To: Recipients of IGC Agenda
From: Chairman IGC GNSS Flight Recorder Approval Committee (GFAC)

CHAIRMAN'S REPORT - IGC GNSS FLIGHT RECORDER APPROVAL COMMITTEE

This report on GFAC activities is dated 10 January 2008 and an update will be given at the IGC Plenary

1. **GNSS Recorder IGC-approvals**. A total of 34 types of recorders from 12 manufacturers have been approved since the system started in March 1995.

1.1 New IGC-approvals. One new type of recorder has been tested and approved since the last IGC plenary agenda report dated 11 January 2007. This is the LXN Colibri 4F with Flarm (Flight Alarm), for which the IGC-approval document was dated 31 March 2007.

1.2 Scope of IGC-approvals. IGC-approval is concerned with recording and security of data in the recorder and in the post-flight IGC file data. IGC and FAI take no responsibility for the consequences of the use of IGC-approved Flight Recorders for purposes other than validation and certification of flights to FAI/IGC procedures. Such other purposes include, but are not limited to: in-flight navigation, airspace avoidance, terrain avoidance, traffic alert, or other matters concerning flight safety. See Annex B to the Sporting Code (SC3B), para 1.1.1.

2. **Future IGC-approvals**. During the year, correspondence has taken place about new types of recorder from the Czech Republic, Germany, Poland, Slovenia, Switzerland and the USA.

2.1 Recorders being tested. Currently the following types of recorders are being tested. Other recorders expected shortly are an LXN LX8000 and a Triadis Altair.

2.1.1 Flarm-IGC. This is a standard Flarm (Flight Alarm) unit with the recorder facility modified for IGC-approval to badge flights up to and including Diamonds (and gliding competitions that allow recorders with this level of approval). A higher level approval would need more major modifications to existing Flarm units. The Flarm traffic alert function is fitted but is not part of the IGC-approval, see para 1.2 above.

2.1.2 Data Swan DSX T-Advisor 7100. This is being tested for full IGC-approval ("all flights"). This model also has a traffic alert function, but this is not part of the IGC-approval, see para 1.2 above.

3. **Updates to existing IGC-approval documents**. Some older IGC-approval documents have been updated with wording that has been used in recent approvals. In addition, approvals for recorders that were previously under the Filser name have been changed to LX Navigation. This is because LXN was always the Design Authority for these recorders but now have their own company in Germany, and Filser has been re-named Funkwerk Avionics. The types of recorder changed in January 2008 from Filser to LXN are the DX50, LX20, LX21 and LX5000. The IGC-approval document for the Garrecht Volkslogger was dated May 1999 and this has also been updated to January 2008.

4. **Analysis Programs for Flight Data**. In the past, 27 programs had been notified to GFAC that are capable of analysing data in the IGC file format. However, over the years several of these programs have become obsolete. A review is currently taking place with a view to only listing on the IGC web pages, programs that are currently available.

5. **Technical Specification**. Amendment 10 to the IGC Flight Recorder Specification was issued on 31 May 2007 after circulation of drafts to the IGC ANDS and GFA committees, technical advisors, bureau representatives, recorder manufacturers and potential manufacturers. This amendment included some new Glossary definitions including ADS-B and GNSS area enhancement systems, the critical cases for Engine Noise Level (ENL) recording and some other updates.

6. **Anomalies found during the year**. Many IGC files have been analysed including those for recorders being tested and those forwarded by a number of organisations for comment and analysis. Advice has been given to a number of NACs on claims for badges and records and also to FAI.

7. **GPS Lat/Long Accuracy**. At the date of this report, GFAC tests show an average error of 11.46m for lat/long fixes recorded in IGC data files from a sample of about 2000 test points. These tests are made from a moving ground vehicle at accurately-surveyed points at about 51N 001W. These points include several with a clear horizontal horizon, one with horizon masking of about 5 degrees above the horizontal and some with nearby low-rise buildings. The average error figure using this method has been between 11 and 13m since the Selective Availability (SA) error was removed from civil GPS systems by the US Government on 1 May 2000. The overall results indicate a 99% probability of being within 27m, 95% of being within 20m, 90% within 18m, 80% within 16m, 70% within 15m, 60%within 13m and 50%within 11m. At the end of each year, the average Lat/long error measured in all GFAC accuracy tests since May 2000 was as follows: end of year 2000, 12.88m; 2001, 11.57m; 2002, 11.56m; 2003, 11.52m; 2004, 11.50m; 2005, 11.50m; 2006, 11.43m; 2007, 11.46m. If only points with a clear horizon are taken, the average figure falls to 7.24m

8. **Drafting of Documents and Amendments**. Amendment 4 to Annex B to the Sporting Code (SC3B) became effective on 1 October 2007 and consisted of details of the critical conditions for an Engine Noise Level (ENL) system. For other documents, see paras 9and 10.

9. **Amendments to the Sporting Code**. The report of the Sporting Code Committee mentions the possible use of Commercial Off The Shelf (COTS) GPS units for position evidence instead of cameras for Silver and Gold badge flights. The reason for not including diamonds is that the IGC-approval system that has been in place since 1995 already applies to Diamond flights up to World Records in three levels of approval (listed in Annex B to the Code). Some of the implications of using non-IGC-approved COTS units are at Appendix 1 to this report. GFAC is concerned that whatever is decided on COTS GPS does not devalue the existing IGC-approval system for Secure Flight Recorders or in the future discourage manufacturers from designing GNSS recorders to the IGC Specification that covers all flights from Silver up to world records. Several GFAC members are not in favour of allowing COTS recorders to be used for flights under IGC rules, because of inferior security of data and the possibility of devaluing the existing IGC-approval system that has worked well since 1995. One GFAC member suggests that allowing COTS recorders with little built-in security, is not far from allowing a pilot to self-certify a flight performance.

10. **FAI Matters**. Although this is not strictly GFAC business, it is related to it and IGC needs to be briefed on the subject. At the FAI General Conference in October 2007, Dr Peter Saundby, President of the FAI Medical Commission (and an experienced glider pilot) presented a paper proposing an expansion of the FAI Technical Commissions. One proposal was for a new Commission on Navigation and Airspace, a concept supported by the IGC Bureau in a letter that was part of the FAI agenda. A paper to FAI filling in the detail on the creation of this Technical Commission on Navigation and Airspace was therefore produced by the GFAC Chairman and placed on the FAI agenda by the IGC President. This paper appears for information at Annex A to this report. The changes to FAI Statutes proposed in Annex A to the paper were approved in October 2007 by unanimous vote at the FAI General Conference. The new Commission is in the process of being formed and the first Plenary meeting is anticipated early in 2008.

10.1 The New FAI Navigation and Airspace Technical Commission. Those FAI Nations who wish to, have nominated Delegates and Alternates and the Air Sport Commissions (ASC) have nominated Representatives and Alternates. The GFAC Chairman has been put forward to FAI as the IGC Representative and the ANDS Committee Chairman as Alternate Representative. Meanwhile the ANDS Committee Chairman has been nominated by the USA as its National Delegate and the GFAC Committee Chairman as Alternate Delegate for the UK.

10.1.1 Proposal for FAI By-laws. In the above process, it has been found that National Delegates to Technical Commissions have a vote and can stand for Commission President and Vice President, but the Representatives of the much fewer Air Sport Commissions have no vote and can not stand for these Bureau positions. This is different to what happens in the FAI Air Sport General Commission (CASI), in which National and Commission nominees have the same status. It is therefore proposed that ASC Representatives on FAI Technical Commissions should be given the same status as National Delegates. A change to FAI By-law 5.3.9 would achieve this and it is recommended that IGC should propose it for the agenda of the next FAI General Conference.

11. **GFAC Work Load**. The workload during the year in dealing with the above has been at its usual high level and with new IGC-approval applications expected, is not likely to reduce.

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Appendices: 1. Sporting Code - considerations for COTS GPS units
2. IGC paper to FAI on a Technical Commission for Navigation and Airspace

References:

All IGC-approval documents: www.fai.org/gliding/system/files/igc_approved_frs.pdf This web page also has a brief history of the US GPS system and early developments of recorders for gliding. New or revised approvals are also announced on newsgroup r.a.s. and on the IGC-discuss list.

Free programs for all IGC-approved Recorders: www.fai.org/gliding/gnss/freeware.asp These are for downloading data from a recorder to a PC, and checking the IGC file as being valid and the same as that downloaded from the recorder. They include the appropriate IGC-XXX.dll file (XXX is the IGC code for the particular manufacturer) that works with the standard IGC Shell program for download and validation functions. For manufacturers who have not produced the *.dll file, the older DATA, CONV and VALI functions in DOS format are available but will not work with some modern PCs and their Operating Systems.

Analysis software for IGC files: www.fai.org/gliding/system/files/gnss_analysis_software.pdf

Technical Specification for IGC-approved Recorders: www.fai.org/gliding/gnss/tech_spec_gnss.asp

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Appendices to 2008 Report to IGC Plenary by GFAC Chairman

Appendix Numbers: 1. Sporting Code - considerations on COTS GNSS units
2. IGC proposal for FAI Navigation and Airspace Commission

Appendix 1 - Sporting Code matters

This adds to proposals by the Sporting Code committee on the possible use of Commercial Off the Shelf (COTS) GPS units to replace camera position evidence for Silver and Gold badge flights. What follows gives some of the implications if IGC were to accept this concept and it is similar to what was put to the 2007 IGC Plenary.

Considerations on the possible use of evidence from COTS GPS units for verification of Silver and Gold badge performances

1 **Existing IGC Procedures for Diamonds and Above**. IGC procedures and standards for GNSS recorders have been in place for over 10 years. They are embedded in the Sporting Code for Gliding (SC3) and its annexes, particularly Annex B to the Code and also in the stand-alone document "Technical Specification for IGC-approved GNSS Flight Recorders" that also contains the protocols for the IGC data file format. These standards involve a number of levels of security, procedures and rules that apply to the validation of flights in the IGC environment. The lowest level of IGC-approval is for badge flights up to and including the three diamonds and the highest is for all flights including for World Records. It is proposed that these existing and well-proven rules and procedures should not be altered by introducing different standards of security, procedures, accuracy and integrity of altitude and position data into the types of flights already covered by the IGC-approval system. It follows that such COTS units could be considered for evidence for flights below the three Diamonds, that is, for Silver and Gold flights. For the reasons given in para 6, it is strongly recommended that pressure altitude to the ICAO ISA must also be available for the flight. In principle, the COTS GNSS unit would replace the camera for evidence of horizontal position.

1.1 Status of GNSS Units. Any COTS GNSS unit used for evidence of Silver and Gold flights must not be regarded as an IGC-approved unit, for which the much more rigorous IGC Specification applies. Such COTS units are not part of the existing IGC-approval system. The use of IGC-approved recorders for all flights from Silver to World Records should continue under the existing system. Any new procedures for COTS GPS units should apply only to flights below Diamond level, that is, for Silver and Gold badge legs. Some features known to be present in some COTS units must be taken into account so that the fix data used in evidence is accurate and to a consistent datum for latitude, longitude and GNSS altitude figures.

1.2 Pressure Altitude. Independent of the COTS GNSS unit, pressure altitude data to normal IGC standards is needed for the purposes below:

1.2.1 Measurement. For accurate gain-of-height and altitude loss calculations in accordance with IGC Sporting Code rules and procedures that have been in place for many decades.

1.2.2 Comparison. So that the altitude profile of the flight from the GNSS unit can be compared to data from the independent pressure altitude source as a check on the integrity of the overall COTS GNSS data. GNSS altitude and Pressure altitude data use different zero datums and different altitude scales, but the general shapes of the two altitude graphs with time should be very similar.

2 **Evidence of Position**. It must be ensured that the Lat/Long figures that are downloaded are derived from GNSS position lines (rather than predictions) and that all data uses the same Earth Model (Geodetic Datum).

2.1 Predicted Data and Averaging. Any GNSS unit that can produce lat/long fixes that are not derived directly from real-time GNSS satellite lines-of-position, should not be used for flight validation purposes. This includes predicted data based on past fixes, used in some COTS units designed for ground use when signal is temporarily lost due to ground obstructions, and units with excessive "averaging" that results in alteration of precise lat/long positions.

2.2 Changes of Earth Model. It is preferred that the GNSS unit will not allow the Earth Model (Geodetic Datum) to be changed when the unit is operating in flight, but can only be changed during the initial set-up process. However, if a GNSS unit permits change of the Earth Model in flight, such units should either be positioned out of reach of the crew in flight, or must be sealed by an OO before flight in such a way that the Earth Model cannot be changed in flight.

3. **Downloading from the COTS unit**. So that one of the existing analysis programs can be used, the downloaded data should be converted to the IGC format for post-flight analysis, as far as possible (allowing for the limitations of data available from the unit concerned). Additional data required by the Sporting Code should be manually recorded by the OO and pilot in the usual way. It is desirable that the program used for downloading and conversion to IGC format should include a system such that any unauthorised changes to the electronic data, can be detected later. This is a similar principle to the IGC Validation system but would apply to the data after downloading rather than being integral with the recorder system itself as in recorders subject to IGC-approvals.

4. **Supervision**. Supervisors of COTS GPS evidence should be aware that the security of the unit itself and of the data initially downloaded from it does not conform to IGC standards for flights other than Silver and Gold. Also that COTS units do not have the physical or electronic security that is built in to IGC-approved GNSS recorders. GNSS recorders with IGC-approvals can also be used for Silver and Gold flights. Depending on the terms of their IGC-approval, they can be used for higher badges, diplomas, records, and Championships that use Sporting Code Annex A rules. Their characteristics are covered in the Technical Specification for IGC-approved GNSS Flight Recorders.

5 **Altitude Evidence**. In the Sporting Code for Gliding (FAI SC3), where accurate measurement of altitude is concerned, pressure altitude has always been required. Such pressure altitude figures must be calibrated to the International Standard Atmosphere of the International Civil Aviation Organisation (the ICAO ISA). Any change to this long-term IGC policy would require major amendments in many places in the Sporting Code and its three annexes. For the reasons given below, it is suggested that such a change is not justified. Every IGC-approved Flight Recorder has a pressure transducer system, calibrated to the ICAO ISA, in accordance with the IGC Specification for such recorders.

6.1 Pressure Altitude and Controlled Airspace. Worldwide, the vertical boundaries of controlled airspace are defined to a pressure altitude datum. This includes airways bases and control zone levels.

6.2 GPS altitude. Pressure Altitude and GPS altitude are to different scales. GPS altitude is vertical height above the ellipsoidal world model (Geodetic Datum) that is used for the Latitude and Longitude figures. This is not the same as the ICAO ISA. In many GPS units, a conversion is available that gives an approximate altitude above local sea level. However, heights Above Sea Level (ASL) on maps are often taken from a Mean Sea Level (MSL) datum that is a good average for the area in question, and this may not correspond to exact MSL at any given point. For the WGS84 system, an approximate local sea level figure can be obtained through the use of look-up tables that convert between the WGS84 ellipsoid and the WGS84 Geoid, an equipotential surface approximately equivalent to local sea level. Such look-up tables can be stored in the GNSS unit in electronic form and often form the basis of ASL selections mentioned in equipment manuals. GPS altitude figures can be converted to pressure altitude to the ICAO ISA but this is not easy and requires a knowledge of the actual atmospheric temperature and pressure structure at the altitudes and positions of the glider concerned during the flight. For accurate conversions, these need meteorological "soundings" derived from radio-sonde ascents or observations from aircraft with appropriate instruments.

6.2.1 Anomalies in IGC fileGPS Altitude. Even if the above was practical, errors in GPS altitude need to be considered. In ideal conditions, GPS altitude errors should be about twice those of lat/long due to the different geometry of the position lines. Unfortunately, analysis of several thousands of IGC files has shown a significant number of cases where GPS altitude figures show examples of electronic noise, that is, random variations of GPS altitude with time. They also show occasional more major anomalies including obvious GPS-altitude errors and altitude unlocks, while lat/long fixes remain unaffected. Examples include GPS altitude overshoots over pressure altitude at high points and undershoots at low points, giving an exaggerated gain-of-height. These anomalies are not a feature of the GPS system itself but of the way GPS altitude fixes are processed within the GPS boards concerned. Fortunately, GPS lat/long figures are processed separately using different algorithms, for instance using noise reduction techniques, and are not subject to the same anomalies as GPS altitude. In comparison, pressure altitude figures in IGC files derived from a separate transducer, have been shown to be very reliable and free of electronic noise.

6.3 Conclusion on Altitude Figures. For the above reasons, it cannot be recommended to IGC that GPS altitude should replace pressure altitude in the Sporting Code for accurate altitude measurement. However, there is no difficulty with the existing use of GPS altitude to prove continuity of flight if pressure altitude recording, fails because for this purpose, accuracy is not as important as demonstrating continuity of flight.

6.4 Altitude in COTS GPS units. The track records of some COTS GPS units do not include altitude, some COTS units do record GPS altitude with each lat/long fix in their track records. However, as described above, such GPS altitude figures are not to the ICAO ISA and the errors that are described above pertain. Such GPS altitude figures should therefore not be used for accurate altitude measurement.

6.4.1 Pressure Altitude. A few COTS units include a pressure altitude capability that may or may not be recorded in the track record. It may not be possible to calibrate this pressure altitude to the ICAO ISA because some units are designed to re-set the pressure datum automatically with time in an effort to obtain an continuous approximate "above sea level" reading. Such pressure altitude figures, if recorded in the track record, will not be to the ICAO ISA and therefore not to the IGC measurement standard.

7. **Changes to the Sporting Code**. The Sporting Code Committee has put forward amendments to the Sporting Code Section 3 and these appear elsewhere in the Plenary agenda. It is suggested that, if IGC agree the use of COTS recorders for Silver and Gold badge flights, the above considerations should be taken into account and the Sporting Code should make it very clear where IGC-approved Flight Recorders are required and where COTS Flight Recorders are allowed.

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Appendix 2. IGC paper on an FAI Navigation and Airspace Commission, accepted by FAI in October 2007

Proposal for FAI Technical Commission on Navigation and Airspace

IGC paper for the FAI General Conference 2007

Proposed Commission title: FAI Commission on Navigation and Airspace (CoNA)

1. **Terms of Reference**

1.1 To co-ordinate knowledge and information within and on behalf of FAI on Air Navigation Systems and on Airspace rules, regulations and policy, as they may affect the types of aviation in which FAI is involved.

1.1.1 The term "Navigation" is to be interpreted widely. It includes position and altitude recording and the processing of such data for the validation of flight performances to FAI standards. It includes any potential use of such systems by FAI, its National members and Commissions, for championships, records, certificates of achievement. Also to aid compliance with FAI, National and International rules and procedures for the avoidance of airspace closed to Sport Aircraft and to avoid collision with other aircraft.

1.1.2 To co-ordinate information on Air Traffic Management (ATM) and Airspace issues as they may affect FAI activities. This includes an International perspective including a study and documentation of relevant rules and procedures so that they can be made available to FAI members in a useful form. This includes those of ICAO and the principal world Aviation Regulatory Bodies such as the European EASA, US FAA and other equivalent bodies. In the European area, fraternal relations with Europe Air Sports (EAS) are to be maintained.

1.1.3 To produce and maintain an information database for use by FAI members on the above and related subjects.

1.2 To make regular reports to General Conference and to other FAI meetings and events as requested.

1.3 To attend conferences and events and make presentations to and on behalf of FAI where necessary.

1.4 Commission structure and procedures are to be those in Statutes and By-laws for Technical Commissions. Experts in relevant disciplines may be co-opted to such Commissions.

2. **Rationale**. Airspace restrictions for sporting aircraft are becoming more critical in many geographic areas where other air traffic is growing. At the same time the accuracy of navigational systems is getting better, particularly those that are based on satellites in earth orbit (GPS and similar systems). Such systems are already in use in many areas of FAI for the recording of evidence for Sporting purposes, but they have wider uses including those in 1.1.1 and 1.1.2 above.

2.1 A basic knowledge of the technology of navigational and reporting systems such as the future ADS-B system (see below) is needed by FAI. This is so that its FAI members and Associations can be provided with enough technical knowledge to liaise, and have credibility with, Air Traffic Management (ATM) bodies, Government Departments and others as appropriate.

2.1.1 This knowledge already exists in several areas within FAI and its air sports and NACs. Such FAI expertise and knowledge is to be pooled and co-ordinated by CoNA. Papers and briefing notes are to be produced with the furtherance of air sports in mind.

Some examples:

3. **ADS-B = Automatic Dependant Surveillance - Broadcast. The System of the Future**

3.1 Sport Aviation and ADS-B. Many sport aircraft are already carrying GPS-based equipment. Since the ADS-B system is GPS-based, the possibility exists for future low-cost ADS-B equipment designed specifically for General Aviation and Sport aircraft. Such equipment should be able to use GPS functions to feed recorders for FAI flight verification and to feed cockpit instruments appropriate to GA/Sport aircraft. It is clearly not appropriate that the type of expensive ADS-B equipment fitted to airliners operating in busy terminal areas, should also be forced on the GA/Sport aircraft sector. However, the future use of the GPS-based ADS-B system on a worldwide basis opens up the possibility of better relations with Air Traffic authorities and even the possibility of extending the airspace in which sport aircraft can fly. In contrast, radar-based technologies will become obsolete over the next few years. An indication of this is the confirmation to the author by the Chief Scientific Advisor to the US FAA during a meeting in London in

October 2006 that the intention of the FAA is to eventually to close down many of their expensive Air Traffic area radar stations as ADS-B comes on line. This has also been reported in the Public Domain. Some comments on ADS-B from various sources follow:

3.2 US FAA – "ADS-B is the future of Air Traffic Control. Instead of using radar for aircraft separation, in the future, GPS-based equipment will provide Controllers and pilots with more accurate information that will help keep aircraft safely separated not only in the sky but on runways ... Radar is essentially a product of 1940s World War II technology and … has problems discriminating airplanes from other returns including clutter". *Source: Extract from FAA Fact Sheet 2 May 2006.*

3.3 Aviation Week Magazine - "ADS-B ground stations are much cheaper to acquire, install and maintain than radar, which is not as accurate. This is one reason why the FAA has decided to go nationwide with ADS-B, so it can de-commission hundreds of secondary surveillance radars .... (*others)* will be stuck with a World War II-era surveillance system while the rest of the world proceeds with satellite navigation." *Source: Aviation Week 27 November 2006 page 10.*

3.4 Flight International Magazine - "Europe has agreed on the objectives of a programme to introduce Automatic Dependent Surveillance - Broadcast (ADS-B) across the EU member states and beyond. Stakeholders, including the European Commission, will publish a consultation document by the second quarter of 2008. Rules for implementing ADS-B air traffic management surveillance are due in the first half of 2009. Europe wants full user compliance by 2015 with a progressive increase in voluntary participation before then. Eurocontrol is already working with some 'pioneer' carriers equipped with ADS-B .... *Source: Extract from Flight International, 10 July 2007 page 10.*

5. **Future Satellite systems**. The US GPS system is updated as new satellites are put in orbit and old ones taken off-line. The future European Galileo system will be independent of the US GPS and opens up the possibility of dual receivers of greater accuracy, integrity and redundancy than before. There is also the Russian GLONASS system. Enhancements to basic system accuracy are provided by regional Satellite-Based Augmentation Systems (SBAS). These increase accuracy by monitoring errors at ground stations in the area concerned and making corrections available to compatible receivers. Such systems in service include WAAS (North America) and EGNOS (Europe). Other future SBAS systems include GAGAN (India) and MSAS (Japan). A Ground-Based Augmentation System (GBAS) is being developed in Australia.

7. **In summary -** there is a lot for FAI to monitor, co-ordinate and in which to develop expertise, credibility and a common approach wherever possible, for our future good. Even, the future survival of air sport in some areas.

8. **Proposal**. General Conference is recommended to establish a FAI Technical Commission on Navigation and Airspace, the Commission to start work as soon as Delegates are nominated.

9. **Initial actions**. Delegates to be nominated to CoNA as soon as possible by FAI Members and Air Sport Commissions asked to nominate Representatives. Initial deadline, end of 2007. Delegates to elect the CoNA Bureau by email. The Bureau to co-ordinate initial work. The Bureau, Delegates and Representatives to consider and propose Subject Matter Experts (SMEs) with Observer status to help in specialist areas. An initial CoNA Plenary meeting to be convened, preferably at a time and place where other FAI meetings are also taking place.

9.1 Assembly of a Database. All FAI Commissions to be asked to send existing examples of work and documentation in the areas of Navigation and Airspace to the CoNA Secretary so that they can be passed to CoNA Delegates, Representatives and SMEs. The CoNA Bureau will collate such knowledge, expertise and documentation into a logical order and series of documents for circulation.

9.2 Dissemination of Information within FAI. A CoNA Plenary meeting is to be convened to review the work and approve documents on Navigation and Airspace matters for the benefit of FAI members and Commissions. Such documents then to be made available to FAI members and Commissions on the FAI web site. Further CoNA activities to follow normal procedures for FAI Technical Commissions.

10. **Statutes and By-Laws**. A new Statute 5.7.3.5 on CoNA is required, based on 1.1 above. See Annex A for proposed wording.

Annex A: Proposed Statute 5.7.3.5, establishing CoNA

Annex B: Glossary of Terms on Navigation and Airspace matters *(not included in the IGC agenda but available from the GFAC Chairman on request)*. This Glossary was produced by the Author of this paper mainly by combining and editing the existing Glossaries from the General Section of the Sporting Code and the Technical Specification for IGC-approved GNSS Flight Recorders. It needs strengthening with Air Traffic Management terms such as those from ICAO and other sources.

Annex A to CoNA paper

Proposed Statute 5.7.3.5 for the establishment of CoNA

S5.7.3.5 **FAI COMMISSION ON NAVIGATION AND AIRSPACE**

To co-ordinate knowledge and information within and on behalf of FAI on Air Navigation Systems and on Airspace rules, regulations and policy, as they may affect the types of aviation in which FAI is involved.

Abbreviation for the Commission: CoNA

The term "Navigation" to be interpreted widely. It includes position and altitude recording and the processing of such data for the validation of flight performances to FAI standards. It also includes any potential use of such systems by FAI, its National members and Commissions, for championships, records and certificates of achievement. Also to aid compliance with FAI, National and International rules and procedures.

To co-ordinate information on Air Traffic Management (ATM) and Airspace issues as they may affect FAI activities. This includes an International perspective including a study and documentation of relevant rules and procedures so that they can be made available to FAI members in a useful form.

FAI By-laws. No change required

Sporting Code General Section. CoNA to be added to the list of Technical Commissions in 1.4 and added to the Glossary.
