

# Consolidation and change continue

## Industry's refocus will alter fleet to meet demand

It has been another difficult year for the contract seismic industry. Data saturation in many markets, limited spending on new multi-client surveys, high debt loads, and delays in industry acceptance of technology advances have all hampered the seismic contractors from capitalizing on their considerable capabilities.

The marine seismic industry has been beaten by fierce internal competition and the oil operators' drive for maximum data at minimal cost. Now, the cheap ride is over. The seismic industry has no more to give and is now regrouping and reconstructing its business. The bottom line is that data purchasers will have to pay more for the value they receive from the seismic technology they need and use (*Offshore*, October 2002). Seismic industry cash flow has been nega-

tive and, because of oil company consolidation, the speculative model of seismic sales has become ineffective.

### Shaping change

Change is required and has begun. Fleet consolidation continues, but most of that effort has already occurred through mergers over the past three years. Only TGS-Nopec left the vessel business this year, having sold their last vessel in November 2002. Now the tough internal consolidation begins. The active fleet must be reduced by:

- Decommissioning vessels from seismic operations
- Converting ships to other purposes
- Selling vessels into the market to generate cash

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Exploration Editor

- Retiring/destroying the oldest hulls.

Much of this needed reduction is already accomplished through stacking ships. No clear numbers are available for stacked vessels or for the disposition of the onboard equipment. Since much of the equipment is leased, it is easily dealt with. Crews can be released so that continuing vessel costs collapse to slip (docking) fees. This buys some time and preserves the option of returning the vessels to activity once demand improves.

Only one or two of the remaining contractors can now be all things to all oil companies. All the others are specializing their capabilities. With tighter control on more focused offerings, acquisition costs will flow directly to the survey buyer. This new transparency should be good for all parties.

### New competition

For the 2D seismic market, new competition is adding more financial stress. In discussions with several contractors, a consensus developed that Russian and Chinese crews are gain-

ing a wider foothold because of their lower operating costs.

Their technology is less sophisticated than that of the full-line contractors, but in the present limited expenditure environment, they have an edge and are winning more work. Their last-generation seismic technology is sufficient for many regional projects. More expensive and higher technology surveys can follow later once oil company spending limits ease.



**Large seismic vessels collect many 3D speculative seismic surveys, whose economics have been undercut by oil company mergers.**

### Survey

This year's survey updates statistics for 105 vessels, down slightly from last year's listing. Changes from last year are relatively minor with the *Veritas Vantage* being the only new-build vessel to enter the fleet in 2002. The tragic loss of the *CGG Mistral* to a fire early this year counters that addition. Several contractors have decommissioned at least one vessel or sold them to other players.

WesternGeco still maintains the largest fleet, but chose not to participate in the survey. PGS has the second largest seismic fleet at 18 vessels. Its fleet of 11 towed streamer vessels is augmented by seven vessels in its seafloor seismic division. Fugro's fleet of 13 vessels is the third largest due to their focus on ocean bottom cable work and coastal 2D surveys. ●

**Editor's Note:** An asterisk (\*) following a company name indicates that the company did not provide an update and that the information listed was not provided by the contractor. Limited information is presented for companies that could not be contacted.

## Worldwide Seismic Vessel Survey

| Vessel name  | Year rigged or converted | Total length (m or ft) | Total beam (m or ft) | Streamer configuration (# streamers x # channels) | 2001 average # streamers used | 2001 average streamer length | Source array configuration as rigged (# arrays x capacity, cu. cm.) | Maximum towable footprint (# cables/length x width in meters) | Acquisition capability |    |    | 2001 acquisition experience |    |        | Technical capability    |           |              |                    |                | Onboard processing |         |           | Final primary recording media (type or cartridge #) | Satellite transmission to shore (company used and transmission speed - BAUD #) | Delivery time after survey (days) |                                 |     |    |
|--|--------------------------|------------------------|----------------------|---|-------------------------------|------------------------------|---|---|------------------------|----|----|-----------------------------|----|--------|-------------------------|-----------|--------------|--------------------|----------------|--------------------|---------|-----------|---|--|-----------------------------------|---------------------------------|-----|----|
|  |                          |                        |                      |   |                               |                              |   |   | 2D                     | 3D | 4C | 2D                          | 3D | 4C     | Shallow transition zone | Deepwater | High density | Ocean bottom cable | Vertical cable | Nav data           | QC data | Full data |   |  |                                   |                                 |     |    |
| BGP/Noreen Shipping Ltd, Norway*                                       |                          |                        |                      |   |                               |                              |   |   |                        |    |    |                             |    |        |                         |           |              |                    |                |                    |         |           |   |  |                                   |                                 |     |    |
| Bin Hai 504  | 1988                     | 74.98 m                | 14.7 m               |   |                               |                              |   |   |                        | x  |    | x                           |    | x      |                         |           |              |                    |                |                    |         |           | x   |  |                                   | 3590                            | N/A | 30 |
| Bin Hai 516  | 1992                     | 57.46 m                | 11.7 m               |   |                               |                              |   | 2 sub-arrays: 1,960 cu. in. - Bolt Long Life                  |                        | x  | x  |                             | x  |        |                         |           |              |                    |                |                    |         |           |   |  |                                   |                                 | N/A | 30 |
| Caspian Geophysical, T. Aliyarbekov St. 9, 370005, Baku, Azerbaijan*   |                          |                        |                      |   |                               |                              |   |   |                        |    |    |                             |    |        |                         |           |              |                    |                |                    |         |           |   |  |                                   |                                 |     |    |
| Baki   | 1994                     | 81.85 m                | 14.8 m               | 3 x 480   | 3                             | 6,000 m                      | 2 x 65, 876   | 3 x 5,500 x 300   |                        | x  | x  | x                           | x  |        |                         | x         |              |                    |                |                    |         | x         | x   | x  | IBM 3590E, Philips LMS 3490       | Available at request at 64kht/s | 1   |    |
| Gilavar  | 1994                     | 84.9 m                 | 15.6 m               | 3 x 400, 1 x 560                                  | 4                             | 5,500 m                      | 2 x 65, 826.6   | 6 x 4,500 x 500   |                        | x  | x  | x                           | x  |        |                         | x         |              |                    |                |                    |         | x         | x   | x  | IBM 3590E                         | Available at request at 64kht/s | 1   |    |
| CGG Marine, 1 Rue Leon, BP 32, 91301 Massy Cedex, France               |                          |                        |                      |   |                               |                              |   |   |                        |    |    |                             |    |        |                         |           |              |                    |                |                    |         |           |   |  |                                   |                                 |     |    |
| CGG Alize  | 1999                     | 100 m                  | 29 m                 | 16 x 480  | 8                             | 5,000 m                      | 2 x 3, (2 x 4,300 cu. in.)  | 10 x 6,000 x 900  |                        | x  | x  | x                           | x  |        |                         | x         | x            |                    |                |                    |         | x         | x   | x  | 3590                              | VSAT 64k baud                   |     |    |
| CGG Amadeus  | 1999                     | 84 m                   | 18 m                 | 8 x 960   | 8                             | 4,500 m                      | 2 x 3, (2 x 3,900 cu. in.)  | 8 x 5,000 x 700   |                        | x  | x  | x                           | x  |        |                         | x         | x            |                    |                |                    |         | x         | x   | x  | 3590                              | VSAT 64k baud                   |     |    |
| CGG Fohn   | 1994/1997                | 84.5 m                 | 18 m                 | 7 x 480   | 6                             | 4,000 m                      | 2 x 3 (2 x 4,300 cu. in.)   | 6 x 6,000 x 500   |                        | x  | x  | x                           | x  |        |                         | x         | x            |                    |                |                    |         | x         | x   | x  | 3590                              | VSAT 64k baud                   |     |    |
| CGG Harmattan  | 1993/1997                | 95.8 m                 | 18 m                 | 6 x 480   | 8                             | 4,000 m                      | 2 x 3 (2 x 200 cu. in.)   | 6 x 6,000 x 500   |                        | x  | x  | x                           | x  |        |                         | x         | x            |                    |                |                    |         | x         | x   | x  | 3590                              | VSAT 64k baud                   |     |    |
| CGG Symphony   | 2000                     | 120 m                  | 23 m                 | 8 x 960   | 8                             | 4,500 m                      | 2 x 3 (2 x 3,500 cu. in.)   | 8 x 6,000 x 700   |                        | x  | x  | x                           | x  |        |                         | x         | x            |                    |                |                    |         | x         | x   | x  | 3590                              | VSAT 64k baud                   |     |    |
| China Ministry of Geology, Beijing, China*                             |                          |                        |                      |   |                               |                              |   |   |                        |    |    |                             |    |        |                         |           |              |                    |                |                    |         |           |   |  |                                   |                                 |     |    |
| Feng DU4   |                          |                        |                      | 1   | 1                             |                              |   |   |                        |    | x  | x                           |    |        |                         | x         | x            | x                  | x              |                    |         |           |   |  |                                   | 9 tr.                           |     |    |
| Feng DU6   |                          |                        |                      | 1   | 1                             |                              |   |   |                        |    | x  | x                           |    |        |                         | x         | x            | x                  | x              |                    |         |           |   |  |                                   | 9 tr.                           |     |    |
| Feng DU7   |                          |                        |                      | 1   | 1                             |                              |   |   |                        |    | x  | x                           |    |        |                         | x         | x            | x                  | x              |                    |         |           |   |  |                                   | 9 tr.                           |     |    |
| China Offshore Oil Geophysical Corp., Box 502, Tanggu, Tianjin, China* |                          |                        |                      |   |                               |                              |   |   |                        |    |    |                             |    |        |                         |           |              |                    |                |                    |         |           |   |  |                                   |                                 |     |    |
| Bin Hai 511  | 1979                     | 256                    | 44                   | 2 x 240   |                               | 6,000 m                      | 6,000 CBin  |   |                        |    | x  | x                           | x  | >33 ft |                         | x         | x            | x                  |                |                    |         | x         | x   |  | 3480                              |                                 |     |    |
| Bin Hai 512  | 1979                     | 259                    | 44                   | 2 x 480   |                               | 6,000 m                      | 2 x 2,000 CBin  |   |                        |    | x  | x                           | x  | >33 ft |                         | x         | x            | x                  |                |                    |         | x         | x   |  | 3480                              |                                 |     |    |
| Bin Hai 514  | 1986                     | 180                    | 38                   | 2 remote 120 ch                                   |                               |                              | 420   |   |                        |    | x  |                             | x  | 0-15 m | x                       | x         | x            | x                  |                |                    |         | x         | x   |  | 6250                              |                                 |     |    |
| Bin Hai 518  | 1995                     | 162.7                  | 41.3                 | 240 ch  |                               | 3,000 m                      | 2,040 CBin  |   |                        |    | x  |                             | x  | >6 m   |                         | x         | x            | x                  |                |                    |         | x         | x   |  | 3480                              |                                 |     |    |
| Nantlai 502  | 1980                     | 216                    | 37                   | 336 ch  |                               | 4,000 m                      | 3,660 CBin  |   |                        |    | x  | x                           | x  | >33 ft |                         | x         | x            | x                  |                |                    |         | x         | x   |  | 3480                              |                                 | 1   |    |
| Orient Pearl   | 1994                     | 258                    | 53                   | 4 x 480 ch  |                               | 3,000 m                      | 2 x 3,660 CBin  |   |                        |    | x  | x                           | x  | >33 ft |                         | x         | x            | x                  |                |                    |         | x         | x   |  | 3480                              |                                 | 1   |    |
| Party No 2335  | 1995                     |                        |                      | 2 x 480 ch  |                               | 12,000 m                     | 4,075 CBin  |   |                        |    | x  | x                           | x  | >2 m   |                         | x         |              | x                  |                |                    |         | x         | x   |  | 3480                              |                                 |     |    |

| Vessel name  | Year rigged or converted | Total length (m or ft) | Total beam (m or ft) | Streamer configuration (# streamers x # channels) | 2001 average # streamers used | 2001 average streamer length       | Source array configuration as rigged (# arrays x capacity, cu. cm.) | Maximum towable footprint (# cables/ length x width in meters) | Acquisition capability |    |    | 2001 acquisition experience |    |    | Technical capability    |           |              |                    |                | Onboard processing |         |           | Final primary recording media (type or cartridge #) | Satellite transmission to shore (company used and transmission speed – BAUD #) | Delivery time after survey (days) |  |  |  |  |
|--|--------------------------|------------------------|----------------------|---|-------------------------------|------------------------------------|---|--|------------------------|----|----|-----------------------------|----|----|-------------------------|-----------|--------------|--------------------|----------------|--------------------|---------|-----------|---|--|-----------------------------------|--|--|--|--|
|  |                          |                        |                      |   |                               |                                    |   |  | 2D                     | 3D | 4C | 2D                          | 3D | 4C | Shallow transition zone | Deepwater | High density | Ocean bottom cable | Vertical cable | Nav data           | Seismic |           |   |  |                                   |  |  |  |  |
|  |                          |                        |                      |   |                               |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    | QC data | Full data |   |  |                                   |  |  |  |  |
| Continental Holdings Ltd., 3030 - 3rd Ave. NE, Suite 210, Calgary, Alberta, Canada, T2A 6T7*   |                          |                        |                      |   |                               |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| S/V Calgary  | 1994                     | 56 m                   | 14 m                 | 1 x 480   | 1                             | 6,000 m                            | 1 x 50,000  | 1/6,000  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| S/V Houston  | 1998                     | 66 m                   | 17 m                 | 4 x 720   |                               | 6,000 m                            | 2 x 60,000  | 4/8,000 x 450  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Dalmorneftegeofizika (DMNG), 426, Mira Ave., Yuzhno-Sakhalinsk, 693004 Russia                  |                          |                        |                      |   |                               |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Geolog Dmitriy Nalivkin  | 2003                     | 71.7 m                 | 12.8 m               | 1 x 960   | 1                             | 6,000 m                            | 1 x 3,410 cu. in.   | 1 x 8,000  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Orient Explorer  | 1995                     | 81.8 m                 | 14.8 m               | 4 x 1,440   | 4                             | 4,500 m                            | 2 x 2,920 cu. in.   | 4 x 4,500  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Zephyr-1   | 1998                     | 81.8 m                 | 14.8 m               | 1 x 960   | 1                             | 8,000 m                            | 1 x 4,120 cu. in.   | 1 x 8,000  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Fairfield Industries, 10627 Kinghurst, Houston, Texas 77099, USA                               |                          |                        |                      |   |                               |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Fairfield Expedition   | 1996                     | 65 ft                  | 18 ft                | Radio Tel.  | N/A                           | N/A                                | N/A   | N/A  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Fairfield Explorer   | 1994                     | 186 ft                 | 40 ft                | Radio Tel.  | N/A                           | N/A                                | 3,830 cu. in.   | N/A  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Fairfield Hunter   | 1995                     | 68 ft                  | 18 ft                | Radio Tel.  | N/A                           | N/A                                | 1,680 cu. in.   | N/A  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Fairfield Mirage   | 1997                     | 65 ft                  | 22 ft                | Radio Tel.  | N/A                           | N/A                                | N/A   | N/A  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Fairfield Quest  | 1996                     | 65 ft                  | 18 ft                | Radio Tel.  | N/A                           | N/A                                | N/A   | N/A  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Fairfield Speculator   | 1996                     | 68 ft                  | 18 ft                | Radio Tel.  | N/A                           | N/A                                | 1,680 cu. in.   | N/A  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Fairfield Vision   | 1997                     | 65 ft                  | 22 ft                | Radio Tel.  | N/A                           | N/A                                | N/A   | N/A  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Roxanne T  | 2000                     | 180 ft                 | 38 ft                | Radio Tel.  | N/A                           | N/A                                | N/A   | N/A  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Fugro-Geodetic, Singapore  |                          |                        |                      |   |                               |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Singaora   | 1996                     | 43 m                   |                      | 1 x 120   | 1                             | 1,200 m                            | 1 x 80, 1 x 160   | -  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Volans   | 2001                     | 45 m                   |                      | 1 x 120   | 1                             | 1,200 m                            | 1 x 80, 1 x 160   | -  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Fugro GeoServices, 200 Dulles Blvd., Lafayette, Louisiana USA                                  |                          |                        |                      |   |                               |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Geodetic Surveyor  | 1981                     | 37 m                   | 9 m                  | 1 x 48  | 1                             | 600 m                              | 90-300 cu. in. CI Guns  |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| L'Arpenteur  | 1982                     | 37 m                   | 9 m                  | 1 x 48, 1 x 96                                    | 1                             | 1,200 m                            | 90-300 cu. in. CI Guns  |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Seis Surveyor  | 1976                     | 45 m                   | 11.6 m               | 1 x 48, 1 x 96, 2 x 48, 4 x 16, 6 x 8             | 2                             | 600 m                              | 90-300 cu. in. CI Guns  |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Universal Surveyor   | 1980                     | 37 m                   | 9 m                  | 1 x 48, 1 x 96                                    | 1                             | 600 m                              | 90-300 cu. in. CI Guns  |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Fugro-Geoteam AS, Hoffsjet Lovenskioldsvei 31c, PO Box 50 Roa, N-0701, Oslo, Norway            |                          |                        |                      |   |                               |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Geo Arctic   | 1988/1997                | 82 m                   | 15 m                 | 1 x 12,000m x 960                                 | 1                             | 10,000 m                           | 5,840 cu. in.   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Geo Baltic   | 1998/2002                | 72 m                   | 18 m                 | 4 x 6,000 m x 480 / 1 x 12,000 m x 960            | 4 (in 3D)/1                   | 4,000 m (in 3D)<br>9,000 m (in 2D) | 2,620 cu. in. Dual Source   | 2 sq km  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Geo Pacific  | 1998                     | 82 m                   | 20 m                 | 6 x 6,000 m x 480                                 | 6                             | 5,000 m                            | 3,460 cu. in. dual source   | 3 sq km  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Fugro Survey Ltd., Denmore Road, Bridge of Don, Aberdeen AB23 8JW, UK                          |                          |                        |                      |   |                               |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Geo Prospector   | 1997                     | 72.6 m                 | 11.8 m               | 120   | 1                             | 600-1,200 m                        | 140/280 cu. in.   | NA   |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Geo Scanner  | 1982/1997                | 58.4 m                 | 10.5 m               | 120   | 1                             | 600-3,000 m                        | 140 cu. in. to 880 cu.in.   | NA   |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Geo Searcher   | 1987/1997                | 69.2 m                 | 12.8 m               | 120   | 1-3                           | 600-1,200 m                        | 140/460 cu. in.   | 3/600/200 m,<br>2/1,200/100 m                                  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Geo Surveyor   | 1982/1995                | 58.4 m                 | 10.5 m               | 120   | 1                             | 600-1,200 m                        | 120 cu. in.   | NA   |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Gardline, Endeavour House, Admiralty Rd., Great Yarmouth, Norfolk NR30 3NG UK                  |                          |                        |                      |   |                               |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Ocean Endeavour  | 2001                     | 77.1 m                 | 14 m                 | 1 x 120   | 1                             | 1,200 m                            | 1 x 2,622   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Sea Explorer   | 1993/1994                | 58.85 m                | 11 m                 | 1 x 120 and 4 x 12                                | 4                             | 150 m, 1,200 m                     | 2 x 2,622   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Sea Profiler   | 1992                     | 65.78 m                | 11.08 m              | 1 x 120   | 1                             | 1,500 m                            | 2 x 2,622   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Sea Surveyor   | 1998/1999                | 64.4 m                 | 11.4 m               | 1 x 120   | 1                             | 1,500 m                            | 2 x 2,622   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Sea Trident  | 1984/1991                | 57.9 m                 | 10.2 m               | 1 x 120   | 1                             | 1,200 m                            | 2 x 2,622   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Kaspmorneftegeophyzzrazedka (KMNG), Moscowkiye Prospect 83, 370033 Baku, Azerbaijan*           |                          |                        |                      |   |                               |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Geofizik-1   | 1989/94                  | 55.78 m                |                      |   | 3                             |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Geofizik 2   | 1989/94                  | 55.78 m                |                      |   | 1                             |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Geofizik 3   | 1989/94                  | 55.78 m                |                      |   | 1                             |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Pendiski   |                          |                        |                      | 1   | 1                             |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| KC Offshore, 36499 Perkins Rd., Prairieville, Louisiana 70769, USA (Affiliate of Veritas DGC)* |                          |                        |                      |   |                               |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Albuquerque  | 1987                     | 39 m                   | 9.7 m                | 1 x 48  | 1                             | 600 m                              | 1 x 200 cu. in.   | 1 x 1 x 1  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Reflection   | 1997                     | 36.5 m                 | 9.1 m                | 1 x 48  | 1                             | 600 m                              | 1 x 200 cu. in.   | 1 x 1 x 1  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| OGS Italy, Borgo Grotta Gigante 42c, P.O. Box 2011, 34016 Trieste, Italy*                      |                          |                        |                      |   |                               |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| OGS Explorer   | 1997                     | 71.9 m                 | 12.8 m               | 6,000 m   |                               | 5,200 m                            | sleeve air gun  |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Offshore Seismic Surveys (OSS), Av. Los Incas 460, San Isidro, Lima 27, Peru*                  |                          |                        |                      |   |                               |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Gulf Supplier  | 1998                     | 55.5 m                 | 11.4 m               | 528 ch  | 3                             | 2,200                              | 2 x 1,020   | 3 x 3,600, 1 x 9,000   |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Oil & Natural Gas Commission, 605 Kailash Bldg., 6th Fl., New Delhi 110701 India*              |                          |                        |                      |   |                               |                                    |   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |
| Sagar Sandhavi   | 1986                     | 70.2 m                 | 15 m                 |   |                               |                                    | 3 x 1,000   |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |  |  |  |  |

| Vessel name   | Year rigged or converted | Total length (m or ft) | Total beam (m or ft) | Streamer configuration (# streamers x # channels) | 2001 average # streamers used | 2001 average streamer length | Source array configuration as rigged (# arrays x capacity, cu. cm.) | Maximum towable footprint (# cables/ length x width in meters) |                     |  | Acquisition capability |    |    | 2001 acquisition experience |    |    | Technical capability    |           |              |                    |                | Onboard processing |         |           | Final primary recording media (type or cartridge #) | Satellite transmission to shore (company used and transmission speed – BAUD #) | Delivery time after survey (days) |               |       |
|---|--------------------------|------------------------|----------------------|---|-------------------------------|------------------------------|---|--|---------------------|--|------------------------|----|----|-----------------------------|----|----|-------------------------|-----------|--------------|--------------------|----------------|--------------------|---------|-----------|---|--|-----------------------------------|---------------|-------|
|   |                          |                        |                      |   |                               |                              |   |  |                     |  | 2D                     | 3D | 4C | 2D                          | 3D | 4C | Shallow transition zone | Deepwater | High density | Ocean bottom cable | Vertical cable | Nav data           | Seismic |           |   |  |                                   |               |       |
|   |                          |                        |                      |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    | QC data | Full data |   |  |                                   |               |       |
| PGS Exploration, 16010 Barker's Point Lane, Suite 300, Houston, Texas, 77079 USA  |                          |                        |                      |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |               |       |
| American Explorer   | 1994                     | 91.5 m                 | 22 m                 | 6 x 240   | 6                             | 5,500 m                      | 2 x 3,090   | 3.6 sq km  |                     |  |                        | x  | x  | x                           |    |    |                         | x         | x            |                    |                |                    | x       | x         | x   | 3590   | 56k                               | 60-90         |       |
| Atlantic Explorer   | 1994                     | 91.5 m                 | 18 m                 | 6 x 240   | 6                             | 5,000 m                      | 2 x 3,090   | 3.6 sq km  |                     |  |                        | x  | x  | x                           |    |    |                         | x         | x            |                    |                |                    | x       | x         | x   | 3590   | 56k                               | 60-90         |       |
| Falcon Explorer   | 1997                     | 81.2 m                 | 16.3 m               | N/A   | N/A                           | N/A                          | 2 x 3,090   | N/A  |                     |  |                        | x  | x  | x                           |    |    |                         |           |              |                    |                |                    |         |           |   |  | 56k                               | 60-90         |       |
| Kondor Explorer   | 1997                     | 60.9 m                 | 13 m                 | N/A   | N/A                           | N/A                          | 2 x 3,090   | N/A  |                     |  |                        | x  | x  | x                           |    |    |                         |           |              |                    |                |                    |         |           |   |  | 56k                               | 60-90         |       |
| Nordic Explorer   | 1993                     | 82 m                   | 16.5 m               | 6 x 240   | 6                             | 5,000 m                      | 2 x 3,090   | 3.6 sq km  |                     |  |                        | x  | x  | x                           |    |    |                         |           |              |                    |                | x                  | x       | x         | 3590  | 56k  | 60-90                             |               |       |
| Ramform Challenger  | 1996                     | 86.6 m                 | 39.6 m               | 16 x 240  | 10                            | 5,000 m                      | 2 x 3,090   | 5.4 sq km  |                     |  |                        | x  | x  | x                           |    |    |                         |           |              |                    |                | x                  | x       | x         | 3590  | 56k  | 60-90                             |               |       |
| Ramform Explorer  | 1995                     | 82 m                   | 39.6 m               | 12 x 240  | 10                            | 6,000 m                      | 2 x 3,090   | 4.8 sq km  |                     |  |                        | x  | x  | x                           |    |    |                         |           |              |                    |                | x                  | x       | x         | 3590  | 56k  | 60-90                             |               |       |
| Ramform Valiant   | 1998                     | 86.6 m                 | 39.6 m               | 20 x 240  | 12                            | 5,000 m                      | 2 x 3,090   | 5.4 sq km  |                     |  |                        | x  | x  | x                           |    |    |                         |           |              |                    |                | x                  | x       | x         | 3590  | 56k  | 60-90                             |               |       |
| Ramform Vanguard  | 1999                     | 86.6 m                 | 39.6 m               | 20 x 240  | 10                            | 6,000 m                      | 2 x 3,090   | 5.4 sq km  |                     |  |                        | x  | x  | x                           |    |    |                         |           |              |                    |                | x                  | x       | x         | 3590  | 56k  | 60-90                             |               |       |
| Ramform Victory   | 1999                     | 86.6 m                 | 39.6 m               | 20 x 240  | 10                            | 6,000 m                      | 2 x 3,090   | 5.4 sq km  |                     |  |                        | x  | x  | x                           |    |    |                         |           |              |                    |                | x                  | x       | x         | 3590  | 56k  | 60-90                             |               |       |
| Ramform Viking  | 1998                     | 86.6 m                 | 39.6 m               | 20 x 240  | 10                            | 5,000 m                      | 2 x 3,090   | 5.4 sq km  |                     |  |                        | x  | x  | x                           |    |    |                         |           |              |                    |                | x                  | x       | x         | 3590  | 56k  | 60-90                             |               |       |
| PGS Seafloor Seismic, 738 Highway 6 South, Houston, Texas 77079, USA  |                          |                        |                      |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |               |       |
| Bergen Surveyor   | 1996                     | 66 m                   | 14.6 m               | N/A   | N/A                           | N/A                          | 2 x 3,690   | N/A  |                     |  |                        | x  | x  | x                           |    |    |                         | x         | x            |                    |                | x                  | x       |           |   |  | 3590                              |               | 60-90 |
| Beulah Chouest  | 1996                     | 59.5 m                 | 12.2 m               | N/A   | N/A                           | N/A                          | 2 x 3,690   | N/A  |                     |  |                        | x  | x  | x                           |    |    |                         | x         | x            |                    |                | N/A                | N/A     | N/A       |   |  | N/A                               |               | N/A   |
| Carlson Tide  | 1995                     | 59.2 m                 | 12.2 m               | N/A   | N/A                           | N/A                          | N/A   | N/A  |                     |  |                        | x  | x  | x                           |    |    |                         | x         | x            |                    |                | x                  | x       | x         |   |  | 3590                              | x             | 60-90 |
| Dickerson Tide  | 1995                     | 59.2 m                 | 12.2 m               | N/A   | N/A                           | N/A                          | N/A   | N/A  |                     |  |                        | x  | x  | x                           |    |    |                         | x         | x            |                    |                | x                  | x       | x         |   |  | 3590                              | x             | 60-90 |
| Jonathan Chouest  | 1996                     | 54.9 m                 | 10.4 m               | N/A   | N/A                           | N/A                          | N/A   | N/A  |                     |  |                        | x  | x  | x                           |    |    |                         | x         | x            |                    |                | x                  | x       |           |   |  | 3590                              | x             | N/A   |
| Ocean Explorer  | 1995                     | 82 m                   | 18 m                 | N/A   | N/A                           | N/A                          | 2 x 3,090   | N/A  |                     |  |                        | x  | x  | x                           |    |    |                         | x         | x            |                    |                | x                  | x       | x         |   |  | 3590                              | 56k           | 60-90 |
| Owen Tide   | 1995                     | 56.1 m                 | 11.6 m               | N/A   | N/A                           | N/A                          | N/A   | N/A  |                     |  |                        | x  | x  | x                           |    |    |                         | x         | x            |                    |                | N/A                | N/A     | N/A       |   |  | N/A                               | x             | N/A   |
| Russian Min. of Energy, Moscow, Russia*   |                          |                        |                      |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |               |       |
| Redjinkin   |                          |                        |                      | 1   |                               |                              | 1   |  |                     |  |                        | x  |    |                             |    |    |                         | x         | x            |                    |                |                    |         |           |   |  |                                   |               |       |
| Seateam, Tveiteråsveien 12, PO Box 133, 5040 Paradis, Bergen, Norway*   |                          |                        |                      |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |               |       |
| Mirfak  | 1986/91                  | 59.3 m                 | 11.7 m               |   |                               |                              | 4 x 40, 160 cu. in.   |  |                     |  |                        | x  |    |                             |    |    |                         | x         |              |                    |                |                    |         |           |   |  |                                   |               |       |
| Seymorneftegeofizika, 17, Karl Marx St., 183025 Murmansk, Russia  |                          |                        |                      |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |               |       |
| Akademik Lazarev  | 1987/96                  | 81.85 m                | 14.8 m               | 1 x 960   | 1                             | 1 x 480 ch                   | 1 x 8,000 m   | 4 x 4,258 cu. in.  | 1 x 1,200 m         |  |                        | x  |    |                             |    |    |                         | x         |              |                    |                | x                  | x       | x         |   |  | 3590                              | 64k           | 7     |
| Akademik Nemchinov  | 1988/97                  | 84 m                   | 14.8 m               | 4 x 500   | 1                             | 1 x 480 ch                   | 1 x 6,000 m   | 6 x 7,084 cu. in.  | 4 x 5,000 m x 450 m |  |                        | x  | x  |                             |    |    |                         | x         |              |                    |                | x                  | x       | x         |   |  | 3590                              | 64k           | 7     |
| Akademik Shatsky  | 1986/91                  | 83.15 m                | 14.8 m               | 2 x 500   | 1                             | 1 x 640 ch                   | 1 x 8,000 m   | 6 x 7,819 cu. in.  | 2 x 5,000 m x 100 m |  |                        | x  | x  |                             |    |    |                         | x         |              |                    |                | x                  | x       | x         |   |  | 3490E                             | 64k           | 7     |
| Iskatel - 3   | 1987/98                  | 49.29 m                | 18.2 m               | 2 x 240   | 1                             | 1 x 240 ch                   | 1 x 3,000 m   | 4 x 2,680 cu. in.  | 2 x 3,000 m x 50 m  |  |                        | x  | x  |                             |    |    |                         | x         |              |                    |                |                    |         |           |   | 3490E  | 64k                               | 10            |       |
| Iskatel - 5   | 1989/97                  | 49.29 m                | 18.2 m               | 1 x 320   | 1                             | 1 x 320                      | 1 x 1,270 cu. in.   | 2 x 1,270 cu. in.  | 1 x 4,000 m         |  |                        | x  |    |                             |    |    |                         | x         |              |                    |                |                    |         |           |   |  |                                   | 45            |       |
| Professor Polshkov  | 1984/94                  | 71.6 m                 | 12.8 m               | 1 x 480   | 1                             | 1 x 480 ch                   | 1 x 6,000 m   | 4 x 3,800 cu. in.  | 1 x 6,000 m         |  |                        | x  |    |                             |    |    |                         | x         |              |                    |                | x                  | x       | x         |   |  | 3490E                             | 64k           | 7     |
| Professor Rjabinkin   | 1989/95                  | 49.9 m                 | 10.5 m               | 1 x 392   | 1                             | 1 x 360 ch                   | 1 x 4,500 m   | 2 x 2,280 cu. in.  | 1 x 4,900 m         |  |                        | x  |    |                             |    |    |                         | x         |              |                    |                | x                  | x       | x         |   |  | 3480                              | 9,6k          | 10    |
| Svitzer Ltd., Morton Peto Rd., Great Yarmouth, NR31 0LT, Norfolk, UK  |                          |                        |                      |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |               |       |
| Svitzer Magellan  | 1990                     | 58 m                   | 12.5 m               | 1 x 120   | 1                             | 1,200 m                      | 2 x 270 cu. in.   | 2 x 50 m   |                     |  |                        | x  |    |                             |    |    |                         | x         | X            |                    |                | x                  | X       | X         |   |  | 3490                              | Inmarsat      | 30    |
| Svitzer Mercator  | 1997                     | 72.9 m                 | 11.6 m               | 1 x 120   | 1                             | 1,200 m                      | 2 x 270 cu. in.   | 6 x 150 m  |                     |  |                        | x  | X  | X                           |    |    |                         | x         | x            |                    |                | X                  | x       | X         |   |  | 3490                              | Inmarsat      | 30    |
| Svitzer Meridian  | 1984                     | 72.5 m                 | 13.82 m              | 1 x 280   | 1                             | 3,500 m                      | 4 x 750 cu. in.   | 2 x 50 m   |                     |  |                        | x  |    |                             |    |    |                         | x         | X            |                    |                | x                  | X       | X         |   |  | 3490                              | Inmarsat      | 30    |
| Thales Survey Group Ltd. (Formerly Racal), Compass House, Davis Road, Chessington, Surrey, KT9 1TB  |                          |                        |                      |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |               |       |
| Baruna Jaya III   | 1988                     | 60.4 m                 | 11.6 m               |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         | x         | x            |                    |                | x                  | x       | x         |   |  |                                   | x             |       |
| MV Askelad  | 1996                     | 34 m                   | 8 m                  | 1 x 48  |                               |                              |   |  |                     |  |                        |    | x  |                             |    |    |                         |           |              |                    |                | x                  | x       | x         |   |  |                                   | x             |       |
| MV Orel   | 1993                     | 60.9 m                 | 13 m                 |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         |           |              |                    |                | x                  | x       | x         |   |  |                                   |               |       |
| Petr Kottsov  | 1991                     | 65.3 m                 | 12.7 m               |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         |           |              |                    |                | x                  | x       | x         |   |  |                                   |               |       |
| Thales Eastern  | 1991                     | 58.9 m                 | 14.5 m               | 2 x 240   | 1                             | 3,000 m                      | 4 x 10 cu. in., 4 x 20 cu. in., 4 x 40 cu. in., 2 x 640 cu. in.     |  |                     |  |                        | x  | x  |                             |    |    |                         |           |              |                    |                | x                  | x       | x         |   |  | 3480                              | x             |       |
| Thales Venturer   | 1992                     | 89.5 m                 | 14.4 m               | 1 x 960   |                               |                              | 2 x 5,200 cu. in.   |  |                     |  |                        | x  | x  |                             |    |    |                         |           |              |                    |                | x                  | x       | x         |   |  |                                   | x             |       |
| TL Geohydrographics (Teknik Lengkap), Tingkat 15, Menara 2, Faber Towers, Jalan Desa Bahagia, Taman Desa, Off Jalan Klang Lama, 58100 Kuala Lumpur, Malaysia* |                          |                        |                      |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |               |       |
| Teknik Glora  | 1996                     | 64.91 m                | 10.1 m               | 600 m GX600                                       | 1                             | 1 plus 50% spares            | 600 m   | 1 x 160 cu. in.  |                     |  |                        | x  |    |                             |    |    |                         |           |              |                    |                | x                  | x       | x         |   |  | 3490                              | Inmarsat B    | 30    |
| Teknik Kembara  | 1993                     | 56.4 m                 | 12.2 m               | 1,500 m GX600                                     | 1                             | 1 plus 50% spares            | 1,500 m   | 2 x 160 cu. in.  |                     |  |                        | x  |    |                             |    |    |                         |           |              |                    |                | x                  | x       | x         |   |  | 3490                              | Inmarsat B    | 30    |
| Veritas DGC, 3701 Kirby Dr., Houston, Texas 77098, USA  |                          |                        |                      |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |               |       |
| Pacific Sword   | 1999                     | 57.7 m                 | 12.2 m               | 1 x 480   | 1                             | 6,000 m                      | 1 x 3,500 cu. in.   | TBD  |                     |  |                        | x  | x  |                             |    |    |                         |           |              |                    |                | x                  | x       | x         |   |  | 3590                              | VSAT 64k baud | 1     |
| Seisquest   | 2001                     | 92.2 m                 | 18.5 m               | 8 x 480   | 8                             | 6,000 m                      | 2 x 4,500 cu. in.   | TBD  |                     |  |                        | x  | x  |                             |    |    |                         |           |              |                    |                | x                  | x       | x         |   |  | 3590                              | VSAT 64k baud | 1     |
| Veritas Searcher  | 1996                     | 66.1 m                 | 13.4 m               | 1 x 480   | 1                             | 6,000 m                      | 1 x 3,500 cu. in.   | TBD  |                     |  |                        | x  | x  |                             |    |    |                         |           |              |                    |                | x                  | x       | x         |   |  | 3590                              | VSAT 64k baud | 1     |
| Veritas Vantage   | 2002                     | 93.35 m                | 22 m                 | 8 x 640   | 8                             | 8,000 m                      | 2 x 4,500 cu. in.   | TBD  |                     |  |                        | x  | x  |                             |    |    |                         |           |              |                    |                | x                  | x       | x         |   |  | 3590                              | VSAT 64k baud | 1     |
| Veritas Viking  | 1998                     | 93.35 m                | 22 m                 | 8 x 480   | 8                             | 6,000 m                      | 2 x 4,500 cu. in.   | TBD  |                     |  |                        | x  | x  |                             |    |    |                         |           |              |                    |                | x                  | x       | x         |   |  | 3590                              | VSAT 64k baud | 1     |
| Veritas Viking II   | 1999                     | 93.35 m                | 22 m                 | 8 x 480   | 8                             | 6,000 m                      | 2 x 4,500 cu. in.   | TBD  |                     |  |                        | x  | x  |                             |    |    |                         |           |              |                    |                | x                  | x       | x         |   |  | 3590                              | VSAT 64k baud | 1     |
| WesternGeco, Schlumberger House, Buckingham Way, Gatwick Airport, West Sussex, RH6 0NZ UK*  |                          |                        |                      |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |               |       |
| WesternGeco elected not to participate in this year's survey and requested that their fleet not be listed.  |                          |                        |                      |   |                               |                              |   |  |                     |  |                        |    |    |                             |    |    |                         |           |              |                    |                |                    |         |           |   |  |                                   |               |       |