



MiniOz

Situation Awareness UNIT INSTALLATION MANUAL

Status

FLARM Software Version 3.08 (April, 2007)

© 2003-2007 FLARM Technology
© 2005-2007 RF Developments Pty Ltd
Boonah, Queensland, Australia
www.rf-developments.com

Version Control.

1.0 **Initial release**

1. Welcome to the community of FLARM users

Thank you for purchasing MiniOz, a modern low-cost situation awareness unit for sailplanes and light aircraft. The main task for MiniOz is to support the pilot while the pilot scans the airspace ahead with his own eyes. MiniOz / FLARM is simple to use and does not distract the pilot from the main responsibility in hand.



Sport flying is an activity that is associated with considerable risks for crew, passengers, third parties and other objects. **In order to make full and safe use of MiniOz, it is absolutely essential to be fully aware of the risks, operating conditions, restrictions and limitations associated with the use of MiniOz. This includes familiarity with and observance of the Operating Manual and this Installation Manual.** Additional configuration information can be found in the 'Data Port Specifications' document.

We always welcome suggestions for the improvement of MiniOz and OzFLARM products.

The latest version of this handbook and other related documents can be found at the Website www.rf-developments.com. This Website also has answers to Frequently Asked Questions.

This Website also carries announcements when new software versions or functions are available. If you enter your name on the mailing list, you will automatically receive notification of changes as and when they happen: support@rf-developments.com



Software-Versions FLARM 3.x will only remain operational until the end of February 2008. On publication, the update will have no functional changes and can be downloaded free of charge (current update is version 3.xx valid till Feb,2008). Users will be able to load the software with the aid of a suitable power supply/data cable (not supplied). This operation requires the user to have the unit serial number to hand. Software validity has to be time-limited to ensure that all FLARM units are mutually compatible and updates include the latest ground obstruction data.

2. How it works

Basically the MiniOz unit consists of the FLARM microprocessor. This controller is identical to the SwissFlarm system being used in Europe. The technology utilises the tried and proven "Aircraft risk prediction Algorithms" and obstacle database. Additional to this MiniOz also uses the standard Flarm datalogger feature. Software updates are performed via the Flarm port which has identical connections to the Swiss Flarm unit. A single data port provides NMEA type sentences for use with display modules such as Minoz is a "flarm" only engine. We recommend using our Flarm-NAV display, Triadis Digital voice unit (DVS) or our Altair glide computer system, the flarm-NAV and Altair have a flarm radar type display and the DVS announces flarm traffic in voice.

Note: This system is by default 100 percent compatible with FLARM from Europe. Europe and Australia operate on a different frequency, contact FLARM if you require changing to the Australian channels if you already have a Swiss Flarm unit. MiniOz units going overseas in gliders for competitions, we can re program your units to suit. Note that due to the different frequency span both systems will be degraded slightly due to matching, however, they will still achieve a satisfactory result.

MiniOz receives position and movement information from an internal 16 channel GPS receiver with an external GPSI antenna. A pressure sensor¹ further enhances the accuracy of position measurements. The predicted own flight path is calculated by the FLARM micro and the information transmitted by radio, as a low power digital burst signal at one-second intervals. Provided they are within receiving range these signals are received by further aircraft also equipped with MiniOz, OzFLARM or other flarm devices. The incoming signal is compared with the flight path calculated and predicted for the other aircraft. At the same time, FLARM micro compares the predicted flight path with known data on ground obstructions, including electric power lines, radio masts and cable cars (only if the obstacle database is loaded).

If FLARM determines the risk of dangerous proximity to one or more aircraft or ground obstructions it will output the appropriate alarm messages via the serial port for display on our Flarm-Nav, Altair or PDA devices.

The operating range is very dependent upon the antenna installation in the aircraft. The normal range is about 2 km, but up to 5 km may be achieved in individual cases that use external high gain antennas or ground stations (use of external high gain antennas and LNA, see options on RF Developments website).

¹ Requires Hardware Version 2 or higher. However, the vertical bearing on the serial data output is also available to third-party equipment on Hardware Version 1.

In addition, MiniOz operates as an IGC-compatible flight data recorder if this software option has been configured (logger is not IGC approved but fully functional including pressure height recording).



3. General Advice on Installation

Installation and operation must be on the basis of non-interference with and no hazard to the existing suite of other certified equipment necessary for safe flying operation, or installed to comply with official requirements. Installation and operation must comply with official regulations and requirements. When MiniOz is permanently installed in an aircraft, the installation must comply with the 'Installation Policy' published by the Civil Aviation and Safety Authority (CASA).

MiniOz is a small, lightweight unit housed in an aluminium case measuring 55mm x 90mm x 25mm (include an extra 10mm for the rear connector) It has 3 rear connectors, 1 is an 8 pin RJ45 socket which provides the power inputs and RS-232 out, GPS socket which is a small MCX female and the RF transmit/receive socket which is an SMA type. Mounting is either Velcro to another instrument or shelf or use the 2 screw holes in the front lid (remove the 2 screws and use the lid as a drill template). The supplied cable has 2 wires for power +, 2 wires for ground and 3 wires for data plus a 4th wire for GPS out only which is a 4800 baud RS232 out for use with a glide computer etc (the sentences are transmitted at 4800 BPS and include the \$GPGGA and \$GPRMC)

External GPS antenna locate up front and clear of interfering sources such as other GPS antennas or metal objects – it must have a clear horizon to horizon view.

External Transmitting/receive antenna, locate as high up and clear of metal objects, we recommend using the on canopy high gain antenna, or the supplied stubby. If the stubby needs moving away from the MiniOz you can purchase an extension cable from us.

Avoid mounting MiniOz on top of the instrument panel as excessive heat WILL cause intermittent faults such as reduced range, GPS loss or microcontroller failure.

After installation, an appropriate entry should be made in the aircraft technical logs as to reflect an installation performed under a “no interference, no hazard basis” as is the case for glide computers and PDA displays, as well as other GPS devices. You as the installer must observe this rule. Additional tests under a no interference basis might include the operation of the radio and a check that OzFlarm causes no interference to its normal operation. Checks that other aircraft systems do not interfere with OzFLARM are also needed. The best method is to fly with a friend at a distance around 2 kms, make sure all systems are off (i.e. other GPS, vario and glide computer), observe his lit target LED and maintain that distance. Turn on each piece of equipment and note any change. Acceptable operation is one that is not affected by other devices. Should a problem occur then consult our FAQ page.

4. Housing

The casing is extruded aluminium and should provide years of protection. Mounting using velco is acceptable or alternatively use the 2 screws on the front cover as described before.



Should the unit become wet, it should be thoroughly dried prior to use. Should the unit be massively cooled condensation may occur. The housing should only be cleaned with a slightly moist non-abrasive cloth without any cleaning agents. Scratches and abrasion can damage the housing.

5. Connectors

From left, the first connector is the SMA socket for the TX/RX antenna. The second is the RJ45 data port and the 3rd is the MCX female GPS socket



6. Power/Data

The eight-pin RJ45 Power/Data socket accepts an eight-pin connector (if necessary, a six-pin connector) that is locked in place. The pin connections are largely in-line with those set out in IGC GNSS FR Specifications², so that the same cables may be used both in the air and on the ground, as used for modern IGC-compatible flight data recorders. The key to the connections is defined by the sequence from left to right, not the numbering³:

FLARM Port (left hand side socket)

1. +6 to +26 VDC (recommended +12 VDC), linked with Pin 2 inside the unit
2. +6 to +26 VDC (recommended +12 VDC), linked with Pin 1 inside the unit
3. FLARM supplies GPS out fixed baud speed and sentences for glide computer
4. GND, with Pin 7 and 8 linked to the unit
5. Tx = FLARM transmits data (PC-side to SUB-D9 Pin 2)
6. Rx = FLARM receives data (PC-side to SUB-D9 Pin 3)
7. GND ('negative'), linked with Pin 8 inside the unit (PC-side to SUB-D9 Pin 5)
8. GND ('negative'), linked with Pin 7 inside the unit

During flight operations at least Pins 2 and 7 must be connected. An 8-pole (or if necessary 6-pole) ribbon cable with an RJ45 push-fit connector, or an 8-pole twisted-pair patch cable with RJ45 adapter, are equally suitable. A suitable patch cable open at one end is supplied with FLARM¹ and must be configured to the aircraft connector in the aircraft. When using an 8-pole cable, Pins 1=2 must be joined. Likewise Pins 7=8. If the remaining wires are not used, they must be individually insulated and must not be soldered or twisted together - not even in pairs.

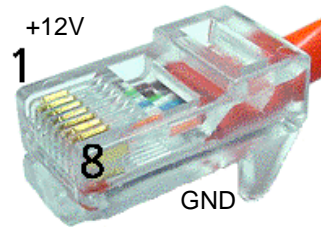
Additional note. On the supplied cables Blue goes to pin 2 , orange/white to pin 3 and blue white to pin 5. If making a plug to go to a PDA then use a DB15 male and swap pins 2 and 3.

² Chapter 2.7.2.2.7.2, www.fai.org/gliding/gnss/tech_spec_gnss.pdf

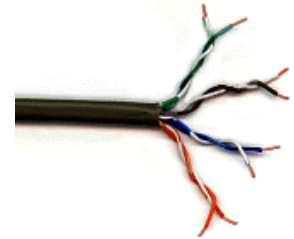
³ FLARM uses Pin-numbering in-line with IGC specifications. The usual numbering is in reverse order.



There must be a direct electrical connection between FLARM and the aircraft battery. This connection must be secured with a 500 mA fuse. Essential electrically operated flight instruments must not draw their power through the FLARM fuse. It must be possible for the pilot to interrupt the power supply to FLARM during flight by means of a switch or circuit breaker without affecting other essential aircraft systems. This might be necessary if the pilot suspects that FLARM may be interfering with another on-board system, the suspected presence of smoke, the smell of smoke, or flying in a country where the use of FLARM is not permitted. In spite of the reverse polarity protection, it is important to check for correct polarity during installation; in particular the power supply and data wires must not be interchanged. The transparent connector allows for a visual check of the cable colour codes, ensuring that the open end of the cable is correctly configured. When using patch cables neighbouring wires on Pins Pin 1/2, 3/4, 5/6 and 7/8 are *usually* (but not always) twisted together. Neighbouring wires *usually* have the same colour, though one of the pair has a colour alternating with white.



Connector with Pin numbers, tab down



Open ended Patch Cable

In normal configuration Pin 5 transmits the most important NMEA-0183 Version 2.0 compatible GPWGA and GPRMC codes at a fixed data rate of 19.2KB * **NOTE : under no circumstances must this speed be changed otherwise the display section and alarms will cease to work** (see document 'Data Port Specifications'); from Hardware version 2 also Garmin proprietary PGRMZ codes with barometric altitude information. Further codes are provided for third party applications (e.g. external displays). These are described in a separate document 'Data Port Specifications'. This document also describes how FLARM may be configured. A PC application exists for this called "FLARMT00L".

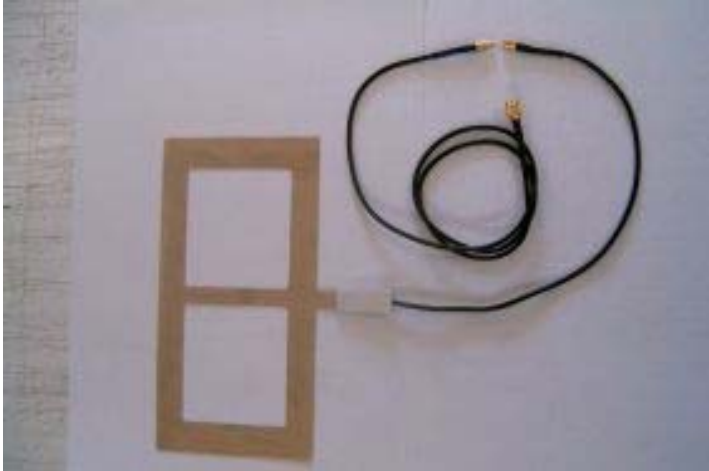
8. GPS antenna

The supplied GPS antenna has 1 metre of cable which if not used can be simply coiled up and tied off. Location of the antenna is important. Avoid locating too far down in behind the panel as it really needs horizon to horizon coverage. Best place is directly under the panel cover, make sure the cover is fibreglass and has not foil placed under it for shielding. Make sure a compass or other equipment are not over the antenna. Try and locate away from the transmitting antenna for the minioz. Poor location WILL result in drop outs during flight.



9. Radio Antenna

The rear of the housing has an SMA connector onto which is screwed the cable going to the TX/RX antenna. Supplied is a small vertical stubby antenna which has to protrude out and above the dash if possible. Best way if not removing it is to Velcro the minioz underneath the dash cover and drill a small hole to stick the rest of the antenna through. Alternatively we sell a 500mm extension cable that has a screw bulkhead connector one end for mounting to a bracket. For gliders we highly recommend our 4db loop antenna or ON Canopy type. This antenna exhibits both horizontal and vertical polarisation so it minimises fading and provides a much improved signal. It comes with 1 metre of cable with a quick disconnect for removing the canopy. This has tiny filament wires much like a car demister on a rear screen so you don't see it when looking ahead.



If using a miniOz in a powered aircraft we recommend an external antenna, our mobile one 4db. It has 1.5 metres of cable and has an SMA connector already crimped on. The antenna mounts through a small 12mm hole. This will ensure maximum signal.



10. Firmware uploading

Software updates can be obtained by checking the Flarm website at www.flarm.com, go to the updates page. Supplied with your minioz is the latest firmware update as well as other utilities.

* Note , the following refers to a windows XP installation, consult an expert if you have 95/98 or ME/2000. The software has been tested on all platforms

On the CD locate the directory FLARM. This can be done using windows explorer and opening the CD rom drive. Some CD roms will automatically open the CD directory.Right click on the main directory called OzFLARMCD and copy.

Go to your hard drive (usually C is available) Click once on the C drive, then right click, select paste. You should now have the directory OzFLARMCD installed on your C Drive.

Located in this directory is the sub directory FLARMTOOL. Double click on this file to open. You will see 2 executable files called flarmsoftware_308.exe and flarmupdate_308.exe (in the case you have a later version of OZFLARMCD the _308 may be _310 , or 312 etc as these will be later versions than the original 300 (version 3)).For new installations double click on the flarmsoftware_308.exe. This is a self installing windows program. Let windows use the default directories and menus suggested by the installer. If you

already have a version of flarmtool then use flarmupdate_308.exe which will overwrite some of the older files with new ones.

Once installed you can find the start menu in the program files section of windows. (START ,



then all programs, scroll to you see the FLARM menu, click to see FLARMTOOL, double click on this to activate.



Flarmtool allows you to:

Update the internal microcontroller with the latest FLARM firmware update.

Change system settings such as frequencies, logger details etc.

Check the units serial number and database revision (if loaded)

Download the IGC logger files.

Upload the obstacle database.

Using FLARMtool.

Make sure the data cable is inserted in the FLARM port on the rear of the MiniOz unit. Connect power to the MiniOz



then all programs, scroll to you see the FLARM menu, click to see FLARMTOOL, double click on this to activate.



Double click on this icon to run the FLARMtool

If using FLARMtool for the first time it may be in german. Simply go to the file tab (Datei), hit enter or single click, select Einstellungen, then select English. Note current software version is 3.02, also if you see an error detected in the obstacle database this is normal as we currently have no Australian obstacle database.

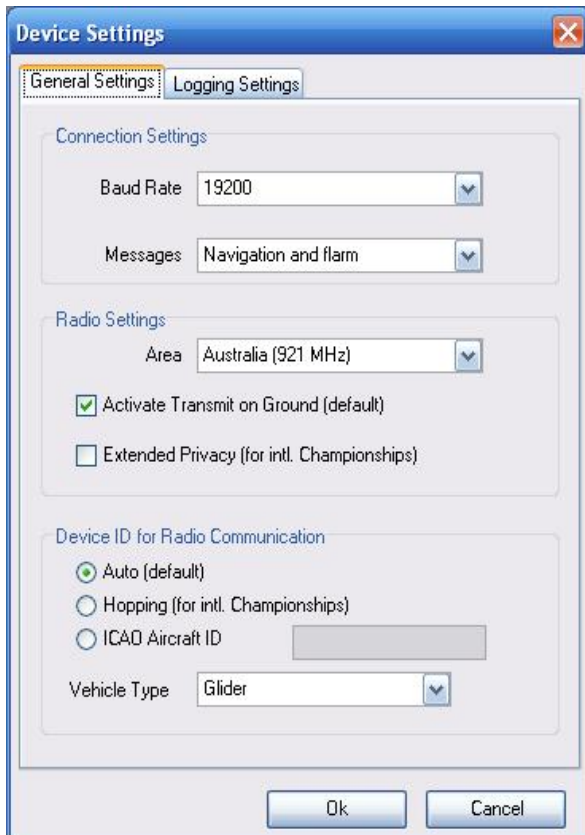


The default com port is com1, if you are using a different com port then select file, flarmtool settings, then select the appropriate com port. You should get the screen above if the MiniOz is connected properly, if you are still not getting this screen that has a serial number, hardware version and software version then something is wrong with the port connections. Check all wiring. You can use a terminal program like hyperterminal to check to see if there is data coming out of the MiniOz unit. I suggest for those who are not wise to these tools to ring a friend and get some advice.

Assuming you are getting the correct screen, if FLARMtool detects an older version of the firmware it will prompt you to update this. Follow the update screens, you must tick yes for the end user agreement. If a download does not happen after hitting yes, try depressing the reset button for a few seconds whilst connecting the power then release (flarmtool refers this as the HOLD button)



If you already have the latest FLARM software installed then you can proceed to the settings page. To do this click on FLARM then settings:

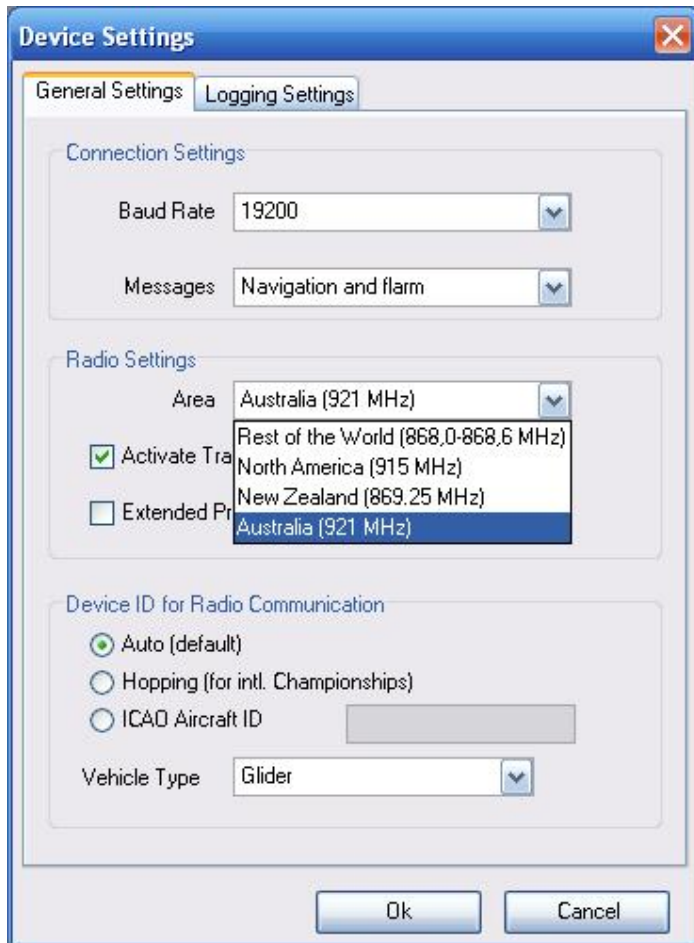


The following screen will appear. **MOST IMPORTANT – NEVER UNDER ANY CIRCUMSTANCES CHANGE THE DEFAULT BAUD RATE EVEN IF A THIRD PARTY PRODUCT ASKS YOU TO – THIS WILL STOP ALL COMMUNICATIONS WITH THE DISPLAY!**

Leave the messages settings as this default , again, **DO NOT CHANGE.**

Radio settings. If your unit was purchased here in Australia it should already be set to Australia (921 Mhz)

This is the default setting we use here. If you change this then you will not be able to communicate with other OzFLARMS in Australia. Should you travel overseas you can change this setting for the corresponding country and it should then be compatible.



The next option sets the vehicle ID. Hopping is not recommended for use, default is Auto which has flarm choose an ID based on the units serial number. ICAO is recommended as well, you can obtain your ICAO number from your certificate of registration form (issued by the authority) This will appear as a series of zeros and ones, example:

VH GAW 011111 000001111001110110

007C1E is the converted value. This then needs to be converted to a 6 digit hexadecimal number. This is beyond most pilots understanding so to make it easy simply cut and paste the code and email to nandrews@rf-developments.com I will then reply with the hex code. Uncheck pseudo random and check Icao, enter the code and press O.K

Some programs use the ICAO callsign to identify the aircraft on SEEyou or other PDA and voice units. This is very handy as it allows one to call the station on the radio and let them know they are FLARM identified.

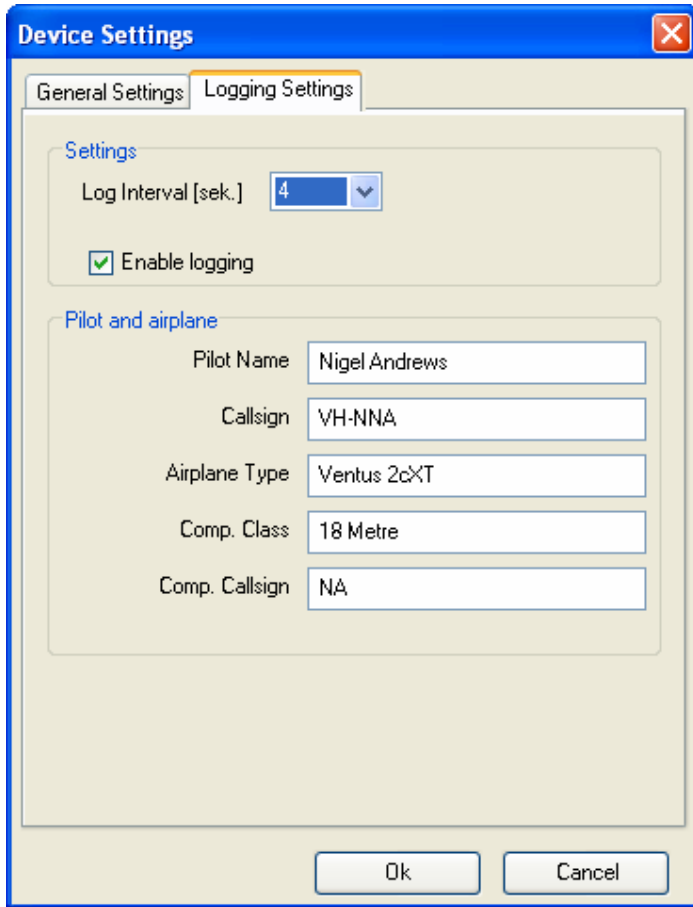
NOTE: For those who want to set the privacy flag so that other aircraft cannot “see” you until you are , 1.2km (they still detect potential collisions to whatever the real receive range is – this is a display thing only) then set the extend privacy flag BUT remember to reset this when flying outside comps as it provides a handy pre warning of traffic to other users.

Next screen is the logging settings. Click on this to enter the screen.

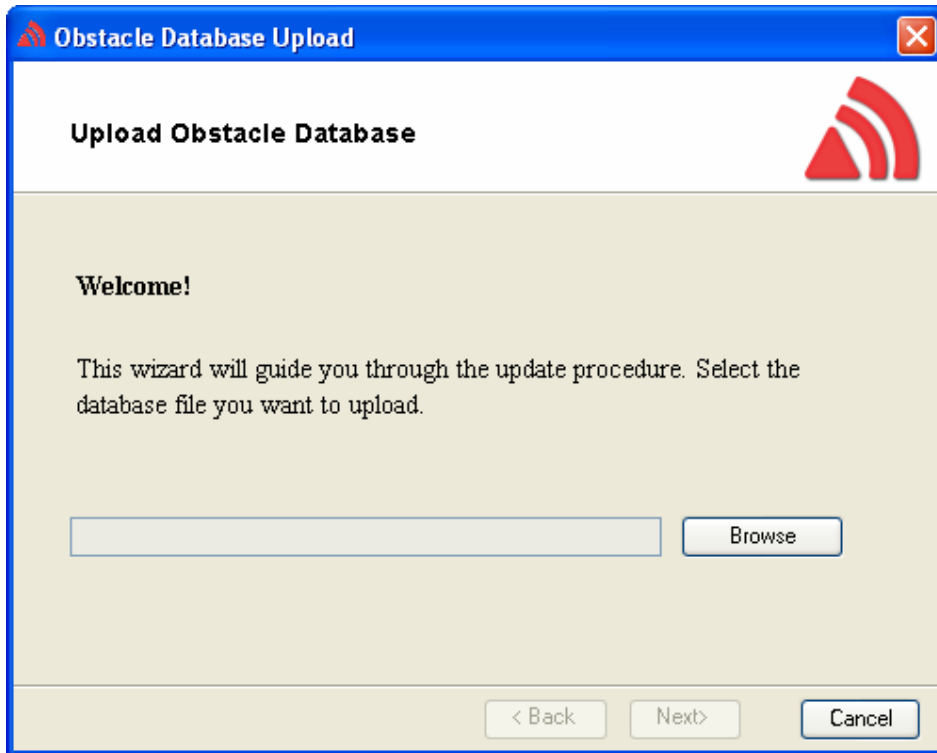
Logging interval default is 4 seconds. MiniOz can log 16 hours of data at 1 second intervals, so 4 seconds is 64 hours! The memory is non volatile (means it is stored for over 100 years if not overwritten). The data will overwrite the earliest log first, thus ensuring you always have the last logs available. There is no need to reset anything. 1 second logging gives you a really cool view when using SeeYou to analyse thermalling!

The rest of the entries relate to IGC style entries which will identify you when used as a logger at competitions either as a main or a back up.

This logger has NO iGC approval, it cannot be used for badge or record flying although a submission has been made to allow it for badge flying up to a certain level.



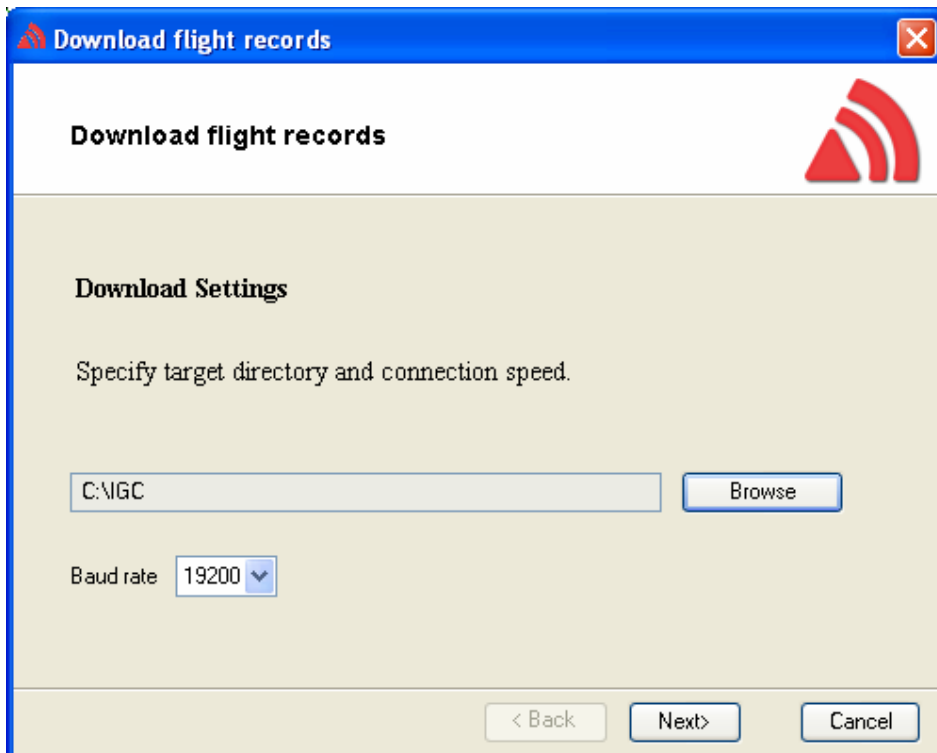
The next screen to access is the upload database. Entering this you will be presented with this screen:



Currently we have not made a database for Australia. The only available one is for the Swiss Alps. We plan to introduce limited databases covering competition areas and mountain flying sites that have power lines etc strung across valleys. This is work in progress. If you have a database available please make it accessible to others. Contact us to have it posted on our web site.

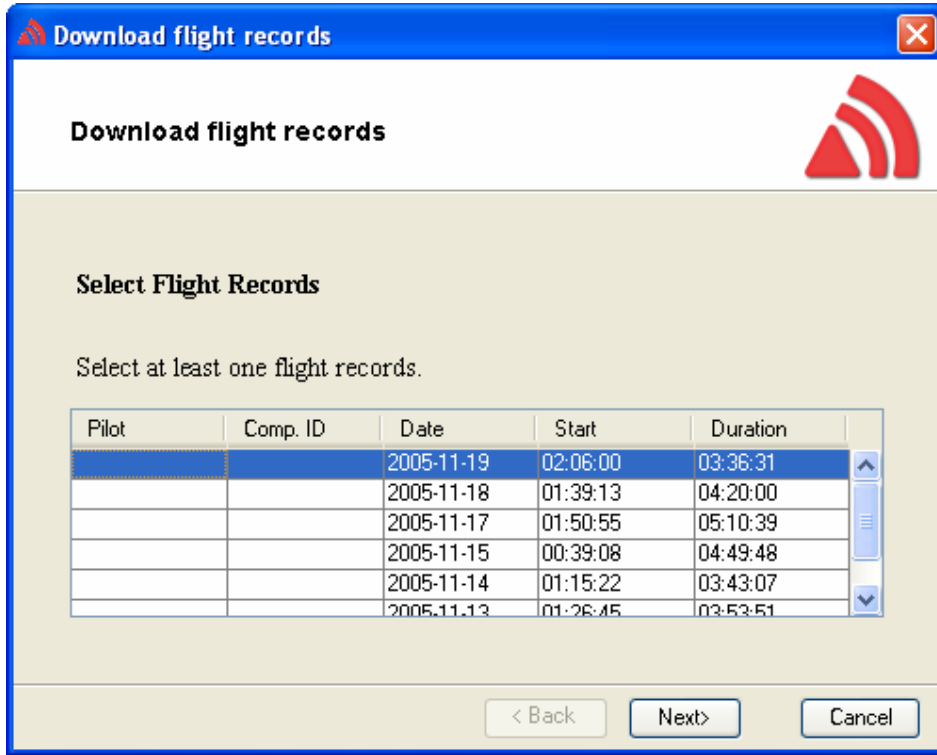
Esc to get out of this menu.

The final option is to download IGC files by clicking on the floppy disk symbol. We advise setting up a directory in C drive called IGC



Make sure the baud rate is set to 19200 just to keep things standard. Hit next:

You will have a selection of flights to choose from, normally the name and comp number would be displayed, this unit didn't have the IGC info entered. Once it is downloaded the file can then be viewed on SeeYOU or another IGC viewer.



That concludes the use of FLARMtool. Please remember to periodically check the farm website for the latest update.



11. Limitations

FLARM, OzFLARM and MiniOz are designed and built as a non-essential situation awareness only units to support the pilot, and cannot always provide reliable warnings. In particular, FLARM, OzFLARM and MiniOz do not give any guidance on avoiding action. Under no circumstances should a pilot or crewmember adopt different tactics or deviate from the normal principles of safe airmanship. The use of FLARM, OzFLARM and MiniOz is solely at the discretion of the commander and his crew. Operation must be preceded by thorough familiarisation by the commander or his delegated crewmember with the Operating Manual.

FLARM, OzFLARM and MiniOz can only warn the pilot of the presence of other aircraft that are also fitted with FLARM, OzFLARM and MiniOz or compatible equipment, or warn of obstructions that are stored in the internal data bank. FLARM, OzFLARM and MiniOz do *not* communicate with Mode A/C/S transponders, and remains undetected by ACAS/TCAS/TPAS or Air Traffic Control systems. Likewise, FLARM, OzFLARM and MiniOz does not communicate with TIS-B, FIS-B or ADS-B.

At present FLARM, OzFLARM and MiniOz is not certified by the Civil Aviation Authorities and has not been tested in accordance with the normal aviation requirements (e.g. DO-160E). The FLARM software development s commensurate with Level E of DO-178B; in other words a failure of the unit will have no effect upon aircraft operation and does not increase crew workload. The FLARM, OzFLARM and MiniOz obstruction data bank is not certified.

Air band radio frequency allocation and licensing conditions may vary from country to country. The aircraft commander is solely responsible for ensuring that FLARM, OzFLARM and MiniOz is operated in conformity

with the respective licensing conditions. No licence is required to operate FLARM,OzFLARM and MiniOz in Australia.

Until further notice FLARM,OzFLARM and MiniOz may not be used in the USA or Canada without written authority of FLARM Technology, or in aircraft that is registered and/or insured in the USA or Canada. Likewise, operation of FLARM is forbidden in aircraft in which one or more of the occupants resides in or is a citizen of the USA or Canada. Likewise, use of FLARM is forbidden if the aircraft concerned takes off from, makes an intermediate or final landing in the USA or Canada.

RF Developments, its associates, development team, suppliers, manufacturers and data suppliers accept no responsibility for any damage or claims that may arise from use of FLARM,OzFLARM and MiniOz.

12. Technical Data

The following data are provided without guarantee and may be altered at any time without notice.

Height:	<i>25 mm housing (without internal radio antenna) 100 mm overall height (with internal radio antenna)</i>
Width:	<i>55 mm</i>
Length:	<i>88 mm housing (without cable connectors) 95 mm overall length including rear TX/RX socket</i>
Weight:	<i>98 g</i>
Power supply:	<i>external power supply 6.0 to 28.0 (peak voltage up to 30.0) VDC via RJ45, recommended value 12 VDC; direct galvanic link to aircraft battery via an obligatory 500 mA circuit breaker, separated from essential aircraft systems; MiniOZ has a reverse polarity protection</i>
Power drain:	<i>typically approx. 55 mA at 12 VDC, approx. 37 mA at 24 VDC (normal operation without warnings or external display), a collision warning may double these values</i>
Serial data:	<i>bi-directional RS232, compatible with NMEA-0183 Version 2.0, standard message format GPRMC, GPGGA, data rate 4.8 to 57.6 kBaud, additional NMEA proprietary sentences PFLA and PGRMZ (described in a separate document)</i>
GPS:	<i>16-Channel WAAS/EGNOS compatible GPS engine, external 50.Ω active antenna with 2.5m RG-174U cable, MCX connector, 3.3V, dimensions depending upon the antenna used, usually rectangular 45x45 to 50x50 mm, oval or circular of approx. 12 mm thickness</i>
Radio:	<i>SRD- -Band 915.0 to 928 MHz (Australia), other frequencies depending upon configuration less than 1 % Duty Cycle, Peak Pulse Power 10 mW (ERP), internal λ/4 antenna (screw-fitted to conventional SMA connector), Range approx 2 km, possibly up to 5 km, depending upon antenna and installation</i>
Temperature:	<i>Operation: -10 to +60 °C, storage: -20 to +70 °C, no certification in accordance with DO-160E Sections 4 and 5</i>
Intercom:	<i>not provided, suitable third party units are available</i>
Vibration:	<i>Use in conditions of strong vibration or turbulence should be avoided or subsequently checked prior to continued operation, no certification in accordance with DO-160E Section 8</i>
Country of Origin:	<i>Australia</i>

DECLARATION OF CONFORMITY

Complies with AS/NZS 4268:2003
Low power transmitting and receiving device.



RF Developments N-15142

ABN 60 789 837 451

This device must be operated in accordance with the manufacturers recommended installation and users guide. Under no circumstances should this equipment be modified. Modifications will render the unit un approved and removes all warranties.