CIVIL AVIATION
SAFETY AUTHORITY
AUSTRALIA

Flight data recorder maintenance

Civil Aviation Advisory Publication
October 2002

This publication is only advisory. It gives the preferred method for complying with the Civil Aviation Regulations 1988 (CAR 1988).

It is not the only method, but experience has shown that if you follow this method you will comply with CAR 1988.

Always read this advice in conjunction with the appropriate regulations.

Contents ...

The relevant regulations and other references

- References to CARs are references to CAR 1988
- CAR 42-L Systems of Maintenance, matters to be included
- CAO 20.18: Aircraft Equipment- Basic Operational Requirements subsection 6 Recording Equipment
- CAO 103.19: Equipment Standards Flight Data Recorders
- ICAO Standards and Recommended Practices (SARPs) Annex 6 Parts 1 & II & III
- EUROCAE: Minimum Operational Specifications for Flight Data Recorder Systems ED-55
- Minimum Operational Standard for Airborne Recorders for Accident Investigation ED-112
- FAA OPSPECS: Policy Letters (MMELs)
- FAA Advisory Circular AC:20-141 Airworthiness and Operational Approval of Digital Flight Data Systems
- UK CAA Specification 10A

Why this publication was written

This CAAP provides guidance:

- To operators that are required to provide a maintenance program for Flight Data Recorder Systems; and
- For operators or maintenance organisations who wish to carry out analysis of the data download.

This CAAP does not provide guidance for those wishing to install a Flight Data Recorder (FDR) under an Supplementary Type Certificate (STC), although the contents of this CAAP should be addressed when verifying installations and assessing continuing airworthiness aspects.

Status of this CAAP

This is the first CAAP written on this subject.

For further information

Contact the CASA Office closest to you.

1. Background

1.1 FDRs are fitted to aircraft primarily as a tool for accident investigation. However operator's have found great benefit in using FDR data in quantifying maintenance action required by confirming reported operation of the aircraft and it's associated systems.

1.2 The requirement for the installation of a FDR is an operational requirement as indicated in the Regulations. However as installed equipment there are maintenance responsibilities to ensure that the system is maintained in an airworthy and properly functioning manner.

1.3 CAR 42L prescribes matters to be included in a system of maintenance and specifically requires that the system contains a schedule that sets out the procedures to be followed in carrying out inspections and tests for the aircraft systems or equipment. This includes a maintenance program covering the Flight Data Recorder System, its ancillaries and the aircraft installation to assure the integrity and functionality of the system is preserved.

2. Definitions

Functional Check: A functional check is a quantitative check to determine if one or more functions of an item perform within specified limits. When applied to a FDR parameter, the functional check determines that the recorded parameter is within the limits (range, accuracy, sampling rate, and resolution) specified in the operating rule. The maintenance functional check should exercise the recording system from the sensor or transducer to check the range, accuracy, resolution, and sampling rate of the recorded data.

Operational Check: An operational check is a failure-finding task to determine if a parameter is being recorded and does not determine if the item is performing within specified limits. When applied to a FDR, the operational check determines that the FDR is active and recording each parameter value within the normal operating range of the sensor. The operational check must also verify each electrical interface to the FDR. A check to determine the reasonableness and quality of the data being recorded is considered an operational check.

Reasonableness: The term reasonableness refers to the assessment of recorded parameter values against expected magnitude, direction and rate of change.

Quality refers to the amount of data that cannot be recovered or is corrupted.

Drop Out is a loss of synchronisation, corrupted bit or data word that was recorded and cannot be correctly recovered by the data recovery and analysis system.

Data Download is the extraction of binary data from an FDR.

Data Con4version is the conversion of binary data to a scaled value.

Engineering Units (EU) is a scaled value relating to the data source e.g Altitude scaled to feet, Airspeed scaled to knots.

Parameter is the aircraft system or motion required to be recorded, e.g. for control surface – flap position and for aircraft velocity – airspeed.

Analogue Data**:** Data transferred between Line Replaceable Units (LRU) via a varying signal on dedicated circuits.

Digital Data**:** Data transferred between LRUs via digital data buses such as ARINC 429.

Test**:** A means of demonstrating compliance, using a test aircraft in a configuration representative of the configuration to be certified, in a ground and/or flight environment.

Simulation**:** The use of a laboratory-installed system of avionic components ('test bench') representative of the aircraft in which the FDR system is to be certified. The test bench may be controlled by a computer-based system including analogue and discrete inputs to create specific operating conditions, such as 90° pitch up, or other conditions that cannot be tested in flight or are difficult to test on the aircraft. The test bench should be configured such that the computer or analogue inputs to the system drive the instruments and displays in a way representative of the aircraft. All avionic components installed in the test bench should be either of production standard or representative of the final production configuration.

Stimulation**:** The use of test equipment, traceable to a known standard, to induce aircraft systems to produce a specific result.

3 Recording standards

3.1 CAO 20.18 subsection 6 details the operational requirement for fitment of FDR systems.

3.2 CAO 103.19 defines recording equipment standards, mandatory parameters required to be recorded, their accuracy, resolution and sampling rate.

3.3 Continuity of Recording – the loss of information shall not exceed 200 milliseconds per event and the cumulative loss shall not exceed 500 milliseconds per hour. It is accepted that power interruption may affect the simple retrieval of whole subframes of data due to loss of synchronisation. (as defined in ED112 paragraph II-3.2.1)

3.4 Data Retrieval – valid data can be retrieved for the periods:

(1) ending a maximum of one second prior to a period of corruption and

(2) commencing a maximum of one second after a period of corruption (as defined in ED112 paragraph II-3.2.5).

3.5 The interval for the Operational Check of recorded data is 2,000 Hours Time in Service (TIS) or 12 months, whichever occurs first. (ICAO Annex 6).

3.6 System Functional Check each 8000 hours TIS or 5 years, whichever occurs first. (ICAO Annex 6).

3.7 Where the parameters of altitude and airspeed are provided by sensors that are dedicated to the FDR system, a functional check should be carried out as recommended by the sensor manufacturer, or at least a period not exceeding three years. (AD /Inst/9).

4 Maintenance program

4.1 DEVELOPMENT OF A SYSTEM OF MAINTENANCE

4.1.1 Each operator should review its System of Maintenance (SoM) as necessary, to include administrative procedures for scheduling, accomplishing, and recording maintenance actions on the FDR system. The maintenance program should identify inspection items, establish time-in-service intervals for maintenance, and provide the details of the proposed methods and procedures. An operator may include the maintenance program for the ULD in the FDR system program or develop it separately. The SoM should include the following items:

- Description of the FDR System. Typically the system description should include the make and model, or part number of the FDR and each data acquisition system. It should include a listing of each parameter recorded (reference to a manufacturers report or technical document would suffice), and should identify any transducers installed specifically for the purpose of sensing FDR data (this should be correlated against any item identified by the aircraft manufacturer's maintenance program). The system description should identify interfaces to other installed equipment and systems.

- Where appropriate, describe the scheduled maintenance tasks for each component of the FDR system. Whenever possible, routine maintenance of the recording system should be timed to coincide with periods of scheduled maintenance of the aircraft. Careful consideration should be made to minimise the requirement for the aircraft to operate should the recording equipment need to be removed.
- A Functional Check that provides sufficient information to assess the range, accuracy and recording interval for each parameter fitted to the aircraft. This information will then be used to confirm the correct operation of the data conversion algorithms utilised in the data recovery and analysis system.
- An Operational Check that provides sufficient information to assess the reasonableness and quality of the recorded values. The operator should use a periodic readout or data extraction of the flight recorder to accomplish this requirement.
- A procedure for the retention of FDR correlation documents applicable to each individual aircraft. Also, retention of any additional documents needed to enable accurate conversion of recorded values to their corresponding engineering units. These documents should also be readily available so that they can be delivered to the Australian Transport Safety Bureau (ATSB) after an accident or a reportable occurrence.
- Procedures for updating the correlation and data conversion documentation for each individual aircraft. These procedures should also provide for an update upon modification of a flight data recording system.
- A procedure for the retention of the FDR information relating to the last two operational and last two functional checks as a part of the aircraft maintenance records. Operators may retain the actual FDR data and corresponding data conversion algorithms used at the time the FDR data was collected in electronic format. However, the operator should be able to print out the data or otherwise provide it in a readable format at the request of CASA or the ATSB. If the operator does not have the capability to download or retain the data in electronic format, a tabular computer printout(s) is acceptable. Provide for retention of these records until they are replaced by records from a subsequent check. (CAO 20.18 requires retention of last two system calibrations).

4.2 MEL CONSIDERATIONS

4.2.1 Where an organisation prepares its customised MEL for approval, the MELs should be structured to ensure that the minimum of inconvenience is caused by having a non mandatory parameter inoperative, and ensuring that a mandatory parameter is rectified within the same time constraints that are applied to the FDR system and reflect the requirements outlined in CAO 20.18 (as amended from time to time).

4.2.2 The MEL should also consider the operational environment of the aircraft and the availability of spares and staff to effect rectification. Proper assessment and evaluation may limit operational delays at a later time.

4.2.3 The MEL should also consider the data acquisition system.

Item	REPAIR INTERVAL	NUMBER INSTALLED	NUMBER REQUIRED FOR DESPATCH	REMARKS OR EXCEPTIONS
31031-1 Flight Data Recorder (FDR/DFDR) System.	A	1	0	May be inoperative provided a) Cockpit Voice Recorder operates normally. b) Aircraft may not depart an airport where spares and equipment is available to affect repair. c) Repairs are made within 21 days. **Must be serviceable for training or test flights.**
1) FDR/DFDR Recording Parameters Required by CAO 103.19	A	-	0	May be inoperative provided a) Cockpit Voice Recorder operates normally. b) Aircraft may not depart an airport where spares and equipment is available to affect repair. c) Repairs are made within 21 days. **Must be serviceable for training or test flights.**
2) FDR/DFDR Recording parameters NOT required by CAO 103.19	A	-	0	May be inoperative provided a) Cockpit Voice Recorder operates normally. b) Repairs are made within * days.

*NOTE : * As submitted by the operator and if approved by CASA .*

Sample of a typical MEL for FDR system

4.3 DEFECT REPORTING

4.3.1 Operators have a responsibility to provide Service Difficulty Reports (SDRs) to the Type Certificate holder, the equipment manufacturer, the STC/CAR 35 holder and CASA. (CAR 1998 Part 139) This enables appropriate investigations and, if necessary, components/systems to be modified to improve reliability.

4.4 RECORDING SYSTEM DOCUMENTATION WHEN ACQUIRING A NEW AIRCRAFT

4.4.1 There can be any number of Flight Data Recorder/Flight Data Acquisition System/Airframe combinations within the same model, that may record different parameters and utilise different transducers. Consequently, there may need to be corresponding differences in the data conversion algorithms that reflect the individual aircraft configurations. Use of data conversion algorithms for the wrong aircraft configuration may provide data that is misleading or incorrect, limiting the effectiveness of any analysis. This is an important factor that should be considered when assessing the introduction into service of a new aircraft. Therefore, it is advisable to check with ATSB to determine if they have data conversion algorithms for your particular Flight Data Recorder/Flight Data Acquisition System/Airframe combination.

4.4.2 For a first of type/first of recording system/airframe combination, ATSB should to be provided with:

- A report from the manufacturer detailing the part number of the Flight Data Recorder/Flight Data Acquisition System/Airframe combination and the conversion algorithms that convert the recorded data to engineering units;
- The original recorder or a copy of the recorded binary data for evaluation;
- Sufficient information to confirm that the FDR Run / Stop logic meets the requirements of CAO 20.18.

4.5 UNDERWATER LOCATOR DEVICE (ULD) MAINTENANCE

4.5.1 The maintenance program should specify:

- Life limits on the battery;
- Cleaning of the switches (contacts); and
- Periodic checking of the device in accordance with (IAW) the manufacturers requirements.

4.5.2 Additional reference material on ULD maintenance is found in CAAP 42L-8.

5. Flight data analysis system

5.1 There is a selection of both manufacturer specified and proprietary devices available to perform this function. Equipment not specified by the manufacturer may be used if it can be proven that it will fulfil the requirements. The advantage of the proprietary devices is that they display the information in both digital format and Engineering Units (EU). A portable device may be used on board an aircraft as a fault finding tool.

5.2 If tooling or test equipment specified by the aircraft manufacturer is not used, then such alternate tooling or test equipment is required to be approved under CAR 42ZS.

6. Functional check procedures

6.1 The functional check procedures described in the following paragraphs are required for the commissioning of an FDR system after installation or modification. These procedures have been included as information and to provide a concept of the requirements. These procedures may be appropriate in providing some guidance in relation to developing a suitable SoM that provides for the continuing airworthiness of the FDR system.

6.2 A Functional Check shall comprise ground and/or flight tests and will vary in extent dependent upon whether the installation is classed as initial or follow-on. Generally, each parameter shall be tested over its entire range of operation, the number of test points being dependent on the data source and how the source (data) is processed. The minimum number of test points is defined below. Required test points for a given parameter may be obtained by simulation, ground test, flight test or a combination of these methods.

6.1 GROUND TESTS

6.1.1 The following tests shall be performed for a Functional Check of an FDR system.

(1) Insert definitive Documentary Data through the Flight Data Entry Panel, if installed, (or equivalent device, e.g.: flight-deck clock suitably configured and wired or an event marker switch) to identify commencement of tests.

(2) With the FDR system operating, perform a calibration check of all parameters and discretes. All sensors or transducers should be exercised over their effective range and all discretes exercised through their '*off* /on' states. Specific test

points should be recorded to enable replay to confirm values.

(3) Sensors which may not be practical to exercise or stimulate for the purpose of calibration tests (e.g. fuel flow, torque, EPR) may be simulated by appropriate test equipment.

(4) The discrete calibration points should be predetermined and tabulated on a calibration record sheet. The calculated value in bits for each calibration point should be shown on the record sheet and the test operator should enter the value indicated on the test set. A typical example of an entry on the calibration record is shown in Table 1.

(5) Where the output of a sensor is indicated on flight-deck instruments and/or displays, the correlation between the indicated value and the predetermined calibration point should be established.

(6) Where a sensor output does not provide a flight-deck indication or where it results in an indication with resolution too low for correlation, (e.g. position of flight control surfaces, spoilers, airbrakes) angle-measuring devices such as clinometers should be used to set predetermined test points required for calibration.

(7) A minimum of five test points should be verified for each non-linear parameter and three test points should be verified for each linear parameter. Test points should include upper, transition and lower values (e.g. left, zero and right lateral deviation) and should confirm test points denoting to, from, north, south, east, west, plus, minus, etc. For parameters derived from flight-deck controls having discrete detent positions (e.g. throttles, flaps), each detented position should be tested.

(8) Upon completion of ground test calibration and correlation testing, the FDR should be removed from the aircraft for data analysis. Alternatively, a suitable copy tape or download of the recording(s) should be obtained from the FDR *in* situ for subsequent playback assessment.

(9) To facilitate the assessment of all recorded data, the block of time allocated to ground testing may be suitably time—marked on the FDR such that the identification and assessment of the ground test data may be made later during the flight test data playback assessment.

6.2 FLIGHT TEST

6.2.1 The flight test shall be performed as the last test and while it should be of minimal duration, should nevertheless be of sufficient length to determine if there has been any degradation

of the recorded data when compared with the ground correlation and calibration data.

6.2.2 The flight test for an FDR system shall include specific test points of all parameters and should cover a range of altitudes including maximum certificated altitude of the aircraft. The test schedule should include the following, where practical, with all test points registered by means of a suitable event marker:

(1) Instrument and/or electronic display readings and recordings made at intervals during the flight for the purpose of determining data correlation of the required parameters;

(2) Unless conducted through the ground test segment, functioning of the equipment and systems in all modes and over their full ranges to generate the various discretes and variable parameters should be recorded;

(3) Unless conducted through ground testing, electrical power switching to demonstrate FDR system tolerance to transients and power interruptions;

(4) Operation of radio transmitters and electrical equipment (e.g. pumps, solenoids, motors, fans) to demonstrate FDR system immunity to electromagnetic interference;

(5) For non-solid state recorders, implementation of a flight profile to demonstrate FDR system tolerance to vibration and acceleration; and

(6) At completion of testing, the FDR should be removed from the aircraft for playback assessment. Alternatively, a suitable copy tape or download of the recording(s) should be obtained from the FDR in situ for subsequent playback assessment. An example of an assessment method is included in Appendix 1.

6.3 ADDITIONAL PARAMETERS AND DISCRETES

6.3.1 If new parameters or discrete signals are added to an existing FDR system, functional check testing is required. If the existing system can accommodate the change(s) without modification to FDR system components (e.g. if Flight Data Acquisition Unit (FDAU) software changes are not required), confirmation of satisfactory performance should be established by means of a functional check of the *additional* FDR system inputs only. If the new parameters or discretes are derived from existing aircraft systems and require additional wiring or modifications to existing cable assemblies, an EMI program should be conducted.

Note: An assessment should be conducted to determine the need for re-testing of existing FDR parameters to confirm continued acceptability.

6.3.2 Where significant architectural and/or software changes result from the requirement to augment the list of parameters and/or discrete inputs to an FDR system, a functional check of the system will be necessary with ground testing of all parameters and discretes required.

Note: The need for a flight test should also be assessed.

6.4 DOCUMENTATION

6.4.1 A report prepared to comply with the requirements shall describe the FDR system installation and the equipment installed and shall contain a record of the results of all ground and flight tests, including calibrations and correlations. A copy of the actual ground and flight test data shall be retained by the installer and operator.

6.4.2 For each follow-on installation, a copy of all ground calibration and correlation data shall be retained by the installer and operator.

6.4.3 Any processing time delays between the FDR acquisition system input and FDR recording output shall be documented.

6.4.4 To aid in the playback and analysis of the recorded data, the following information should also be documented and made available in electronic format:

- Bits per FDR Word;
- FDR Words per Subframe;
- Seconds per Subframe;
- Parameter Name;
- Subframe Numbers(location of parameter);
- Parameter Word Numbers;
- Bits (comprising Word);
- Superframe Cycle Counter Name (if applicable);
- Superframe Cycle Numbers (if applicable);
- Signed Value;
- Raw Data Range;
- Polynomial Coefficients;
- Tabular data;
- Predefined Equation;
- Conversion Description;
- Units (e.g. degrees, radians, feet, knots, G);

- Sign Convention; and
- Discrete Interpretation.

PITCH ATTITUDE : PARAMETER NUMBER 013 : RATE 1Hz					
SELECTED CAL. POINT	-10° DN	-5° DN	0°	+5° UP	+10° UP
CALCULATED VALUE	655-665	673-683	689-699	703-713	716-726
TEST SET READING					

Table 1: Example of Parameter Calibration Record

7. Operational checks

7.1 The Operational Check required to check the continued serviceability of the installed flight recorder system will depend on the extent of the monitoring built into the recorder and its sensors. The C of R holder will need to perform an analysis of the system to identify those parts of the system which, if defective, would not be readily apparent to the flight crew or maintenance personnel. Appropriate inspections and functional checks, together with the intervals at which these would need to be performed, will need to be established as indicated by the analysis.

7.2 A copy of the recording made in flight should be made at specified intervals. The copy should be converted to EU and analysed to confirm correct operation of the recording system. Inspection of the data should reveal defective or noisy sensors and indicate necessary maintenance actions. Credit can be given where the serviceability of flight recorder sensors is checked by inspection of the record produced by a maintenance provider. An example of an assessment method is included in Appendix 1.

Note: A readout in EU is recommended.

7.3 The checks will include verification of sensor calibration where appropriate. Sensor calibration data shall be retained by the aircraft operator and made available when required by the accident investigation authorities.

7.4 Any maintenance or test requirements specified by equipment manufacturers must be observed, e.g. check of the fire protection integrity of the flight data recorder.

8. Typical maintenance tasks

8.1 Table 2: shows the primary maintenance tasks for the installed flight recorder system. Maintenance intervals should be specified and established on the basis of the system analysis.

Table 2: Maintenance Tasks and Intervals

ITEM	INTERVAL	TASK
Flight Recorder System indication	Pre-flight 2000 hr / 12 months 8000 hrs / 5 years or as escalated by a reliability analysis of system	Check for no-fail. Check all mandatory parameters are active and are of acceptable quality. Check serviceability of recorder and sensors and test for calibration
Flight Data Recorder	As specified by equipment manufacturer. As specified by equipment manufacturer.	Remove tape recorders for bench check in accordance with manufacturer's instructions. Remove for check of crash/ fire protection features
Accelerometers	As specified by equipment manufacturer.	Test for calibration.
Underwater/Radio Location Beacons	As specified by equipment manufacturer.	Check serviceability of beacon and battery.

Bill McIntyre
Executive Manager
Aviation Safety Standards

APPENDIX 1

TYPICAL FLIGHT DATA RECORDER SYSTEM CHECK PROCEDURES

1 General

1.1 The operator should accomplish a reasonableness and quality check of the recorded flight data to ascertain that the data is being recorded correctly and that noise and data dropouts do not interfere with the ability to interpret the recorded data. The check may be performed using data that is in electronic format or using hard copy data. If a hard copy printout is used, data traces should also be available. The check should be performed using data that has been extracted in engineering units. Octal, binary coded decimal, or hexadecimal coded data does not provide the analyst a clear understanding of how the parameters are varying and how they are correlated to each other. Particular attention should be paid to using the correct data conversion algorithm appropriate to the aircraft recording system configuration.

1.2 It should be noted that the actual parameter fitment to an aircraft may be much more comprehensive than required under the regulations and the structure of the check should include a check of all parameters recorded.

2 Procedure/Report

2.1 The analyst should use a checklist to ensure that all necessary checks have been accomplished. The checklist should ensure the analyst accurately documents inconsistencies in the data so that appropriate troubleshooting/repair procedures be instigated.

2.2 The output of the reasonableness and quality process is a report that documents the status of the aircraft recording system as a result of an Operational or Functional Check.

3 Data Analysis/Flight Segment Selection

3.1 Parameter Check

- Failed Parameters. The analyst should examine the extracted data to determine if parameters that normally vary in flight do so within expected ranges, e.g. flight controls, flight control surface positions, and heading, are indeed varying. Pegged or unmoving parameter values are indications of an inoperative sensor or other failure. Accelerometers tend to fail in the "pegged" position. If the accelerometer trace is unmoving throughout all segments of flight, check to see if it indicates maximum or minimum acceleration. An accelerometer failure indicating a mid-point value is uncommon.
- Correlation to Other Parameters.
    - ◊ The reasonableness check should include a check of the correlation between parameters that depend upon each other. For example: if ROLL increases, a turn is indicated and HEADING should begin to change soon after the increase is detected. Also, AILERON POSITION and CONTROL WHEEL POSITION should have changed before the ROLL increase. One may even note a variation in LATERAL ACCELERATION.
- The data to be used by the analyst should be extracted from takeoff, cruise and landing phases of flight. The takeoff and landing segments of flight provide the analyst an opportunity to observe data that is changing as the aircraft climbs, descends, accelerates, decelerates, and banks or turns. During the cruise segment of a flight most parameters

should remain reasonably steady. A lack of stability may reveal a fault in the recording system.

3.2 Table 1 and Table 2 of this Appendix are samples provided as an aid in preparing a reasonableness checklist. It summarises the mandatory parameters recorded in a 6-parameter Digital Flight Data Recorder System and 20-parameter Digital Flight Data Recorder System respectively. A check mark (✓) in a block indicates that the parameter identified in the row and the parameter identified in the column are interdependent at some time during takeoff and climb or approach and landing. Therefore, a change in value of one parameter may cause or be caused by a change in the value of the other.

3.3 The following examples show how the Tables may be used in developing a reasonableness checklist for each parameter. Actual operation of the recorded parameters may vary depending on the sensors installed and the aircraft systems that are monitored.

4 A typical Thrust Reverser Position Reasonableness and Quality Check

4.1 In Table 2 the column labelled Thrust Reverser Position contains check marks in the rows labelled airspeed, engine thrust, longitudinal acceleration and air/ground sensing. In preparing the checklist, one would normally expect the thrust reverser to deploy during rollout after landing. Thus, the following checklist might be developed using the parameters identified by a check mark:

- Examine the thrust reverser in-transit and the thrust reverser deployed data to determine that they indicate in-transit only for a short period during the landing roll and deployed at the end of the in-transit period. Following touchdown, as indicated by a change in the air/ground sensing discrete, the data should indicate a change in the in-transit discrete followed by a change in the deployed/stowed discrete.
- Examine the engine thrust data during the in-transit period and immediately after the deployed indication. During the in-transit period, engine thrust should have decreased to ground idle and immediately after the deployed indication, the engine thrust should remain at ground idle or increase.
- Examine the airspeed and longitudinal acceleration data. These two parameters should be decreasing during the in-transit period and should dramatically decrease immediately after the deployed indication as reverse thrust comes into effect.
- Examine the engine thrust, thrust reverser deployed and thrust reverser in-transit data to determine cancellation of reverse thrust. The engine thrust should remain at ground idle or decrease to ground idle, the thrust reverser deployed/stowed and the thrust reverser in transit discretes change state. Check that the discrete parameters examined return to the values prior to landing.
- Examine the remaining data for the thrust reverser discrete to ascertain that no in-transit or deployed indications appear. If intermittent indications appear, determine that they are within allowed values and do not have sufficient duration to be interpreted as an actual deployment and that they would not obscure an actual deployment.

5 Typical Lateral Control Surface Position Reasonableness and Quality Check

5.1 In Table 2 the column labelled lateral control surface position contains check marks in the rows labelled heading, roll attitude and lateral control position. The lateral control surfaces are typically ailerons that are used in establishing the aircraft in a turn and returning the aircraft to straight flight from a turn. The lateral control surface position data may be checked along with the

lateral control position data. These checks may be accomplished during the approach and landing segment.

- Examine the lateral control surface position trace for deviations during the initial approach segment. A large sustained deviation would normally indicate the aircraft turning onto final approach heading. Check that the lateral control position and roll attitude make a large change at the same time.
- Check to determine that heading begins to change immediately after the lateral control surface position begins to change. Heading should continue to change after the lateral control surface position returns to the zero or null value. The heading data should begin to change at a lower rate when the lateral control surface position data moves in the opposite direction and after the lateral control position is again returned to zero or null the heading data should again be constant.

5.2 Check the lateral control surface position data to determine that there are no data dropouts and that there is no noise in the data. If dropouts or noise are detected, determine that they are within allowable values and that they would not be interpreted as an actual control surface position movement.

Paramater		Time	Pressure Alt	Airspeed	Heading	Vertical Acceleration	Manual Mic Keying						
1	Time	■											
2	Pressure Alt		■	✔	✔	✔	✔						
3	Airspeed		✔	■									
4	Heading		✔		■								
5	Vertical Acceleration		✔			■							
6	Manual Mic Keying		✔				■						

TABLE 1 6 PARAMETER CORRELATION
Note: The Parameters are numbered as per CAO 103.19 Appendix 1.

	Time	Altitude	Airspeed	Heading	Vertical Acceleration	Pitch Attitude	Roll Attitude	Manual Mic Keying	Engine Thrust	Longitudinal Acceleration	Pitch Control Position	Lateral control Position	Yaw Control Position	Pitch control surface position	Lateral control surface positi	Yaw control surface position	Lateral acceleration	Pitch trim surface position	Trailing edge Flaps	Leading edge Flaps Slats	Thrust Reverse position	air ground sensing	Angle of attack
(1) Time	■																						
(2) Altitude		■	✔	✔	✔			✔	✔				✔			✔			✔	✔		✔	
(3) Airspeed		✔	■															✔	✔	✔	✔	✔	
(5) Heading		✔		■			✔					✔			✔								
(4) Vertical Acceleration		✔			■	✔				✔	✔			✔			✔					✔	
(7) Pitch Attitude					✔	■					✔			✔				✔					✔
(8) Roll Attitude				✔			■								✔		✔						
(6) Press to Transmit for each tranceiver		✔						■															
(9) Thrust of each engine		✔							■											✔	✔		
(11) Longitudinal Acceleration					✔					■							✔	✔	✔	✔	✔	✔	
(18) Pitch Control Position					✔	✔					■			✔				✔					✔
(19) Roll control Position				✔			✔					■			✔								
(20) Yaw Control Position		✔											■			✔							
(18) Pitch control Surface Position					✔	✔					✔			■				✔					✔
(19) Roll Control surface position				✔			✔					✔			■								
(20) Yaw control surface position		✔											✔			■							
(16) Lateral Acceleration					✔		✔			✔							■						
(17) Pitch trim			✔			✔				✔				✔				■					
(10) Trailing edge Flaps		✔	✔							✔									■	✔			
(14) Leading edge Devices stowed/deployed		✔	✔							✔									✔	■			
(13) Thrust Reverser stowed/deployed(each engine)			✔						✔	✔											■	✔	
(12) Undercarriage squat or tilt switch		✔	✔		✔				✔	✔											✔	■	
(15) Angle of attack						✔					✔			✔									■

TABLE 2: 20 PARAMETER CORRELATION
Note: The Parameters are numbered as per CAO 103.19 Appendix 1.