

Department of Geodesy and Geophysics
Cambridge University

M. V. SURVEYOR
REPORT ON CRUISE
July - August 1970

N.W. Coast of Scotland.

Gravity and seismic refraction on Rockall Plateau

This was a joint N.I.O. - Cambridge cruise on which priority was given to N.I.O. work. The report deals solely with the activities of the Cambridge party.

D A T E S

July 13th - 16th 1970 Installed apparatus in ship at Barry.
July 17th Sailed for Leg 1.
July 25th - 26th Line B shot north to south.
July 30th - 31st Queen's Wharf, Londonderry.
August 1st Sailed for Leg 2.
August 6th - 7th Line B shot south to north.
August 13th Queen's Wharf, Londonderry; Left ship
August 28th Collect apparatus from ship at Barry.

SCIENTIFIC PERSONNEL

Leg 1.

D. Gaunt (N.I.O.) Senior Scientist
M. Bacon
T. Vertue
R.A. Scrutton
Jennifer Lort

Leg 2.

D. Cartwright (N.I.O.) ..Senior Scientist
D.H. Matthews
T. Vertue
R.A. Scrutton

CRUISE INTENTIONS

N.I.O. plans for the first leg of the cruise involved laying four moorings with current meters and tide recorders, two south of St Kilda, one on Anton Dokru Kuppe and one near Rockall Islet. The second leg was to be devoted to wave recording and current measuring on Rockall Bank, and the third leg to recovering the four moorings. Dr John Wilson was to use intervening time to take grab samples of bottom sediments.

A list of Cambridge projects arranged in order of priority follows. Before the cruise began discussion at N.I.O. had made it clear that there was only likely to be time during the month to complete the first two of these.

Geophysical projects - in order of priority

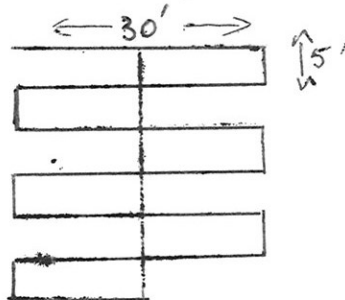
- Z A 150 miles long gravity traverse from Rockall Trough ($55^{\circ}55'N$, $11^{\circ}00'W$) to Rockall Bank ($57^{\circ}07'N$, $14^{\circ}45'W$).

This is to complete a 1,000 miles long traverse from Bloody Foreland, N.W. Ireland across Rockall Plateau. Minimum 15 hr. required.

- B A 100 miles long reversed refraction line (Line B) along the axis of the Hatton-Rockall Basin. Bearing 032° to the north end at $58^{\circ}17'N$, $16^{\circ}00'W$. Minimum $3\frac{1}{2}$ days.

- G A 100 miles long reversed refraction line (Line D) along the crest of Hatton Bank. Bearing 024° to the north end at $58^{\circ}41'N$, $18^{\circ}00'W$. Minimum $3\frac{1}{2}$ days.

- Y A detailed gravity and magnetic survey of a positive gravity and magnetic anomaly at $58^{\circ}00'N$, $17^{\circ}45'W$, 255 miles of track:-



Minimum 26 hr required.

- X Reversal of a seismic refraction line in Rockall Trough, 50 miles long on a bearing 034° from $56^{\circ}12'N$, $11^{\circ}56'W$. Minimum 16 hr required.

NARRATIVE

The seismic recording apparatus was conveniently installed in a wooden hut measuring 12 x 8.5 ft on the upper deck and the buoys were secured to a specially installed hitching rail under the Bridge. A removeable firing platform was installed over the starboard quarter. Almost 8 tons of explosive were stowed in four wooden lockers in the hold. Because of the congested state of the after deck and A-frame the buoys were eventually laid and recovered using the derrick on the well deck forward.

When the ship reached Barry the NERC La Coste gravimeter was found to have broken down and it was taken ashore. R.R.S. John Murray returned to harbour with the Cambridge Askania meter on board and it was decided to instal that aboard Surveyor in spite of the fact that it was known to be urgently in need of overhaul. It has been almost continuously in use throughout the past ten years during which time the meter itself has been overhauled only once. The Askania meter and its recorders were installed in the lower lab. with the help of R.V.U. Staff. The platform was run up and the routine calibrations made. The meter and gyro were then put back in their boxes until after the seismic refraction line.

On the first leg after the four N.I.O. moorings had been laid our sonobuoy was laid for trial p.m. 24th July. Next morning a danbuoy was moored at the north end of Line B in Hatton-Rockall trough and the three sonobuoys were laid at two mile intervals on course 212° T. Navigation was by Loran C and D.R. Charges of Geophex up to 300 lb in weight were fired between 1330 and 2300 hr, the last at a range of 100 miles. The buoys and danbuoy were recovered after sound-ranging next morning. The danbuoy could be detected at a range of only 4 miles. The sea was calm throughout. On the passage back to Londonderry the gravimeter was put into service on July 26th.

After leaving Londonderry for the second leg we steamed along the gravity traverse between Bloody Foreland and Rockall Bank. On 6th August we laid a danbuoy and three sonobuoys at the south end of line B and shot from noon until 2130, finishing with a 400 lb charge at a range of 95 miles. The buoys were recovered in the morning. One hydrophone had stopped working after 20 shots due to a flooded cable connexion. The sea was calm throughout.

During the rest of the leg we obtained shreds of gravity traverses. We prepared to reverse line C in the Rockall Trough on the passage

home on August 12th but when we reached the laying position, the wind was 30-40 knots, freshening, and it did not seem expedient to risk the buoys for such a short line. We made a gravity traverse back to London-derry

COMMENT

Surveyor is an admirable and surprisingly stable small ship. It is necessary for the scientists to do the navigation, at least when out of Decca coverage. Both AC and DC voltages fail to attain their stated values.

Although we achieved everything that we expected to achieve it is not economic to send a party to sea for a month to do three days work.

PROJECT REPORTS

1. Seismic Refraction

The apparatus worked well enough and minor difficulties on one or other buoy were traced and mended, so far as we know. A list of defects is appended.

2. Gravimeter

Sporadic failures and minor tares of the recording system did not reoccur after the voltage was stepped up on 3rd August. The clamp on the meter appears to have become inadequate. The meter suffered a tare of some 60 mgal., probably during the refraction line on 6th August, and this may invalidate gravity observations. The meter will not be available for use until it has been overhauled. A scheme for repairs is appended.

APPENDIX

Sonobuoys

1. Paint the buoy cans. Use colours visible at a distance to distinguish them.
2. Two more buoys to build.
3. Plugs for battery supplies fixed to framework to replace long leads.
4. Fix plugs at the back of the Bradley unit. Check the demod units.
5. Fix the dud galvo in the big U. V. recorder.
6. Shipborne clock jumps to OH (or back one hour) at 21 hours.
7. Fix the replay unit in a Creeth case.
8. Make new hydrophone cables up.
9. Make spare hydrophones.
10. Discuss flotation with John Swallow.

APPENDIX

Gravimeter defects

1. Fix Servomex (servomotor not working); carry the Gustav Klein as spare.
2. Eliminate the great big stand for the gyro amplifier and course correction unit and pack them in Creeth cases.
3. Tidy up and label informatively the board with resistors on the gyro supply cable.
4. Should there be any play in the roll bearings of the platform?
5. Go over all the cables; examine the soldering; label them adequately; fix dust caps.
6. Adjust the microscope so we can see the vernier and then take the meter over the calibration line.
7. Return the meter to Germany, then calibrate it again. All leads to plugs on the meter should be inspected.
8. Send bottom box of Enograph rack back to Germany. Either replace or recondition it and fit new filter condensers for x 1 clamping.
9. Send the 6v supply box back to Germany for repair or replacement.
10. Replace the Enograph, perhaps by two Hewlett Packard recorders.
11. Tidy up the XCC. Fix a new horizontal accelerometer to the platform so as to be independent of the electric gyro.
12. Build analogue off levelling computer.
13. Go over all spares and tools.
14. Mend spare servo amplifier.
15. Fix the Rikadenki and match it to the XCC.
16. Buy a stethoscope.

DISTRIBUTION

NERC (London)

NERC (Barry)

Master, M. V. Surveyor

Dr A. S. Laughton (N.I.O.)

Mr D. Roberts (N.I.O.)

Dr D. Cartwright (N.I.O.)

Mr D. Gaunt (N.I.O.)

Professor M. H. P. Bott (Durham)

Professor D. H. Griffiths (Birmingham)

Sir Edward Bullard

Dr F. Gray

Mr T. R. E. Owen

Mr L. H. Flavill

Dr D. H. Matthews

Mr M. Bacon

Mr T. Vertue

Mr R. A. Scrutton

Miss Jennifer Lort

2 spares.

