

TECHNICAL SPECIFICATION FOR IGC-APPROVED GNSS FLIGHT RECORDERS

AMENDMENT LIST NUMBER 9

Effective 3 December 2024

Chairman's name and contact information updated, a new general e-mail contact gfac@fai.org added, and references to a separate GFAC webpage removed throughout the document.

Glossary. Additional definitions added:

Calibration The formal definition of calibration by the International Bureau of Weights and Measures (BIPM) is the following: "Operation that, under specified conditions, in a first step, establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties (of the calibrated instrument or secondary standard) and, in a second step, uses this information to establish a relation for obtaining a measurement result from an indication." This definition states that the calibration process is purely a comparison. In the context of this Specification, the second step is the creation of a Calibration Chart which can be applied to the Pressure Altitude figures in the IGC File to give a more accurate measurement. See <https://en.wikipedia.org/wiki/Calibration>

Pressure Reference An instrument with traceable accuracy to a standard with better uncertainty than 0.1 hPa, used for comparison with an Approved Flight Recorder for calibration purposes

Traceability –Measurement The term *measurement traceability* or *metrological traceability* is used to refer to an unbroken chain of comparisons relating an instrument's measurements to a known standard. Calibration to a traceable standard can be used to determine an instrument's bias, precision, and accuracy. In many countries, national standards for weights and measures are maintained by a National Metrological Institute (NMI) which provides the highest level of standards for the calibration / measurement traceability infrastructure in that country. Examples of government agencies include the National Physical Laboratory, UK (NPL) the National Institute of Standards and Technology (NIST) in the USA, the Physikalisch-Technische Bundesanstalt (PTB) in Germany, and the Istituto Nazionale di Ricerca Metrologica (INRiM) in Italy. As defined by NIST, "Traceability of measurement requires the establishment of an unbroken chain of comparisons to stated references each with a stated uncertainty." See also Calibration. (AL9)

Contents – Hyperlinks added to enhance document navigation.

1.1 title changed to 'IGC Flight Recorders – Policy and General' as a better description of the Chapter contents

1.3.5.1. Currency and amount of the Fee for a new type of Flight Recorder updated to 1,200 Swiss Francs (CHF)

A new para. 1.4.2.4.1 added, referred to in a new para. 5.5.4

1.4.2.4.1 Approval of individual type installations. An approval for use of an acoustic ENL system on electric of jet equipped gliders may be issued if flight tests demonstrate that the flight recorder clearly differentiates the use of the engine at low power levels. Such an approval shall be for a specific Flight Recorder and Glider Type. The approval shall be added as an Appendix to the Flight Recorder approval giving details of the Glider Type and full installation details. Testing for compliance with para. 1.4.2.5.2 must be carried out before issuing such an approval.

1.10 Chairman's e-mail address added.

3.10 First lines of IGC files - Serial and Version Numbers.

The first line of the IGC file contains a manufacturer identification and a three-character or six digit alphanumeric Serial ID (S/ID) unique to that Recorder.

Chapter 4 Completely revised. In particular:

4.4.3.1. The required accuracy tolerance is increased:

4.4.3.1 For all FRs before or immediately after initial sale, on set-up and calibration of their pressure altitude system, the sea level setting should correspond to 1013.25 hPa \pm 0.5 hPa/mb, and the error in pressure no more than 1.5 hPa/mb up to the maximum altitude specified in the FR IGC Approval document

4.5.2 A new section on acceptable methods of creating altitude corrections has been added

A 3.1 Additional format of 6 character S/ID permitted.

A.3.2.4 and 3.2.5 HFFTYFRTYPE line clarified:

H F FTY FR TYPE: HARDWARE MANUFACTURERS THREE LETTER CODE ,FR MODEL NAME CRLF

A 3.7, A4.7 A new category of Records added to allow the addition of multiple data lines that may be removed without affecting the Security G-Record

A 4.1 'The data stored in the B-record is part of the data to be signed (see A3.6 on signing and the G record),' added for clarity.

A 7 Additions to Three Letter code list

AOA (Angle of Attack) added

HRT (Heart Rate) added

OXY (Oxygen saturation) added

WVE (wind velocity, combined Windspeed and Direction) is the wind measurement recommended to be recorded in IGC files.

A 9.2 I and J records moved to be placed immediately after the Header records.

B 4.1.5 (Quantitative tests of ENL systems) added.

G 2.1.2 ECC is now the recommended Key Encryption system for new Recorders

G 4.1.2 added:

G4.1.2 Flight Recorders with repeater display systems. If a repeater display can download an IGC file, it must use an 'X' character as the first letter of the Manufacturer's TLC in the A-record, indicating that the file is downloaded from a non-approved recorder.

Appendix J added which defines a Pressure Correction File Format suitable for use in a consistent database of calibrations.