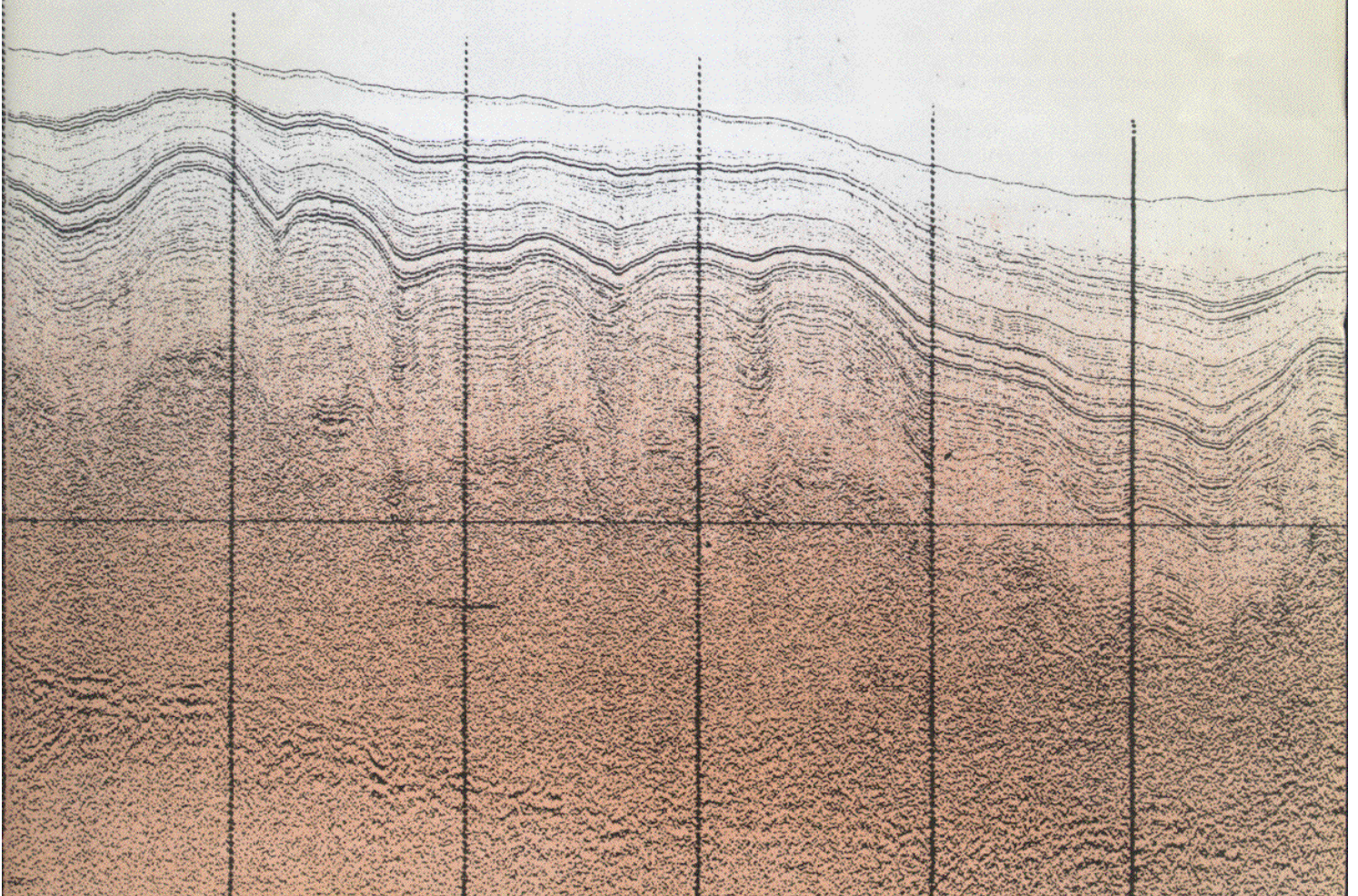


Hydrosonde DeepTow Seismic System



INTRODUCTION

The Huntec Hydrosonde DeepTow Seismic (DTS) Systems are a family of high resolution seismic profilers incorporating optional Side Scan Sonar. A patented method of correcting data for variations in towfish depth and heave motion enables the system to produce accurate profiles of the seabed under the harsh weather and sea conditions frequently encountered over continental shelves and margins.

DTS Systems provide highly detailed information concerning the topography and first 150 metres of the sea floor in water depths from 20 metres to 1500 metres.

Outputs of the system include superb graphic recordings with very fine resolution as well as a quantitative measure of small scale surface roughness, hardness and variability of the sea floor. This data in combination

with the records from the integral side scan sonar provide the comprehensive suite of information required for seafloor engineering and geological studies.

The system may also be configured to include a sparker. This allows the user the flexibility to obtain high resolution records in very stiff sediments or in areas where greater penetration is desired.

SYSTEM DESCRIPTION

Towfish

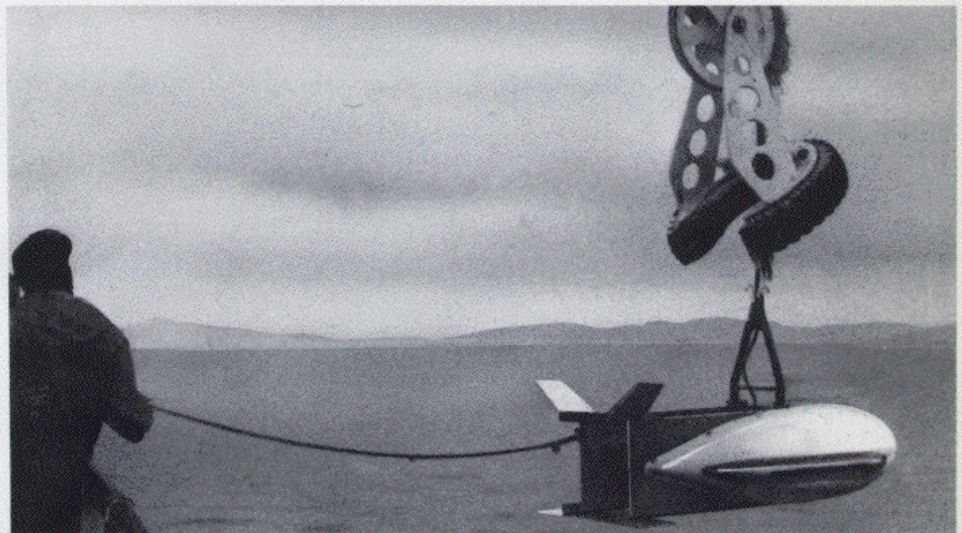
The Towfish provides deployment of the sound source and receiving hydrophones close to the seabottom. The sound source is a pressure compensated 500 to 1000 joule boomer which generates a high intensity short time duration pressure pulse with well defined directional characteristics. The energy is distributed over a bandwidth of 500 Hz to over 6 kHz providing both high resolution and penetration acoustic components.

The boomer is driven by the discharge of energy from the Energy Storage Unit (ESU) housed in the towfish. Therefore the radiated source energy is independent of the depth of the towfish.

The internal hydrophone is mounted just below the centre of the boomer plate, shielding it from downward travelling acoustic signals and noise. The system also includes a ten element seismic streamer to provide a second channel of information. The streamer hydrophone has a better signal to noise ratio at low frequencies than the internal hydrophone, resulting in greater penetration in hard bottom areas.

System Console

The system console is a standard 18 in. mainframe housing the signal conditioning and calibrating modules of the unit. The two channel processor units and Adaptive Signal Processor (ASP) serve to normalize, filter and condition the seismic signals for presentation to the graphic and tape recorders. The Body Motion Compensator (BMC) determines the position of the towfish relative to mean sea level datum via sensors within the fish and adjusts the sound source trigger pulse



Subbottom profiler and side scan sonar – one winch – one cable – one towfish.

from shot to shot accordingly. The end results of this process are high resolution profiles unaffected by heavy sea states.

The system console also houses a visual and audio alarm to alert the operator in the event of moisture in any of the tow fish units.

Power Control Unit (PCU)

The Power Control Unit supplies the high voltage dc power and trigger signals to the Energy Storage Unit. Power supply can be adjusted from 2 kVA to 6 kVA, providing a corresponding adjustment of output from the sound source from 50 joules to 1000 joules.

Graphic Recorder

The Hydrosonde DTS System accommodates most standard dry or wet paper recorders. The only two requirements are that the recorder provide a TTL level output pulse to mark

the start of the sweep, and have the facility to be synchronized to an external TTL level trigger pulse.

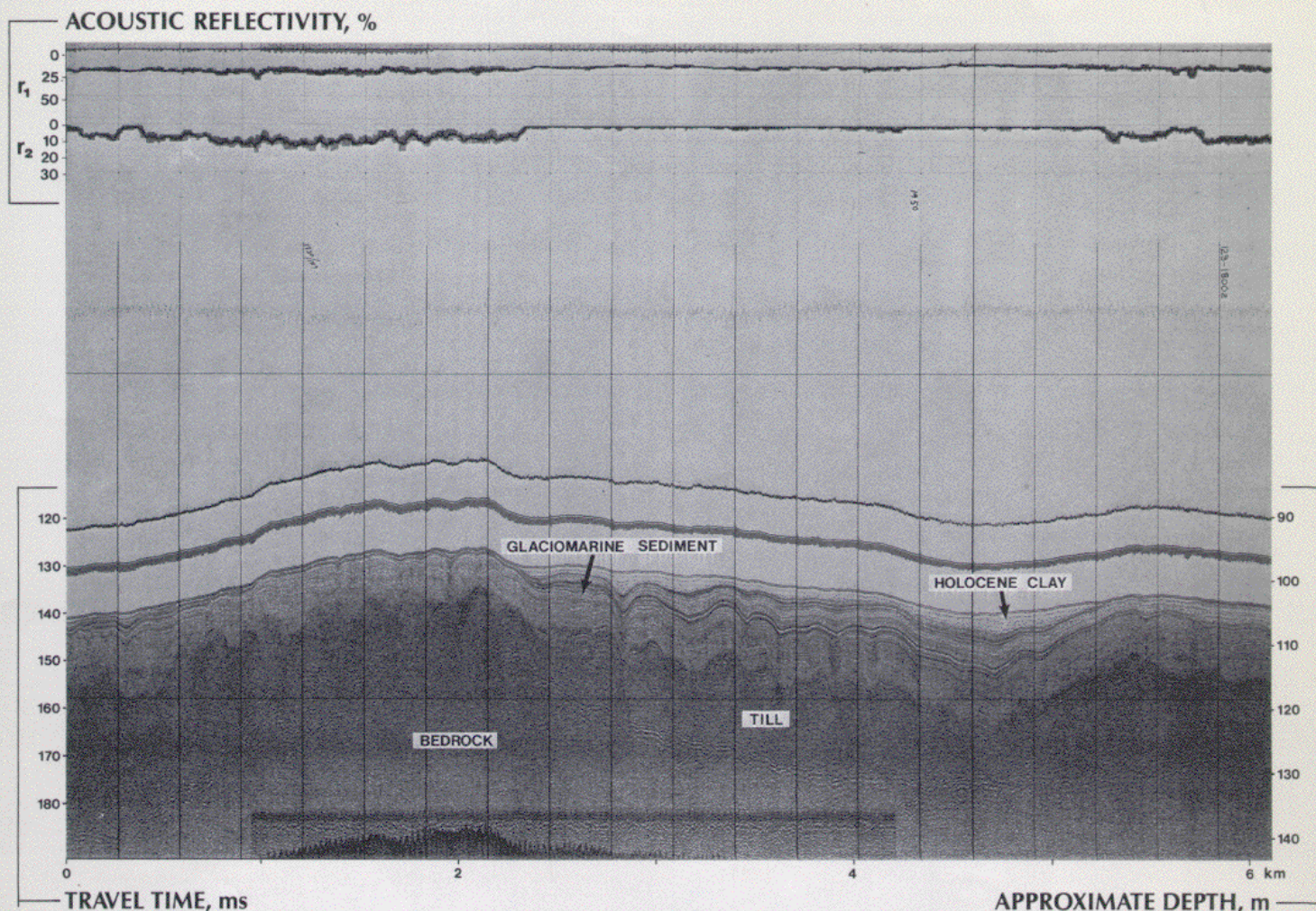
Tape Recorder

The tape recorder should have four channels with a bandwidth preferably greater than 10 kHz. The taped data may be recovered on board by playing back through the system console onto the Graphic Recorder.

Acoustic Reflectivity Unit (ARU)

The Acoustic Reflectivity Unit measures the strength and distribution of the energy in two time windows following the bottom arrival. The magnitude and statistical variation of these signals are calculated in real time and displayed on the graphic record along with the seismic section. Together the ARU record and the seismic section enable quantitative classification of sediment type and texture.

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SAMPLE PROFILE

Huntec DeepTowed Seismic (DTS) high resolution profile and reflectivity metrics from the Eastern Canadian Continental Shelf.

The seismic section shows four well defined geological units. The bedrock surface is marked by a relatively strong reflection at depth which can be traced across the entire record. Stratification in the bedrock is well resolved to depths of 8-10 metres and helps to identify it as part of a sequence of well indurated Cambrian-Silurian sediments. Overlying the bedrock is a deposit of till characterized by a uniformly high grey level and lack of coherent reflections. The surface of the till undulates, and where exposed at the surface, in nearby areas, forms ridges. Overlying the till is a 15 metre thick deposit of glaciomarine sediment characterized on the seismic section by closely spaced coherent reflections. Sampling indicates that the unit is composed of poorly sorted,

weakly banded silt with interspersed sand and gravel. Overlying the glaciomarine sediment is a deposit of Holocene marine clay characterized by weak continuous reflections and a low grey level on the seismic section.

In addition to the seismic profile, the record contains several graphic displays of the acoustic reflectivity of the seabed. At the top of the record is a display of the distribution of energy reflected from the seabed for a running block of 20 shots; while two separate measures of the peak amplitude of each individual reflection are shown immediately above the seabed. At the contact between the clay and the glaciomarine sediment, there are changes in both the character and amplitude of the reflectivity profiles. Over the deposit of clay, the r_1 profile shows values of 15 to 20% with little variation in the values. The r_2 profile shows low, uniform values of 1% indicating a homogenous sedi-

ment within the first metre of the seafloor and a low surface roughness. Over the glaciomarine sediment the reflectivity values are both higher and more varied than those over the clay. This is caused by an increase in the impedance contrast between the sediment and the water; indicating a decrease in the porosity and an increase in the grain size of the sediment. The variations in the reflectivity values are caused by an increase in the surface roughness and a decrease in the homogeneity of the sediment. Note how the small pockets of clay at the extreme left of the record affect the reflectivity profiles.

The addition of the reflectivity profiles to the seismic section has provided valuable information to the interpreter of the data for use in his investigation of the geological characteristics of the area.

FEATURES AND CAPABILITIES

- Tow speeds to 8 knots, 10 knots maximum.
- Maximum Towfish depth 500 metres.
- Operation in water depths from 20 metres to 1500 metres.
- Penetration of 100 metres in soft sediments 40 meters in sand when in boomer mode. Penetration of 80 metres in sand when in sparker mode.
- Layer resolution at the seafloor of 10 cm.
- Horizontal resolution equal to elevation of towfish above bottom.
- Adjustable firing rates and source energy to meet a wide range of survey requirements and geological situations.
- Energy Storage Unit contained in Towfish eliminating cable transmission losses.
- Boomer pulse shape and intensity independent of depth due to automatic depth compensation.
- Automatic calibration of each shot.
- Unique Body Motion Compensator allows operation in up to Beaufort Sea State 7.
- Available with 50 kHz and 100 kHz Side Scan Sonar.
- 500 joule sparker option allows greater survey flexibility.
- Can be run with one channel dedicated to resolution data, the other to penetration data.

SPECIFICATIONS

FUNCTIONAL

Tow Speed	2-8 knots, 10 knots maximum.
Maximum Tow Depth	300m or 500m.
Water Depth	20m-1,500m.
Layer Resolution	10cm or 20cm.
Frequency Spectrum	500Hz - 8kHz.
Source Input Energy	60J - 540J or 120 - 1,080J, selectable.
Source Characteristics	Broadband 0.34ms duration, 217dB/1 μ Pa at 1m.
Source Firing Rate	Typically 1 shot/sec., 25 shots/sec. maximum.
Time Variable Gain (TVG)	Spreading correction and adaptive sediment attenuation.
Body Motion Compensation	Removes effective heave motion on graphic record.
Options:	
Sidescan Sonar (SSS)	50kHz - 1.5°, 100kHz - 1.0°.
Sparke Source	Multitip electrode, 500J input.
Reflectivity Metrics	To absolute measures computed and displayed.
Fish Positioning Beacon	User selectable.
Winch	300m, 600m or 900m cable capability.

POWER REQUIREMENTS

Systems Console	115V AC, 100W, 50/60Hz, single phase
Power Control Unit (PCU)	115V/230V AC, 3kVA, 50/60Hz, single phase.

MECHANICAL

Towfish Assembly

Dimensions	DT500Lg., DT1000Lg. -184cm (72-3/8") x 126cm (49-3/8") x 52cm (20-5/16").
(with SSS)	DT500Sm., (66-1/4") x 113cm (44-3/8") x 52cm (20-5/16").
Weight	DTL1000Lg. - 476kg, DT500Sm. - 369kg.

Power Control Unit (PCU)

Dimensions	56cm (21-3/4") x 46cm (18") x 60cm (22-3/4").
Weight	93kg (205 lb.).

Systems Console

Dimensions	49cm (19") x 31cm (12") x 14cm (5-1/4").
Weight	12kg (25 lb.).

Tow Cable

	<u>21-Conductor Cable</u>	<u>14-Conductor Cable</u>
Diameter	2.1cm (0.815")	1.6cm (0.645").
Weight in Air	862 lb./1,000 ft. (1.3kg/m).	560 lb./1,000 ft. (0.8kg/m).
Minimum Recommended Sheave Diameter	61 cm (24").	56 cm (22").

ENVIRONMENTAL

Ship Electronics	0 to 45° C (32 to 113° F).
Towfish	0 to 45° C (32 to 113° F).
Storage	-50 to 150° C (-58 to 302° F).

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