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**REPORT ON**

The Environmental Qualification of a McMurdo Personal Locator Beacon

**Report No: SX 609598**

**May 2002**

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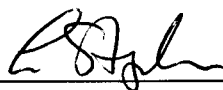
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Issue 1

**PREPARED FOR**

McMurdo Limited  
Silver Point  
Airport Service Road  
Portsmouth  
Hampshire  
PO3 5PB

**PREPARED BY:**

  
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**G STEPHENS**  
Project Manager

**APPROVED BY:**

  
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**R L HARRIS**  
Environmental Group Leader

**DATED:**

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## **EXECUTIVE SUMMARY**

The Environmental Qualification of a McMurdo Personal Locator Beacon

**Project Engineer : G Stephens**

## 1.1 **STATUS**

|                                            |                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------|
| OBJECTIVE                                  | The Environmental Qualification of a<br>McMurdo Personal Locator Beacon |
| MANUFACTURER'S DESCRIPTION                 | Personal Locator Beacon                                                 |
| MANUFACTURER                               | McMurdo Limited                                                         |
| MANUFACTURER'S TYPE NUMBER                 | 85-860-800                                                              |
| SERIAL NUMBER                              | 0521                                                                    |
| SECURITY CLASSIFICATION                    | Unclassified                                                            |
| QUANTITY                                   | One                                                                     |
| SPECIFICATION NUMBER                       | To RTCM 5-97/SC110-STD                                                  |
| INCOMING RELEASE                           | Not Released                                                            |
| ORDER NUMBER                               | 704232                                                                  |
| TÜV PRODUCT SERVICE<br>REGISTRATION NUMBER | SX609598/01                                                             |
| START OF TEST                              | 29 April 2002                                                           |
| FINISH OF TEST                             | 30 May 2002                                                             |

## 1.2 INTRODUCTION

A Personal Locator Beacon, serial number 0521 was delivered to TÜV Product Service to undertake Environmental Qualification. The unit was to be subjected to salt mist, drop, immersion and life tests.

Testing was carried out in accordance with RTCM 5-97/SC110-STD.

## 1.3 BRIEF SUMMARY OF RESULTS

| TEST                                     | RESULT                   |
|------------------------------------------|--------------------------|
| Salt Mist                                | Completed satisfactorily |
| Drop, with Temperature Conditioning      | Completed satisfactorily |
| Immersion, with Temperature Conditioning | Completed satisfactorily |
| Operational Life Test                    | Completed satisfactorily |



## **TEST DETAILS**

The Environmental Qualification of a McMurdo Personal Locator Beacon

**Test Engineers :**      **L Spencer**

## 2.0 TEST DETAILS

### 2.1 Salt Mist Test

#### 2.1.1 Date of Test

29 April to 4 May 2002

#### 2.1.2 Test Specification

To RTCM 5-97/SC:110-STD Section A5.0

#### 2.1.3 Test Equipment Used

| Instrument   | Type    | Inv Number | Calibration Due Date |
|--------------|---------|------------|----------------------|
| Salt Chamber | Weiss   | 0904       | 7 September 2002     |
| Data Logger  | Anville | 2569       | 7 September 2002     |

#### 2.1.4 Test Procedure

The unit was installed in a salt chamber at ambient conditions. The chamber temperature was then raised to +35°C and the unit stabilised for two hours. The unit was then subjected to the following salt test:

1. With the chamber temperature at +35°C the unit was sprayed with a 5% sodium chloride solution for a period of 48 hours.
2. The unit was then dried at 20°C for 24 hours.
3. With the chamber temperature at +35°C the unit was sprayed with a 5% sodium chloride solution for a period of 12 hours.
4. The unit was then dried at 20°C for 12 hours
5. On completion of the spray period the units were washed with running tap water for 5 minutes then stored at ambient conditions for 1 hour.
6. On completion of the test the unit was inspected and functioned by TUV Product Service.

#### 2.1.5 Test Results

The unit showed no sign of damage or deterioration on completion of the test. All functional tests showed the unit to be functioning correctly.

## 2.2 Drop Test, with Temperature Conditioning

### 2.2.1 Date of Test

7 May 2002

### 2.2.2 Test Specification

To RTCM 5-97/SC:110-STD Section A6.0

### 2.2.3 Test Equipment Used

| Instrument       | Type    | Inv Number | Calibration Due Date               |
|------------------|---------|------------|------------------------------------|
| Climatic Chamber | Ringway | 2613       | 8 June 2002                        |
| Data Logger      | Anville | 2569       | 8 June 2002                        |
| Tape Measure     | R.S.    | 4671       | T/U. Manufactures tolerances apply |
| Test Block       | TUV     | 2647       | T/U                                |

### 2.2.4 Test Procedure

The unit was installed in a climatic chamber at ambient conditions. The chamber temperature was then lowered to -50°C and the unit stabilised for two hours. The chamber temperature was then raised to -40°C and the unit stabilised for two hours.

The unit was then removed from the chamber and within a five minute period subjected to one drop onto each face of the unit from a height of one metre, six drops in total. The drop surface was a piece of solid hardwood with a thickness greater than 150 mm and a mass greater than 30 kg resting on a concrete floor.

On completion of the test the unit was inspected and functioned by TUV Product Service.

### 2.2.5 Test Results

The unit showed no sign of damage or deterioration on completion of the test. All functional tests showed the unit to be functioning correctly.

### 2.3 Immersion Test, with Temperature Conditioning

#### 2.3.1 Date of Test

8 to 10 May 2002

#### 2.3.2 Test Specification

To RTCM 5-97/SC110-STD Section A7.0

#### 2.3.3 Test Equipment Used

| Instrument          | Type      | Inv Number | Calibration Due Date               |
|---------------------|-----------|------------|------------------------------------|
| Climatic Chamber    | Ringway   | 2613       | 8 June 2002                        |
| Data Logger         | Anville   | 2569       | 8 June 2002                        |
| Immersion Tank      | 940 Litre | --         | T/U                                |
| Tape Measure        | R.S.      | 4670       | T/U. Manufactures tolerances apply |
| Dipping Thermometer | Zeal      | 3581       | 23 January 2003                    |

#### 2.3.4 Test Procedure

The unit was installed in a climatic chamber at ambient conditions. The chamber temperature was then raised to +65°C and the unit stabilised for one hour.

The unit was then removed from the chamber and immediately immersed in water at +20°C to a depth of 100 mm for 48 hours. The unit was then immersed at a depth of one metre for one hour.

On completion of the test the unit was removed from the water wiped dry then inspected and functioned by TUV Product Service.

#### 2.3.5 Test Results

The unit showed no sign of damage or deterioration on completion of the test. All functional tests showed the unit to be functioning correctly. There was no sign of water ingress when the unit was opened by McMurdo.

## 2.4 Operational Life Test

### 2.4.1 Date of Test

22 May 2002

### 2.4.2 Test Specification

To RTCM 5-97/SC110-STD Section A10.1

### 2.4.3 Test Equipment Used

| Instrument                    | Type          | Manufacturer    | Serial No  |
|-------------------------------|---------------|-----------------|------------|
| Hygrometer                    | Series 1-1000 | Rotronic        | 1826-15    |
| Freq & Time Interval Analyser | 5372A         | Hewlett Packard | 3141A1073  |
| Logic Analyser                | 1613D         | Hewlett Packard | 2713A02725 |
| Power Meter                   | 436A          | Hewlett Packard | 2330A15908 |
| Power Sensor                  | 8481A         | Hewlett Packard | 1926A17245 |
| Signal Generator              | SMX           | Rohde & Schwarz | 827372-002 |
| Attenuator                    | 8308-200      | Bird            | EMC1458    |
| Attenuator                    | HFP-50N       | Texscan         | EMC1602    |
| Combiner                      | 1506A         | Weinschel       | AC5343     |
| Crystal Detector              | 8470B         | Hewlett Packard | 1822A15821 |
| Environmental Chamber         | MINI-P-MECH-P | Montford        | 3369-K5707 |
| Mixer                         | M2TC          | Watkins Johnson | 050033     |
| Low Pass Filter               | WLJ 1.4C9EF   | Wainwright      | 1          |
| Digital Thermometer           | T208          | Digitron        | 08413      |

#### 2.4.4 Test Procedure

The Personal Locator Beacon (PLB) was operated for 24 hours plus an additional 1.9 hours to allow for loss of battery capacity due to self testing and self discharge of the battery pack (as recommended by McMurdo Limited, see Battery Self-Discharge Statement).

The PLB was turned on for 1.9 hours at ambient temperature. It was then turned off and subjected to a cold soak at -20°C for 2 hours. The PLB was then switched on and was kept at minimum operating temperature for a period of 24 hours. The Auxiliary radio-locating device peak envelope power was measured at 6 hourly intervals until the 24 hour period was over.

#### 2.4.5 Test Results

| PARAMETERS TO BE MEASURED DURING TESTS | RANGE OF SPECIFICATION | UNITS | TEST RESULTS                                                                                       |
|----------------------------------------|------------------------|-------|----------------------------------------------------------------------------------------------------|
|                                        |                        |       | T <sub>min</sub><br>(-20°C)                                                                        |
| 9. OPERATIONAL LIFE TESTS (A.10.1)     |                        |       |                                                                                                    |
| Auxiliary PEIRP                        | 14 - 20                | dBm   | 0 hours +18.325<br>+6 hours +18.505<br>+12 hours +18.515<br>+18 hours +18.515<br>+24 hours +18.475 |

See statement below.



## McMurdo -20°C Fastfind Plus PLB

### Battery self-discharge statement

This statement details the additional life test that must be applied to a fresh -20°C Fastfind Plus battery pack to compensate for self-test and self-discharge effects.

McMurdo Ltd wishes to quote a 5-year rated life for the battery pack.

### Self discharge at 20°C:

The battery pack comprises of seven Lithium iron di-sulphide cells. The quoted self-discharge rate is 1% per year. Over 10 years this equates to a loss of 0.2Ah capacity. Hence the self-discharge loss for 5 years is 0.1 Ah.

### Self test

The Fastfind Plus self-test regime lasts for 10 seconds and consists of 3 sweeps of 121MHz, a frame inverted (short) 406MHz transmission and confirmation that the GPS module outputs data of the correct format.

The McMurdo Fastfind Plus user manual recommends carrying out self-test on a monthly basis. This gives a current profile of :

$(0.1A \times 10s) + (1.6A \times 0.44s) = 1.704As = 0.00047Ah$ . Based on user testing once per month, over 5 years this equates to  $0.00047Ah \times 12 \times 5 = 0.028Ahrs$ .

### Total Losses

Total losses =  $0.028 + 0.1 = 0.128Ah$

### Fastfind plus -20°C current break down for 24Hr lifetest.

Ublox gps module 83.2mA 90secs on 20mins off = 6.191mA = 0.124Ahrs(20Hrs)

121Mhz / oven / micro 42.9mA = 42.9mA = 1.0512Ahrs

Led 7.5mA 0.5secs on 3secs off = 1.25mA = 0.03Ahrs

406Mhz Tx 1.65A 520mS on 50secs off = 17.16mA = 0.4118Ahrs

Total lav = 67.5mA

Therefore the over-test is  $0.128Ah / 0.0675A = 1.9$  hours.

Richard Read, (Senior Engineer).



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