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COMMERCIAL IN CONFIDENCE

McMurdo Z500 Product Family - General Description
Model numbers Z501 and Z502

AIS-based Personal Beacons for Overboard Recovery Situations

AIS, the international maritime radiocommunications system for Automatic Identification of Ships, based on the use of two dedicated channels of the marine VHF band to provide a radio data network between participating stations of the Maritime Mobile Service, has been a great success.

Since the beginning of 2010, with IMO Resolution MSC.256(84), use of the AIS system has been extended to provide for Search And Rescue Locating Devices facilitating the recovery of survivors in marine distress situations. Specifically the AIS-SART was introduced to meet SOLAS carriage requirements as an alternative to the conventional Radar SART.

With advantages in both price and performance, we can anticipate that the AIS-SART will replace the Radar SART in due course (ultimately the withdrawal of Radar SARTs from service will allow the commercial marine industries to benefit from developments in low power radar, whose use in this sector is currently inhibited only by the requirement to emit enough signal to activate a Radar SART).

The functionality of the AIS-SART is to obtain a GPS position and broadcast it, with a unique identity, over the AIS VHF Data Link in a dedicated AIS-SART message protocol. The AIS-SART transmission scheme specifies that every minute a sequence of eight messages will be sent within a total time frame of 14 seconds. This time frame is designed to maximise the probability that one of the transmissions will coincide with the device being at the top of a wave, to enhance the probability of reception.

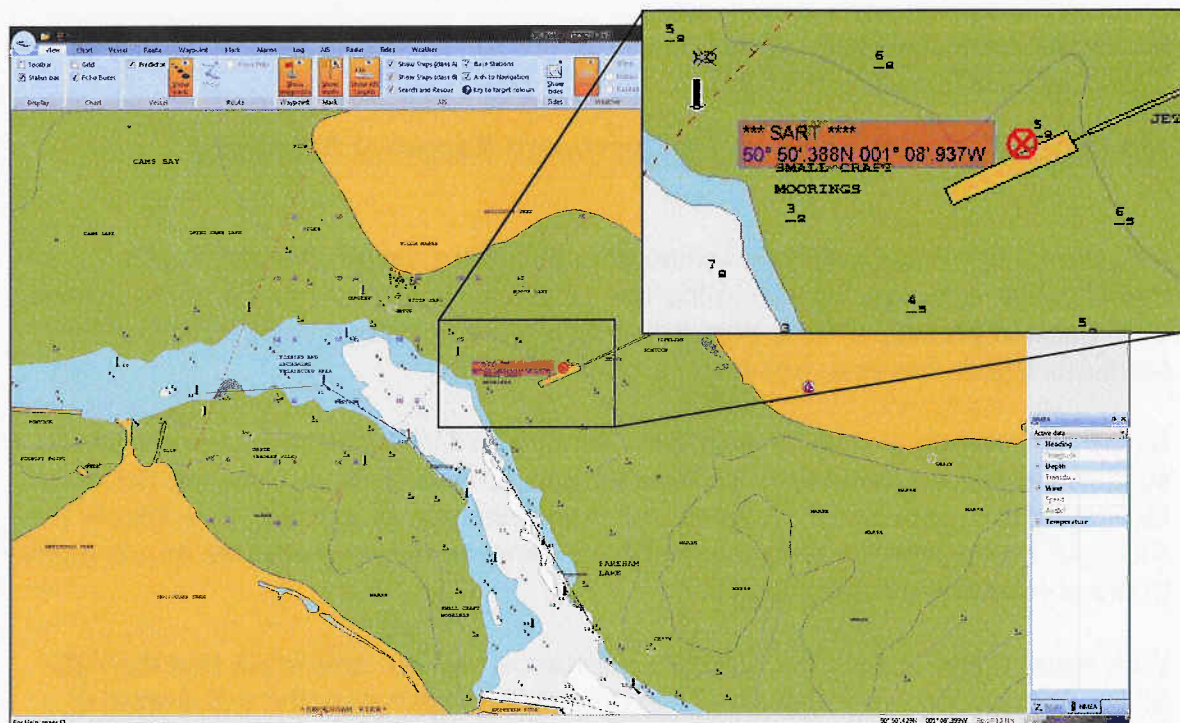
Individual transmissions alternate on the two international AIS dedicated channels:

AIS1	161.975 MHz
AIS2	162.025 MHz

Whereas the AIS-SART proper is specified for deployment in a survival craft, this functionality is also ideally suited to the 'man overboard' situation; further this functionality can be implemented in a sufficiently small footprint and low cost to allow a personal, wearable beacon to be realised.

Any standard AIS receiver operating standard up-to-date software will display a received AIS-SART message and identify it as such. In an enhanced system where the AIS receiver is connected to an Electronic Chart system operating up-to-date software, the position of the beacon will be displayed on the Electronic Chart (the dedicated AIS-SART symbol is a circle with a built-in cross - see IMO Safety of Navigation document SN.1/Circ.243/Add.1 of 10 December 2008).

A typical example presentation is shown below:



In a situation such as a yacht race, for example, participant and steward vessels equipped with such an enhanced AIS capability will be able to quickly identify that an incident has occurred, and quickly place the location of the survivor in the water, and so may be able to render immediate assistance, without having to raise a full distress alert and set an expensive SAR incident in motion.

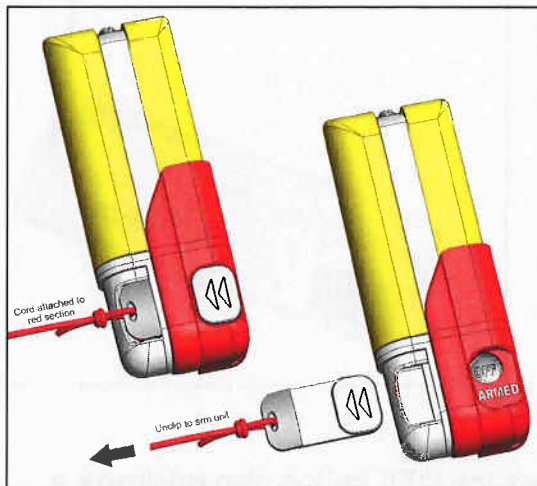
The AIS-SART is specified as a low power device (nominal EIRP of 1 W). In personal, wearable beacon applications the point of radiation must necessarily be close to the sea surface, which will further tend to limit range by limiting the line of sight from the beacon to other surface traffic (trials suggest a 0.5 W transmitter at sea level will give a range of 4 nm). This is in keeping with a system philosophy of local alerting to those most able to immediately assist the person in the water, whilst minimising interference with ordinary AIS traffic. Of course the device should only be activated in an emergency situation in any case.

In situations where a quick recovery does not prove possible, suitably long ranges are still achieved by such a beacon at angles of elevation appropriate to contact airborne SAR resources.

In the Z500 product family McMurdo Limited is developing two variations on this theme of the personal, wearable AIS-SART beacon.

The Products - model number Z501

Model Z501 is intended to be affixed to a lifejacket.



model number Z501

Lifejacket mounted

- i) the beacon is **SECURED** by a clip which prevents the red 'activation cap' from being pulled away;
- ii) the beacon is **ARMED** by removal of the 'securing clip'

Operation is by two simple and independent actions, as shown in the graphics above and below. If professionally fitted, the device may be set up so that inflation of the lifejacket triggers activation of the beacon (semi-automatic operation) - the lifejacket manufacturer should be consulted before using this mode of deployment.



model number Z501

- iii) the beacon is **ACTIVATED** by pulling away the red 'activation cap' using the attached cord:

- for semi-automatic operation the device must be armed beforehand;

- the cord may be pulled by the wearer for manual activation;

When the beacon is armed ('securing clip' removed) the OFF button is revealed. This button also serves to invoke the self test functions (this control is intentionally non-obvious to discourage random self-testing by the non-technical user, and consequent depletion of the battery - it is assumed that the person responsible for care and maintenance of the beacon will read the User Guide).

Self test will always provide an indication of the battery status.

model number Z501

iv) removal of the red 'activation cap' releases the blade antenna which is then self-erecting for DEPLOYMENT.

The antenna will remain substantially vertical in most conditions, contingent upon the body of the beacon being maintained in a suitable orientation.



The opal section of moulding which carries the OFF button also encloses a flashing white LED which provides feedback to the user on self-test, and which operates continuously on activation, providing positive indication that the beacon is working and also serving as a means of direct visual location of survivors. This part of the beacon should point away from the user's face to avoid disorientation.



model number Z501

Early 'concept prototype' illustrating typical mode of use.

METS Trade Fair
Amsterdam
November 2010



Note: the product name and branding of model number Z501 are not yet finalised.

The Products - model number Z502

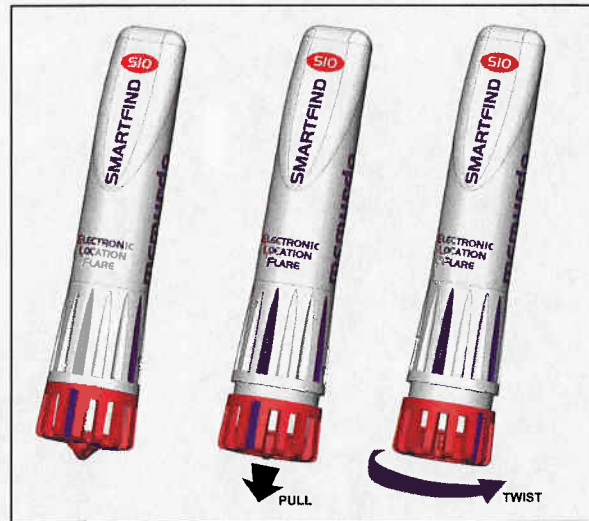
Model Z502 can be clipped to a belt or worn in a pouch, and is intended for manual activation only.

Operation is by two simple and independent actions:

the red base moulding is twisted one way for activation and the other way for self-test;

however before it can be twisted in the 'on' direction it must be pulled outwards against a spring;

the base moulding will then spring to lock in the 'on' position.



Self-test will initiate a self-completing test routine.

Activation will leave the beacon activated until it is switched off.

The beacon is switched off by pulling out the red base and returning it to the rest position, and then turning it to the off position, from where it will spring back to rest (this last part is the same action which otherwise initiates self-test - this dual function of the OFF control is the same scheme as described above for model number Z501).

The primary application for this device is for workers on marine installations or on docksides, who need to work unencumbered by a lifejacket, but who are at some risk of falling into the water. The small size and streamlined shape allow the device to be easily clipped to a belt or harness without significantly impeding physical activity.

This beacon is intended also to address, as a secondary application, the needs of divers who may return to the surface out of sight of their attendant dive-boats and so need to call assistance. This model is therefore designed for deep submersion, which leads to the characteristic single long moulding of the enclosure body. The requirement to pass light from the flashing white LED leads to the entire body therefore being moulded in opal plastic rather than the usual yellow or orange.



model number Z502

Early 'concept prototype'

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The product name and branding of model number Z502 are not yet finalised.

The Parent Product - McMurdo AIS-SART

The McMurdo Limited AIS-SART, marketed as three differently branded but technically identical products, holds approvals as follows:

EC RTTE BABT Notified Body reference NC/14652

FCC BABT TCB Grant FCC-ID KLS-S5-1

Models Z501 and Z502 are two technical variants of this 'parent product', developed for man overboard recovery applications as described above.

The product Family - Z500

Both models will use the same PCB, differing only in that Z502 will use reed switches and Z501 will use tact switches (for test/off and activate controls). The PCB includes an integrated antenna for Z502, designed to snap off and be replaced by a blade antenna for Z501.

The GPS module will be different to that used in our original AIS-SART product. Otherwise the PCB will be simply a new board carrying the circuit design and layout used in the parent product, identical in all respects relevant to the generation and transmission of the AIS-SART messages.

Both variants will use the same software (firmware). This will have a new firmware part number, compared to the firmware of the parent product, but the core of the software responsible for generation and transmission of the AIS-SART messages will be unchanged in all essential respects from that developed for the parent product.

The parent product was tested against the requirements of the appropriate international standard IEC 61097-14 for AIS-SARTs.

The Z500 models will differ from the parent product in terms of compliance with this standard in the following respects, determined by their intended application:

- Operation will be specified for 24 hours
- IEC 61097-14 calls for 96 hours

There will be no means for mounting at 1 m above seal level

There will be no 10 m buoyant lanyard

The ERP requirement will be met by these models when deployed as intended

- not at 1 m above sea level, but
- 5 – 15 cm above the water

Z501 is intended for incorporation into a buoyant device, and where appropriate should be tested with such a device

Approval Considerations

As detailed above, both models are identical in respect of the hardware and software responsible for the generation and transmission of the AIS-SART messages, and both hardware and software are unchanged in all essential respects from the parent product. We propose specifically that the evidence of compliance of the parent product in respect of IEC 61097-14 Clause 8 Link layer tests holds good for these technical variants of that product. Technical detail can be supplied to show that the extent of variation between these variants and the parent product is as described.

Both models are intended specifically for maritime use, and this will be addressed by appropriate testing to the requirements of the international standard IEC 60945 as applicable to portable maritime radiocommunications equipment.