Report from Chairman of the
GNSS Flight Recorder Approval Committee (GFAC)

for the agenda of the 2016 IGC Plenary

5 January 2016

1 **GNSS Flight Recorders**. A total of 53 types of GNSS Flight Recorders (FRs) from 20 different manufacturers are currently IGC-approved. New FR Manufacturers this year are Logstream from Poland and PressFinish from Germany.

1.1 GFAC Testing and IGC-approvals. Activity in 2015 was as follows:

10 March 2015 – ClearNav Instruments, ClearNav II, initial approval

10 April 2015 – PressFinish GCA-IGC, initial approval

5 October 2015 - LXNAV LX8000 and 9000 series, addition of electric current sensor for gliders with rear-mounted electric engines *

22 November 2015 – Logstream FR-1, initial approval

10 December 2015 - LX Navigation Eos, addition of external MOP sensor box for gliders with rear-mounted jet and electric engines, and other low-ENL installations *

* Note: For front-mounted electric engines such as the FES series, no separate MOP sensor is required if the FR is mounted in the instrument panel just behind the engine and it can be shown that the internal ENL sensor inside the FR clearly indicates any forward thrust.

1.2 Ongoing Work. A new type of FR is expected to be tested shortly, also two types of remote MOP box for connecting by cable to two existing type of IGC-approved FRs.

2 **GPS Lat/Long Accuracy**. Accuracy tests in Lat/Long position with FRs using modern multi-channel GPS receivers have shown improvement over previous figures which showed an average error over many years of just over 11m. Recent new types of FR have shown average errors at accurately surveyed ground positions between 4 and 7 metres.

3 **IGC File Analysis**. Many IGC files have been analysed including those from FRs being tested, and those sent to GFAC by a number of organisations. Advice has been given to NACs, competition organisers, pilots, OOs and FR manufacturers. This also applies to IGC files from IGC Position Recorders that have a low level of security but use the same IGC file structure.

4 **Amendments**

4.1 FR Specification. Amendment 4 to the FR Specification was published on 10 September 2015. Wording was refined on external MOP engine sensors and also on High Altitude Flight Recorders (HAFRs) for altitude performances over 15,000 metres.

4.1.1 Amendment to time for FR power changeover. Para 3.7 is titled "End of an IGC file" and allows 5 minutes for a change of battery power while airborne before the IGC file must be ended. An FR manufacturer has pointed out that some engine installations are capable of producing power well within 5 minutes, particularly front-mounted electric engines such as the FES series and some 4-strokes. This could allow someone to deliberately take the FR off power, run the engine for a short period and then power the FR again. It is proposed for FRs with ENL engine systems to change 5 minutes to 1 minute.

4.1.2 Sporting Code. As a result of 4.1.1 it is proposed that the following be added to para 3.5.4 in the Sporting Code (SC3) on MOP Recorder Procedures: "The record of Means-of-Propulsion operation in the IGC file must either be continuous for the claimed flight performance, or if there is a break in MoP recording (such as due to FR power being changed in flight from one battery to another) this must not exceed the time in which it would be possible to produce any forward thrust from the MoP. This refers to the three numbers in each fix for ENL and from an external MOP sensor, where fitted."

If this statement of principle is added to SC3, it can be amplified in Annex B, for instance to point out that fuselage-mounted engines without pylons (FES and some 4-strokes) can develop thrust quickly, whereas pylon-mounted engine installations take more time.

4.2 Annex B to the Sporting Code. Amendment 10 to SC3B became effective on 1 October 2015. References were added on the FAI World Distance Calculator and the Vincenty formula.

4.2.1 To cover different designs, the following has been added to 1.1: "This document covers the normal FR design situation, but other designs will be assessed and tested by GFAC and given IGC-approval if security of data and other important provisions of this document can be demonstrated to the satisfaction of GFAC."

4.2.2 Low-ENL installations were clarified by an addition to 1.4.2. as follows: "Where the ENL system in the recorder does not produce high enough readings with particular types of engine and FR installations, an additional external sensor under the MOP code must be used that can be positioned to receive a high engine signal. Critical cases are covered in 1.4.2.2-4 below and more detail is in Chapter 5 of the FR Specification".

5 **Earth Models**. The main volume of SC3 says that "the WGS84 earth model shall be used" and under ICAO rules, airspace boundaries worldwide are defined with respect to the WGS84 ellipsoid. The IGC FR Specification uses the WGS84 ellipsoid, as does the GPS system.

However, Annex A to the Code says that "the Earth Model to be used for all calculations specified in this Annex shall be a sphere of radius 6371.0 kilometers". Annex A also includes penalties including disqualification, for "entering forbidden airspace". Because airspace is defined with respect to the ellipsoid, not a 6371 km radius sphere, it is not possible to calculate airspace penalties accurately using the Annex A spherical earth. Also, Controlled Airspace could be entered without the competition organisers being aware of it, making it difficult in the event of a complaint or an AirProx.

It is recommended that the Annex A earth model is brought into line with that used for worldwide airspace boundaries and the main volume of SC3.

It is understood that an IGC sub-committee on competition scoring, chaired by Dr Angel Casado, is looking at the above situation and will make recommendations to IGC.

7 **Plenary Update**. An update will be given to the Plenary.

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