

For Sea Marshall®AU9-HT 121.5MHz Digital Personal Locator Beacon

Final Report rev002

Monday 19th October 2009

1.0 Manufacturer – Marine Rescue Technologies Ltd. Units 3 & 4 Front Street Court, Middleton On The Wolds, Driffield, East Yorkshire, YO25 9TZ .
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2.0 The AU9-HT units are representative of actual production units, they are the same excepting that for testing purposes the antenna spring was removed and a dummy load applied across the antenna cable at the point where the spring would normally sit, the dummy load absorbed the radiated power. (*This was done to avoid full power transmission on the live 121.5MHz frequency in areas where the signal could not be contained via a Faraday cage; we do not have permission to broadcast openly on the live frequency*). Applying a dummy load did not in any way affect or alter the performance of the AU9-HT during the testing it is important to note there is nothing in the antenna spring which can cause inadvertent activation of the AU9-HT. Units were tested in the ARMED setting, i.e. battery engaged and on full power on 121.5MHz - except for the waterproof IP rating tests which had to be conducted without electronics fitted otherwise the unit would activate courtesy of it's auto-overide, fail-safe, function after 180 seconds of continuous immersion (refer to operators manual section 1.5); there is no way around this. The AU9-HTs internal buzzer was used by the test houses to identify if a unit had inadvertently activated - the internal buzzer only sounds continuously when the unit is transmitting on full power, this indicates an activated unit. We are pleased to say the AU9-HT unit did not inadvertently activate during the tests.

3.0 Eurocae ED-14F environmental tests

Table 1.0

Section	Environmental Test	Category	Explanation Of Category	Test House	Status + Manufacturers NOTES	Test report reference
4	Temperature & Altitude	B2	Equipment that is operated in non-pressurized and non-controlled temperature locations on an aircraft that is operated at altitudes up to 25,000 ft (7,620 m).	PARC Unit 11 Caddsdown Ind Park, Bideford, North Devon, EX39 3DX. Tel	PASS	MRT Ltd. Report No. 001 Test House Report No. 2734
5	Temperature Variation	B	Equipment that is operated in a non-temperature-controlled or partially temperature controlled internal section of the aircraft.	PARC Unit 11 Caddsdown Ind Park, Bideford, North Devon, EX39 3DX. Tel	PASS	MRT Ltd. Report No. 002 Test House Report No. 2734
6	Humidity	C	Equipment that may be required to be operated under conditions such that it is subjected to direct contact with outside air for periods of time in excess of that specified for the standard humidity environment.	Radio-Cad Cowden East Yorkshire	PASS	MRT Ltd. Report No. 003 Test House MT147-CH6
7	Operational Shock & Crash Safety	B	Equipment tested for standard operational shock and crash safety.	PARC Unit 11 Caddsdown Ind Park, Bideford, North Devon, EX39 3DX.	PASS	MRT Ltd. Report No. 004 Test House Report No. 09244
8	Vibration	U	Equipment to be operated in helicopters with unknown rotor related frequencies. If the vibration environment is known, and the relevant equipment specification requires a service life test, the robust test can be made to represent a service life test by adjusting the test levels and/or the test times using accepted fatigue scaling relationships	PARC Unit 11 Caddsdown Ind Park, Bideford, North Devon, EX39 3DX. Tel	PASS	MRT Ltd. Report No. 005 Test House Report No. 2734

9	Explosive Atmosphere	A Env II	Equipment to be operated in rotorcraft where, in normal operation, the temperature of any surface will not rise to a level capable of causing ignition, nor will any operating part cause ignition Environment II is an atmosphere in which flammable mixtures can be expected to occur only as a result of a fault-causing spillage or leakage. Equipment shall meet the standards and test procedures for any one of the explosive atmosphere categories (paragraphs 9.4.1, 9.4.2 or 9.4.3).	Radio-Cad Cowden East Yorkshire	PASS	MRT Ltd. Report No. 006 Test House Report No. MT147-CH9
10	Waterproofness	S	Equipment operated in locations where it may be subjected to the forces of a heavy stream of fluid such as would be encountered in aircraft de-icing, washing or cleaning operations.	PARC Unit 11 Caddsdown Ind Park, Bideford, North Devon, EX39 3DX.	PASS Rating, IP-68 6 = Totally Dust Tight 8 = Protection against heavy seas & powerful jets of water & immersion under pressure	MRT Ltd. Report No. 007 Test House Report No. 2726
11	Fluid Susceptibility	F	Equipment operated in locations where fluid contamination could be commonly encountered. Testing to cover the relevant fluids identified in Table 11-1 of ED-14F.		PASS Concession to test criteria Refer to the report on page 4 of this document	MRT Ltd. Report No. 008
12	Sand & Dust	D	Equipment that is operated in locations where it is subjected to blowing dust in the course of normal aircraft operations.	PARC Unit 11 Caddsdown Ind Park, Bideford, North Devon, EX39 3DX.	PASS IP-68 6 = Totally Dust Tight 8 = Protection against heavy seas & powerful jets of water & immersion under pressure	MRT Ltd. Report No. 007 Test House Report No. 2726
14	Salt Fog	T	Equipment that is operated in locations where it is subjected to a severe salt atmosphere, such as equipment exposed directly to external unfiltered air on hovering aircraft that may operate or be parked near the sea.	PARC Unit 11 Caddsdown Ind Park, Bideford, North Devon, EX39 3DX.	PASS Covered by Waterproof Rating & Humidity Tests IP-68 6 = Totally Dust Tight 8 = Protection against heavy seas & powerful jets of water & immersion under pressure. The unit is made from non-corrosive materials (plastic components), the two external metal waterpin contacts are made from stainless steel and the unit is completely sealed to IP-68 during use. Historically on our previous ISPLB8 unit which utilised lesser quality materials, salt Fog was never recorded as having caused an issue with any component. The humidity test PASS also demonstrates the unit would not inadvertently activate in a high saturation atmosphere such as fog. In alignment with regular maintenance and service procedures any component which exhibits signs of wear and tear have to be repaired / replaced.	MRT Ltd. Report No. 007 Test House Report No. 2726
15	Magnetic Effect	Z	Compass safe distance of greater than 0.3m.	Radio-Cad Cowden East Yorkshire	PASS Compass safe distance 23 cm	MRT Ltd. Report No. 009 Test House Report No. MT147-CH15
20	RF Susceptibility	T	Test level for equipment with moderate criticality intended to withstand the external RF environment..	RN Electronics Arnolds Court, Arnolds Farm Lane, Brentwood, Essex, CM13 1VT.	PASS	MRT Ltd. Report No. 010 Test House Report No. 10-733/4085/09 Cert Num:- 4085/1

21	RF Emissions	M	Equipment that is operated in the passenger cabin where electro-magnetic apertures are significant but not directly in view of radio receiver antennas.	Radio-Cad Cowden East Yorkshire	PASS	MRT Ltd. Report No. 011 Test House Report No. MT147-CH21
24	Icing	A	Equipment that is operated in locations where it may be subject to the effects of external ice or frost adhering to it.	PARC Unit 11 Caddisdown Ind Park, Bideford, North Devon, EX39 3DX. Tel	PASS	MRT Ltd. Report No. 012 Test House Report No. 2734
25	ESD	A	Electronic equipment that is installed, repaired, or operated in an aerospace environment.	Radio-Cad Cowden East Yorkshire	PASS	MRT Ltd. Report No. 013 Test House Report No. MT147-CH25
26	Fire & Flammability	C	Non-metallic equipment, component parts, sub-assemblies operated in pressurized or non-pressurized zones and non-fire zones with largest dimension greater than 50 mm.	Paper exercise	PASS NOTE- We approached a test house (Exova Warrington Fire) who advised that in accordance with ED-14F the AU9-HT would need to be tested as individual components as anything less than 50mm did not apply. Quoted from ED-14F 26.3.3 Category C: Flammability Non-metallic equipment, component parts, sub-assemblies installed in pressurized or non-pressurized zones and non-fire zones with largest dimension greater than 50 mm. The <i>flammability</i> procedure shall be applied. NOTE: If materials used in the construction of the equipment can be shown to meet the equivalent vertical and horizontal flammability tests herein, either through composition or previous testing, this test is not required. Manufacturers NOTE – The following components of the AU9-HT, which are greater than 50mm in their largest dimension are required under ED-14F to meet the flammability tests and do so through merit of their composition/fire retardant characteristic which meet ED-14F. 1. Body + Base Cap + PCB holder Fire rating- UL-94VO 2. Antenna Cord Fire Rating- UL-94 3. Antenna Spring Cover Fire Rating- UL 224 4. Front and rear label Fire Rating- UL-94 VTM-O 5. Arm switch restrainer 'O' ring Fire Rating- FAR25.853(a)(1)(iv) & (a)(1) (v) horizontal flammability 6. Printed Circuit Boards Fire Rating - UL94VO Under the above guidelines laid down in ED-14F the other components of the AU9-HT are of a small enough size, less than 50mm in their greatest dimension to not be required to comply.	MRT Ltd. Report No. 014

Maritime Survivor Locating Devices



Sea Marshall® AU9-HT Helicopter Transit 121.5MHz PLB environmental test report

Test Type – Eurocae ED-14F

SECTION – 11

Description – **FLUID SUSCEPTIBILITY**

MRT Ltd. test report reference number – MRT-008

Concession asked for – YES/NO = YES

Status – PASS - Based on the following

Advancements In Design

The AU9-HT units is a totally new unit made from higher grade, mostly fire-retardent, materials above and beyond the specification of the earlier ISPLB8 units. The AU9-HT unit has a higher IP rating (IP-68), it also passes all the other test criteria laid down in the ED-14F air worthiness document.

Day To Day Use And Precautions

Any fluids which come into contact with the unit will be wiped clean as part of the regular PLB maintenance schedule as laid out in the operator manual and also as part of the jacket maintenance procedures. The AU9-HT unit is built into the LAP jacket in such a way that a high degree of protection is provided by the jacket. If any PLB component shows signs of damage the AU9-HT unit will be immediately withdrawn from service and repaired/replaced.

Servicing

An annual service is recommended, during which the following components will be replaced:

1. Battery
2. Base cap seal
3. Base cap screw seal
4. Side switch/magnet
5. Arm switch restrainer 'O' ring

Human Factors

It is unlikely that a passenger is going to come into contact for an extended period with the chemicals listed on the test criteria.

Historical Evidence

The earlier model Sea Marshall® ISPLB8 units have been carried on helicopters for a period of 10 years, during that time, out of over 1500 units in use we have had no units returned to us which have shown damage due to chemical reaction. During that time we have received no report of a PLB unit having inadvertently activated due to chemical contamination. Table 001 on page 3 shows a typical PLB repair/service sheet. The first item on the list is an IPSLB unit with serial number SMRSUK 10110, this unit was purchased in 2001 and repaired in 2005, the unit showed no sign of damage caused by chemical reaction, the same unit was still in service up until the plbs were withdrawn from flights in the last 12 months.

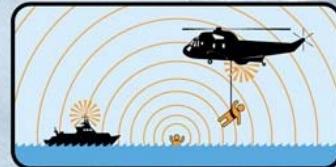
PLB Inspection Report. 2658

CUSTOMER	ADDRESS	DATE RECEIVED	PERIOD OF INSPECTION
SURVIVAL ONE	UNIT 5 BESSEMER WAY, HARFREYS IND; EST; GT YARMOUTH, NR31 0LX	03/03/2006	29/03/2006

Inspector	TEST RESULTS															
	ARM SWITCH RETAINER	BASE CAP	ANTENNA	ANTENNA SHROUD	ANTENNA LUG	ARM SWITCH	PLASTIC CASES	LOW POWER TEST	L.E.D. ACTION (TEST)	FULL POWER TEST	L.E.D. ACTION (FULL)	WATER PIN FUNCTION	FALSE ACTIVATION TEST	BATTERY	PUSH BUTTON	
S/No:	INSP. RESULTS	P	P	F	F	F	P	P	F	P	F	P	P	P	P	P
SMRSUK 10110	ACTION TAKEN			R	R	R			P		P					
MODEL	COMMENTS	DATE SOLD 2001 – DATE REPAIRED 08-2005 – ANTENNA SNAPPED, SHROUD WORN.														
ISPLB8																
S/No:	INSP. RESULTS	P	P	F	F	F	P	P	F	P	F	P	P	P	P	P
51100	ACTION TAKEN			R	R	R			P		P					
MODEL	COMMENTS	DATE SOLD 03-2005 - ANTENNA SNAPPED, SHROUD WORN														
ISPLB8-X																
S/No:	INSP. RESULTS	P	P	F	F	F	P	P	F	P	F	P	P	P	P	P
51086	ACTION TAKEN			R	R	R			P		P					
MODEL	COMMENTS	DATE SOLD 03-2005- ANTENNA SNAPPED, SHROUD WORN, TX FAULT														
ISPLB8-X																
S/No:	INSP. RESULTS	P	P	F	F	F	P	P	F	P	F	P	P	P	F	P
MRTUK 21026	ACTION TAKEN			R	R	R			P		P					R
MODEL	COMMENTS	DATE SOLD 04-2002 – REPAIRED 09-2004 - ANTENNA SNAPPED, SHROUD WORN, BATTERY LOW POWER														
ISPLB8																
S/No:	INSP. RESULTS	P	P	P	P	P	P	P	F	P	F	P	P	P	P	P
MRTUK 20007	ACTION TAKEN								P		P					
MODEL	COMMENTS	DATE SOLD 09-2001 – REPAIRED 08-2005 – TX AUDIO FAULT.														
ISPLB8		C5 COMPONENT RE SOLDERED.														
S/No:	INSP. RESULTS	P	F	F	F	F	P	P	F	F	F	F	F	F	F	P
MRTUK 20005	ACTION TAKEN		R	R	R	R			P	P	P	P	P	P	R	
MODEL	COMMENTS	DATE SOLD 09-2001 - ANTENNA SNAPPED, SHROUD WORN, BASECAP CRACKED, BATTERY LOW POWER														
ISPLB8		C5 COMPONENT RE SOLDERED.														

KEY: P = PASS F = FAIL R = REPLACED RS = RESOLDERED RP = REPAIRED U = UPGRADE REQD

Maritime Survivor Locating Devices



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COVER SHEET Sea Marshall® AU9-HT helicopter transit 121.5MHz PLB environmental test report

Test Type – Eurocae ED-14F

SECTION – 26

Description – Fire & Flammability

MRT Ltd. test report reference number – MRT-014

Concession asked for – YES/NO = NO

Reason for concession request –

NOTE- We approached a test house (Exova Warrington Fire) who advised that in accordance with ED-14F the AU9-HT would need to be tested as individual components as anything less than 50mm did not apply.

Quoted from ED-14F

26.3.3 Category C: Flammability

Non-metallic equipment, component parts, sub-assemblies installed in pressurized or non-pressurized zones and non-fire zones with largest dimension greater than 50 mm.

The *flammability* procedure shall be applied.

NOTE: If materials used in the construction of the equipment can be shown to meet the equivalent vertical and horizontal flammability tests herein, either through composition or previous testing, this test is not required.

The following components of the AU9-HT, which are greater than 50mm in their largest dimension are required under ED-14F to meet the flammability tests and do so through merit of their composition/fire retardant characteristic:

- Body + Base Cap + PCB holder.

No. 8 (Body and Base Cap) on fig.001 on Page 9 (PCB holder internal component not shown)

Fire rating- UL-94VO

- Antenna Cord

No. 13 on fig.001 on page 9

Fire Rating- UL94VO/V2

- Antenna Spring Cover

No.1 on fig.001 on page 9

Fire Rating- UL 224

- Front and rear label

No.7, 15 on fig.001 on page 9

Fire Rating- UL-94 VTM-O

- Arm switch restrainer ‘O’ ring

No.6 on fig.001 on page 3

Fire Rating- FAR25.853(a)(1)(iv) & (a) (1) (v) horizontal flammability

- Printed Circuit Boards

Not shown on fig.001 this is an internal component

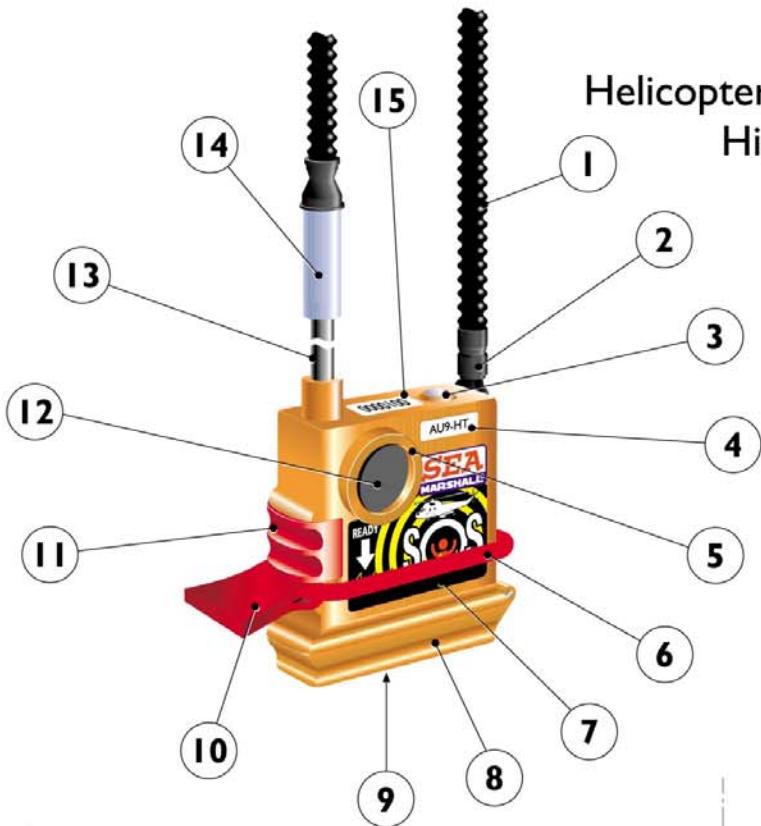
Fire Rating - UL94VO

Under the above guidelines laid down in ED-14F the other components of the AU9-HT are of a small enough size, i.e. less than 50mm in their greatest dimension are not required to comply.



Sea Marshall®AU9-HT

Helicopter Transit 121.5MHz High Power Personal Locator Beacon



- ① Helical antenna
- ② Antenna end lug
- ③ Auto-activation waterpin screw
- ④ Product code label
- ⑤ Activation button guard
- ⑥ Arm/Ready switch restrainer 'O' ring
- ⑦ Front label
- ⑧ Base cap (hinged - not separate)
- ⑨ Base cap screw (Auto-activation waterpin screw)
- ⑩ Arm/Ready switch restrainer grab tag
- ⑪ Arming/Ready switch
- ⑫ Activation button
- ⑬ Antenna cord
- ⑭ LED strobe
- ⑮ Serial number label
- ⑯ Rear instruction label

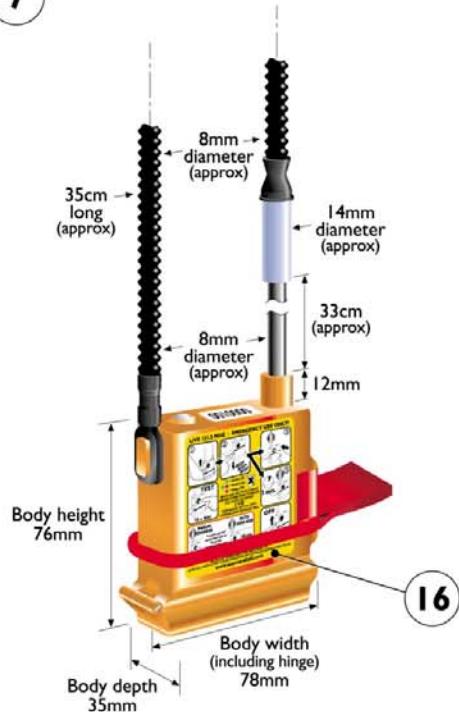


Fig: 001