M/V OSPREY EXPLORER

TECHNICAL SPECIFICATION

2D Long Offset / 6 Sub-Array Source Vessel

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1 Vessel Technical Information

Name:	M/V Osprey Explorer
Call Sign:	3EHE9
Flag:	Panama
Type:	Seismic Survey Vessel
Built:	1985, Poland
Converted:	1998, Holland
Refitted:	2006, Gdynia, Poland
Home port:	Panama

Owner:	Osprey Navigation Ltd
Classification and Notation:	DNV , 1A1 HELDK-SH Seismic Vessel
Length overall:	81.16 m
Beam:	15,96 m
Draft:	5,65 m
Gross Tonnage:	3517
Net Tonnage:	1056
Cruising Speed:	12.5 knots
Cruising Range:	12000 nautical miles
Fuel Capacity:	1050 m^3
Fuel Consumption:	Transit: 16.5mt / day Operation: 13.0mt / day
Fresh water capacity:	100 m3
Fresh water consumption:	7 m^3/day
Water maker:	2 x Searecavery 25m3 a day
Endurance:	Cruising: 40 days; seismic: 40 days
Accommodation:	Single cabins:13 Double cabins:11, 1 x 4man Hospital: 1
Main Engine/Motor:	2 x ZGODA SULTZER 6ZL 40/48 500rpm 3600 Bhp
Generators:	1 x Hedamora 900Kw 3 x 380Kw CEGIELSKI SULZER 6AL 20/40
Propeller:	2 x CPP ZAMEX PH 1050/4-R315
Bow Thruster:	1 6AL20/24 ZAMEX 410kW 557 Bhp
Cranes:	main crane SWL 4,6 T 10 MTR Provision crane SWL 1 T
Incinerator:	TEAMTEC OGS 200C
GMDSS:	GMDSS station (VHF, MF, HF, Inmarsat C). Sperry Marine GMDSS.
Additional radio sets	5 x Standard hand held VHF.
Radars:	3 cm FURUNO E (ARPA) 10 cm Sperry Marine Bridgemaster E (ARPA)
GPS Navigator:	MX 420 Navigational system
Gyro Compass: Autopilot: Rudder indicator: Course Monitor:	Sperry Marine c. Plath Mk1 (digital) Robertson AP9 Mk III (complete with STS 500 unit) Anschutz Sperry Marine

Speed Log:	Sperry Marine Naviknot III
Echo sounder:	Skipper IR 301
Navtex/weather fax:	JMC-NT -2000
Weather station	GILL: Wind strength and Direction indicators.
Video Monitoring system:	10 x Cameras networked with output signal available on all network PC's
Internal telephone/PA:	Vingtor VMP-603
Inmarsat System:	Sailor, Litton Marine
Inmarsat numbers:	Telex (1) : (Sailor) 437204819 (Litton) 437204811
Vsat	4 Fixed lines, 384 kbit data transmission
Inmarsat Mini-M:	+ 870 763 686 023
Helideck	Maximum "D" value: 22.8 (single rotor) Maximum take-off weight: 12.0 t

Life Boat:	N/A
Life Rafts:	Viking 6 x 20 persons 1 x 6 person.
MOB raft	1 x Jon Buoy, manual and remote auto release.
Rescue Boat:	Norsafe Magnum 7.5.
Work Boat	N/A
Emergency radios:	5 x TR20 (Jotron)
Life Boat radios:	N/A
Fire pump:	3 x 160 Wa 65T53
Emergency fire pump:	1 DESMI NSL 80-265/DOZ – 63 m3/h
Fire Extinguisher:	Foam AB 9 ltrs 33. CO2 5Kg 35. Powder class ABC (FRC) 1. Powder class ABC 25Kg 3. Foam AB wheeled 45 ltr 4. Foam AB 135 ltr 1. Helideck CO2 20Kg 1,Helideck powder 50Kg 1.
CO2 System:	Engine room, paint store, emergency generator room.
Streamer reel fire fighting:	N/A.
Storage reel fire fighting:	N/A

Fire suits (BA-sets):	4 sets.
Air compressor:	1
Smoke hoods:	39
Line thrower:	4 on Bridge
Survival suits:	48
Life vests:	120
Life rings:	3 x lights, 2 x line, 2 x smoke + light, 2 life ring only.
Work floating vest:	12 (9 for back deck use, 3 MOB use)
Gas monitor:	1 Combi-Mate; 1- Droger
Medical Equipment:	As per Class requirements
Resuscitators:	1 set

2 HSSEQ management system

The vessel has a Management system (MS) based on the corporate MS structure for health, safety, security, environment and quality which are fully auditable, compliant with and aligned to Corporate OGP model, ISM / ISPS and ISO9001/14001.

All vessels conform to these to ensure Industry and regulatory compliance in all its worldwide operational spheres.

These practical on-board systems cover (but not limited to)

1 Leadership and commitment
- 1.1 Mission Statement
- 1.2 Management activity
- 1.3 Plans and targets

2 Pol icies and strategic objectives
- 2.1 Strategic objectives
- 2.2 Policies

3 Organisation, resources and documentation
- 3.1 Organisational structure and responsibilities
- 3.2 Management representatives
- 3.3 Resources
- 3.4 Competence
- 3.5 Contractors and suppliers
- 3.6 Communication
- 3.7 Documentation and its control

4 Evaluation and risk management
- 4.1 Identification of hazards and effects
- 4.2 Evaluation

5 Planning
- 5.1 General
- 5.2 Asset integrity
- 5.3 Manuals
- 5.4 Procedures
- 5.5 Management of change
- 5.6 Contingency and emergency planning
- 5.7 Checklists
- 5.8 Project planning

6 Implementation and monitoring
- 6.1 Activities and tasks
- 6.2 Monitoring
- 6.3 Records
- 6.4 Non-compliance and corrective actions
- 6.5 Incident management

7 Auditing and reviewing
- 7.1 Auditing
- 7.2 Reviewing

4.3 Recording of hazards and effects
4.4 Objectives and performance criteria
4.5 Risk reduction measures

Access to Vessel and Corporate Management System is thru the web based SeaArc and SeaNet Interfaces. Two way replication over the vsat link insures that systems in the office and all vessels are always synchronised and up-to-date. Access is available throughout the vessel with job specific access granted to on-board clients.

3 Planned Maintenance and Spare Part Control System

MV Osprey Explorer uses the TM-MASTER database system for planned maintenance and spare part control for marine systems.

The marine department has created a database of all components containing details of component name, maker, type, serial number, basic specifications and other contact information.

Component suppliers can be accessed, supplier details updated and new ones added.

The system allows spare part tracking and order processing. Spare parts are linked to each component; details include spare parts group for that component, spare parts in each group, spare parts name and location, number of parts in stock and ordered, supplier details.

The system displays planned maintenance routines for each component, including information on job types and description, job numbers, job intervals and (colour-coded) Next Due Date, running hours count and spare parts requirements.

The history for any specified job or component may be viewed and also reports on spare part consumption. Furthermore, it is possible to write a service report independent of the regular jobs scheduled for each component.

TM Master is also used by all Seismic departments for asset tracking, planned maintenance, spare part tracking and order processing via TM Procurement

TM Master ® is the main product of Tero Marine AS. It is a Windows based Planned Maintenance and Spare Part Control System for Ship Management with the following main functions:

- Equipment and Inventory control
- Spare part stock control
- Purchase and order processing
- Maintenance planning with work order processing and reporting
- Maintenance and service history, including conditions, reasons, symptoms, manhours, free text- and standard forms-reporting
- Analysis of maintenance history

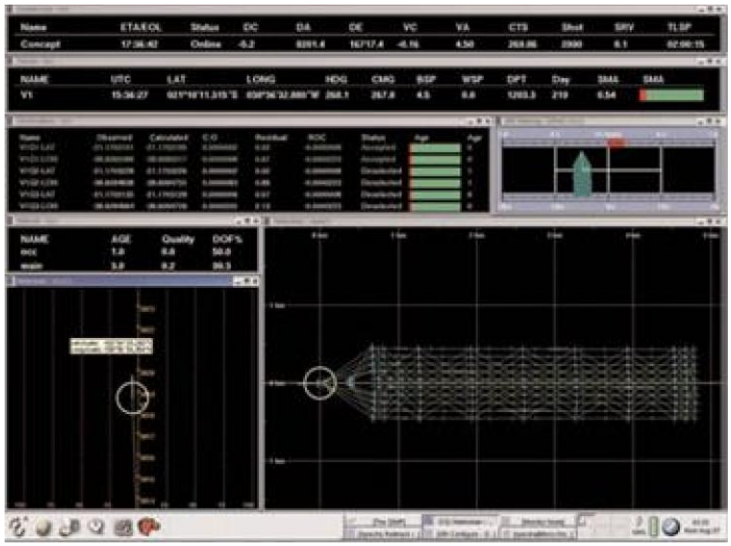
- Survey and certificate control

TM Procurement is a cost and time saving purchasing system, tailored to the needs of the maritime industry. The module, which is fully integrated in TM Master, is easily scalable and streamlines the entire procurement process from requisition to delivery and payment.

4 Positioning Systems

4.1 Integrated Navigation System

Spectra is a comprehensive integrated seismic navigation system with a modular design allowing customers to quickly reap the benefits of any innovations in navigational techniques. With approval from all major oil companies and used by the majority of leading seismic contractors, Concept Systems provide 24 hours system support and are committed to a policy of continuous improvement to keep pace with ever increasing positioning and quality control demands. Coupled to Concept REFLEX , Spectra provides customers with a potent package for cost-effective on-board integrated navigation, incorporating position quality control and binning to meet Survey needs. It is an inherently flexible and scalable product, capable of quickly adapting to survey requirements.



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| | |
|---|---|
| Type | 2D Integrated Navigation System |
| Model | SPECTRA |
| Manufacturer | CONCEPT, UK |
| Program Version | 14.2.01 |
| Gyro Compass | 2 X TSS Meridian Surveyor, 2 X Veripos GPS Gyro |
| Echo sounder | Kongsberg EA400 200Khz, 38Khz |
| Draft Correction | Yes |
| Shot Interval, nominal | Customer specified, nominal 25m |
| Line mode | Grid, rhumb or Great Circle |
| Projection | Selectable between UTM and TM |
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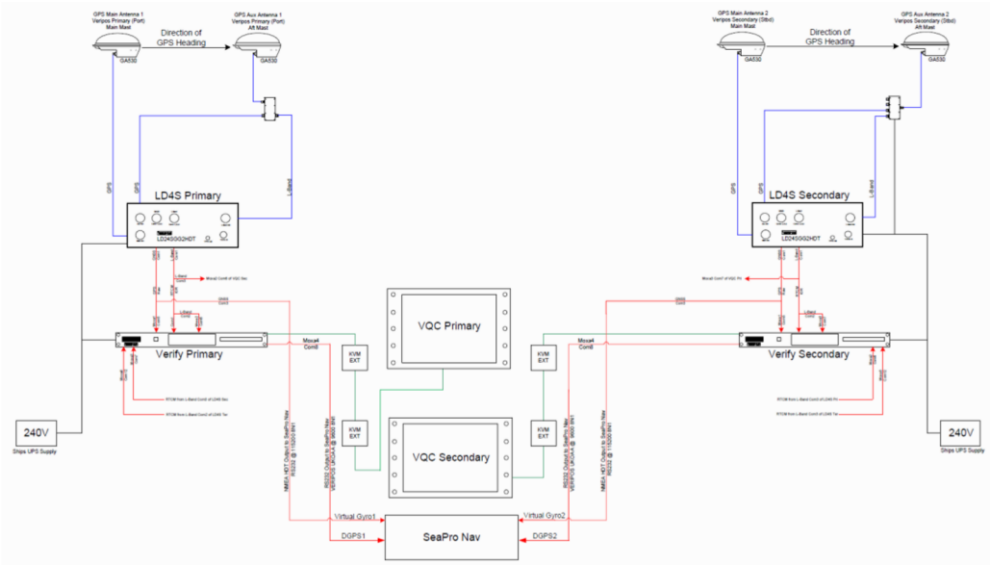
Working Spheroid	Job Specified
Semi-major axis	Job Specified
Inverse Flattening	Job Specified
Working Datum Used	Job Specified

4.2 GNSS GPS Positioning

The VERIPOS Apex 2 / Ulta service is the latest, global, high-accuracy GNSS positioning service designed to meet all offshore positioning and navigation applications. VERIPOS Ultra service provides decimetre level accuracy. Ultra uses Precise Point Positioning
(PPP) – an absolute positioning technique which corrects or models all GNSS error sources, i.e. GPS satellite orbit and clocks, tropospheric, ionospheric and multipath errors. The PPP technique consists of a single set of 'globally applicable' corrections to the satellite orbits and clocks, so position accuracy is maintained regardless of user location.
VERIPOS operates its own orbit and clock determination system (OCDS) which derives real-time corrections for all satellites in the GPS constellation using proprietary algorithms. The OCDS uses data from the
VERIPOS reference station network with multiple and redundant OCDS systems running in VERIPOSoperated Network Control Centres in Aberdeen and Singapore. These stations are independent from the reference stations used by JPL to derive the orbit and clock corrections used by Ultra. Apex is broadcast alongside Ultra via seven geostationary communications satellites to ensure availability and service redundancy.



Manufacturer	Subsea 7 Veripos
Model	Veripos LD4s Dual Redundant System
Type	Apex 2 GNSS with fall back to Ultra GNSS or Standard +/Standard Solutions
Position Type	Precise Point Positioning

Observations Used	L1/L2 carrier phase
Availability	Worldwide
Typical Latency	2 Seconds
Normal Vertical Accuracy	20cm (95%)
Normal Horizontal Accuracy	10cm (95%)
GPS Gyro	Dual LD4S Veripos GPS Gyro
QC	Veripos VerifyQC, FGPS
Type	PC based QC system

4.4 RGPS

Vessel utilizes Seamap's Buoylink RGPS system for position aiding of source arrays, headfloats and tailbuoys. The Seamap Buoylink Ex is a RGPS based system capable of providing sub meter positioning of seismic gun floats, tailbuoys and other remote vehicles through the employment of data transmission by either cable or UHF radio telemetry or both simultaneously.

A reference GPS receiver is installed on the vessel to provide a reference position. The processing PC will calculate a range and bearing to each remote module using the GPS pseudo range and carrier phase data. Processed and raw data may be output to the vessels integrated navigation system as well as stored on the processing PC.

Manufacturer / Model	SeaMap / Buoylink EX
GPS Receivers	Novatel GPS receivers in master and each remote
Range	Radio Source Pod >1Km, Tailbuoy Pod >12Km
Frequency	902 to 928MHz (Spread spectrum) @ 1 watt
RGPS Module housing	High Strength Delrin® Plastic
Operator Console	Windows XP PC, RtkNav RGPS Software

4.5 Streamer Positioning

Offset is determined by measuring the distance from the geometrical centre of the source to the centre of first the group. Using a single gun, this is done by measuring the time, from when the gun fires, using the Gun Sensor, to when the pulse reaches the first water break. Taking into account the distance from the near-field hydrophone to the Gun, the hydrophone might be used instead of the Gun Sensor.

Tailbuoy positioning is achieved using Buoylink software from SeaMap.

4.5.1 Streamer Control and Monitoring

The DigiCourse System 3 PCS system controls the depth of the streamer while providing the navigation INS system with acoustic and compass data.

Manufacturer	ION DigiCourse
Model	System 3 PCS
Software Version	Sys3 V.6.01

Modem, Model	SYS 3 LIU

4.5.2 Cable Depth Control / Heading Sensor

The Model 5011 Compass Bird has a Model 321 Heading Sensor in the body of the unit. This allows depth, temperature and heading data, plus depth-keeping ability to be derived from just one externally mounted device.

The assembly is streamlined to minimise flow-inducted noise generation, and is designed for compatibility with existing mounting hardware and communication coils. The unit is battery powered, and supports a number of functions for improved cable depth control.

Communication with up to 63 DigiBIRDs occurs over a single twisted pair transmission line, using traditional inductive coupling techniques in a 27 kHz FSK communication link.

The DigiBIRD supports a variety of command and data acquisition functions, including:

- Setting cable running depth
- Reporting current depth and temperature
- Reporting battery usage in hours and minutes
- Reporting wing angle with a resolution of .1 degree
- Providing ballast information

Using a seawater port, the bird monitors depth over a range of 0 - 400 feet (122 meters), with a resolution of 0.1 feet and absolute accuracy of up to ± 0.5 feet. Operator controlled parameters can maintain depth to ± 0.5 feet or lengthen battery life from 2000 to 5000 hours. Once programmed with an operating depth, the bird operates autonomously to supply sufficient force to control cable depth. In addition, the control algorithm parameters may be altered under software control to respond to changing environmental or operational conditions.

Emergency surface or emergency dive facilities are provided in the System 3 Operation Station.

Manufacturer	ION DigiCourse
Mechanical:	
Weight 5011	6.1 lb or 2.8 Kg in sea water
Length	48.2 inches (1.2 meters)
Cells	SLB 150
Life	150 days
Communication:	
Type	Serial FSK
Frequency	27 Mhz
Data Rate	2400 Bits/sec
Diving plane:	
Lift	35 pounds (15.9 Kg) at 5 knots

Airfoil	NACA 651-012 airfoil section
Aspect ratio	2.0
Wing Span	19 inches (48 cm)
Surface area	140 sq inches (903 sq.cm)
Depth Sensor:	
Operating range	to 400 feet (122 m)
Accuracy	+/- 0.5 feet (0.15 m)
Resolution	+/- 0.1 feet (0.03 m)
Compass:	
Resolution	0.3 degrees
Accuracy	+/- 0.5 degrees
Sampling	0.3 to 6 seconds
Averaging	0,3,7,15,31 samples

5 Streamer System

5.1 Recording System

Vessel is equipped with an industry standard Sercel Seal, Marine 24 bit recording system. System is capable of zero dead time recording and maintained to the latest software revision level thru maintenance agreements with the manufacturer. A complete set of online QC displays and inbuilt test set insure the system is always performing above the manufacturer recommended specification.

Manufacturer	Sercel
Type	SEAL v 5.2
Max. number of streamers	1
Max. number of channels / streamer	1260 (15.75 Km streamer, 12.5m Channel)
Auxiliary channels	24
Channels per Acquisition Line Section	12
Preamplifier gain	0 or 12dB

Sample rate	0.25, 0.5, 1.0, 2.0 or 4.0 milliseconds
Lo-cut Filter type	Analogue 3Hz @ 6 dB/Oct, Selectable Digital low cut from 2.5–15Hz @ 6 dB / Oct
Hi Cut filter	Digital Linear Phase FIR Filter, 0.8FN

5.2 Storage System

All seismic data is written to IBM 3592 cartridge drives. DataBuffers are used to insure any tapedrive failures do not result in loss of data.

Tape stations, manufacture	IBM 3592
Recording Media	IBM 3592 Cartridge
Capacity	60 / 300 GB
Recording Format	SEG D rev 1, IEEE 8058

5.3 Streamer

Vessel uses Sercel ALS streamer, Sections have a reduced diameter no bigger than 50 mm, the smallest sections of any Sercel systems available today. Electronics are distributed throughout the active sections resulting in fewer modules and connections. 2 transmission lines are available in each section, so that the Seal system can automatically reroute data if any interruption occurs in the active sections. Redundancy is also carried in the power delivery system with 2 independent pairs, the Seal System continually supplies power even if a problem occurs.

Active streamer length	1 X 12,000m
Number of channels	960
Channel numbering	Trace 1 at head (Vessel)
Streamer Type	Sercel Seal ALS
Streamer manufacturer	Sercel
Group length	11.78m non overlapping
Group Interval	12.5 m Centre to centre group
Hydrophone type	Sercel SLH-20
Groups per section	12
Hydrophones per group	16
Group sensitivity	(17.4 V/bar) @ 20°C

Operating depth	Client specified
Active section length (nominal)	150 metre
Active section Diameter	50 mm

5.4 Automatic Streamer Retrievers

Manufacture	Concord Technologies, Inc., Houston; USA
Model	SRD-500S recovery device
No. in use per 8000 m streamer	8
Release depth	48 metres

6 Energy Source

6.1 Source Array Configuration

Vessel is equipped with four soft float sub-arrays designed to be configured as a single 2D array or dual 3D array. Array design and output can be redesigned as required using in-house Nucleus Software.

Number of arrays	Single or Dual Source
Type	BOLT Technologies 1900LLXT Air-Guns
No. sub-arrays	6 sub-arrays
Air Gun type	BOLT 1900 LLXT
Volume	Client specified
Gun Depth	Client specified
Towing width	Client specified
Seismic Offset	Client specified, 120m Standard
Nominal working pressure	2000 psi

6.2 Air Gun Controller System

Manufacturer	SeaMap
Model	SeaMap GunLink 2000
No of guns	System configured for 96 guns, 6 GCUs
Input gain	Programmable
Parameter Back-up	Hard Disk
Operator Consoles	Observer 2 X 21" , Remote 2 X 21”
Synchronisation model	Automatic Individual
Synchronisation	Typical +/- 1.00 msec
Resolution	0.1 msec
Timing method	Positive threshold Peak Detetct

6.3 Source Positioning

The source is positioned using a SeaMap BuoyLink RGPS system with ruggedized RGPS pods located on the each sub-array. The centre of source is calculated by the Spectra INS based on the range & bearing information provided by the RGPS pods.

6.4 Towing techniques

The airguns on each sub array are suspended on gun plates hanging from an 18" flexible float. Separation between each array is achieved by adjusting the tow point on the vessel. The two outer arrays are towed from Baro 8 Vanes.

6.5 Gun Depth Transducer System

The Gun Depth Transducer System provides an accurate and reliable method for determining the depth of seismic source. The two-wire, frequency-modulated devices are mounted in close proximity to the air gun and report depth to the boat either continuously or periodically in sequential mode when used in multiplexed system. All enabled gun depths are recorded for every shot to a SQL database on the host PC hard disk for subsequent analysis if required.

6.6 Compressor Plant

Compressors	**LMF 1** Type: LMF 31D Screw compressor: SIGMA 4 G Piston compressor: VC – 3221 - W21 Output capacity: 31m3/min 1094cu.ft/min **LMF 2** Type: LMF 51D Screw compressor: SIGMA 5 G Piston compressor: VCS– 3421w 14/20 Output capacity: 31m3/min 1801cu.ft/min **LMF 3** Type: LMF 62D Screw compressor: SIGMA 5 G Piston compressor: VC – 3421w 14/20 Output capacity: 62m3/min 2189cu.ft/min
Output Pressure	2000 PSI
Output Capacity	1x 1064 CFM. 1 x 1801 CFM. 1 x 2198 CFM.

6.7 Pressure monitoring & Control

Pressure transducers in the system, are typically of type AG Geophysical type AGH 33M4. Sub-arrays have one pressure transducer each for continuous monitoring, and one mounted at the main distribution manifold on-board the vessel. Air pressure can be monitored and recorded continuously throughout the line

7 Navigation Processing & QC

SeisPos is a Windows based program used to perform processing of raw navigation data, both 2D & 3D, for seismic surveys from UKOOA P2 raw data format to UKOOA P1/90 final data format. SeisPos comprises a number of discrete modules which, executed in turn, form a logical processing flow:

Input: Builds a proprietary database of network and observation data from raw data files recorded in UKOOA P2/91 and P2/94 formats. Performs format compliance checking and data integrity checks, taking advantage of redundant information.

Precondition: Pre-conditions raw data to eliminate outliers and reduce noise.

Database: Fast bespoke binary database of header information, raw and processed data.
Network Adjustment: Multi-vessel, multi-streamer. Fully integrated weighted least squares solution.

Output: Outputs user configurable positioning data in the industry standard UKOOA P1/90 format or Shell Processing Support (SPS) format.

Quality Control: Interactive time series plots of all adjustment QC data

P1Tools is a Windows based program used to perform Quality Control of navigation data for seismic surveys recorded in the industry standard UKOOA P1/90 format, and which also provides an extensive set of utilities relating to P1/90 and Shell Processing Support (SPS) datasets:

QC Offsets and Integrity: Computes ranges between pairs of nodes as configured by the user

QC Nodes: Computes shot to shot movement and depth of nodes configured by the user
Compare: Performs shot by shot comparison of positions and depths between two P1/90 files for nodes configured by the user

Trend Analysis: Line-by-line time series plots of:

-Node offsets

-Node movement

-P1/90 Comparison

Statistical Testing: Application of user defined acceptance criteria to:

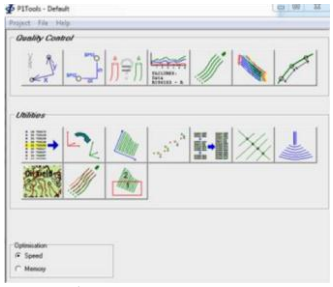
-Node offsets

-Node movement

-P1/90 Comparison

Replay: Interactive graphical replay of P1/90

SeisPos



P1 Tools

8 Seismic Processing QC

GLOBE Claritas is a sophisticated software package for 2D and 3D land and marine seismic data processing. Designed for maximum flexibility, it gives you a no-constraints enabling layer for seismic data processing, developed over 20 years by GNS Science, New Zealand's premier geoscience provider.

Model	Globe Claritas
Manufacturer	GNS SCIENCE
Program Version	5.6.8046 Latest By Support License
Workstation	Dell T-1600 Workstation
Operating System	Linux Ubuntu 12.04LTS
Tape Drives	IBM 3592 x EOS x 2
Plotter	iSYS V24
External Storage	Western Digital 500Gb USB 2.0 HDD, 2 X 2.0 TB HDD

9 Gravity Meter (Option)

Not installed at this time.

An industry standard operation can be provided by a third party if required.

10 Velocity Meter System

Available for deep water full column velocity profiles, the vessel is outfitted with a MK21 Sippican system using XBT disposable probes.

Manufacturer	Lockheed Martin
Model	MK21 USB with XBT probes

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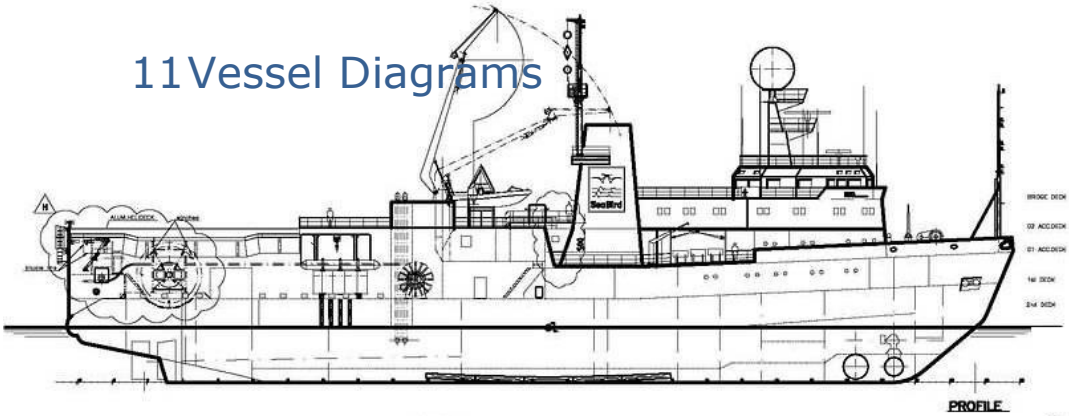
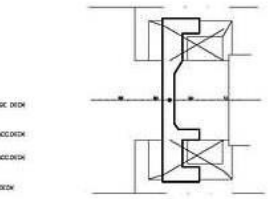
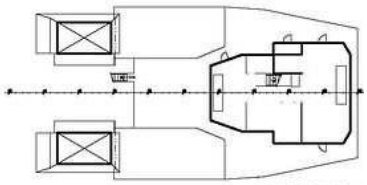
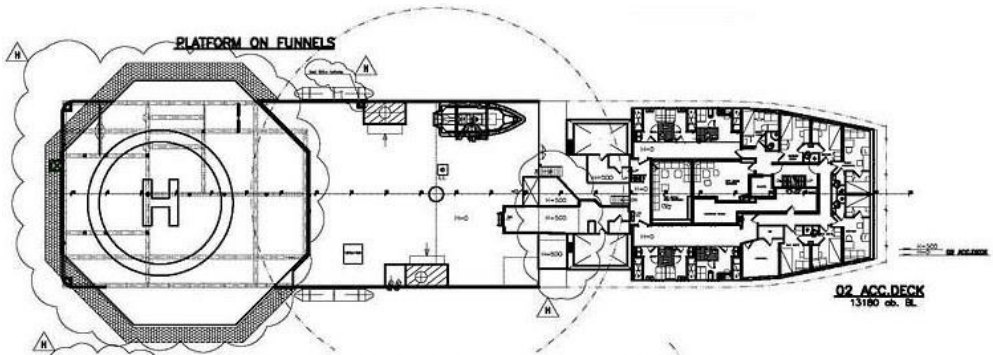
SeaBird Exploration

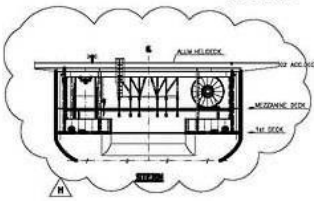
11 Vessel Diagrams

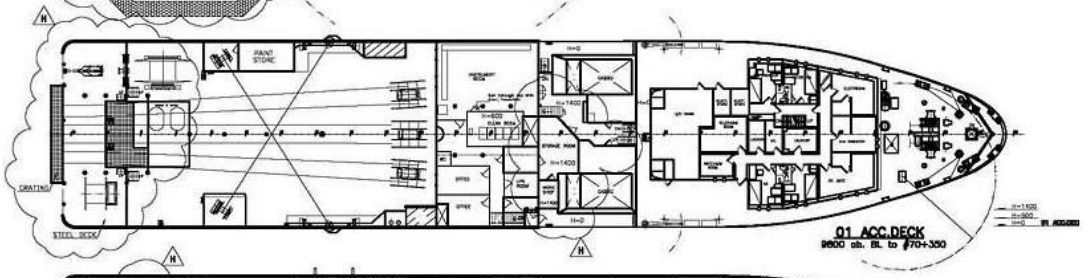


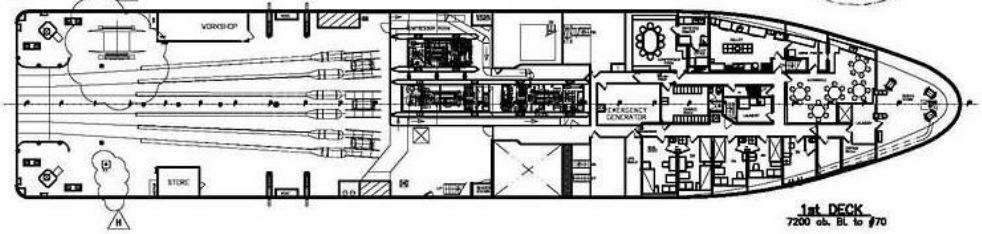


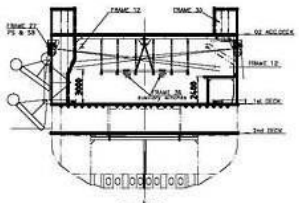


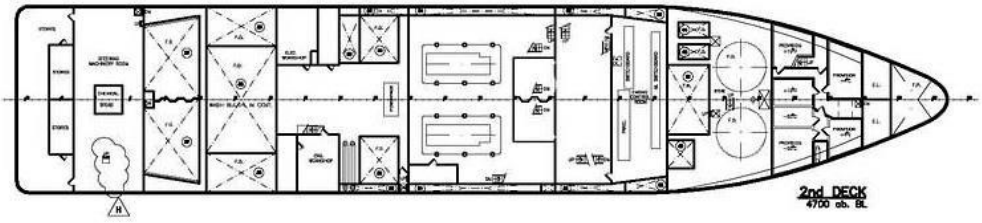


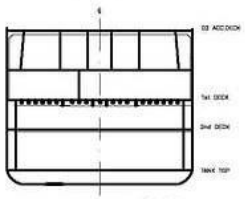


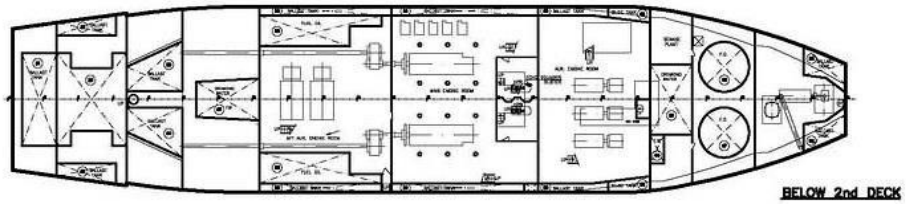


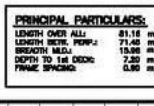












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