



PRAKLA-SEISMOS AG



SV MINTROP

AN ADVANCED MARINE SEISMIC SURVEY TOOL

SV MINTROP Fulfills the Exploration Requirements
of Marine Oilfield and Gasfield Operators
by Offering the Highest Standards
in Today's Comprehensive Marine Seismics





▲ Mast table to fit various antennae of radio survey systems in one beamline

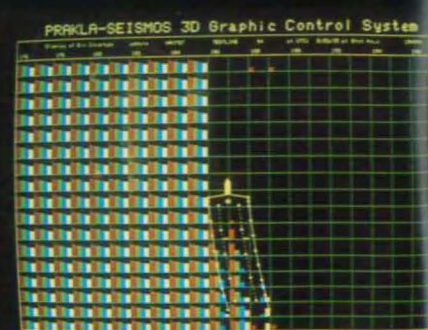
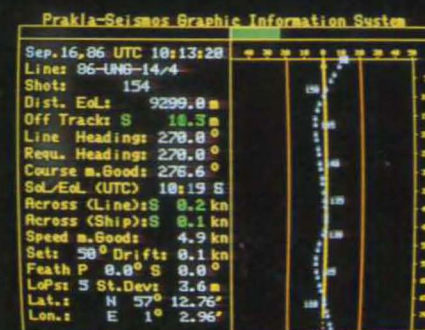
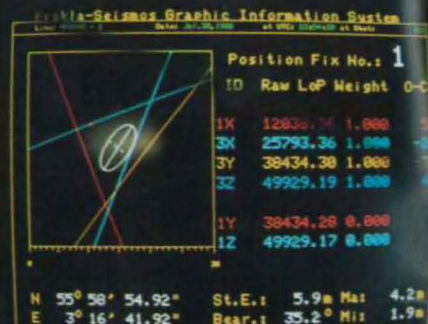
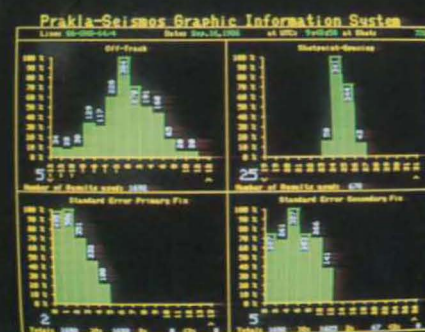


▲ Bridge — all controls and video screens are within easy reach

▼ NAVDATA 3000 with its peripheral instrumentation



▼ Graphs from the NAVDATA 3000 and 3-D graphic control system



THE ESSENTIAL INSTRUMENTATION OF SV MINTROP

NAVIGATION SYSTEM NAVDATA 3000

Two LSI-11/73 computers calculate 3 individual radio fixes per second. Sat-nav and GPS fixes are edited independently by the MAGNAVOX 1107 GPS in respective cycles.

All non-seismic data are recorded simultaneously on magnetic tape and disc for mutual verification after line completion.

Optimum positioning of a seismic line is guaranteed by an advanced process control system which guides the vessel with its deployed sources and sensors along the determined line. Closeness to true line track depends very much on the intelligence of the realtime editing and smoothing algorithms in the integrated positioning system. The status of all con-

certed computations undertaken during operation is visible on colour screens and continuously depicted as graphs, such as:

- LOP graph showing:
Lines of position (LOP) with "error ellipse", raw LOP values of the primary and secondary radio fix, their weighting factors and residual errors.
- Bar graph of line statistics showing:
Off-track error, shotpoint spacing, standard deviation of primary fixes and secondary fixes.
- Track graph showing:
On-line tracking situation and all information in text display required for the operation, updated every 1 to 3 s.

3-D GRAPHIC CONTROL SYSTEM

Securing a uniform coverage in a 3-D prospect area is obtained from an advanced 3-D graphic control system operated by a 16 bit multiprocessor-based computer system for high-speed computation providing instant references such as:

- Binning graphs:
Graphs of the 3-D binning control system depicting in realtime the bin fill-in situation with single or dual streamer operation.

- Streamer-shape graph showing:
Horizontal and vertical shape of one or two streamers with scaled sea-bottom sounding.
- Bar graph showing:
C-O differences of angles of heading sensors and the statistical error of angle values.
- Graph showing:
Heading sensors' course values versus distance.

PRECISION DIRECTION FINDING SYSTEM (PDF)

The PRAKLA-SEISMOS PDF operates on the SHF band by comparing the phase angle of a continuous wave, transmitted from the streamer tailbuoy. The PDF continuously pro-

vides the angle between true North and the streamer tail buoy. The accuracy is to within ± 0.2 degree.

Hardcopies of all relevant information of the NAVDATA 3000 and 3-D graphic control system are plotted and printed simultaneously.

AIRGUN ARRAY CONFIGURATION

The airgun array concept on board SV MINTROP is realized by 6 sub-array strings of which two in each case represent an individually tuned airgun array of 22.58 litres (1377.92 cu.in.). Therefore a total airgun volume of 67.74 litres is available and can be fired at intervals of 8 s, thus providing a variety of source power to meet the operators individual area airgun array requirements.

- Three different airgun arrays are ready for use without string modification:

Volume	Power output	Filter
22.58 litres (1377.92 cu.in.)	34.0 bar m, 6 m gun depth, 128 Hz/18 dB	
45.16 litres (2755.83 cu.in.)	68.0 bar m, 6 m gun depth, 128 Hz/18 dB	
67.74 litres (4133.75 cu.in.)	102.0 bar m, 6 m gun depth, 128 Hz/18 dB	

Operating pressure: 140 bar (2030 psi approx.)

- All three airgun arrays produce an identical signal with mainly similar frequency characteristics, and similar signal-to-bubble ratio when deployed at the same water-depth.

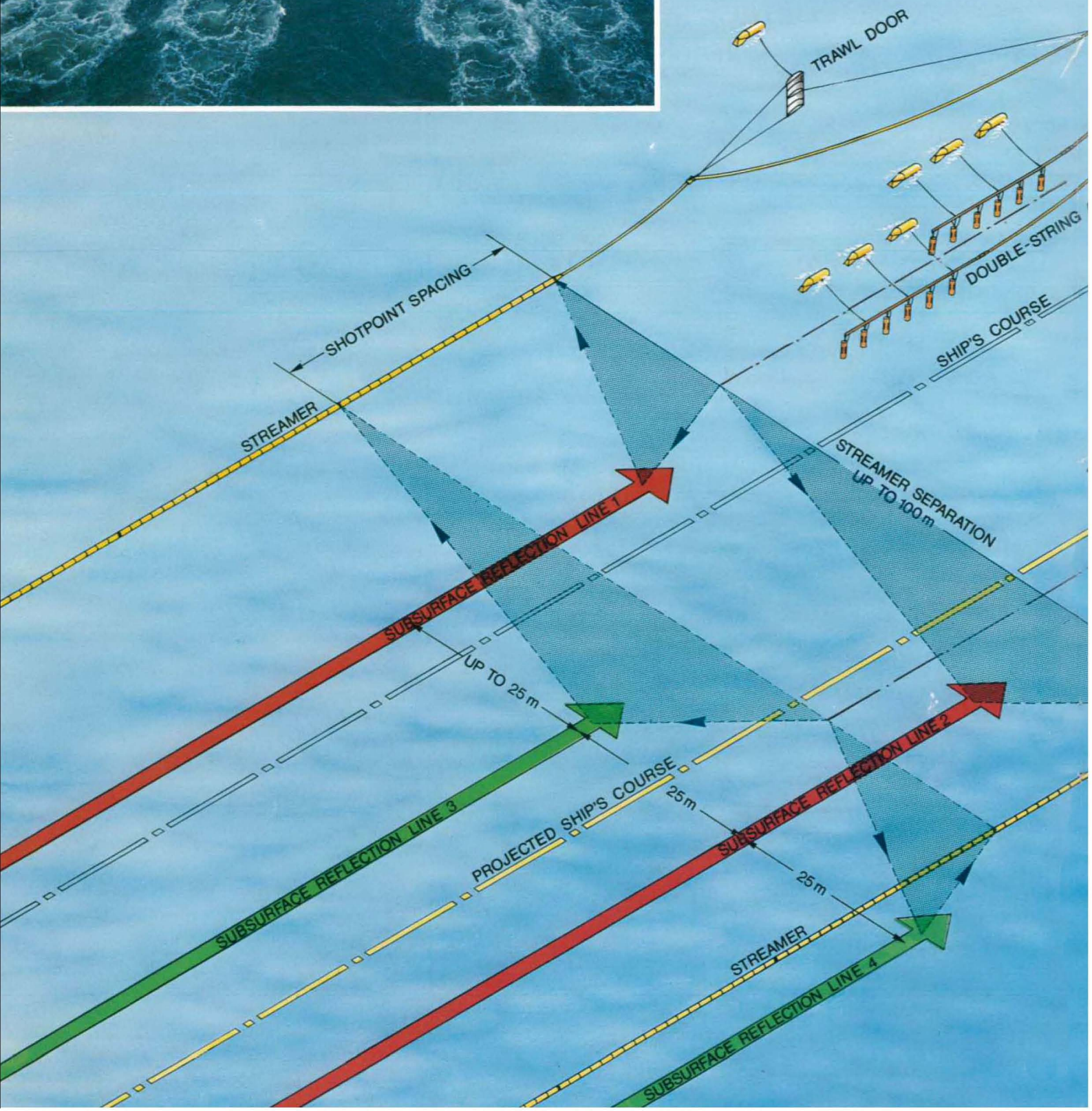
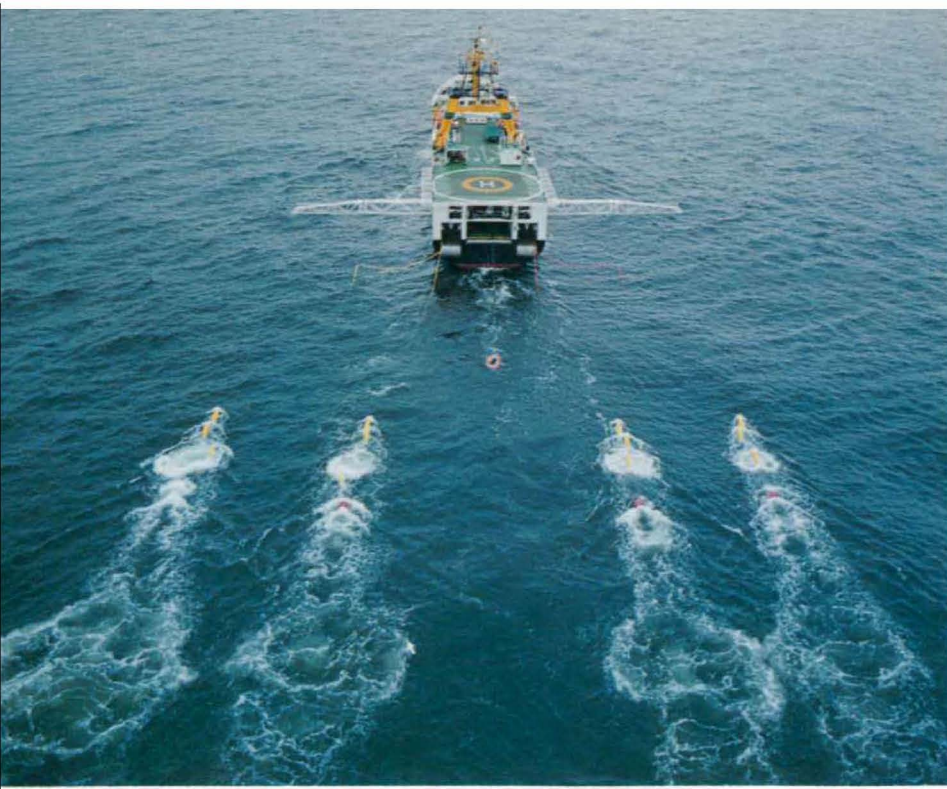
- Alternate or sequential firing of two or even three airgun arrays of 22.58 litres.
- Quick change from one array configuration to another, e.g. lateral, longitudinal or combined.
- Individual air supply to each airgun of the array is provided from the shipboard manifold, thus malfunctioning airguns can be cut off.
- Spare airguns are on standby to replace important airguns which are cut off during operation.
- Near-field signal signatures are recorded from the individual single airgun and airgun clusters, the same sensors provide the respective airgun depths which are stored in the header of each seismic record.

AIRGUN SYNCHRONIZATION

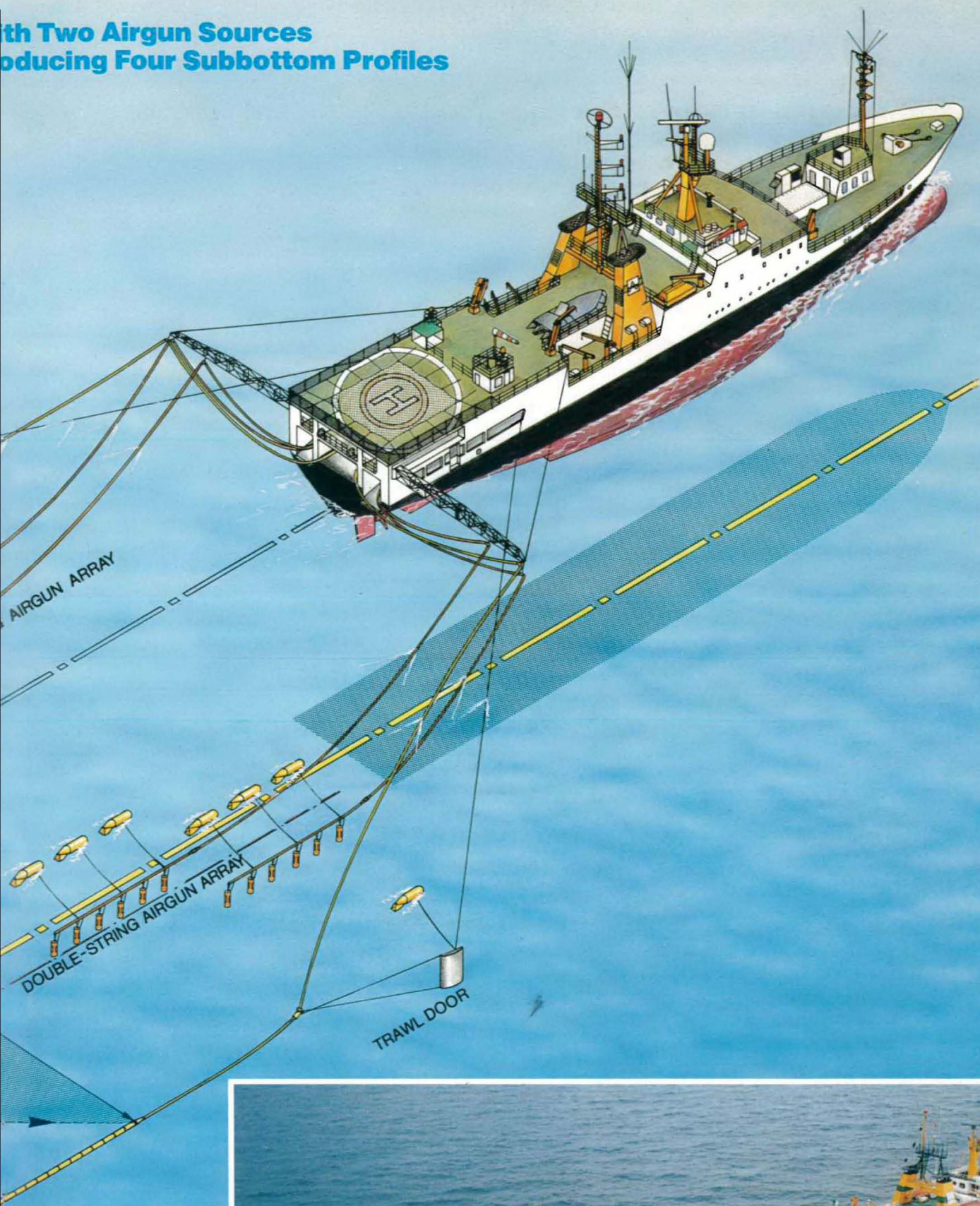
In a tuned airgun array the individual airguns unavoidably drift to a small extent from their offset points. Manual monitoring and correction of a large number of airguns of varying size is almost impossible. Therefore a microcomputer enables continuous control and adjustment of the individual airguns.

- An extended VZAD airgun synchronizing system from PRAKLA-SEISMOS handles 60 individual airguns simultaneously.
- Synchronization adjustment of each individual gun is performed in steps of 0.2 ms for accuracy of ± 1.0 ms.

Dual Streamer Spread with Operating Alternately Pro



With Two Airgun Sources Producing Four Subbottom Profiles



SEISMIC STREAMER AND RECORDING SYSTEM SYNTRAK 480

The SYNTRAK 480 Marine Digital Telemetry System relegates the problems of marine seismic data gathering, for example when hard-wired streamers of up to 240 or even more hydrophone groups are used, to a thing of the past.

The SYNTRAK 480 system provides a range of components and features, in conjunction with multiplicity, such as:

- Single streamer operation — 6000 metre streamer with 480 seismic channels — or dual streamer operation — two 3000 metre streamers with 240 seismic channels each.
- Various lengths of hydrophone groups, such as 6.25 m, 12.50 m, 18.75 m, 25.00 m, 37.50 m and 50.00 m.
- Only 37-pin section connectors.
- Instantaneous sampling and digitizing of twelve seismic channels by each titanium encased acquisition module. A maximum of 480 seismic channels can be digitized by means of 40 acquisition modules with a one millisecond sampling rate.
- Realtime resampling of 2 or 4 ms is handled by a unique linear digital filter.
- Comprehensive quality control circuits are included in each acquisition module, which provide system impulse response, amplifier noise, dynamic resolution, harmonic distortion, channel gain accuracy, D.C. offset, cable noise, and hydrophone leakage testing.
A unique streamer power monitoring system provides instant feedback and insulation of power leakage to ground. Internally mounted pressure transducers provide precise streamer depth information at each acquisition module.
- The shipboard system of SYNTRAK 480 is interfaced with the GOULD-SEL/STC recording system. All streamer related operations are controlled by a shipboard telemetry processor which formats seismic data into dual asynchronous scan buffers for transfer to the host recording system. Streamer telemetry communications, telemetry error status, streamer diagnostics, depth display and operator control are provided by this processor.
- Recording format: SEG-D 8015 (demultiplexed). Packing density: 6250 BPI.
- PRAKLA-SEISMOS system-control unit ZXCD provides microprocessor handling of shot control, extended header assembly and observer's automatic logging.

Further components attached to the streamer provide information and active control of the streamer:

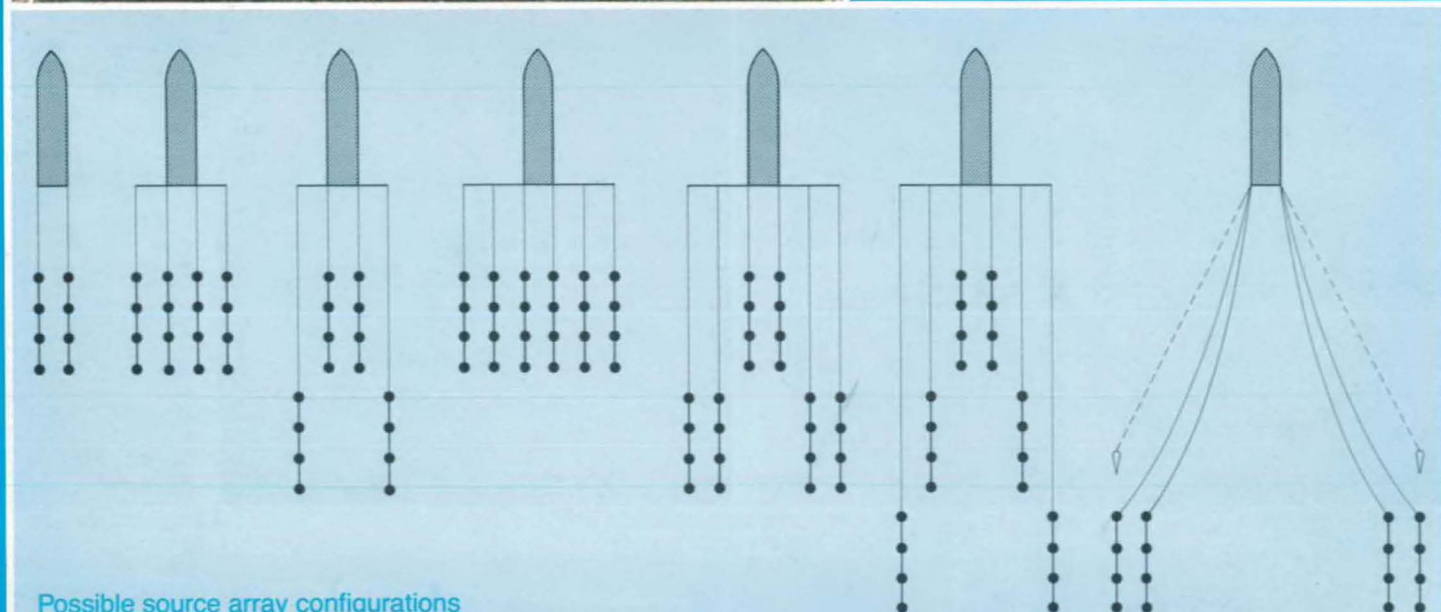
- Horizontal streamer shape monitored by means of the SYNTRON heading sensors, and the vertical streamer shape monitored by the pressure sensors in the SYNTRON depth controllers and SYNTRON heading sensors.
- Active control of the streamer depth is maintained by means of the SYNTRON depth controllers, the proper balance of the streamer is monitored by the indication of the angle of attack of the controller's wings.
- SYNTRON retrievers prevent the streamer from sinking to dangerous waterdepths and support quick recovery when the streamer is disconnected from the survey vessel.



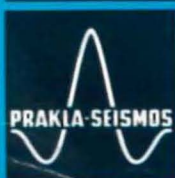
Source variety in conjunction with multiple digital streamers gives multiplicity which corresponds to the needs of improved directivity and of control of source generated noise.

PRAKLA-SEISMOS' tuned airgun arrays of different sizes have proved a success for more than 20 years. They are capable of achieving high resolution and deep penetration.

It is intended to equip the vessel with an established watergun system to be operated as an alternative source from mid 1987 onwards.



Possible source array configurations



PRAKLA-SEISMOS AG · BUCHHOLZER STR. 100 · P.O.BOX 51 05 30
D-3000 HANNOVER 51 · FEDERAL REPUBLIC OF GERMANY
PHONE: (5 11) 64 20 · TELEX: 9 22 847 + 9 22 419 + 9 23 250 · TELEFAX: 6 47 68 60
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