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**KLS-E5-2 Exhibit 02a - Compliance Rationale**

The evidence assembled in this Technical Construction File is itemised in Exhibit 1:

**KLS-E5-2 Exhibit 01 - Index of TCF**

McMurdo Limited manufactures a family of Emergency Position Indicating Radio Beacon (EPIRB) products, including brand variants, intended for use in distress alerting via the Cospas-Sarsat system. The family members are designated as follows:

McMurdo Smartfind E5 Sailor SE406-II Simrad EP50 Kannad Marine Automatic EPIRB Kannad Marine Manual EPIRB	non-GPS variants  <b>this filing</b>
McMurdo Smartfind Plus G5 Sailor SGE406-II Simrad EG50	GPS variants

All family members use the same PCB, but the non-GPS variants are sub-equipped by the non-fitment of the relevant components. All family members are otherwise technically identical, varying only in branding and labelling.

In its current build standard this product family is covered by FCC Grants of Equipment Authorization identified by:

FCC ID:	KLS-E5-1	-	non-GPS variants
FCC ID:	KLS-G5-1	-	GPS variants

With this current build standard (E5-1 build) these beacons transmit on 406.028 MHz to the satellite link. At the request of Cospas-Sarsat they are being re-engineered to shift transmission to 406.040 MHz. We understand this change of frequency requires a new equipment authorization filing and a new FCC ID.

The frequency shift for Cospas-Sarsat requires change of the TCXO frequency determining component. Frequency stability requirements are covered by the Beacon Specification (C/S T.001) and Type Approval Standard (C/S T.007) and compliance with these has been addressed by a submission to Cospas-Sarsat.

Approval by the Cospas-Sarsat organisation of the updated product family is attested by their Reports copied at:

KLS-E5-2 Exhibit 02c - Cospas-Sarsat Report 204-1

KLS-E5-2 Exhibit 02d - Cospas-Sarsat Report 204-2

(these reports can be viewed on-line at the Cospas-Sarsat website - the updated product is identified in these reports by the transmit frequency parameter)

The occasion of the Cospas-Sarsat frequency change is being used as an opportunity to carry out a more general mid-life product update (some elements of this update address requirements in the International standard IEC 61097-2 changed at Edition 3 - compliance with Edition 3 is required by the EC by 10 December 2011):

- this product family is a mature design, and the GPS module is changed to take advantage of recent developments in the component technology which benefit both cost and performance;
- IEC 61097-2 Edition 3 makes material changes to the low-duty-cycle-light requirements necessitating a change from the former solution (a single LED with an LED lens): the reflective disc mounted in the horizontal plane on the end of the (vertical) PCB in the E5-1 build will be replaced with a PCB disc, which will carry four LEDs;
- IEC 61097-2 Edition 3 makes material changes to the requirements for retro-reflective material surface area, necessitating a change to the former solution;
- there is a component obsolescence issue with a transistor in the 121.5 MHz oscillator stage, which is addressed with a like-for-like component replacement;
- the audio buzzer component will no longer be fitted;
- the mould tool used in manufacture of the plastic body is due for replacement, and some minor modifications are being introduced with the new tool to facilitate easier release of the part from the mould, and to improve plastic flow in the moulding process with the aim of improving manufacturing yields;
- the material currently used for the float-free housing enclosure is being withdrawn by its manufacturer, and an equivalent material has been sourced.

The automatic release (float-free) housing and the manual release bracket will remain unchanged in function and appearance.

These changes have been identified to United States Coast Guard, and they have attested their satisfaction that the product remains compliant with their requirements:

#### KLS-E5-2 Exhibit 02e - USCG Letter of Approval

In the new build standard (G5-2 build for the GPS variants) the GPS Module is changed as follows:

G5-1 build..... uBlox TIM-4P            changes to ...

G5-2 build..... uBlox NEO-6M

Since all members of the product family use the same PCB and the same firmware, the non-GPS variants are also affected by these changes.

This GPS module change requires corresponding PCB track changes to interface the new GPS Module to the Microcontroller, and also requires firmware changes appropriate to drive the new Module (which operates at a different data rate).

Taken in isolation these GPS-related changes have nothing to do with the transmitters in the device, and do not affect the characteristics required to be reported to the Commission.

The component replacement in the 121.5 MHz oscillator, taken in isolation, corresponds to a Class I permissive change: this modification does not degrade the characteristics formerly accepted by the Commission.

This filing reprises evidence submitted for earlier assessment of this product family at E5-1 build by FCC.

A general description of the form and function of the products is provided in the User Manuals (see Exhibit 3). These are copied at current issue as applicable to the current build - when the E5-2 build goes into production these manuals will be revised to incorporate the minor modifications required.

The external appearance of the product at current build, in McMurdo branding, is shown by Exhibit 4a:

#### KLS-E5-2 Exhibit 04a - External Photos E5-1 Build

Because there is no change to form and function, this exhibit is representative of the appearance of the updated product. An additional Exhibit 4b shows the minimal change which is actually externally visible in the updated product:

#### KLS-E5-2 Exhibit 04b - External Photos E5-2 Build comparison

Because the E5-2 build is still in the pre-production phase, differences in appearance arising from the new reflective material solution are shown by an engineering drawing in the design documentation package.

The technical description of the product remains unchanged (Exhibits 5 and 6).

The set of design documentation (Exhibit 7) defines the build standard of the updated product through the following elements:

- 'Family Tree' - top level composition
- an Assembly drawing for the EPIRB
- an Assembly drawing for the main PCB
- an Assembly drawing for the LED Disc PCB
- a Circuit Schematic
- a Bill of Material

The Circuit Schematic covers the product family (including two non-SOLAS technical variants which are not applicable to the US market). The product firmware version is detailed on the first page of the Bill of Material.

The set of design documentation also details the product labelling.

A Hydrostatic Release Unit, HRU, is an integral part of the product in all Class 2 (float-free) system configurations. This should be either a McMurdo HRU or, interchangeably, a Hammar H20 HRU. The McMurdo HRU comes in two variants:

McMurdo BreaktHRU

Kannad Marine HRU

These two variants are technically identical, differing only in the labelling. Exhibit 7 includes top-level build information for the McMurdo HRU.

All relevant radio test suites have been carried out, with results provided in various test reports.

Exhibit 11 reprises the original test data, wherein the GPS product is fully tested, and the basic or non-GPS product, as a sub-equipped variant of the GPS product, is subjected to limited testing.

Exhibit 12 augments the original test data with supplementary test reports covering limited testing of the updated product family. Exhibits 12a and 12b address the requirements of Cospas-Sarsat. Exhibit 12c validates the new low-duty-cycle-light solution, and repeats the mechanical stress elements of environmental testing to provide a confidence that the device remains robust following update (other tests in the report are relevant to changes in IEC 61097-2 Edition 3).

The EPIRB is a mobile intentional radiator, and the RF Maximum Permitted Exposure evaluation is unchanged, since radiated power levels and frequency bands are unchanged:

#### KLS-E5-2 Exhibit 13 - RF Exposure Evaluation

The Quality Management System applicable to all aspects of development and manufacture of these products is subject to external approval by an accredited body as shown by:

#### KLS-E5-2 Exhibit 02f - QMS Certification

We propose that the evidence presented in this Technical Construction File justifies a presumption of compliance of the updated product (E5-2 build) with the requirements of the Commission.



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