NEW
C-CLASS ADDITIONS
TO FUGRO FLEET

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Two new C-class vessels have joined the Fugro fleet in 2010. Both have been built in Norway to Fugro Geoteam specifications and at just over 108m long, 28m beam and with GRT of 12,600 tonnes, they will be the slightly bigger sisters of Geo Celtic and Geo Caribbean already in operation with Fugro.

On 19 March 2010, Fugro formally took delivery of a new-build seismic survey vessel, the M/V **Geo Caspian**, the M/V Geo Coral is being built in Bergen and will be delivered at the end of July. These vessels have been designed to work worldwide in the most challenging offshore areas, and are capable of towing up to 16 seismic streamers on dedicated streamer winches with a capacity of 8000m of cable. The C-class vessel design therefore allows deployment of the largest possible spread of seismic streamers which are considered essential for operational efficiency when acquiring data on very large exploration prospects. The vessels are designed to operate all around the world in the ambient, and sea water temperature range that typically encountered.

Purpose-built in 2010, Geo Caspian is the world's largest CLEAN-DESIGN seismic vessel and a key new asset in Fugro's fleet.

HSE

C-Class vessels have the class designation of "Clean" and "Clean Design", which means they comply with the highest environmental standards and have a double skin in the area of the fuel tanks.

The class notation applies strict rules and procedures to cover emissions of any material with Global Warming Potential (GWP). This includes fire fighting chemicals, refrigerants and fuel. Geo Caspian is the world's largest Clean Design seismic vessel. Deck areas have been arranged to provide maximum working space and clear visibility, and the handling solutions throughout the vessel have been selected that by design will result in a lower potential risk for personnel injury. Throughout the vessel there are well appointed offices for ships officers and senior survey specialists, and these are supplemented by large conference rooms to facilitate the effective implementation of the ships safety and operational management systems.

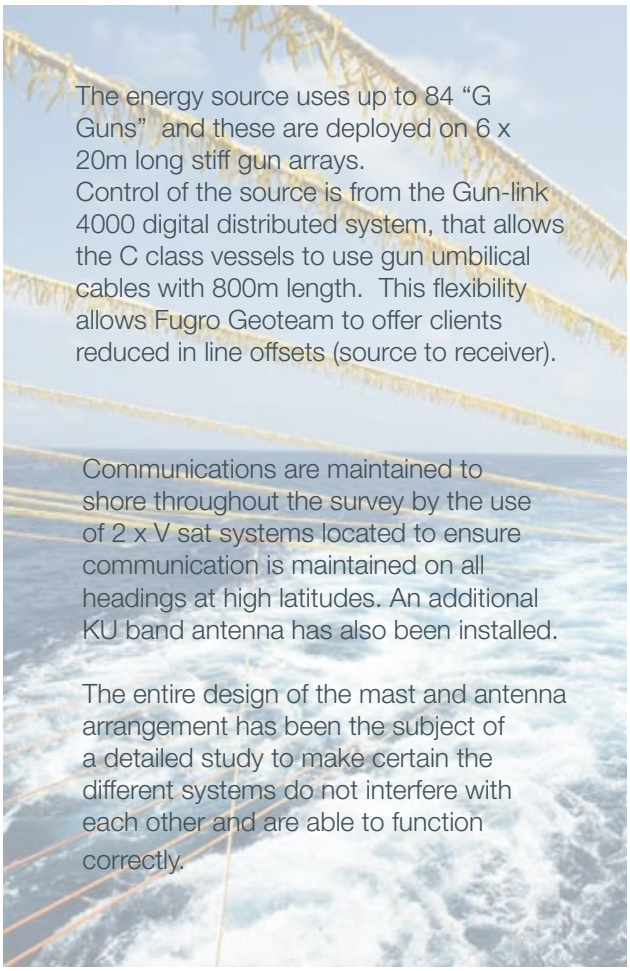
SEISMIC SPECIFICATIONS

The vessels are rigged to tow up to 16 solid streamers with the potential to achieve an overall spread of 1500m, and dual sources each up to 5100 cubic inch each. The wide tow is achieved using deflectors made by Baro Mek Verksted in Norway known as the Baro 410, these 11.3m high deflectors with a weight of 12 tonne each, require robust handling and towing systems have been designed to have a high level of redundancy and has taken into account the high forces experienced when recovering in severe weather conditions encountered in harsh environmental areas.

- The latest recording system from Sercel is installed, the Seal 428, which allows continuous recording of seismic data, eliminating the typical one second of dead time between data records. This is expected to be a great benefit during complex surveys using several vessels, such as wide azimuth and undershoots.

- All Fugro vessels have been equipped with the latest in streamer control technology, which in combination with Fugro's Fresnel Zone Binning approach, can position the streamers to optimize subsurface seismic coverage and minimize infill. Utilization of lateral steerable birds has also been proven successful for 4D purposes, when working in obstructed areas, or when applying new acquisition techniques like shooting in turns or in fan-mode. Other benefits of the lateral controllers include more efficient equipment deployment and recovery, and safer work boat operations due to improved streamer control.

- A unique feature of the C class vessels is the widespread use of electrically drives on the winches and handling systems using vector control technology, this gives and accuracy of 0.01% compared to 5% on traditional large scale hydraulic installations, this precise control during equipment deployment and recovery has proved to have much shorter installation times and fewer operational issues than the traditional hydraulic installations.



The energy source uses up to 84 "G Guns" and these are deployed on 6 x 20m long stiff gun arrays.
Control of the source is from the Gun-link 4000 digital distributed system, that allows the C class vessels to use gun umbilical cables with 800m length. This flexibility allows Fugro Geoteam to offer clients reduced in line offsets (source to receiver).

Communications are maintained to shore throughout the survey by the use of 2 x V sat systems located to ensure communication is maintained on all headings at high latitudes. An additional KU band antenna has also been installed.

The entire design of the mast and antenna arrangement has been the subject of a detailed study to make certain the different systems do not interfere with each other and are able to function correctly.

MARINE SPECIFICATIONS

The crew accommodation is built with the typically high standards of Norwegian shipyards, 70 single cabins all with private bathroom, a 70 seat cinema/auditorium, fully equipped hospital, a gymnasium to rival most 5 star hotels and a swimming pool. The comfort and vibration levels as defined by the classification society are V(3) – C(3) which is a high standard for an offshore service vessel.

- The integrated helicopter deck located on the fore part of the ship is built according to the UK CAP 437 rules for a Sikorsy S92 helicopter. Adjacent to the helicopter deck is a large and well equipped hospital that is managed by a professional medic.

- The bridge is designed and classed according to the NAUT-AW rules which are intended to improve nautical safety and reduce the risk of failure in bridge operation causing collision, grounding and heavy weather damage.

- The main propulsion arrangement is a Diesel electric solution, with conventional Variable pitch and variable speed propellers.

- The Diesel electric solution that also uses vector control technology allows for an optimised setting to be made during towing operations thereby leading to reduced fuel consumption, and emissions for a given towing force.

» *C class vessel have a Bollard pull > 150 tonnes on the main shafts only. The retractable 360 degree azimuth thruster installed in the fore part of the vessel provides addition towing force and improves propulsion redundancy.*

MARINE SPECIFICATIONS

The main generator sets use medium speed engines delivered by either Rolls Royce or Wartsilla, and power onboard is managed through a power management and automation system, with operator stations on the bridge console and the main control room. The automation systems have been evaluated using the enhanced system verification technique known as “Hardware in loop” testing (HIL), this analysis has assisted Fugro Geoteam in risk management related to automation, and improvements have been made.

Remote dial in diagnostics are in place for trouble shooting by onshore based specialists with automation issues on the vessels operationally critical systems.

The compressed air for the seismic source is provided by three LMF compressors with an output of 2190 SCFM each and with delivery pressure up to 3000 PSI , these are electrical driven variable speed units, which leads to reduced emissions as only the required amount of air needed for the source is compressed, sensors and the automation system control the speed the compressors to maintain pressure and flow at the optimal level.

There are five additional boats onboard, 2 x Lifeboats with capacity for the complete crew within each boat, a high specification 7.5m Fast rescue craft (FRC), and 2 x 9.6m Seismic workboats.

The Seismic workboats have a top speed of 25 knots, and can carry two sections of seismic streamer, they also have twin engines and additional tools built into the design to facilitate in sea replacement of damaged sections within the streamers.

The seismic workboats are recovered into recesses that allow good weather protection of the crew when performing maintenance and handling related to workboat operations.
The davit system uses a passive shock absorber to reduce stress during handling.

Geo Caspian & Geo Coral - the most impressive seismic vessels ever launched