CHAPTER 40
FLIGHT DATA ANALYSIS PROGRAMME (FDAP)

1.0 INTRODUCTION

Flight Data Analysis Programme (FDAP), sometimes referred to as Flight Data Monitoring (FDM), or Flight Operations Quality Assurance (FOQA), provide another tool for the proactive identification of hazards. They are a logical complement to the incident reporting systems and to Line Operations Safety Audit (LOSA) Programme. Flight Data Analysis Programme (FDAP) assist an operator to identify, quantify, assess and address operational risks. FDAP can be effectively used to support a range of airworthiness and operational safety tasks.

Operators of larger aircraft authorized to conduct international commercial air transport operations will be accountable for the operation of a non-punitive FDAP, which contains adequate safeguards to protect the source(s) of the data. Operators may obtain the services of a specialist contractor to operate the Programme.

1.1 PURPOSE

The purpose of this document is to provide background information and guidance to any Air Operator that intends to develop and establish a Flight Data Analysis Programme (FDAP) and for NCAA in the assessment of those Programmes. Furthermore, it aims to develop and implement a non-punitive FDAP to promote compliance with the Annex 6 Part I and III requirements regarding establishment of non-punitive FDA Programme.

1.2 DEFINITION

For the purposes of this Chapter, a Flight Data Analysis Programme (FDAP) may be defined as: A proactive and non-punitive Programme for gathering and analysing data recorded during routine flights to improve flight crew performance, operating procedures, flight training, air traffic control procedures, air navigation services, or aircraft maintenance and design.

2.0 REFERENCES

1. ICAO Annex 6, Part I
2. ICAO Annex 6 Part III
3. ICAO Annex 19
4. ICAO DOC 10000 AN/501
5. Nig. CARs 9.2.2.10 and 9.2.2.11

6. ICAO Accident Prevention Programme
7. FORM: O-OPS 012
8. FORM: O-OPS 012A
9. CL: O-OPS 043

3.0 BACKGROUND

3.1 ICAO Annex 6 Part 1 Chapter 3 requires that an operator of an aeroplane of a maximum certificated take-off mass in excess of 27 000kg shall establish and maintain the FDAP as part of its accident prevention and flight safety programme from 1 January 2005 and ICAO Annex 6 Part III recommends that the operators of helicopters (more than 7 000 kg) establish and maintain an FDAP.

Furthermore, ICAO Annex 19 Chapter 5 requires States to establish Safety Data Collection and Processing Systems (SDCPS) to capture, store, aggregate and enable the analysis of safety data and safety information; establish a mandatory safety reporting system that includes the reporting of incidents; and establish a voluntary safety reporting system to collect safety data and safety information not captured by mandatory safety reporting systems.

3.2 Flight Data Analysis Programme (FDAP) is a continuous pro-active safety Programme that utilizes Quick Access Recorder (QAR) data to collate and analyze digital flight data in routine line operations. The Programme is also known as the Flight Data Monitoring (FDM) or Flight Operations Quality Assurance (FOQA). It is mainly used to identify adverse safety trends from Flight Operations and enable corrective actions can be introduced before unsafe trend leads to accidents.

3.3 Data gathered can also be analyzed to improve crew performance, operating procedures, flight training, air traffic control procedures, air navigation services, or aircraft maintenance and design.

3.4 In Incident Investigation, the FDAP provides the Quantitative description of the event supplementing the Contextual crew report.

3.5 Additionally, flight profile and engine operations parameters can also be collated through FDAP for the operator's maintenance Programme and as part of the continuing airworthiness Programme to monitor, analyze and improve operational efficiency as part of continuing airworthiness. This represents a separate part the FDA Programme which is distinct from flight parameters exceedence detection.

4.0 SCOPE

4.1 The scope of this document is to provide guiding principles to Air Operators for implementation and management of an effective Flight Data Analysis Programme

and how the Civil Aviation Authority Operations Inspectors will provide required oversight functions to monitor and ensure compliance.

5.0 OBJECTIVES AND USE OF A FLIGHT DATA ANALYSIS PROGRAMME

5.1 Identification of Undesirable and Unsafe Trends through Exceedence Detection and Routine Operational Measurements.

5.1.1 FDAP enables analysis of flight data to identify areas of operational risk through a pro-active and routine collation of a pre-determined core set of flight parameter exceedances. These de- identified non-standard flight operations, deviation from prescribed operating procedures and unsafe circumstances can be detected and quantified into undesirable and unsafe trends for remedial action(s) to be taken.

This looks for deviations from flight manual limits, and standard operating procedures. A set of core events should be selected to cover the main areas of interest to the operator. The event detection limits should be continuously reviewed to reflect the operator's current operating procedures. Some triggered events may include:

- excessive pitch on takeoff;
- climb out speed low or high during takeoff; and
- excessive rate of descent below 1000 feet.

5.1.2 De-identified exceedence detection data gathered and lessons learnt are shared with the operator's flight crew for risk awareness.

5.1.3 The FDAP also enables the continued monitoring of the effectiveness of remedial actions introduced.

5.1.4 Routine measurements - Ideally, data should be retained from all flights. At the very least a sufficient selection of measures will be taken from the fleet to ensure that normal practice is defined. Data will be recovered sufficiently frequently to enable significant safety issues to be considered and then mitigated. This may be accomplished by retaining select parameters at a given point in space. For example:

- climb speed at 400 AAL;
- flap retraction altitude/speed;
- gear extension altitude/speed;
- airspeed at 1000 feet AAL on approach; and
- rate of descent at 1000 feet AAL on approach.

A comparative analysis can then be made between any given flight and the established profile for normal procedures. Undesirable trends may be identified

before there are statistically significant numbers of events. Emerging trends and tendencies are monitored before the trigger levels associated with exceedences are reached.

5.2 Incident Investigation

5.2.1 FDAP provides quick and valuable quantifiable recorded data for safety investigation of mandatory reportable incidents. FDAP captured flight parameters, performance and system status assist in concluding the cause and effect of the event.

5.2.2 In the safety investigation of mandatory reportable incidents, the FDAP's protocol of data confidentiality would not apply as crew narrative of the incident providing the context of the incident and the applicable specific human factor issues contributing to incident plays an integral part of the investigation.

5.2.3 Additionally, in the event that the FDAP reveals a flight profile and/or operating parameters that are classified as a mandatory reportable incident under ICAO Annex 13 and NCAA Regulations, the event must be immediately identified and incident report filed in line NCAA Mandatory Occurrence Reporting (MOR) accordingly and investigated by the operator.

5.3 Continuing Airworthiness

5.3.1 Routine and specific event data from the FDAP can be utilized as an integral part of an operator's continuing airworthiness function as required under ICAO Annex 8. The data areanalyzed to ensure that the operator's aircraft are in a condition for safe and efficient operation.

5.3.2 FDAP can also be used by the operator as an engine-monitoring Programme to analyze engine performance and its efficiency. Other use of the data includes airframe drag measurements, avionics and other system performance monitoring, flight control performance, taxi fuel monitoring, brake and reverse thrust usage.

5.3.3 Routine or specific event data acquired from FDAP for continuing airworthiness forms part of the operator's maintenance and efficiency Programme and are separate from the flight parameters exceedence detection and safety trend data collection. Therefore, the extent and dimension of data collection in this category remains solely at the discretion of the operator provided the non-punitive and confidentiality aspect of the FDAP is maintained.

5.4 Integrated Safety Analysis

5.4.1 FDAP data should be kept in a central safety database and linkable to, or accessible by other safety database such as incident reporting systems and technical fault reporting system while safeguarding the confidentiality of the FDAP data.

5.4.2 This cross-reference capability enables a multi-dimensional and circumferential understanding of events providing accurate information on the overall safety health of flight and maintenance operations.

5.4.3 The integration of all available sources of safety data provides the company SMS with viable information on the overall safety health of the operation. For example, a flap over-speed results in:

(i) a crew report;
(ii) an FDAP event; and
(iii) an engineering report.

The crew report provides the context, the FDAP event provides the quantitative description and the engineering report provides the result.

5.5 Removal of Recording Medium

Where older flight recording equipment is installed, and there is no opportunity to use aQuick Access Recorder (QAR) or equivalent to download data, operators should coordinate the removal of the recording medium in harmony with maintenance schedules and/or routines. The removal time period should also coincide with recording medium memory capability and meet the operator's need for a timely analysis of the data as defined in the operator's FDAP goals. Specific procedures for data removal should be defined for maintenance personnel to permit proper data download. It is expected sufficient spare recording medium will be available at the operator's maintenance facilities so that the recording unit can be placed back into service after download, as shown in Fig. 40-1 below:

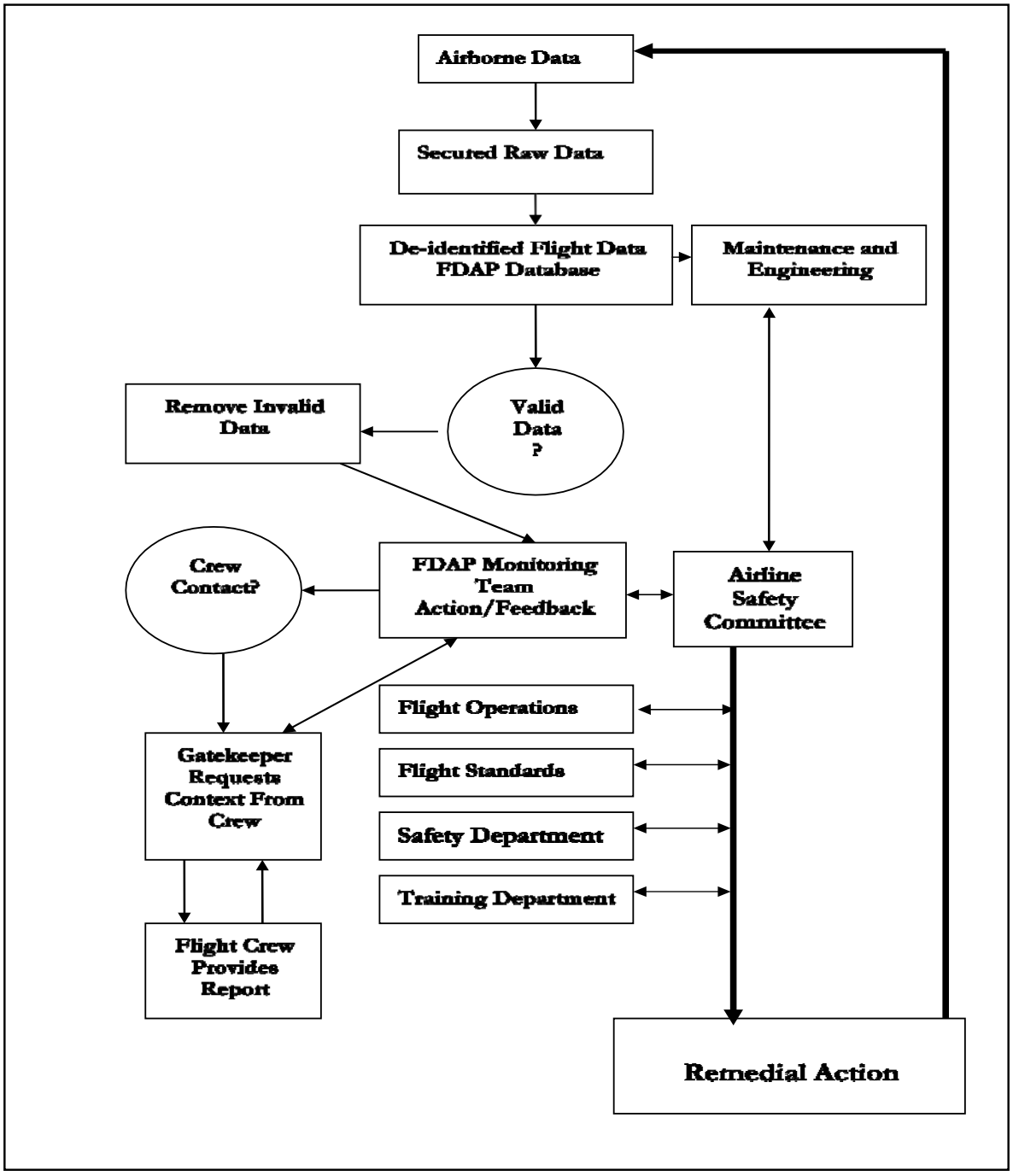
Airborne Data
Secured Raw Data
De-identified Flight Data
FDAP Database
Maintenance and
Engineering
Remove Invalid
Data
Valid
Data
?
Crew
Contact?
FDAP Monitoring
Team
Action/Feedback
Airline
Safety
Committee
Flight Operations
Flight Standards
Safety Department
Training Department
Gatekeeper
Requests
Context From
Crew
Flight Crew
Provides
Report
Remedial Action

Fig. 40-1

6.0 IMPLEMENTATION

6.1 Reference Documents and Implementation Requirements

To assist with the implementation of the Flight Data Analysis Programme, operators should make reference to:

a. ICAO Doc 10000 Flight Data Analysis Programme Manual (FDAPM)
b. ICAO Doc 9422 Accident Prevention Programme
c. ICAO Annex 13 Attachment E Legal Guidance for the Protection of Information from Safety Data Collection and Processing System.

6.1.1 For a start-up airline, it is expected that it would take a minimum of two years to implement an effective monitoring program and implementation would need to be a phased approach. Typically, the following steps are required to implement an FDAP:

a. Implementation of pilot association agreements;
b. Establishment and verification of operational and security procedures;
c. Installation of equipment;
d. Selection and training of dedicated and experienced staff to operate the Programme;and
e. Commencement of data analysis and validation.

It is also considered essential that the FDAP is integrated seamlessly within the SMS to maximise safety benefits. The data provided by the Programme will provide quantitative information to support investigations that would be otherwise based on subjective reports.

6.1.2 Equipment Requirements

FDAPs involve systems that capture flight data, transform the data into an appropriate format for analysis and generate reports to assist in assessing the data. Basic equipment required to implement and support FDAP includes:

a. A flight data recorder (FDR, QAR or equivalent);
b. A data retrieval device which may be an optical disc/PC card or a wireless QAR thatautomatically transmits the encrypted data through a ground link to the ground station;
c. A ground station (usually a desk top computer loaded with the appropriate software), to analyse the data and identify deviations from expected performance; and
d. Optional software for flight animation facilitating a visual simulation of actual flightevents.

6.1.3 Training Requirements

Due to the importance of FDAP, the NCAA will ensure that it's Flight Operations Inspectors and other Inspecting Officers receive FDA/FDM Core Course training and other related training on FDAP implementation and oversight, as a pre-requisite to FDAP audit/inspection.

The minimum qualification requirements for the technical personnel performing safety-related functions are as detailed in TGM Vol. 3 Operations Policy & Procedure Manual (PPM) Chapter 3. Provision has been made for appropriate initial and recurrent training to maintain and enhance Operations Inspectors competence at the desired level in TGM Vol. 3 Operations Policy & Procedure Manual (PPM) Chapter 7. The system for the maintenance of training records for technical personnel are detailed in TGM Vol. 3 Operations Policy & Procedure Manual (PPM) Chapter 5.

Operators must ensure that their FDAP Team members receive FDA/FDM (Core Course) training and on the software to be used for the management and implementation of the programme, as a pre-requisite to FDAP functions. The team members must meet the minimum qualification requirements for technical personnel responsible for FDA. All training records must be maintained in line with Nig. CARs 9.2.2.5.

6.1.4 Implementation Plan

The following is a broad guide to the major steps required to implement an FDAP:

1. Confirm Management approval and support for FDAP implementation.
2. Implementation of a formal agreement between management and flight crews.
3. Identification of an FDAP implementation committee, including the future FDA team
4. Development of a business plan, including processes, software and hardware and assignment of adequate resources.
5. Establishment and verification of operational and security procedures.
6. Development of a FDAP Manual.
7. Assessment of possible interfaces between the FDAP and other safety data sources (i.e. SDCPS) and of integration of the FDAP into the SMS.
8. Selection of equipment (airborne, ground-based computer system, interface with other data sources and the SMS).
9. Selection and training of the FDA team members, according to their respective roles.

10. Testing of data transfer; testing of the ground-based computer system (including data acquisition, definition of trigger logic expressions, data analysis and visualization, data de-identification, final storage of data).
11. Testing of data security, including security procedures;
12. Identification of areas of interest that should be first looked at in the data;
13. Checking of the proper decoding and of the quality of flight parameters used by the FDAP; and start of data analysis and validation, focused on key areas in operation.
14. Produce Completion Report.

6.2 Pilot Support

6.2.1 Pilot support and cooperation is essential for a successful implementation of the FDAP. The narrative provided by the pilots on exceedence detection provides an important part in the investigation and analysis loop. Raw data itself collated from the FDAP will not provide meaningful understanding of hazards and the associated risk.

6.2.2 De-identification of crew involved in exceedence events from management contributes to the development of trust for the FDAP. De-identification of gross exceedence data also forms the tool for the non-punitive aspect of the FDAP.

6.2.3 Formal agreement/ protocol between the management and pilots on the procedures and data protection for gross exceedence events should be reached prior to FDAP implementation. It should be stressed that such agreement only encompass gross exceedence data management and must not include data required by the operator for reportable incident investigation and continuing airworthiness aspect of the FDAP.

6.3 FDAP Committee

6.3.1 Administration of the FDAP should involve all stakeholders and the formation of a committee. Members of the FDAP Committee team should include the following:

(i) Safety Department
(ii) Pilot representative
(iii) Data Analyst/ Technical Interpreter
(iv) Flight Operations Fleet Management
(v) Flight Operations Training Department
(vi) Human Factor interpreter

In addition to their existing subject area expertise, all FDAP team Members should be given at least basic training in the specific area of FDR data analysis. It is essential that a regular, realistic amount of time is allocated to FDAP tasks.

Lack of manpower resources usually results in underperformance or even failure of the whole Programme.

6.3.2 The FDAP Committee is responsible for the formulation of the pilot re-engagement Programme in gross exceedence events. Such re-engagement Programmes should be documented and validated by the continuing FDAP trending.

6.3.3 FDAP Procedure Document

The FDAP procedure document, or memorandum of understanding (MOU), is to be signed by all parties (airline management including the Flight Safety Manager and the Accountable Manager, flight crew member representatives nominated by the pilot union and the pilot association) will, as a minimum define:

1. The aim of the FDAP;
2. A data access and security policy that should restrict access to information to specifically authorized persons identified by their position;
3. The method to obtain de-identified crew feedback on those occasions that requirespecific flight follow-up for contextual information; where such crew contact is required the authorised persons need not necessarily be the Programme manager, or safety manager, but could be a third party (broker) mutually acceptable to flight crew members representative and management;
4. The data retention policy and accountability including the measures taken to ensure thesecurity of the data;
5. The conditions under which, on the rare occasions, advisory briefing or remedial training should take place; this should always be carried out in a constructive and non-punitivemanner;
6. The conditions under which the confidentiality may be withdrawn (e.g. for reasons of gross negligence or significant continuing safety concern);
7. The participation of flight crew member representative(s) in the assessment of the data, the action and review process and the consideration of recommendations; and
8. The policy for the publishing the findings resulting from the FDAP.

6.4 JUST CULTURE

6.4.1 The FDAP places emphasis on data de-identification as a mean to support the non-punitive nature of the Programme. In gross exceedence events, the FDAP provides learning lessons and trends are to be generated without the threat of censure to the event actors.

6.4.2 Operator should balance the benefits of a Just Culture within the overall Safety Culture in the organization against willful violations of Standard Operating Procedures detected by the FDAP. The emphasis on non-punitive aspect of the

FDAP must not be all encompassing and be allowed to evolve into a No-Blame Culture which may erode disciplined adherence to safe operational procedures. In cases of gross exceedence events attributable to willful violation resulting in unsafe and undesirable aircraft state, the operator must seek to identify the violator through the FDAP committee and prescribe a re-engagement Programme to prevent recurrence. In such cases, the FDAP committee should not withhold the identification of the event without compelling justification.

6.4.3 NCAA will not take ownership of an operator's risk or their responsibility to react appropriately to any safety issues discovered. The principles of a just culture still apply, therefore in the very rare event of a significant safety concern which is not being adequately addressed by an operator, the Authority retains its right to react and ensure safety standards. Normally, the Authority expects the operator's proactive SMS to cover and account for these activities at all times. The Authority must ensure the full application of the SMS provisions through standard oversight activities.

In case of gross excedence events that are not attributable to willful violations, the Authority will ensure that the operator has not been sanctioning the crew involved which may eventually erode the principle of Just Culture and make the voluntary reporting system to be ineffective.

Where there are gross excedence events attributable to willful violation resulting in unsafe and undesirable operational practices, the Authority will ensure that the operator follow clear procedures to ensure fair treatment and proportionate remedial action to prevent reoccurrence.

6.5 ALTERNATIVE TRAINING & QUALIFICATION PROGRAM (ATQP)

(Train the way you operate and operate the way you train)

6.5.1 An ATQP allows an operator to provide a more effective and more operator-specific recurrent training and checking package for its crews. The Programme ensures a higher level of civil

aviation safety by utilizing improved training and evaluation over the current system. The Programme is a company and type-specific alternative to traditional training. Ongoing data collection can be developed into a responsive programme that can adapt to an operator's changing requirements such as new technology, new equipment or a differing route structure. Focusing on specific needs of fleet and groups of pilots targeted training can enhance performance while reducing cost in the long run.

6.5.2 Operators are encouraged to establish ATQP in order to create training and qualification standards that are higher than the core requirements of the Air

Operations and to priortise training where the greatest benefits can be achieved. To maximise effectiveness, an operator's training programme needs to be targeted at areas that are pertinent to the operator's type and area of operation.

6.5.2 To achieve the aims of an ATQP, an operator will be required to develop a task-oriented training programme that is objectively based. To develop the Programme, the operator must conduct a task analysis to provide justification and a rational for the programme's structure and content, supported by a data monitoring / analysis system which includes an established FDA Programme.

6.5.3 All ATQPs must be evaluated and approved by the Authority, before implementation.

7.0 MANDATORY OCCURRENCE REPORTING AND FDAP

This section deals with the practical issues arising when FDAP information is used in the follow-up process.

Once it has been ascertained that there is significant actual or potential risk associated with an issue raised by any safety Analysis process then it is widely accepted that there is an obligation to:

a. act upon it to prevent a repetition; and
b. spread the safety message both within the company and to industry to prevent "someone else's accident".

After recording and acting upon such information as an Air Safety Report (ASR) within the company then the principal medium for informing is the Mandatory Occurrence Reporting System (MORS). It is logical to feed the lessons obtained from FDAP into this existing and trusted system.

7.1 Air Safety Reports and Mandatory Occurrence Reporting

7.1.1 Air Safety Reports (ASRs)

The incident reports initially submitted to the operator's flight safety officer are often referred to as Air Safety Reports (ASRs). The processing, assessment and actions arising from each ASR will form part of the operator's Safety Management System. ASRs are raised by a wide range of methods and triggers. A flight crew or air traffic controller's assessment of a risk, the result of an engineer's inspection, cabin crew reports, security staff etc. all contribute to an overall awareness of the safety risk to the operation. Be aware that an incident may be reported in one or more reporting systems e.g. ground report, maintenance, human factors, cabin crew etc. and that an integrated system will bring together all the relevant information. Reports could indicate failure of the defensive measures you have put in place to prevent a hazard.

7.1.2 Mandatory Occurrence Reports (MORs)

The more significant ASRs (along with maintenance and other reports) will be noted, either by the person submitting the report or the safety officer, as requiring submission to the CAA's MOR Scheme. These reports are further considered, acted upon and publicised to increase awareness.

7.1.3 Retention of FDR data for MORs

NCAA Mandatory Occurrence Reporting System gives the following advice:

1. The NCAA expects to use flight recorder data only when this is necessary for proper investigation of the more significant occurrences. It is not intended to use data to check on information contained in a written report, but to supplement and extend the written information. Examples of the types of occurrences for which flight data records would be most useful are:
   - Significant excursion from the intended flight parameters;
   - Significant loss of control or control difficulties;
   - Unexpected loss of performance or a genuine GPWS warning.

2. The more comprehensive recorders fitted to some aircraft are capable of providing valuable data on a wider range of occurrences and the NCAA would expect to make judicious use of such information in relation to appropriate occurrences. For this purpose, the NCAA requests that operators retain the data from an FDR which is relevant to a reportable occurrence for a period of 60 days from the date of the occurrence being reported to the NCAA, or a longer period if the Authority so requests.

3. The NCAA depends upon the judgment of those responsible for submitting reports to establish which occurrences require the retention of FDR data, it is equally incumbentupon the NCAA to advise the reporting organization, as quickly as possible, when it requires such data.

After an incident, a quick judgement has to be made as to whether FDR data is likely to be useful in an investigation. The short recycling/overwriting time of most DFDRs makes it critical that a decision to quarantine the data is taken very rapidly. Experience shows that this is a very difficult requirement to fulfill. Where QAR data is available it is suggested that operators may wish to approach theca with a proposal to substitute QAR data for that from the DFDR.

7.1.4 Confidentiality Issues

While all ASRs are attributable to the reporter, an open safety reporting culture relies on the knowledge that the identification of individuals is restricted to a need-to-know basis and that it is definitely non-punitive. It should be noted that there is a difference between anonymity and confidentiality with the former being less desirable in an integrated safety system. While the reports generated automatically from FDAP should be treated confidentially, the greatest benefit will be gained by correlating this information with other relevant safety and technical reports especially in the case of the most hazardous or significant events. Where an air safety report has already been submitted then (only) relevant FDAP events can be used to add to the understanding of the circumstances of the incident. It is important to emphasise that it is not the purpose of the process to check out the reporter's recollection and accuracy.

7.1.5 Withdrawal of Protection of Identity

Experience has shown that very rarely there will be cases where an important issue has been raised by FDAP and for some reason no report has been submitted. In this case the persons involved have been encouraged, through a confidential contact by a crew representative or other trusted person, to submit, "without prejudice", a report. This method of contact has proved to be very effective in soliciting reports and a good means of imparting constructive safety advice to those involved. Almost invariably any advice or remedial action, i.e. training, is well received by the crews – on the understanding that this is not "held against them".

In the extremely rare case where there is a definite ongoing safety risk and no reports forthcoming despite requests, making remedial action impossible, then agreed procedures are followed to allow essential safety action to be taken. It should be emphasised that at no stage in this process is disciplinary action considered. There may have to be a judgement made on the probability of recurrence against a potential reduction in the openness of the overall safety culture resulting from a loss of confidence. However, experience has shown that the vast majority of FDAP information is concerned with lower levels of hazard where no identification is needed.

7.1.6 Confidentiality and Mandatory Occurrence Reports

It should be noted that while MORs are not subject to FDAP confidentiality agreements, it is possible to submit a confidential MOR. In this way, although the original report must be identified, this information will be restricted during subsequent publication and analysis.

7.2 FDAP and Mandatory Occurrence Reporting

Within a good safety culture, the vast majority of significant Individual FDAP events/exceedences will be the subject of crew air safety or occurrence reports and investigations. This section considers the interaction of FDAP information and the MOR system.

7.2.1 Reporting Standards and Audit Events

FDAP systems have proven to be very effective in reminding crews to submit reports during the early stages and are then a useful audit tool, confirming reporting standards in an established Programme. Issues covered may include the following:

1. Various warnings: Stall, Hard GPWS, high speed or major systems warning
2. Heavy landing
3. Tailscrape
4. Rejected take-off at high speed and go-arounds
5. Engine failure
6. Severe turbulence and vortex wake encounters
7. Altitude deviation
8. Flight control difficulties indicated by excessive/untypical control deflections

It should be remembered that in the case of significant incidents found as the result of FDAP analysis, the crews should be encouraged to submit retrospective reports – without prejudice or penalty to the crew concerned.

7.2.2 Reporting of Issues raised by FDAP Events

It would only be in cases of general underlying trends and wider issues when FDAP dataalone would be used to raise ASRs or MORs.

Multiple FDAP events may come together to indicate a potential issue for widerconsideration or action. Examples of the type of issue that would be appropriate for sucha submission include:

a. Unacceptable number of unstabilised/rushed approaches at a particular airfield.
b. False/nuisance GPWS warnings at a particular location or with certain equipment.
c. Rough Runway – permanent problem area or out of Specification temporary ramps.
d. Repeated near tailscrapes due to pilot rotation technique indicating revised guidancerequired.
e. Repeated events considered unacceptable elsewhere produced by a particular SID.
f. Reduced fuel reserves on certain sectors

8.0 REGULATORY OVERSIGHT OF FDAP

8.1 Introduction

8.1.1 FDAP is primarily a tool of gathering intelligence from flight operations in order to monitor, maintain and improve safety. As FDAP data becomes increasingly important in Safety Management System (SMS) and Alternative Training and Qualification (ATQP). NCAA needs to be:

a. Assured of the effectiveness of FDAP, and
b. Its compliance with the regulatory requirements.

Under Nig. CARs Part 9.2.2.10 FDAP must be integrated as part of an operator's Safety Management System (SMS). A more detailed description of a Safety Management System can be found under Nig. CARs Part 20.

8.1.2 The underlying principles set out in **FORM: O-OPS 012 and FORM: O-OPS 012A** in the **NCAATechnical Guidance Material (TGM)** form the basis of the audit methodology. Each applicable operator will be assessed on how effectively they have implemented FDAP against each of the principles. This Section describes some of the considerations pertinent to such oversight.

8.2 METHOD OF FDAP OVERSIGHT

8.2.1 The NCAA's audit schedule for an operator includes an assessment of how effectively the operator is implementing its FDAP against the underlying principles referred to above. Each of the principles in **FORM: O-OPS 012** is accompanied by processes which illustrate the type of supporting mechanisms and procedures needed for a satisfactory FDAP.

FORM: O-OPS 012 shall be used by operators to confirm that all the mechanisms are in place to implement FDAP. The acquittal of the items listed is considered the minimum necessary by NCAA for regulatory assessment of the Programme.

FORM: O-OPS 012A (Flight Data Summary) is given as just an example of the data that operators ought to be able to produce from their FDAP and with agreement share – there are potentially many other areas beyond these that could be considered to gain a further understanding of safety risks.

8.2.2 A pre-audit questionnaire **Form: O-OPS 012** enables an operator to provide a useful overview of their Programme for the audit. Furthermore, experience has

shown that the completion has helped operators review and, in some cases, improve their FDAP by clarifying critical components.

8.2.3 The Operations Inspector, after reviewing the completed questionnaire, conducts a physical audit and focuses on any perceived deficiencies and the integration and use of FDAP within the operator's Safety Management System.

8.2.4 Additionally, through this process, the Operations Inspector has to assess the implementation and effectiveness of the operators' FDAP as a national safety performance indicator. For example, scales of the maturity, effectiveness and innovation of each operator's Programme.

8.2.5 The operator shall attach with the questionnaire **Form: O-OPS 012** theFDAP data summary **Form: O-OPS 012A** to provide information relating to its ability to analyse output from the FDAP. As de-identified information, this can form a useful overview of national safety performance.

8.3 THE ROLE OF THE OPERATIONS INSPECTORS

8.3.1 Flight Operations Inspectors and other Inspecting Officers will use Checklist **CL: O-OPS 043** to evaluate **FORM: O-OPS 012** and Flight Data Summary based on the format in **FORM: O-OPS 012A** completed by the operator and submitted to the Authority.

8.3.2 An important feature of the NCAA's safety assurance process is the Inspector's expertise and judgement, based partly on professional aviation experience and also through training, when assessing an operator. The use of the pre-audit questionnaire **(Form: O-OPS 012)** would further aid their understanding of a particular operation and of the operator's competence in this area.

8.3.3 Due to the importance of FDAP the NCAA will ensure that it's Operations Inspectors receive training on FDAP implementation and oversight as a pre-requisite for FDAP audit / inspection.

8.3.4 The Operations Inspector checks that the operators' FDAP is run properly and fully integrated with the other information sources.

8.3.5 The Operations Inspector checks that the operators' FDAP provide rational evidence of the level of risk and how much the operator has control over its risks. FDAP assessment will provide a key indication of the status of the operator's SMS.

8.3.6 The Operations Inspector will generate and submit Reports of FDAP audits/inspections. Deficiencies observed shall be communicated to the operator concerned with corrective actions required and target dates. Follow-up audit/inspection shall be carried out (if necessary) to ensure proper closure of gaps identified.

APPENDIX A

TERMS, DEFINITIONS AND ABBREVIATIONS

1) DEFINITIONS

Accident	An unintended event or sequence of events that cause death injury, environmental or material damage.
FDA Event/Exceedence	Circumstances detected by an algorithm looking at FDR data.
FDA Parameter	Analysis Measurements taken from every flight e.g. maximum g at landing.
Hazard	A physical situation, often following from some initiating event that can lead to an accident.
Incident	An occurrence, other than an accident, associated with the operation of an aircraft that affects or could affect the safety of operation.
Level of Safety	A level of how far safety is to be pursued in a given context, assessed with reference to an acceptable risk, based on the current values of society.
Qualitative	Those analytical processes that assess system and aeroplane safety in a subjective, non-numerical manner.
Quantitative	Those analytical processes that apply mathematical methods to assess system and aeroplane safety.
Risk	Is the combination of the probability, or frequency of occurrence of a defined hazard and the magnitude of the consequences of the occurrence.
Risk Assessment	Assessment of the system or component to establish that the achieved risk level is lower than or equal to the tolerable risk level.
Safety Assessment	A systematic, comprehensive evaluation of an implemented system to show that the safety requirements are met.
Safety Objective	A safety objective is a planned and considered goal that has been set by a design or project authority.

Safety Policy	Defines the fundamental approach to managing safety and that is to be adopted within an organisation and its commitment to achieving safety.
Severity	The potential consequences of a hazard.
System	A combination of physical components, procedures and human resources organised to achieve a function.
Validation	The process of determining that the requirements are the correctrequirements and that they are complete.
Verification	The evaluation of the results of a process to ensure correctness and consistency with respect to the inputs and standards provided to that process.

2) ABBREVIATIONS

ACARS	Aircraft Communication Addressing Reporting System
ADS	Air Data System - computer interface between aircraft systems and Instrumentation/FDR
AGL	Above Ground Level - measured by aircraft's radio altimeter
APMS	Aviation Performance Measuring System - NASA's advanced FDR analysis tool set
AQP	Advanced Qualification Programme – relates training to operational experience
ASR	Air Safety Report - (normally) aircrew report on a safety incident
ALPA	Airline Pilots Association
ATQP	Alternative Training and Qualification Programme
CAADRP	Civil Airworthiness Data Recording Programme
C of A	Certificate of Airworthiness
DFDR	Digital Flight Data Recorder - normally the crash recorder
DPA	Data Protection Act
EFIS	Electronic Flight Instrument System
EGT	Exhaust Gas Temperature
FDAP	Flight Data Analysis Programme
FDR	Flight Data Recorder - normally the crash recorder

FLIDRAS	Teledyne FDA analysis software
FMC	Flight Management Computer - aircraft system control computer
FMS	Flight Management System - aircraft control system
FOQA	Flight Operational Quality Assurance - FAA's term for flight data Analysis and its systematic use as a quality and safety monitor.
FSO	Flight Safety Officer - investigates incident reports and promotes safety
GRAF	Ground Replay and Analysis Facility – Teledyne Controls - Flight Data Company - FDR data replay and analysis software
MEL	Minimum Equipment List
MORS	Mandatory Occurrence Reporting System
MQAR	Mini Quick Access Recorder
OQAR	Optical Quick Access Recorder
PCMCIA	Personal Computer Miniature Computer Interface Adaptor – credit card size PC interfaces - Disk storage versions used for QAR recording mediums
PQAR	PCMCIA Quick Access Recorder
QA	Quality Assurance
QAR	Quick Access Recorder - secondary recorder with a removable recording medium - traditionally tape, now moving towards Optical Disk or solid state
SFB	Specific Fuel Burn
SID	Standard Instrument Departure
SDCPS	Safety Data Collection and Processing System
SSDFDR	Solid State Digital Flight Data Recorder
TCAS	Traffic Alert and Collision Avoidance System
UFDR	Universal Flight Data Recorder - Sundstrand/Allied Signal crash recorder
UNS	User Needs Study - Research study into the application of FDR data within an operator
WQAR	Wireless Quick Access Recorder

APPENDIX B

FDAP EVENT SET

Example of FDAP Event Set

These operational events are typical of those found in most software packages. FDAP event sets can be tailored to the specific requirements of the operator and can be expanded with the maturity of the Programme.

Event Group	Description
Rejected take-off	High speed rejected take-off
Take-off pitch	Pitch rate high on take-off Pitch attitude high during take-off
Unstick speeds	Unstick speed high Unstick speed low
Height loss in climb-out	Initial climb height loss 20 feet AGL to 400 feet AGL Initial climb height loss 400 feet to 1500 feet AGL
Slow climb-out	Excessive time to 1000 feet AAL after take-off
Climb-out speeds	Climb out speed high below 400 feet AAL Climb out speed high 400 AAL to 1000 feet AAL Climb out speed low 35 feet AGL to 400 feet AAL Climb out speed low 400 feet AAL to 1500 feet AAL
High rate of descent	High rate of descent below 2000 feet AGL
Go-around	Go-around below 1000 feet AAL Go-around above 1000 feet AAL
Low approach9	Low on approach
Glideslope	Deviation under glideslope Deviation above glideslope (below 600 feet AGL)
Approach power	Low power on approach
Approach speeds	Approach speed high within 90 secs of touchdown Approach speed high below 500 feet AAL Approach speed high below 50 feet AGL Approach speed low within two minutes of touchdown
Landing flaps	Late land flap (not in position below 500 feet AAL) Reduced flap landing Flap load relief system operation

Landing pitch	Pitch attitude high on landing Pitch attitude low on landing
Bank angles	Excessive bank below 100 feet AGL Excessive bank 100 feet AGL to 500 feet AAL Excessive bank above 500 feet AGL Excessive bank near ground (below 20 feet AGL)
Normal acceleration	High normal acceleration on ground High normal acceleration in flight flaps up (+/- increment) High normal acceleration in flight flaps down (+/- increment) High normal acceleration at landing
Abnormal configuration	Take-off configuration warning Early configuration change after take-off (flap) Speed brake with flap Speed brake on approach below 800 feet AAL Speed brake not armed below 800 feet AAL
Ground proximity warning	GPWS operation – hard warning GPWS operation – soft warning GPWS operation – windshear warning GPWS operation – false warning
TCAS warning	TCAS operation - RA
Margin to stall/buffet	Stick shake False stick shake Reduce lift margin except near ground Reduce lift margin at take-off Low buffet margin (above 20000 feet)
Flight Manual Limitations	V_{MO} exceedence M_{MO} exceedence Flap placard speed exceedence Gear down speed exceedence Gear selection up/down speed exceedence Flap/slat altitude exceedence Maximum operating altitude exceedence