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KANNAD 406 AF / AF-H / AF (6D)

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TECHNICAL PRESENTATION

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KANNAD 406 AF / AF-H / AF (6D)
TECHNICAL PRESENTATION

LIST OF REVISIONS

Rev	Date	Pages	Description of modifications
A	FEB 06/2003		First issue
B	APR 04/2003		KANNAD 406 AF(6D)
C	OCT 23/2003	9 - 12 - 28 - 32	Complementary information
D	MAR 11/2004	25	List of evolutions
E	JAN 18/2005	4 - 26 - 28	ABD0031E Compliance
	JAN 18/2005	7	Reference to Windows Software
	JAN 18/2005	10	State flowchart deletion
	JAN 18/2005	20 - 21	Installation configuration
	JAN 18/2005	22	RCP operational test
	JAN 18/2005	24	RCP compatibility list, Antenna approvals
	JAN 18/2005	25	Evolutions: Equipment Change Sheets references (N° and date)
	JAN 18/2005	31	Battery pack and kit reference
F	JUL 28/2005	4	TCCA ref.
		9	Battery kit reference
		10	VCO, complementary information
		13	Electrical performances, complementary information
		14	Complementary environmental characteristics
		15	Reference to dongle connection
		19	Add of 4 washers for mounting bracket, Figure 9 modified
		23 & 25	Modification of reference to Cospas-Sarsat decoder
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1. GENERAL

1.1. Background

1.1.1. COSPAS-SARSAT system

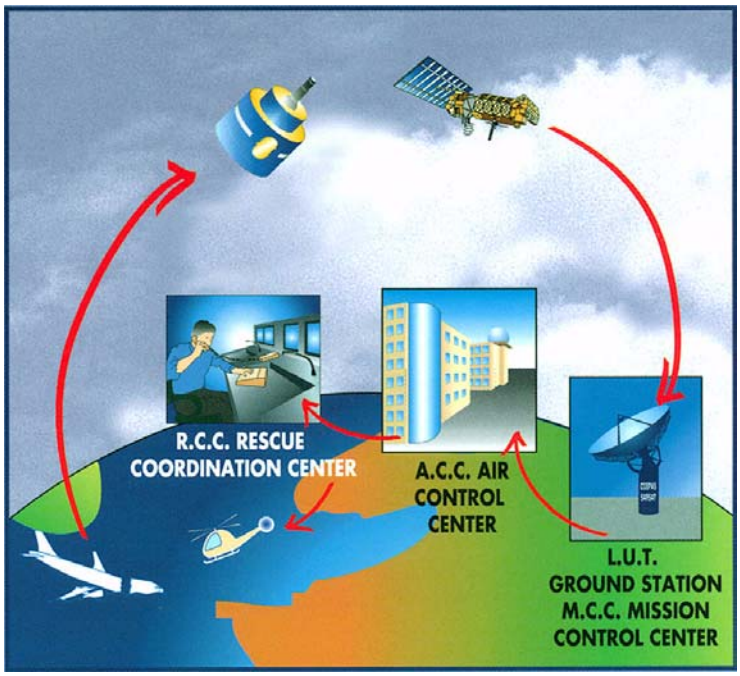
Launched in the early eighties by the four founder countries (Canada, France, Russia, USA), the COSPAS-SARSAT system provides satellite aid to search and rescue (SAR) operations for maritime, aeronautical and terrestrial vehicles anywhere in the world.

It uses distress beacons fitted on mobiles and a constellation of LEO and GEO satellites which relay the 121.5 / 243 MHz signals and process the 406 MHz signal to ground stations (LUT) where the beacon positions are determined (with a precision of 10 NM with 121.5 / 243 signals and less than 2 NM with 406 signals).

Several types of beacons are designed to match the various applications of the COSPAS-SARSAT system:

- EPIRB (Emergency Position Indicating Radio Beacon) for maritime applications.
- ELT (Emergency Locator Transmitter) for aeronautical applications.
- PLB (Personal Locator Beacon) for land expeditions.

Figure 1: COSPAS-SARSAT system



1.1.2. ELT system

The ELT system is composed of 6 Line Replaceable Units (LRU) :

(1) a transmitter

(2) a mounting bracket

(3) a remote control panel

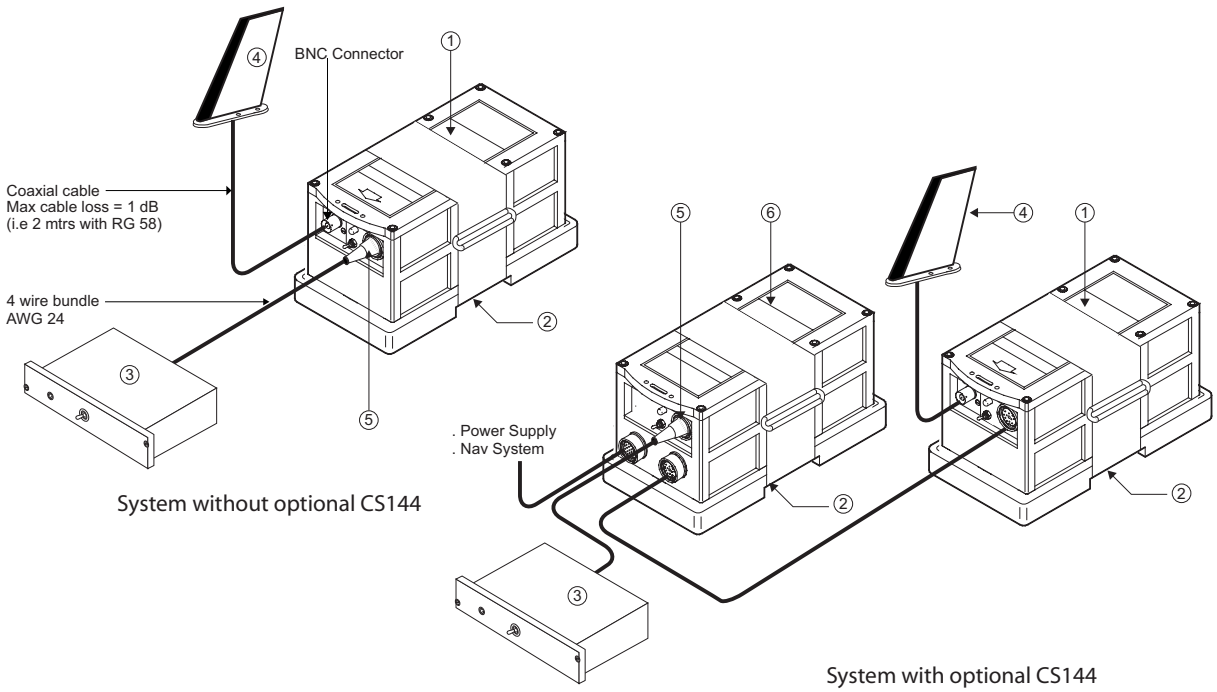
(4) an outside antenna

(5) a "Programming Dongle" for pin-programming function (option)

(6) CS144 Interface Module (option).

The transmitter, bracket, Programming Dongle and CS144 Interface Module are installed in the aircraft near the tail. The outside antenna is mounted on the fuselage near the tail. The remote control panel is installed in the cockpit and connected to the ELT with a 4 or 5 wire bundle.

Figure 2: ELT system description



This document is a technical presentation of:

- KANNAD 406 AF transmitter P/N S1821502-02 to be installed on an aircraft or helicopter,
- KANNAD 406 AF-H transmitter P/N S1822502-02 to be installed on an helicopter only,
- KANNAD 406 AF (6D) transmitter P/N S1821502-06 to be installed on an aircraft or helicopter.

IMPORTANT NOTICE: S1821502-02, S1822502-02, and S1821502-06, KANNAD 406 AF, AF-H and AF (6D) do not contain S1820511-01 (Mounting bracket, 1 strap) that must be ordered separately.

Refer to relevant document for information on remote control panels, antennas, programming and testing equipment.

1.2. List of acronyms

AA ..... Airworthiness Authorities
AD ..... Automatic Deployable
AF ..... Automatic Fixed
AP ..... Automatic Portable
ATC ..... Air Traffic Control
BFE ..... Buyer Furnished Equipment
BNC ..... Bayonet Nut Connector
BPS ..... Bits Per Second
CSN ..... Cospas Sarsat Number
CS144 ..... Cospas Sarsat 144 bits Interface Module
DDP ..... Declaration of Design and Performance
DGAC ..... Direction Générale de l'Aviation Civile (France)
DIN ..... Deutches Institut für Normung
DONGLE ..... Connector Plug with Serial Memory Module
EEPROM ..... Electrically Erasable Programmable Read Only Memory
ELT ..... Emergency Locator Transmitter
EPIRB ..... Emergency Position Indicating Radio Beacon
FAA ..... Federal Aviation Administration
FAR ..... Federal Aviation Rules
FEE ..... Fiche d'Evolution d'Equipement
FH ..... Flight Hours
FMS ..... Flight Management System
GEO ..... Geostationary Earth Orbit
GPS ..... Global Positioning System
GSAC ..... Groupement pour la Sécurité Aviation Civile
IATA ..... International Air Transport Association
ICAO ..... International Civil Aviation Organisation
JAA ..... Joint Airworthiness Authorities
JAR ..... Joint Airworthiness Rules
JTSO ..... Joint Technical Standard Order
LEO ..... Low Earth Orbit
LRU ..... Line Replaceable Unit
LUT ..... Local User Terminal
MTBF ..... Mean Time Between Failure
MTBUR ..... Mean Time Between Unscheduled Removal
MSN ..... Mainframe Serial Number
PLB ..... Personal Locator Beacon
P/N ..... Part Number
QAC ..... Qualification Aviation Civile
RAM ..... Random Access Memory
RCP ..... Remote Control Panel
S ..... Survival
SAR ..... Search And Rescue
SB ..... Service Bulletin

SFACT .....Service de la Formation Aéronautique et du Contrôle Technique
SMM..... Serial Memory Module
TCAS .....Traffic Collision Avoidance System
TCCA .....Transport Canada Civil Aviation
TBC..... To Be Confirmed
TBD..... To Be Determined
TSO..... Technical Standard Order
XPDR .....Transponder

2. APPLICABLE DOCUMENTS

The study of older generation ELT failures has enabled a better understanding of the environmental conditions of a crash. All these environment studies resulted in the writing of new specifications for ELT by both RTCA (Radio Technical Commission for Aeronautics) and EUROCAE (EURopean Organisation for Civil Aviation Equipment).

Their work is published in RTCA DO183/204 and EUROCAE ED62 documents.

This has given birth to a new generation of ELTs. The main differences with the older generation are better mechanical characteristics, severe specifications for automatic activation and identification of the aircraft with the introduction of the " 406 MHz frequency ".

Reference	Title
RTCA DO-182	"Emergency Locator Transmitter (ELT) Equipment Installation and Performance"
RTCA DO-183	"MOPS for Emergency Locator Transmitters. Automatic Fixed, Automatic Portable, Automatic deployable, Survival Operating on 121.5 and 243.0 Megahertz"
RTCA DO-204	"MOPS 406 MHz Emergency Locator Transmitters (ELT)"
RTCA DO-160C EUROCAE ED14C	"Environmental conditions and test procedures for airborne equipment"
QAC3	Radiobalise de détresse fonctionnant en VHF (121.5-243 MHz)
QAC14	Radiobalise de détresse conforme au TSO-C91a et/ou au TSO-C126
QAC23	Radiobalise de détresse triple fréquence conforme à l'ED62
FAA TSO-C91a	"Emergency Locator Transmitter (ELT) equipment"
FAA TSO-C126	"406 MHz Emergency Locator Transmitter (ELT)"
EUROCAE ED62	"MOPS for aircraft Emergency Locator Transmitters (121,5/243 MHz and 406 MHz)"
COSPAS-SARSAT C/S T.001	"Specification for COSPAS-SARSAT 406 MHz distress beacons"
COSPAS-SARSAT C/S G.005	"COSPAS-SARSAT guidelines on 406 MHz beacon coding, registration and type approval"
COSPAS-SARSAT C/S G.004	"COSPAS-SARSAT glossary"
IATA A45	"International Air Transport Association (IATA) Dangerous Goods Regulation, section A45"
ABD0031E	"Fireworthiness Requirements. Pressurized Section of Fuselage"

3. DESIGN FEATURE

3.1. General

The KANNAD 406AF, AF-H and AF (6D) belong to the AF type of ELTs which are permanently attached to an aircraft.

3.2. Mechanical design

The KANNAD 406 AF, AF-H and AF (6D) are made of moulded plastic with excellent mechanical resistance (ASA/PC). They are color compound (light yellow).

The housing is designed to be easily taken in one hand.

The front panel of 406 AF, AF-H and AF (6D) has the following features:

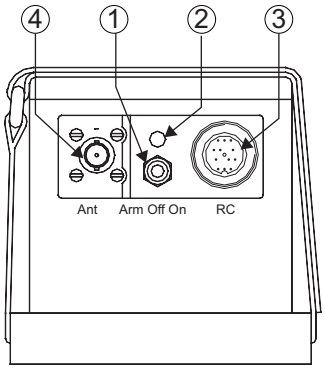
(1) Arm / On / Off switch,

(2) Control LED,

(3) Female DIN 12 connector to connect a programming dongle, a maintenance dongle, a RCP or a CS144 Interface module,

(4) BNC connector used to connect the transmitter to an outside antenna.

Figure 3: Front face description



3.3. Working principle

The KANNAD 406 AF, AF-H and AF (6D) can be activated either automatically when the crash occurs (thanks to a shock sensor) or manually (thanks to a switch on the transmitter itself or on a Remote Control Panel).

The KANNAD 406 AF, AF-H and AF (6D) are designed to transmit on three frequencies (121.5, 243 and 406 MHz). The two basic emergency frequencies (121.5 and 243 Mhz) are mainly used for homing in the final stages of the rescue operations. The 406 MHz frequency is used by the COSPAS-SARSAT satellites for precise pinpointing and identification of the aircraft in distress.

3.3.1. Transmitter

Once activated, the transmitter operates continuously on 121,5 and 243,0 MHz with an output power of 100 mW on each frequency. The modulation is an audio frequency sweeping downwards from 1420 Hz to 490 Hz with a repetition rate of 3 Hz. The AM modulation factor is over 85%.

During the first 24 hours of operation, a digital message is transmitted on 406,025 MHz every 50 seconds. The output power on 406 MHz is 5 W.

The KANNAD 406 AF, AF-H and AF (6D) can transmit two types of messages on 406 MHz:

- 112 bits for a short message (identification only)
- 144 bits for a long message (identification + aircraft position)

The long messages are generated by a separate interface module (called CS144) connected to the ELT and either to a GPS or a FMS.

Bi-phase modulation at 400 BPS enables to transmit all the relevant identification information to the COSPAS-SARSAT satellites in 440 ms (short message) or 520 ms (long message).

3.3.1.1. Technology

The KANNAD 406 AF, AF-H and AF (6D) transmitter is an integrated design and not a standard 121,5 / 243 MHz transmitter with 406 MHz upgrade module. Indeed, the main advantage of this configuration is that it uses one single antenna connector and coaxial cable.

All components used in the KANNAD 406 AF, AF-H and AF (6D) are of the latest technology in order to bring maximum performance with minimum power consumption.

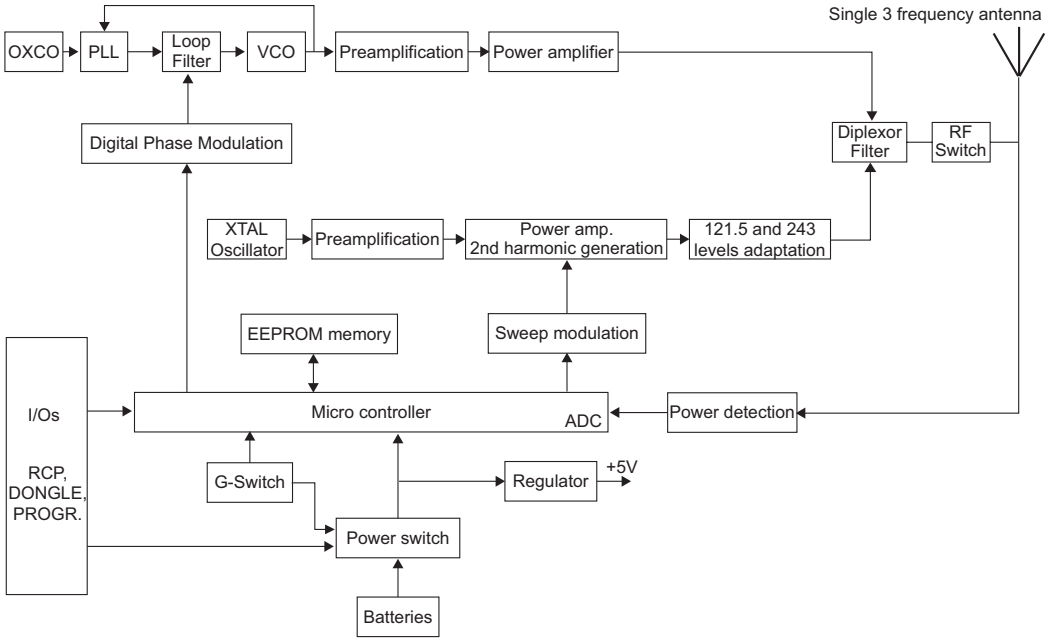
Surface Mounted Components improve mechanical resistance to shocks and vibrations.

3.3.1.2. Architecture

The transmitter is driven by a HCMOS micro-controller (68HC705P6DW) that manages the PLL, amplitude and phase signal modulation as well as I/Os.

The great stability of the 406 MHz carrier (0,002 parts/million/100 ms) is given by an OCXO (Oven Controlled Crystal Oscillator).

Figure 4: Block diagram of KANNAD 406 AF-H transmitter



3.3.2. Digital message transmission

One of the major improvements of the new generation of ELTs is the transmission of the identification of the aircraft in distress in the 406 MHz digital message.

3.3.2.1. Protocols

The KANNAD 406 AF, AF-H and AF (6D) are fully compatible with the transmission protocols specified by the

COSPAS-SARSAT C/S G005 document :

- Serial Identification Number ("Cospas-Sarsat Number of the ELT or serial number from an allocated segment or serial number given by the local authority)
- Aircraft 24 bit address (ICAO number of the aircraft, also used for MODE S XPDR or TCAS).
- Aircraft Operator Designator + serial number up to 4096.

- Aircraft Nationality and Registration Marking also called "tail number" (up to 7 alphanumeric characters).
- Aircraft Operator Designator or Aircraft 24 bit address + aircraft position (Standard Location Protocol) *
- Aircraft Nationality and Registration Marking + aircraft position (User Location Protocol) *

(*) only available if connected to an interface module (CS144) that computes the "long message".

3.3.2.2. Programming

Programming of the identification number can be carried out either

- with an interface to run a PC/DOS or Windows® software (PR550);
- with a " Dongle" (Connector with Serial Memory Module).

Computer Interface

The ELT is connected to a PC computer running a PC/DOS or Windows® software via a special computer interface.

At the beginning of the self-test sequence, the ELT tries to establish an asynchronous serial link. If the PC software replies correctly, the identification is downloaded in the ELT. This operation takes less than 2 minutes and does not require any hardware operation.

Programming and maintenance dongles

To facilitate maintenance operations especially in case of removal and/or exchange, the KANNAD 406 AF, AF-H and AF (6D) offer pin-programming capabilities.

Instead of installing the DIN 12 connector for connection to the Remote Control Panel, a special connector with a small Serial Memory Module called "Programming Dongle" is installed.

This Programming Dongle remains attached to the aircraft even if the ELT is removed.

When an unprogrammed ELT is installed, connected to this Programming Dongle and switched to "ARM", the ELT automatically updates its own memory with the identification data contained in the Programming Dongle memory.

When the ELT is removed from the aircraft, it keeps its identification data.

However, if the removal is not due to distress purposes, this might be a problem with regards to COSPAS-SARSAT system integrity because two ELTs (the removed one and the replacement one) will have the same identification data. This is why MARTEC SERPE-IESM developed another type of Dongle called "Maintenance Dongle" that enables to reset the identification information of the ELT. A Maintenance Dongle looks like a DIN 12 connector with a Serial Memory Module and a red "Remove Before Flight" streamer. Its memory contains a specific maintenance code (country, manufacturer, serial number) recognized by COSPAS-SARSAT as "not on board". Any transmission in the shop during maintenance procedure will not involve Search And Rescue operation.

As a rule, the aircraft operator shall equip:

- each aircraft in operation with a "Programming Dongle",
- each ELT in spare with a "Maintenance Dongle".

3.3.2.3. Reliability of the "pin-programming" function

The "pin-programming" and "long message" capabilities have been developed at the same time as the ELT. This means that several safeguards have been anticipated to ensure that the ID code transmitted is correct even in extreme condition should the Dongle be damaged during data transfer.

One of the safeguards concerns the internal memory organisation:

- MC: EEPROM that contains the maintenance code ("SI" + 5 last digits of the CSN),
- TC: EEPROM that contains the code to be transmitted,
- TX: RAM that contains the code transmitted once the ELT is activated.

Once activated, TC is copied into TX and the ELT detects if a programming and testing equipment is connected.

- If no programming and testing equipment is detected, the beacon tries to read a Serial Memory Module by testing the synchronous serial link.
- If a Maintenance Dongle is detected, the contents of MC is copied into TC and into TX.
- If a Programming Dongle is detected, its contents is copied into TC and into TX.
- If a "long message" interface module is detected, its contents is copied into TX.

The above procedure is performed during self-test and during 20 minutes after activation of the ELT.

The other safeguard consists in duplicating the Dongle and CS144 interface module memory and to compute two checksums. This point is all the more interesting for the CS144 option, as, should the power supply of the CS144 interface module be shut down during data transfer, the older message containing the aircraft position just before shut down will be available (Refer to FMEA - CS144).

3.3.3. Shock sensor (G-Switch)

3.3.3.1. AF and AF-H G-Switch

The shock sensors (also called G-switch) currently fitting ELTs are the cause of a large number of false alarms.

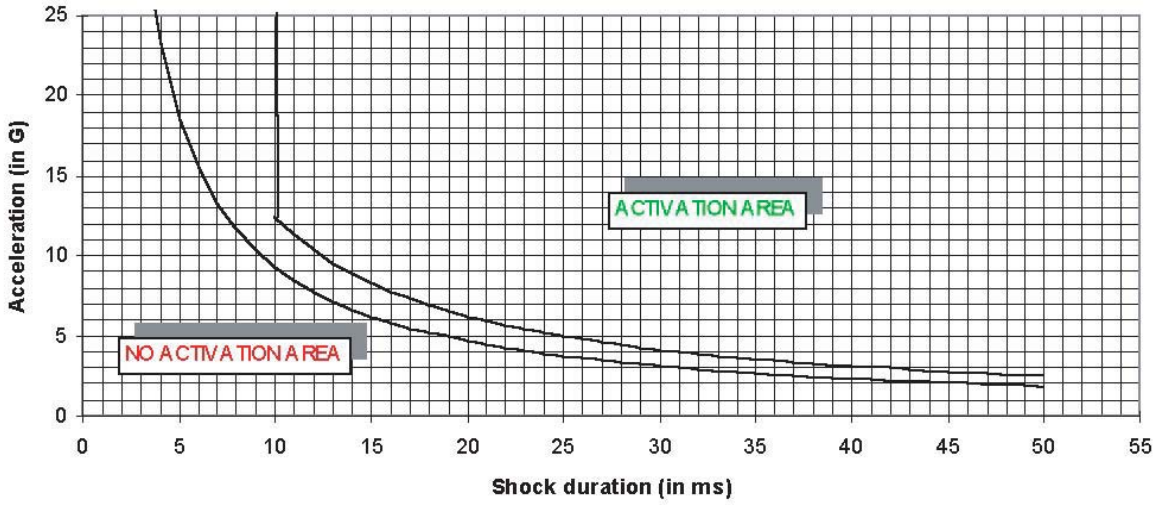
Important work has consisted in studying aircraft crashes (study made by the " Crash Research Institute") and evaluating the acceleration amplitudes involved.

If older generation of G-Switches trigger with an acceleration threshold, the new generation not only takes into account acceleration but also shock duration.

The G-Switch that equips the KANNAD 406 AF-H is a mechanical design by AERODYNE Corp ref. 8316-1-000 that is widely used in ELTs and has proven extremely reliable.

It complies with EUROCAE specifications. RTCA specifications with regards to G-Switch activation threshold are slightly different from EUROCAE specifications. Considering that it provides an equivalent level of safety, TSO was granted with a deviation in compliance with FAR 21.609 procedure.

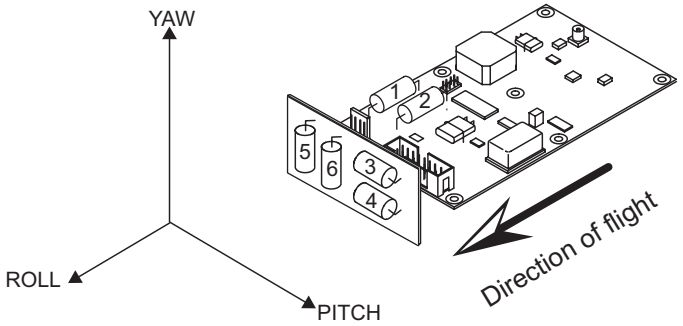
Figure 5: Activation curve according to EUROCAE standard



3.3.3.2. 6D G-Switch

The Kannad 406 AF (6D) is equipped with 6 G-switches set on 2 PC boards:

Figure 6: G-Switches implementation



- The main PC board is fitted with 2 horizontal G-Switches (1 and 2).
- An additional PC board is fitted with 2 horizontal G-switches (3 and 4) and 2 vertical G-Switches (5 and 6).

The 4 horizontal G-Switches (1, 2, 3 and 4) are calibrated according to EUROCAE specifications. The 2 vertical G-Switches (5 and 6) are calibrated with a lower sensitivity in order not to activate the ELT in case of abrupt pull up, hard handling or heavy turbulence.

3.3.4. Power supply

The energy is provided by a battery pack included in a battery kit (P/N S1820516-99) composed of 3 LiMnO2 D cells.

The autonomy of the 121,5/243 transmission is close to 100 hours at -20°C with new batteries.

The 406 MHz transmission is deliberately stopped after 24 hours (in line with COSPAS-SARSAT specifications).

The transmitter battery expiry date is fixed at 6 years after manufacturing. If no activation of the ELT occurs during the battery lifetime, it shall be replaced every 6 years.

The Remote Control Panel (when connected) is also energized by this battery pack.

3.4. Working modes

The KANNAD 406 AF, AF-H and AF (D) have 4 different modes:

- Off.
- Self-test (temporary mode).
- Armed (standby mode to enable automatic activation by the shock sensor or by the remote control panel).
- On (transmission).

Transmission is effective if the beacon is activated (either manually on the ELT control panel, remotely by the "ON" button on the remote control panel or automatically by the shock sensor).

3.4.1. Off

The ELT is off when the switch is in position "OFF".

No part of the ELT is energized.

This mode must be selected when the ELT is removed from the aircraft.

3.4.2. Self-Test

The self-test mode is a temporary mode (max duration 5 sec) in which the ELT checks the main characteristics of the transmitter (Battery voltage, 406 MHz transmission power, VCO locking, Programming) and enables digital communication with a programming and testing equipment.

This mode is selected:

- when switching from "OFF" to "ARM",
- when switching to "RESET / TEST" on the Remote Control Panel (provided that the switch of the ELT is in position "ARM"),
- when switching to "ON" prior to transmission.

The buzzer operates during the self-test procedure.

After about 3 seconds, the test result is displayed on the LED as follows:

- One long flash indicates valid test.
- A series of short flashes indicates false test result.

The number of flashes indicates the type of failure:

- 3 + 1 = LOW BATTERY VOLTAGE.
- 3 + 2 = LOW TRANSMISSION POWER.
- 3 + 3 = FAULTY VCO LOCKING (Faulty frequency).
- 3 + 4 = NO ID NUMBER.

It is recommended to test the ELT regularly in order to detect any possible failure:

- after installation,
- every first flight of each month,
- at every maintenance operation.

The number of self-tests carried out is recorded. This information is available when the ELT is connected to a programming and testing equipment (PR550).

3.4.3. Armed

In order to enable activation by the G-Switch or with the Remote Control Panel, the ELT must be in standby mode with the switch in position "ARM".

This mode is mandatory during flight. The ELT should remain in position "ARM" all the time except when the aircraft is parked for a long period or for maintenance.

The Remote Control Panel is energized by the ELT when switched to "ARM".

3.4.4. On

This mode is selected:

- manually by switching to position "ON",
- by switching the Remote Control Panel switch to position "ON" (provided that the ELT switch is in position "ARM"),
- when a crash occurs (provided that the ELT switch is in position "ARM").

When this mode is selected, the ELT starts transmission:

- on 121,5 MHz & 243 MHz immediately (continuous transmission),
- on 406 MHz after 50 seconds (406 burst every 50 sec during 24 hours).

The red control LED on the ELT (and on the remote control if installed) flashes and the buzzer operates.

In case of accidental activation, the ELT can be reset either by switching it to "OFF" or by switching to "RESET" on the Remote Control Panel.

The number of 406 bursts effectively transmitted is recorded. This information is available when the ELT is connected to a programming and testing equipment (PR550).

4. TECHNICAL CHARACTERISTICS

4.1. Mechanical characteristics

The housing is to be installed on a Mounting Bracket (P/N S1820511-01).

4.1.1. Material

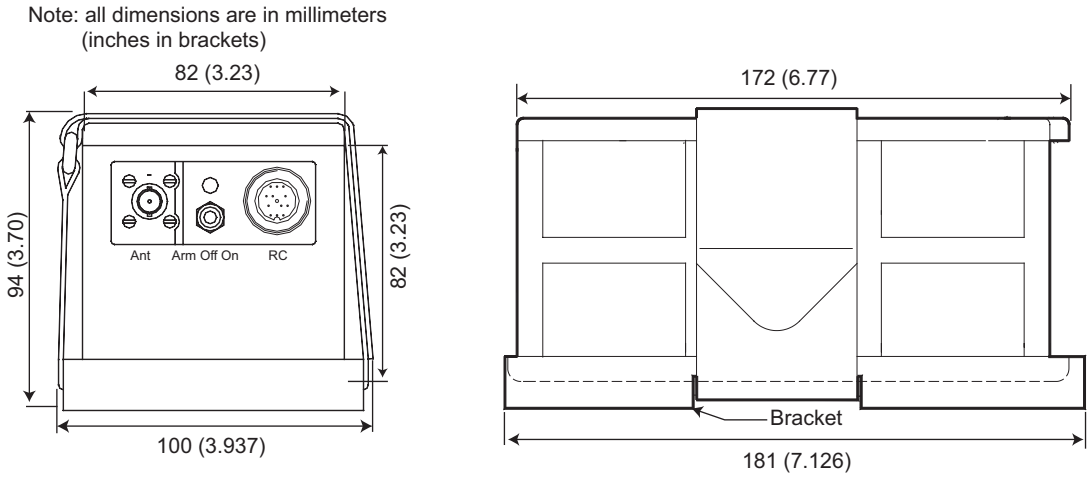
- Material: Plastic ASA-PC LURAN SKR2867 CWU.
- Treatment: Light yellow color compound (RAL 1018), Fire classification M0.
- Tightness is provided by 2 O-rings.

4.1.2. Overall dimensions

Outline dimensions: 172 x 82 x 82 mm.

Outline dimensions (with mounting bracket): 181 x 100 x 94 mm.

Figure 7: Overall Dimensions



4.1.3. Weight

Including bracket and batteries:

	AF	AF-H	AF (6D)
Typical	1110 g (2.47 lbs)	1120 g (2.469 lbs)	1190 g (2.623 lbs)
Max	1180 g (2.60 lbs)	1190 g (2.623 lbs)	1260 g (2.778 lbs)

4.1.4. Crash sensor (G-Switch)

	AF	AF-H	AF (6D)	
Type	Mechanical			
Manufacturer	AERODYNE CONTROLS Corp	AERODYNE CONTROLS Corp	AERODYNE CONTROLS Corp	
Reference	8316-1-000	8316-1-000	8316-1-000	7316-6-00
Relevant specif.	EUROCAE ED62	EUROCAE ED62	EUROCAE ED62	
Threshold	4.5 ± 0.5 ft./s	4.5 ± 0.5 ft./s	4.5 ± 0.5 ft./s	not communicated
Mounting		45° downwards of the flight direction	4 on horizontal axis	2 on vertical axis

4.2. Electrical performances

121.5 / 243.0 MHz Transmitter	
Frequencies	121.500 +/- 0.003 MHz, 243.0 +/- 0.006 MHz
Output power	20 to 26 dBm for each frequency (100 to 400 mW). Typical 22 dBm for each frequency
Duty cycle	Continuous except during 406 transmission (500 ms every 50s)
Modulation type	3K20A3N
Modulation rate	> 85 %
Modulation signal	Decreasing sweep from 1420 to 490 Hz
Repetition frequency	Approx. 3 Hz
Transmission duration	Over 48 hours at -20°C

406.025 MHz Transmitter	
Frequencies	406.025 +/-0.002 MHz
Output power	37 +/- 2 dBm (5W)
Data encoding	16K0G1D (Biphase L encoding)
Transmission duration	440 ms (short message) every 50 s. Compatible with long message transmission (520 ms).
Repetition period	47.5 to 52.5 s
Speed of transmission	400 BPS +/-1%
Frame synchronization	0 0001 1111, 0 1101 0000 (during self test)
Transmission duration	Over 24 hours at -20°C

Batteries	
Battery replacement kit reference	S18 20 516-99
Transmitter power supply	3 x $LiMnO_2$ D type cells
Replacement	Every 6 years

4.3. Environmental characteristics

Environmental	
Flame	AVGAS flame / 2 minutes
Shock	500 G for 4 ms each axis
Crash worthiness	100 G for 13 ms each axis
Penetrator drop	25 Kg from 20 cm each side
Crush test	450 Kg / 5 min each side
Temperature & Altitude Operating temperature Storage temperature Altitude	DO160C / ED14C Section 4 Category D1 -20°C to +55°C extended to -40°C to +55°C by TCCA(1) -55°C to +85°C 55 000 ft.
Humidity	DO160C / ED14C Section 6 Category C
Vibrations	DO160C / ED14C Section 8 Category YLM/C, 5 Hz à 14 Hz: 2a = 5.1 mm (a = amplitude), 14 Hz à 45 Hz: γ = 2 G (γ = acceleration) 45 Hz à 55 Hz: 2a = 0.49mm, 55 Hz à 2000 Hz: γ = 3 G, Speed: 1 octave / min.
Explosion	DO160C / ED14C Section 9 Category A
Waterproofness	DO160C / ED14C Section 10 Category W
Magnetic effect	DO160C / ED14C Section 15 Category Z
Induced signal susceptibility	DO160C / ED14C Section 19 Category Z
Radio frequency susceptibility	In compliance with ED 62 § 4.4.10 DO160C / ED14C Section 20 Category W
Radio frequency emission	DO160C / ED14C Section 21 Category B
Lightning Induced Trans. Susc.	DO160D / ED14D Section 22 Category (Categories A1, A2, A3)
ESD	DO160D / ED14D Section 25 Category (A)

4.4. Reliability

The MTBF calculated according to MIL HDBK-217F is not significant, bearing in mind that the equipment is permanently on standby and operates only during about 100 hours once activated.

However, we can give two estimates of the MTBF:

- in standby: it is the calculated MTBF applied to the components permanently active (latch, transistor...) which does not take into account the battery lifetime. Note that a "false activation" by the G-Switch is not considered as a failure.
- in transmission: it corresponds to the MTBF calculated for all the components energized when the ELT is transmitting.

Reliability	
MTBF in standby mode	58 000 hours
MTBF in transmission	35 000 hours

5. INTERFACES

5.1. Controls and connectors

The following elements are to be found on the KANNAD 406 AF, AF-H and AF (6D) front panels:

(1) 3 position switch ON/OFF/ARM,

(2) High intensity red light (LED),

(3) J1: DIN 12 connector for connection to Remote Control Panel, CS144 Interface Module, dongle or programming equipment,

(4) J2: BNC connector for the antenna.

The red light gives an indication on the working mode of the beacon:

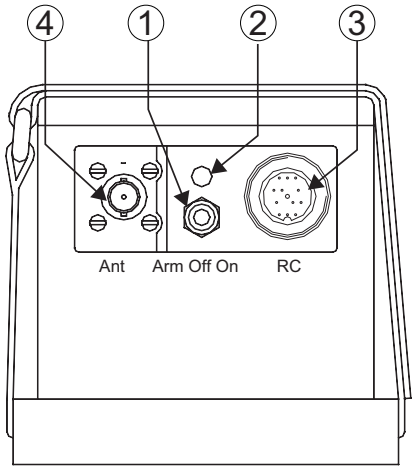
- after the self test, short flashes indicate the self test failed, one long flash indicates that the self test is OK,
- 2 flashes per second during 121.5 / 243 transmission,
- long flash during 406 transmission.

An internal buzzer gives aural information on the working mode of the beacon:

- continuous beep during the self test procedure,
- 2 beeps per second during 121.5 / 243 transmission,
- silence during 406 transmission.

NOTE: The operation of the remote control light (when connected) is identical to that of the ELT. The remote control buzzer (when connected) is continuous as soon as the ELT is activated and whatever the operating mode (self test, 121,5/243 transmission, 406 transmission).

Figure 8: Front Panel



5.2. Electrical Interface

The KANNAD 406 AF, AF-H and AF (6D) is a standalone system. There is no connection with the aircraft power buses.

When installed on board, the ELT has to be connected:

- to a Remote Control Panel via a DIN12 connector,
- to an outside antenna via a BNC connector.

The DIN12 connector is also used to connect a programming dongle or a programming and testing equipment.

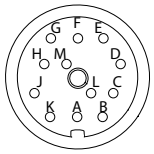
5.2.1. J1

This connector is dedicated for connection to the Remote Control Panel, to the Programming or Maintenance Dongles, to "long message" interface module and/or to the programming equipment (PR550).. The required wires are AWG24.

Receptacle		
Supplier	**Designation - P/N**	**Remarks**
Standard designation	DIN 45321 - FEMALE - 12 PTS	
SERPE-IESM	KCI01009	
BINDER	680-4-09-0332-80-12	see drawing referenced in 11.2. Drawings

Mating connector reference info		
Supplier	**Designation - P/N**	**Remarks**
Standard designation	DIN 45321 - MALE - 12 PTS	
SERPE-IESM	S18 20 514-01	Programming Dongle (DIN 12 connector with Serial Memory Module)
SERPE-IESM	S18 20 514-03	DIN 12 connector without Serial Memory Module
BINDER	680-1-09-0329-00-12	see drawing referenced in see drawing referenced in 11.2. Drawings

Table 1: J1 Pin-Out

J1	PIN	Signal Name	Destination	Direction
Viewed from Front Face 	J1-A	RCP TEST/RESET	RCP	IN
	J1-B	DONGLE RX	SMM / PGM	IN
	J1-C	DONGLE CS	SMM	OUT
	J1-D	DONGLE SK	SMM	OUT
	J1-E	DONGLE TX	SMM / PGM	OUT
	J1-F	DONGLE ALE2P	SMM	OUT
	J1-G	RCP COMMON	RCP	OUT
	J1-H	RCP BUZZER	RCP(*)	OUT
	J1-J	RCP LED	RCP	OUT
	J1-K	RCP ON	RCP	IN
	J1-L	DONGLE GND	SMM / PGM	OUT
	J1-M	N/C		

RCP : Remote Control Panel

SMM : Serial Memory Module (Dongle or GPS interface)

PGM : programming and testing equipment

N/C : not connected

(*) This wire is not used with some versions of Remote Control Panels. For precise information, refer to Remote Control Panel technical description.

Short-Circuit Protection (SCP):

In order to prevent any accidental reset of the beacon, the KANNAD 406 AF, AF-H and AF (6D) use an exclusive and patented "Short Circuit Protection" system. No combination of short circuits between the Remote Control Panel wiring and airframe will inhibit the ELT from being automatically activated or from reset once activated. This function is of utmost importance as the bundle might be damaged in the event of a crash.

5.2.2. J2

Connector J2 is used to connect the outside antenna through a 50 Ω coaxial cable.

IMPORTANT: The length of the coaxial cable should not exceed 2 meters (6 ft) for a standard RG58 or equivalent coaxial cable. If the distance between the transmitter and the outside antenna exceeds 2 meters, a special low loss cable should be used to keep attenuation less than 1 dB.

Receptacle		
Supplier	**Designation - P/N**	**Remarks**
Standard designation	BNC FEMALE	Waterproof
SERPE-IESM	KCC02031	
RADIALL	R141254	see drawing referenced in §11

Mating connector reference info		
Supplier	**Designation - P/N**	**Remarks**
Standard designation	BNC MALE PLUG	Waterproof
SERPE-IESM	KCC00040	
RADIALL	R141007	

Pin-out			
PIN	**Signal Name**	**Destination**	**Direction**
J2	RF OUT	ANTENNA	OUT

6. INSTALLATION AND ACCEPTANCE TEST PROCEDURE

6.1. Installation

6.1.1. Bracket

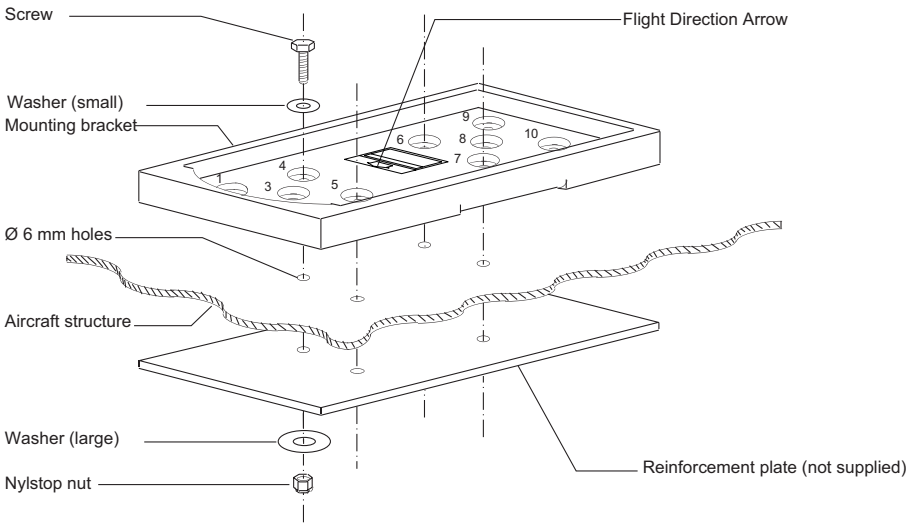
The KANNAD 406 AF, AF-H and AF (6D) are installed on board the aircraft on a mounting bracket (P/N S1820511-01).

A Velcro strap enables to tighten the ELT.

The mounting bracket is screwed to the aircraft structure with 4 x TH M5 screws, 8 washers and 4 nylstop nuts.

The bracket is qualified to hold the ELT during 500 G shocks for 4 ms. Any modification in the mounting invalidates the JTSO and TSO qualification and requires new certification of the installation.

Figure 9: bracket installation



IMPORTANT: **For KANNAD 406 AF, Refer to 6.1.3. KANNAD 406 AF installation.**
For KANNAD 406 AF-H, Refer to 6.1.4. KANNAD 406 AF-H installation.
For KANNAD 406 AF (6D), Refer to 6.1.5. KANNAD 406 AF (6D) installation.

6.1.2. Installation recommendations

"The location of the ELT shall be chosen to minimize the potential for inadvertent activation, damage by impact, fire and contact by passengers or baggage" (RTCA DO-183)

"The ELT must be attached to the aircraft in such a manner that the probability of damage to the transmitter in the event of a crash impact is minimized." (FAR 91.207)

"The ELT shall be mounted to primary aircraft load-carrying structures such as trusses, bulkheads, longerons, spars, or floor beams (not aircraft skin). The mounts shall have a maximum static local deflection no greater than 2.5 mm (0.1 inch) when a force of 450 Newton (100 lbf) is applied to the mount in the most flexible direction. Deflection measurements shall be made with reference to another part of the airframe not less than 0.3 meters (1 foot) nor more than 1.0 meter (3 feet) from the mounting location)." (RTCA-DO183)

The precise location of the ELT on board is to be determined according to the aircraft manufacturer's instructions.

The ELT control panel should be easily accessible to connect the outside antenna and the remote control panel and to check the ELT good operation (controls and lights).

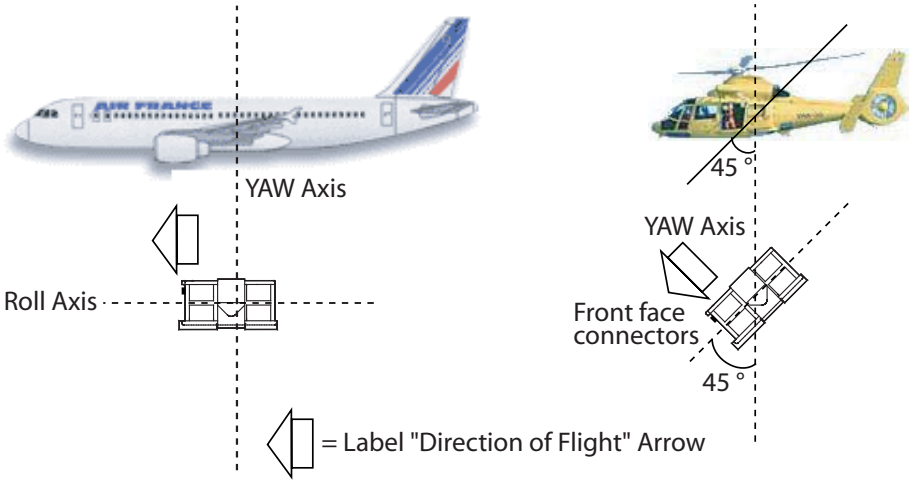
If no remote control panel is installed, "ELT controls and displays installed for in-flight use shall be readily accessible from the pilot's normal seated position. The pilot shall have an unobstructed view of displayed data when in the normal seated position." (RTCA DO-183).

The ELT shall not be installed at less than 60 cm (2 ft) of a compass or flux gate.

6.1.3. KANNAD 406 AF installation

The KANNAD 406 AF can be installed on board fixed wings aircraft or helicopters.

Figure 10: KANNAD 406 AF installation



Fixed wings:
The G-Switch sensor axis shall be pointed to sense the primary crash pulse along the longitudinal axis of the aircraft (with maximum tolerance of 15°). Consequently, the KANNAD 406-AF shall be mounted with the arrow of the "Direction of Flight" label pointed towards the front of the aircraft,

Helicopters:
The KANNAD 406 AF can be installed in its standard version on helicopter. The ELT unit should be mounted:

- with the front face connectors pointing downwards at a 45° angle to the yaw axis;
- **and** with "Direction of Flight" arrow towards the front of the helicopter.

6.1.4. KANNAD 406 AF-H installation

Important: The KANNAD 406 AF-H is designed to be installed on board helicopters only.

Figure 11: KANNAD 406 AF-H installation

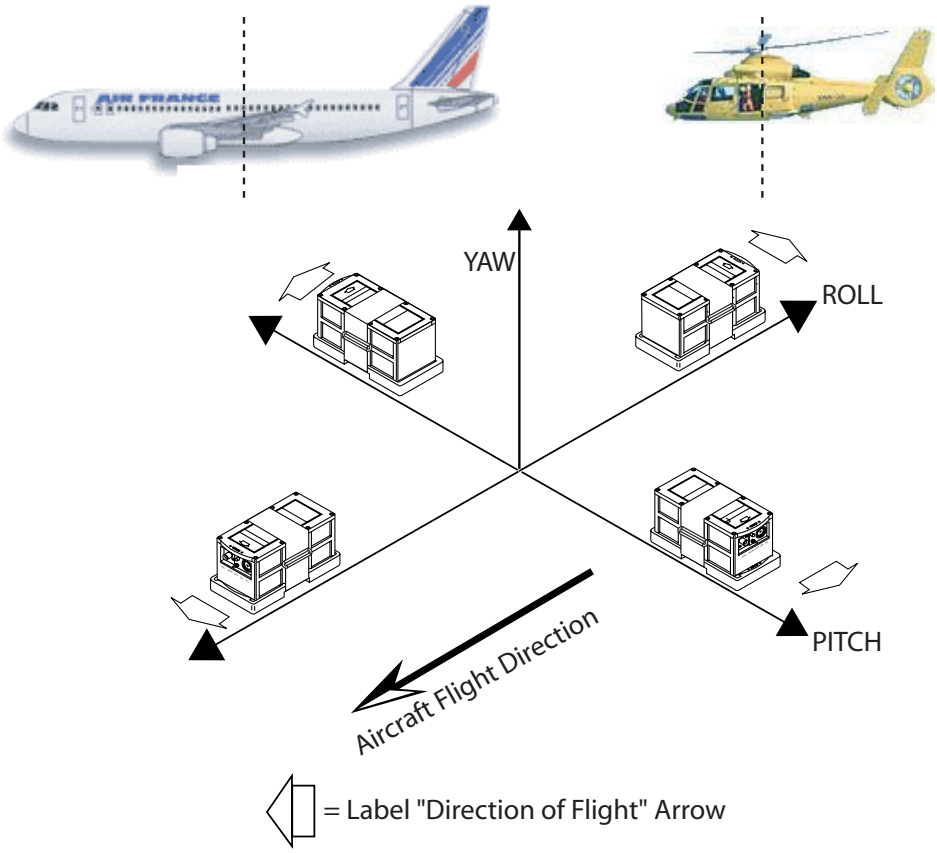
The "Direction of Flight " arrow shall point towards the front or the bottom of the helicopter (and not pointing 45° downwards):

- If the KANNAD 406 AF-H is installed with the "Direction of Flight " arrow pointing towards the front of the helicopter, the ELT shall be mounted with the upper side pointing towards the top of the helicopter.
- If the KANNAD 406 AF-H is installed with the "Direction of Flight " arrow pointing towards the bottom of the helicopter, the ELT shall be installed with the lower side pointing towards the front of the helicopter.

6.1.5. KANNAD 406 AF (6D) installation

The KANNAD 406 AF (6D) can be installed on board fixed wings aircraft or helicopters.

Figure 12: KANNAD 406 AF (6D) installation



For fixed wings aircraft and helicopters, the KANNAD 406 AF (6D) shall be mounted in roll or pitch plane, either parallel or perpendicular to the aircraft flight direction.

6.2. Acceptance Test Procedure

Perform the following test:

(1) ELT operational tests,

(2) RCP operational tests,

(3) 406 and 121 MHz transmission tests (optional).

6.2.1. ELT operational tests

6.2.1.1. Installation without programming dongle:

- Connect DIN12 to J1 and outside antenna to J2,
- Switch the ELT from OFF to ARM,
- Check that the Self-Test result is OK (one long flash).

6.2.1.2. Installation with "Programming Dongle":

- Connect the outside antenna to J2,
- Switch the ELT from OFF to ARM,
- Check that the Self-Test fails (3+4 flashes).
- If not, connect a maintenance dongle to J1:
  - Switch the ELT from OFF to ARM,
  - Check that the Self-Test fails (3+4 flashes),
  - Remove the maintenance dongle from J1.
- Connect the "Programming Dongle" to J1
- Switch the ELT from OFF to ARM:
  the buzzer operates during the whole self-test procedure, after a few seconds the LED displays the result.
- Check that the Self-Test result is OK (one long flash).

6.2.2. RCP operational tests

Check correct operation of RCP LED and external buzzer by switching ELT and RCP as described in the sequential procedure hereunder (with ELT switch in position "ARM").

Table 2: RCP LED and buzzer operation

Sequence	RCP Switch	Result
1	TEST/RESET then back to ARMED (neutral)	Self-test: ELT and RCP LEDs flashing + uninterrupted buzzer activation (max. duration 5 seconds).
2	ON(1)	ELT transmission: ELT and RCP LEDs flashing + uninterrupted buzzer activation. **IMPORTANT:do not operate for more than 50 seconds.**
3	ARMED (neutral)	ELT transmission goes on.
4	TEST/RESET then back to ARMED (neutral)	ELT transmission stops.

IMPORTANT: (1) before switching the RCP to ON, wait for the end of the self-test.

6.2.3. 406 and 121 MHz transmission tests

NOTE: These tests are optional.

6.2.3.1. 406 MHz transmission test

This test must be carried out with a COSPAS-SARSAT decoder.

- Perform self-test (Press RESET and TEST on the RCP or switch ELT from OFF to ARM).
- Check with the COSPAS-SARSAT decoder that, ***except for the 5th and the 6th digits***, the decoded message is identical to the programmed message.

NOTE: The message transmitted during self-test sequence always begins with FF FE ***D0*** whereas a "real" message begins with FF FE ***2F***.
Example of message programmed in ELTas sent during self-test sequence:
*FF FE **2F** 53 C3 24 97 38 0B A6 0F D0 F5 20*
Example of same message decoded by SARTECH ARG5410:
*FF FE **D0** 53 C3 24 97 38 0B A6 0F D0 F5 20*

6.2.3.2. 121 MHz transmission test

IMPORTANT: this test must only be carried out between H and H+5 minutes.
Do not exceed 30 seconds of transmission.

This test must be carried out with a VHF receiver.

- Tune VHF receiver to 121.5 MHz,
- Start transmission:
  - either on ELT: ON position,
  - or on the RCP: ON position (the ELT shall be in ARM position),
- Listen to the 121.5 MHz "sweep tone",
- Stop transmission:
  - either on ELT: OFF or ARM position,
  - or on the Remote Control Panel: press TEST and RESET (the ELT shall be in ARM position).

7. COMPATIBILITY

7.1. Compatibility list

Remote control panels	P/N	Supplier
RC100 (Kit)	S1820513-03	SERPE-IESM
RC110 (Kit)	S1820513-06	SERPE-IESM
RC150 (Kit)	S1820513-07	SERPE-IESM
RC160 (Kit)	S1820513-08	SERPE-IESM
RC200	S1820513-11	SERPE-IESM
RC200-NVG	S1820513-14	SERPE-IESM
RC300	S1820513-09	SERPE-IESM
RC300-NVG	S1820513-10	SERPE-IESM
RC400	S1820513-05	SERPE-IESM
RC500-320	S1820513-02	SERPE-IESM
RC600-NVG (Y)	S1820513-12	SERPE-IESM
RC600-NVG (W)	S1820513-13	SERPE-IESM

ELT - RCP Connectors	P/N	Supplier
PROGRAMMING DONGLE	S1820514-01	SERPE-IESM
PROGRAMMING DONGLE A320	S1820514-04	SERPE-IESM
PROGRAMMING DONGLE A330 A340	S1820514-05	SERPE-IESM
MAINTENANCE DONGLE	S1820514-02	SERPE-IESM
DIN 12 CONNECTOR (without SMM)	S1820514-03	SERPE-IESM

Interface modules for long message	P/N	Supplier
CS144-RS	S1825501-01	SERPE-IESM
CS144-A	S1825501-02	SERPE-IESM

Antennas	P/N	Supplier
ANT100 (auxiliary antenna)	0124206	SERPE-IESM
ANT110 (auxiliary antenna)	0124194	SERPE-IESM
ANT300 (rod antenna)	0124220	CHELTON
ANT400 (rod antenna)	0139767	DAYTON GRANGER
ANT600 (blade antenna)	0124221	CHELTON
ANT650 (blade antenna)	0124251	CHELTON

Programming and testing equipment	P/N	Supplier
PR550	S7025501	SERPE-IESM
COSPAS-SARSAT DECODER	ARG 5410 or equivalent	SARTECH

7.2. Evolutions

List of Equipment Change Sheets (ECS or FEE), description of modifications, date and references.

Type	P/N	Amdt	Description of modification	Date	Ref.
406 AF	S1821502-02	A	First issue		
		B	First stage of 406 MHz amplifying chain	JAN 07/2001	2001-011
		C	Second stage of 406 MHz amplifying chain	JUN 05/2001	2001-023
		D	ELT activation circuit	MAR 19/2003	2003-009
		E	External buzzer commands (reduction of consumption)	NOV 11/2003	2003-020
		F	DIN12 pins isolation	DEC 23/2003	2003-031
406 AF-H	S1822502-02	A	First issue		
		B	First stage of 406 MHz amplifying chain	JAN 07/2001	2001-012
		C	Second stage of 406 MHz amplifying chain	JUN 05/2001	2001-024
		D	ELT activation circuit	MAR 19/2003	2003-010
		E	External buzzer commands (reduction of consumption)	NOV 11/2003	2003-021
		F	DIN12 pins isolation	DEC 23/2003	2003-033
406 AF (6D)	S1821502-06	A	Add of 5 G-Switch on 406 AF PCB	MAR 03/2004	2004-03

8. QUALIFICATION

8.1. Approvals

The KANNAD 406 AF, AF-H and AF (6D) transmitters are approved by COSPAS-SARSAT to ensure compatibility with the satellite system (reference to COSPAS-SARSAT type approval in §11.3).

The KANNAD 406 AF (6D) is qualified as an evolution of KANNAD 406 AF (FEE).

Airworthiness approval was granted by DGAC (French notified Airworthiness Authorities) which is also the notified body for evolutions on previously approved equipment.

Application for recognition of JTSO approval done according to carriage requirement regulation. Paragraph 11.3. Qualification certificates lists KANNAD 406 AF, AF-H and AF (6D) approval certificates to date.

TSO-C91a and TSO-C126 are granted on the same part-number with a deviation for the G-switch activation curve. This means that an aircraft equipped with this ELT can change country of registration without having to replace the ELT already installed.

8.2. Test reports

The table hereunder gives references to the test reports carried out with the KANNAD 406 AF, AF-H and AF (6D).

Index	Laboratory	Date	Ref.	Title
A	SERPE-IESM	03/07/1998		Bilan des essais de certification ED62 de la balise KANNAD 406 AP (Emission 121.5/243, Autonomie, Susceptibilité aux fréquences radio, Haute température, Imperméabilité)
B	SERPE-IESM	10/09/1998		Bilan des essais de certification ED62 des balises KANNAD 406 AP/AF/AF-H&121AF (Flamme, influence magnétique, pénétration, G-Switch à 45°)
C	CGI	June 1998		Tests de résistance à la compression
D	EMITECH	16/07/1998	RM98 -10288	Rapports d'essais CEM
E	LET	07/07/1998	E984600116	Rayonnement 121,5 and 243 MHz
F	INTESPACE	20/07/1998	M1262.MT	Test report of 406 MHz distress beacon
G	SERPE-IESM	30/06/1998		Electrical test for an alternative battery approval
H	CEPr	29/07/1998	3601 - RE98	Rapport d'essais mécaniques et climatiques
I	SERPE-IESM	30/09/1998	DOC98181	Essais d'intermodulation par couplage Direct
J	SERPE-IESM	01/02/1999	DOC/ESSAIS_AP/ 010299	Essais complémentaires - KANNAD 406 AP et variantes
AC	SERPE-IESM	05/01/00	D99265	Mesure des caractéristiques de l'émetteur COSPAS-SARSAT I286 à -40°C
BO	CEAT	10/12/2003	S-03/3020167	ELT KANNAD 406 AF JAR/FAR 25.853 compliance
BU	EMITECH	28/04/2005	RM-05-10339-2	Electrostatic Discharges
BV	EMITECH	28/04/2005	RM-05-10339-1	Lightning transient induced susceptibility

8.3. Qualification tests

121.5/243 MHz TRANSMITTER	DO 183	DO 204	ED62	Test Report Index
Operating life	§ 2.2.1		§ 3.1.6	F/G
Operating frequencies	§ 2.2.2.1		§ 3.1.1	A/U
Modulation characteristics	§ 2.2.2.2		§ 3.1.2	A
Modulation duty cycle	§ 2.2.2.3		§ 3.1.2	A
Transmitter duty cycle	§ 2.2.2.4			A
Peak effective radiated power	§ 2.2.2.5		§ 3.1.5	E
Automatic Crash Activation	§ 2.2.3		§ 3.1.9	H
Antenna Radiation Characteristics	§ 2.2.4			E
Radio Frequency Intermodulation	§ 2.2.7		§ 3.1.7	I

406 MHz TRANSMITTER	DO 183	DO 204	ED62	Test Report Index
Transmitted frequency		§ 2.2.2.1	§ 3.2.1	F/U
Digital message generator		§ 2.2.2.2	§ 3.2.2	F
Modulation		§ 2.2.2.3	§ 3.2.3	F
Transmitter output power		§ 2.2.2.4	§ 3.2.5	F/U
Voltage standing wave ratio		§ 2.2.2.5	§ 3.2.6	F
Maximum Continuous Transmission		§ 2.2.2.6	§ 3.2.8	F
Spurious emissions		§ 2.2.2.7	§ 3.2.9	F
Operational life requirements		§ 2.2.2.8	§ 3.2.12	F/G

ENVIRONMENTAL CONDITIONS	DO 183	DO 204	ED62	ED160C	Test Report Index
Temperature and altitude tests	§ 2.3.1		§ 4.4.1	§ 41	A/H
Frequency and other electrical tests	§ 2.3.2	§ 2.3.2	§4.6.3		F
Magnetic effect			§ 4.4.5	§ 15	B
Humidity test	§ 2.3.3	§ 2.3.3	§ 4.5.1	§ 6	A
Shock test	§ 2.3.4.1	§ 2.3.4	§ 4.5.7	§ 7	H
Impact / penetration test	§ 2.3.4.2	§ 2.3.4.2	§ 4.5.8		B
Crush test	§ 2.3.4.3	§ 2.3.4.3	§ 4.5.10		C
Vibration test	§ 2.3.5	§ 2.3.5	§ 4.4.4	§ 8	H
Explosion test	§ 2.3.6	§ 2.3.6	§ 4.4.14	§ 9	H
Flame test		§ 2.3.7	§ 4.5.11		B
Waterproofness test	§ 2.3.7	§ 2.3.8	§ 4.5.2	§ 10	B

ENVIRONMENTAL CONDITIONS	DO 183	DO 204	ED62	ED160C	Test Report Index
Immersion test	§ 2.3.3.8		§ 4.5.13		U
Induced signal susceptibility test	§ 2.3.15	§ 2.3.16	§ 4.4.9	§ 19	D
Radio frequency susceptibility test		§ 2.3.17	§ 4.4.10	§ 20	A
Emission of radio frequency energy test	§ 2.3.16	§ 2.3.18	§ 4.4.13	§ 21	D
Lightning transient susceptibility test		§ 2.3.19	§ 4.4.11	§ 22	BV
Electrostatic discharge (ESD) test				§ 25	BU
Fireworthiness (JAR FAR 25.853)	N/A	N/A	N/A	N/A	BO
Fireworthiness (ABD0031E)	N/A	N/A	N/A	N/A	* (1)

NOTE: (1) compliance under aircraft manufacturer deviation.

9. MANUFACTURING

9.1. Quality insurance

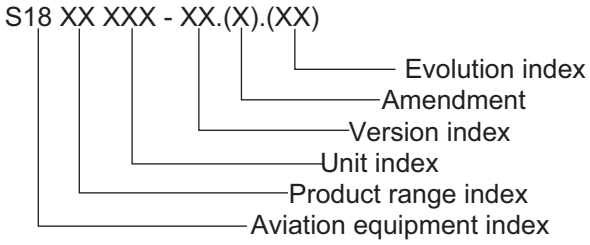
All aviation equipment manufactured by SERPE-IESM are covered by the JAR21-Sub part G Production Agreement number F.G.132 delivered by the French Civil Aviation Authority. It is GSAC's responsibility to control periodically compliance of the production process with Production Agreement Specifications.

The Quality Control integrity of the equipment is attested by the issuance of the Certificate of Airworthiness for export (JAA Form 1).

9.2. P/N structure

All series equipment are described in the production management system by an assembly number including sub-assemblies or components.

The assembly numbers are designated as follows:



The "Part Number" (P/N) corresponds to the first 10 digits of the assembly number.

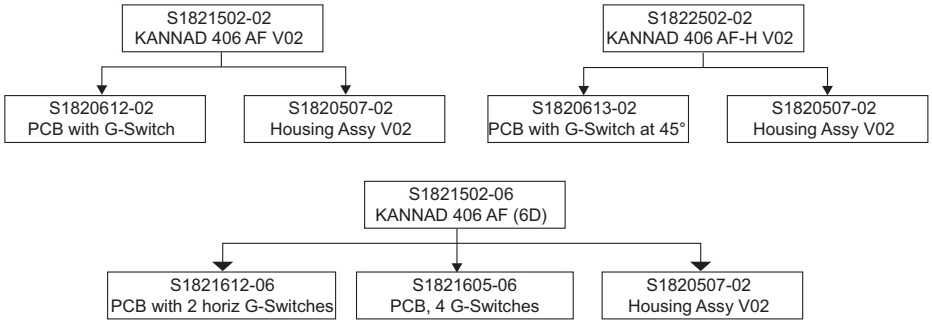
S18 XX XXX - XX

In case of equipment evolution, if "Form Fit Function" is altered, the Version index is modified.

If not, either Amendment or evolution index will be increased depending on the level of demonstration required by the Airworthiness Authority to validate the modification.

As a consequence, all series equipment having the same Part Number are fully interchangeable.

9.3. Assembly



9.4. Marking

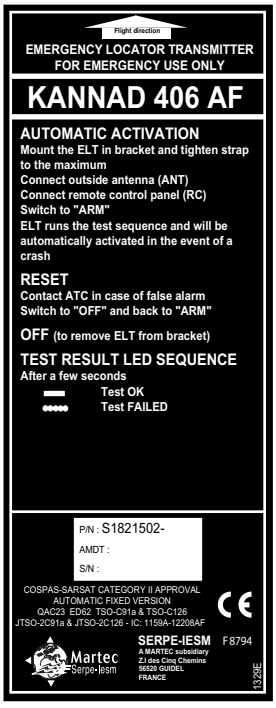
9.4.1. Name plate

A label is stuck on the upper side of the housing. It gives information on:

- Part Number (P/N),
- Amendment (AMDT),
- Serial Number (S/N),
- Qualification Certificates (references of),
- Manufacturer name,
- Manufacturer code,
- Manufacturer details,
- Data Base / Software version,
- Brief description of LED sequence.

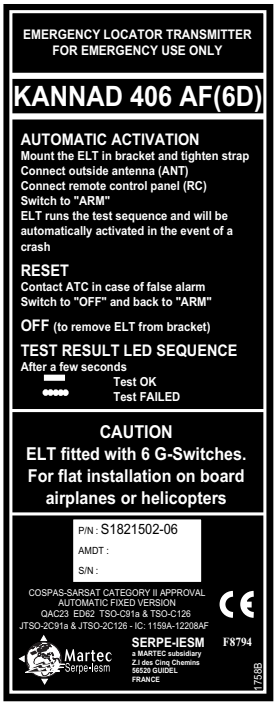
Figure 13: Name plates and instructions marking

KANNAD 406 AF



KANNAD 406 AF - H

KANNAD 406 AF (6D)

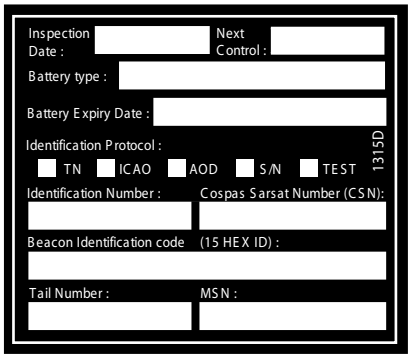


9.4.2. Identification and maintenance marking

The identification and maintenance markings give information on the battery (type, expiry date), on the identification data that are programmed in the ELT (protocol, Identification number, Hexadecimal transcription of the Beacon Identification code) and on the aircraft (Tail number).

The identification and maintenance markings are updated by the maintenance station at:

- each battery change,
- each change of identification data.



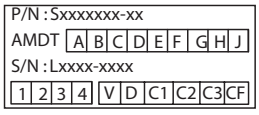
9.4.3. Production stamp

This marking, stuck on the lower part of the name plate, enables to determine the status of the equipment and some of it sub-assemblies. It gives information on (from top to bottom):

- P/N,
- Amendment,
- S/N: Serial number including year of production release (H=2000, J=2001, K=2002, L=2003 …), batch number, serial number in that batch,
- The number of evolutions since the production release,

Control Status (V = visual inspection, D = burn-in, C = control according to procedure XXX, CF = final control).

Figure 14: Example of production stamp



9.5. Programming

The ELTs are programmed in our factory:

- with a maintenance code if the distributor or the aircraft operator is equipped with programming equipment. Once installed the "Programming Data Sheet" shall be returned duly completed to SERPE-IESM responsible for keeping its database up-to-date.
- with the aircraft identification data if neither the distributor nor the operator are equipped with programming equipment. In this case, the order must be sent with the "Programming Data Sheet" duly completed.

In any case, the operator is responsible for registration of his ELT with the "COSPAS-SARSAT point of contact for 406 Mhz beacon registration matters". The list is available upon request.

10.MAINTENANCE POLICY

The periodic inspection can only be carried out by an accredited JAR or FAR 145 maintenance station with valid agreement for KANNAD ELTs maintenance.

10.1. Scheduled maintenance (recommendation only)

The KANNAD 406 AF, AF-H and AF (6D) should be serviced periodically. Unless otherwise specified by the relevant Civil Aviation Authority, inspection is recommended every 2 years.

This maintenance operation can be carried out with standard test and measurement equipment (spectrum analyzer, radio tester...) without opening the ELT.

- Self-test.
- Battery voltage.
- Verification of G-Switch activation.
- 121,5 MHz / 243,0 MHz / 406 MHz transmission power.
- 121,5 MHz / 243,0 MHz / 406 MHz frequency.
- VCO lock.
- 121,5 MHz AM modulation ratio.
- 406 MHz demodulation (to compare with programmed information).

10.2. Battery replacement

Battery replacement is mandatory:

- after more than 1 hour of real transmission (cumulated duration),
- before or on the battery expiry date

IMPORTANT: **Only original battery pack supplied with battery kit P/N S18 20 516-99 must be installed. The battery shall not be charged, thrown in fire, short-circuited. It contains Lithium and is subjected to special procedure before disposal.**

Testing of the various elements of the ELT is mandatory during battery replacement.

- Visual control of the housing and accessories.
- Opening of housing.
- Battery replacement.
- O-Ring replacement.
- Closing of housing.
- Watertight test.
- Functional test procedure.

All necessary parts for battery replacement are available in:

- Battery Replacement Kit, BT300: P/N S1820516-99.

11.RELATED DOCUMENTATION

11.1. Files

Document	Reference	Distribution
Declaration of Design and Performance KANNAD 406 AF KANNAD 406 AF-H KANNAD 406 AF (6D)	 DOC99012 DOC99013 DOC03183	 ATTACHED ATTACHED ATTACHED
Definition file	DOC99019	RESTRICTED
Production file	DOC99062	INTERNAL ONLY
Production Agreement Specifications (MOP)	DOC00025	INTERNAL & GSAC
Installation Manual / Operation Manual / Inspection Log	DMA0174	WITH EQUIPMENT
Component Maintenance Manual with Illustrated Parts List	DOC99043 25-63-01	WITH MAINTENANCE TRAINING
Programming data sheet	DIM00300	ON REQUEST
Sales leaflet	DOC98054	ON REQUEST

11.2. Drawings

Document	Reference	Distribution
Outline Drawing	S18 21 8 04	ATTACHED
Drilling mask	S18 20 1 32	ATTACHED
Wiring diagram	S18 19 4 45	ATTACHED
Markings: instructions & nameplate AF	010 11 3 29	ON REQUEST
Markings: instructions & nameplate AF-H	010 11 3 30	ON REQUEST
Markings: identification & maintenance	010 11 3 15	ON REQUEST
Markings : bracket	010 11 3 36	ON REQUEST
DIN 45321-12 receptacle	S18 20 4 14	ON REQUEST
DIN 45321-12 plug (mating connector)	S18 20 4 15	ON REQUEST
Acceleration switch	8316-1-000	ON REQUEST

11.3. Qualification certificates

Document	Reference	Distribution
Production Agreement certificates (JAR 21G)	FG132	ON REQUEST
COSPAS-SARSAT Type approval	N°105	ON REQUEST