Procedures for CIA-approved Loggers

1. CIA-approved Competition Loggers

1.1. Policy and General.

CIA-approval of a particular type of GPS Logger for competition purpose is achieved after evaluation by the New Technology Subcommittee (NTSC). When a competition logger system is submitted for CIA-approval, NTSC examines it for compliance with CIA rules and procedures for hardware, firmware, software, output data in a standard data file format, and security of the Logger system both physical and electronic. The full level of CIA-approval indicates that the equipment meets the standards of availability, continuity, integrity, accuracy, and security that are required for the certification of flights for FAI/CIA World Records and all FAI/CIA Badges. Other levels of approval also apply. Conditions that frequently occur in large competitions must also be taken into account. Other aspects are matters between customers and manufacturers, navigational features, and post- flight analysis systems. See below for levels of approval for types of flights for which a logger may be used.

1.2. FAI Liability.

FAI takes no responsibility for and has no liability for the consequences of the use of CIA-approved competition loggers for purposes other than validation and certification of flights to FAI/CIA procedures. Such other purposes include, but are not limited to, navigation, airspace avoidance, or other matters concerning flight safety.

1.3. Operating Procedures for a Logger Type.

Recommended operating procedures for each type of competition logger may be specified by NTSC in the CIA-approval document. The CIA-approval process has the objective of making procedures on the day of flight as simple as possible. Also, after flight it must be quick and easy to transfer the flight data to a PC in a common flight data format. However, the loggers must be operated in a way that minimises the possibility that either one logger could be substituted in the balloon concerned by another one that was not carried on the flight in question, or that the data in and from the logger that was in the balloon could be interfered with without this being detected. Particularly with small portable loggers, this may require either continuous observation of the balloon before takeoff and/or after landing, or the physical sealing of the logger unit or receptacle to the balloon by an official at any time or date beforehand. Such a seal must be applied and marked in a manner such that there is incontrovertible proof after the flight that it has not been compromised. This can be achieved by marking it with the balloon registration, the date, time and competitor's name, signature, and/or the competitor identification number. Other procedures specific to the type of competition logger concerned may be required, such as stowage of certain modules out of reach of the flight crew, or limitations on the types of flight for which the logger may be used. Such procedures and limitations will be an integral part of the CIA-approval document for the type of equipment concerned, and will depend on the logger design and the results of the evaluation process.

1.4. CIA-Approval Documents for Specific Types of GPS Logger.

The CIA-approval document for each logger type is produced by NTSC on behalf of CIA. Before the approval document is finalised, it will be circulated several times in successive drafts to NTSC members, other technical experts and consultants, and the manufacturer concerned. When finally issued, the CIA-approval document will give the procedures under which equipment must be checked, installed, and operated for flights that are to be validated and certificated to FAI/CIA criteria. The definitive version of the CIA-approval document for a particular type of logger is that which is currently available from the NTSC web page.

1.5. Format of CIA-approval documents.

These documents have a standard format which consists of an introduction; standards; version numbers for hardware, firmware and software; connections to the logger; types of GPS receiver and pressure transducer; and a list of Conditions of Approval. There may be further information for pilots and notes for competition officials and National Airsport Control authorities (NACs).

1.6. Pilot checks on individual loggers

It is the responsibility of owners of loggers and pilots using them, to check that the logger characteristics correspond to those described in the CIA-approval document. If they do not, the individual logger should be returned to the manufacturer or his authorised agent to be re-set to the CIA criteria. This particularly applies to pressure altitude calibrations. These must be close to the ICAO standard atmosphere.

1.7. Valid versions of the CIA-approval.

Only the latest version of the CIA-approval document is valid for use with CIA/FAI claims. The latest version is that which is currently posted on the CIA/NTSC web site.

1.8. Levels of CIA-approval

The CIA-approval document for individual types of loggers will specify procedures to be used and any limitations on types of flights for which the approval is valid. Reduced levels of approval apply to types of loggers that do not meet the requirements for full approval at the time that the approval is given. They also apply in cases where the security of a type of logger has either been compromised or is below the requirements of the current Specification, or where other features do not meet the current Specification. The following levels of CIA-approval apply:

CIA-approval for all flights
This applies to loggers that may be used for evidence for all flights up to and including FAI/CIA world records, badge and diploma and competition flights in any event.

Competitions
This applies to loggers that may be used for competition flights in worlds, continental and CAT1 competitions. This level may be used for new loggers that do not meet the current specification in some areas.

CIA-approval for CIA/FAI badge and Diploma flights
This applies to loggers that may be used for evidence for all CIA/FAI badge and diploma flights, but must not be used for CIA/FAI world record flight evidence. This level may be used for new loggers that do not meet the current specification in some areas.

No CIA-approval.
This applies to types of loggers that have either not been tested and approved by NTSC to CIA standards, or have not been awarded an CIA-approval as above, or to loggers that were previously CIA-approved but where a major security or other problem has been shown to exist which could compromise the integrity of flight data from other loggers of the same type that are in service.

1.9. Security of the Logger

For CIA-approval to be given, the logger module must be protected by both physical and electronic security mechanisms. A seal must be fitted in such a way that it will be broken if the case is opened.

2. Logger approval committee

The NTSC will work as logger approval committee to evaluate, test and approve individual types of competition loggers. NTSC members may delegate specialist work to other experts but are responsible for coordinating the work and for producing final recommendations. The detail of the work and any opinions expressed within NTSC discussion are confidential to NTSC and any other experts and CIA officials who may be involved. All results and decisions will be published at the CIA/NTSC webpage.

2.1. Working Language.

The English language shall be used for formal communications to and from NTSC, and within NTSC.

3. Application for approval

Owners, manufacturers or any other body may submit a logger type for CIA-approval by sending all relevant documents to the NTSC.

3.1. Correspondence with NTSC

Manufacturers must correspond with NTSC through its chairman who will inform other members as necessary and co-ordinate any responses to the applicant. In cases where specialist matters are being discussed, the Chairman may authorise direct correspondence with an appropriate specialist NTSC advisor (such as on electronic security matters), but the Chairman must be copied with all correspondence so that he is aware of progress and of the issues involved. Email is the recommended communication method.

3.2. Submission of a type of competition logger

Details of the logger type should be sent to the NTSC Chairman. These should include a brief specification, drawings, manual, commonality with any other approved models, etc. The Chairman will circulate such details to NTSC members and appropriate technical advisors and will co-ordinate evaluation. The details sent by the applicant will be treated as confidential to NTSC and any other experts who may be involved.

File format

A copy of generated files should be send to the NTSC so that the format can be checked for compliance with a common standard.

Logger hardware

A logger should be made available to the NTSC. The NTSC evaluation expert will test the hardware and report to NTSC members, relevant technical experts.

3.3. Re-approval after changes to a logger

For re-approval or continued- approval of a type of logger after changes have been made to its design, the provisions of the previous paragraph that are relevant to the changes, continue to apply.

3.4. Documentation

The logger applicant for CIA-approval shall provide information to NTSC on how the particular model of logger is intended to meet the CIA specification in practical use.

Security Protection

A detailed description of security protection must be provided, that is, the design and operational features that prevent deliberate or inadvertent misuse or production of false data. Both physical and electronic security must be addressed with respect to the CIA specification at the time. Such information will be held in confidence by NTSC members and their advisors.

Pressure Altitude Calibration

In case pressure altitude is recorded, the recording system in the logger must be calibrated using standard FAI procedures for barograph calibration. A calibration table must be forwarded with any hardware that is sent.

3.5. Expenses

Expenses such as customs duties and national taxes for postage of logger hardware must be paid by the applicant and not be an expense on NTSC members, CIA or FAI. CIA-approval will not be given until all expenses attributable to the applicant have been paid.

3.6. Publication

The list of all CIA-approved loggers will be published and updated after every logger evaluation/test at the CIA/NTSC webpage.

4. Evaluation

Upon receipt of all of the formal application material, NTSC will complete the evaluation as soon as practicable and normally within 120 days of the application date, unless there are unforeseen difficulties.

4.1. Laboratory Testing

NTSC may decide that a report on the logger (or a particular aspect of the logger and/or its peripherals) is needed from a recognised independent testing laboratory. In this case, the applicant will be responsible for the expense. The applicant shall be given the opportunity to withdraw the application before incurring this expense. This circumstance might arise if test or evaluation is required that is outside the expertise or facilities available to NTSC members and their advisers, who work voluntarily on behalf of CIA in their own time.

5. Approval

On behalf of CIA, NTSC shall either approve, conditionally approve to a certain level, or not approve a logger. Drafts of approval documents will be circulated beforehand to NTSC members and associated experts, also to the applicant concerned. The final version is the responsibility of NTSC alone.

5.1. Conditional Approval

Conditional approval means that some changes are needed before approval can be given to the appropriate level when the factors which led to the conditional approval have been changed. However, wherever possible an CIA-approval document will be issued which will include appropriate limitations until changes are made and the limitations can be removed.

6. Applicant's Agreement on Issue of CIA-approval

When an CIA-approval is issued, an applicant agrees to the following conditions:

6.1. Changes to an CIA-approved Logger.

Notification of any change to hardware, firmware or software must be made by the applicant to the NTSC so that a decision can be made on any further testing which may be required. This includes changes of any sort, small or large.

6.2. Action on Changes

NTSC may decide that a formal evaluation of such changed features is required, or, if the changes are extensive, that another full approval process is required.

6.3. Changes in CIA-approvals

NTSC may remove or alter the existing approval of any logger at any time.

6.4. Manufacturer details

An CIA-approval is for the named product or products manufactured by (or under the control of) the Organisation whose details are given in the approval document. Any changes to these details shall be sent to the NTSC without delay, so that the approval document can be kept up-to-date.

6.5. Cease of Manufacture and/or Support

Where a manufacturer ceases to manufacture a particular type of logger, NTSC shall be informed. The applicant shall state whether support for the type will continue such as updates and/or repairs to existing loggers.

6.6. Exclusions

The CIA-approval process is not concerned with, and FAI, CIA and NTSC have no responsibility for, matters related to: (1) Intellectual Property (IP) and Intellectual Property Rights (IPR) or, (2) the relations of the Organisation with any others except with FAI and its agents or as they affect FAI, its agents and this approval.

7. Use of Loggers within Nations

A competition logger operated in accordance with its CIA-approval document may also be used by NACs, at their discretion, for other flights where FAI/CIA validation criteria are specified by the NAC. Where flight validation is not required to FAI/CIA criteria, the choice of criteria is at the discretion of those responsible for validating the flight, such as, for competitions, appropriate competition officials.

8. Publication of CIA-approval Documents and Program Files

Notification of issue of a new or amended CIA-approval document will be posted on the CIA website. The complete CIA-approval document will be posted in addition to available program files for transferring, validating or analyzing data files.

9. Production standards

FAI reserves the right to inspect and test examples of products manufactured, updated or serviced, for the purpose of checking compliance with the standards and conditions of this approval.

9.1. Testing production equipment

Such testing will be carried out by NTSC and may be at any time and without prior notice. NTSC may obtain logger units under its own arrangements such as from owners or sales outlets, but, if requested by NTSC, the Organisation listed in the CIA-approval document shall supply, or cause to be supplied, hardware required for such testing.

9.2. Results of testing

If any problems are found or questions are raised, NTSC will correspond with the applicant to solve the noted problems. If this cannot be done to the satisfaction of NTSC, NTSC reserve the right for the approval to be altered.

10. Problems in Use

If any problems arise during practical usage of NTSC-approved Loggers, the NTSC should be notified.

11. Evaluation details

The following tests may be carried out by members of NTSC or by an individual NTSC member who has the test facilities or access to them. Members may delegate detailed testing and assessment to other experts who are bound by the same confidentiality as NTSC itself. Results, assessments and opinions will be confidential to NTSC members, their advisors and to CIA or FAI officials who may be involved if CIA or FAI policy may be affected. These tests are not necessarily all and NTSC reserve the right to carry out any other non-destructive testing where it is deemed relevant to assessing the probable validity of flight data.

11.1. GENERAL REQUIREMENTS

The following aspects will be evaluated: ease of operation in an air sport environment from badge and record flights (up to World Records) and large competitions. This will include integrity of data, fix accuracy, recording of errors and anomalies, security against unauthorised input and changes to data, failure recovery, and standard data file structure.

11.2. EVALUATION AND ANALYSIS

The following aspects will be evaluated through an analysis program independent of the manufacturer: presenting all and selected segments of the flight path in graphical plan views, also vertical views of GPS and altitude with time. This will include checks on required data such as fix accuracy (FXA), Pilot Event (PEV) and fast fixing.

11.3. PHYSICAL INSPECTION OF THE EQUIPMENT

The following physical properties will be inspected: Quality of construction and components; Layout and type of components; Susceptibility to inadvertent or deliberate production of invalid flight data, sealing, shielding, access; Construction of the recorded flight data processor memory and relation to other components, data streams and memories; Crashworthiness aspects including preservation of flight data after impact or damage.

11.4. SYSTEM ACCURACY AND RECORDING CAPABILITY

Ground Tests
Several ground runs of the equipment will be made. Runs of up to several hours may be made to check memory capacity for long flights and the ability to hold exact UTC in fix data. Tests will normally start with the equipment mounted in a ground vehicle driven over a test course that is recorded in position, height and time. Accuracy will be recorded over surveyed ground positions. If an external antenna is used, tests will be made first with the antenna connected and then with the antenna disconnected. If the logger uses a pressure-altitude recording system a valid calibration certificate must be made available. Temperature of the equipment may be varied during the test runs between +40C and -20C, depending on facilities available to the tester.

Flight Tests
Flight data should closely compare with that from any control equipment.

11.5. ANTI-TAMPERING PROTECTION

General
Tests will be made to assess the susceptibility of the equipment as a whole to corruption of the recorded flight data by inadvertent or deliberate means.

Minimum standard
The minimum standard is a positive and recorded identification on every occasion that false data is produced or introduced into the recorded flight data store.

Evaluation and tests
Tests of the electronic and physical security of the logger will be made to ensure that a determined attempt to bypass the security features will normally fail.

11.6. POWER SOURCE

Measurements of power consumption will be made, and, where relevant, of battery characteristics under different conditions of charge and temperature. Misleading results must not be produced as voltage falls or even fails.

11.7. ELECTROMAGNETIC INTERFERENCE

Susceptibility to ElectroMagnetic Interference (EMI) will be. Logger data memories must be resistant to levels of EMI that could be experienced in flight, so that the integrity of flight data is preserved. Also, some GPS equipment designed primarily for ground use, may cease to operate or produce spurious results when in the presence of high-powered EM radiation such as from airband transmitters. Tests will be made with hand-held radios using VHF transmissions at up to 1 watt RMS. Transmission distances tested will be down to 1 foot proximity. No adverse effects should be shown on the logger, its GPS board, data memory, its security devices, and its output data.

11.8. FLIGHT TESTS

Flight tests may be made balloons or, during periods of poor weather, in light aircraft.

Accuracy
Flights will take place over accurately-surveyed points, or in aircraft fitted with known GPS equipment used as a "control". Flight data will be compared between the control GPS and the output of the equipment under test.

Security
Security protection and procedures before and after flight, will be assessed. The effect of mis-switching will be investigated, and deliberate attempts will be made to insert false data after the pre-flight inspection. The possibility of transferring false data after flight will also be assessed.

Pressure altitude recording
Tests will be made on the barograph (pressure-altitude recording) function. On flight tests it will be ensured: that the barograph function continues if GPS signal is lost; that re-lock occurs quickly once signal is restored; and that in the event of total GPS failure, the Logger functions as a barograph after switching on. These tests will involve disconnecting and re-connecting the antenna, or, for Loggers with fixed antennas, covering up the antenna with RF shielding (such as metal foil).

11.9. Continuous evaluation

After a CIA-approval has been given, for any loggers used in a competition, an official technical report of their use will be send to the NTSC. This report may be made by an member of the jury or any other competition official.