



## MULTI-ROLE GEOPHYSICAL SURVEY SERVICES

Gardline CGGV Pte Ltd is a Joint Venture formed between Gardline Geosurvey and CGGVeritas. Drawing from the experience and expertise of each of its parent companies, Gardline CGGV offers a wide range of multi-disciplinary marine site survey and 2D exploration seismic survey capabilities.

Though headquartered in Singapore to primarily service the Asia Pacific region, Gardline CGGV is able to offer its unique range of multi-disciplinary capability for world-wide deployments.

### MULTI-ROLE SURVEY VESSEL

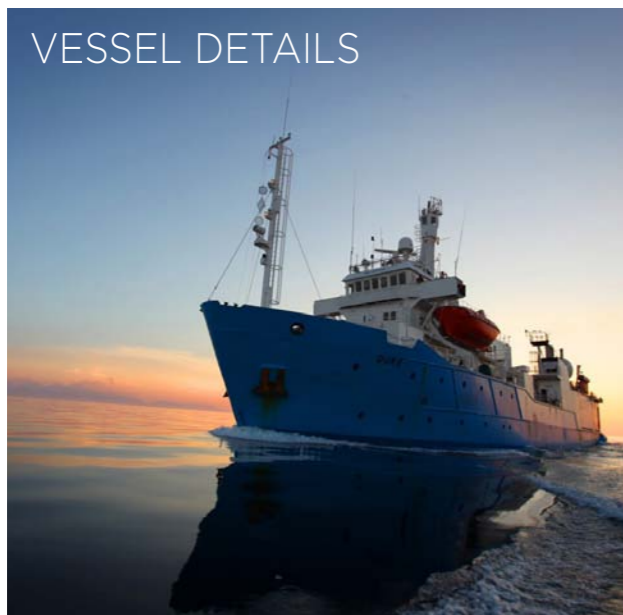
Gardline CGGV owns and operates the M/V Duke, a well established exploration vessel which has been refitted to include site survey investigation packages. In addition to the vessel's 960 channel digital streamer system, featuring a Sercel Guardian Solid Streamer and up to 4280in<sup>3</sup> energy source, the new equipment installed includes superior deep water Kongsberg EM 302 (1 x 1 deg) multi beam; EA502 and EA 400 echo sounders; a range of GeoResources High Resolution / High Frequency profiling systems; a hull-mounted Kongsberg SBP300 Sub Bottom Profiler system; GeoResources Boomer and Sparker sound sources and ministreamers; GeoAcoustics 160D side scan sonar equipment and a range of high frequency air-gun and mini-airgun acoustic sources for detailed shallow penetration site survey projects.

Unique for this class of vessel, the M/V Duke also carries a wide range of seabed sampling equipment to include gravity and piston corers and optionally vibrocorers and CPT systems.

The M/V Duke's unique equipment configuration enables the vessel to offer an efficient and cost-effective multi-disciplinary mobilisation, in particular for long-distance assignments, with excellent accommodation for a team of up to 27 personnel. Additionally, the vessel benefits from a dedicated survey laboratory which facilitates full on-board data processing, interpretation and report preparation whilst on the work site.

### GARDLINE CGGV KEY SERVICES INCLUDE

- *2D Exploration Seismic*
- *Site Survey*
- *Bathymetric (deep and shallow water)*
- *Debris Clearance*
- *Pipeline and Cable Route*
- *Geotechnical Investigation*
- *Environmental Baseline*
- *Wreck Investigation*
- *Unexploded Ordnance Investigation*
- *UNCLOS (extension of Continental Shelf)*
- *Multi Disciplinary Survey*



Owner	Gardline CCGV Pte Ltd
Flag	Bahamas
Port Of Registry	Nassau
Built / Rebuilt	1983, A/S Vaagen Verft, Norway/1998
Class	DNV 1A1-E0-Sealer (for max. draught 5.30m) pwdk
Class ID N°	DNV 13520
IMO icial Number	8200838
Call Sign	C6YT7
Length	66,8 m
Beam	13,00 m
Max Draft	5,80 m
Gross Tonnage	2031 GRT
Net Tonnage	537
Maximum Load Speed	12 kts
Cruising Speed	10 kts
Fuel Capacity	660 m3
Fuel Consumption	At 10.0-11.5 knots: 9m3 / 24h All 2D Seismic gear out (4,5 knots) appr. 11m3 / 24h Site Survey appr. 5.5m3 / 24h At Stand by (one engine running): appr. 4m3 / 24h
Endurance	50-60 days in survey mode
Engines	2 MAK 6M 453aK 1640 kW / 2250 bhp each at 600 RPM
Total Propulsion	3280 KW
Propellers	1 Hjelset var.pitch. type HM 1530. Rpm 246. Dia 2800mm

<b>ACCOMMODATION ARRANGEMENT</b>	
Cabin Types	1 and 2 man cabins Marine crew: 9 x single cabins. 5 x double cabins = 19 berths CGGV crew: 7 x single cabins. 10 x double cabins = 27 berths Hospital
Business, Conference And Training Room	Plasma TV. Projector. DVD/Video systems. Surround sound
Fitness Room	Treadmill, Bike, rowing machine, Multigym, Wall bars. Entertainment centre

<b>ENERGY SOURCE</b>	
2D Source Volume	2960 cubic inches (standard array) Optional Array sizes available: 2530 cubic inches (flip flop Operation @ 18.75mtrs SPI) 3610 cubic inches @ 25m SPI 4280 cubic inches @ 37.5m SPI
Number of subarray	4
Number of Guns (Maximum)	48
Source Configuration	Cluster and single guns
Operating Pressure	2000 psi
Number of Winches	4
Array Elements	Bolt LL & LLX
Guns per Subarray	Array 1-6 guns: Arrays 2 & 3 -8 guns: Array 4 -6 guns
Array Size Options	Up to 4280 cubic inches

<b>RECORDING SYSTEM</b>	
<b>Syntrak 480 System</b>	
Max Channel Capacity	960
Maximum Auxiliary Channels	24
Maximum Recording Length	62 seconds @ 2 ms sample rate per 480 channels
Recycle Time	1.35s dead time subject to operation configuration

<b>ACQUISITION MODULE</b>	
Number of Seismic Channels	60 maximum
Sample Rates	0.25, 0.5, 1.0, 2.0, or 4.0 ms
Dynamic Range	112 dB (instant) 136 dB (system)
Word Size	24 bit
Distortion	-105 dB
Common Mode Rejection	110 dB
Crosstalk	120 dB
Recording delay	50 ms
Analog Low Cut Filter (always ENABLE)	Butterworth 2 Hz, 6dB/octave plus selectable digital low cut 2.5 - 15 Hz @ 6 dB/octave
Tape Subsystem	3590
Tape Format	SEG D formats: 8015, 2.5 byte (20-Bit Binary); 8048, 4-byte, IFP (32-Bit Hexadecimal); 8058, 4-byte, IFP (32-Bit IEEE); 8036, 3-byte, Integer (24-Bit Integer); 8038, 4-byte, Integer (32-Bit Integer)
Tape Decks	3590B IBM
Recording Format	SEG D

<b>QC</b>	
Processor	Promax
Display	2 x 19" LCD monitors
Hard Copy	n/a
Plotter	V24 Isys
Printer	Virtual printer (txt or pdf file)
Real Time	
Instrument Performance Test Including	DCO/Noise/Range Test, RMS Noise Test, Channel-Gain Accuracy Test, Harmonic-Distortion Test, Common-Mode Rejection, Impulse-Response Test, Crosstalk Isolation Test, Hydrophone Leakage Test

<b>SEISMIC STREAMER SYSTEM</b>	
Manufacturer	Sercel Solid Guardian Streamer
Defined Onboard Streamer Stock Level	80 sections
Number Of Groups Per Streamer	840 based on 10,500 metre streamer
Number Of Groups Per Section	12
Standard Group Length	12.5 metres
Other Group Length Available	25 metres

<b>INTEGRATED NAVIGATION SYSTEM</b>	
<b>Gardline Proprietary Voyager 5 System</b>	
Computer	Dell Precision PC
Operating System	Windows. Voyager 5
Disk Drives	228GB
Network	LAN
Logging Formats	UKOOA P190, P294
Logging Support	Local Hard disk
Navigation QC	IMB PC, FGPS Seispos v. 14.31
Display	DELL precision PC
Plotter	HP Designjet
Peripherals	Printer

<b>PRIMARY DGPS</b>	
Name of System	Starfix (HP / XP) or equivalent
Manufacturer	Fugro

<b>SITE SURVEY EQUIPMENT SYSTEM</b>	
Sound Velocity Profiler	STD 204/CTD
Expendable Profiling System	Sippican XBT
Water Speed Log on Hull	Skipper EML224
Echo Sounder	Kongsberg Simrad EA502 & EA 400
Gyrocompass	Anschutz st. 20
Site Survey Array Configuration	160 cubic inch array or equivalent
Site Survey Array Power	Circa 10 barM Primary to Bubble greater than 15:1
Multibeam Swathe System (Deep)	Kongsberg EM 302 (1° x 1°) Rated to operate upto max water depth 7 kms, with swathe width x 5.5 water depth upto a max of 8 kms.
Multibeam Swathe System (shallow)	Kongsberg EM 3002 (EM 2040 1°x 1°due Q2/3 2011)
Position, Heading and Attitude System	Kongsberg Seapath 300 Plus System

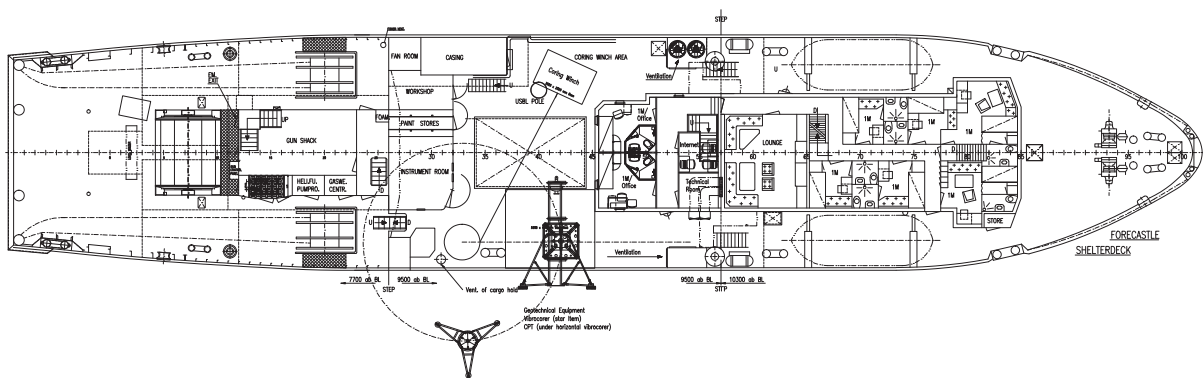
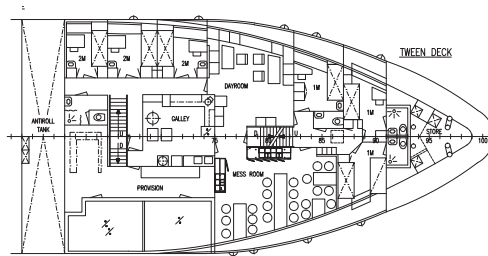
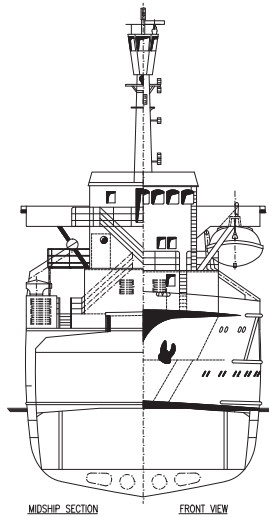
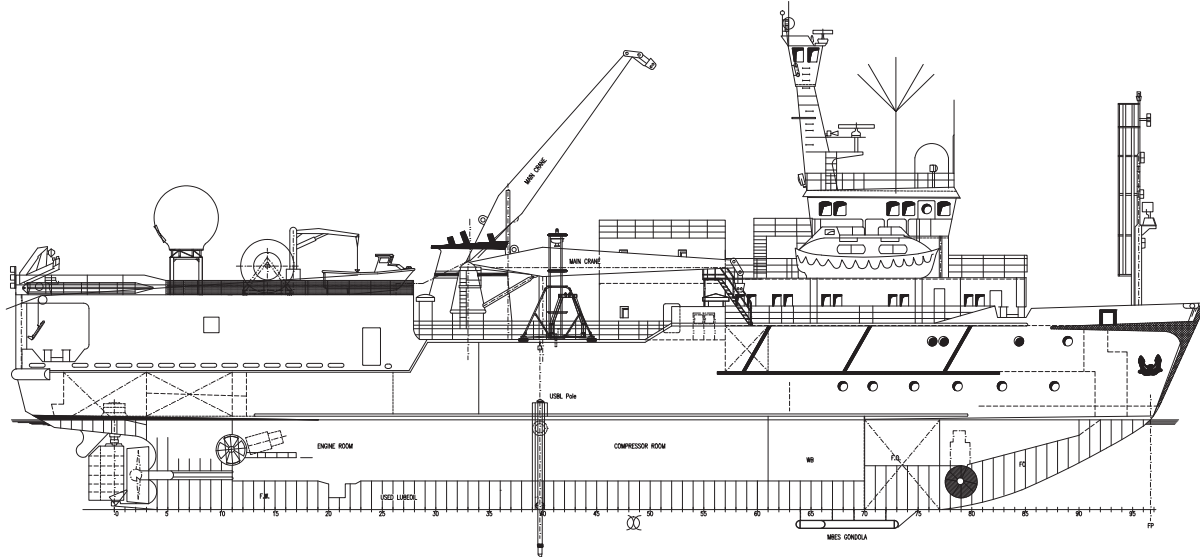
Sub Bottom Profiler	Kongsberg SBP 300 (6°system)
Sub Bottom Profiler	Geo Resources Sub Tow Boomer
Sub Bottom Profiler	Geo Resources SIG sparker system
Sub Bottom Profiler	Mini Airgun Source TBC
Recording System	OMS Octopus 760
Printers	Thermal 12" Units
Sonar System	GeoAcoustic System
Recording System	OMS Octopus 760
Geotechnical Sampling	Kullenberg Piston Coring System
Assorted Seabed Sampling Systems (Optional)	Vibrocoring (3 or 5 mtrs) Cone Penetration Test (CPT) Box Corer Day Grab Van Veen Grab
Environmental Package (optional)	Box corer Assorted grabs Deep water camera system (6000m rated) Environmental Baseline Study acquisition package
Network Storage	Dual Servers each with upto 6 TB each
USBL	Sonardyne Ranger Pro System

<b>ON BOARD SEISMIC PROCESSING</b>	
Processing Equipment	PROMAX
Processing Platform	Dell T7500
Num of CPU@frequency	12 CPU's
Total RAM Memory	48 GB
Disk Storage (stage)	4 TB
Network	100Mb/sec
Ethernet Link	1Gb/sec
Operating System	Linux Redhat / Centos
Tape Drives	
Data Transmission	FTP, tapes
Processing Software	Promax ver 5000.2
Processing Workstation	3 x Dell 1950 processing nodes (+ 1 spare) 2 x HP xw4600 Workstations with 30" monitors 1 x Verari tape server (+ 1 spare)
Plotter/Printer	1 x Isys V24 Plotter and Netlink
Capability	The processing power is sufficient for comprehensive acquisition QC and full pre-stack processing with Fast Track NMO/Stack or final DMO/Stack and post stack migration.



# M/V DUKE

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