



OPERATIONS REPORT  
MARINE SEISMIC SURVEY  
BASS STRAIT  
BCS-81 (TAS T.14P)

FOR

CUE MINERALS  
153 DORCAS STREET,  
SOUTH MELBOURNE. VIC. 3205

CLIENT REPRESENTATIVE                      J. NEEDHAM

BY

GEOPHYSICAL SERVICES INTERNATIONAL  
P.O. BOX 106, NORTH RYDE, N.S.W. 2113

PARTY 2931 : M/V "EUGENE McDERMOTT II"

RECORDING DATES: FEBRUARY 20 - FEBRUARY 24, 1981.



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SECTION I

INTRODUCTION

A Marine Seismic Survey was conducted by Geophysical Services Incorporated using the M/V "Eugene McDermottII" in the Bass Strait area for Cue Minerals, between February 20 and February 24, 1981.

The survey consisted of 550.375 kilometres of 48 fold reflection coverage utilizing a 2400 metre streamer under continuous tow in conjunction with a Pneumatic Acoustic Energy Source (AIRGUNS). Operations were generally conducted 24 hours a day.

Recordings were made using one set of DFSV instruments with two tape transports. Records were made on 12.7 mm magnetic tape in 9 track 1600 BPI Seg. B. digital format (see Section II Instruments).

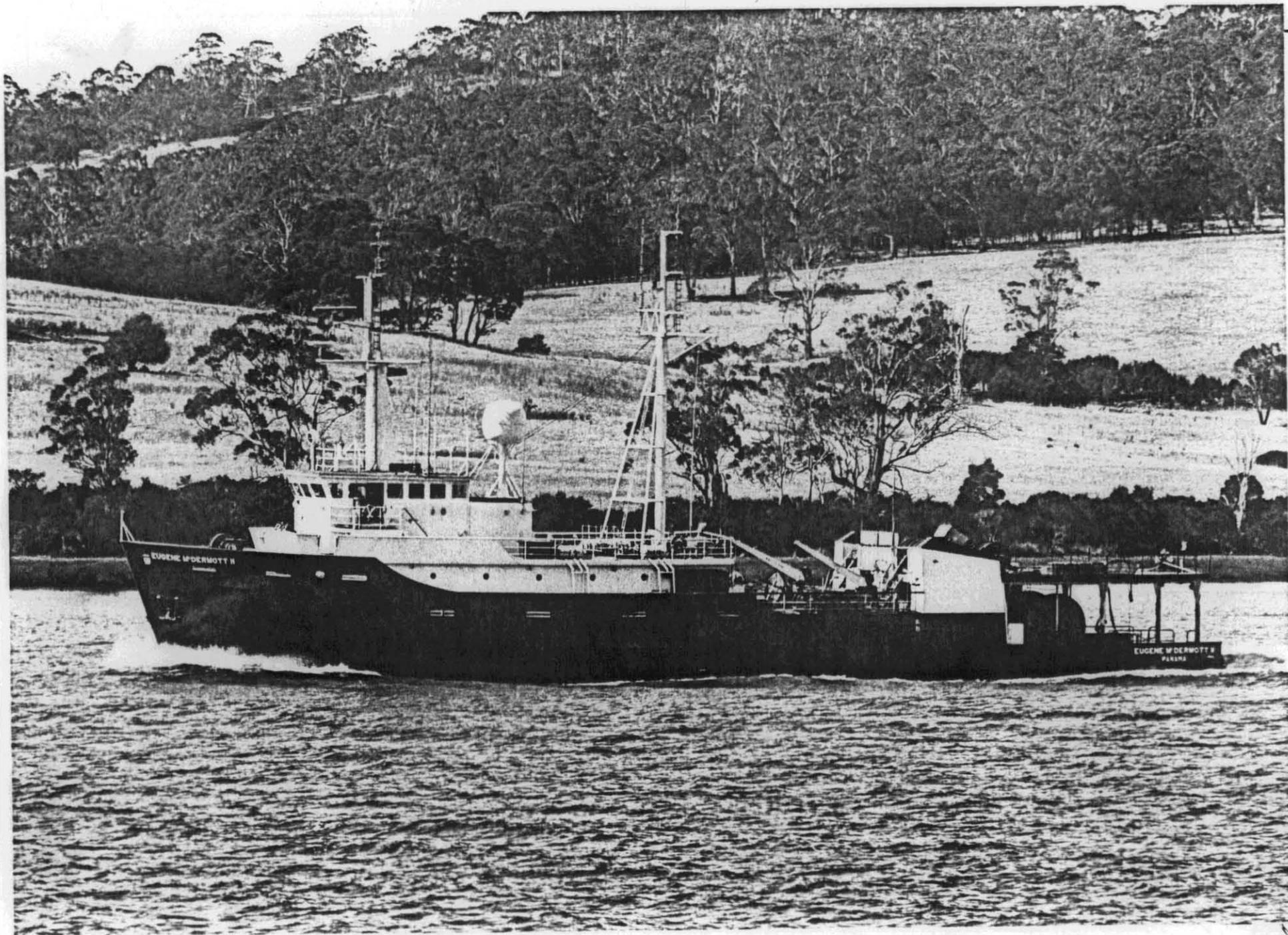
The ships location was determined by Maxiran, a precise radio location system, owned and operated by O.N.I. (see Section II - Survey).



A. SURVEY VESSEL

M.V. "EUGENE McDERMOTT II"

Flag	Panama
Homeport	Panama
Trade	Foreign Going-Seismic Exploration
Owners	Geophysical Service Inc.
Call Sign	H0 9376
Length	52.73 metres L.O.A.
Breadth	12.19 metres
Depth	4.27 metres
Draft	3.05-3.24 metres
Official Number	7062 - PEXT - 1
Gross Tonnage	929.89 tonnes
Net Tonnage	249.09 tonnes
Engine Power	2 x 839.25 HP engines





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SECTION I

## B. KEY PERSONNEL

February 20 - February 24, 1981

Client Representative	J. Needham	
Australia Marine Manager	R. Miles	
Party Manager	C. Orr	
Vessel Controller	A. Welfare	
Jr. Geophysicist	W. Lloyd	
	A. Cairns	
Instrument Engineers	D. Kenny	
	F. Hemmings	
Junior Observers	J. Anheuser	
	T. Hess	
Survey Operators	I. Johnson )	} CMS II
	J. Hennessey )	
	D. Taylor )	} ONI
	A. Hennessey )	
Compressor Mechanics	W. Jenkins (Dallas)	
	J. Simmons	
Airgun Mechanics	P. Stephanovich	
	P. Ferrier	
	P. Harris	
	D. Mercadante	
	M. Clark	



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SECTION I

## B. KEY PERSONNEL ( Contd.)

Captain	M. Gusterson
First Mate	G. Nilsen
Boat Manager	J. Stanton
Administrator	L. Williams



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SECTION 11

EQUIPMENT

A. INSTRUMENTS

One Texas Instruments DFS V system consisting of two analog modules, a control module and two  $\frac{1}{2}$  inch tape transports was used for this survey. Recordings were made in SEG. B format (see Plate 2A, B,C) at 1600 BPI.

Prior to beginning the survey, on January 27th a full calibration and set of instrument tests as recommended by Texas Instruments were performed on the DFS V instruments by onboard G.S.I. personnel. These tests, recorded on both magnetic tape and paper camera records, were couriered to the G.S.I. processing centre in Sydney for immediate analysis by their TIMAP system. The instrument tests included, converter linearity, dynamic range determination, equivalent input noise, gain accuracy, harmonic distortion, crossfeed and skew. All tests met with both Texas Instruments and client standards.

The DFS V instruments were calibrated for 96 channel, 2 ms sampling rate with a 128HZ @ 72db/octave high-cut filter and a 8HZ @ 18db/octave low-cut filter.

Instrument tests were performed each day and the results examined in analog form onboard. These tests consisted of: dynamic range determination, amplifier noise, automatic gain control, tape speed and skew checks.

SECTION 11

## A. INSTRUMENTS (contd.)

Tapes recorded on each transport were frequently replayed on the other transport as a confirmation of readability.

The performance of the recording instruments was in general, very good. On a few occasions, after backing up for the start of a record, the transport would then run forward but fail to write any data whatsoever. Consequently the DFS Start was recorded as being missed. No fault was indicated on the status display and after changing to the other transport, the system functioned correctly. This fault was not restricted to either transport. The resultant missed shotpoints were relatively few.

All data was recorded on  $\frac{1}{2}$ , Stotch brand magnetic tape. Although the problem just related could have been attributable to bad tapes, it was never definitely established.

SECTION II

## A. INSTRUMENTS (contd.)

## Instrument Details

Recording System : DFS V Serial Number 306  
Tape Transports : Two, T.I. DFS V 10 inch,  
9 track  
Tape Format : SEG B, phase encoded 1600 BPI  
Tape Speed : 79.375 ips e

No. Words/Data Scan : 127  
No. Words/Header : 114 (+16 from extender header)

Channels Seismic : 1 -96  
Waterbreaks : Aux. channel 1+2

Recording method : IFP  
Sample Period : 2 ms  
Record Length : 5 seconds  
Gain Control Mode : P.G.C.  
Gain Constant : 24 db  
Final Gain : 108 db

Dynamic Range  
(referred to input  
noise) : 84 db

Filters  
High-cut : 128HZ @ 72 db / octave  
Low-cut : 8 HZ @ 18 db / octave

SECTION 11

## B. ANCILLARY EQUIPMENT

## SERVO PROFILER

Manufacturer	:	EPC Labs Inc.
Model		4600 Graphic Recorder
Serial Number		371
Source		Trace number 94
Record Length		4 seconds
Gain Mode		AGC
Filters		
High-cut		128 HZ @ 72 db/octave
Low-cut		8 HZ @ db/octave

NOTE:

The graphic recorder input is from the analog reproduce section of the DFS V.

The profiler was marked approximately every kilometre along all lines.

Early in the prospect, the profiler became defective and much of the section for line BCS81-03 was missed. The problem was caused by a build up of self generated dust in the stylus section of the unit and once cleaned, the unit functioned normally.

The stylus was replaced by a new one on two occasions but the short life of these was probably due to inexperience of the fitting procedure by the operator on shift.

SECTION II

## B. ANCILLARY EQUIPMENT (cont.)

FATHOMETER

Manufacturer : Simrad  
Model : EA  
Conversion Frequency : 1478 m/sec  
Operating Frequency : 38 kHz  
Transducer relating  
to Maxiran Antenna  
(see Antenna Positions  
Plate 7 : 6.6 m fwd and 1.1 m to stbd  
Instrument  
correction for  
draft : 3.7 m  
  
Scale : On Chart Paper  
Calibrated : 14 February 1980 at  
Launceston, Tasmania

The Simrad Model EA has both a paper and digital output. The display chart scale is completely adjustable to suit depth and rate of depth changes.

The scale selected is automatically written on the proper display by the unit. Plate No. 8 shows scale ranges.

The digital output was interfaced with the GSI CMS II System for automatic logging on magnetic tape at every shotpoint.



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SECTION II

B. ANCILLARY EQUIPMENT (cont.)

FATHOMETER (cont.)

The analog chart was marked approximately every kilometre along all lines.

No problems occurred with the Fathometer during this survey.



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SECTION II

B. ANCILLARY EQUIPMENT (contd.)

CAMERA

Manufacturer : S.I.E.

Model : 10C

Number of Channels : 64

Polarity : GSI Normal  
Positive Pressure =  
Downbreak

The Camera worked well throughout the survey.



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## SECTION II

### C. STREAMER

A G.S.I. Manufactured, 2400 metre streamer was utilized during this survey. This consisted of 48, 50 metre "live" sections, connected together with quick-coupling plugs. Each "live" section consisted of two independent 25 metre length groups (see plate number 4).

Generally there were seven nylon stretch sections located between group 96 and the vessel. These were used to attenuate the ships generated noise. There were five nylon stretch sections connected after group one, these sections were connected to the tailbuoy by 115 metres of nylon rope.

Each "live" group contained 15 acceleration cancelling hydrophones, which were connected in parallel to produce one group. These hydrophones are used to reduce the low frequency noise which is caused predominantly by boat noise propagated along the streamer, tailbuoy noise and cable strumming.

Six depth transducer sections were positioned along the streamer at regular intervals. They were calibrated to the required streamer depth of 40 feet before the streamer was reeled into the sea.



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SECTION II

C. STREAMER (contd.)

Each transducer section contains a single hydrophone which is used as a waterbreak detector. Waterbreak returns from detector number six, located between group 96 and the first front end stretch, and detector number five, located between groups 81 and 80 were recorded on both magnetic tape and camera records. The time measurement of the return was also recorded on the CMS tape and printer logs.

Waterbreak number six was used to determine the streamer offset, (centre of group 96 to the centre of airgun array). The offset was determined manually by the time measurement explained on plate number 6.

The offset was also calculated by the CMS. The CMS streamer offset sensor fires a single airgun between the DFS records. The sensor then measures the arrival time of waterbreaks number six and five and uses this time to calculate the offset value which was recorded on both CMS tape and printed logs.

The streamer offset would change during the line by  $\pm$  one or two metres, a result of varying sea states and currents which caused slight variations in the stretched length of the nylon rope sections.

Due to ship speed changes made to maintain airgun operating pressure, on occasions, as noted on all observer logs and reports, the offset had to be changed between



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SECTION 11

C. STREAMER (contd.)

lines, in order to maintain correct streamer ballast.

The average offset used during this survey was 218 metres, the offset varied between a maximum of 236 metres to a minimum of 209 metres.

Tailbuoy bearings were checked and logged at regular intervals to ensure that feathering angle did not exceed the specified limits.

Leakage was experienced on groups 85 & 86 early in the survey and the traces killed whenever appropriate. These instances are clearly indicated on the associated logs.

An attempt to clear this leakage was made early on 21st February. This attempt was thought to be successful but it was necessary to perform further maintenance before the problem was resolved successfully. The final solution necessitated section 46 of the streamer to be changed out because of salt water contamination in the streamer fluid.

The average streamer noise during the survey was approximately 7 U Volts.



SECTION II

C. STREAMER (cont.)

STREAMER DETAILS

Length Centre to Centre	:	2395 metres
Number of groups	:	96
Group Interval	:	25 metres
Live Section Length	:	50 metres
Number of Hydrophones/group:		15
Hydrophone Interval	:	1.67 metres
Hydrophone Type	:	T.I. - A.C.H.
Number of Nylon Stretch		
Sections in Front End	:	7
Tail End	:	5
Skin Type	:	Tropical
Location of Depth		
Transducers	:	Between Groups; 2/3, 20/21, 40/41, 60/61, 80/81, 96/FE.
Source of Waterbreaks	:	In Depth Transducers sections between Groups: 80/81, 96/FE
Location of Control Fins	:	On all Depth Transducers
Near Group	:	Number 96
Streamer Sensitivity	:	5.15 uv/u bar

SECTION II

## D. ENERGY SOURCE

An Electro-Pneumatic Acoustic Energy Source known as "Airguns" was used for reflection work. The Airgun has basically two moving parts, the shuttle and solenoid. Compressed air is supplied to this unit at a pressure of 13789 kPa (2000 psi). The shuttle is forced to close on initial application of pressure. Compressed air fills the reservoir chamber through a central orifice in the shuttle. To discharge the gun an electrical current activates the solenoid and retracts a plunger, thus enabling compressed air to pass through a port hole to the underside of a flange at the shuttle. The pressure difference above and below the shuttle then thrusts it open. The air from the chamber then escapes through four port holes near the centre of the gun and expands rapidly through the water, producing a single bubble and resultant shock wave. The air bubble collapses in a manner similar to that caused by explosives with one notable exception in that its period is controlled and is placed in the desired seismic frequency band.

The energy source used by M/V "McDERMOTT II" was a tuned airgun array of 2000 cubic inches total capacity, designed for deep penetration and good resolution. This array has a broadband frequency output that extends below the normal low frequency band for seismic energy source.

Good primary to bubble ratio is obtained by using a wide variety of airgun barrel sizes.

SECTION II

## D. ENERGY SOURCE (cont.)

Attached, Plate 5, is the diagram showing gun utilization and spacings.

Average pressure obtained from the array is 55 bars at 1 metre, with an average primary-to-bubble ratio of 8:1 at the designed operating depth of 21 feet. Normal operating pressure 2000 psi, with a minimum allowable pressure of 1600 psi.

The array includes 4 low pressure open-ended air lines so that the depth of the array could be monitored at all times by means of static air pressure measurements.

TIGER, the Texas Instruments Automatic Airgun Controller, monitors the firing of each airgun in the array. Individual gun firing times are continuously controlled to give phasing within + or -1 millisecond for maximum pulse amplitude and front to back ratio.

The TIGER also performs a quality control function, by indicating with individual gun L.E.D. (light emitting diode) displays, the status of a gun if not operating correctly, either no fire or self fire. This is also logged on printer and magnetic tape, along with changes to the total gun array status (on/off line). TIGER operates in conjunction with the CMS-11 (Configurable Marine System) that is onboard the M/V "McDERMOTT II".



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SECTION 11

D. ENERGY SOURCE (contd.)

The guns were maintained by the GSI personnel on line changes, so that throughout the survey the gun array was up to specifications. No malfunctions outside the range normally encountered, were experienced.

The "McDERMOTT" uses a combination of three Le Roi screw compressor combination with three Norwalk reciprocating compressor.

The Le Roi machines output a low pressure (150 psi) air to the Norwalks which then increase this to the working pressure of 2000 psi.

The system is designed so that any two Le Roi and any two Norwalk machines need to be running at one time to maintain ample working pressure at a shooting speed of 5 knots.

However this newly designed Norwalk system has been plagued with troubles and because of this only one machine was able to be kept running. When this was the case the shooting speed was kept down to a maximum of 4.5 knots. This speed resulted in an approximate shotpoint time interval of 12 seconds, which was enough time for the single Norwalk to maintain 1800 + psi.



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SECTION 11

D. ENERGY SOURCE (contd.)

The airguns performed well throughout the survey. Autofiring of some smaller capacity guns occurred on a few occasions when air pressure was low.

A failure of the only operational Norwalk compressor on the run in to line BCS81-16 was only rectified at the last minute and very nearly caused the approach to be terminated.

This line was successfully completed but some four hours of maintenance and repairs were then carried out before the next line (BCS81-11) was attempted. After 620 shotpoints of this line, the compressor shut itself down again. The machine was not able to be re-started in time to avoid a termination and a circle was necessary to complete the line.

SECTION II

## D. ENERGY SOURCE (cont.)

2000 CUBIC INCH - AIRGUN ARRAY

Operating Volume	:	2000 cubic inches
Total Spare Volume	:	520 cubic inches
Operating Pressure	:	1800 - 2000 psi
Operating Depth	:	6 ± 0.5 M
Timing Control	:	TIGER Serial Number 7
Firing Delay	:	51.2 msec
Compressors	:	3-Type - LeRoi Screw 3-Type - Norwalk Reciprocating
Distance from Maxiran antenna to Array Centre (Refer to Antenna Positions Plate 7	:	51.1 metres
Distance from stern of vessel to Array Centre	:	25.7 metres.

SECTION II

## E. SURVEY

The prime navigation system used was Maxiran, a precise range/range system owned and operated by Offshore Navigation Inc. (O.N.I.).

The Maxiran equipment was calibrated onshore before the start of the survey. The accuracy of the survey net was verified at sea by baseline crossings and three way fixes.

O.N.I. will submit a separate full report.

The Maxiran mobile monitor was interfaced to G.S.I.'s Configural Marine System II (CMS II). The CMS II System consisted of a Texas Instruments 980B computer, a system co-ordinator, TIGER Airgun Controller, automatic data logger, satellite receiver, two Houston Instruments trackplotters (one each located in instrument room and bridge) and two Digi-Data, 800 bpi, ½ inch tape transports. The CMS II function was survey control and navigation data recording. It used the input Maxiran raw ranges to calculate, by two or three way fixes the vessels velocity and position.

Shotpoint positioning was done in the "distance" mode with the CMS II triggering the DFS V instruments and also the TIGER unit to fire the airguns at every 25 metres of travel along the preplotted survey lines. Occasional changes to "time" mode were made when real time shotpoints became displaced with respect to the pre-plotted shotpoint.

SECTION 11

## E. SURVEY (cont.)

The CMS 11 satellite navigation system was utilized as an onboard Q.C. check of the Maxiran positioning, this satellite data was also recorded on the CMS Magnetic tape.

Three way fixes were manually calculated at the start and end of every line, using a TI-59 calculator and "Three-Way Fix by Iteration" programme.

During the survey, the CMS doppler sonar was used as the velocity source and the system gyro provided Azimuth information.

Although the dogleg angle was effectively  $0^{\circ}$ , line BCS81-03 was shot as a dogleg into line BBS81-09 of the adjoining Bass Strait Oil & Gas Survey. The last shotpoint was calculated to be #1152 and the seismic recording tape was changed at that point also.

The CMS idled at shotpoint 1282 of line BCS81-04. It was re-started by the operator but two shotpoints were missed whilst the system was updating.

Sat./Sonar was used very briefly at one point on line BCS81-10 to enable work to be done on Maxiran base stations.



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SECTION 111

OPERATIONS

A. OPERATION DISCUSSION

To avoid excessively long line changes, two lines of this survey were shot before the adjacent Bass Strait Oil & Gas Survey was completed.

The weather conditions were good throughout with seas ranging between states 1 & 3.

Data quality was under constant check by R.A.W. on board monitoring which enabled a high standard to be maintained at all times. Any risk of deviation from specification was immediately brought to the attention of the on board client representative.

Slight interference from a passing ship was evident for a brief period of line BCS81-12. Noise strips were taken to ensure that this noise did not exceed specifications.



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## B. OPERATIONS SUMMARY

February 20th

LINE BCS 81-01	Complete
LINE BCS81-03	Shot as a dogleg into line BBS81-09 - last SP1152 - complete

February 21st

LINE BCS81-05	Traces 85 & 86 killed throughout - complete
1000 - 1500	Streamer work to eliminate leakage
LINE BCS81-04	Complete

February 22nd

LINE BCS81-02	Complete
LINE BCS81-09	Complete
LINE BCS81-16	Compressor problem on run in -complete
1730 - 1900	Compressor Repair
LINE BCS 81-11	Terminated - Compressor shut down

February 23rd

LINE BCS81-11A	Complete
LINE BCS81-13	Complete
LINE BCS81-08	Complete
LINE BCS81-10	Complete

February 24th

LINE BCS81-12	Slight ship noise SPs 1240 -1280 - Complete
LINE BCS81-14	Complete
LINE BCS81-07	Complete
LINE BCS81-06	Complete

081-708

<u>DATE</u>	<u>LINE</u>	<u>DIR</u>	<u>SP RANGE</u>	<u>TOT S.P.</u>	<u>CHARGEABLE KM</u>	<u>COMMENTS</u>	<u>DAILY TOTAL</u>
20th FEB	BCS81-01	057°	0001 - 0953	953	23.825	Complete	
	BCS81-03	236°	0001 - 1152	1152	28.8	Complete	52.625
21st FEB	BCS81-05	057°	0001 - 1371	1371	34.275	Complete	
	BCS81-04	146°	0001 - 1461	1461	36.525	Complete	
	BCS81-02	326°	0001 - 0430	430	10.75	Complete	81.55
22nd FEB	BCS81-02	326°	0431 - 0881	881	11.275	Complete	
	BCS81-09	236°	0001 - 2861	2861	71.525	Complete	
	BCS81-16	149°	0001 - 0718	718	17.95	Complete	
	BCS81-11	056°	0001 - 0620	620	15.5	Terminated T B C	
	BCS81-11A	056°	0621 - 1150	530	13.25	Midnight S.P.	129.5
23rd FEB	BCS81-11A	056°	1151 - 1410	260	6.5	Complete	
	BCS81-13	236°	0001 - 0471	471	11.775	Complete	
	BCS81-08	326°	0001 - 2611	2611	65.275	Complete	
	BCS81-10	147°	0001 - 2611	2611	65.275	Complete	
	BCS81-12	328°	0001 - 0180	180	4.5	Midnight S.P.	153.325

SECTION 111  
C. PROSPECT DETAILS- 26 -  
131029

801-708

<u>DATE</u>	<u>LINE</u>	<u>DIR</u>	<u>SP RANGE</u>	<u>TOT S.P.</u>	<u>CHARGEABLE KM</u>	<u>COMMENTS</u>	<u>DAILY TOTAL</u>
24th FEB	BCS81-12	328 <sup>0</sup>	0181 - 2211	2031	50.775	Complete	
	BCS81-14	148 <sup>0</sup>	0001 - 1222	1222	30.55	Complete	
	BCS81-07	057 <sup>0</sup>	0001 - 1861	1861	46.525	Complete	
	BCS81-06	146 <sup>0</sup>	0001 - 0221	221	5.525	Complete	133.375

SECTION 111 C. PROSPECT DETAILS (Cont.)



131030

SECTION 111

## D. STATISTICS

Prospect	:	Bass Strait BCS81- (TAS T.14P)
Operation Period	:	February 20th - February 24th 1981
Number of Lines	:	16
Total Production	:	550.375
Field Tapes Used	:	354
Production Shotpoints	:	22015
Unusable shot percentage of total shot points	:	0.5
Seismic Data shipped to	:	GSI - Sydney
Navigation Data shipped to	:	GSI - Dallas



E. PERMITTING

The Marine Operations Centre, Canberra, was advised as to the ship's location throughout the survey to enable the necessary navigation warning to mariners to be issued.



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SECTION 111

## F. FIELD TAPE INVENTORY

<u>DATE</u>	<u>TAPE NO</u>	<u>LINE NO.</u>	<u>SHOTPOINTS</u>
20 FEB	157744	BCS81-1	001 - 063
	157745	"	064 - 128
	157746	"	129 - 196
	157747	"	197 - 263
	157748	"	329 - 393
	157749	"	329 - 383
	157750	"	394 - 459
	157751	"	460 - 524
	157752	"	525 - 589
	157753	"	590 - 654
	157754	"	655 - 719
	157755	"	720 - 784
	157756	"	485 - 850
	157757	"	851 - 916
	157758	"	917 - 953
	157759	BCS81 - 3	001 - 063
	157760	"	064 - 125
	157761	"	128 - 192
	157762	"	193 - 257
	157763	"	258 - 322
	157764	"	323 - 387
	157765	"	388 - 452
	157766	"	453 - 517
	157767	"	518 - 582
	157768	"	583 - 647
	157769	"	648 - 713



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<u>DATE</u>	<u>TAPE NO.</u>	<u>LINE NO.</u>	<u>SHOTPOINTS</u>
20 FEB 81	157770	BCS81-3	714 - 778
	157771	"	779 - 843
	157772	"	844 - 908
	157773	"	909 - 973
	157774	"	974 - 1038
	157775	"	1039 - 1103
	157776	"	1104 - 1152
21 FEB	157812	BCS81-5	001 - 063
	157813	"	067 - 130
	157814	"	131 - 195
	157815	"	196 - 260
	157816	"	261 - 325
	157817	"	326 - 390
	157818	"	391 0 455
	157819	"	456 - 520
	157820	"	521 - 585
	157821	"	586 - 649
	157822	"	650 - 714
	157823	"	712 - 779
	157824	"	780 - 844
	157825	"	845 - 909
	157826	"	910 - 974
	157827	"	975 - 1039
	157829	"	1106 - 1170
	157830	"	1171 - 1236
	157831	"	1237 - 1301
	157832	"	1302 - 1348
	157833	"	1349 - 1371
	157834	BCS81-4	001 - 060
	157835	"	061 - 125
	157836	"	126 - 190
	157837	"	195 - 259
	157838	"	260 - 324



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<u>DATE</u>	<u>TAPE NO.</u>	<u>LINE NO.</u>	<u>SHOTPOINTS</u>
21 FEB	157839	BCS81-4	325 - 389
	157840	"	390 - 455
	157841	"	456 - 520
	157842	"	521 - 586
	157843	"	587 - 653
	157844	"	654 - 718
	157845	"	719 - 783
	157846	"	784 - 848
	157847	"	849 - 913
	157848	"	914 - 978
	157849	"	979 - 1043
	157850	"	1044 - 1108
	157851	"	1109 - 1173
	157852	"	1174 - 1238
	157853	"	1239 - 1305
	157854	"	1306 - 1370
	157855	"	1371 - 1428
	157856	"	1429 - 1461
	157857	BCS81-2	001 - 062
	157858	"	063 - 127
	157859	"	128 - 192
	157860	"	193 - 257
	157861	"	258 - 322
	157862	"	323 - 387
	157863	"	388 - 452
	157864	"	453 - 517
	157865	"	518 - 582
	157866	"	583 - 647
	157867	"	648 - 712
	157868	"	713 - 778



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<u>DATE</u>	<u>TAPE NO.</u>	<u>LINE NO.</u>	<u>SHOTPOINTS</u>
21 FEB	157869	BS81-2	880 - 843
22 FEB	157870		844 - 881
	157871	BCS81-90	001 - 061
	157872	"	062 - 126
	157873	"	127 - 191
	157874	"	192 - 256
	157875	"	257 - 321
	157876	"	322 - 386
	157877	"	387 - 451
	157878	"	452 - 516
	157879	"	517 - 582
	157880	"	583 - 646
	157881	"	647 - 711
	157882	"	712 - 776
	157883	"	777 - 841
	157884	"	842 - 906
	157885	"	907 - 971
	157886	"	972 - 1036
	157887	"	1037 - 1102
	157888	"	1103 - 1139
	157889	"	1141 - 1206
	157890	"	1207 - 1272
	157891	"	1273 - 1337
	157892	"	1338 - 1403
	157893	"	1404 - 1468
	157894	"	1469 - 1533
	157895	"	1534 - 1598
	157896	"	1599 - 1663
	157897	"	1664 - 1728
	157898	"	1729 - 1794



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<u>DATE</u>	<u>TAPE NO.</u>	<u>LINE NO.</u>	<u>SHOTPOINTS</u>
22 FEBRUARY	157899	BCS81-09	1795 - 1858
	157900		1859 - 1923
	157901		1924 - 1988
	157902		1989 - 2053
	157903		2054 - 2118
	157904		2119 - 2182
	157905		2187 - 2251
	157906		2253 - 2317
	157907		2318 - 2382
	157908		2383 - 2448
	157909		2449 - 2513
	157910		2514 - 2579
	157911		2580 - 2675
	157912		2676 - 2710
	157913		2711 - 2775
	157914		2776 - 2840
	157915		2841 - 2861
	157916	BCS81-16	BLANK
	157917		003 - 066
	157918		067 - 131
	157919		0132 - 196
	157920		198 - 262
	157921		263 - 327
	157922		328 - 394
	157923		395 - 459
	157924		460 - 524
	157925		525 - 589
	157926		590 - 654
	157927		655 - 707
	157928		708 - 721



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<u>DATE</u>	<u>TAPE NO.</u>	<u>LINE NO.</u>	<u>SHOTPOINTS</u>
22 FEB	157929	BCS81-11	001 - 061
	157930	"	062 - 126
	157931	"	127 - 191
	157932	"	192 - 256
	157933	"	257 - 321
	157934	"	322 - 386
	157935	"	387 - 451
	157936	"	452 - 516
	157937	"	517 - 581
	157938	"	582 - 631
	157939	BCS81-11A	521 - 620
	157940	"	621 - 685
	157941	"	686 - 750
	157942	"	751 - 815
	157943	"	816 - 880
	157944	"	881 - 945
	157945	"	946 - 1010
	157946	"	1011 - 1076
	157947	"	1077 - 1141
157948	"	1142 - 1206	
23 FEB	157949	"	1207 - 1271
	157950	"	1272 - 1337
	157951	"	1338 - 1390
	157952	"	1391 - 1410
	157953	BCS81-13	001 - 061
	157954	"	062 - 126
	157955	"	127 - 190
	157956	"	195 - 256
	157957	"	257 - 320
	157958	"	321 - 381



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<u>DATE</u>	<u>TAPE NO.</u>	<u>LINE NO.</u>	<u>SHOTPOINTS</u>
23 FEB	157959	BCS81-11	382 - 442
	157960	"	443 - 471
	157961	BCS81-08	001 - 061
	157962	"	062 - 123
	157963	"	124 - 187
	157964	"	188 - 252
	157965	"	253 - 317
	157966	"	318 - 382
	157967	"	383 - 447
	157968	"	448 - 512
	157969	"	513 - 578
	157970	"	579 - 643
	157971	"	644 - 707
	157972	"	708 - 772
	157973	"	773 - 838
	157974	"	839 - 903
	157975	"	904 - 968
	157976	"	969 - 1033
	157977	"	1034 - 1094
	157978	"	1096 - 1158
	157979	"	1159 - 1218
	157980	"	1219 - 1281
	157981	"	1282 - 1343
	157982	"	1344 - 1402
	157983	"	1403 - 1465
	157984	"	1466 - 1528
	157985	"	1529 - 1590
	157986	"	1591 - 1648
	157987	"	1649 - 1711
	157988	"	1712 - 1773



<u>DATE</u>	<u>TAPE NO.</u>	<u>LINE NO.</u>	<u>SHOTPOINTS</u>
23 FEB 81	157989	BCS81-08	1774 - 1838
	157990	"	1839 - 1903
	157991	"	1904 - 1968
	157992	"	1969 - 2034
	157993	"	2035 - 2099
	157994	"	2100 - 2164
	157995	"	2165 - 2229
	157996	"	2230 - 2297
	157997	"	2295 - 2359
	157998	"	2360 - 2424
	157999	"	2425 - 2489
	158000	"	2490 - 2554
	158001	"	2555 - 2611
	158002	BCS81-10	001 - 062
	158003	"	063 - 127
	158004	"	128 - 192
	158005	"	193 - 257
	158006	"	258 - 322
	158007	"	323 - 387
	158008	"	388 - 452
	158009	"	453 - 517
	158010	"	518 - 582
	158011	"	583 - 647
	158012	"	648 - 712
	158013	"	713 - 777
	158014	"	778 - 842
	158015	"	843 - 907
	158016	"	908 - 972
	158017	"	973 - 1037
	158018	"	1038 - 1103



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<u>DATE</u>	<u>TAPE NO.</u>	<u>LINE NO.</u>	<u>SHOTPOINTS</u>
23 FEB	158019	BCS81-10	1104 - 1168
	158020		1169 - 1233
	158021		1234 - 1298
	158022		1299 - 1363
	158023		1364 - 1428
	158024		1429 - 1496
	158025		1497 - 1558
	158026		1559 - 1623
	158027		1624 - 1688
	158028		1689 - 1753
	158029		1754 - 1818
	158030		1819 - 1883
	158031		1884 - 1948
	158032		1949 - 2013
	158033		2014 - 2078
	158034		2079 - 2143
	158035		2144 - 2207
	158036		2208 - 2272
	158037		2273 - 2336
	158038		2337 - 2401
	158039		2402 - 2465
	158040		2466 - 2530
	158041		2531 - 2594
	158042		2595 - 2611
	158043	BCS81-12	001 - 062
	158044		063 - 122
24 FEB	158045		123 - 185
	158046		186 - 245
	158047		246 - 308
	158048		309 - 373



<u>DATE</u>	<u>TAPE NO.</u>	<u>LINE NO.</u>	<u>SHOTPOINTS</u>
24 FEB	158049	BCS81 - 12	374 - 438
	158050		439 - 496
	158051		497 - 560
	158052		561 - 620
	158053		621 - 682
	158054		683 - 745
	158055		746 - 809
	158056		810 - 870
	158057		871 - 935
	158058		936 - 1000
	158059		1001 - 1065
	158060		1066 - 1129
	158061		1130 - 1194
	158062		1195 - 1259
	158063		1260 - 1323
	158064		1324 - 1388
	158065		1389 - 1453
	158066		1454 - 1518
	158067		1519 - 1583
	158068		1584 - 1642
	158069		1643 - 1704
	158070		1705 - 1765
	158071		1766 - 1828
	158072		1829 - 1890
	158073		1891 - 1953
	158074		1954 - 2015
	158075		2016 - 2075
	158076		2076 - 2138
	158077		2139 - 2186
	158078		2187 - 2211



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<u>DATE</u>	<u>TAPE NO.</u>	<u>LINE NO.</u>	<u>SHOTPOINTS</u>
24 FEBRUARY	158079	BCS81-14	001 - 055
	158080	"	056 - 119
	158081	"	120 - 181
	158082	"	182 - 246
	158083	"	247 - 309
	158084	"	310 - 372
	158085	"	373 - 434
	158086	"	435 - 496
	158087	"	497 - 559
	158088	"	560 - 623
	158089	"	624 - 687
	158090	"	688 - 753
	158091	"	754 - 818
	158092	"	819 - 883
	158093	"	884 - 948
	158094	"	949 - 1013
	158095	"	1014 - 1078
	158096	"	1079 - 1144
	158097	"	1145 - 1209
	158098	"	1210 - 1222
	158099	BCS81-7	001 - 062
	158100	"	063 - 127
	158101	"	128 - 194
	158102	"	195 - 259
	158103	"	260 - 323
	158104	"	324 - 388
	158105	"	389 - 452
	158106	"	453 - 517
	158107	"	518 - 581
	158108	"	582 - 646



<u>DATE</u>	<u>TAPE NO.</u>	<u>LINE NO.</u>	<u>SHOTPOINTS</u>
24 FEBRUARY	158109	BCS81-7	647 - 711
	158110	"	712 - 776
	158111	"	777 - 840
	158112	"	841 - 906
	158113	"	907 - 971
	158114	"	972 - 1036
	158115	"	1037 - 1101
	158116	"	1102 - 1166
	158117	"	1167 - 1231
	158118	"	1232 - 1296
	158119	"	1297 - 1361
	158120	"	1362 - 1426
	158121	"	1427 - 1491
	158122	"	1492 - 1556
	158123	"	1557 - 1621
	158124	"	1622 - 1686
	158125	"	1687 - 1751
	158126	"	1752 - 1816
	158127	"	1817 - 1861
	158128	BCS81-6	001 - 062
	158129	"	063 - 127
	158130	"	128 - 192
	158131	"	193 - 221

131045

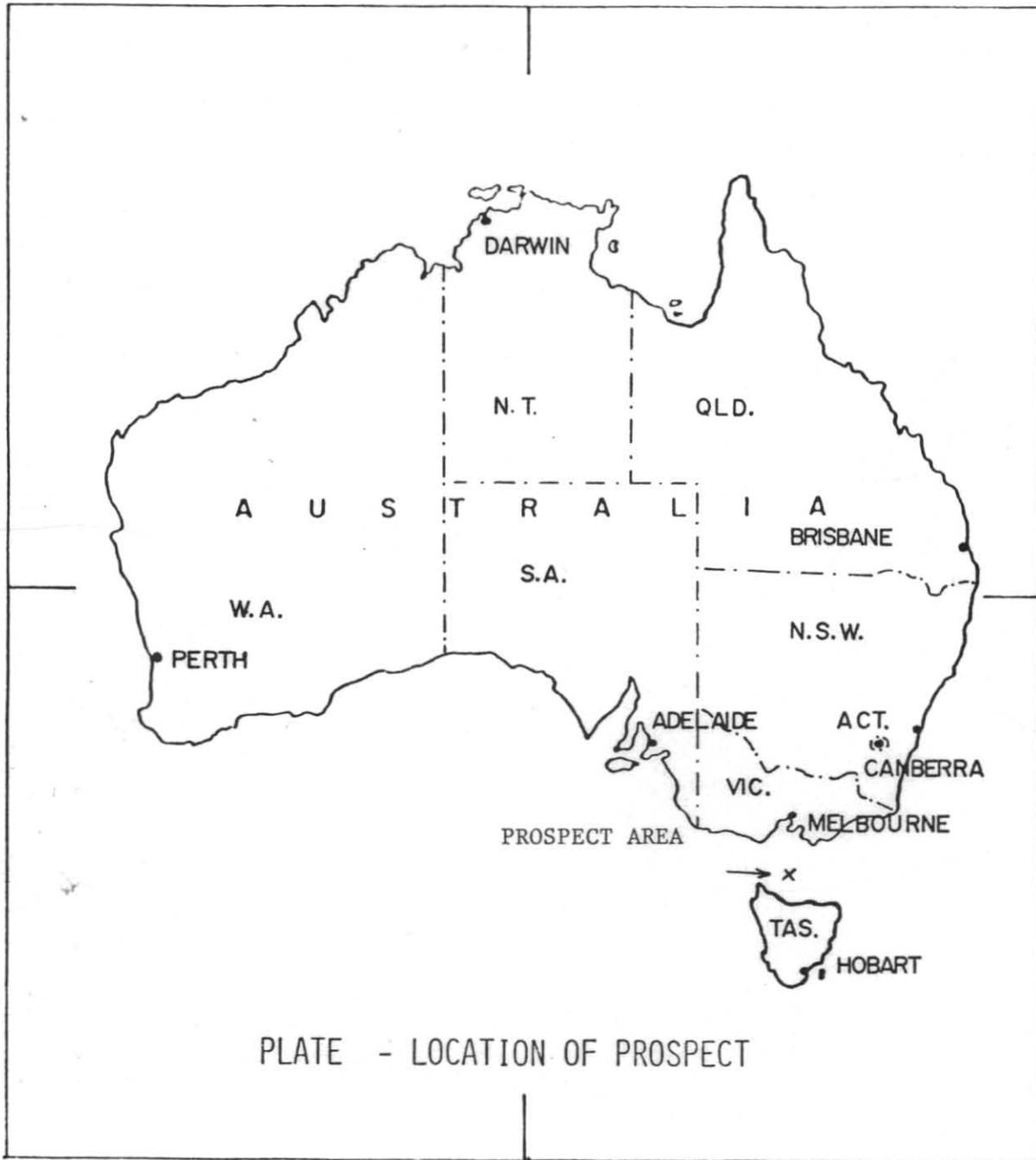


PLATE - LOCATION OF PROSPECT

5 cm



**LEGEND**

- F<sub>1</sub>-F<sub>4</sub>** File number - 4 BCD digits
- Y<sub>1</sub>-Y<sub>4</sub>** Format Code - 4 BCD digits 0200 for SEG-B (with no header extension)
- K<sub>1</sub>-K<sub>12</sub>** General constants entered from panel switches - 12 BCD digits
- B<sub>1</sub>-B<sub>3</sub>** Bytes per multiplexer scan in data block - 3 BCD digits. Bytes per scan = 2.5 x no. of channels + 14
- M<sub>3</sub>-M<sub>n</sub>** Instrument serial number - 6 BCD digits.
- R<sub>1</sub>,R<sub>2</sub>** Record length in multiples of 1.024 seconds. 00 if manual stop is selected.
- J** Amplifier gain control mode -1001 is recorded to designate floating point gain control system.
- LC<sub>1</sub>,LC<sub>2</sub>** Low-cut filter frequency (Hz) - 2 BCD digits. 00 (out), 03, 05, 08, 12, 18, or 27.  
NOTE: 03 is actually 3.56Hz.  
05 is actually 5.33Hz.
- LS** Low-cut filter slope in multiples of 6 dB/octave - 1 BCD digit. Normally 3, (18dB octave) for DFS-V.
- S<sub>1</sub>,S<sub>2</sub>** Notch (rejection) filter frequency - 2 BCD digits. 00 (out) 50, or 60 (for 60 or 16 2/3).
- A** Alias filter frequency:  
1 - 256Hz      4 - 64Hz  
2 - 128Hz      8 - 32Hz
- D** Channel identification code:  

BIT	TYPE	CHANNEL
0 1 2		
0 0 0	Unused channel	
1 0 0	Waterbreak channel	
0 1 0	Timebreak channel	
0 0 1	Seis channel	
0 1 1	Uphold channel	
1 0 1	Time counter	
1 1 1	Other	
- Z** Record type:  
8 - normal shot 4 } Not used  
2 - test record 1 }
- W<sub>N</sub>** Ones recorded for normal field timebreak recording. Zeros record if system operated from internal timebreak.

- T<sub>1</sub>-T<sub>14</sub>** 14 bit binary timing word  
  - T<sub>14</sub> - 1 millisecond
  - T<sub>1</sub> - 8,192 seconds
- Q<sub>N</sub>** Digitized output of A/D converter  
  - Q<sub>s</sub> - sign (note 4)
  - Q<sub>1</sub> - 4096 millivolts
  - Q<sub>14</sub> - 0.50 millivolt
- G<sub>N</sub>** Binary gain code for channel N. Least significant bit (6dB) is always 0 for quaternary coded IFP gain.
- P** Vertical (byte) parity. Bit P is one if bits 0 - 7 of the same byte contains an even number of ones.
- CH** Number of channels. Bit 6 of the four sync group bytes, indicates number of seismic data channels.  

BYTE	1	2	3	4
24 CH	0	0	0	0
36 CH	0	1	0	0
48 CH	0	0	0	1
Other	1	1	1	1

See B, bytes per scan.  
No. of data channels =  

Bytes per scan-14
2.5

**NOTES**

- 1 - Auxiliary channel identification code assignments are as follows unless otherwise specified:  

AUX 1 will always be the timing counter.	28 or 60 Seis channels	Number of seis Channels other than 28 or 60
AUX 2 unused	AUX 2 uphole	
AUX 3 unused	AUX 3 timebreak	
AUX 4 uphold	AUX 4 unused	
AUX 5 timebreak	AUX 5 unused	

  - These AUX channels are not available for data and will always be recorded as zero in the data record.
- 2 - Additional externally supplied digital data may be recorded in the header block following byte 36+2n.
- 3 - Negative values are recorded in 1's complement code (standard) or 2's complement (optional).

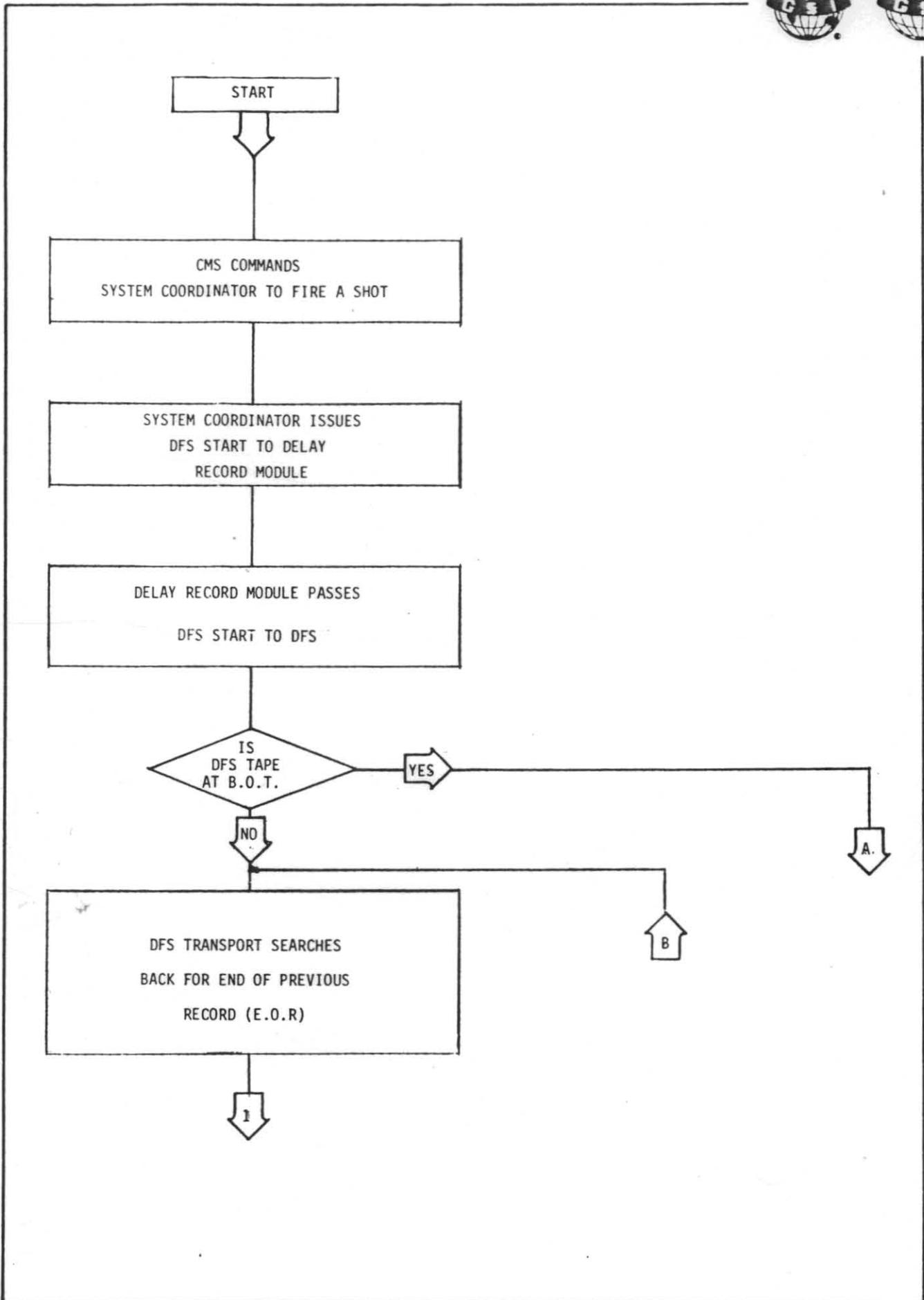
Format conforms to the SEG standard specific values shown, such as filter settings, etc, are those of the DFS-V.

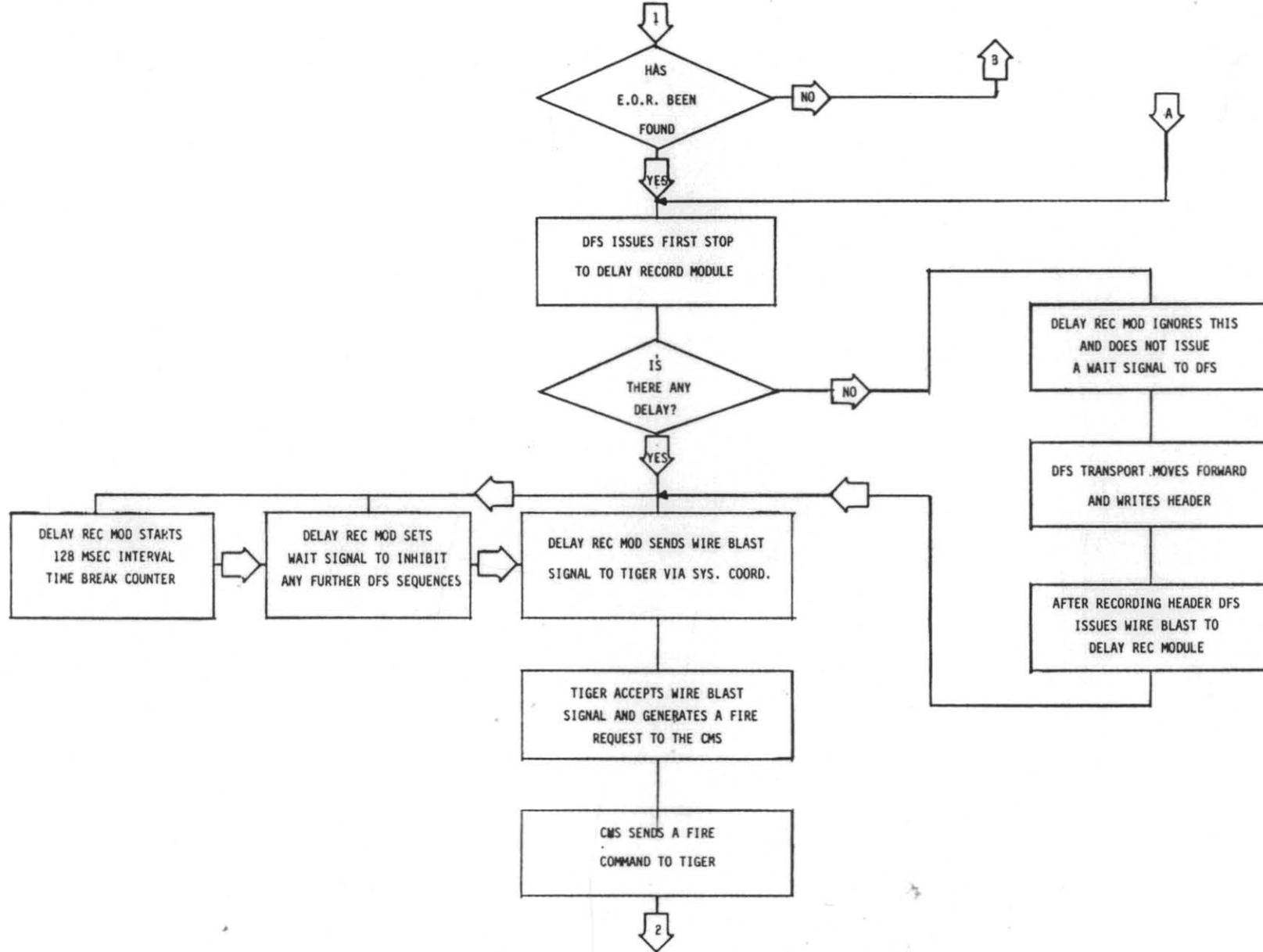
- I** Sample interval recorded according to the following table:  

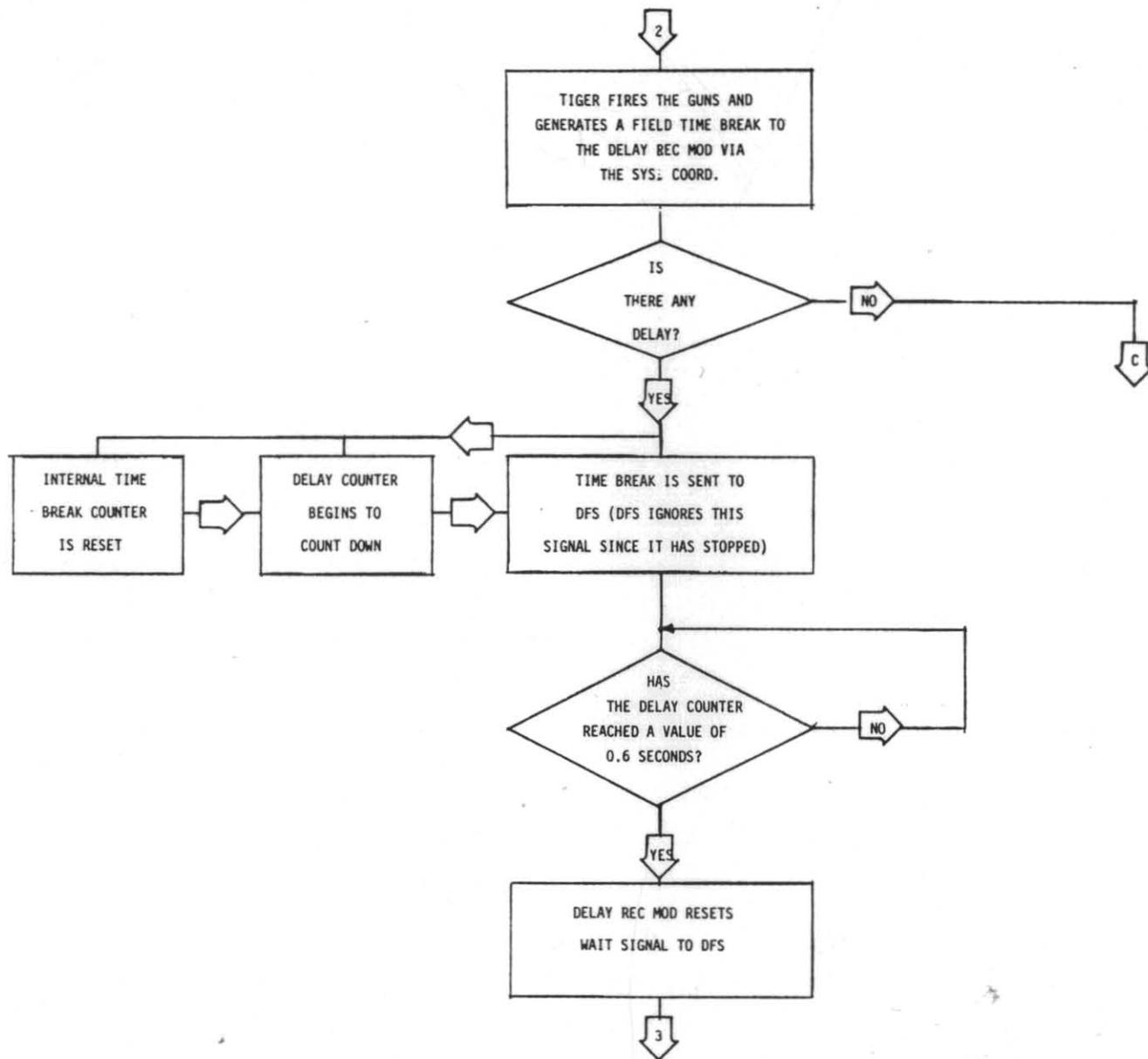
BIT	SAMPLE INTERVAL
4 5 6 7	
0 0 0 1	1 millisecond
0 0 1 0	2 milliseconds
0 1 0 0	4 milliseconds
1 0 0 0	8 milliseconds
1 0 0 1	0.5 milliseconds
1 0 1 0	1 millisecond
1 1 0 0	2 milliseconds

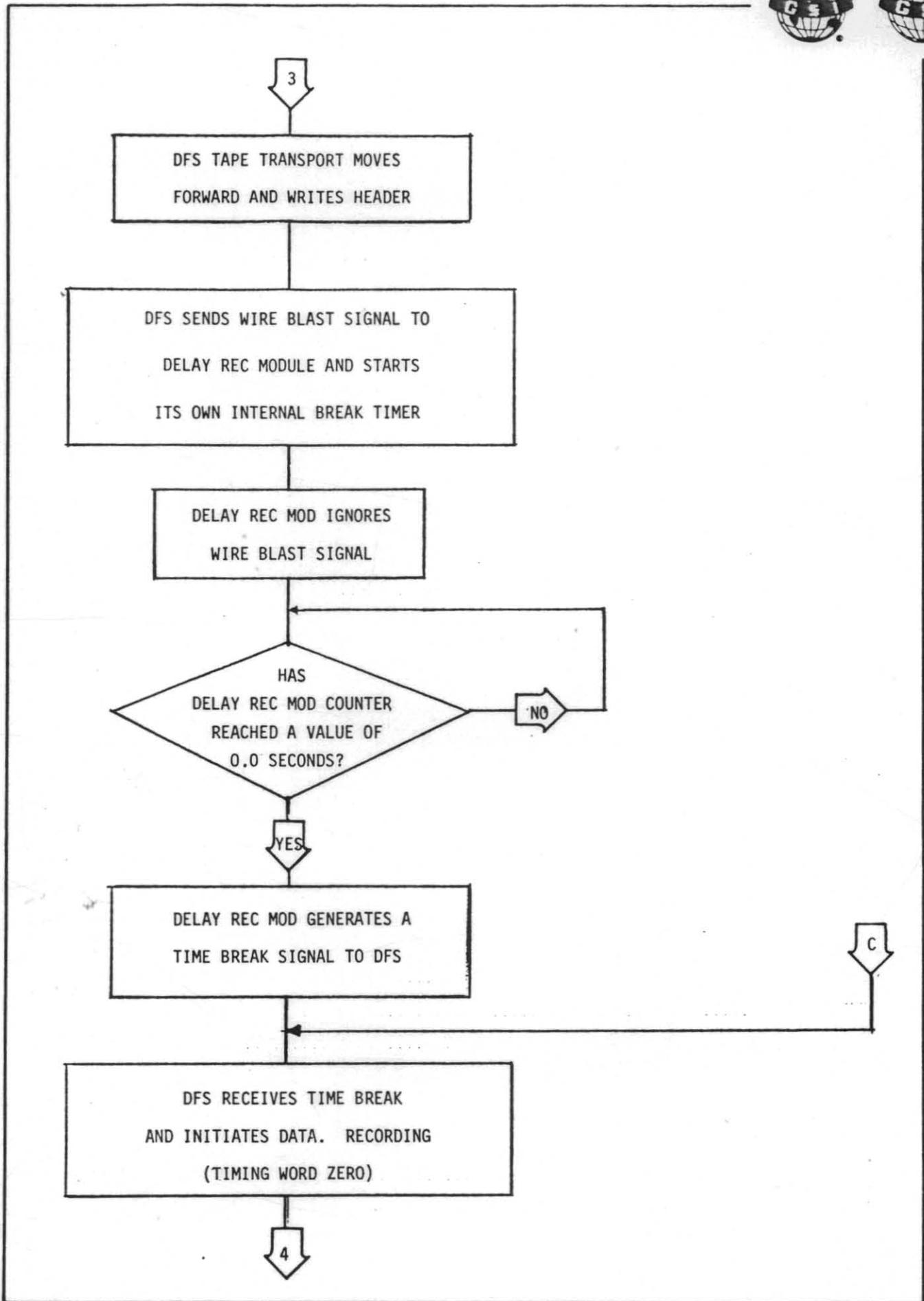
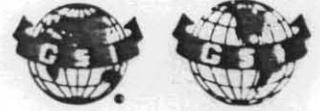
All zeros for other sample intervals
- GC** Gain constant (fixed gain) recorded as a 4-bit binary code. The most significant bit has a gain value of 2<sup>3</sup> (48dB); the least significant bit has a gain value of 2<sup>1</sup> (6dB). The least significant bit is recorded as a zero for the DFS-V.
- GW** Gain word recorded as a 4-bit binary code. 0000 is recorded when operating in floating point gain control. When operating in manual gain control, the most significant bit has a gain value of 2 (48dB) and the least significant bit has a gain value of 2<sup>1</sup> (6dB). The least significant bit is recorded as a zero for the DFS-V.

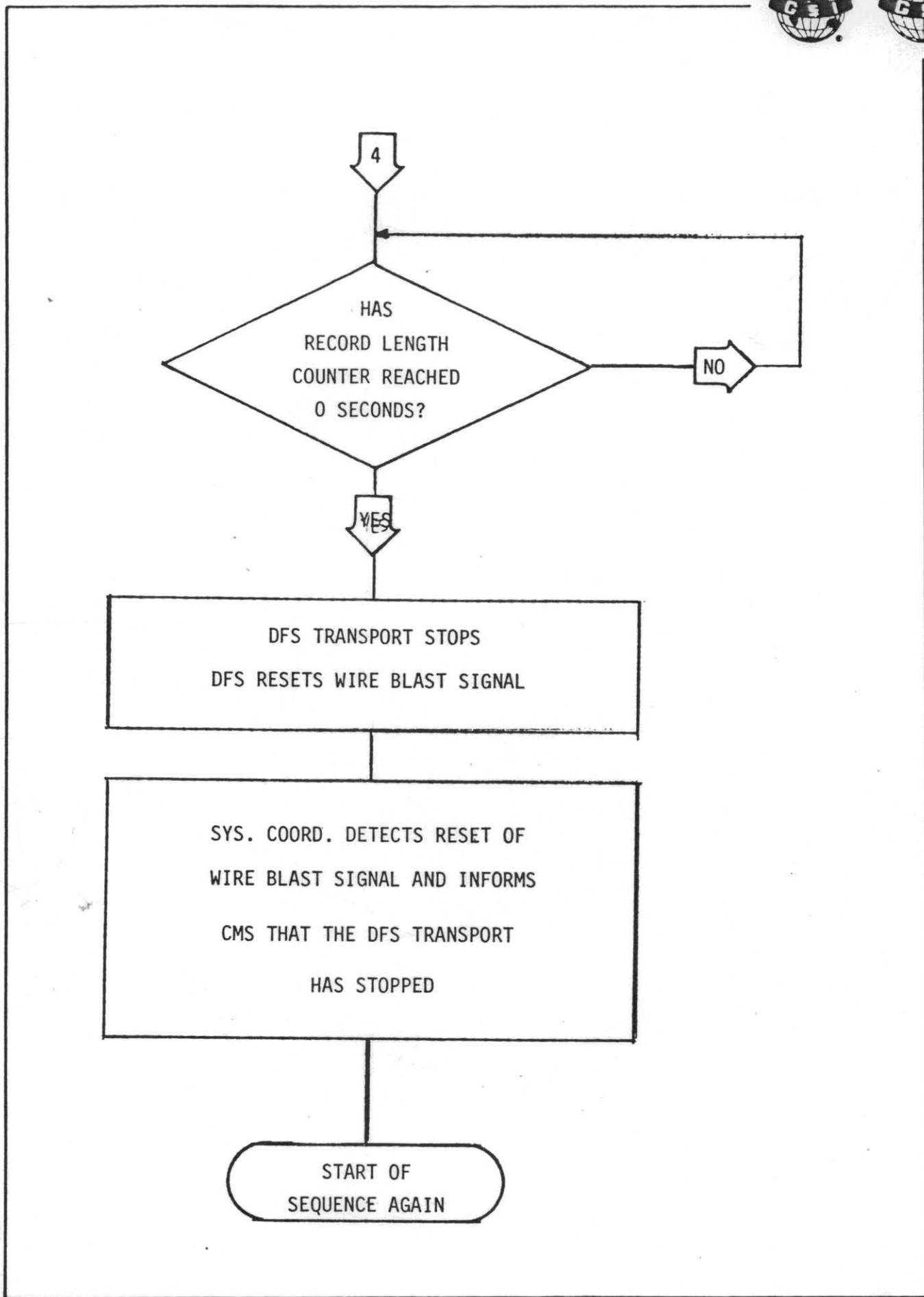


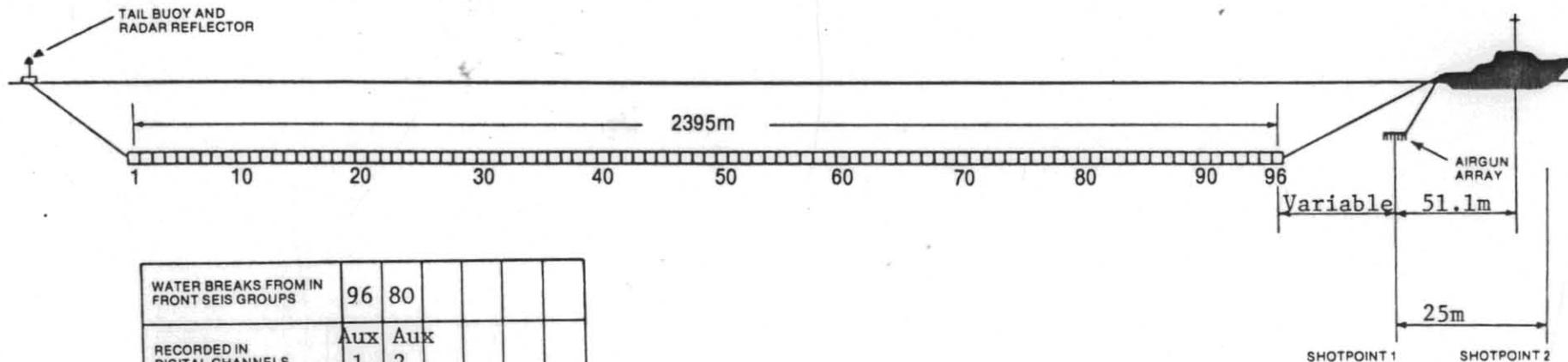












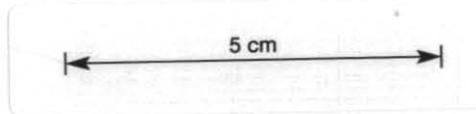
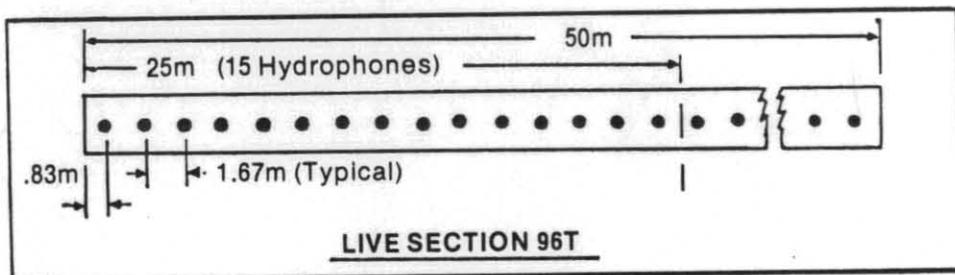
WATER BREAKS FROM IN FRONT SEIS GROUPS	96	80				
RECORDED IN DIGITAL CHANNELS	Aux 1	Aux 2				
DISPLAYED ON SEISMOGRAPH TRACES	61	62	/	/	/	/

DEPTH TRANSDUCER NUMBERS	1	2	3	4	5	6
AT/NEAR SEIS GROUP NUMBERS	2	20	40	60	80	96
	3	21	41	61	81	FF

DEPTH CONTROLLER AT SEIS GROUP NUMBERS (On Depth Transducers)

NYLON STRETCH	7 (FRONT) + 5 (Tail)
PIG SECTIONS	NONE

6 TRANSDUCER SECTIONS 4M LONG



**MARINE CABLE DIAGRAM**  
 2400 METRES  
 (OFFEND SPREAD — 96 GROUPS)  
 G.S.I. PARTY: 2931  
 SHIP: M.V. Eugene McDermott 11  
 CLIENT: Cue Minerals  
 AREA: Bass Strait BCS81  
 DATE: 20th - 24th February 1981





STERN OF VESSEL

2000 Cu In TUNED AIR GUN ARRAY

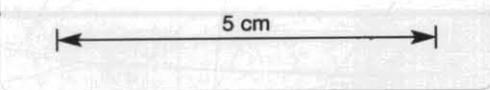
PORT STRING

STARBOARD STRING

GUN No.	SIZE (Cu in)	SEPARATION (In)	GUN No.	SIZE (Cu in)	SEPARATION (in)
1.	120	● 18	19.	120	● 18
2.	120	● 18	20.	120	● 18
3. (spare)	120	○ 18	21.	120	● 18
		65	22. (spare)	120	○ 18
					65
4.	100	● 18	23.	100	● 18
5.	100	● 18	24. (spare)	100	○ 18
6. (spare)	100	○ 18			62
		62			62
7.	80	● 18	25.	100	●
8.	80	● 18			62
9. (spare)	80	○ 18	26.	80	●
		65			58
10.	120	●	27.	40	●
		65			51
11.	100	●	28.	40	●
		62			51
12.	80	●	29.	40	●
		58			51
13.	40	●	30.	40	●
		51			51
14.	40	●	31.	20	●
		51			41
15.	40	●	32.	20	●
		51			41
16.	40	●	33.	20	●
		51			41
17.	20	●	34.	20	●
		41			41
18.	20	●	35.	10	●
					33.
			36.	10	●

TOTAL LENGTH 60ft 10 in

TOTAL LENGTH 60ft



## PLATE 6

OFFSET DETERMINATION (EXAMPLE ONLY)

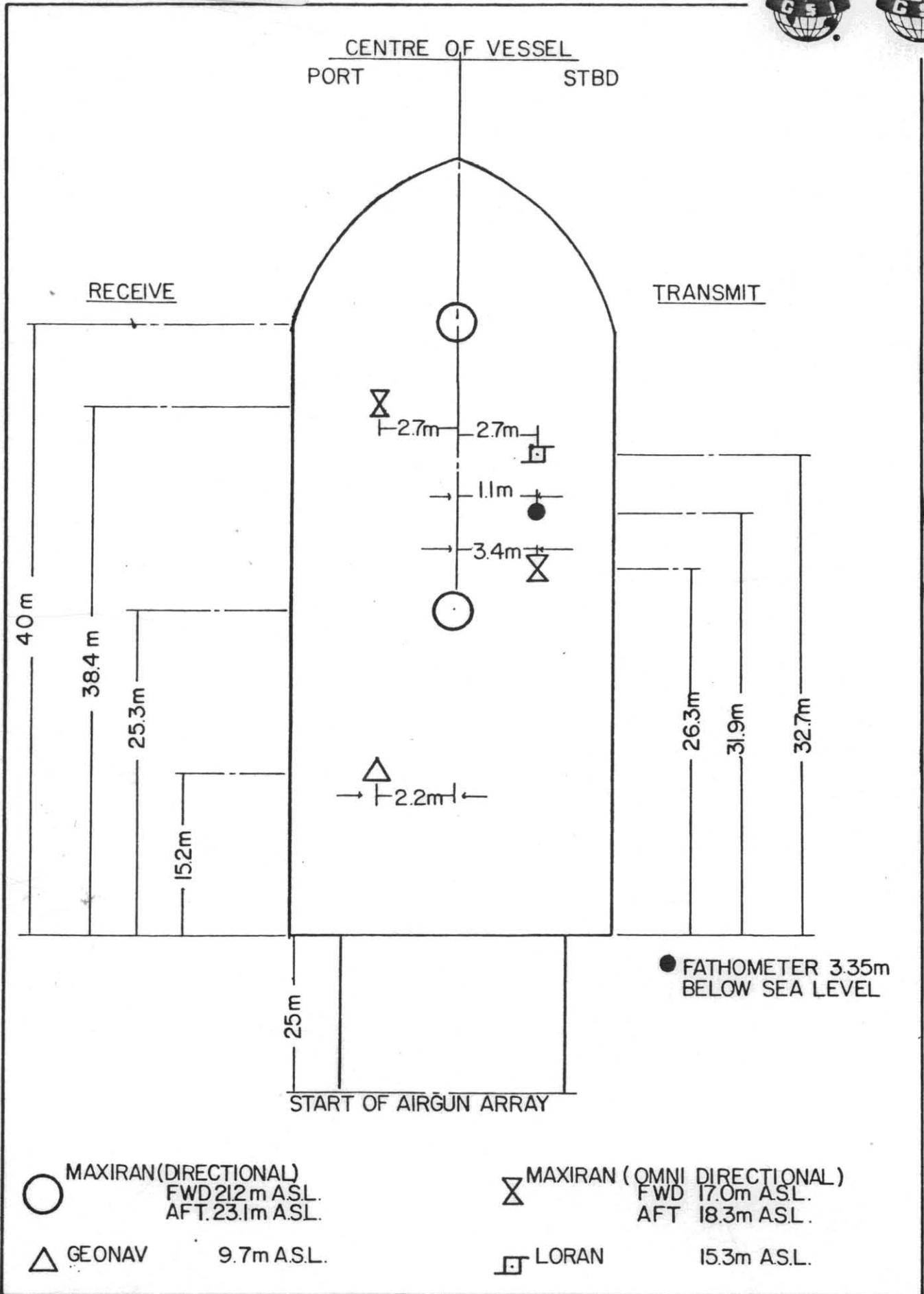
## PHYSICAL MEASUREMENT

1. Length of stretch sections with : 200 metres + 18 metres  
9% stretch factor (4 x 50m) = 218 metres
2. Distance two bracket to stern : +2.0 metres
3. Total length of Transducer : 2 metres  
sections in front of #96
4. Distance from boat to near : 238.5 metres  
group centre  
(1+2+3+12.5 metres)
5. Distance from boat to centre : 24.1 metres  
of source
6. Offset (5-4) : 214.4 metres

## TIME MEASUREMENT

As computed by the CMS-11 computer ADL, STS Systems. Typically  
210 - 214 metres (computed on all lines).

5 cm



● FATHOMETER 3.35m BELOW SEA LEVEL

○ MAXIRAN (DIRECTIONAL)  
FWD 212m ASL.  
AFT. 23.1m ASL.

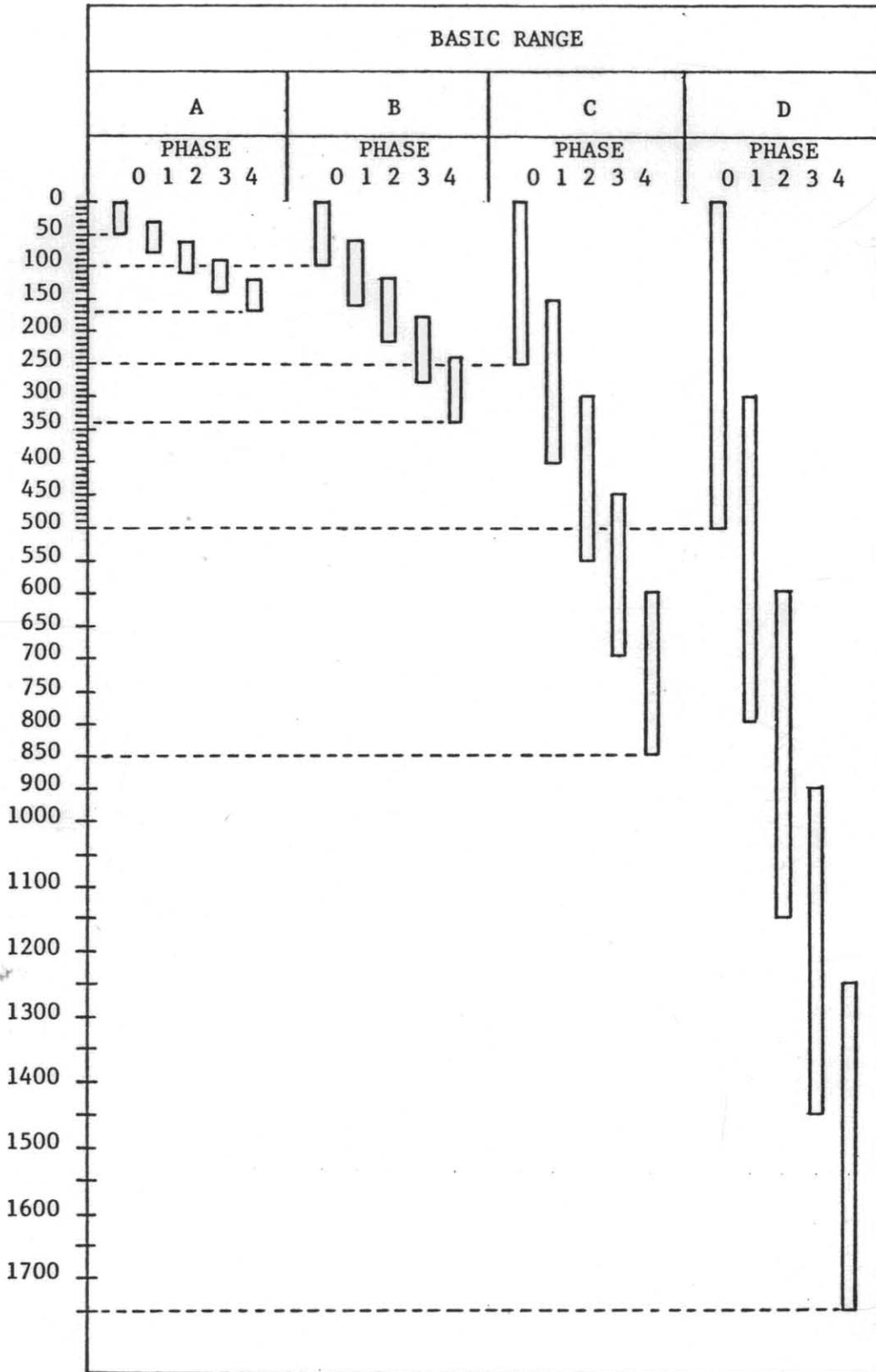
⊠ MAXIRAN (OMNI DIRECTIONAL)  
FWD 17.0m ASL.  
AFT 18.3m ASL.

△ GEONAV 9.7m ASL.

□ LORAN 15.3m ASL.



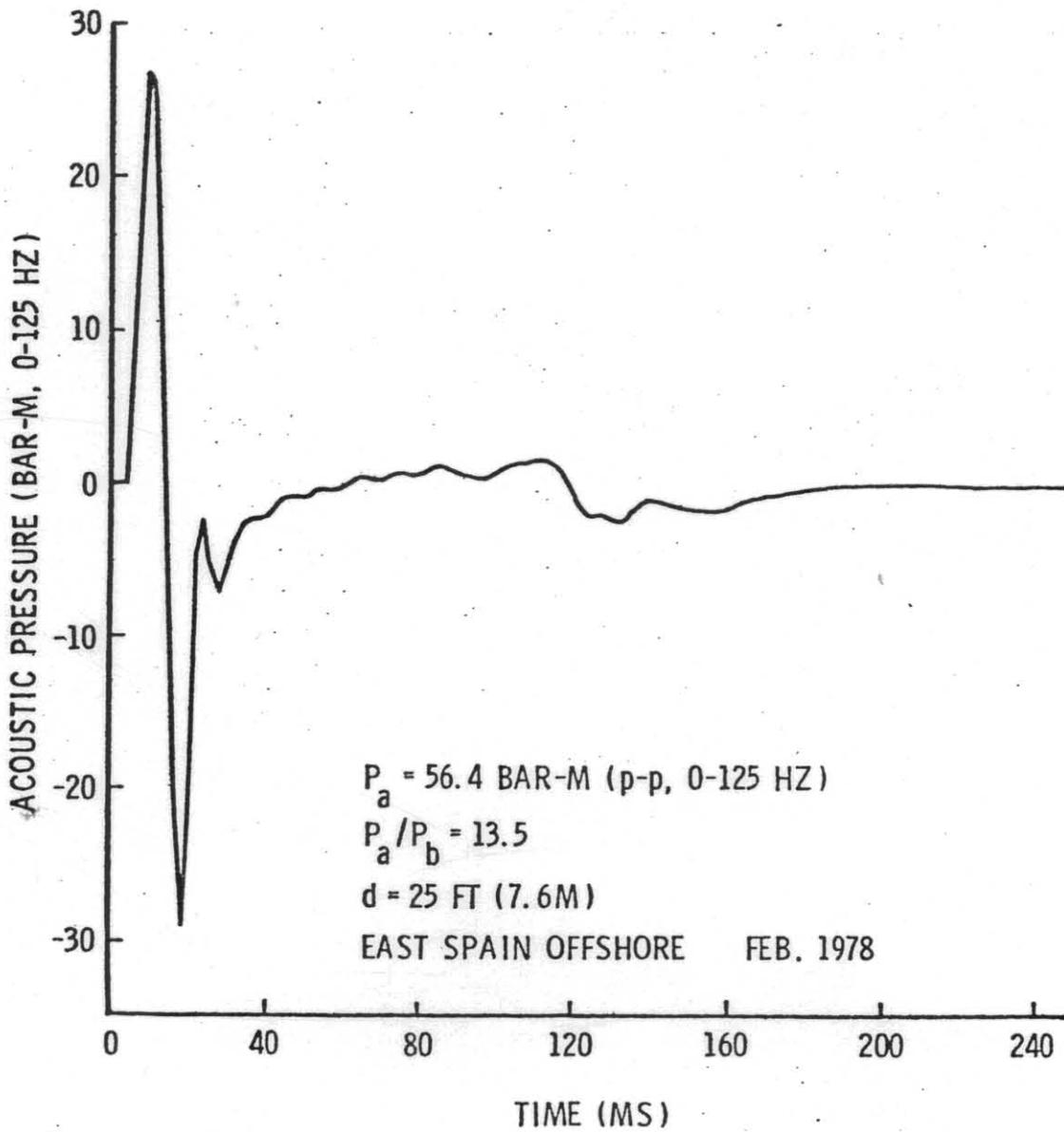
SIMRAD MODEL EA FATHOMETER SCALE





Power spectrum of 2000 cu. in. tuned air gun array

5 cm



Farfield signature of 2000 cu. in. tuned air gun array

