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INTERNAL DOCUMENT 30

I.O.S.

Technical and Operational Difficulties experienced on the UKOOA Foula project

June to December 1977

NATURAL ENVIRONMENT RESEARCH COUNCIL

INSTITUTE OF OCEANOGRAPHIC SCIENCES

INSTITUTE OF OCEANOGRAPHIC SCIENCES

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Technical and Operational Difficulties experienced on the UKOOA Foula project

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Internal Document No 30

Institute of Oceanographic Sciences
Crossway
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INTRODUCTION

The Marex data buoy system was deployed on the Foula station for the first time on 4 December 1976. In the following months the buoy operated satisfactorily for much of the time, except during February 1977 when some data were lost because of a power supply failure and during March 1977 when the buoy broke adrift and went ashore on the coast of Shetland. During these periods good (although not complete) coverage of wave information was maintained using the data transmitted by the data-buoy and the back-up Waverider.

However, in mid-June the performance of the system deteriorated and no further data were recorded by the buoy during the rest of the period covered by this report. The buoy was found drifting by MV Gorm Viking on 14 December 1977, and was subsequently redeployed on 19 January 1978. It was not until then that reliable data recording recommenced.

Over this period wave data were recovered using the radio transmission from the buoy, but the reliability of the link was less than had previously been the case, partly due to increasing interference and partly due to technical difficulties on the buoy. An added difficulty was that prior to this period the Waverider had drifted off-station and had not been replaced, so that when transmission from the buoy ceased there was no back-up transmission available. UKOOA instructed Marex to redeploy the Waverider at the meeting of the Technical Advisory Group of 18 October 1977, and the Waverider was redeployed on 25 November 1977.

UKOOA expressed concern at the poor performance of the Foula data buoy system, and at their meeting of 12 January 1978 they asked IOS to report to them in detail on the problems which had been experienced on the project. Accordingly, IOS arranged a meeting with Marex to discuss the problems which had occurred in the project. This took place at Marex House on 10 February 1978.

The results of these discussions were reported verbally to the TAG on 11 April 1978, and the present document is the formal report promised on that occasion.

The aims of the report are to document the causes of the failures which have occurred on the project, to detail actions which Marex have taken to overcome the problems and to suggest some courses of action which will improve the data return from the project in future.

REPORT ON VISIT TO MAREX LTD TO DISCUSS PROBLEMS EXPERIENCED IN THE FOULA DATA BUOY SYSTEM OPERATIONS

The meeting took place at Marex House, Cowes, Isle of Wight on 10 February 1978.

PRESENT: Marex staff - Alan Ainslie
Dr Martin Springett

IOS staff - E G Pitt
Dr C H Clayson

The discussion began with a general review of the system and of problems/failures experienced, this was followed by a detailed examination of similar equipment under test in the electronics laboratory and, finally, by a discussion of recommendations for action which could improve the future performance and reliability.

System Performance

Operations have been based on buoy servicing at intervals of nominally four weeks. However, during the period in which the failures were experienced inter-service intervals extended to six weeks or more on several occasions. This led to long periods of data loss.

16 June 1977 — 10/11 Aug — 17/18 Sept — 4 Nov — 14 Dec

(1)	(2)	(3)	(4)
Prototype	Production	Prototype	Production

The bar-chart shows the period under consideration divided by lines representing the service visits into the four inter-service periods. Also marked is the processor - either the production version or the prototype - which was in use during that period.

Only 4 days of data were recorded in period (1), and none at all in periods (2), (3) and (4). The causes of failure are listed below.

Period (1) An integrated-circuit memory failed after four days.

Period (2) The testing and switching procedure which was applied to the processor immediately prior to deployment created a previously unrecognised logical fault condition. Recording was inhibited throughout the period.

Period (3) Processor failure due to ingress of water when the plastic module case leaked.

Period (4) This period ended when the buoy was found adrift by MV Gorm Viking. The buoy broke away when the wire rope which connected the taut wire to the anchor clump abraded through. The cause of the processor failure is not known since the processor is still with British Rail, presumably lost.

Discussion Before 16 June the data return from the buoy had been highly satisfactory. The failure in period (1) was due to a fault which developed in one program store location. Marex assured us that they burn-in all integrated circuits properly before a module is used on the buoy, so this fault could probably not have been prevented. It is presumed that the electronics were adequately protected against lightning strike and pick-up of significant voltages from the transmitter. (This point was not checked during this visit, but previous technical discussions have confirmed that this is the case).

Trouble experienced with low received signal strength from the radio transmitter (trouble which first became apparent in period (1)) was attributed to poor contact in an EO 'Watermate' connector. These connectors use beryllium copper contacts and IOS has not had any significant trouble with them in the towed Hermes profiling fish over several years' use. Although the gold-plated version of these connectors would undoubtwdly be better, it is felt that attention to cleaning and vaselining the connectors should suffice: it is realised that this may not be easy on the buoy at sea.

At the start of period (2) the microprocessor system latched-up due to an unfortunate sequence of connections during installation - this latch-up problem has since been remedied by software modifications. In addition, Marex are in the process of making a waterproof test set which will be plugged into a connector on the buoy module at sea: this will enable the performance of a module to be checked at the time of its installation.

The possibility of setting up a service facility in Shetland was raised but Marex considered that this was not practical in view of the equipment which would have to be tied up in Shetland for only infrequent use. We were not entirely convinced by this argument, especially since the shipping of modules up and down between Cowes and Shetland seems to be a distinctly risky business (a subject referred to again later).

Early in period (3) the processor failed due to the ingress of water into the plastic module case. The leak was caused by a hair-line crack which Marex consider was the result of rough air-freight handling. The damage (which was visible) was thus presumably caused during shipment from Cowes to Scalloway since the modules are leak tested with air under pressure during servicing at Cowes. Since this incident, special transit cases have been constructed for the modules.

The production processor used during (4) had been mislaid by British Rail so it was not available for inspection or testing. However, the fault which caused the data loss may have been due to a battery or battery-charging malfunction, as evidenced by some trends in the (excessively garbled) data recovered. The power supply system incorporates NiCd rechargeable cells which are charged, at suitable intervals under control by the microprocessor, from air-depolarised cells. The stable voltage of the NiCd cells then allows the design of efficient voltage regulators although the overall power efficiency is probably not improved very significantly by this method. The reliability of NiCd cells under this cycling regime may be a significant factor in the overall system reliability and sealed gel-electrolyte lead acid could be a better choice. It was understood that the rechargeable batteries were replaced at 6-month intervals, together with a number of other 'perishable' components such as connectors (to which reference is made above).

The failed mooring which caused the buoy to drift off-station was in Aberdeen and not available for inspection. However, Marex informed us that the wire rope which was connected to the taut line and threaded through the mooring clump had abraded through. A modification to this part of the mooring which eliminates the wire rope should eliminate the problem. No protection anodes are used in this part of the mooring.

Module construction

Most of the data gathered so far with the buoy has been with the prototype system using wire wrap connections. The new (production) system was engineered in a modular fashion using printed circuit boards in edge connectors on a mother-board in a card frame. In the redesign some important improvements were made such as the 4-wire link control panel interface, allowing in-situ monitoring and control. Detail design changes such as the incorporation of an integrating Analogue to Digital convertor in place of the original successive approximation type have also been made.

The general standard of construction was good and the design appeared sound so far as one could judge from this brief acquaintance. The performance of the Memodyne data logger in this application has been rather disappointing so far, but although one could see some deficiencies in its design, it is used in several commercial oceanographic instruments with apparent success. In particular the head carrier seemed to have excessive free play which might lead to varying skew although the head does, of course, have an integral tape guide. Since the head carrier also holds the pinch roller one could imagine that sudden acceleration of the capstan would tend to move the head carrier towards the take-up spool end of the cassette due to rotational inertia and friction in the pinch roller assembly. As there is apparently surplus storage capacity available, it might be worth reducing the packing density to 615 bpi: presumably this is achieved by an increase of capstan diameter. It is also recommended that the tape in new cassettes is spooled back and forth a few times, to ensure that it is free, before loading in the loggers.

The relative merits of the Memodyne and Sea-data tape decks was discussed - with IOS pointing out the much greater robustness of the Sea-data and the electronic deskewing on replay feature. However, Marex will not consider such a major change at this stage.

Conclusions

After several months of reliable operation, the system has had a succession of failures - some due to bad luck, some due to design inadequacies which showed up only in operational conditions and some due, possibly, to inadequate maintenance. It is to be expected that a data buoy system will not succeed in achieving very high data capture reliability (at least in its early days) due to operational problems. A microprocessor based system can be expected to be prone to total disablement by relatively simple faults which might have caused only partial data loss in a modular, rather than a centralised, system. An unattended microprocessor-based system must, therefore, be checked out extremely carefully after installation: the new monitoring and control test box should make an important contribution to this procedure.

Experience over the months during which the failures have occurred suggest that there is considerable risk attached to the transhipment of processors between Cowes and Shetland, and it may be that some simple test/service facility should be established in Shetland so that such routine transhipment is not required. It is clear that much valuable data would have been saved if the faults had been detected earlier in the recording period. In future a more determined effort will be made by Marex to change the modules at intervals of less than one month, and a full-time project coordinator has been assigned to the project to improve control and coordination.

With regard to the electronics and software design, it would be presumptuous to make any detailed criticism without making a thorough study of the system. The overall impression was, indeed, favourable and it is hoped that there are now no more undetected bugs. The performance of the tape units is still a matter for concern: a bit error rate of greater than 1 in 10^5 is quite unacceptable for this type of equipment. The standard of construction of the Marex electronics and module hardware appeared to be very satisfactory. External hardware was not, of course, available for examination.

C H CLAYSON and E G PITT
6 March 1978

MARINE EXPLORATION LIMITED

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marex

Mr. E.G. Pitt
Institute of Oceanographic Sciences
Crossway
Taunton
Somerset TA1 2DW

ARA/MMB/2557/78
17th May 1978

Dear Ted,

Thank you for the draft copy of the Foula Data Buoy operations report received today. This is an accurate description, with one or two minor exceptions :

1. It is not clear that the non-replacement of the Waverider was a UKOOA decision, not a Marex lapse.

2. Our temperature cycling facility was not available during the period described, so "burn in" refers only to an adequate test period, although temperature cycling will be carried out in future.

3. It is quite possible to clean and grease the connectors at sea and this is done. The addition of blanking connectors during handling has been made.

4. It is not clear that the "mooring clamp" modification has been carried out. The sentence could be amended to make this clear, e.g. "A modification has been made to this part of the mooring which eliminates the wire rope and should solve the problem."

5. Corrosion at the bottom end of the mooring is minimal; however anodes are now used as an additional safeguard following IOS recommendations.

ARA/MMB/2557/78
17th May 1978

6. We feel that "due, possibly to inadequate back up facilities" would be a fairer description than "inadequate maintenance." Our field personnel have worked extremely hard and have often carried out module changes and deployments under very difficult conditions.

The above are points of detail but the addition of a test/service facility in Shetland would be a significant change. We already have a work area where module assembly and field testing can be carried out. To duplicate the test/service facility we have at Cowes would, however, be impracticable as it would need full-time staff to have the same capability.

The method proposed to overcome the transport difficulties is as follows :

1. Have three processors available for the project. This will enable a minimum of one spare system to be available at all times. Marex will have the third processor completed within one month.

2. Completion of the field test set ; this to be available for all module changes. This would, with the addition of some basic electronic test instrumentation, provide the basis of an adequate test/service facility in Shetland. Modules could be kept there and any faults put right by printed circuit board replacement. Transport to Cowes would be necessary only if the fault could not be corrected by this means.

(This is rather a long-winded way of saying that we agree but will need a production test set with full test programs and a third processor module before it can be implemented).

With regard to the various reports written by Marex personnel, we have no objection to these being passed on to UKOOA in their present form.

Yours sincerely,

Alan

A.R. Ainslie
Managing Director

[illegible] EXPLORATION LIMITED

[illegible] HOUSE
[illegible] TREET, COWES
[illegible] OF WIGHT, [illegible]
[illegible] 332 [illegible]

marex

Ref:ARA/DK/2222/78
24th. February, 1978.

Mr. E. G. Pitt,
Institute of Oceanographic Sciences,
Crossway,
Taunton,
Somerset, TA1 2DN.

Dear Ted,

West Shetlands Data Buoy.

Here is the summary of data buoy operations promised in my letter of 16th. February.

It is a summary of any problems which have occured, rather than a detailed summary of the complete operation. The intention is to define whether any of the problems could recur, and the steps taken to prevent this happening.

One factor which is not covered is operating cost, usually a major factor in data gathering operations. The Foula project has indicated that the budget is realistic, provided, of course that a high level of data return is achieved. This supports the conclusion that small data buoys can be an effective method of data aquisition in remote areas.

We would welcome any comments on the enclosed summary.

Yours sincerely,

Alan

A.R. AINSLIE.

Director.

Marine Exploration Limited.

Encl.

c.c. Dr. Rees and Mr. Woollen.

Data Buoy Operation West of The Shetland Isles

This brief summary has been written with the purpose of identifying any factors which have caused loss of data and the steps taken to eliminate these.

Contents are as follows :

Marex, 24 FEB 78

1. <u>Hull</u>

1.1. Damage to the hull occurred when the buoy was driven onto a rocky coast on the Shetland Isles in storm conditions. The buoy remained awash in heavy seas for 3-4 days before being secured on shore.

The hull damage was superficial, and it retained flotation and structural integrity. The modules were protected by the hull and were undamaged.

Repairs were effected at Cowes and the buoy was re-deployed at sea later in the project.

1.2. A vessel struck the buoy near the mooring point and dented the hull. Damage to the hull was superficial and the mooring was intact. The buoy was, however, dismasted and had to be brought ashore for repair. The buoy was towed ashore, confirming that slow speed towing is feasible.

<u>Summary of hull performance</u> :

(1) Hull strength is sufficient to withstand environmental forces and collision.

(2) The mast will withstand environmental forces but may be damaged by severe collision. Increasing the strength of mast and rigging would probably not prevent sensor damage in such a collision.

2. <u>Mooring</u>

2.1. The cause of the first mooring failure is unknown as all removable fittings were taken by the locals and not recovered.

2.2. The second failure was caused by abrasion of a steel wire strop which was used to fasten the clump weights together. This was done on site and was not part of the mooring design.

Since then, chain weight has been used, shackled to the bottom of the taut wire. This eliminates this type of failure.

2.2. cont'd

The mooring had operated for 35 weeks, which is above the design life of 25 weeks. Wear and corrosion were negligible.

The mooring was not replaced on schedule because the contract had ended and it was not known for how long it would be extended. This information was needed to decide whether to replace the mooring only, or the complete buoy.

Summary of mooring performance :

(1) Mooring strength and resistance to corrosion and abrasion is sufficient for this location.

(2) Failure could occur through faulty assembly or deployment. Rigorous quality control for these operations will prevent this.

(3) The buoy is in an area with frequent trawling activity where the loss rate of moored equipment (e.g. current meters) would probably be high. Such vessels may avoid the buoy, but it has not been deployed for long enough to estimate the probability of mooring damage by shipping.

(4) A method of transmitting the buoy's position ashore would reduce any data loss or repair costs associated with shipping damage.

3. Electronics

3.1. A crack in the printed circuit board of one of the power supplies caused a high current drain, which caused the battery to go flat after about twelve days. The replacement board was modified by additional supports. The production system does not use this board.

3.2. A store integrated circuit failed after about four days' operation. This was replaced.

This component was of high quality and was replaced by an identical component.

3.3. On the first deployment of the production electronics, a logic error prevented the electronics from starting when the power was applied. This was a design fault and was rectified.

3.4. The electronics operated throughout the deployment and recorded values every hour, but the values were incorrect because the tape recorder became wet. When dried out, the unit was found to be functioning correctly.

The leak was due to a hairline crack in the module, caused by airline baggage handling. The forces were large, as the module base surround had been broken in places.

The module was replaced, and for all subsequent transportation, the modules were carried in specially manufactured cases to prevent such damage.

3.5. The first production electronics module was lost by British Rail and the cause of failure a few hours after deployment is not yet known.

Summary of Electronics Performance :

(1) The sensors are sufficiently reliable for data buoy operation.

(2) The faults which have occurred have been minor and easily rectified. No basic design flaws have been found.

(3) The processor has survived wrecking on a rocky coast in storm conditions, vessel collision and handling by airlines without damage. It appears to be sufficiently robust for data buoy operation.

(4) A minor fault occurring soon after deployment can lead to a major loss of data. A method of confirming on shore that data are being recorded on the buoy would prevent this.

(5) A long commissioning period, including a soak test and temperature cycling, is necessary for a processor which will operate unattended on a data buoy.

4. Operation

4.1. During this operation it has often not been possible to visit or deploy buoys when planned because of weather conditions. The long intervals between some service visits have, unfortunately, coincided with recording system failures.

The operation is now scheduled so that service visits are organised at shorter intervals.

4.2. Because the exact dates for servicing are not predictable, the identity of the service personnel has depended on their availability at that time. This has led to a lack of continuity.

An experienced operator is now attached full time to the project, and goes on every service visit. His duties include quality control of the equipment assembly and operation.

5. Further Developments

As a result of the Foula operation, the following additions to the system would appear to be useful :

5.1. Position Indicator

For these, some kind of link to shore is needed.

(1) The simplest method is to use the existing hardware for satellite position fixing. This is low cost and of proven performance. It will be used on the buoy for any project/location where a suitable satellite is available. The availability of satellites for this purpose is planned to increase, but is insufficient at present.

(2) The data link developed by Marex for current measurements can be used to confirm that the mooring is intact and at the same water depth. If so, there is a very high probability that it is still at the same location. Development of this item is nearing completion.

(3) Hyperbolic navigation systems – Decca/Omega and satellite navigation systems can be used for buoy position fixing. The feasibility of using these has been studied, but for various reasons (e.g. cost, power consumption, ambiguity) they are not suitable at present.

5.2. Data Recording Indicator

These assume that a link to shore is available.

(1) The simplest method is to send a signal confirming that the data sequence is completed. This will confirm that the processor has worked correctly, but not that the recorder has advanced. To date, on every occasion that the processor has worked correctly, the tape has recorded. Dual recorders working in parallel could be used to reduce the possibility of tape recorder failure.

This system would be simple to develop and could be transmitted over the waverider channel, and thus used for the Foula project. Only a very

5.2. (1) cont'd

simple signal would be necessary and its absence would indicate a fault in the processor.

(2) A complete end-to-end check could be provided by having a read-after-write recorder. These are available, and the processor could be modified to check the recorded data with that calculated. A signal that the recorded data was correct could be transmitted to shore. This could, again, be a simple signal, not a transmission of all recorded data.

This solution involves an appreciable amount of development work. This will be undertaken when the present development projects are completed.

Conclusions

1. The operation to date has not revealed any basic design faults which would prevent the buoy system meeting the design criteria.

2. The operation is feasible in remote locations using ships of convenience.

3. To achieve a high level of data return, a full spares back-up (hull, mooring, electronics, sensors) is needed, and these must be available without delay.

4. Developments planned and in progress will provide means to transmit to shore confirmation that the buoy is on station, and is recording data. This will improve data return and reduce operating costs.

R 252

MARINE EXPLORATION LIMITED COWES ISLE OF WIGHT

Foula Data Buoy Service X292

4-5 November

Personnel : M.S. Martin
G. Venables

Objectives :
- To change electronics module, battery module, heave sensor module
- To inspect the upper mooring by diving
- To make measurements of environmental conditions at the time of the visit for comparison with recorded data.

1. Timetable

3 Nov.		Travel to Gatwick - (allow two hours at least from Portsmouth by hire car)
4 Nov.	1400	Arrived Scalloway. Rebuilt battery module - there was water in it; needs transporting to Marex for testing/repair. Handed cheque to W. Scott.
	1500	Left for location.
	2100	Arrived on location - buoy visible at 2 miles on radar, 1/2 mile for flashing light. Changed electronics and battery modules, failed to change heave module or inspect mooring.
	2300	Left station for Scalloway.
5 Nov.	0530	Arrived Scalloway. Retrieved cassettes, left module to be forwarded to Marex by W. Scott.
	1100	Left by taxi for Sumburgh.
	1205	Plane left Sumburgh.
6 Nov.	0100	Arrived Cowes

2. Readings

a) Buoy location. Decca Red : C2.75
Green : J30.28
Purple : A67.68

These are as previous report – Captain confirmed no shift in position.

b) Met. at 2100 4 November.

Wind Speed :	9 min. 10 av. 12 max. kts.
Wind Direction :	315° mag.
Air Temperature :	10.5°C
Water Temp. :	10.6°C
Barometric Press.	0996.0 mb.
Waves :	Hs = 2 m (estimated)

c) Batteries. Old : not measured
New : 27.77, 27.85 v.

d) Padlocks. Electronics module (was) K
Heave module M

3. Work Schedule

On arrival in Scalloway, the "Sceptre" was ready at the quay.

The spare battery module was opened up and found to contain some water, about 1–2 pints. This was removed and the module dried out, tube connections checked and O-ring regreased. Battery volts and polarities were recorded.

"Sceptre" then sailed for location on a clear evening with a light NW wind and fair swell running.

Clouds closed over during the evening and at the buoy location, conditions were judged just possible for work, due to the light wind. The sea was choppy.

"Sceptre" left decklights on and played a searchlight on the buoy as much as possible. This was essential since there was no moonlight.

Recorder and battery modules were exchanged. The new spanners worked well and all connectors locked easily without binding.

The air temperature probe was washed with fresh water.

Oil Rig

A semi is located about 4.5 n. miles NNW of the buoy at present. We should inform them of the buoy's presence and project outline to aid security.

Time spent on the buoy was 2¼ hours, which represented about a physical limit.

Heave module changing and a diving inspection were not therefore, undertaken.

"Sceptre" then returned to Scalloway.

At 0830 the recording module was opened and the cassettes retrieved. Both had advanced about halfway. The module contained water, about one cupful. Some connectors on the lid were corroded and the aluminium card box showed streaks, indicating a leak at the top, which dripped downwards.

The lower cassette recorder was coated with water droplets (this is the processed data recorder).

This module was dried, resealed and left with W. Scott for freighting to Marex for checking/repair..

4. Inventory

Remaining in W. Scott's store are :

Zodiac and rockets, oars, repair kit, inflater, module carrier.

One battery module (has leaked, needs changing)

One heave module - condition?

One tool bag with - carabino clip, water bottle, flare, one padlock K (no key), bag of short bolts

One polythene bag with - two flares, two torches, ring spanner, one broken tube spanner, one paint brush, three long bolts, 3 ft. polythene tube

Plus - assorted poly tube, braid line, 3 x plywood discs, 4 rubber discs, 50 cable ties, 1/2 paper roll, Waverider mooring.

M. S. MARTIN. 7th. November, 1977

CC : PGD/BJM/DJC/BA/X292 R264

MARINE EXPLORATION LIMITED COWES ISLE OF WIGHT

Foula : Waverider Deployment

Dates : 21.11.77. - 26.11.77.

Engineer : B. Altman

Principal Events :

21.11.77.	1230	Arrive Peterhead.
	1430	Visit Phillips at Asco Base.
		Check Waverider and mooring, test Waverider.
22.11.77.		Purchased mooring weight.
24.11.77.	0900	Arrived Asco Base.
		Waverider switched on and loaded onto 'Stad Scotsman' with mooring and weight.
	1840	Sailed for Atlantic I.
25.11.77.	1430	On data buoy site.
	1530	On location.
	1615	Off to lay Waverider.
	1649	Buoy in the water.
	1655	Weight released.
	1715	Back on location.
	2000	Sent panel-meter up to Atlantic I.
	2030	Left location.
	2100	Check Waverider and second look for databuoy.
26.11.77.	0930	Arrived Peterhead.

Work Done :

The Waverider was laid on Decca at :

Red	C	3.1
Green	J	30.2
Purple	A	67.7

At a bearing and distance from Atlantic I of 125^{o}, 3.75 n.m.

At no time during the three occasions of being on the location was the data buoy visible. Conditions were : wind NNE 4-5; sea moderate swell; light poor.

BA/JB/R264
30th November, 1977

B. ALTMAN

MARINE EXPLORATION LIMITED

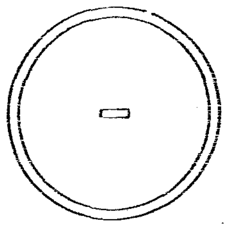
DATAWELL WAVERIDER BUOY SERVICE SHEET

Serial No: Top Hatch	6679
Hull	6679
Deployment	Foula
Date of calibration	October 77
Next calibration due	May 78

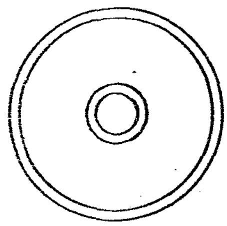
MECHANICAL STATUS

Antenna	/
Antenna nuts	/
Antenna washers	/
Antenna spring	/
Antenna seating	/
Swivel	/
'O' ring	/
Tx xtal	

Hull status



Bottom view



Top view

ELECTRICAL STATUS

Item	Limits		before repair	after repair		Comment
	max	min				
Battery I A–H	22	15		20.55	volts	
Battery II D–E	22	15		20.50	volts	
Life remaining	10	5		9	mths	
Stabiliser voltage B–I	12.1	10.9		10.93	volts	
Accelerometer sensitivity	–	–			–	
Frequency	–	–		27.065	MHz	
Channel	–	–		–	–	
Receiver Frequency	–	–			MHz	
Antenna voltage	7.5	6.0		6.3	volts	
Flash group time	4.0	6.0		5.0	secs	
Flash cycle time	20	25		23	secs	
day/night switch	–	–		/	–	

Comments

Buoy wet inside, probably condensation.
Foam rubber and silica gel dried and replaced.

Field Engineer	B. Altman
Date	21.11.77.

MARINE EXPLORATION LIMITED COWES ISLE OF WIGHT

Data Buoy Assembly At Scalloway, Shetland : 2nd-5th December

Personnel : M.T. Westbrook
D. Latham

Timetable :

1/12	1400 hrs	Lorwood departed Aberdeen for Scalloway with Data Buoy on board.
2/12	1000 hrs	M. Westbrook arrived Scalloway.
	1800 hrs	D. Latham arrived Scalloway.
3/12	0100 hrs	Lorwood docked Scalloway.
	0845 hrs	Started to offload buoy and mooring.
	1020 hrs	All offloaded, Lorwood free to sail.
	1100 hrs	Finish with crane.
	1115 hrs	Lorwood sailed from Scalloway.
		Fitted keel, tightened stays, seized shackles.
		Fitted 'top hat' hatches.
		Shackled and seized overbound strop to ring of confidence.
4/12		Fitted quad pod, ran string through mast for cables, fitted mast, tightened shrouds, locked bottle screws with split pins.
5/12		Pressurised both sets sub surface buoys and moved into compound with mooring.
		Cut one lot chain ballast in half, to make up two 3,000 lbs weights.
	1245 hrs	Departed Scalloway.

Work Schedule :

Friday, 2nd December	Arrived Scalloway 1000 hrs, went to TTF and contacted Walter Scott. He had not heard from the Lorwood and was unable to contact her. Carried out inventory of equipment in TTFs store and compound. Walter Scott tried to contact the Lorwood every two hours throughout the day, with no success.
Saturday 3rd December	Lorwood finally docked in Scalloway at 0100 hours. It had been arranged for a crane to be standing by in Scalloway for Saturday morning and this arrived at TTF at 0830 hours. It, in fact, turned out to be a lorry with a hydraulic arm, but this system worked o.k. It took about 1½ hours to offload one rope mooring, one wire mooring, three lots of chain weights, sub-surface buoys, one battery module, one mast, five 'top hat' hatch covers and one buoy hull and keel. The buoy was then stowed alongside the fish factory and the keel fitted before the crane left at 1115 hours. The wire stays were then fitted and the keel set up. All shackles were seised, but the bottle screw locking bars were not fitted as the bolts needed more thread run down. These plates will be fitted when the modules are installed. Two plates were also missing. The five 'top hat' hatches were fitted to buoy. Fitted the overbound 2 metre strop to ring of confidence and seized shackles.
Sunday, 4th December	Fitted quad pod, found bolts in top of pod legs became thread bound. Will need two stainless steel washers per bolt to be fitted on module installation. Ran three strings through mast for cables, one from mast head (anemometer and new light), one for air temperature, one for compass.

Fitted mast (air temperature sensor opposite mooring point) and tightened shrouds, bottle screws locked with split pins and taped with self-amalgamating tape.

Monday, 5th December

Pressurised both sub surface buoys. Buoys for deployment were pressurised to 66 pis. The spare buoys to 60 psi.

As the chain ballast had arrived in three clumps, we had the odd clump cut in half to make up two lots of 3,000 lbs. One for December deployment, and one for spare.

All mooring lines and sub surface buoys were stored in the compound. The chain ballast was stored on wooden palates alongside the data buoy.

As the 10 mm chain for anchor and 14 mm wire for the weights did not arrive in Scalloway onboard the Lorwood This was ordered from Shetland Rigging at Scalloway.

Equipment required at module installation :

8 off	3/8" stainless steel washers for quad pod bolts
4 off	3" x 1/4" bolts with 1" thread for keel bottle screw locking bars
2 off	bottle screw locking bars
1 off	1 5/8" anchor shackles or 1 3/4" bow shackles with pin fitted
2 off	battery modules and 1 off processor module

Equipment in TTFs Store Scalloway :

1 off	container flares for Zodiac
1 off	blue string bag with 2 red hand flares and 1 orange smoke flare
1 off	3' length polythene tube ¼" I/D
2 off	coils galvanised seizing wire (heavy gage)
1 off	coil stainless steel seizing wire
1 off	2" anchor shackles
1 Off	1 3/4" D shackle
2 off	1" D shackles
1 off	5/8" D shackle
1 off	stainless steel swivel (3 ton)
1 off	round blue nylon 'dead eye'
1 off	square white nylon 'dead eye'
1 off	bottle freon (half full)
	air temperature compass and anemometer sensors

1 off	heave sensor module without guard or long bolts
1 off	battery module with long bolts and guard (2 pin socket flush)
3 off	3/8" plywood discs 14½" diam.
10 off	1/2" neoprene discs 17¼" diam.
1 off	stainless steel mast shroud
	wire strops for strapping buoy to trawler
1 off	waverider rubber cord c/w s/s swivel and 2 shackles
1 off	Waverider mooring lower end c/w 3/8" chain
2 off	8" trawl floats
1 off	9' 12 mm galvanised wire
5 off	1/2" galvanised

Spare equipment in TTFs compound

1 off	2" surface line c/w thimble and 1¼" anchor shackle used as link
1 off	drum 14 mm galvanised wire hand spliced eyes each end 400'
1 off	overbound strop plus swivel to surface line triangle plate
1 off	braided strop and ring of confidence, shackles and strops for sub surface buoys
1 off	welded sub surface buoy c/w valve each end pressured to 60 psi
1 off	3,000 lbs chain ballast

Equipment for December deployment :

1 off	complete mooring as spare equipment with sub surface buoy
1 off	3,000 lbs weight and 1 off 50 kgs bruce anchor
7 off	5/8" bulldogs
6 off	bottle screw locking straps

MTW/JB/R267
9th December, 1977

M. T. WESTBROOK

R271

MARINE EXPLORATION LIMITED COWES ISLE OF WIGHT

INSTALLATION REPORT

Foula Data Buoy

Visit to: Scalloway, Shetlands

Date: 13th - 16th December 1977

Personnel: D. Vodden, M. Westbrook

Objectives: To install the sensors and modules on the data buoy hull and deploy if conditions permitted

Summary:
1. All sensors and modules fitted satisfactorily
2. Sample test tape run on ambient conditions over 6 hour period. Tape retrieved for analysis at Cowes
3. Buoy ready for deployment apart from final mooring assembly, fitting of new cassette and refitting electronics module

Work Carried Out

Tuesday 13th December

Checked if freight despatched Friday 9th December had been through Sumburgh - it had not. Proceeded to Scalloway (freight comprised modules, cables and sensors).

Checked through cabling between transmitter (hand carried) and heave sensor (at Scalloway). Discovered watermate shroud tight and slots cut to facilitate removal.

Chased freight consignment and arrival due Wednesday.

Bundled one scrap chain weight together with wire rope terminating in 2 in pin shackle which enabled scrap chain to pass through shackle itself rather than relying on the wire rope to take all the load.

Special bolt with lock nut fitted to standard 1¾" bow shackles. Bolt was drilled for split pin. Weather prospects poor.

Wednesday 14th December

Bundled second scrap chain weight - requires shackle. This is for spare mooring. Fitted quick release connectors to all air lines (Baro Press and battery vents).

Freight arrived early afternoon.

Compass and Air Temperature cables run and sensors fitted.

Fitted Navigation Light Power Module. Because of neoprene edging now fitted around base of modules only 1" of neoprene cushion required. Clearance around module is now minimal due to stiffener on top flange.

Removed Datalogger from module – power supply inverter still operational. Marked tapes for overnight sample run.

Checked heave sensor connector wires to terminal board.

Fitted locking bars to keel rigging screws. Fitted chain to anchor (in store) ready for deployment.

Thursday 15th December

Processed data tape appeared to have run on overnight. Checked out heave sensor to electronics module connection.

Checked transmitter power output on bench – 6.4 – Frequency 27.015 MHz. Filled heave module with freon and sealed up. Taped over valves with self amalgamating.

Placed dessicant in Transmitter and sealed up. Fitted remaining cables to mast and fitted transmitter and remaining sensors.

Pushed foam blocks down mast to limit cable movement.

Fitted remaining modules after removing 1 layer neoprene in each of the four outer module holes. Heave sensor is not fitted with neoprene edging strip. Checked Power Output of transmitter on mast – 7.0

Checked raw data transport at 1200 hrs. Sealed up electronics for test run with sensors on hull. Power connected 16.15 hrs. Tied all cables to quadrapod tubes and cable trays.

Disconnected power at 2217 hrs. Processed data tape retrieved and tape recorders marked to identify. No new cassette fitted.

Transmitter aerial removed and put in store. Locks put on modules MTW has keys.

Electronics module fitted with dessicant but not freon filled.

Packed old transmitter battery module in one crate and useful components in the store in second crate. Walter Scott to arrange return to Heathrow. These crates required for new electronic module + power module. Packed tools ready for return.

Friday 16th December

Removed anemometer and taped over socket. Wind Direction Sensor taped up.

Fitted air entrapment funnel to power module vent pipe.

Rigging screw mounting bolts tightened.

Sub surface buoy pressures checked – no change from previous week.

Weather Outlook – Winds 7 – 9 forecasted.

Electronics Test Summary

Power On	1615 hrs	15.12.77
Power Off	2217 hrs	15.12.77

Wind Speed 20 knots gusting 26
Measured 10 knots at anemometer
Wind Direction Vane taped up at position approximately south west relative to buoy reference
Air Temperature 7.8° C
Barometric Pressure 1025.4 millibars

Required
- Spare 3/8" SS spring washers
- Spare 3/8" wht SS plain nuts
- Spare Stainless Spacers
- Freon + Adapter
- Dessicant
- Spare 3/8" galv bolts
- Silicon grease
- Module O Rings
- Cassette
- 3 off P clips + 4 BA nuts bolts washers for securing air temperature and transmitter cables to brackets

Addendum

Wednesday 14th December contact was made with standby vessel to Sedco 135H located approximately 4 miles from Data Buoy position. Request was made to search for Waverider and Data Buoy. Waverider found on location but no sign of Data Buoy at last reported Decca coordinates. Vessel reported heavy swell in general area coupled with gale force winds.

Ref: DV/SKS/R 271
19th December 1977

D. VODDEN

/4

copies: DV, MTW, X292, MSM, PGD

K277

MARINE EXPLORATION LIMITED COWES ISLE OF WIGHT

FOULA DATABUOY

Visit Report

Visit to: Mobil Warehouse, Aberdeen

Visit by: D C H Vodden

Date of Visit: 22nd - 23rd December 1977

Purpose of Visit: To inspect the Foula Data buoy picked up by Viking Supply Services

Timescale:

Date	Time	Event
22.12.77	1430	Left Cowes
	1945	Arrived Dyce
	2000	Arrived Mobil
	2045	Left Mobil
23.12.77	0800	Removed tapes from module
	1000	Visited supply boat basin
		Arranged despatch of module to IOW by rail
	1235	Left Dyce
	1630	Arrived IOW

Report:

The complete hull and part mooring had been transported to Mobil and positioned in an outside unlit corner at the rear of the warehouse site.

Items on site

1. Hull complete with keel, mast, all sensors, modules etc. intact. The navigation light was still flashing.
2. One subsurface buoy complete with strops, strop ring and upper 25mm isolation strop which had been disconnected at its lower end from the triangle plate.

Hull Damage

1. Hull fender including wooden rings - requires replacement in one quadrant
2. One mast stay requires replacement, this having been damaged and temporarily repaired during routine servicing
3. Electronics Power module protective cover which had been distorted and requires replacement
4. Electronics module cover hasp which had been sawn off on a previous visit

Hull Damage (cont'd)

5. Air temperature sensor output socket, which had been wrenched off since the last service visit. The socket had broken and onset of corrosion was evident.

General Conditions

The buoy's general condition was in accordance with that expected over a six month deployment. The buoy requires repainting and anti-fouling and replacement of the zinc anodes, the hull units having corroded away to about one half of the original mass. The paintwork on the aluminium quadrapod legs and mast has not adhered particularly well, and is easily removed, but the base metal is still in a reasonable condition.

All other sensors, cabling and mountings appeared in good condition and suitable for further use after routine maintenance.

Mooring

The buoy mooring attachment shackles were on the buoy but no surface line or thimble was present. It is not possible for the thimble to be separated from the attachment shackles without disconnecting the latter item.

The lower subsurface buoy, complete with its connecting strops to the triangle plate was present, and it was obvious that the isolation strop had been disconnected from the triangle plate as the securing bolt had been replaced.

The triangle plate and lower mooring components were not available for inspection and the actual break point (if the mooring had failed) could not be deduced.

The upper subsurface barrel was absent but one thimble was in situ on the lower barrel. It was not possible to see evidence of chafing and so the means of disconnection, i.e. by mooring failure or human interference, could not be deduced. The existing buoy appeared to be in good general condition, and all the lower strops were connected satisfactorily,

Electronics Module etc.

The electronics module was disconnected at 20-15 hrs and the module removed for transportation to Cowes.

Electronics power was checked and the voltages measured as follows :

pins 1 and 2	10.36
pins 2 and 3	10.56

The air vent tubes and their connections were all satisfactory.

The electronics module was removed to a warm dry place (B.R. parcels office) for safe-keeping.

The module was opened the following morning and the tapes removed. The module was dry and appeared in good condition. The unit was resealed and then despatched to the Isle of Wight for servicing.

DV/SKS/JB/R277
3rd January, 1978

D. VODDEN

Circulation : X292/ARA/PGD/MSM/MRS/DV MTW/RGN

MARINE EXPLORATION LIMITED COWES ISLE OF WIGHT R286

Report on Foula Data Buoy disassembly at Mobil Warehouse Aberdeen 8th. - 11th. January 1978

Personnal:	M. Westbrook
Purpose:	1. To collect information as to where and when buoy was recovered from Viking Shipping.
	2. Collect any mooring components still at Viking Shipping.
	3. Remove all sensors and cables, heave sensor and power modules and return to Cowes.
	4. To remove mast, quad pod and keel from hull, ready for shipment to Scalloway, by North Sea Fishing.

Timetable:

8-1-78	1855hrs	Arrived Dyce Airport.
9-1-78	0930hrs	Went to see Captain Schultz of Viking Shipping.
	1400hrs	Took photographs of buoy and had it moved. Removed modules.
	1630hrs	Picked up mooring wire from Viking Shipping.
	1700hrs	Visit to North Star Fishing.
10-1-78		Remove sensors, cables, mast, quad pod and keel shrouds.
11-1-78		Removed guards from modules, lifted keel out of buoy and stored alongside fence. Packed Car.
	2045hrs	Departed on MotorRail for Cowes.

Work Schedule:

9-1-78		Went to Viking Shippings office. Contacted Captain Schultz, handed over cheque for £500., as sum for recovery of Data Buoy. Captain Schultz showed me an extract from the log of the "Gorm Viking" which stated: Ship "Gorm Viking" standing by "Pentagone 82" on 14th. December, 1977. On location 60'-42"N -- 02'-37"W.
14-12-77	0925hrs	Sighted buoy drifting.
	1225hrs	Proceed to recover buoy.
	1330hrs	Lifted buoy on deck.
	1500hrs	Buoy secured on deck. Weather SW 7-8 Sea State 5

A copy of this letter has been sent to Marex by Captain Schultz.
Asked Captain Schultz water depth at Pentagone 82- 166 to 169 metres.
The wire rope mooring from Sub-surface buoys to anchor weight was recovered intact and is in Viking Shipping office. Surface line was also recovered, but was left onboard the Gorm Viking which has now sailed, this will be returned to Marex next time the ship docks in Aberdeen.
The mooring wire was in good condition, it would seem that the wire strop on the anchor weight parted.
Went to Mobil warehouse yard, took photographs of buoy.
See report R277 dated 3rd. January, 1978 for condition of buoy.
Had buoy lifted out into open space and removed modules.
Took battery voltages: Electronics power = 15.5 and 16.2 V.
NavLight power = 9.4 V. Tx power = 36.75 V.
Returned to Viking Shipping office and picked up mooring wire for return to Cowes.
Went to North Star and saw Billy Dick about transporting buoy from Mobil yard to Scalloway. He will take care of this when he has a ship available. Should happen in about two weeks time.

cont....

10-1-78 Removed all sensors and cables, left Barometer and battery intake pipes in place. There was some water in all of these pipes. Sensors appeared in good condition although the Anemometer cups were very stiff and the Navagational light connections were slightly corroded. The air temperature sensor cable was not connected, the plug was badly corroded. Compass and Transmitter plugs sockets were O.K. It could be that the mast was dunked when the buoy was recovered.
Removed mast and Quadrapod from buoy. There was slight corrostion on the Quadrapod feet. The Neoprene pads and bolts were left on the Quadrapod. Removed stainless shrouds from mast for transporting to Cowes. One Bottlescrew bent and shroud was broken, this was done during mooring change in June 1977.
Removed rigging from keel, these wires were discarded. Had to cut bottle screws off wire as shackles were seized. Returned bottle screws to Cowes.

11-1-78 Had to remove guards from top of modules as they wouldn't fit in the car. Packed car while waiting for crane to lift out keel. Lifted keel out of buoy and stored buoy hull, keel, mast and Quadrapod alongside fence ready for Billy Dick to collect.
There was no room left for transporting the one sub surface buoy back to Cowes, so this was stored in Container No. 66 which has some Marex rope and tubs in it left over from Beryl current Survey.
Contacted Billy Dick to inform him of equipment to be shipped to Scalloway, four items. Ian McPherson of Mobil was also informed of the situation.
Departed for Cowes on 2015 MotorRail.

MTW/DK/R286
23rd. January, 1978.

M.T. WESTBROOK.

cc : MTW/PGD/BJM/DJC/SH/X292

R285

MARINE EXPLORATION LIMITED   COWES   ISLE OF WIGHT

Report on Check-Out of Data Buoy

17th-18th January, 1978

Location : Scalloway, Shetland Isles.

Personnel : M.R. Springett
M.T. Westbrook
P. Tirrard

Object : To check out the Data buoy electronic system prior to deployment.

Associated Report : R287 - Data Buoy Deployment West Foula (MTW).

Work Schedule :

17.1.78. On arrival at Scalloway, M. Springett and M. Westbrook retrieved the electronics module from Walter Scott's store, and opened it up. Tests were then carried out as follows :

1115	Measured internal battery voltage : 13.5v. Measured 5v. logic rail : 4.89v.
1125	Connected up 24v. external power supply and plugged in control panel. Processor responds to all control panel functions.
1133	Programme starts up.
1151	Check supplies to peripherals have been switched on under programme control. O.K.
1201	Half second sampling stops. Processed data recorder operates for fifteen seconds, the raw data recorder starts.
1204	Raw data recorder stops. Computer halts.

The store was then examined for the processed data results : (see over)

17.1.78. cont'd

	Octal	Eng. Units
Time :	3000	1200
Date :	245	165
Barometric Pressure :	1723	993.5 mb
Air Temperature :	7774	-
Water Temperature :	3645	-
Battery :	2363	20.17 v
Hrms :	11	-
Hmon :	43	-
H1 :	47	-
Zcnt :	51	-
Wind Speed :	1	-
Wind Direction :	1000	-

The wind, wave and temperature sensors were not connected, and their results have been ignored.

At this point, the control panel was removed and the processor allowed to complete another cycle. Startup and peripheral power supplies were checked with a meter at the appropriate times and movement of the processed data cassette only were checked at 1301. All checks were satisfactory.

During the afternoon, three x PP9 batteries were purchased locally, soldered together in series, and installed on the electronics frame in replacement of the existing ones. The control panel was plugged in again and time and date set up.

However, it proved impossible to get the correct date back from the clock. (The time was O.K.).

This explains the error in date in the above set of results, and unfortunately, it was not possible to investigate the fault under the conditions under which the job was being done.

Since the clock was working, which is more important than the date, and operation of the rest of the processor was unaffected, it was decided to take no further action on the matter at present, and rectify the fault the next time the module was returned to Cowes.

By this time (about 1700 hours), it was dark and raining, and since there was no chance of the Scottish Queeen arriving before mid-afternoon, the next day, the outdoor tests connected up to the buoy sensors were left until the following day, hoping for better weather.

18.1.78. The processor was supported on a crate adjacent to the well in the buoy deck and all the sensor cables and power cables were connected. (Except the sea temperature probe, which is attached to the module case and could not be plugged in).

A tarpaulin was pulled over the hull and rigging to protect the exposed electronics in the event of rain. With the control panel plugged in, the drain on the batteries was such that the voltage supply visibly slumped, and so the system was allowed to operate without the control panel plugged, which was then plugged in to obtain the results at the appropriate time, and then removed.

(N.B. The batteries recovered their voltage after the control board was removed, the drop being due to the high rate of extraction of change rather than the total charge used).

0915	Power connected.
0920	Checked time : O.K.
	Checked date : faulty.
0932	Processor switched on.
0949	Anemometer, barometer and compass power on.
1000	Thermometer power on for four seconds.
	Processed data recorder operates for fifteen seconds.
	Processor turns off.
1032	Processor switches on.
1049	Anemometer, barometer and compass power on.
1100	Thermometer and power on for four seconds.
	Processed data recorder operates for fifteen seconds.
	Processor turns off.

Results :

	1000 hrs			1200 hrs	
	Recorded		Measured	Recorded	
Time	2400_8	1000 hrs	1000 hrs	2600_8	1100 hrs
Date	730_8	473	–	317_8	207
Bar. Pressure	2041_8	1000.95	1001.85	2042_8	1001.23
Air Temp.	1527_8	4.44°c.	5.2°c.	1574_8	6.8°c.
Sea Temp.	3610_8	–	–	3630_8	–
Batteries	2313_8	19.5v		2330_8	19.7v
Hrms	6_8			–	
Hmax	20_8			–	
H1	20_8			–	
Wind Speed	1_8			7_8	
Wind Direction	2220_8			2327_8	

Although connected, the heave sensor gave no output because the buoy was stationary and the wind reading must be ignored because the buoy was laying on its side. However, the function of the anemometer was checked during the time when it was switched on by rotating it slowly by hand and observing that the output maximum and minimum was >3v and <2v respectively. The action of the wind vane was checked by rotating the vane slowly and checking that each of the three outputs reached a maximum and minimum at the correct position.

The reading of temperature and barometric pressure were not taken at exactly the same time as the manual readings (which were taken between 1000 and 1030 hours, and also the barometer was on its side, which affects its calibration. These values therefore, should only be taken as a guide to correct functional operation, rather than an absolute calibration check.

18.1.78. 1115 hrs. Electronics taken back indoors, new cassettes were fitted, the module was purged with freon, a new dessicant tube fitted, and closed up, ready for deployment.

MRS/JB/R285
6th February, 1978

M. R. SPRINGETT

cc : MTW/PGD/DV/MSM/MRS/X292

1/2/78

MARINE EXPLORATION LIMITED COWES ISLE OF WIGHT.

Foula Data Buoy recovered December 1977.

Report on Modules and Sensors.

Module inspection carried out 24-1-78

Electronics Power:

On inspection the foam on top of the batteries was wet through and the batteries themselves were rather damp. After removing foam and batteries, about half a gallon of water was left in the bottom of the module. No fault could be found in the welds, or 'O' ring seal. Module was air pressure tested to 3 P.S.I and passed with no leaks, therefore the water must have entered through the vent pipes. It is almost certain that the mast was dipped into the sea on recovery.

Tx Power:

On inspection the foam was dry and the batteries and dessicant was in good condition. Module was air pressure tested to 3 P.S.I. and passed O.K.

Navigation Light Power:

This module was dry and the batteries and foam were in good condition. Passed pressure test of 3 P.S.I.

Heave Sensor:

Module was dry, heave sensor and dessicant in good condition. This module has not been pressure tested yet as it is being used for housing radio transmitter during transmission tests at Cowes. Plastic stiffening strips are being fitted over the top weld on all modules as one of the welds have cracked in the past.

Sensor inspection 26-1-78

Wind Speed and Direction:

The Anemometer cup bearings are rather stiff, these will be returned to Brooks and Gatehouse for inspection and service. The wind direction vane will also be returned to Brooks and Gatehouse for service.

Heave Sensor Transmitter:

Serial no. R020 Transmitter was dry and in good condition.

Navigation Light:

Some salt crystals were present in the navigational light globe, this has not affected the light itself, as it is water proof in its own right cont. . . . .

Compass:

As this is a sealed unit, unable to see if water has entered. Although plug socket etc. looks O.K. this unit is being returned to Brooks and Gatehouse for service and inspection

Static Pressure head:

All in good condition. Disassembled cleaned and reassembled.

Air Temperature:

Cable plug was already disconnected on inspection at Aberdeen, and the socket was badly corroded. On inspection salt crystals were present inside the sensor housing. The water has entered through the corroded plug socket in the base of the housing. The probe transmitter looked in good condition and checked out O.K.

Cables:

Tested for insulation on Comark Insulation meter Serial No. 34119.
All cables tested at 100V.
Cables tested for continuity on Data Precision Volt meter Serial No. 13658.

Air Temperature:

Checked out O.K. for Insulation and Continuity.

Compass:

Checked out O.K. for Insulation and Continuity

Wind Speed and Direction:

Checked out O.K. for Insulation and Continuity

Navigation Light:

Continuity checked out O.K. with reading of 1megohms on insulation meter.

Tx Power:

Continuity O.K. 3 megohms on insulation meter.

Tx to Heave:

Continuity shorting out on all pins.. Insulation 0 megohms

Ref: MW/DK/R289 — 1st. February, 1978

M. WESTBROOK.

c.c. ARA PGD DV MSM MRS MTW
BM DC X292

R287

MARINE EXPLORATION LIMITED COWES ISLE OF WIGHT

Data Buoy deployment West Foula. 17th. – 19th. January, 1978.

Personnel: P. Tirrard. M. Westbrook. M. Springett.

Purpose:
1. To check out processor
2. Connect mooring and make ready for deployment
3. Deploy buoy

Timetable:

17-1-78	1000hrs	M. Springett, M. Westbrook arrived Scalloway
	1315hrs	P. Tirrard arrived Scalloway Checked processor Fitted 'P' clips to sensor cables Made ready mooring
18-1-78	1215hrs	M. Springett departed for Cowes
	1400hrs	Check all battery voltages
	1445hrs	Connected power to processor Flake out mooring on Quay
	1915hrs	Scotish Queen docked Scalloway
	1930hrs	Started to load buoy and mooring
	2015hrs	All loaded Scotish Queen took on water ballast
	2050hrs	Sailed for buoy location
19-1-78	0230hrs	Arrived deployment area
	0300hrs	Start buoy deployment
	0315hrs	Ready to let go weight
	0330hrs	Took weather readings
	0400hrs	Let go of weight. Deployment complete
	0430hrs	Departed for Scalloway
	1015hrs	Docked Scalloway
	1035hrs	P. Tirrard, M. Westbrook depart Scalloway for Aberdeen

Work Schedule:

17-1-78 On arrival at Scalloway Walter Scott informed us that the Scotish Queen that was due to dock in Scalloway this evening will not arrive until Midday tomorrow. Checked out the processor, see Report No. R285 MRS. Fitted 'P' Clips to Air temperature and Transmitter cables. Fitted Anemometer cups, took tape from wind-direction vane and checked it rotated 360°. Fitted rubber edging where cables go over cable trays. Moved mooring from compound to alongside buoy, connected mooring to weight and buoy to make sure all fitted together.

As there is now a 2" pin shackle fitted to the chain ballast a 1½" shackle is fitted between this and the 1" shackle on the mooring wire. Disassembled mooring so it could be moved and loaded onto the Scotish Queen.

Phoned North Star to see when the Scotish Queen was due to arrive, the latest E.T.A. between 1200 and 1800hrs tomorrow.

Weather forecast at 1700hrs was winds North 10–15 knots going South 20–25 knots moderating tomorrow.

18-1-78 Weather forecast looks good. Wind variable 5-10 knots, later becomming light North to NE. Outlook overnight little change, wind veering SE.

Phoned North Star No word from Scotish Queen.

Fitted Electronics module to buoy to check through whole system

See Report R 285 MRS

Removed module, fitted new cassette and dessicator. Purged with Freon and sealed module.

M. Springett departed from Scalloway at 1215hrs for Cowes.

Walter Scott contacted North Star to discover that the Scotish Queen had radioed in, in the last two hours and was South of Orkney after sailing straight past Scalloway, as she had not been informed that she was to come to Scalloway to pick up our buoy. She had now turned round and was heading back to Scalloway E.T.A. 2200hrs

Fitted Electronics module into buoy, checked all battery volts:

Electronic Power pins 1&2= 26.22v pins 2&3= 26.28v.

Tx Power = 40.59v.

Nav. Light = 12.53v.

Fitted transmitter aerial and connected all sensors. Power connected at 1445hrs.

Flaked out surface line and wire mooring on quay ready for loading onto Scotish Queen.

Latest E.T.A. 1900hrs. South East gale warning for buoy location by 0600 tomorrow morning.

Scotish Queen docked 1915hrs. Loaded mooring, then stowed buoy on Starboard rail, sitting against the bridge wing, with keel forward and outside the rail. A wire was made onto a pad eye, high up on bridge, round the buoy and through a block onto the winch. This is the same method as December 1976 deployment. Anchor chain was stowed forward, over the rail and lashed. Connected mooring to buoy and 30' of four core cable to mooring then onto keel shroud, as trial for current meter link. Made off wire lower end onto anchor weight, fitted one 50KG Bruce anchor to mooring shackle.

Scotish Queen had to take on four tons of water in her port tanks to compensate for the buoy and ballast weight. Sailed from Scalloway at 2050hrs wind SSE 10-15 knots.

19-1-78 Arrived deployment location 0230hrs. Weather not very good, wind SSE about force 7. Seas 3 metres.

Started buoy deployment 0300hrs this went very well by surging the keel rope and wire round hull together, the keel being lower than the mast all sensors stayed dry during this operation. The whole mooring was payed out and the weight ready for cutting by 0315hrs. The only problem being we had not drifted over the 82 fathom hole we had found half an hour before. Depth readings were 74 fathoms. While we drifted took weather readings at 0330hrs.

Wind Speed	Wind Direction	Wave high

	Wind Speed	Wind Direction	Wave High
mean	38 knots		
max	50 knots		

Air Temperature: 5.25°C.

Pressure: 990.1 mb

Located 83 fathoms and let go anchor weight at 0400hrs on Deccs readings:

Red C 03.18
Green J 32.4
Purple A 68.86

Bearing 275° (T) at 27.5 miles from South tip of Foula. Departed buoy location 0430hrs, arriving Scalloway at 1015hrs. After storing wire and tool kit in Walter Scotts store, departed for Sumburgh air port 1035hrs.

NB Wind speed was measured with Hand held Anemometer Serial No. MO 1442. Pressure was measured with Precision Aneroid MN1 Serial No. MO 346/62. Air temperature measured with inglass thermometer.

Thermometer and buoy tool case were stored at Walter Scotts ready for service visit in two to three weeks time.

Position of Modules:

Electronics = Aft Port, key E. Electronics Power = Aft Star. Key A
Tx Power = Fwd Star. Key C. Nav. Power = Fwd. Port Key D.
Heave sensor = Centre, Key B.

M. WESTBROOK.

Ref: MW/DK/R287

cc MTW DJC PGD PJM DV MRS X292

METEOROLOGICAL OFFICE

CALIBRATION OF HAND ANEMOMETER

SERIAL No M 1442

AIR SPEED (kts)	CORRECTION*
5	0
10	0
20	0
30	0
40	-0.5
50	0
60	+0.5

* WHEN SIGN IS + THE CORRECTION SHOULD BE ADDED TO THE OBSERVED READING, WHEN — IT SHOULD BE SUBTRACTED FROM IT

MET. O. 16. C TEST ROOM EXAMINED

THIS CARD MUST REMAIN WITH AND ACCOMPANY THE INSTRUMENT AT ALL TIMES

DATE 22 JUN 1977 RS

Met. O./Carto/D.O./1428

METEOROLOGICAL OFFICE

CALIBRATION OF PRECISION ANEROID BAROMETER

RIAL No. M 346/62

READING (MB)	RRECT AT 20°C
1050	+0.2
1020	+0.[illegible]
1000	0.0
980	+0.1
950	+0.1
920	+0.1
900	+0.3

WHEN SIGN IS + THE CORRECTION SHOULD BE ADDED TO THE OBSERVED READING, WHEN – IT SHOULD BE SUBTRACTED FROM IT

T. O. 16 C ST ROOM KAMINED

NOTE THIS CARD MUST REMAIN WITH AND ACCOMPANY THE INSTRUMEN AT ALL TIMES

13/5/7[illegible]

MARINE EXPLORATION LIMITED

Registered in England No. 871053

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HIGH STREET, COWES,
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marex

ARA/MMB/2529/78
12th May 1978

E.G. Pitt
Institute of Oceanographic Services
Crossway
Taunton
Somerset

Dear Ted,

This letter is to inform you of some further progress we have made in improving the equipment for the Foula data buoy project.

1. We have now completed (except for testing) a further production processor.

2. A third processor for the project will be completed within one month. (Two production ones plus the prototype).

3. The test set program controller is now in production form and one will be provided for field use for the Foula project as soon as manufacture is completed.

4. We have purchased a temperature cycling area, which will be used for testing.

5. We have installed and are now using a floppy-disc based software development system.

6. A programmer with suitable experience has been assigned full time to microprocessor systems.

7. The use of component reliability assessment services, as offered by some organisations, is being investigated.

ARA/MMB/2529/78
12th May 1978

The loss of the prototype production processor by British Rail was a serious setback and delayed manufacture of the next system. We have now lost hope of recovering this one.

The steps taken earlier to improve the operation are being continued. In brief, these are the provision of a full time project technician to go on all module changes so as to assure continuity and scheduling of changes at shorter intervals to minimise possible data loss.

It is hoped that this increased back up will be reflected in the data return.

Yours sincerely,

Alan Ainslie

A.R. Ainslie
Managing Director

cc : Dr. Rees - IOS
W.B. Woollen - MATSU