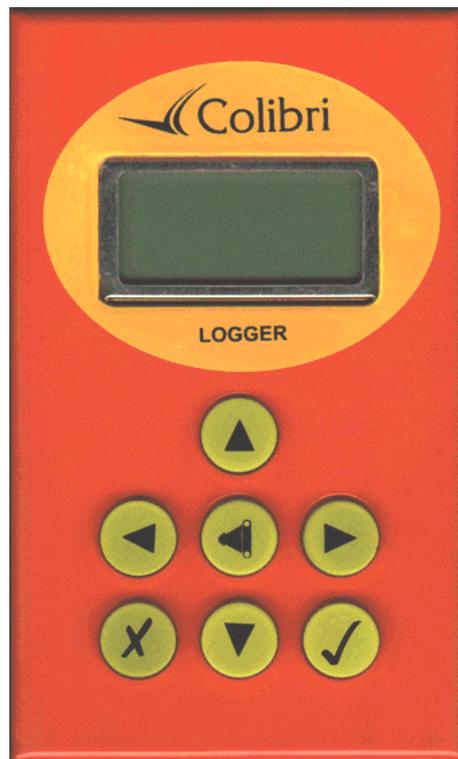


FILSER ELECTRONIC GmbH

Colibri FAI Logger

DRAFT 25.11.98



COLIBRI FAI Logger

V 1.0

1.General data

Seite: 1

Colibri FAI Logger is an approved flight logger. The unit is extremely small and practicable (55x100x32mm). All the manipulation is done via seven keys which are painted with symbols. All data are displayed on a 2x8 matrix display. One BNC connector is used to connect the GPS antenna to the unit. After the power is connected (telephone connector) is the instrument immediately on.

Technical data:

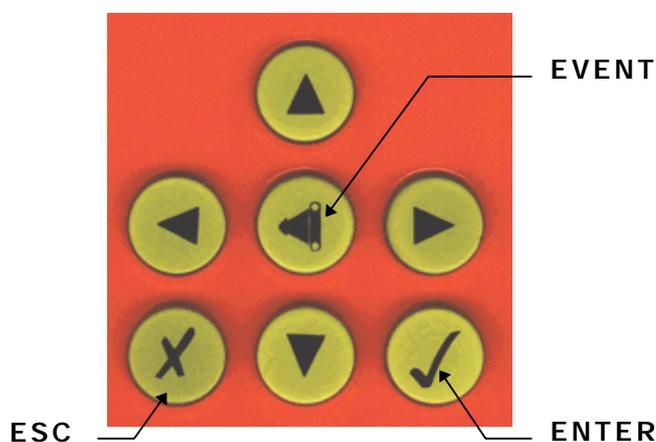
- | | |
|--|-------------------|
| - Power Supply | 10-24 V DC |
| - Current consumption | ca. 100 mA / 12 V |
| - 11 channel GPS receiver | |
| - NMEA output | |
| - Dimensions | 55x100x32mm |
| - Weight | 220 g |
| - Engine noise level as standard equipment | |
| - Zoomer | |

2. Keys and the philosophy of manipulation

All necessary manipulation could be done using seven keys:

- arrow down
- arrow up
- arrow right
- arrow left
- enter
- escape
- event

The unit has four main menus, to select the menu is to press horizontal arrows (left or right). After the power on is Apr. 20 seconds displayed the program version and capacity of the memory in flying hours. After this initial procedure jumps the logger into **GPS status menu**.



After right arrow press follows the **Navigation menu** which allows navigation under bearing, distance and ground speed. Normally all turning points which are stored in the data base could be selected and also edited.

Set up menu is not for flying and is normally used before the flight to define logger and task parameters. All pilot and glider data are defined in this menu too.

The View logger menu is for the flight analysis. All the flights being stored in the unit could be analyzed whit out data transfer to the PC (immediately after landing).

All four menus have normal **sub menus** to enter to the sub menu use vertical arrows. For detailed information see descriptions of menus.

ENTER key always starts edit procedure and is use like confirmation

ESC key has two functions, go back and to accept the whole row in edit procedure. During the flight this key starts the wind calculation procedure.

3. GPS Status menu

This menu is active after the instrument is switched on. There is no edit function, that means the data could be only read from the display. Using arrows following pages of GPS status are displayed:

GPS OK
SAT=6

GPS status

LAT N 45
00.12
LON E016
45.15
actual coordinates

ALTITUDE
230m
altitude (1013)

12:13:44
12.05.98
time

BAT=12.1
DOP =3.3
battery voltage and DOP

LOG:STOP
Mem89.6h
logger status STOP or run and logger capacity

The logger capacity doesn't mean rest useable memory it depends only on settings of logging time. After the flight the number will not be changed, but a new setting will change the number.

4. Turning point menu

Allows navigation to the selected turning point and edit the turn point data.

123t AJDO
126b235km
123 is track, 126 bearing, 235 distance and four letters of the turning point designation

A new turning point could be selected only using vertical arrows. After a short press a new turning point which follows the old one under alphabet will be selected. For Apr. 1 second is the turning point designation shown in 8 character form to be sure about the name. This data base has a capacity up to 600 turning points. To make selection quicker there are special algorithms which allows jumps over more points. After the arrow is pressed continuously the jumps are bigger and bigger.

After ESC in this menu the wind calculation procedure is started and a message wait 2 is displayed.

Wind
WAIT 2

This method based on ground speed changes during the circling affected with wind. To calculate the wind two circles are necessary (constant speed and no changing of position). After the procedure is finished the wind speed and direction are displayed.

After Enter following screen will appear:

TP
MENU

After using arrows four sub menus will follow.

5.1 LOGGER SETUP

All important logger parameter are defined in this menu. After Enter following settings could be done.

NORMAL: after Enter is the cursor activated which enables logging interval settings

12s

NEAR TP: logging interval near Turning point

2s

.

NEAR RAD: inside this radius Near TP logging interval is used

1.0km

PEV INT: this setting defines logging interval after event key was activated

2s

PEV FIX: number of fixes stored after event key is activated

30.

For example: PEV INT 2s, PEV FIX 30 setting

After event is activated 30 fixes each 2 seconds will be stored

K Record setting is not active.

5.2 DECLARED TASK

This a very **important setting**, using this procedure the task which will be flown must be declared before the flight. A flight without declaration could not be evaluated like badge or record flight. After Enter on **DECLARED TASK** following sub menus could be selected.

**COPY
TASK**

**DELETE
TASK**

or

**EDIT
TASK**

The Edit procedure is used to change the already declared task or built a completely new one , delete clears the declared task and copy makes a copy from TP menu (100 task in memory).

The FAI task has following structure:

TAKE OFF

START

TURNING POINTS (0- 9)

FINISH

LANDING

Example: declaration of a completely new task using EDIT TASK function.

After DECLARED TASK and Enter select **EDIT TASK** and press Enter.

T:NOTPRG after Enter **SELECT** and Enter **TP NAME:**
TAKE OFF **TPOINT** *********

Selection of turning point is done by well known method replacing stars with letters or numbers. After the Take off is selected continue the procedure using **INSERT** to define start point and the same way is used for all turning points. Landing is automatic set like Take off and the turning point before landing is finish (F). To change landing for another Turning point use select. Using Arrows (vertical) the pilot is able to check his task before leaving the declaration

Important!

The procedure is finished after pressing **ECAPE**.

The COPY TASK procedure copies one task from TP menu (see 4.4), the right task is selected using arrows. Using this method the take off and start are always the same points, the same is by landing and finish. After the task is copied a normal edit procedure could be used to modify it.

All this data could be transferred via PC using Flight Info.

5.3 TPOINT ZONE

This setting defines TP confirmation method, photo sector or cylinder.

IMPORTANT: using cylinder confirmation, the NEAR TP RADIUS defines cylinder where the acoustic signal will be activated to warn the pilot. After selected photo sector the acoustic signal will be activated exclusively inside photo sector.

5.4 TPOINT BEEP

To adjust acoustic signal to the pilot two parameters **INTERVAL** and **PERIOD** could be defined. After adjusting the BEEP TEST could be started to check the setting.

5.5 I-RECORD DATA

This menu extends logging data if set Y.

GSP ground speed
TRM magnetic track
TRT trough track
TEN total energy
WDI
WVE

All this settings are not obligatory but if use they will reduce the memory capacity.

5.6 J-RECORD

The J Record has the same setting like I Record is not obligatory an reduces the memory capacity.

5.7 FLIGHT INFO

Information about pilot, glider and observer are to be input using this menu

PILOT:
GLIDER:
REG.NUM:
CMP.NUM:
CMP.CLS:
OBSERVER:

All this data could be transferred using PC.

6. VIEW LOGGER (after flight statistics)

All flights stored in the instrument could be evaluated using this menu. Downloading the flights to the PC will not delete the memory. If the memory is full the oldest flights will be lost, that means an automatic overwrite procedure is present. Using Password 99999 all flights could be deleted. For flight evaluation change over to:

VIEW LOGGER

and press Enter. Now you are able to observe all flights stored in memory.

Flt.: 2
30.07.98

It is the second flight flown on 30.07.98

TAKE OFF
12:33:55

LANDING
15:45:11

DURATION
03:12:00

DATE
30.07.98

TASK
STAT.

After Enter is the task statistics calculation started

WAIT
23%

The unit calculates selected task and needs some seconds to finish the job (depends on flight length)

TSK.dist
530 .5 km

Task distance

FINISH !
v= 88.1 k/h

Task regular finished, task speed 88.1km/h

Vario :
1.3m/s 22%

Vario average,percentage of climbing

Track d.
580,6 km

Flown distance under truck

To start the leg statistics press right arrow.

Leg 1 / 2
56.7 km

Using down arrow further items will follow

From:
CELJE AD
500m
12:33:55

To:
BRIDGE
500m
17:14.22

Duration:

2:44:45

**Speed
78.5 kh**

**XC speed
79.8 kh**

XC speed means the hypothetical speed between two turning points over flown on the same altitude (not real flown).

**Vario:
4.5 m/s 18%**

**Track d.
79km**

Using arrow to the right next legs could be evaluated.

7. Preflight briefing

The unit is ready immediately after GPS OK message. For the flight documentation only, doesn't matter is the task declared or not. A non declared flight has normally only flight statistic. For all flights for badges and records is obligatory to declare the task before take off.

Some remarks:

- define cylinder,photo sector
- declare the task on ground
- switch the Colibri Apr. 5 minutes before take off on (will not reduce the memory)
- after landing dont switch the instrument immediately off
- wait till message **security check** will appear, or

**LOG:STOP
Mem.89.7h**

in GPS status menu.

8. PC communication

Using PC communication following data could be transferred via PC and Colibri.

- read logger
- TP and TSK data
- APT database (using LXGPS program)
- flight info (bidirectional)

For the communication is necessary to run the LXFAL program. One special cable is delivered whit the unit which allows PC communication.

Procedure

Connect both (PC and Colibri) via special cable and run the LXFAL program and press T.

**PC
Read logger
Setup logger
Read flight info
Write flight info**

**Colibri

19200 bps
CONNECT**

Read TP and TSK

Write TP and TSK

After pressing T connect message will appear on Colibri and all commands are now sent from the PC. From instance after **write flight info**, the data about pilot and glider will be transferred from PC into Colibri. Read command will transfer data from Colibri into PC.

9.0 Wireing

The Colibri is immediately on after power is applied to the connector (no on switch). Each unit is supplied with two cables:

- power supply cable (+red, GND black)
- PC cable with power supply and PC connector

Power supply cable extensions:

- output for LED for GPS monitoring
- NMEA output

Both modifications could be done by users.

-yellow /white	GND
-black	Rx
-red	Tx (NMEA)
-green	LED Anode
-white	LED Katode
-blue	+12V

10.0 Appendix

Some examples of flight evaluation using LXFAI program.

Transfer		Edit		Logger		Setup	
FILE: 67df0ew1.igc		INTEGRITY: OK		FLIGHT DATE 13.07.96			
GPS Device: FDK/GSU-14		Pilot: ERAZEM_POLJUTNIK		Glider: NIMBUS_3/25		Registration: S5-3068	
Competition number: CC		Class: OPEN					
Turning point		Latitude	Longitude	Dist.[km]	Course		
TAKE OFF	SZEGED	N46°15.470'	E020°05.400'	---	---		
START	KKDOR+	N46°16.500'	E020°03.000'	---	---		
POINT 00	DOBOZHID	N46°43.500'	E021°13.300'	102.0	60		
POINT 01	TORTEL	N47°07.120'	E019°56.030'	107.2	294		
FINISH	LINIJA	N46°14.890'	E020°05.610'	97.6	173		
LANDING	SZEGED	N46°15.470'	E020°05.400'	1.1	351		

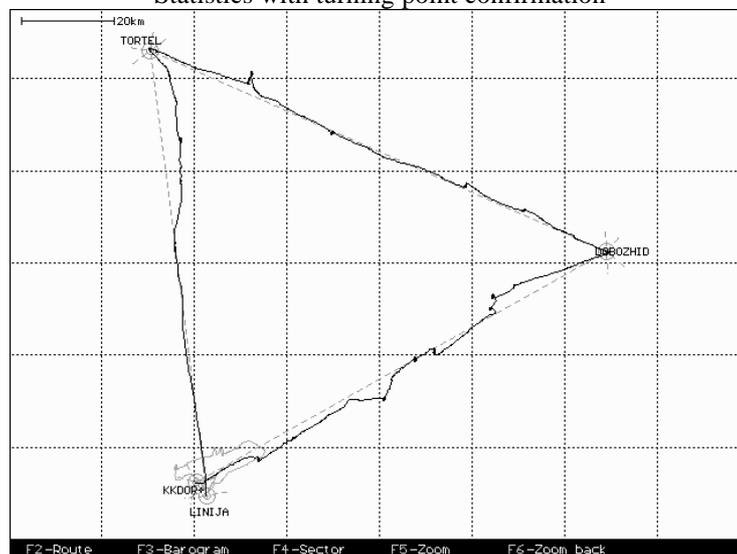
F1 Help F2 Statistics F3 Print F4 Graphics F5 Convert F6 Task F7 Fly

Task specification with integrity control

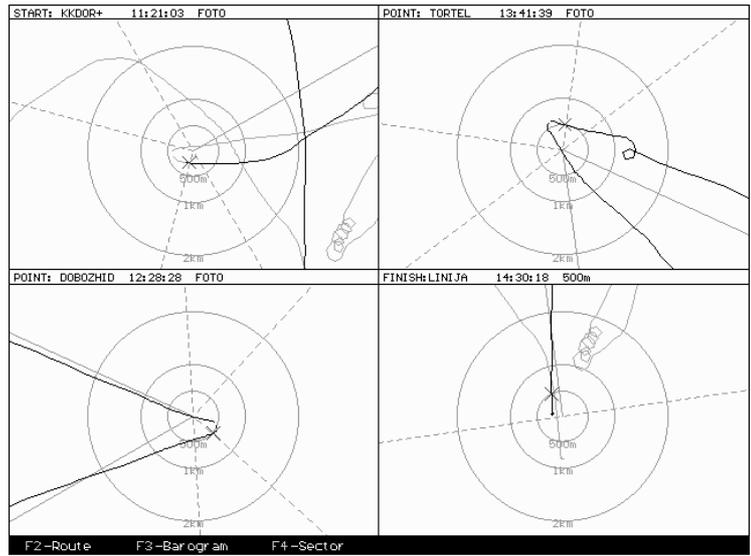
Transfer		Edit		Logger		Setup		
FILE: 67df0ew1.igc		FLIGHT DATE 13.07.96						
Pilot: ERAZEM_POLJUTNIK		Glider: NIMBUS_3/25		Registration: S5-3068				
Flight statistics				Task statistics				
Start:	10:30:29	Task finished OK!						
Finish:	14:32:44	Total task distance:	306.7km					
Duration:	4:02:15	Task speed:	97.23km/h					
Tr.point	Lat./Lon.	Time	Dist.[km]	v[km/h]	Type			
KKDOR+	N46°16.50' E020°03.00'	11:21:03	---	---	FOTO			
DOBOZHID	N46°43.58' E021°13.38'	12:28:28	102.0	90.74	FOTO			
TORTEL	N47°07.12' E019°56.03'	13:41:39	107.2	87.87	FOTO			
LINIJA	N46°14.89' E020°05.61'	14:30:18	97.6	120.31	500m			

F1 Help

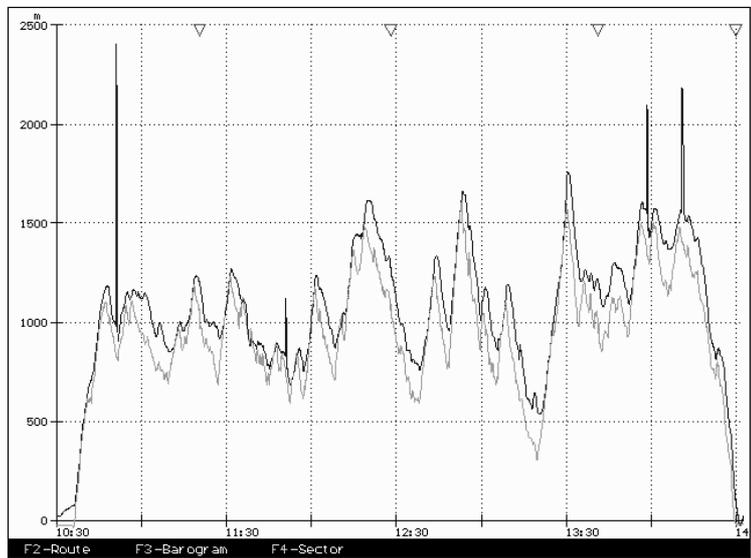
Statistics with turning point confirmation



route

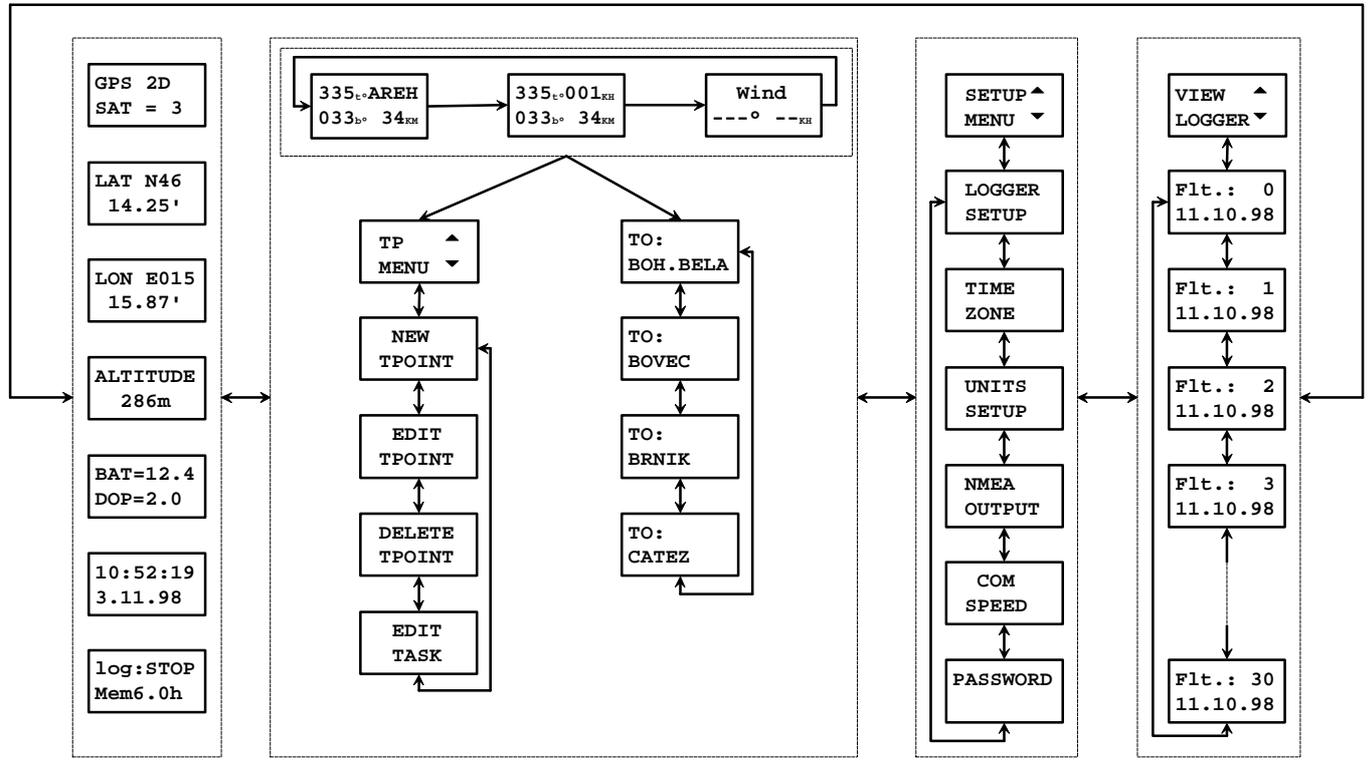


turning point confirmation graphic



barogramm (pressure and GPS altitude)

COLIBRI - Menu Structure



THE FAI INTERNATIONAL GLIDING COMMISSION (IGC)
GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)
FLIGHT RECORDER (FR) APPROVAL COMMITTEE (GFAC)

FAI web site: <http://www.fai.org>
IGC web site: <http://www.fai.org/gliding>
IGC GNSS web site: <http://www.fai.org/gliding/gnss>
IGC GNSS site for software: <ftp://www.fai.org/gliding/software/gps/pc>

To: FAI for IGC email mailing list
Internet newsgroup rec.aviation.soaring
IGC GNSS web site under "List of Approvals"

Copy: Manufacturer

26 October 1998

VERSION 2 IGC-APPROVAL FOR GNSS FLIGHT RECORDER
LX NAVIGATION - LXN COLIBRI MODEL 1.0

This document gives formal approval for this GNSS FR equipment to be used for validation of flights under the FAI Sporting Code Section 3 (Gliders and Motor Gliders) for FAI badge and record flights, subject to the conditions and notes given later. This Version 2 adds the Engine Noise Level (ENL) function to the original approval dated 31 Aug 98, which it supersedes. It is posted on the FAI/IGC GNSS web site given at the top of this page. FAI reserves the right to alter the terms of this approval.

GFAC tests are concerned primarily with data accuracy, security, data transfer, and conversion to the standard *.IGC file format. Other aspects of the equipment may not be tested and are a matter between the FR manufacturer and customers.

The attention of NACs, Officials and Pilots is drawn to the latest edition of the FAI Sporting Code Section 3, including amendments. Annex B to the Code deals with equipment used in flight validation, and a separate document published by FAI is entitled "Technical Specification for IGC-Approved Flight Recorders". Copies of all of these documents may be obtained from the FAI/IGC web site (click RULES).

It is recommended that a copy of this approval including its annexes is kept with each unit of the equipment.

Manufacturer:

LX Navigation D.O.O.
Tkalska 10, 3000 Celje, Slovenia
Tel: +386 63 490 46 70
Fax: +386 63 490 46 71
Email: erazem.polutnik@fs.uni-lj.si; or avionic2@mail.siol.net
Web: <http://members.xoom.com/lxnav/>
Contact: Erazem Polutnik, Ctomir Rojnik

Equipment:

Hardware: Version 1.0h or later, as shown on the LCD on start up. The FR consists of a rectangular metal case about 97 x 58 x 34 mm, and weighs about 210 grammes. A 30 x 14 mm LCD is on the 98 x 58 mm face together with seven buttons, and a RJ11 rectangular external electrical connector and a bayonet-type antenna connector are on an end face. National regulations may apply to electrical and electronic equipment, such as the EC "CE" mark for compliance with EC directives on EMC and voltages. Compliance with such regulations is not the responsibility of FAI. This equipment is understood to have the EU CE mark.

Firmware: Version 1.0h or later, as shown on the LCD for a short time after applying power.

Software: LX Navigation DATA, CONV and VALI files Version 4.2a or later. The version number appears on the screen when the file is executed. The file DATA-LXN.EXE is for transferring flight data from the FR to a PC and produces two files for each flight, one in *.LXN and the other in *.IGC file format. The DATA file has unrestricted access and is available from the FAI/IGC GNSS web site. The file VALI-LXN.EXE is for validation of the electronic security and data integrity of the *.IGC files by NACs and FAI, and is also available from the IGC web site. The DATA, CONV, and VALI files are copyright of the FR manufacturer but are freeware. The file CONV-LXN.EXE is for converting LXN format files to the IGC format if the original IGC format file is not available.

CONDITIONS OF APPROVAL:

1. **Permitted Connections to the Main (FR) Module.** The external connector consists of a female 9 x 6 mm RJ11 socket with 6 connections, placed on the end of the case (as used for some modems and telephones). The antenna connector is the standard 9 mm diameter bayonet type, and is situated next to the RJ11.

2. **Security of the Equipment.** GFAC is presently satisfied with the physical and electronic security of this equipment. See para 4 overleaf on security seals.

2.1. **Installation in a glider:** The FR may be fitted anywhere in the glider, subject to para 3.2. If the GPS antenna is accessible to the crew in flight, no attempt must be made to inject data; any abuse of this may lead to a future requirement to place the antenna out of reach of the flight crew.

2.2. **Motor gliders:** When the ENL function is enabled (see Annex A for method), the microphone system automatically produces an ENL (Engine Noise Level) value with each fix up to a maximum ENL value of 999.

2.3. **Sealing of data ports and plugs:** no present requirement, but no attempt must be made to pass unauthorised data into the FR.

3. **Check of Installation in the Glider.** There must be incontrovertible evidence that the FR was in the glider for the flight concerned, and was installed in accordance with IGC procedures. This can be achieved either: by observation at takeoff or landing, or by sealing the FR to the glider at any time or date before takeoff and checking the seal after landing.

3.1. **Observation of Installation before Takeoff or at Landing.** For observation, either a preflight check of the installation must be made and the glider must be under continuous observation by an OO until it takes off on the claimed flight, or an OO must witness the landing and have the glider under continuous observation until the FR installation is checked. This is to ensure that the installation is in

accordance with the rules, and that another FR has not been substituted before the data is transferred to a PC after flight.

3.2. **Sealing to the Glider.** If para 3.1 cannot be met, the FR must be sealed to the glider by an OO at any time or date before flight so that it cannot be removed without breaking the seal. The sealing method must be acceptable to the NAC and IGC. Paper seals must be marked in a manner such that there is incontrovertible proof after the flight that seals have not been tampered with, such as by marking with the glider registration, the date, time and OO's name and signature. The use of adhesive plastic tape is not satisfactory for IGC-approved sealing because it can be peeled off and re-fitted. Gummed paper tape is recommended, as used for sealing drum-type barographs. The OO must seal the FR unit to glider parts which are part of the minimum standard for flight. It is accepted that such parts can be removed for purposes such as servicing; such parts include the canopy frame, instrument panel, and centre-section bulkhead fittings. If the FR is sealed to such removable part, if such a part is transferred between gliders, any FR seal for the previous glider must be removed.

4. **Security Seals, Physical and Electronic.** A silver-coloured tamper-evident seal with the European "CE Mark" and the manufacturer's name, is fitted over at least one of the case securing screws. In addition, an internal electronic security mechanism is included and the electronic security check will no longer produce a valid IGC file if the case has been opened. On switching on, after the LCD screen shows the unit model number, if there is a security problem the screen will show "SEAL NOT VALID!" and audible bleeps will be heard which can be cancelled by pressing the ENTER button. If the FR is found to be unsealed either physically or electronically, it must be returned to the manufacturer or his designated agent for investigation and resealing, with a statement of how the unit became unsealed. Whenever any unit is resealed, the manufacturer or agent must carry out positive checks on the internal programmes and wiring, and ensure that they work normally. If any evidence is found of tampering or unauthorised modification, a report must be made by the manufacturer or agent to the Chairman of GFAC and to the NAC of the owner; the IGC approval of that individual unit will be withdrawn until the unit is re-set and certified to be to the IGC-approved standard.

5. **Analysis of Flight Data** - may be through any analysis programme which is approved by the relevant NAC. For a list of those which use the *.IGC file format, see the IGC GNSS web site under SOFTWARE). The NAC must check that the *.IGC file is valid and unaltered, by the use of a copy of the VALI-LXN.EXE file. The VALI file must have originated from the IGC web site or from the FR manufacturer. See Annex B for how to use.

6. **Manufacturer's Changes.** Notification of any intended change to hardware, firmware or software must be made by the manufacturer to the Chairman of GFAC so that a decision can be made on any further testing which may be required.

Ian Strachan
Chairman, IGC GFAC

Annexes:

- A. Notes for owners and pilots
- B. Notes for Official Observers and NACs

Any Queries to:

Chairman IGC GFAC, Bentworth Hall West, Alton,
Hampshire GU34 5LA, England

Tel: +44 1420 564 195; Fax: +44 1420 563 140;

email: ian@ukiws.demon.co.uk

Annex A to IGC Approval Dated 26 Oct 1998

NOTES FOR OWNERS AND PILOTS -

Seite: 16

PART OF IGC APPROVAL FOR LXN COLIBRI 1.0 GNSS FR

To be read together with the main terms of approval to which this is an Annex. It is recommended that a copy of the approval document including annexes is kept with the equipment concerned, for the use of pilots and Official Observers.

Pilot's Responsibility. It is the responsibility of the pilot to ensure or to note the following:

A1. **Antenna** - That the antenna is positioned in order to give sufficient signal strength for IGC purposes. No deliberate attempt must be made to inject data via the antenna; any abuse of this may lead to a future requirement to position antennas out of reach of the flight crew.

A2. **Geodetic Datum**. Latitudes and longitudes recorded by the FR are to a fixed Geodetic Datum of WGS84. No pilot action is required except to ensure that other lat/long data such as for start, turn and finish points, is entered also to the WGS84 Geodetic Datum (IGC rule).

A3. **Observing the FR installation in the glider**. The pilot must ensure that an OO has checked the place of the equipment in the glider and how it is fixed to the glider. If it may be difficult to obtain an OO immediately before takeoff, or to witness the landing, you should ask an OO to seal the FR to the glider, and this can be done at any time or date before flight. See para 3 in the conditions of approval.

A4. **Takeoff** - The pilot must ensure that the time and point of takeoff has been witnessed and recorded for comparison with that recorded by the GNSS FR, see para B1.2.

A5. **Connection to Ports**. Although this approval does not presently require sealing of any ports or plugs, no attempt must be made to pass unauthorised data into the FR. See paras 2.3 and 3 in the conditions of approval.

A6. **Use in Motor Gliders** (including self-sustainers): When enabled, the internal microphone system automatically records an ENL (Engine Noise Level) value with each fix. The ENL system is enabled through the SETUP MENU which is selected by pressing the left/right buttons. Then use the up/down buttons to select LOGGER MENU, and press ENTER. Use the up/down buttons until "I-RECORD DATA" appears. Press ENTER and use up/down buttons until "DATA: ENL" appears, press ENTER and use up/down buttons to select "Y" for "Yes". Then press the ESCape button until SETUP MENU appears, and left/right buttons to regain the screen required. Note that it is also possible to set ENL and other functions through the full LXFAI programme using TRANSFER then SETUP LOGGER, see the manufacturer's instructions for this programme.

A7. **After Flight** - The pilot must ensure that the time and point of landing has been witnessed and recorded for comparison with that recorded by the GNSS FR (see para B2.1). Until an OO has witnessed the FR installation to the glider, the pilot must not alter the installation or remove the FR from the glider. The OO will carry out the actions given in para B2.3, and the OO's copy of the transferred flight data will be sent to the NAC. The OO does not personally have to transfer the data from the FR, but witnesses the transfer and takes or is given a copy on electronic media. Different rules may apply for competition flights, for which a central data transfer facility may be used, but for a flight to IGC record and badge rules, the above continues to apply.

A8. **Calibration of Barograph Function**. Pilots are advised to have a barograph calibration carried out either by the manufacturer or by an NAC-approved calibrator before any GNSS FR is used for a claimed flight performance. An IGC-format file showing the pressure steps used in the calibration must

be recorded and kept. Altitude and height claims require a calibration for the flight performance concerned, speed and distance claims need a calibration for calculating the altitude difference of the glider at the start and finish points, and some competitions carry out airspace and other altitude checks for which calibration data is required. Also, for claims sent to the NAC or FAI, pressure altitudes recorded on the FR for takeoff and at landing may be compared with QNH pressures for the appropriate times recorded by a local meteorological office.

Annex B to IGC Approval Dated 26 Oct 1998

**NOTES FOR OFFICIAL OBSERVERS AND NACs -
PART OF IGC APPROVAL FOR LXN COLIBRI 1.0 GNSS FR**

To be read together with the main terms of approval to which this is an Annex. It is recommended that a copy of this approval document is kept with the equipment concerned, for the use of pilots and Official Observers.

B1. Installation and Takeoff Records

B1.1. **Installation in the Glider.** An OO shall witness and record the position of the FR in the glider, the type and serial number of the FR, the glider type and registration, date and time. Before flight, if requested, the OO shall then seal the FR to the glider in a way acceptable to his NAC and to IGC, and such sealing may be at any time or date before flight. If sealing is not used, either a preflight check of the installation must be made after which the glider must be under continuous observation by an OO until it takes off on the claimed flight, or an OO must witness the landing and have the glider under continuous observation until the FR installation is checked. This is to ensure that the installation is correct, and another FR has not been substituted in the glider before the data transfer (B2.3). See paras 2 and 3 of the Conditions of Approval.

B1.2. **At Takeoff.** The time and point of takeoff shall be recorded, either by an OO, other reliable witnesses, or by other means such as an Air Traffic Control or official Club log of takeoffs and landings. This will be compared to the FR takeoff data.

B2. Landing.

B2.1. **At Landing.** The time and point of landing shall be recorded, either by an OO, other reliable witnesses, or by other means such as an Air Traffic Control or official Club log of takeoffs and landings. This will be compared to the FR landing data.

B2.2. **Checking the Installation of the FR.** As soon as practicable after landing, an OO shall inspect the installation of the FR in the glider (including any sealing to the glider), so that this can be compared to the check described in para B1.1 above. The transfer of flight data shall then take place in accordance with B2.3.

B2.3. **Transferring the Flight Data.** If a portable PC is available, the flight data may be transferred at the glider without disturbing the installation of the FR; if a portable PC is not available, the OO shall check and break any sealing to the glider, and take the FR module to a PC. If the OO is not familiar with the actions required, the pilot or another person may transfer the data while the OO witnesses the process. Security is maintained by electronic coding embedded in the FR and in the data transferred, which is then independently checked later at the NAC (and at FAI if the claim goes to them).

Method: connect the PC to the female 9-pin computer connector provided on the cable which goes to the recorder unit, and use the file DATA-LXN.EXE on either a floppy diskette or on the PC hard disk. See under “software” on page 1, the software version being shown when the file is executed. This programme file executes in the normal way such as by typing “DATA-LXN, enter”, at a DOS prompt or RUN function, or by double-clicking "DATA-LXN" in a file list (File Manager/Windows Explorer, etc), and then following the menu actions in the DATA-LXN file. The floppy diskette may be self-booting. This process will produce an IGC-format flight data file with the file name YMDCXXXF.IGC, where Y=year, M=month, D=day, C= manufacturer (L for LXN), XXX = FR Serial Number and F = flight number of the day (full key, Appendix 1 to the IGC GNSS FR Specification). A copy of this IGC-format file shall be retained securely by the OO such as by immediately copying it to a separate diskette or PC card, or by the use of the OO's own PC. This file shall be retained by the OO in safe keeping for later checking and analysis under NAC procedures.

Competitions: Different rules may apply for competition flights, for which a central data transfer facility may be used, and for which file names may be changed, for instance to the glider competition number of pilot's name (integrity of data within the file is preserved by the electronic security system and may be checked by using the VALI-LXN programme file).

B.3. Analysis of Flight Data Files. A Data Analyst approved by the NAC will then evaluate the flight using an analysis programme approved by the NAC concerned (list, see the IGC GNSS web site under SOFTWARE). In addition to checking flight data, an authenticated version of the file VALI-LXN.EXE shall be used by the NAC and by FAI (if the data goes to them) to check the electronic security coding, that the FR had not been interfered with, and that the flight data in the *.IGC file has not been altered since it was transferred from the FR. The version number of the VALI file (see at the beginning under Software) is shown when the file is executed.

Method: at the appropriate prompt or run function, type VALI-LXN followed by a space and the name of the file to be checked. The message "integrity OK" should appear, not "integrity Bad!" which indicates either that the FR security seal has been broken, or that the IGC file has been altered or has become corrupted since it was transferred from the FR. The VALI check may be applied to either the LXN or IGC file formats.

B4. Means of Propulsion (MoP) Record - Motor Gliders. The MoP must either be sealed or inoperative, or the built-in microphone system used. The microphone system records an ENL value with each fix up to a maximum ENL value of 999. ENL readings of less than 060 indicate normal quiet gliding flight. During aero tow, in a high-speed glide, or in a noisy glider, the ENL may increase to 200 (on aerotow a reading of 279 has been recorded). On engine running, an increase to over 800 ENL is typical, and the maximum value of 999 has been recorded with the engine running at full power. During ground contact during takeoff and landing, short-duration ENL readings up to about 550 are to be expected due to wheel rumble; unlike engine running these last only for a short time, showing a short “spike” on the noise/time trace. Short periods of higher ENL while gliding (up to about 200 ENL) may indicate aerodynamic noises such as due to airbrakes, lowering the undercarriage, sideslip, etc, and are normal before landing. Finally, a motor glider with the engine mounted on a retractable pylon, will show a high ENL reading if flying with the pylon up and engine not running, due to the high aerodynamic noise (up to 395 has been recorded). In all cases, it is normally easy to see when an engine has been running and when it has not.

B5. Barograph (Pressure Altitude) Function. The FR can be calibrated in an altitude chamber in the same way as a drum barograph. Recording starts soon after power is applied, and no GPS fixes are required for a pressure altitude trace to be produced. After the calibration, the data containing the pressure steps used, is transferred to a PC as if it was flight data (see B2.3 above). The IGC format calibration data file will then be analysed and a correction table produced of true against indicated

altitudes. This table can then be used to adjust pressure altitudes which are recorded during flight performances and which require correction for validation to IGC criteria. These include takeoff, start and landing altitudes for altitude difference and for comparison with independently-recorded QNH readings, and low and high points on gain-of-height and altitude claims. Pressure altitudes are recorded up to 9 km (29,528ft), and GNSS altitude is recorded up to 18km (59,055ft) . The maximum altitude tested by GFAC was 35,000 ft.

B5.1 GPS altitude records. It should be noted that in this GNSS FR there appears to be a time delay in the GPS altitude when compared to the pressure altitude. In some flight files the shape of the GPS altitude trace differs from the shape of the pressure altitude trace. This is being investigated with the GPS board manufacturer. Lat/long fix accuracy is not affected and is typical of that for a 12 channel GPS system, but data analysts and NAC officials should allow for the above when comparing the GPS altitude and pressure altitude records.

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