

MR510 PSAR PLB

Product Information (Preliminary data)

(Survey of Customer's feedback)



MR510 SURVEY Dated 2008/03/04



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PRESENTATION

1. General Presentation Becker Avionics

Thank you for your interest in our SAR equipment. Becker Flugfunkwerk GmbH is a privately owned company and was founded in Germany in 1956. Becker is a leader in the avionics industry.

During this time the company has earned an excellent international reputation for unsurpassed quality and reliability if its products, designed and built by highly qualified engineers and technicians.

Advanced technology and high levels of quality in the fields of communication and navigation systems have made Becker known world wide. Becker is the only European company which offers a complete range of systems for ground, airborne and SAR applications.

Becker products are user-friendly and renowned for their sturdiness.

Compact size and state of the art technology, at reasonable cost, combined with an international sales and support organisation, allows the Becker Avionics Group to successfully compete world wide at the highest level.

Becker Avionics Group consists primarily of the following companies:

Becker Flugfunkwerk GmbH	Headquarters, Distribution and Support Center	Germany
Rheinmünster	info@becker-avionics.de	
Becker Avionics Inc.	Representative Office and Support Center	USA, incl.
Miramar, Florida	Latin America, Australia & New Zealand	
	info@beckerUSA.com	
Becker do Brasil Ltda.	Representative Office and Support Center	Brazil
Rio de Janeiro	becker@beckerdobrasil.com.br	
Becker Eléctronique France	Representative Office and Support Center	France
Strasbourg	avionics@wanadoo.fr	
Becker Electronics Taiwan Lto	I. Representative Office and Support Center	Taiwan
Tao Yuan Hsien	info@becker.com.tw	



Wroclaw	becker@becker-avionics.com.pl	
Becker China	Representative Office and Support Center	China
Beijing	leigh.yang@beckerchina.com	
Becker Russia	Representative Office and Support Center	Russia
Moscow	becker@progtech.ru	

The company has earned an excellent international reputation based on a German tradition for unsurpassed quality and reliability. Products are designed and built by highly qualified engineers and technicians.

The group designs, manufactures, sells and supports a complete range of navigation and communication equipment for airborne, Air Traffic Control, mobile and Search and Rescue applications.

Research and Development is performed in Germany, Poland and Taiwan, with industrialization and production activities in Germany, France, USA and Taiwan.

The Becker Avionics Group employs over 200 staff, over half of which are qualified engineers and technicians. Annual group sales exceed 25 million US dollars.

Compact size, sturdiness and state-of-art technology, at optimum cost, combined with an international sales and support organization, allows the Becker Avionics Group to successfully compete worldwide at the highest level.

The group is the foremost supplier of Search and Rescue equipment. Over 30,000 Personal Locator Beacons are in successful service with the Armed Forces of the following countries:

Germany	Portugal
Austria	Italy
Switzerland	Poland
Norway	South Korea
Spain	New Zealand
Malaysia	

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2. Business Capability

Becker Flugfunkwerk GmbH is a limited company incorporated under the German law.

Due to the worldwide activities Becker is acting inside Germany as well as in all foreign markets as a well known and qualified supplier to military and civil customers.

The headquarters of Becker is organized within four business segments in order to support in a best way the customer requirement.

Business Segment 1 **AVIONICS** Business Line

Business Segment 2 SAR Business Line

Business Segment 3 ATC Business Line

Business Segment 4 SERVICE Business Line

Business Capability

Becker provides within the organization the following Business Capabilities:

- PRODUCT DESIGN AND DEVELOPMENT
- SYSTEM DESIGN AND DEVELOPMENT
- SOFTWARE ENGINEERING AND VALIDATION
- PROJECT AND PROGRAMME MANAGEMENT
- PRIME CONTRACTING
- MANUFACTURING
- QUALIFICATION TESTING
- SYSTEM INTEGRATION
- PRODUCT SUPPORT
- INTEGRATED LOGISTIC SUPPORT
- REPAIR FACILITY FOR CIVIL AVIONIC SYSTEMS (LBA JAR 145)
- REPAIR FACILITY FOR MILITARY SYSTEMS (GAF)
- CUSTOMER SERVICE AND TECHNICAL TRAINING

(LBA JAR 21-G)



3. Quality Assurance

Becker is an approved aviation company and holds different certificates of domestic and foreign airworthiness authorities.

- TÜV Cert
- EADS Airbus Hamburg
- EASA
- EASA
- EASABWB

DIN EN ISO 9001:2000 QSF-C JAR 21-G JAR 145 BWB-1921Y-B07/97/01

Becker has established a Quality Management Handbook which is accordance to the applicable airworthiness regulations. The QMH is the overall guide for all internal and external processes related to sales, design, manufacturing, testing, procurement, qualification, ILS, repair and customer support.

4. Manufacturing Process

Becker has several internal manufacturing facilities within the Becker Avionics Group:

•	Becker Flugfunkwerk	Germany	LRU Assembly, Board Assembly Test, ATP/ATR, Dispatch, Repair
•	Becker Electronique	France	SMD Assembly, Test
•	Becker Electronics	Taiwan	Displays, Computers, Test
•	Becker Avionics	USA	LRU Assembly, Test, Dispatch Repair

Becker uses the latest manufacturing technologies (SMD) as well as automatic test equipment (ATE) for continuous production testing as well as final testing prior to delivery.



5. References

OEM Manufacturers EADS Airbus, EADS Eurocopter, EADS ATR British Aerospace, CASA, Fairchild/Dornier Xian Aircraft Corporation, Agusta, Pilatus Hindustan Aeronautics Ltd (HAL)

Police and Military German Air Force, Navy and Army, German Border Patrol, Dutch Police FMV, Försvarets Materielverk Irish Air Corps, Austrian Army and Police Swiss Air Force, Egypt Navy, Indonesian Navy Portuguese Air Force, US Navy, South African Air Force Royal New Zealand Air Force US Civil Air-Patrol

Airframes - Helicopter

EADS Eurocopter

Agusta Bell Helicopter Textron Sikorsky Boeing HAL AS 355, BO105, BK117, Alouette III EC120, EC135, EC145, NH90 A109 B206, B407, B430, UH-1D Sea King, CH53 MD 900 Shetak

Fixed Wing Aircraft

EADS Airbus EADS ATR Fairchild/Dornier Transall Dassault-Breguet CASA Canadair Pilatus Xian A318, A319, A320, A321, ATR42, ATR72 DO228, 328TP, 328Jet, 728Jet C160 Atlantique C212 CL601 PC7, PC9 Y7-100/200, MA-60



TECHNICAL PART

6. General System Description

The following Information details technical features of the new Becker's Personal Locator Beacon

MR510-X-(XXX).

This Unit and its accessories are fully based on the experience from the currently produced Personal Locator Beacon MR509, but provides a completely new design, with reduced dimensions, and an additional 16 channel GPS-Receiver.

System feature highlights:

- Beacon Mode 406.037 MHz, 243 MHz and 121.5 MHz Beacon,
- Two-way Voice Communication on VHF and UHF,
- Manual or automatic activation by lanyard or if the beacon immersed in water,
- Rugged design,
- Waterproofed down to 10 meters,
- Compliance with STANAG 7007, Part PSAR-Devices, C/S specifications T.001and T.007 and for environmental condition according Mil-Std. 810 E,
- C/S Class I and Class II devices available,
- Battery technology LiMnO2, Life time > 5 Years,
- Equipment antennas for VHF/UHF/ C/S Frequencies and for GPS,
- Connection for external Antennas for VHF/UHF /C/S Frequencies and for GPS,
- Proofed Life vest antennas available.

The Personal Locator Beacon is designed for use in a military environment as a survival radio by aircrew, mariners and other personnel engaged in military missions.

When activated, the PLB transmits sweep tone radio distress signal on the international VHF/UHF emergency frequencies and messages on the Cospas Sarsat (C/S) satellite frequency.

The voice communication mode permits the survivor to communicate with the rescue team in the VHF and/or UHF band.

Guaranteed operating time for Class I device > 24h@-40°C and for Class II device > 24 h@-20°C.

Built-in test facilities allow a simple confidence check of the unit and the battery capacity for secured 24 h operating. Acoustical and optical indication for GO or NOGO.

The available special type Test and Programming Units provides the possibility for:

- Programming of the device in accordance to all C/S-Protocol types.
- Unit test and readout of the stored BIT-Results for maintenance purposes.
- Test of the Life Vest antenna.

Our customers have the possibility to comment and address specific needs in chapter 12: Survey of Customer's Requirements (at the end of this document).

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7. **Technical Data**

Design & Test Specifications:

- Cospas-Sarsat: C/S T.001, C/S T.007 & C/S T.012, •
- NATO STANAG 7007. •
- MIL-STD 810E,
- ED-14E (DO-160E). •

Operating Frequencies:

- F1: 121.5 MHz ± 1.5 MHz step 25 kHz,
- F2: 243 MHz ± 3 MHz step 50 kHz, •
- F3: 406.037 MHz (according to C/S T.001, C/S T.007 & C/S T.012). •

Output power in Beacon Mode:

- F1: ≥ 100mW,
- •
- •
- Detection range in accordance with STANAG 7007: 50 NM@10000 ft.

Output power in Voice Mode

F1: ≥ 50mW.

- F2: \geq 50mW,
- Minimum communication range of 10 NM @ 10000 ft with the approved equipment and life vest antennas.

Voice communication on F1 and F2

- Tx and Rx on F1 only, •
- Tx and Rx on F2 only, •
- Tx on F1 and F2, Rx on F1 and F2 (not simultaneously).

F1, F2 Remote Voice Mode Activation

- This function allows to interrupt momentary and at distance the emission of the 121.5 MHz and 243 MHz emergency signals,
- A specific signal received on F1 or F2 during the standard Rx time window of normal Tx sequence • will switch automatically the beacon into the audio receiving mode allowing SAR operator to send voice messages through the beacon speaker to the person in distress situation.

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GPS receiver

- 16 channels,
- Low power consumption: 38mA@3VDC, •
- High sensitivity: -158dBm (in tracking mode).
- L1 C/A Code. •

Beacon Controls:

- Automatic activation:
 - . by tether,
 - by water sensor.
- Mode switch positions:
 - o Self Test (spring loaded, returning to OFF position),
 - OFF, 0
 - 0 Armed (for automatic activation and water sensor),
 - ON. 0
- Information Separate push button for voice communication (PTT).

IBIT (Initiated Self Test) The IBIT function check the following features:

Receiver correct operation,

- Transmitter correct operation with connected equipment antenna,
- Battery ability to fulfil the minimum operating life time,
- Control board normal operation,
- GPS receiver.

The self test result is provided in both optical and acoustical mode.

End life beacon mode operating time :

- C/S PLB Class 2: ≥ 24h @ -20°C, •
- C/S PLB Class 1: \geq 24h @ -40°C, •

Battery pack:

- Chemistry: LiMnO2, ٠
- Shelf Life: 5 years (with the recommended storage figure),
- Replacement: only possible by approved service facilities. •

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Beacon Physical Characteristics:

- Dimensions (in storage position including embedded antennas): 155 x 86 x 46,
- Weight including batteries: \leq 700g.

Beacon Surface (Inscriptions and Colours):

- Available Colours: Yellow, Green, other shades on demand,
- Inscriptions in English and with a necessary space for inscriptions in a second language depending of the customer requests.

Maintainability / Testability

- Self test: maximum allowed one time per month (60 Self Test / 5 years period),
- Level 1 Maintenance Action: One Self Test every 6 month to "refresh" the battery, •
- Battery replacement: every 5 years (workshop maintenance),
- Recommended Full performance check: every 2,5 years (workshop maintenance), •
- Storage in non volatile memory of the all relevant beacon life cycle data.

Storage Temperature Range:

- Long term (5 years) with batteries: -40°C to +23°C.

Operating Temperature Range:

- CLASS 1: -40°C to +55°C,
- CLASS 2: -20°C to + 55°C.

Fire Resistance:

- Compliant with UL94-5VA . After being exposed 5 times to a flame during 5 seconds the housing will:
 - not burn for more than 60 seconds, 0
 - not exhibit burn through, and, 0
 - no flaming particles that may ignite nearside materials. 0

Buoyancy:

Do not float on water surface.

Waterproofness:

- Immersion to depth of 10 meters during 5 minutes,
- Immersion to depth of 200 meters with the specific container.

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MR510 Personal Locator Beacon (PLB) for PSAR Product Information



8. Preliminary Layout



Dimensions in (mm)

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9. Becker's Personal Locator Beacon

The presented MR510-X-(XXX) unit is a new development, having similar form factor as the MR 509 but enhanced features in Line with latest requirements for PSAR PLBs.



MR510-X-(XXX) with antenna in operational position.

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MR510-X-(XXX) in storage mode.

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10. Accessories

<u>Life vest antennas:</u> remote antennas for transmission and reception of GPS signals can be customized to almost any type of life vest. With these options the performance of the beacon is optimized for transmissions at water level.



MR510 Life vest TX/RX and GPS antennas.

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11. Test and Programming Units

MR510 PLB ML1Test Box, allows to program and test the beacon and the remote antennas.

Test and Programming Unit for the MR510-(X)-(XXX) and the following units:



Laptop or PDA required

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12. Survey of Customer's Requirements

In order to take into account as much as possible your requirements we would be pleased to have your remarks and corrections filled in the table here below.

Req. ID	Requirement Description	Customer's		Customer's Remarks
1	Customer's Name:	1	/	
2	Customer's Contact Information:	/	1	
3	Standards			
3.1	The PLB shall be COSPAS/SARSAT certified and approved as a Class 2 beacon (-20°C to +55°C, 24 hours at -20°C). (See also req. 10.1.)			
3.2	The PLB shall be COSPAS/SARSAT certified and approved as a Class 1 beacon (-40°C to +55°C, 24 hours at -40°C).			
3.3	The PLB shall meet the requirements according to NATO STANAG 7007, latest edition.			
4	Main Functions			
4.1	A complete unit of PLB shall consist of the PLB with battery and antenna.			
4.2	The PLB transmitter shall operate on 121.5, 243.0 and 406 MHz.			
4.3	The PLB shall have the possibility to transmit a pre- programmable digital message on 406 MHz (change of message can be done at I-level).			
4.4	The PLB shall have a GPS-receiver in order to be able to automatically transmit the GPS-position.			
4.5	The PLB shall have the possibility to transmit and receive a two-way voice communication on 121.5 MHz and if possible also on 243.0 MHz.			
4.6	The PLB shall minimum have the following power outputon each frequency:121.5 MHz100mW243.0 MHz100mW406 MHz5W			
4.7	The PLB should have a power output of minimum 200mW on the frequencies 121.5 MHz and 243.0 MHz.			

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Req. ID	Requirement Description	Customer's Statment		Customer's Remarks
		Yes	No	
5	Dimensions, Weight and Colour			
5.1	The dimensions shall be maximum 195mm * 98mm * 53mm (including battery, excluding antenna in deployed position).			
5.2	The PLB should fit into the pocket of specific type of Survival Jacket or Life Vest (need to be specified by the customer).			
5.3	The PLB should fit into the pocket of specific Helicopter Life Vest (need to be specified by the customer).			
5.4	The PLB shall have a maximum weight of 1000 grams including battery.			
5.5	The PLB should have a weight of maximum 700 grams including battery.			
5.6	The PLB shall be able to be delivered in discreet green or black, and in a clearly divergent colour (signal green, yellow or orange).			
5.7	The PLB shall exist in a dummy version. The dummies shall be alike to the real PLB(s) in appearance and in the possibility to manoeuvre the controls.			
6	Training capability			
6.1	The PLB-system shall have training capability (with training frequencies other than 121,5 MHz and 243,0 MHz), either by training frequencies on each PLB (change of frequency can be done at I-level) or by specific training beacons, PLB-T.			
6.2	The training frequencies shall include at least 121.875 MHz and 243.75 MHz.			
7	Activation Monitor			
7.1	The PLB shall have a manual activation possibility.			
7.2	The PLB shall have an automatic activation function, activated when the pilot/crew member is ejected from an aircraft, either mechanical or by g-force. The function shall however be disengageable.			
7.3	The PLB should have automatic g-force activation (disengageable), activated when the pilot/crew member is ejected from an aircraft. (Activation values: 9.5G to 11.5G for 25 milliseconds to 35 ms, or >= 11.5G for >= 35 ms.)			
7.4	The PLB should have automatic activation in fresh water and saltwater (disengageable).			



Req. ID	Requirement Description	Customer's Statment		Customer's Remarks
		Yes	No	
8	Battery			
8.1	The battery lifetime shall be minimum 5 years (unused).			
8.2	There should be rechargeable batteries (for training purposes) and battery chargers for use with the PLB (or PLB-T, if any).			
9	Antenna			
9.1	The main antenna shall be flexible.			
9.2	The main antenna shall provide an optimum performance at 121.5, 243.0 and 406 MHz.			
9.3	The GPS-antenna shall be directly mounted on the PLB or integrated in the main antenna.			
-	For requirements regarding spatial coverage of the main antenna, signal modulation, frequency stability etc, please refer to NATO STANAG 7007.			
10	Environment			
10.1	The PLB shall be functional within the temperature interval of -40° to $+55^{\circ}$ Celsius. (See also req. 3.1 and 3.2.)			
10.2	The operating time of the PLB at -40°C shall be stated in the tender and in technical documentations.			
10.3	The PLB shall be functional (and the controls shall be manoeuvrable) after being subjected to water with a temperature interval of -2° till +25° Celsius.			
10.4	The PLB shall be waterproof to depths of not less than 10 metres for 5 minutes.			
	The PLB should be able to float in water.			
-	For requirements regarding relative humidity, altitude and explosive decompression etc, please refer to NATO STANAG 7007.			
11	Construction and Design			
11.1	The PLB shall be able to be used/operated in darkness.			
11.2	The PLB shall be easy to activate with one hand, even if the operator is not able to see the activation device.			
11.3	Manoeuvring of the PLB shall be possible when using gloves.			



Req. ID	Requirement Description	Customer's Statment		Customer's Remarks
		Ves No		
11.4	The PLB shall not limit the movability of the user/crew member, neither cause physical discomfort or have any other negative effect for the user/crew member.	103	NO	
11.5	The exterior of the PLB shall not have sharp edges or projections that could damage inflatable survival equipment or injure the personnel.			
11.6	Choice of material shall be made in such a way that no special consideration, due to today known environmentally risks, need to be taken in a future liquidation of the system.			
11.7	The construction shall make possible to easy recycle the system.			
-	For requirements regarding operating instructions on the case, refer to NATO STANAG 7007.			
12	Additional Conditions and Functions			
12.1	The risk of accidentally activating the PLB shall be minimized.			
12.2	The risk of producing FOD from the PLB shall be minimized.			
12.3	The fire resistance shall be specified in the tender and in technical documentations.			
12.4	The PLB shall be functional after an emergency landing.			
12.5	The PLB shall be functional after an emergency ejection.			
13	Marking for Identification			
13.1	The PLB shall be labelled with a self-adhesive sign / identification plate to be defined by the customer: approximate size and contents containing (military stock number and serial number etc)			
13.2	The battery shall be labelled with a self-adhesive sign / identification plate to be defined by the customer: approximate size and contents containing (military stock number and serial number etc)			
14	Reliability			
14.1	The mean time between failure (MTBF) shall be at least 10,000 hours (operating time).			
14.2	The probability for full functionality after an activation attempt (manual or automatic) shall be at least 99,5%.			
14.3	The technical length of life shall be at least 10 years.			

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Req. ID	Requirement Description	Customer's Statment		Customer's Remarks
		Yes	No	
14.4	The technical length of life should be at least 15 years.			
15	Maintenance			
15.1	The PLB shall have a self-test / built in test function for at least the transmitter, battery and GPS-functions.			
15.2	Any necessary maintenance equipment shall be stated in the tender.			
15.3	Preventive maintenance actions shall not be needed to be carried out more often than every 6th month.			
15.4	Preventive maintenance that needs to be carried out more often than every 12th month shall be possible to be performed at I-level.			
15.5	All preventive maintenance and all external corrective maintenance (exchange of replaceable parts on the outside of the PLB such as antenna + test of waterproofness and test of beacon frequency and power output in a closed chamber etc), shall be possible to be performed by the Armed Forces at I-level or at central workshop level.			
15.6	Internal corrective maintenance (such as repair of the radio electronics) should be possible to be performed by the Armed Forces at central workshop level.			
15.7	If the PLB consists of exchangeable parts, the construction should make possible to replace them with similar new developed parts.			