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

References:
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: http://www.fai.org/gliding/gnss/freeware.html

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

Copy: Manufacturer concerned

5 May 2003

VERSION 2 OF IGC APPROVAL
FOR SCHEFFEL THEMI T3.0 GNSS FLIGHT RECORDER
FOR ALL IGC/FAI BADGE AND DIPLOMA FLIGHTS

(i) This document gives formal approval from the above date for the undermentioned GNSS FR equipment to be used for validation of flights under the FAI Sporting Code Section 3 (Gliders and Motor Gliders), subject to the conditions and notes given later. IGC reserves the right to alter this approval in the future. Version 1 was issued on 31 October 2002 for badge flights up to Diamonds, this Version 2 extends the IGC-approval to include all FAI/IGC Badge and Distance Diploma flights.

(ii) This type of recorder does not comply with all of the requirements in the IGC Specification at the date of issue of this approval and is therefore not approved for "all flights" including world records. The types of flight covered by this approval are all badge and distance diploma flights as listed in the FAI Sporting Code Section 3 (Gliders and Motor Gliders) Use in competitions is up to the organisers and any other rules and procedures (such as Annex A of the Sporting Code for gliding) with which they have to comply. Para 1.1.3.3 of the Technical Specification for IGC-approved GNSS Flight recorders and the same paragraph in the Sporting Code Annex B, refer.

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

(iv) The attention of NACs, officials and pilots is drawn to the latest edition of the FAI Sporting Code Section 3 (Gliding) including its annexes and amendments. Annex A to this code (SC3A) deals with competition matters, annex B to the Code (SC3B) deals with equipment used in flight validation, Annex C to the Code (SC3C) consists of guidelines and procedures for Official Observers, pilots, and other officials involved in the flight validation process. Copies of all of these documents may be obtained from the FAI/IGC web sites listed above and links are provided from the IGC web site. A separate document published by FAI is entitled "Technical Specification for IGC-Approved Flight Recorders" and is available through the IGC/GNSS web site shown above.

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

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EQUIPMENT:

HARDWARE

Hardware Versions. Version T3.0 or later. This is shown in the header record of IGC-format flight files in the form "HF RHW HARDWARE VERSION: 3.0".

Dimensions and connectors for the recording unit. The FR unit consists of a rectangular metal case about 140 x 72 x 44 mm in size, weight about 340 grammes. A RJ45 8-pin female socket is on one end of the case, also a male D-SUB 13W3 mixed layout connector that contains 10 pins and one female 3mm diameter co-axial connector for the GPS antenna signals.

Cable harness. A female D-SUB 13W3 mixed layout connector matching that on the electronic unit contains the cables for power supply, signal lights, pilot event button, NMEA data to other instruments, optional speaker and GPS antenna.

GPS receiver board. Motorola GT-Oncore parallel receiver capable of receiving data from up to 8 satellites for any one fix.

Pressure altitude sensor. Sensym SX15, compensated for temperature variation. The FR case is vented to atmosphere and records "cockpit static" pressure.

National regulations. These 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 has the EU CE mark.

FIRMWARE

Version 2.3 or later. This is shown in the header record of IGC-format flight files in the form: "HF RFW FIRMWARE VERSION: 2.3"

SOFTWARE

Free availability. The DATA-SCH and VALI-SCH files are copyright of the FR manufacturer but are freeware. There is also a free short program TURN-SCH.EXE for making inputs of Waypoints into the recorder. The latest versions may be obtained from the IGC GNSS Internet site for software or through the IGC/GNSS site through a link. See the web site titles given at the beginning of this document.

Program file functions. The short program file DATA-SCH.EXE is for transferring flight data from the FR to a PC It automatically produces an IGC-format file for the last set of data recorded, leaving a menu on screen for transfer of other data in the memory of the recorder. The file VALI-SCH.EXE checks the security and integrity of an IGC file, and ensures that data that is designed to be secure has not been altered since it was transferred from the FR.

Versions to be used. For correct operation, version 2.0 or later of the program files must be used. The initial release dates for version 2.0 were 13 December 2001 for the VALI program, 25 May 2002 for the DATA program and 12 October 2002 for the TURN program.

CONDITIONS OF APPROVAL:

1. **Permitted Connections**. The position and size of the connectors is described above under Hardware.

1.1 RJ-45 8-pin connector. Genders: female on the recorder case, male on the cable connector lead. The connector lead connects the male RJ-45 to 12 volt power connections and a 9-pin female RS232 for plugging in to a PC for transfer of data to and from the recorder. Connections and pinning are to the IGC standard (given in the IGC Specification, para 2.7.2.2.).

1.2 Rectangular 10-pin/3-co-ax D-SUB 13W3 mixed layout connector. Genders: male on the recorder case, female on the cable connector lead. Only one of the three connectors for co-axial cables is used, for the GPS antenna. An example of this connector is part number #717-TWC25W3P by the Amphenol Corporation (http://www.amphenol.com). The female D-SUB 13W3 connector lead is specially made up for the recorder and has six sets of cables, all of them with multiple wires. These lead to the following connectors:

1.2.1 Antenna. This is an SMA connector, female on the recorder case (this has a 6mm screw fitting). The cable on the wiring harness goes to the A2 co-axial connector on the D-SUB 13W3 mixed layout connector (the A1 and A3 co-ax connectors are not used).

1.2.2 Power and on-off switch. This is for 12VDC supply and consists of red and black wires with a switch in the red wire.

1.2.3 Audio speaker. This is a female socket connector for a 3.5mm mono speaker plug.

1.2.4 THErMalling Indicator (THEMI) lights. This is a cable with two red lights on the end. Before and after flight they give signals about the state of the flight recorder and during flight about the centre of the thermal and the availability of GPS fixes. Both lights flashing means "no fixes".

1.2.5 RS232 9-pin connector, male gender. This is for connecting through a serial cable to other instruments such as Palm PCs such as the Compaq IPAQ for the display of navigational data. It can also be used for downloading flight data, see the detail in para B3.3.

1.2.6. Pilot Event buttons. These are two buttons, pressing either of which initiates PEV symbol against the fix concerned, and starts a set of 40 fixes at 1 second intervals.

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

2.1. Installation in a glider. The FR may be fitted anywhere in the glider, subject to para 3.2 on sealing. 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. Particularly in single-seat gliders, the position of any ancillary displays connected to the recorder should not be remote from sight lines used for pilot lookout and scan for other aircraft and gliders.

2.2. Motor gliders. No engine sensing system is fitted to this model, so any Means of Propulsion (MoP) must either be sealed or inoperative, or a separate approved MoP recorder fitted.

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 particular FR was present in the glider for the flight concerned. 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. The recorder may be sealed to the glider in accordance with 3.2. Otherwise, either a pre-flight 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 before Flight. If direct observation under para 3.1 cannot be achieved, 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. It should be possible for the OO to recognise the seal markings afterwards. 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 that 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**.

4.1. Physical Security. The metal case is shrink-wrapped in a black plastic sheath with gaps at each end for the maker's details and the cable connectors. In addition, an internal security mechanism is included that activates if the case of the FR is opened. If the FR case has been opened, breaching physical security, subsequent IGC files will fail the VALI check (see para B4).

4.2. Electronic Security. If the internal security mechanism has been activated (such as by opening the case), any data in the memory will be lost, settings will revert to defaults, and the electronic security algorithms in the FR will be trashed. Any flight data files subsequently produced will fail the VALI test for electronic security. This test will also fail if an IGC file has been altered in any way after being transferred from the FR.

4.3. FR found to be unsealed. If either physical or electronic security is found to have failed, the FR must be returned to the manufacturer or his appointed agent for investigation and resealing. A statement should be included on how the unit became unsealed.

4.3.1. Checks before re-sealing. Whenever any unit is resealed, the manufacturer or agent must carry out positive checks on the internal programs 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 returned to the IGC-approved standard.

5. **Analysis of Flight Data**. Analysis for flights to be validated to IGC criteria should be through the use of a program which complies with IGC rules and procedures and is approved for this purpose by the relevant NAC. For a list of programs which are capable of reading and displaying flight data in the IGC file format, see the fai.org/gliding/gnss web site under the link to SOFTWARE (the full web reference is at the beginning of this document). Before a Flight Performance is officially validated, the authority responsible for validation must check that the data in the IGC file has originated from the Recorder concerned, and has not been altered after it was download from the Recorder to a PC. This is simply done by checking the IGC data file with an authorised copy of the VALI-SCH.EXE short program. The VALI program is on a single file and must have originated from the current FAI/IGC web site for software at the beginning of this document. See Annex B for how to use the VALI program file with any IGC flight data file.

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. This includes changes of any sort, small or large. If in doubt, notify the change so that the responsibility for any possible action passes from the manufacturer to GFAC.

Ian Strachan
Chairman, IGC GFAC

Annexes:
A. Notes for owners and pilots
B. Notes for Official Observers and NACs

Any Queries to:
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Alton, Hampshire GU34 5LA, England
Tel: +44 1420 564 195; Fax: +44 1420 563 140;
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NOTES FOR OWNERS AND PILOTS
PART OF IGC APPROVAL FOR SCHEFFEL THEMI T3 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:

A.1. **Level of Approval - types of flights**. This type of recorder is IGC-approved for the types of flights mentioned in para (ii) after the title to this document, and amplified in para B.1.

A.2. **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, and any abuse of this may lead to a future requirement to position antennas out of reach of the flight crew.

A.3. **Geodetic Datum**. Latitudes and longitudes recorded by the FR must be to the WGS84 Geodetic Datum, or the flight data will be invalid for IGC purposes. This recorder is fixed on the WGS84 Datum. No pilot action is required except to ensure that other lat/long data such as for start, turn and finish points, is also entered to the WGS84 Geodetic Datum (IGC rule).

A.4. **FR installation in the glider**. The pilot must ensure that an OO has checked the place of the Flight Recorder in the glider and how it is fixed to the glider. If it may be difficult to find 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. Regarding the position of any ancillary displays connected to the FR, see para 2.1 in the Conditions of Approval which refers to sight-lines and the need for pilot lookout and scan.

A.5. **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 B2.2.

A.6. **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.

A.7. **Use in Motor Gliders** (including self-sustainers): No sensing system for a Means-of-Propulsion (MoP) is fitted to this model, so any MoP must either be sealed or inoperative, or a separate approved MoP recorder used.

A.8. **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 Recorder (see para B3.1). 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 B3.3, 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.

> A8.1. Use of Portable PC at the glider. So that there is no need to disturb the cockpit installation or any sealing to the glider, a portable (laptop/notebook) PC can be used for transferring the data at the glider. The portable PC may be owned by the pilot or any other person. It should be set up for ease of downloading, such as by easy access to the current DATA-SCH.EXE program file or an equivalent program from the manufacturer that carries out the same function. Transfer of flight data is witnessed by the OO, and the flight data in IGC format is then given to the OO on portable media such as a floppy diskette.

A.9. **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. For the procedure, see para B6. A valid IGC-format file showing the pressure steps used in the calibration must be recorded and kept (Sporting Code rule). Altitude and height claims require a calibration for the flight performance concerned, and speed and distance claims need a calibration for calculating the altitude difference of the glider at the start and finish

points. Also, the NAC or FAI may wish to compare pressure altitudes recorded on the FR for takeoff and at landing, with QNH pressures for the appropriate times recorded by a local meteorological office.

A.10. **Specialised cables - availability of spares.** The 10 pin/3 co-ax Amphenol connector is custom-wired and not easy to replace unless a spare is available, or at least a connector wired for functions that are essential for the recorder to operate in a basic mode, such as power and the GPS antenna. Also, as antenna serviceability and performance is critical to GPS operation, pilots are advised either to have access to a spare antenna with the 6mm SMA screw fitting, or to an interface cable from the SMA screw fitting to a commonly-available GPS antenna connector such as the 9mm BNC bayonet.

---------- end of Annex A ----------

NOTES FOR OFFICIAL OBSERVERS AND NACs - PART OF IGC APPROVAL FOR SCHEFFEL THEMI T3.0 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.

B.1. **Level of Approval - types of flights**. In accordance with Annex B of the Sporting Code (SC3B) para 1.1.3.3, this type of recorder is IGC-approved for the following types of flights: All IGC/FAI Badge and Distance Diploma flights. See also para (ii) on the first page after the title of this document.

B.2. **Installation and Takeoff Records**

B.2.1. **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 particular FR, the glider type and registration, date and time. The serial number of each individual recorder consists of three characters made up of letters and/or numbers and is shown on the case. 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 pre-flight 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 that another FR has not been substituted in the glider before the data transfer (B3.3). See paras 2 and 3 of the Conditions of Approval. Regarding the position of any ancillary displays connected to the FR, see para 2.1 in the Conditions of Approval which refers to sight-lines and the need for pilot lookout and scan.

B.2.2. **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.

B.3. **Landing**.

B.3.1. **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.

B.3.2. **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 B2.1 above. The transfer of flight data shall then take place in accordance with B3.3.

B.3.3. **Transferring the Flight Data**. The flight data can be transferred to a portable PC at the glider, without disturbing the installation of the FR (see para A8.1). If a portable PC is not available, the OO shall check and break any sealing to the glider, and take the FR 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 which is then independently checked later at the NAC (and at FAI if the claim goes to them).

Method: Use the RJ-45 connector on the end of the case and wired to the IGC standard (Specification para 2.7.2.2). A current version of the short program file DATA-SCH.EXE must be available on the PC. This program is available free from the IGC GNSS web site for software given at the beginning of this document, or through a link from the main fai.org/gliding/gnss web site. The DATA program file can be executed on either a floppy diskette or on the PC hard disk. If the DATA program does not execute using the PC hard disk, this may be due to incompatibility with other installed programs, and a self-booting floppy disk containing the DATA program file should then be used. When the DATA program is executed, the software version is shown at the top of the menu (see under software on page 2, which gives the required version). This program file executes by typing at a DOS prompt "DATA-SCH, enter". In emergency, if the RJ-45 connector is not available or does not work, the male RS232 connector that is part of the cable loom attached to the 10 pin/ 3 co-ax Amphenol plug can be used for downloading flight data. In this case a cable with female to female RS232 connectors is required, cross-wired as for Laplink or other purposes.

Files produced. This process will automatically produce an IGC-format flight data file for the most recent flight in the memory with the file name YMDCXXXF, where Y=year, M=month, D=day, C= manufacturer, XXX = FR Serial Number/letters and F = flight number of the day (full key, Appendix 1 to the IGC GNSS FR Specification, also listed in Annex C to the Sporting Code, SC3C).
OO's Copy. A copy of the IGC file shall be retained securely by the OO such as by immediately copying them 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/IGC procedures.

Storage media. The OO may keep the required data files on a floppy diskette or other industry-standard portable storage media. The hard disk of a PC may also be used but the OO must be able to positively identify the flight data files as being from the flight concerned.

Competitions: Different rules may apply for competition flights, for which a central data transfer facility may be used. For ease of identification within the competition, file names may be changed, for instance to the glider competition number or the pilot's name. Integrity of data within the file is preserved by the electronic security system and may be checked at any time by using the VALI program file.

B.4. **Analysis of Flight Data Files**. A Data Analyst approved by the NAC will then evaluate the flight using an analysis program 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-SCH.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 is shown at the top of the screen when the file is executed. The latest version of VALI-SCH should be used and is available from the IGC GNSS web site for software given at the beginning of this document.

Method: at the appropriate prompt or run function, type VALI-SCH.EXE followed by a space and the name of the file to be checked. First, the Recorder serial number will be shown (for instance: "THEMI #206"), and the following message should appear: "Validation check passed, data indicated as correct". If there is a problem the message will be "Either file data may have been altered or security system may have to be reset at factory"; in this case the NAC or other validating authority must investigate the reason. It should be noted that GFAC tests include ensuring that the change of a single character in an otherwise-correct IGC file, cause the VALI program to fail as indicated above.

B.5. **Means of Propulsion (MoP) Record - Motor Gliders**. No MoP sensing system is fitted to this model. Any MoP must either be sealed or inoperative or an approved MoP recording system fitted, if a flight to IGC criteria is to be made.

B.6. **Altitude analysis and calibration**. Flight data files will be analysed in accordance with Sporting Code procedures. Part of this is to compare the general shapes of the GNSS and pressure altitude fix records with time and to ensure that no major differences are seen that could indicate malpractice or manufactured (false) data. As part of this process, the FR can be calibrated in an altitude chamber in the same way as a drum barograph.

B.6.1. **Calibration method, making a calibration table**. No GPS fixes are required for a pressure altitude trace to be produced. Recording starts when power is connected to the recorder and the pressure altitude change threshold is exceeded (about 1 m/sec for 5 sec). The calibrator should be asked to cycle the pressure briefly before starting the calibration itself, so that recording will start. The calibrator will record the pressure steps used, for later comparison with the flight file. The stabilised pressure immediately before the altitude is changed to the next level, will be taken as the appropriate value unless the calibrator certifies otherwise. After the calibration, the data file containing the pressure steps is transferred to a PC as if it was flight data (see B3.3 above); this may be done by an NAC-approved person other than the calibrator who may not have this knowledge. The IGC format calibration data file will then be analyzed, compared to the calibration pressure steps, and a correction table produced and authenticated by an NAC-approved person (for instance an OO or GNSS FR Data Analyst). The correction table will list true against indicated altitudes. This table can then be used to adjust pressure altitudes which are recorded during flight performances and which require correction before 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. Only pressure altitude is valid for IGC altitude purposes except for proof of flight continuity (no intermediate landing) where GNSS altitude may also be used.

B.6.2. **GPS altitude figures recorded in the IGC file**. Occasional short-duration differences in the shape of the GPS altitude/time graph have been noted when compared to the pressure altitude figures. This is not unusual with GPS receivers operating without a local differential beacon. The altitude accuracy from satellite-based systems will not be as good as accuracy in lat/long, because satellite geometry is not as favourable for obtaining accurate altitude fixes compared to horizontal position. This effect may be increased by less-than-ideal antenna positioning in some gliders. Lat/long fix accuracy is not affected and is typical of that for an 8-channel GPS system, but data analysts and NAC officials should allow for the above when comparing the GPS altitude and pressure altitude records.

B.6.3. **Maximum Altitudes Recorded in the IGC file**. These are limited by the processing used rather than the capability of the altitude sensors.

B.6.3.1. **Pressure Altitude**. The manufacturer has designed the recorder to have a reliable pressure altitude capability up to 7km (22,966ft). On GFAC testing, pressure altitude recording continued until 8,500m (27,887 ft) and above that altitude continued to record 8,500m.

B.6.3.2. **GNSS altitude**. The Themi has 32-bit resolution and the maximum positive recorded value is theoretically 32,767m (107,503ft). However, US limitations on the recording of GPS altitude by non-military GPS receivers limits recording to 60,000ft (18,288m), and 18,000m is stated in the IGC file header record.

---------- Annex B ends ----------