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MEMORANDUM

September 1, 1983

TO: Dr. Arthur E. Maxwell
FROM: Yosio Nakamura
RE: Cruise Report - Third OBS Field Test (FM-19)

The R/V Fred H. Moore cruise FM-19 for the third OBS field test took place on 24-25 August 1983. The primary objective of the cruise was to acquire reversed seismic refraction data from the line which was shot during the second field test (FM-17). In addition, field testing of several improvements to the OBS was also planned, including a) programming modification to increase the amount of recorded data, b) use of newly marketed extra length (600 feet) cartridge tapes also to increase the amount of data recorded, c) addition of an ocean-bottom hydrophone channel for comparison and additional information, and d) newly designed gimbal-mounted three-component geophones.

With the highly commendable performance of both the ship's crew and of the scientific/engineering support group, and helped by the calm sea, the cruise went smoothly and well. Three OBS's were deployed and recovered successfully at the planned locations. Unfortunately, however, the experiment was not without problems as described later.

The following personnel participated in the scientific party:

Chief Scientist: Yosio Nakamura
OBS Operation: Paul McPherson, Bill O'Brien, Mike Butterfield
Navigation/Data Logging: Patty Ganey, Dale Sawyer, Chris Bennett
Air Gun Operation: Ty Keimig, George Percy
Electronics: Ken Griffiths
Observers: Art Maxwell, Dan Orange, Jack Connell (USGS)

A copy of revised pre-cruise test plan, which was followed very closely without difficulty, is attached. A summary of activities during the cruise follows:

Wednesday, August 24

- 06:55 All OBS's were powered on
- 07:00:00 All OBS clocks, including a spare, were started and verified for operation
- 10:20 Left Galveston dock
- 11:15 to 11:30 Conducted a LORAN-C calibration by exactly timing the passage of ship-channel marker bouys 7A, 7, 5 and 3 while recording LORAN-C TD's at 30 second intervals.
- 16:30:55 OBS No. 1 (4.5 Hz vertical geophone and a hydrophone) was deployed at LORAN-C coordinates TDW=11090.0, TDX=25530.5 (Northstar geographic coordinates: 28°34.16'N, 94°40.71'W), ship's heading = 196°
- 17:12:56 OBS No. 2 (4.5 Hz vertical geophone) was deployed at LORAN-C coordinates TDW=11093.1, TDX=25461.3 (28°29.94'N, 94°45.48'W), heading = 293°
- 17:59:30 OBS No. 3 (4.5 Hz vertical geophone) was deployed at LORAN-C coordinates TDW=11095.4, TDX=25391.2 (28°26.11'N, 94°50.56'W), heading = 54°
- ~19:30 Both of the 2000 in³ air guns were deployed, towed at about 30 foot depth and started test firings at 2000 psi. A Benthos hydrophone was also deployed and towed near the surface slightly behind the air guns. The hydrophone signal was connected to the demuxer and the spare OBS.
- 19:55:00 Primary line shooting started at TDW=11095.7, TDX=25380.6 (28°25.54'N, 94°51.35'W), cruising at about 6 knots and shooting both air guns simultaneously at 30 second intervals, or approximately every 93m.
- ~11:40 Lost output from the starboard air gun. The gun was pulled in and inspected for a leak.
- 12:08:30 Starboard air gun was back in operation.
- ~12:20 The starboard air gun failed again, was pulled in and thoroughly inspected and serviced.

Thursday, August 25

- ~01:35 The starboard air gun was back in operation
- 03:30:00 Completed the primary line at TDW=11074.0, TDX=25920.0 (28°56.62'N, 94°12.92'W) and started the extension line at a cruising speed of about 4.1 knots.
- 04:30:03 Completed the extension line at TDW=11072.2, TDX=25968.6 (28°59.25'N, 94°09.32'W).
- 05:00:00 Started the reverse line shooting at TDW=11073.1, TDX=25950.7 (28°58.20'N, 94°10.58'W), at cruising speed of about 4.0 knots and increasing to about 4.6 knots.
- 07:00:00 Completed the reverse line at TDW=11077.7, TDX=25849.0 (28°52.15'N, 94°17.77'W).
- 10:36 OBS No. 1 was sighted following a successful timed release burn, which started at 10:30.

10:44:20 OBS No. 1 was recovered on board at TDW=11090.0, TDX=25528.9.
11:37 Beacon signal from OBS No. 2 was detected following a successful
timed release burn, which started at 11:30.
11:47 OBS No. 2 was sighted
11:56:40 OBS No. 2 was recovered on board at TDW=11093.6, TDX=25460.7
12:38 OBS No. 3 was sighted following a successful timed release burn,
which started at 12:30.
12:56 OBS No. 3 was recovered on board at TDW=11095.7, TDX=25391.1
19:30 Returned to Galveston

Throughout this cruise, LORAN-C TD coordinates were used for navigating to the OBS drop and recovery sites and along the shooting lines. This was because the LORAN-C geographic coordinates computed by the Northstar 6000 were found to be unreliable during the last OBS test cruise. This worked very well, and those in charge of navigation should be especially commended for maintaining excellent ship tracks by keeping good communication with the bridge.

As stated above, we encountered a few problems, some of which may require thorough examination in order to avoid recurrence:

- 1) The gimbal-mounted three-component geophone unit was not available for the test, and we had to delete an OBS from our original plan. The delay in delivery of this prototype geophone unit by the manufacturer was due to Hurricane Alicia, which gave a direct hit to the Galveston-Houston area during the preceding week, thus is considered unavoidable.
- 2) The air gun failure forced us to shoot a part of the line with only one air gun, significantly reducing the signal strength for about two hours in the middle of the experiment. The cause of the failure is uncertain at this writing and needs to be investigated. Fortunately, expeditious repairs by Ty Keimig at around midnight saved the remainder of the experiment.
- 3) The LORAN-C receiver (Northstar 6000) in the ship's lab failed several times during the shooting. It was evident that the failure occurred in the receiver because another receiver in the bridge functioned properly while we were having trouble. I understand that a similar failure occurred earlier, but apparently it was not repaired.
- 4) A data playback from OBS No. 1 shows irregular hydrophone signals. The cause may be traced to improper matching of the hydrophone output to the OBS pre-amplifier.
- 5) OBS No. 2, though functioned excellently otherwise, recording data for all 1272 shots at correct time windows, recorded only preamplifier noise. A poor electrical connection between the geophone and the preamplifier appears to be the cause of the problem.

At least some of these problems are attributable directly or indirectly to work interruption caused by Hurricane Alicia immediately preceding the cruise. The preparation for the cruise was clearly hampered by this natural disaster which struck our home port.

Despite these problems, however, we obtained good-quality refraction data from geophones in OBS's No. 1 and No. 3. The success of the OBS instrumentation is entirely due to our team of field technicians, Phil Roper, Paul McPherson and Mike Butterfield who should be highly commended for their dedication to the project, exceptional skills and thoroughness in preparation.

YN:km

Copy: Scientific Party
Research Scientists
Phil Roper
Archie Roberts
Bill Mitchell
Bruce Collins
Eleanor Picard
Ann Ginder
Dave Canham
Tom Davies

OBS THIRD FIELD TEST PLAN
(Revised)

Test Dates: August 24-25, 1983 (Wed.-Thurs.)

OBS's: OBS/OBH #1, 4.5 Hz vertical & hydrophone, 28°34'N, 94°40.5'W
OBS #2, 4.5 Hz vertical, 600 ft. tape, 28°30'N, 94°45.5'W
OBS #3, 4.5 Hz vertical, 450 ft. tape, 28°26'N, 94°50.5'W

Shooting Lines: Primary: 28°25.67'N, 94°50.92'W to 28°56'N, 94°13'W
course 48°, length 45.5 nm (84 km)
Extension: 28°56'N, 94°13'W to 28°58'N, 94°10.5'W
course 48°, length 3 nm (5.5 km)
Reverse: 28°58'N, 94°10.5'W to 28°54'N, 94°15.5'W
course 228°, length 6 nm (11 km)

Ship Schedule: (R/V Fred Moore)

10:00	Depart from Galveston	
16:00-16:30	Deploy OBS #1	(45 nm from seabuoy)
17:30-18:00	Deploy OBS #2	(6 nm from OBS #1)
19:00-19:30	Deploy OBS #3	(6 nm from OBS #2)
19:30-19:55	Deploy & Test Air Guns	
19:55-03:30	Shoot Primary Line	(45.5 nm @ 6 knots)
03:30-04:30	Shoot Extension Line	(3 nm @ 3 knots)
05:00-07:00	Shoot Reverse Line	(6 nm @ 3 knots)
07:00-07:30	Retreave Air Guns	
10:30-11:00	Recover OBS #1	(30 nm from end of shooting)
11:30-12:00	Recover OBS #2	(6 nm from OBS #1)
12:30-13:00	Recover OBS #3	(6 nm from OBS #2)
19:30	Return to Galveston	(54 nm to seabuoy)

Shooting Schedule:

	<u>Shot Nos.</u>	<u>Time</u>	<u>Interval</u>
Primary Line	1- 911	19:55:00-03:30:00	30 Sec.
Extension Line	912-1031	03:30:33-04:30:03	30 Sec.
Reverse Line	1032-1272	05:00:00-07:00:00	30 Sec.

Recording Schedule:

<u>Record Nos.</u>	<u>Time</u>	<u>Interval</u> Sec.	<u>Record</u> <u>Length</u> sec.	<u>Shots Covered</u>
<u>OBS/OBH #1</u>				
1- 125	19:55:00-21:59:00	60	20	1, 3, ..., 249
126- 456* (467)	22:00:00-03:30:11	60 + 1/30	20	251, 253, ..., 911
<u>OBS #2</u>				
1- 130	19:55:00-20:59:30	30	20	1 - 130
131-1031	21:00:00-04:30:15	30 + 1/60	20	131 - 1031
1032-1272 (1284)	05:00:10-07:00:10	30	20	1032 - 1272
<u>OBS #3</u>				
1- 911* (930)	19:55:00-03:30:15	30 + 1/60	20	1 - 911

*May be extended to record until tape runs out. Estimated tape capacity is given in parentheses.

Scientific Party:

Chief Scientist: Yosio Nakamura

OBS: ~~Phil Roper~~
Paul McPherson
Bill O'Brien
Mike Butterfield

Navigation/Data Logger: Patty Ganey
Dale Sawyer
Chris Bennett

Air Gun: ~~Archie Roberts~~
Ty Keimig
George Pearcy

Electronics: Ken Griffiths
~~Stirling Gilfillan~~

Observers: Dan Orange (MIT)
Jack Connell (USGS)
~~To be determined (Texas ACM)~~
Art Maxwell

