covered in present stability standards, much progress has been made in recent years towards understanding the physics of capsize mechanisms and identifying potentially critical conditions.

IMO circular, MSC.1/Circ 1228, outlines the various dangerous phenomena and proposes actions and procedures to assist Masters in maintaining the safety of their vessels. It is intended as a guide for Masters in the above-mentioned situations and should be read and understood.

Docking Limitations

The vessel shall be able to maintain its position and heading when exposed to a steady wind of 28 knots from any direction. The waterjets and bow thruster(s) shall be used to maintain station and heading. For all Tides and Current information, see Marine Exchange of Alaska at www.mxak.org.

Vessel Loading

Loading – See 18.2.1.10 (this document) and Tank Capacity Plan NG408-525-01-1.
Fuel Tanks – Max. Capacity, 13,800 gallons
Speed – Max.Speed (Calm water), 36.5 knots.
Potable Water Tank—Max. Capacity 1000 gallons
Sewage Tank—Max. Capacity 3600 gallons

Depending on the conditions, vessel speeds in rougher water / weather shall be limited to those speeds imposed by the classification society and USCG (see limiting sea conditions above). The vessel shall be operated with due respect for the safety of the craft. Speeds shall be reduced in any prevailing conditions that cause excessive slamming and passenger discomfort giving forethought to any maneuvering that may be required.

Vessel speed shall also be limited in following or stern quartering seas to ensure that the vessel is safe from broaching or bow diving. All persons responsible for the safe operation of the craft should have a working knowledge of IMO circular MSC.1/Circ 1228. This document should be carried on the vessel at all times.

There are no speed limitations other than those listed above for operating the craft in calm water to maintain passenger safety in the event of failure to one propulsion system.

There are no operating limits imposed on the craft due to the control and maneuverability issues highlighted in HSC Code section 17.5 and Annex 9.

The vessel has been designed to operate at maximum speed in the lightship or full load conditions specified in the loading conditions document report number NG408-910-02-1.

The vessel should ideally be loaded to a level trim condition for optimum performance.

The loading of the vessel should ensure that the vessel will not be operated with trim in excess of that allowed by Trim and Stability Book.

For additional information regarding the FMEA study conducted for the Fairweather, refer to the following:

Alaska Marine Highways FFV
FAILURE MODE AND EFFECT ANALYSIS FOR
NGA PROJECT NG408
73M FAST CATAMARAN VEHICLE FERRY FOR ALASKA
Document : NG408-990-01

The minimum depth for safe operation of this vessel is 20 feet.

The following pages provide limiting values of all machinery parameters requiring compliance for safe operation:

- Main Engines
- Gearboxes
- Waterjets
- Generators
- Steering (Turning Radius)

The following are the limiting values of all machinery parameters requiring compliance for safe operation

Main Engines—MTU 20V 4000 M73L

(MTU Alarm List Draw. No. XZ59600100041, MTU TEN Data for 20V 4000 M73L)

Replenishable Fluid Consumption

FO Consumption @3600kW {4830 HP)	238.3 US Gal/hr
LO Consumption @3600kW {4830 HP)	0.7 US Gal/ hr

Speeds

Minimum RPM	300
Idle RPM	500
Maximum RPM	2050
Engine Overspeed Shutdown RPM	2360

Capacities

Engine coolant	440 liter
Engine oil capacity, initial filling	365 liter
Oil change quantity, maxl	320 liter
Oil pan capacity, dipstick mark min.	268 liter
Oil pan capacity, dipstick mark max.	315 liter

Coolant

	Limit value	**Unit**	**Action**
P-Coolant water after pump Liml	curve 0	bar	warning
P-Coolant water after pump Lim2	curve 0	bar	reduction
T-Coolant Liml	99.0	°C	warning
T-Coolant Lim2	101.0	°C	reduction
T-Coolant Lim3	105.0	°C	shutdown
P-Raw water Liml	curve 4	bar	warning

Curve 0 P-Coolant Water

	rpm	0	300	400	500	900	1200	1500	1800	2100	2500
Lim1	bar	0	0	0.2	0.25	0.6	1.2	2	3.3	4.5	4.5
Lim2	bar	0	0	0.1	0.15	0.3	0.7	1.5	2.8	4	4

Curve 4 P-Raw water

	rpm	0	300	400	500	900	1200	1500	1800	2100	2500
Lim1	bar	0	0	0.1	0.1	0.6	1	1.3	1.8	2.3	2.3

Oil

	Limit value	Unit	Action
P-Oil after filter Lim1	curve 1	bar	warning
P-Oil after filter Lim2	curve 1	bar	shut down
T-Oil Lim1	95.0	°C	warning
T-Oil Lim2	97.0	°C	reduction
P-Oil filter difference	curve 2	bar	warning
P-Oil refill pump	0.3	bar	warning

Curve 1 P-Oil after filter

	rpm	0	300	400	500	900	1200	1500	1800	2100	2500
Lim1	bar	0	0	1.8	2	3	4	5	5.5	5.5	5.5
Lim2	bar	0	0	1.5	1.7	2.7	3.7	4.7	5.2	5.2	0.8

Curve 2 P-Oil filter difference

	rpm	0	300	400	500	900	1200	1500	1800	2100	2500
Lim1	bar	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8

Fuel

	Limit value	**Unit**	**Action**
P-fuel after filter Lim1	curve 3	bar	warning
P-fuel after filter Lim2	curve 3	bar	reduction
T-fuel Lim1	95	°C	warning
T-fuel Lim2	100	°C	reduction
P-fuel difference	curve 8	bar	warning
P-HD rail fuel low Lim1	-30	bar	limitation
P-HD rail fuel high Lim1	+30	bar	limitation

Curve 3 P-fuel after filter

	r	0	300	400	500	900	1200	1500	1800	2100	2500
Liml	bar	0	0	3	3.5	4.5	5	5	5	5	5
Lim2	bar	0	0	2.5	3	4	4.5	4.5	4.5	4.5	4.5

Curve 8 P-fuel difference

	rpm	0	300	400	500	900	1200	1500	1800	2100	2500
Lim1	bar	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Charge Air

	Limit value	**Unit**	**Action**
T-charge air Lim1	75.0	°C	warning
T-charge air Lim2	30.0	°C	reduction
T-Umblasen	250.0	°C	warning

Exhaust

	Limit value	Unit	
T-exhaust before turbine 1/2/3/4 Liml	curve 6	°C	warning
T-exhaust before turbine 1/2/3/4 Lim2	curve 6	°C	reduction
T-exhaust after cylinder high Liml (Offset)	curve 7	°C	warning
T-exhaust after cylinder high Lim2 (Offset)	20	°C	reduction
T-exhaust after cylinder low Liml (Offset)	curve 7	°C	warning
T-exhaust after cylinder low Lim2 (Offset)	20	°C	reduction

Curve 6 T-exhaust 1/2/3/4

	rpm	0	300	400	500	900	1200	1500	1800	2100	2500
Liml	°C	600	600	700	700	750	750	750	750	750	750
Lim2	°C	620	620	720	750	770	770	770	770	770	770

Curve 7 T-exhaust after cylinder

	mean°C	40	200	400	550	700
High	°C	240	330	530	680	750
Low	°C	-50	70	270	420	620

Others

	Limit value	Unit	Action
Engine overspeed limit	2360	RPM	shut down
Turbo overspeed ETC 1/2/3/4 Lim 1	60500	RPM	reduction
Turbo overspeed ETC 1/2/3/4 Lim 2	60500	RPM	limitation
P-crankcase Lim1	curve 5	mbar	warning
P-crankcase Lim2	curve 5	mabr	shutdown
T-oil bearing Lim1	130.0	°C	warning
T-oil bearing Lim2	135.0	°C	shutdown
T-splash oil difference Lim1	7	°C	warning
T-splash oil difference Lim2	10	°C	shutdown

Curve 5 P-crankcase

	rpm	0	300	400	500	900	1200	1500	1800	2100	2500
Lim1	mbar	6	6	6	8	10	15	15	20	20	20
Lim2	mbar	16	16	18	20	25	25	30	30	30	30

Maximum Engine Trim Conditions

Maximum longitudinal inclination, driving end up	10 Degrees
Maximum longitudinal inclination, driving end down	15 Degrees
Maximum transverse inclination	22.5 Degrees

Gearboxes—Reintjes VLJ 2230 HL/HR

(All Information Taken from the Reintjes Operating Manual (Various Pages Throughout))

Minimum Oil Pressure	17 Bar (246.5 psi)
Maximum Oil Pressure	25 Bar (362.5 psi)
Maximum Pressure Differential Across Oil Filter	5 Bar (72.5 psi)
Minumum Oil Volume	40 US Gallons
Maximum Oil Temperature	70° C (158° F)
Minimum Output Shaft RPM	0 (Engine Declutched)
Maximum Output Shaft RPM	799 (Engine Overspeed)
Minimum Engine Engaging Speed	580 RPM
Maximum Engine Engaging Speed	790 RPM
Maximum Raw Water Cooling Inlet Temp	35° C (95° F)
Minimum Cooling Water Flowrate	183 L/min (48.4 USgal/min)
Maximum Cooling Water Flowrate	200 L/min (52.8 USgal/min)
Maximum Temporary Longitudinal Operational Trim	10 Degrees
Maximum Temporary Transverse Operational Heel	30 Degrees

Waterjets—KaMeWa 90SII

(Following Info From Mechanical Installation Manual Drawing No. 130351-1)

Maximum Forward Thrust	85200 lbf
Maximum Astern Thrust	24500 lbf
Minimum RPM (Calculated off MTU Minimum)	190
Maximum RPM (Calculated off MTU Maximum)	799

(Following Info from Hydraulic Installation Manual Dwg. 130354 & 965417)

Minimum Hydraulic Pressure	1.5MPa (217.5 psi)
Maximum Hydraulic Pressure	21 MPa (3046 psi)
Maximum Hydraulic Oil Temperature	65° C (150° F)
Minimum Hydraulic Oil Volume	140L (37 US Gal)
Maximum Hydraulic Oil Volume	190L (50 US Gal)

(Following Info from Hydraulic Installation Manual Dwg. 130355 & 965467)

Minimum Lube Oil Pressure	0.15 MPa (21.7 psi)
Maximum Lube Oil Pressure	0.7 MPa (101.5 psi)
Minimum Lube Oil Flow	4.5 L/min (1.2 USgal/min)
Maximum Lube Oil Temperature	65° C (150° F)
Minimum Lube Oil Volume	38 L (10 US Gal)
Maximum Lube Oil Volume	60 L (15.85 US Gal)

Northern Lights M6125T Diesel Generators

(Information from NL operating manual)

Maximum Raw Water Suction Head	39 inches
Maximum raw-water inlet temperature	30° C (85° F)
Freshwater Cooling Water Capacity	8.5 US Gallons (32 L)
Minimum Battery Capacity	200 amps hrs / 800 cca
Maximum Exhaust Gas Temperature	523° C (975° F)
Maximum Exhaust Back Pressure	30 in H2O
Minimum Lube Oil Pressure	15 psi
Maximum Cooling Water Temperature	96° C (205° F)
Operating Lube Oil Capacity	8.5 US Gal (32 L)
Minimum Turbocharger Boost Pressure	12 psi
Maximum Turbocharger Boost Pressure	15 psi
Overspeed Trip rpm setting	2034

List of Figures:

