Manual

Version 1.0

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Introduction

A PowerFLARM unit draws its position and movement information from an internal GPS-receiver. The position measured is rendered more accurate by an integral pressure sensor. The unit calculates the predicted flight path and transmits this information as a short, low-power digital signal burst at one-second intervals together with a unique identification code. At the same time, the unit receives similar signals from FLARM units installed in other aircraft and within radio range, or from aircraft equipped with ADS-B, Mode-C and Mode-S transponders. The PowerFLARM unit compares the signals received with its own projected flight path. An optional future additional feature will be for PowerFLARM to compare its own projected flight path with the positions of known fixed obstacles (e.g. cables, aerials, cable railways, avalanche detonation sites) held in the unit's data base.

If PowerFLARM determines one or more threats of a dangerous conflict with another aircraft or obstacle, it warns the user of the most dangerous threat as per the internal calculation. Acoustic warnings are issued via a warning bleeper and headset audio output, also an optical warning via an LCD display. These signals indicate the height of the threat, the direction from which it has been detected, and the height difference. During turns, a different calculation algorithm is applied from that used in approximately straight flight. The GPS- and collision threat data received are also fed to a serial data port output for use by other units such as an external display and PDA. Suitable equipment is available from a number of suppliers.

Warnings are issued in accordance with the time remaining to a possible collision, not the geometric distance between the aircraft. The first warning is typically issued between 19 and 25 seconds prior to the calculated possible collision with aircraft or obstacle; the second is issued 14 to 18 seconds beforehand, and the third 6 to 8 seconds in advance. Warnings are sustained as long as the threat remains as calculated. Depending upon the prediction, the threat may be downgraded or deleted. Warnings are selective, i.e. they are only issued if the calculation detects a high probability of a collision in the immediate future.

Communications between PowerFLARM units employ a proprietary copyright protected protocol in different frequency bands allocated by region. Effective range depends very much upon the position in which device is fitted.

The communications system between units is locked against unauthorised access. The design is patent protected. There is no public access to the protocol. Any unlicensed use, copying, distribution, conversion, replication, de-compiling, reverse engineering, or further transmission of knowledge so acquired relating to the system components or software, in whole or in part, is forbidden and will result in legal enforcement action. FLARM is an internationally registered Trade Mark and may not be used by third parties without a license. Technical data may be changed at any time and without prior warning. Some named functions are not provided in all versions of PowerFLARM, but may be provided at extra cost or for a fee.

Installation

General Advice on Installation

Installation and operation is on a non-interference and non-hazard basis, and may not be allowed to endanger the safe operation of certificated equipment that is either necessary or required by regulation for safe flight. Installation must comply with official requirements.

PowerFLARM must be so secured that the pilot can see the displays, hear the acoustic warnings, and operate the turning-button. PowerFLARM must not obstruct the pilot in his operation of the aircraft (including emergencies); in particular at all times it must not obstruct his view of the sky, even in the event of serious vibration or acceleration. PowerFLARM is not suitable for use in conjunction with night vision equipment, for night flying, or in pressurised cabins.

Ideally, PowerFLARM will be fitted to the instrument panel glare-shield or cockpit sidewall. If the PowerFLARM internal display is in use, the rear face of the unit with cable connectors must face the direction of flight. If the unit is coupled to an external display with controls, PowerFLARM can be installed in another position or point in a different direction. Usually, this will require the use of separate communications and GPS aerials.

The installation must ensure that the communications antenna A and ADS-B are not in contact with any other objects through which there might be a regular electrostatic discharge.

For example, the communications antenna should not be in permanent contact with the cockpit windscreen inner face, because this could result in damage to the PowerFLARM communications transceiver. The unit will not operate properly in the absence of an antenna or if the antenna is not properly screwed tight; the unit cannot self-test for correct antenna function.

For updates, configuration and flight data evaluation it is helpful if the unit is installed such that the power and data connectors and the microSD-reader are easily accessible or reachable with an extension cable. The PowerFLARM serial number must be known for software updates.

It is advisable that the PowerFLARM is so fitted to the aircraft that the turn-button cannot be inadvertently pressed during entry to or egress from the aircraft. Should the PowerFLARM or any associated components be fitted to a part of the aircraft that will be jettisoned in an emergency, suitable break points should be incorporated to prevent any interference with the jettison sequence.

Cables must not be folded or placed under tension. Adequate space must be left for the cable connectors. Cables for power supply, data, and external units must be shortened as necessary: to prevent the occurrence of inductive effects they may not be coiled. Only a single PowerFLARM may be installed in each aircraft.

The PowerFLARM and any associated aerials should be located as far away as possible -- at least 25 cm -- away from any other GPS aerial and the magnetic compass.

After installation, an inspection must be made to ensure that the PowerFLARM unit does not interfere with any mechanical, electrical, electronic (radio) or magnetic (e.g. compass) system, and this fact must be recorded in the aircraft documents. In addition, the aircraft documents must bear a record of the PowerFLARM serial number and Software Version Number. If employed in a fixed installation, the Means of Compliance must be recorded in the aircraft documentation, and an AFM Supplement is to be carried on board the aircraft.

Housing

The lower face of the polycarbonate housing has two threaded screw holes, so that PowerFLARM may be easily secured using two M4 screws (max. 10 mm long). The thread matches those of most standard fixtures. The PowerFLARM must be fitted to a flat surface and the housing not subjected to any mechanical stress. Several types of fixture are available.

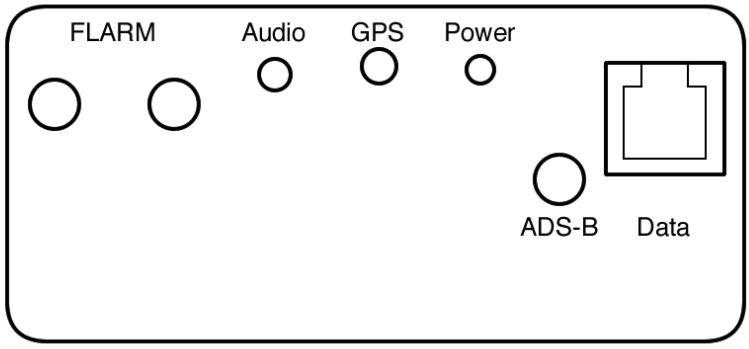
The housing can also be secured using DualLock® industrial hook and loop tape, which can be secured and released several times. Users should note that the adhesive used on DualLock® is exceptionally strong and will not easily release. The adhesive tape should not cover the battery compartment lid, but should be applied elsewhere on the housing.

The housing is not air or watertight and users should avoid the ingress of solid particles and liquids. Should the unit get moist, it must be completely dried prior to further use. If the unit becomes wet, it may be permanently damaged and rendered unusable; no guarantee claim will be accepted for any unit damaged by moisture. Should the unit be suddenly cooled this may result in the formation of condensation. The housing may only be cleaned using a slightly moist non-abrasive cloth without a chemical cleaning agent. The housing does not resist scratches or abrasion.

The plastic housing is black to reduce glare and has been tested in the temperature range -10 °C to +60°C. Care should be taken to avoid over-heating due to direct or indirect sunshine, in particular because the housing can become deformed at temperatures above +84 °C without any mechanical tension, and also at lower temperatures. The unit must not be locally over-heated by exposure to focused sunrays, and care is required when cockpit doors or canopies have been opened (risk of fire to due lens effect).

Connections

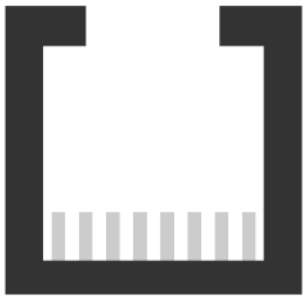
Overview



Power and Data Connections

The 8-pin RJ45-socket accepts and retains an 8-pin (temporarily also a 6-pin) plug. The pin connection is mostly in accordance with IGC GNSS FR specifications. (http://www.fai.org/gliding/system/files/tech_spec_gnss.pdf).

An 8-pin (temporarily also a 6-pin) ribbon cable with an RJ45 push-fit connector or an 8-pin twisted-pair patch cable with RJ45 may be used. Suitable cables are obtainable from retailers.



1: +8 to +27V DC
2: +8 to +27V DC
3: PowerFLARM supplies + 3V DC
4: GND
5: TX (RS232): only 1 user!
6: RX (RS232): only 1 user!
7: GND
8: GND

Pin 1 Pin 8 (view from rear)

For 8-pin cables Pins 1=2 are to be linked. Also Pins 7=8. If the other wires are not to be used, they should be individually insulated and may not be soldered together or twisted in pairs.

If the incoming power supply uses the Power/Data connection, special attention must be given to the instructions given in the chapter in this handbook entitled *Electrical Power Supply*.

The transparent plug must be examined to determine the cable colour coding so the open cable end may be correctly configured. On patch cables the neighbouring wires of Pins 1/2, 3/4, 5/6 and 7/8 are usually twisted together. Neighbouring wires are usually of the same colour, though one of the two colours alternates with white.

As standard, Pin 5 transmits the most important NMEA-0183 Version 2.0 compatible GPGGA and GPRMC information at a configured data rate, and Garmin proprietary PGRMZ barometric height information. Further information is available for third-user devices (e.g. external display). Do not connect more than one external application at the same time.

Audio

The audio signal is a standard de-coupled aviation signal of no more than 1 V. The connector is a standard 3.5 mm jack plug.

Communications Antennas

The primary communications antenna for the FLARM protocol is preinstalled and locked to the FLARM A socket. Do not try to remove this antenna as this may cause damage to the device. For proper operation the included ADS-B antenna must be carefully and tightly screwed to the SMA socket marked with ADS-B. The installation has a great influence upon both transmission and the reception range achieved, and thus requires careful consideration. The antennas must be vertical to ensure unimpeded emission especially to the front, and to the sides. Users are advised not to install the unit within or under the instrument panel without external antennas. In principle, the installation may be inverted, provided that the unit is connected only to an external display and an external GPS antenna. Horizontal or non-upright antenna presentation is unacceptable. No electrically conducting surfaces (e.g. metal, carbon fibre)

should be located over or immediately alongside the antennas. The antennas must not be subjected to physical pressure (e.g. cockpit windscreen) and may not be bent.

If a second FLARM communications antenna (used for reception of FLARM signals only, not included) should be connected to socket B, it must be located at least 1.5 metres from the unit.

Alternative offset antennas, external antennas and antenna extension cables (50Ω on normal SMA) can be obtained from retailers. An externally mounted antenna must be properly earthed with the aircraft. The installation must be within a Zone 2A or 3 as defined by DO-160/F Section 23.

GPS-System

The GPS system in PowerFLARM is subject to the limitations found in typical GPS applications. The system is not certified for aviation use.

PowerFLARM will not work without adequate reception.

PowerFLARM can be operated using both the GPS antenna within the housing and with an external GPS antenna (not supplied) connected to the MCX socket. Connecting an external antenna automatically deactivates the internal antenna.

Operation with an internal Antenna

When operating with the internal GPS antenna, the unit presentation must be unhindered to the sky ahead and sides. Further, the upper side of the unit must not be covered.

Operation with an external Antenna

The antenna should be located in an upright position such that it has an unhindered presentation to the sky, including when the aircraft is in a turn. There should be no electrically conducting surfaces (e.g. metal, carbon fibre) over or immediately alongside the antenna. Ideally, the antenna will sit atop the instrument panel coaming. Conducting surfaces under the antenna may have

a positive effect upon antenna function. Users are advised not to install the PowerFLARM unit within or under the instrument panel cover.

If more than one GPS antenna is present, it is recommended that they are at least 25 cm apart; the same holds good for separation from the PowerFLARM communications antenna.

FLARM®-COMMUNICATIONS

The PowerFLARM radio communications are made using a public frequency band known and requiring no user licence. This means that the band is also used by a number of other applications. FLARM has no exclusive rights to use the frequency band, so there is no guarantee that FLARM reception will be free from interference by other users.

The use of unlicensed bands by aircraft is subject to a number of limitations, with some national differences. The pilot and user of PowerFLARM are solely responsible for ensuring that the unit is used in accordance with the current local regulations.

Essentially, the PowerFLARM communications protocol places no limit on the number of units that may be contacted within the working range. However, an increasing number of PowerFLARM units within range leads to a reduction in the probability ('graceful degradation'), that a single signal report can be received. But the probability that the next signal from the same transmitter will not be received is generally small. PowerFLARM is designed to simultaneously receive and process the signals from more than 50 aircraft within radio range. A large number of signals from other aircraft does not reduce the working range.

Transponder and ADS-B Reception

The ADS-B and transponder antennas are inserted and screwed to the reverse-polarity SMA socket as marked. Make sure you do not mistakenly insert the FLARM communications antenna in the SMA socket, and do not use any force.

Audio

To make sure that an acoustic warning can be heard above loud ambient noise, the signal may be fed direct into the intercom or headset. To this end, there is a 3.5 mm socket for a jack plug on the rear side of the unit.

PowerFLARM also has an integral warning bleeper. The housing front face has an outlet to improve sound release from the internal bleeper. This outlet must not be obstructed by any adhesive agent.

When set at large volume, the bleeper sound level could damage a human ear at close distance. The volume is adjustable.

Micro SD-Card

FLARM has a built-in microSD card reader. The microSD card (also known as TransFlash) is not supplied, but is in widespread use for mobile telephones and can be purchased from most camera or mobile phone retailers. FLARM uses the microSD card to update the firmware, obstacle and terrain data, to configure the unit and download the flight log.

Some functions are not available in all PowerFLARM versions; these may be available for payment of an additional charge or fee.

microSD cards are smaller than SD cards or miniSD cards. However, for communication with a PC there are mechanical adapters for insertion of a microSD card in SD or a miniSD card. Such adapters are often sold together with the cards.

Note, that the microSD card must be formatted to FAT or FAT32.

Insertion and Removal

Hold the card with the metal contacts on the right and insert carefully into the slot; then, gently press with the fingertip until the card is retained with a slight 'click'. To remove the card, press the card gently into the FLARM slot until a slight click

releases the card, which can then be gently withdrawn. Do not use force.

Power Supply

PowerFLARM can be operated using the aircraft's own electrical power system, internal or external rechargeable batteries.

Power Supply using the Aircraft's own Electrical Power System

If the unit draws its electrical power through the Power/Data socket, there must be a direct galvanic link between the FLARM and aircraft battery via a 500 mA circuit breaker. This power supply must be separate from any other instruments that are essential for the safe conduct of the flight. In flight the pilot must be able to isolate the FLARM unit from the aircraft's electrical power system without interrupting the power supply to any other important systems. Possible reasons might be a suspected fault in other on-board systems, the presence of smoke, the smell of smoke, or flying over a country where the operation of FLARM is forbidden.

In spite of the integral electrical polarity guard, it is important not to confuse the power supply with the data cable.

Power Supply Using Batteries or Rechargeable Batteries

PowerFLARM can be operated using different types of batteries or rechargeable batteries. The unit requires six AA cells or compatible products:

- Alkaline Batteries (Alkaline Manganese Cells)
- Nickel Metal hydride (NiMh) rechargeable batteries

The unit should not be operated in conjunction with any other types of battery; other types may damage PowerFLARM.

PowerFLARM recognises the type of non-chargeable or chargeable batteries that have been fitted and responds accordingly.

Battery endurance depends upon the type of battery, the incidence of traffic, and display brightness.

The battery life remaining is indicated above the battery symbol on the right upper corner of the traffic display.

Battery Insertion

PowerFLARM has a battery compartment on the lower face, and holds six AA batteries. The batteries are inserted by removing the compartment lid. It is essential to ensure that the batteries are inserted with the correct polarity, with no excessive application of force on the battery compartment lid.

Rechargeable internal Batteries

PowerFLARM features an internal NiMH battery charger. When the device is turned off and electrically connected to the vehicle or aircraft battery (either via “Power” socket or power pins on the RJ45 socket), inserted batteries will be charged if the ambient temperature lies within the allowed range for charging NiMH batteries.

If non-rechargeable batteries are fitted to the unit, do not connect your PowerFLARM device to an external power source (e.g. aircraft or vehicle battery).

The internal batteries may only be charged if the unit is resting on an inflammable, dry base. When the unit is being recharged, never allow it to remain unsupervised.

Technical Data

Dimensions:

- Length: 94mm
- Width: 96mm
- Height: 46mm

Operation:

- Integral turn/push button

Audio:

- Built-in warning beeper
- Output for Headset Audio
- Volume control

Communication:

- Internal RS232 NMEA
- Data output for Moving-Map unit and external displays (only one user at a time!)
- internal power supply for external units

Sensors and GPS:

- Pressure sensor
- Microphone
- Integral 50-channel GPS receiver

FLARM:

- 868MHz FLARM Transceiver

ADS-B:

- 1090 MHz receiver for Mode-C/S and ADS-B signals

Antennas:

- 868MHz FLARM antenna (preinstalled and locked)
- ADS-B antenna (on housing, rpSMA-socket)
- Integral GPS antenna
- External GPS-antenna, optional connection (MCX-socket)

Memory:

- SD card slot (Micro-SD)
- Update via SD card possible

Fixtures:

- Two threaded holes for M4 screws
- Adapter plates and holders (optional)

Display:

- New generation sunlight-readable Matrix TFT display
- Resolution 132 x 176 pixels
- 2 inch diagonal screen

Operation:

- Integral push/turn button
- Zoom and settings

Power Supply and Batteries:

- 6 removable AA batteries (non-rechargeable or rechargeable)
- Integral, intelligent battery charger with temperature monitor
- Can operate directly attached to aircraft on-board electrical power: 10 to 26V DC
- Up to 5h battery life, (depending upon traffic and type of battery)

Operation

General Advice on Operation

Use

PowerFLARM is designed for use in non-essential conditions as a 'situation awareness only' device, only to support and assist the pilot. It cannot always be relied upon to provide a warning of collision threat. When using FLARM, under no circumstances should the aircrew adopt any change in flight tactics, or modify the actions of the user or aircraft commander. Even though you have installed a FLARM unit, you remain personally responsible for the safe conduct of the flight, the safety of your passengers and other aircraft in the vicinity. Users of FLARM do so entirely upon their own responsibility and that of the aircraft commander. The FLARM unit may only be operated by persons who are thoroughly familiar with the user instructions.

Compatibility

FLARM warnings of the presence of other moving aircraft can only be given if the latter is also equipped either with FLARM or other compatible unit, or a compatible SSR-reply system (Transponder Mode-C/S). FLARM does not communicate actively with Mode A/C/S transponders, and is thus not detected by ACAS/TCAS/PCAS or terrestrial air traffic control.

Radio Range and Reception

If a warning is to be issued, compatible equipment must be located within range. This range is greatly dependent upon the type and position of the communications antenna installation on the aircraft, also the spatial relationship of the two aircraft to each other.

FLARM signals between two aircraft are only possible in a line of sight; there can be no signal between two aircraft on opposite sides of the same mountain.

Position Determination

To operate correctly FLARM must be constantly aware of its own current position, for which reason it will only operate if there is good, three-dimensional GPS reception. GPS reception is greatly influenced by the correct installation and position of the GPS antenna and aircraft attitude. It also requires that the US GPS system is in full and unrestricted use. Especially when flying in a turn, close to hills or mountainsides, in areas where reception is known to be unreliable, or if the antenna installation is poor, the GPS signal quality may be degraded; this also causes rapid deterioration of height calculation. FLARM operates correctly again when the GPS signal quality is restored.

The movements registered by a GPS relate to a fixed system of terrestrial coordinates. When the wind is strong, the aircraft heading deviates from Track over Ground, and this has an effect upon the collision threat calculated. If the wind speed is one third of True Airspeed (TAS) and the aircraft heading is at 90° to the wind and with no drift, then the display has an error of e.g. 18°. If the wind is very strong the Track over Ground can deviate as much as 180° from the Heading. If the aircraft is circling, the calculation and thus collision warning threat are unusable.

In the event of poor GPS reception, for aircraft at close distance and at similar heights, the angle offset from the vertical is imprecise and irregular.

Flight Path Calculation

FLARM calculates its own predicted flight path for about the next 20 seconds. The prognosis is based upon immediate past and current vectors, plus a movement model that has been optimised for the respective user. This prognosis incorporates a number of errors that increase with the duration predicted. There is no guarantee that the aircraft will fly along the projected flight path. For this reason, a prediction may not be accurate in every case.

In light aircraft, flight path predictions of more than half a minute are unusable.

Data Protection

The transmitter has no influence on what a receiver does with the data received. It is possible that this data might be logged by other airborne or ground stations and then used for other purposes. In many instances this could be to the user's advantage (e.g. automated flight log, flight tracking, last position recovery): The data could also be used as evidence against the aircraft's airspace or height violations or collision avoidance actions. With each signal FLARM transmits a unique identification code relating to the aircraft or pilot.

Limitations

The use of FLARM is strictly limited to non-commercial flights in daylight under VFR (Visual Flight Rules). FLARM may not be used for navigation or in aerobatics.

Certification

FLARM has not undergone the conventional aeronautical certification process. FLARM software development was conducted in accordance with the usual standards and procedures required for industrial electronics products.

Start-Up

To switch on PowerFLARM, the operating button must be pressed for at least three seconds.

A start-up display then appears with further information about the battery charge condition.

After start-up, the PowerFLARM display shows how many GPS satellites have been found. As soon as GPS reception is sufficient to give a worthwhile determination of position, PowerFLARM then switches to normal operation.

Fault Reporting and other Information

During normal operation the PowerFLARM display advises the user on operational conditions. In addition, PowerFLARM has a self-test function. Should it detect a fault, the unit will display a fault report. Several types of reports might be displayed:

Serious Fault: Operation may not continue.

Caution / Fault: A fault has occurred and/or extra care is required.

Information: Simple information report, no fault.

Operation

PowerFLARM is operated using the integral turn-button with push function.

Turn/push-button

The following table gives a brief overview of the most important push-button combinations.

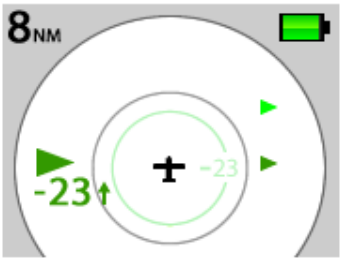
Brief push on button	Select / Enter
Longer push on button	Open/Close menu
Very long push on button	Switch On/Off
Turn button	Choose zoom depth, or select

object in menu

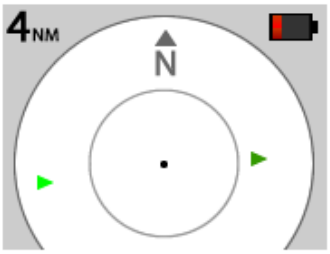
Normal Operation

In normal operation the PowerFLARM shows signals received from other FLARM®- or ADS-B targets on a radar-like display. The user can select different zoom levels by turning the button.

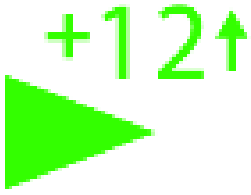
In normal operation, other aircraft are displayed in green. Different symbols are used to denote different conditions.



Aircraft in the vicinity are displayed as green arrows of different size. The nearest aircraft not equipped with ADS-B or FLARM is indicated as a light green circle.



When on the ground, the radar screen will operate provided there is adequate GPS reception. The screen image is always oriented to the north, symbolised in the screen by an 'N'.



Large arrow with height information: the large arrow always indicates the nearest aircraft and its relative height in steps of 100 ft, together with climb/descent information. The arrow indicates the direction in which the target aircraft is flying above ground. For example: 2300ft lower, flying from left to right in a climb.

Small arrow: like the large arrow, the small arrow gives the flight direction over ground. A dark arrow indicates the other aircraft is at

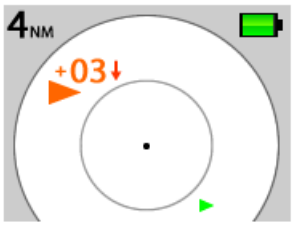
a lower altitude, while a light arrow indicates it is higher.

Green circle: the green circle gives the position of the nearest aircraft not equipped with ADS-B or FLARM, i.e. aircraft with Mode-C/S transponders. The height information is given in 100 ft steps and the circle symbolises the distance. (Example: 2300ft lower)

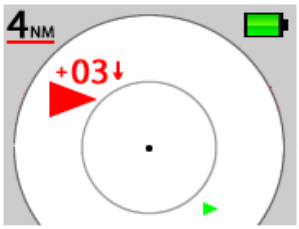
Collision Warnings

Warning Presentation

If a dangerous situation is recognised during normal operation, PowerFLARM gives an appropriate warning. The target image displayed is adjusted in accordance with the nature of the threat.



In dangerous situations, aircraft posing a threat are presented in orange or red, depending on the urgency of the threat. An acoustic alarm is issued in addition to the optical alarm.



In very dangerous situations the zoom factor is automatically adapted to an appropriate value.

Depending upon the threat level, the acoustic alarm varies in bleeper frequency and volume.

Large orange coloured arrow: this aircraft poses a threat of collision. The flight direction and height difference of the other aircraft are given to the nearest 100 ft,

together with an indication of climb/descent. In this example: 300ft higher, descending, flying from left to right.

Very large red arrow: there is an immediate threat of collision. In addition, the display gives an indication of the vertical angle to the other aircraft. The flight direction and height difference of the other aircraft are given to the nearest 100 ft, together with an indication of climb/descent. In this example: 300ft higher, descending, flying from left to right.

Information about Warnings

If there are several fixed or moving objects within radio range, FLARM uses a mathematical algorithm to determine that which poses the most immediate threat, and issues a warning about this threat and none other. The pilot is unable to acknowledge the warning. However, in spite of a warning having been given for a single object it remains possible that several, or other objects simultaneously represent a major threat, or in effect are together more dangerous than the object for which the warning was issued. If the unit simultaneously detects a threat from a moving object and a fixed object, then a warning is issued for that which represents the earliest threat of collision.

On the basis of calculation FLARM indicates the direction taken by the most dangerous object, and its current location. FLARM does not indicate where the closest proximity may occur, nor what avoiding action is required. Whether and what avoiding action should be taken is the sole responsibility of the pilot, whose correct response must be based upon his own observation of the local airspace. In particular, he must observe the avoidance rules of the air, and ensure that the avoidance action does not endanger any other airspace user. Depending upon the flight phase, FLARM uses different forecast processes, movement models and warning calculations to provide the pilot with the best possible support without distraction. For example, sensitivity is reduced when a sailplane is circling. These models

and processes are optimised, but always represent a compromise. As seen by the pilot, these models will issue 'unnecessary' warnings; in other words FLARM may give a warning in situations where there is no subjective danger. It is also possible that FLARM will not give warning of the most serious threat, or gives no warning at all.

Warnings are given at very short notice, normally up to 20 seconds prior to the closest calculated proximity. The intensity of the warning indicates the threat level (calculated collision time) but not the geometric distance. FLARM only issues a warning if it calculates and predicts a considerable threat of collision. It is thus possible that although a signal is received, that no report is issued about the presence of another aircraft.

Settings Menu

The settings menu is called up by extended fingertip pressure on the button. The user then navigates his way through the menu by turning the button. A short push on the button selects the item that is currently displayed.

At the upper end of each menu, a push returns to the previous level. At any level, the user may quit the menu by a long press of the button.

Menu Diagram

The following diagram shows the PowerFLARM menu sequence.

Volume

Warning bleeper volume

Settings

Aircraft

Type: Selection of aircraft type
ICAO Address: Enter ICAO Address
XPDR: Own transponder details

FLARM

Range: FLARM-range

PCAS

Range: Horizontal range Transponder Receiver
Vertical Range: Vertical Range Transponder Receiver

ADS-B

Range: Horizontal Range ADS-B
Vertical Range: Vertical Range ADS-B

Data-Port

Baud Rate: Set data rate for RS232 data output
Sentences: Selection of data issued
Range: Horizontal Range of data issued

Brightness

Brightness Setting

Factory Reset

Return to factory settings

Info

Information about the unit

Power Off

Switches unit off

Essential Settings Prior to First Flight

There are a number of FLARM settings that *must* be configured prior to the use of PowerFLARM. These are aircraft-specific settings, that can be found under 'Settings > 'Aircraft'. The values chosen depend upon the aircraft and *must* be altered before the unit is used in another aircraft.

These settings are obligatory for correct operation of PowerFLARM.

Selection of Aircraft Type

This setting is required to specify the type of aircraft in which your PowerFLARM will be used.

ICAO Address

Under this heading the user enters the ICAO address of the aircraft in PowerFLARM unit. The aircraft's ICAO address is found in the aircraft documents. It is the hexadecimal address transmitted by a mode Mode-S Transponder, where fitted.

Incorrect settings will result in false alarms or a failure of the warning function.

Transponder

Select whether your aircraft has a transponder, or not.

Legal Notes

Product Guarantee

The guarantee is immediately cancelled should the unit be opened, misused, faulty installation, and any breach of copyright.

Limitations

PowerFLARM has been designed as a non-essential 'situation awareness only' unit, whose task is solely to support the pilot; it is not always in a position to provide a reliable warning. In particular, PowerFLARM does not provide any suggestions as to avoiding action. Under no circumstances does PowerFLARM facilitate a change in flight tactics, user or commander response. Even though you have installed PowerFLARM, you remain responsible and liable for the safety of all passengers and other aircraft. Operation of PowerFLARM is solely a matter at the discretion of the user and commander. The unit may only be operated by persons who have made a careful study of the user instructions.

PowerFLARM can only warn of the presence of other aircraft that are equipped with PowerFLARM or compatible equipment, and of obstacles that are recorded in the internal data bank. PowerFLARM does *not* communicate actively with A/C/S transponders, and is therefore not detected by ACAS/TCAS/PCAS or Air Traffic Control. Likewise, PowerFLARM does not communicate actively with TIS-B, FIS-B and ADS-B.

FLARM has not undergone the conventional aeronautical certification process. FLARM software development was conducted in accordance with the usual standards and procedures required for industrial electronics products. The obstacle data bank in PowerFLARM is not certificated. The use of public access unlicensed radio bandwidths in the air is subject to a number of limitations, with some national differences. The pilot and user of PowerFLARM are solely responsible that PowerFLARM is operated in accordance with the valid local regulations.

Legal Liability

FLARM Technology GmbH, also its agents, designers, component suppliers, manufacturers and data suppliers accept no legal liability or responsibility for damage or legal claims.

Conformity Declaration

FLARM Technology GmbH, Haldenstrasse 1, CH-6340 Baar, Switzerland, declares that the product *PowerFLARM Collision Warning Unit* in Hardware Version FLAPFP23E and typical configuration, meets the requirements of the CE mark.

The communications conformity meets the requirements of EN 300 220 (power class 9), EMC- Conformity EN 301 489 (class 3 SRD-Device, equipment type I). The units accord with the requirements of the European R&TTE Directive.

This device complies with Part 15 of the FCC. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC ID: ZKUGC625161

This device may only be used in vehicles or airplanes.